

Hornsea Project Three
Offshore Wind Farm



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Appendix 1 to Deadline 8 submission - Applicant's Comments
on Natural England's response to the Rule 17 (REP7-064)

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Front cover picture: Kite surfer near a UK offshore wind farm © Ørsted Hornsea Project Three (UK) Ltd., 2019.

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1. Introduction

1.1 Following a submission of responses to Further ExA questions (Rule 17) by Natural England at Deadline 7, the Applicant has taken the opportunity to provide comments that are set out within this document below.

2. Applicant’s Comments on Natural England’s response to the Rule 17 questions (REP7-064) submitted at Deadline 7

Ref	ExA Question	Natural England’s Response	Applicant’s Comments
Statements of Common Ground			
F2.1	Written questions Q2.2.1 and Q2.2.37 requested the submission of agreed Statements of Common Ground for benthic ecology and offshore ornithology by D6. Please submit these statements using the required headings noting any areas where there will be no agreement.	<p>Natural England provided updated comments to the applicant on both Benthic and Ornithology Statements of comment Ground prior to Deadline 6. We have also held discussions with the Applicant and provided subsequent comments since this time</p> <p>In Natural England’s view there have been versions of these documents that could have been submitted at each deadline as an indication of our progress, however, as these documents are owned by the Applicant, it is for them to submit to Examining authority.</p> <p>The Applicant is seeking to provide SoCGs that are clear and well-structured in line with the ExA’s requests.</p>	<p>The Applicant has submitted a Statement of Common Ground with National England for Ornithology in its submission for Deadline 8. For Benthic Ecology, following discussions with Natural England, the parties have chosen to produce a Position Statement based on Natural England’s Deadline 7 submissions (REP7-065, REP7-066, REP7-070 and REP7-075). The Applicant will submit this at Deadline 9.</p>

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General Benthic Issues			
F2.2	You submitted geographical data at D4 [REP4-131, REP4-132] and an associated report by Vanstaen & Whomersley (2015) [REP4-140]. Please submit a text document that contains the justification for assigning a 500m buffer to the reef layer.	Please see “Marine Buffers” doc submitted as part of our D7 submission.	Other than the Applicant’s comments on this paper provided at Deadline 4 (Q2.2.54 at REP4-012), the Applicant has nothing further to add.
Cable Specification and Installation Plan			
F2.3	In your D6 submission [REP6-049] you state that the rock protection within MPAs would be 10% plus 25%. The ExA understands that 25% is the replenishment rate of the maximum design scenario where up to 10% of the cable route within MPAs would require protection during the lifetime of the project. If this is correct, how do you arrive at a figure of 35%? In paragraph 12 of your submission you seek clarification on the maximum	[For clarification the 35% figure was a query, and we received subsequent information from the applicant to clarify this point.] We have considered the issue of 10% vs 25% further in ANNEX C Natural England’s Deadline 7 Submission. Please note that both Natural England and the MMO believe that the 10% of cable protection should be restricted to the construction phase only. There are also some outstanding concerns/considerations in relation to the quantities relating to the 25%. Therefore, we request that should the SoS of state be minded to permit the application as is (i.e. considers there to be no AEol) the parameters of the both the 10% and the	The Applicant will be providing a Position Statement on Benthic Ecology matters, including the NNSSR SAC and WNNC SAC, which will be submitted at Deadline 9. The Applicant would direct the ExA to that document when considering these comments. The Applicant will also provide a further response on cable protection during the operation and maintenance phase at Deadline 9, in response to the ExA’s request for further information (PD-020).

Ref	ExA Question	Natural England’s Response	Applicant’s Comments
	design scenarios, can you explain your concerns more fully?	25% in both Volume, Area and length are secured in the DCO/DML so that the necessary restrictions are in place	
Cable Trenching Assessment			
F2.4	Please explain why you think that the trenching assessment [REP6-026] should consider more than the direct areas of overlap between the MPAs and the cable corridor as stated in paragraph 9 of your D6 submission [REP6-048].	Natural England has reviewed our previous comment and can confirm that there was an error on our part and we are content with the sections considered by PTA.	The Applicant welcomes the confirmation that Natural England is content with the sections considered by the PTA.
F2.5	In paragraph 7 of your D6 submission [REP6-048] you raised questions about how the insights from the trenching assessment would be implemented and incorporated into the Cable Specification and Installation Plan (CSIP). However, the Applicant appears to have set out how this would occur through liaison with an Ecological Clerk of Works and ongoing dialogue. Please explain why you do not think	Natural England recognises that the Applicant is making upfront assumptions in relation to contractor installation capabilities, before they have a contractor on board. It is recognised that not all contractors will be able to deliver all requirements. Therefore we are seeking assurances on how the applicant will ensure the contractor can deliver on the ground what they are committing to now i.e. is the applicant committing themselves to have a contract tender/s for the work that specifies any particular requirements/tools to achieve desired outcomes	One of the aims of the post consent consultation outlined in the outline CSIP is to identify risks to successful cables burial (including, but not limited to ground conditions) and discuss and agree the approach to minimising these with the MMO and SNCBs. The Applicant expects that by engaging proactively with SNCBs and ensuring SNCB concerns are properly and explicitly expressed during the tendering process (i.e. in tender documents) this will ensure contractors are aware of the sensitivities regarding cabling within designated sites and take appropriate action to maximise the burial potential, when tendering. The Applicant has full confidence that contractors will be able to install cables within the limits of the maximum

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	<p>that this would be adequate. What specific measures do you suggest?</p>		<p>design parameters assessed within the ES and RIAA, as the project envelope has been designed based on the Applicant’s extensive experience of offshore wind farm construction and cable installation in the UK and overseas.</p> <p>In conclusion, the Applicant would also note that it will be required to comply with the maximum design scenarios assessed in the RIAA for each designated site and as secured within the DCO and as set out for each designated site within the outline CSIP (REP7-021). This requirement will be passed on through to contractors and therefore any contractors appointed as part of Hornsea Three construction, operation and maintenance and decommissioning, would be contractually obliged to comply with the limits of the DCO and associated post consent plans, including the CSIP, which themselves will be approved by the MMO prior to construction.</p>
F2.6	<p>You note in paragraph 10 of your D6 submission [REP6-048] that the Applicant hasn’t considered mixed sediments. The ExA notes that they are not listed in table 4.2. Do you have any further clarification from your geologist to be able to elaborate on this point? Do you have any further comments on</p>	<p>Please refer to ANNEX A of our D7 submission where we have provided further advice on REP5 - 10.</p> <p>Our Stratigrapher has raised some concerns in relation to the adequacy the ground model particularly in relation to coverage, lithologies, and Ground models (section 3), but is unfortunately without more evidence from the Applicant we are unable to provide further advice in relation to mixed sediment.</p>	<p>The Applicant’s Comments on Natural England’s Annex A Further Advice on REP5-010 Preliminary Trenching Assessment (REP7-074) are presented in a separate table below</p> <p>As per previous submissions during the examination phase (e.g. Applicant’s response to NE original comments on Preliminary Trenching Assessment; REP7-007) the Applicant has carefully considered the implications of installing cables within the mixed or coarse sediments present along the offshore cable</p>

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	the adequacy of the ground model?	As a sub feature of Annex I sandbanks it is highly probable that this features will be regularly found along the cable route. Mixed sediment have proven to be challenging for cable installation for other projects and therefore It would be helpful for the Applicant to consider this further.	corridor and its experience is that this will not pose a particular difficulty to cable installation.
F2.7	Please explain how seeing the detail of the geotechnical surveys undertaken in 2018 within the Wash and North Norfolk Coast Special Area of Conservation, as set out in paragraph 13 of your D6 submission [REP6-048], would inform your views and help the examination at this stage?	As with other thematic areas such as Ornithology having sight of the survey data can often help us formulate our own views on what the data shows and enable us to have a better understanding on what the applicant has based their assessment on. It would hopefully provide a greater degree of confidence in the findings of the PTA.	The Applicant’s considers that the conclusions and implications of the Preliminary Trenching Assessment are clear and readily understandable.
F2.8	Please elaborate on the point you made about Edmond Ground in paragraph 15 of your D6 submission [REP6-048]. How does this relate to potential impacts on site integrity.	Please see sections 1 and 3 of ANNEX A of Natural Deadline 7 submission.	The Applicant’s Comments on Natural England’s Annex A Further Advice on REP5-010 Preliminary Trenching Assessment (REP7-074) are presented in a separate table below.
F2.9	You have suggested in paragraph 16 of your D6 submission [REP6-048] that the Applicant might not be able to	Please see Further comments on REP5-010 submitted at Deadline 7. (Annex A) Please note that the Applicant themselves have identified that outcropping stiff clay is particularly challenging to	The Applicant’s Comments on Natural England’s Annex A Further Advice on REP5-010 Preliminary Trenching Assessment (REP7-074) are presented in a separate table below.

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	<p>trench through Boulder’s Bank because of the stiff clay. This contradicts the applicant’s tool assessment which highlights two viable trenching options. What technical evidence or direct engineering experience have you drawn upon to suggest that either mechanical trenchers or cable ploughs would be unsuitable under these circumstances? What are JNCCs views and how are they informed by direct engineering knowledge of the equipment that would be used? If cable trenching has been unsuccessful elsewhere was the trenching equipment the same in all respects as the equipment that would be used in this project?</p>	<p>install cable through, citing one advantage of the alternative route through The Wash and Norfolk Coast SAC away from Cromer Shoal Chalk Beds MCZ is avoiding known outcropping clay within the MCZ.</p> <p>Whilst Natural England’s Stratigrapher has also highlighted the challenges of this sediment, we do not have sufficient engineering knowledge of the specific equipment and or evidence presented in the PTA to comment on the unsuitability of the equipment.</p> <p>Whilst both Natural England and JNCC are aware that stiff clay was a challenge this awareness is derived from industry who have cited challenges with stiff clay as justification to progress alternative installation options which avoid those areas. We are also aware that both Sheringham Shoal and Humber Gateway OWFs have cut through stiff clay in the near shore area some of which is part of the boulder bank formation there is no evidence to demonstrate how analogous that is to stiff clay formations in the offshore environment.</p> <p>And whilst we know that cutting tools were required for those two projects, we do not have sufficient information on the schematics of the tools to make a direct comparison of the equipment presented in the PTA and/or evidence of the</p>	<p>The Applicant would like to clarify that the reason outcropping clay was a key factor in the decision to re-route the offshore cable corridor to avoid the Cromer Shoal Chalk Beds MCZ, was due to these being a protected habitat features of the MCZ (i.e. Peat and Clay Exposures). These habitats have considerably reduced recovery potential following cable installation and therefore the rationale for decision to re-route was not an engineering concern, but driven by the impacts on the sensitive communities associated with clay exposures.</p> <p>The presence of clay exposures do not present a specific challenge to cable installation, as demonstrated by Humber Gateway which successfully installed cables through clay exposures on the Holderness coast.</p> <p>It is noted that in response to this question Natural England has no detailed knowledge of any difficulties it says have been encountered elsewhere and has provided no actual evidence for its contention that trenching through stiff clay would not be possible.</p>

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		<p>impacts of using said tools on designated site features as either outside of a site or monitoring not undertaken. In addition as set out in question F.2.5 The PTA sets out known tools on the market that could undertake the work to the desired outcome. But as with all equipment some manufactures and models are better than others at achieving the desired outcome.</p>	
F2.10	<p>You queried the consistency of the chalk in paragraphs 19 and 21 of your D6 submission [REP6-048]. What, if anything, do you infer from the fact that all of the sample cores readily penetrated the chalk up to a depth of 6m? If there was no impedance why would a mechanical trencher not work under these circumstances?</p>	<p>Please see “NE’s Further Advice on PTA” section 2 submitted at deadline 7 in relation to the chalk. Natural England acknowledges that a trencher could work in these habitats as Sheringham Shoal used similar. However, the scale of the impact remains unknown. But we remain cautious because similar CPT tests were undertaken prior to construction for other projects only for the installation tool to fail in burying to the optimum depth. Is this because the wrong tool was chosen/used for the job? Or is it a compromise between repeatedly switching between tools and potential requirement for cable protection therefore choosing a suboptimal tool for one particular habitat in favour for one that is more of a generalist that can install in most habitats.</p>	<p>As outlined in previous submissions and within the Preliminary Trenching Assessment, there are a range of reasons why cable protection may be required and these are not limited simply to ground conditions (see paragraph 4.10 of REP7-009).</p>
Cable protection Decommissioning			

Ref	ExA Question	Natural England’s Response	Applicant’s Comments
F2.11	<p>The Rock Protection Decommissioning Report submitted at D6 [REP6-018] states that rock protection measures could be removed either with a Trailing Suction Hopper or a Backhoe Dredger. If up to 30cm of seabed was removed, would you still conclude that the removal of the rock protection would lead to the permanent loss of interest features? Would this conclusion apply equally to all features or would some have a greater potential for recovery? If so, which ones? Do you have any other comments to make regarding this report?</p>	<p>Please see section 7 ANNEX C of our D7 submission which provides our advice on the limitations of REP6 – 018. Natural England remains of the view that removal of 30cm of annex I feature below the rock armouring would be a permanent habitat loss. The Annex I habitat that has the greatest potential for recovery is Annex I Sandbanks, but not where there are mixed and coarse sediment sub features. Natural England is of a view that for all other features an AEoI can’t be ruled out.</p>	<p>See the Applicant’s Deadline 7 submissions relating to recovery of sediments and communities following extraction (paragraphs 4.27 to 4.30 of REP7-009).</p>
F2.12	<p>The Applicant has highlighted the fact that some studies suggest a greater frequency of rocky habitats previously occurred in the North Sea and that significant infaunal and epifaunal communities, including sabbelariid reefs, can</p>	<p>Please ANNEX B of our D7 submission in which Natural England presents our advice on colonisation of Sabellaria spinulosa on rock armouring. Please note that whilst we don’t disagree that the North Sea may have looked very different in the past. The habitats Regulations requirements is to protect the interest features of</p>	<p>The Applicant has nothing further to add on this point.</p>

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	develop on rock berms [REP1-138]. What are your views? Could the rock protection lead to ‘no net loss’ of biodiversity in its broader sense? What would be the consequences of removing rock protection under those circumstances?	the sites at the time of designation. Therefore, our advice remains unchanged.	
F2.13	In your D6 response [REP6-055] you state that you would welcome the inclusion of a commitment to remove rock protection in the dDCO but you then go on to state that it no longer provides mitigation and that you have significant concerns over its effectiveness. Why would a condition be justified if it would not provide the necessary mitigation?	Natural England welcomes any commitment to minimise the impacts the impacts of a project. Natural England has previously considered the removal of cable protection as mitigation as the impacts would be ‘long lasting, but temporary’ (Dogger Bank Creyke Beck 2014 and Dogger Bank Teesside 2015). However as set out in our Deadline 1 response we no longer have the confidence that decommissioning can occur and if it can that there wouldn’t be wider impacts to the features as a result i.e. permanent removal of the interest feature.	See the Applicant’s Deadline 7 submissions on this point (paragraphs 4.25 to 4.32 of REP7-009).
North Norfolk Sandbanks and Saturn Reef Special Area of Conservation			
F2.14	You referred to a ‘standard set of analyses’ in your D6 response [REP6-47] to a D4 submission [REP4-097]. Please indicate where this standard has	The SNCBs advice to all developers and marine industries on best practice/standard set of analyses are based on our <i>ongoing</i> consideration of casework and assessment that have been undertaken and all relevant peer reviewed	The Applicant is pleased to note that Natural England acknowledge the approach taken by the Applicant is not incorrect and there is more than one way to analysis of benthic data.

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	<p>been established, whether it has been subject to peer review in an academic journal and the extent to which benthic researchers apply the analysis you favour in the peer reviewed literature. If there is more than one accepted way to analyse benthic data why is the approach used by the Applicant unacceptable?</p>	<p>guidance that is out there (best available evidence). And yes these are subject to change as knowledge and understanding evolves. Therefore we are not necessarily saying the applicant is incorrect in their approach, but we are trying to ensure that the competent authorities can undertake an equitable in- combination assessment i.e. comparing apples with apples and the only way to do this is to undertake standard analysis to provide a common currency. The applicant figures could then be used by the competent authority (if considered appropriate) to inform the level of confidence or risk around standard analysis figures.</p>	<p>The approach taken to the Hornsea Three in-combination assessments (e.g. see section 5.9 of the RIAA; APP-051) has been to consider such effects at an Annex I feature level, rather than at the level of biotope. As such, the ‘common currency’ used is the Annex I features and sub-features, following the conservation objectives of the relevant SAC.</p> <p>In light of Natural England's response, the Applicant remains content that the approach taken in the analysis of benthic datasets and biotope classification is robust and in line with best practice guidelines.</p>
F2.15	<p>In your D6 response [REP6-47] you stated that the methodology used by the Applicant, which includes the techniques highlighted in Jenkins et al. (2015), was not ‘scientifically rigorous’. Could you explain why you consider this to be the case and whether this was related to the sampling strategy, sample processing, measurements or the processing of the resulting data? In your view, what should</p>	<p>Natural England has provided the Examiner at D7 with a copy of a JNCC report on undertaking surveys within MPAs. This is provided to help demonstrate the expected survey design and effort required when trying to determine the scale of the impacts and possible mitigation measures required for sustainable development in SACs. Short of doing further surveys, it is our opinion there is nothing that the Applicant can do at this time to address the survey shortfall and therefore their remains scientific doubt. And whilst any preconstruction survey could provide that rigour it doesn't address our current uncertainties.</p>	<p>Guidelines provided by NE at Deadline 7 (REP7-072) have not previously been brought to the Applicant’s attention during pre-application consultation or during examination. It is also not clear how relevant these are, as they primarily relate to monitoring and not to characterisation surveys or biotope classification. The Applicant would note that the scope of characterisation surveys and data analysis were discussed throughout the Evidence Plan, via the Expert Working Group meetings (see the Position Statement on Benthic Ecology matters to be submitted at Deadline 9 for further detail).</p>

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	have been done differently and why?		
The Wash and North Norfolk Coast			
F2.16	<p>You raised a number of concerns in your D6 submission [REP6-051] in relation to the revised in combination assessment for this site [REP3-024]. You noted that the assessment did not include Race Bank or explicitly consider permanent loss from cable protection. Please explain these comments in more detail bearing in mind, among other things, the content of section 3 and table 3-1 of [REP3-024]. You have also noted a failure to consider the ‘Large Shallow Inlet and Bay’ feature. What did your own data from the MAGIC website show? If there was no overlap with the cable export corridor why should it be considered in the assessment?</p>	<p>The details behind the figures included in table 3.1 have not explicitly been included, therefore we are unable to collaborate any figures presented here. Please also note that discussions in relation to Race Bank cable protection are ongoing and currently we are unable to advise that an adverse effect on integrity could be ruled out alone.</p> <p>Whilst MAGIC provide a boundary for the Large Shallow Inlet and Bay Feature the conservation advice packages and objectives for The Wash and North Norfolk Coast doesn’t make the same distinction. Therefore we don’t believe that it was appropriate to screen this feature out at the tLSE stage, but recognise that an argument could be put forward to demonstrate why there is unlikely to be an AEol.</p>	<p>The full details behind the figures included in Table 3.1 are set out in paragraph 3.5 of REP3-024 for Hornsea Three, i.e. all cable protection placed in each of the sub-features. Details behind the Race Bank numbers are set out in the Supporting Environmental Information for the relevant Marine Licence Application (which NE is currently considering as part of that marine licence application).</p> <p>Ørsted (2018) Race Bank Offshore Wind Farm. Remedial Cable Burial in the Wash: Supporting Environmental Information. Ref: 2985I&BRP1808171547.</p> <p>With reference to the Large Shallow Inlets and Bays feature, the Applicant’s position is that there is no interaction between Hornsea Three and this feature (see Table 2.1 and Figure 2.1 of REP7-006). Furthermore, it is noted that Natural England is not suggesting there is a possibility of any AEol.</p>
Cromer Shoal Chalk Beds Marine Conservation Zone (MCZ)			

Ref	ExA Question	Natural England’s Response	Applicant’s Comments
F2.17	<p>In your D6 submission [REP6-050] you recommend further discussions with relevant parties over Measures of Equivalent Environmental Benefit (MEEB). Section 126(5) of the Marine & Coastal Access Act (2009) states that authorisation should not be granted where harm might be caused unless three tests are met which includes arrangements for MEEB. Section 126(9) requires an authority to attach conditions to an authorisation in order to secure MEEB. As a consequence, and given your unresolved concerns, is it the case that consent cannot be granted for the proposal unless MEEB are secured through the dDCO? If this is the case then what would be your advice to the SoS?</p>	<p>If the SoS were to conclude that the impacts on the MCZ were significant and that MEEB are required, we would recommend that further Advice is sought from Defra on the status of the designation (noting that we do not yet have a timetable for the decision on tranche 3 sites) and for further guidance in relation to MEEB. As highlighted in our D6 [REP6-050], there is currently no formal guidance on MEEB, consequently we would we would recommend that discussions relating to MEEB (should the need arise) include input from the SNCBs, Regulatory Agencies (i.e. MMO and BEIS) and Defra.</p> <p>[It should be noted that the applicant has concluded that the impacts are not significant]. The Applicant has not provided information in their application or additional submissions that allows Natural England to understand and advise the potential significance of impacts to the designated features at this stage. Natural England hopes to explore this matter with the applicant over the coming week, with a view to informing our SoCG with the Applicant.”</p>	<p>The Applicant will be providing a Position Statement on the Cromer Shoal Chalk Beds MCZ to be submitted at Deadline 9 and would direct the ExA to that document when considering these comments from NE.</p>
Markham’s Triangle pMCZ			
F2.18	<p>Do you consider that the proposed reduction in the</p>	<p>Natural England’s understanding is that the commitment to reduce the Maximum Design</p>	<p>The Applicant will be providing a Position Statement on Markham’s Triangle pMCZ to be submitted at Deadline 9</p>

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	maximum design envelope within Markham’s Triangle and removal of cable/scour protection would reduce the risk of hindering the conservation objectives to an acceptable level at this site? If this is not the case, do you also advise that MEEB should be secured for this site?	<p>scenario from 24% overlap with the pMCZ to 10.5% is secured within the dDCO/DML.</p> <p>Obviously, the reduction of infrastructure in the site would intuitively reduce the overall footprint of impact within the site. However, as explained further in NE’s Deadline 7 Submission “Summary of Advice on Markham’s Triangle pMCZ” NE/JNCC would require further information before we could comment on the likely significance of the impact on each feature of the site.</p> <p>It should also be noted that NE would consider cable/scour protection would constitute a permanent impact on the site.</p>	and would direct the ExA to that document when considering these comments from NE.
F2.20	If Markham’s Triangle is designated as an MCZ before the SoS determines the application, is it the case that consent cannot be granted for the proposal unless MEEB are secured through the dDCO? If this is the case then what would be your advice to the SoS?	As Markham’s Triangle is a pMCZ it is a material consideration and therefore should be treated in the same way as a designated MCZ.	The Applicant has nothing further to add, although the Applicant intends to address legal matters in its closing summary.
F2.21	In your D4 response [REP1-131] you raised concerns over inconsistencies in biotope classification compared to Sotheran et al. (2017). Given	Whilst NE and JNCC would be happy to answer this question in detail, we would first direct the ExA to consider NE’s Deadline 7 Submission: Summary of Advice on Markham’s Triangle pMCZ. Should	The Applicant notes that section 2.1: Baseline Characterisation of REP7-073 acknowledges that there is sufficient information to characterise the broadscale

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	<p>that the majority of samples were in the eastern part of Markham’s Triangle, away from the array area, how can this survey be considered representative and why do the inconsistencies matter? Whilst some samples indicated a different biotope in the western area, the Applicant considers that there would be no significant difference in recoverability given the similarity to what was identified in their own analysis [REP5-008]. How do you respond? Sotheran et al. (2017) states that ‘biotope allocation can be subjective and dependent on the opinion of the analyst’. If there is no objective method of assigning biotopes could the differences not simply be the result of subjective similarity thresholds that were used in the cluster analysis?</p>	<p>the ExA have any further Questions we would be happy to provide further comment.</p>	<p>habitat features for the purposes of the MCZ Assessment.</p>
F2.22	<p>In your D4 response [REP1-131] you stated that the applicant has not undertaken</p>	<p>Please note, Natural England has provided a summary of our position on Markham’s Triangle pMCZ, and Cromer Shoal Chalk Beds MCZ with</p>	<p>The Applicant will be providing a Position Statement on Cromer Shoal Chalk Beds MCZ and Markham’s Triangle pMCZ to be submitted at Deadline 9 and would direct the</p>

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	<p>MCZ assessments in a way that allows the best scientific understanding of the potential impacts. Can you be more specific about what, in your view, needs to be done to enable the impacts to be more clearly understood for both Markham’s Triangle and Cromer Shoal Chalk Beds?</p>	<p>our Deadline 7 submission. Natural England hopes to explore this matter with the applicant over the coming week, with a view to informing our SoCG with the Applicant.</p>	<p>ExA to that document when considering these comments from NE.</p>
<p>Cumulative Benthic Effects</p>			
<p>F2.23</p>	<p>In your D4 response [REP4-130] you stated that repetitive impacts on the same benthic footprints had not been adequately considered between different stages of installation and under a phased scenario. The Applicant disputes your position and has stated that no recovery was assumed between different phases of installation [REP1- 178] and that the approach to assessing cumulative impacts was no different to other projects [ERP4-012]. In the light of these</p>	<p>Natural England notes that in [REP - 178] the applicant has not anticipated that recovery will happen between both the different construction stages and the phased builds. Therefore any Appropriate Assessment would need to take into account both the spatial and temporal impact to the interest feature/s of the site. As there could 13 years of impact before the site would start to recover and up to 18 before full recovery could occur unless cable protection was used when we believe there would be a permanent habitat change.</p> <p>Therefore we can confirm that we do not believe the cumulative impact is flawed, it is more a recognition of the temporal scale of the impacts.</p>	<p>The Applicant is pleased to note that Natural England is now satisfied that the cumulative assessment is not flawed and that it considers the interaction between different phases of Hornsea Three.</p> <p>However, it is not correct to state that there could be 13 years of impact before the site would start to recover; as set out in REP1-178, once the cable is successfully installed in an area of seabed, this area would not be further disturbed and recovery would commence immediately.</p> <p>While the construction phase may last up to eight years in total (potentially over two phases), the total duration of cable installation along the offshore cable corridor (including the NNSSR SAC) would only be up to three years (bearing in mind the point above that cable installation occurs progressively so not all parts of the</p>

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	comments what are your outstanding concerns and are they sufficient to conclude that the cumulative impact assessments are flawed? If so, please suggest how this should be remedied..		site are impacted at one time or continuously throughout that 3 year period). Even in a two phase construction scenario, areas affected by the first phase would have at least partly recovered while the second phase cable installation is occurring. As such the scenario described by Natural England is not accurate.
Marine mammal site integrity plan			
F2.24	You stated at ISH5 [REP6-055] that you were awaiting general guidance on Site Integrity Plans (SIP) from BEIS and the MMO as part of the Review of Consents. Do you have any further information?	BEIS/MMO conducted a second consultation on what the SIP will include. Natural England have responded, but still have concerns that there is no mechanism for the review and oversight of multiple SIPs.	The Applicant has no further comments to make on this issue given NE's response to F2.25 below.
F2.25	You stated at ISH5 [REP6-055] that you required a mechanism to enable regulators to consider the impact of multiple SIPs occurring over varying timescales and that procedural elements need to be in place to ensure noise generating activities do not happen at once. Do you have any suggestions about how this could be	Natural England consider that the current requirement within the dDCO for a SIP to be produced and signed off by the MMO (in consultation with the SNCBs) prior to construction commencing, would be sufficient to address the AEol issue. The point Natural England seeking to raise is that in order for the SIP to be signed off, it would need to be demonstrated that there would not be an adverse effect on site integrity in combination. This would require consideration of multiple SIPs over	The Applicant welcomes agreement from NE that appropriate control measures (in the form of the SIP commitment) are in place to ensure no AEol.

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	achieved bearing in mind the legal scope of the dDCO?	different timescales, and as yet there is no mechanism in place for this which would presents a potential risk to the project (rather than the harbour porpoise) down the line.	
Ornithological Collision Risk Model			
F2.26	<p>The Applicant submitted a revised Collision Risk Model (CRM) analysis at D6 that includes your recommended parameters [REP6-043]. Leaving aside the baseline data issue, please can you indicate precisely which aspects of this analysis accord with your original recommendation and how any relevant results would alter the baseline mortality estimates for gannet and kittiwake, as set out in tables 7.13 and 7.17 of [APP-051] and tables 5.26 and 5.27 of [APP-065]. Please address whether the apportioning outside the core breeding season is realistic and give a reasoned justification for your conclusion. In your D1 submission [REP1-211] you</p>	<p>Applicant’s revised collision risk modelling Natural England has provided precise information on the aspects of REP6-043 that accord with our advice in the Table 1 below and in ANNEX E of our D7 submission, including how these affect the annual mortality relative to the baseline mortality for gannet and kittiwake for comparison with information presented by the Applicant as set out in tables 7.13 and 7.17 of [APP-051] and tables 5.26 and 5.27 of [APP-065] and associated text.</p> <p>Apportioning outside the core breeding season. Birds are apportioned to individual SPAs throughout the year – outside the breeding season the standard approach is to refer to Furness (2015 - REP4-036) and derive proportions from this. The approach set out in Furness (2015) defines seasonal ‘biologically defined minimum population sizes – (BDMPS), and calculates what proportion a particular SPA population constitutes of this BDMPS. (e.g. 4.8% of the total gannet population estimated to be in the North Sea in the post</p>	<p>In our experience it is unusual to apportion 100% of adult birds to SPAs during the breeding season. It is generally accepted that ‘adult type’ birds observed in offshore locations comprise, in addition to breeding birds associated with a specific colony, sub-adult birds (particularly in the case of kittiwake) and non-breeding adult birds. Reflecting this understanding, apportioning rates much lower than 100% have been applied and accepted in the assessments undertaken for, for example, Dogger Bank Creyke Beck A&B, Dogger Bank Teesside A&B, East Anglia One, East Anglia Three, Hornsea Project One, Hornsea Project Two projects and multiple projects in Scotland.</p> <p>The approach to deriving appropriate apportioning rates at Hornsea Three is entirely consistent with the approach taken at other wind farms, most notably Hornsea Two, where Natural England were in agreement.</p> <p>The Applicant has provided responses in relation to the appropriate seasonal definitions to apply in assessments throughout the application and examination and therefore disagrees with the points raised by Natural England. Natural England continue to concentrate on the</p>

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	<p>recommend the use of Option 2 but do not specify which generic height data should be used. Please indicate your preferred choice. Please also submit a table showing what CRM parameters you feel should be applied to each species and the publications that justify each of your choices, these should include: proportion flying at risk height, windfarm latitude, nocturnal activity factor, flight speed (m/sec), wing span (m), bird length (m), flight style, proportion of upwind flights, avoidance rate for the basic model and avoidance rate for the extended model.</p>	<p>breeding season are estimated to be adults that breed at FFC SPA) During the breeding season the approach in the past (if only one breeding colony is within foraging range) has been to assume either that 100% of birds are apportioned or that 100% of adults are connected (and hence apportioned) to the colony in question. As NE have explained in our response to the first Ex A (REP1-212 Q1.2.51) and in our written representation (REP1-211, Section 7.9-7.15), the outcome of defining a ‘core’ breeding season (i.e. excluding ‘non-core’ early/late breeding season months) is that a very low number of birds are apportioned to the colony in the ‘non-core’ breeding season months .As an example, in the case of Gannet the applicant has defined the ‘core’ breeding season as April – August. In August somewhere between 40-60+% of birds are apportioned to FFC SPA (depending on the data set used to inform the % of adults observed – in the case of Gannets adults can be aged, so there is no reason to think that immatures are included in this figure). In September, FFC SPA reserve managers/researchers observe substantial numbers of birds to still be present at the breeding colony,(RSPB, pers com, Langston et al 2012) however only 4.8% of birds observed at the project site would be apportioned to FFC. We do not consider this approach to apportioning in the ‘non</p>	<p>occurrence of birds at a colony located 150 km away from Hornsea Three and do not discuss the likelihood of occurrence of migrating/dispersing birds and immature and non-breeding birds which, in September are likely to represent a significant proportion of the population of birds present at Hornsea Three due to the large populations from which these birds derive.</p> <p>The Applicant has presented information in APP-053 which highlights why the apportioning values used by the Applicant (and by implication Natural England) are likely to be over-estimates with the most pertinent of these the information presented in Cleasby et al. (2018) and Langston et al. (2013).</p>

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		<p>core’ breeding months to be a realistic, and more specifically we consider this approach to lead to an underestimation of impact at the SPA in question (FFC) which is contrary to the precautionary principle. The most data driven approach is to assume that all adults observed during the full breeding season (‘core and non ‘core) are apportioned to FFC SPA based on the proportion of adults at the project site (admittedly, for kittiwake and puffin this is ‘adult-type’ birds which will contain an unknown proportion of pre-adult birds). We do not have specific data that will inform the proportion of birds that are non-FFC birds, or the proportion of immatures (in the case of puffin and kittiwake). If this approach is employed it is the case that an unknown proportion of birds will be incorrectly apportioned to FFC SPA, i.e. the impact may be over-estimated. The two approaches then, ‘core’ vs ‘full’ breeding season apportioning lead to inaccuracies – either under or over estimating the impact (respectively). However, of the two approaches, NE consider the latter is more appropriate and justifiable, it makes no assumptions in regards when the ‘core’ months might be (an aspect open to considerable debate) and establishes a precautionary baseline that can be examined via presentation of a range of lower apportioning rates. NE suggested presenting a</p>	

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		<p>range of apportioning values (in much the same way that a range of displacement and mortality effects are presented for displacement) acknowledging that there is likely to be a proportion of non-breeding adult FFC birds present, and the applicant has followed this advice and presented such a range in REP4-049 (e.g. Table 1.28 Annex C). Generic height data for use with Option 2 of the Band Model. See below table for information on the generic flight height data that Natural England advises should be used with Option 2 of the Band (2012) collision model and other CRM parameter information requested.</p>	
F2.27	<p>In your D1 response [REP1-211] you use Johnston and Cook (2016) as one of the reasons for rejecting the use of boatbased observations of flight height from earlier Hornsea projects when used in conjunction with digital aerial survey data. Why does this matter when: a) the same study shows that there was only a significant overall difference in height estimation between the two methods for gannet and Sandwich tern; and b) a</p>	<p>The issue that Natural England raised in our [REP1- 211] response related specifically to the use of flight height distributions generated from boat based observations with density data derived from digital aerial data when the Extended Band Model simple percentage of birds at collision height (PCH) measure, but uses detailed information on flight height distributions in one metre height intervals. Johnston and Cook (2016) found that for most species, the fitted distributions generated from digital aerial survey data differed from distributions previously estimated with boat survey data. The reasons for these differences were not clear and may have included different observation processes and data collection processes resulting</p>	<p>It should be noted that the Applicant is not proposing, and has not proposed at any time, the use of flight height distributions derived from boat-based surveys with the Extended version of the Band (2012) collision risk model for Hornsea Three. So, to the extent that there is any merit in Natural England’s point, it is not relevant to the assessments undertaken by the Applicant in this case.</p> <p>Contrary to Natural England’s response to the ExA Rule 17 question (REP7-064), an identical methodological approach was taken by Cook <i>et al.</i> (2018) and the surveys described in REP2-017 in the application of equipment and data processing. This includes use a LiDAR scanner synchronised with digital still cameras to measure the flight height of identified seabirds (e.g. as in</p>

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	<p>supplementary aerial survey [REP2-017] indicates that the flight heights recorded during boat-based surveys are representative of flight behaviour of birds in the array area when recorded by more accurate means.</p>	<p>in for example, differences in the accuracy of the different survey methods, analytical differences, site-specific differences, survey times in different seasons or times of day, behavioural patterns affected by the presence of boats or planes (Johnston and Cook 2016). So although Johnston and Cook (2016) found that the estimated proportion at potential collision height for the distributions derived from boat survey data and digital aerial data was similar for 5 out of 7 species, the fitted distributions that are needed for the Extended Band Model were not. In other words it is possible to have a similar value for PCH but for the fine scale distribution of flight heights to be different between datasets. As a result Johnston and Cook (2016) concluded that “if the extended Band model is used, the flight height distributions may not be transferable across platforms, i.e. distributions derived from digital aerial survey data should not be used with densities derive from boat-based surveys and vice versa.”</p> <p>Natural England do not agree that the supplementary aerial survey [REP2-017] provides evidence to prove that the flight heights recorded during boat-based surveys are representative of flight behaviour of birds in the array area. The Applicant did not test whether the flight heights</p>	<p>Cook et al 2018), as stated in section 2 <i>Aims and objectives</i> of REP2-017.</p> <p>Contrary to Natural England’s response to the ExA Rule 17 question (REP7-064) for both the studies of Cook <i>et al.</i> 2018 and REP2-017, the internal geometry (angle and distance to points) of the LiDAR dataset was analysed in order to isolate single points, or groups of points, that could be the reflections of birds in flight. This information was then used to pinpoint the location of the bird in photographs taken before and after the LiDAR pulse. The LiDAR equipment and the camera were both attached to an Inertial Measurement Unit (IMU) on board the aircraft. The IMU precisely measures acceleration in three directions to survey grade accuracy. This meant that the images from the camera could be matched to the information from the LiDAR with a high degree of accuracy. The photographs were then passed to an ornithologist for identification. In order to help identify which bird the LiDAR recorded in instances where two or more birds occurred on the same photographs, the LiDAR point(s) were projected onto the image. It should be noted that the drones used in the validation exercise conducted by Cook <i>et al.</i> (2018) were clearly detected by LiDAR.</p> <p>Contrary to Natural England’s response to the ExA Rule 17 question (REP7-064) the methodology applied for</p>

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		<p>from the LiDAR data were statistically comparable with the historical boat based data</p> <p>used in the Applicant’s collision risk modelling. The LiDAR data collected by the Applicant was limited to July and August 2017. Flight heights of species are known to vary by season, so any comparison with historical flight height data would need to account for this. The study did not use a LiDAR scanner synchronised with digital still cameras to measure the flight height of identified seabirds (eg. as in Cook et al 2018), instead the Applicant used the LiDAR data to indicate where in a separate image database to find an image subset, and from there make a manual visual interpretation of species. No review of the robustness of this method has been undertaken. Using this method the Applicant was not able to identify all birds to species level in their study – for example the Applicant states that “Thirty-four birds were identified as probable Kittiwake across HOW03. However, it was also considered likely that the majority of birds identified as grey backed gull species from the images (91 birds) were also Kittiwake”. Given that there are differences in the flight height behaviour of the different gull species, being able to accurately identify birds to a species level is important. The Applicant also states that “The findings of this study found a markedly lower</p>	<p>measuring the flight heights of seabirds by REP2-017, has been validated by Cook <i>et al.</i> (2018).</p> <p>The validation exercise demonstrated that the height of birds in flight could be measured using LiDAR to an accuracy of within 1 m. This compares very favourably to other approaches used for measure seabird flight height (Cook <i>et al.</i> 2018).</p> <p>The Applicant agrees with the Natural England’s viewpoint in their response to the ExA Rule 17 question (REP7-064) that “<i>Given that there are differences in the flight height behaviour of the different gull species, being able to accurately identify birds to a species level is important.</i>” However, this doesn’t invalidate the assertion by the Applicant that the majority of birds identified as grey backed gull are considered to be Kittiwake on the basis of flight profile, size and what was discernible on wing colouration; adults of the species have distinctive two toned grey coloured wings. This concurs with baseline characterisation surveys at Hornsea Three from two previous years, when typically no grey gulls other than Kittiwake were recorded in July /August (i.e. a month either side of the survey dates of 1st and 2nd August of REP2-017). When other grey gull species were recorded in these months, it was only on two of the four surveys sampled and constituted no more than 2% (5 Herring Gull) and 0.4% (4 Common Gull) of the total raw data counts of 225 and 1,103 grey-backed gulls on two different surveys. All these factors considered, the</p>

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		<p>proportion of birds at potential collision height than the baseline characterisation surveys at HOW03 (HiDef pers comm.)”, however it is not clear whether this statement refers to the digital aerial baseline data or the historical boat based data. The Applicant states that “In combination with those birds</p> <p>identified as probable Kittiwake (34 birds), only 2.4% (3) of grey backed gulls flying were at potential collision risk. This is markedly lower than the proportion of Kittiwakes baseline characterisation surveys at HOW03 have identified as being at collision risk...”. This statement is confusing as the Applicant has used a PCH value of 0.78% for kittiwake in collision risk modelling at Hornsea Project Three (Table 1.6 [REP-109]) which the Applicant apparently derived from the boat based survey data for Hornsea Project Three. Further, this statement does not seem to indicate that the LiDAR data demonstrate that “flight heights recorded during boat-based surveys are representative of flight behaviour of birds in the array area when recorded by more accurate means” as stated in part b of question F2.27. Using LIDAR is a novel approach to assess height information. The Applicant has stated that the work presented in [REP2-017] was a pilot trial to test a system. Most birds were not identified to species</p>	<p>evidence would suggest to the Applicant, that the grey-backed gulls are almost certain to be all Kittiwake and therefore appropriate to be treated as such in the flight height analyses of REP2-017.</p>

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		<p>level, therefore it is difficult to draw conclusions on flight heights at a species level.</p> <p>Neither the method, nor the data derived by the Applicant has been reviewed in detail in terms of robustness.</p> <p>Natural England does not believe that the LIDAR methodology has been validated so it would be a leap for the applicant to state that this validates the boat based data in any way. There have only been a few studies with LIDAR data. Until recently there was a widely accepted methodology for using digital aerial survey data to derive flight height which has now been shown to be invalid, so this demonstrates the need to fully evaluate methodologies prior to accepting them.</p>	
F2.28	<p>In your D3 response [REP3-075] you state that the flight height data in Skov et al. (2018) are not more widely applicable because the results relate to a single site outside the breeding season. Figure 3.4 of Skov et al. (2018) seems to suggest otherwise. Please explain the basis for your view that flight height measurements in this study did not occur during the</p>	<p>Our comments regarding the ORJIP study were in relation to the flight speed data not flight height data, as the Applicant has proposed use of the Skov et al (2018) data presented on flight speeds but not the data collected for flight heights. Figure 3.4 of Skov et al (2018) shows the fieldwork effort from 1 July 2014 - 14 April 2016 for the ORJIP study. This does include survey effort in months that represent the breeding season for seabird species, but does not indicate if birds were recorded in those months. In the case of kittiwake the majority of rangefinder track samples (which</p>	<p>The Applicant has provided a response to Natural England’s comments on the flight speed data from Skov <i>et al.</i> (2018) throughout the examination.</p> <p>As Natural England highlight, bird flight speeds can be highly variable this therefore supports the use of data from Skov <i>et al.</i> (2018) as a dataset that has large sample sizes covering a variety of weather conditions, contrary to the data derived from existing sources (Alerstam <i>et al.</i>, 2007; Pennycuick, 1987).</p> <p>Natural England continue to suggest that the Skov <i>et al.</i> (2018) data is not representative of the potential flight behaviour of breeding birds. There is no connectivity</p>

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	<p>breeding season. Given that Pennycuik 1987 relates to a single site why is it more acceptable to use this as the basis for gannet flight speed estimation in a CRM rather than Skov et al. (2018) which has a larger sample size? What evidence do you have to suggest that flight speed varies in a statistically significant manner between spatially distinct seabird populations?</p>	<p>were the platform used to derive flight speed data) came from the non-breeding season months (~84% of rangefinder tracks were from the months September to February), and of those ~16% of tracks that were recorded between March and August, 86% were in March.</p> <p>Further, there are no colonies within foraging range of Thanet for kittiwake (or gannet) so Natural England’s view is that any flight speed records from breeding season months for these species will not relate to birds that are engaged in breeding activity in that season. This is the basis for our view that flight behaviour measurements relate to a single site (Thanet OWF) and the data are derived from birds that were not breeding birds with foraging connectivity to a colony, and further were birds that were recorded predominantly in non-breeding season months.</p> <p>Bird flight speeds are highly variable depending on environmental factors, notably wind speed and direction as well as behavioural state e.g. migrating, foraging, and also at different stages of breeding season (e.g. incubation versus chick rearing) e.g. Elliott and Gaston 2005, Pennycuik 1987, Spear and Ainley 2008), all of which have a spatial as well as temporal component.</p>	<p>between breeding colonies for lesser black-backed gull, herring gull or great black-backed gull and Hornsea Three and therefore the use of Skov <i>et al.</i> (2018) is justified based on Natural England’s requirements. Similarly, the Applicant would contend that based on the limited connectivity between Hornsea Three and kittiwake from FFC SPA based on the results of Cleasby <i>et al.</i> (2018) this would also apply to kittiwake.</p> <p>The use of flight speed data from Alerstam <i>et al.</i> (2007) and Pennycuik (1987) at previous projects is not a robust argument for suggesting that these values should be used at Hornsea Three as when these projects were seeking consent the flight speed data from Alerstam <i>et al.</i> (2007) and Pennycuik (1987) were the only data available.</p> <p>It remains the position of the Applicant that Skov et al. (2018) represents the best available evidence on flight speeds for the key species considered in this assessment.</p>

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		<p>For example, GPS logger data from studies of great black-backed gulls at two sites – one in Swedish Baltic Sea and the other in Danish Kattegat showed a similar distribution of flight speeds, but the mean flight speed for the Swedish data was 45.1 km/hr compared to 38.8 km/hr for the Danish offshore data (Gyimesi et al. 2017).</p> <p>Seabird flight speed data for use in CRM with the Band Model have typically been taken from Pennycuik 1987, 1997 for gannet and Pennycuik 1987, 1997 and Alerstam et al 2007 for kittiwake.</p> <p>The Pennycuik data are based on observations at Foula, Shetland. Foula is an SPA for breeding seabirds including kittiwake.</p> <p>Natural England accepts that there are now additional sources of data available which include information on flight speeds (e.g. from seabird tracking studies) and that a review is needed of appropriate flight speeds and variability around these to use for Collision Risk Modelling. However this needs to be based on all of the available information, and not just a single study or set of outputs. There is no evidence that any single published set of figures is more appropriate than the current set, irrespective of sample sizes and what those “samples” represent (e.g. number of birds, number of tracks, number of segments within</p>	

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		<p>tracks, length of tracks etc). There are a number of factors that need to be considered including weather conditions at the time of the studies, methods used to measure flights speeds (e.g. rangefinders, data from tagged birds etc) and methods used to analyse the data and derive flight speed statistics (e.g. how data have been processed for analysis and how flight speed data have been calculated from the recorded information), as well as time of year and location of studies.</p> <p>A further consideration is that the appropriate avoidance rates (ARs) to use in CRM are dependent on other model parameters and flight speed is one of these. The avoidance rates that Natural England advise are used for CRM with Band (2012) were calculated using the flight speed data from Pennycuik/Alerstam et al. and are based on the work in Cook et al (2014) which derived ARs using flight speeds from Pennycuik/Alterstam et al.</p> <p>These ARs are not transferable for use in CRM with the flight speed data from Skov et al. (2018). Natural England note that projects that have generated collision risk figures that use Pennycuik (1987) and Alerstam et al (2007) flight speed data include East Anglia 1, Burbo Bank Extension, Hornsea Project One, Hornsea Project Two, Dogger Bank Creyke Beck, Dogger Bank Teesside,</p>	

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		<p>East Anglia 3, Beatrice, Moray East, Nearte na Gaoithe, Norfolk Vanguard, Thanet Extension (noting that the Skov et al (2018) study was based at Thanet OWF) and Hornsea Project Three in their original ES and RIAA, amongst others. Given that the majority of projects that have recently been consented or are in the planning system have used Pennycuik/Alterstam et al. figures and that the ARs that are recommended by the SNCBs for the key species were derived using the Pennycuik/Alterstam et al. flight speed data, Natural England advise that these figures should be used until a full review of all evidence sources has been undertaken.</p>	
Table 1 – flight type			<p>The Applicant would highlight that the Band (2012) CRM guidance states: <i>“Gliding’ flight has a marginally lower collision risk than ‘flapping’ flight – notably for passage at points level with the rotor hub, where the wings lie parallel with potentially colliding blades. However the difference is rarely sufficient to warrant detailed consideration of different bird behaviours; the flight type used should be that which best typifies most flights for the species in question.”.</i> As the species considered for collision risk modelling generally exhibit flapping flight the use of ‘flapping’ within the Band (2012) CRM is entirely justified.</p>

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Table 1 – Proportion flying at risk height (PCH)			Natural England have previously accepted the use of the flight height data used at Hornsea Three as part of their assessments for the Hornsea Project Two consent application.
Table 1 – Avoidance Rates (AR) Extended Band model			The JNCC et al. (2014) guidance in relation to avoidance rates provides avoidance rates for use with the Extended model for lesser black-backed gull (98.9%), herring gull (99.0%) and great black-backed gull (98.9%).