

Norfolk Boreas Offshore Wind Farm

Appendix 12.1

Marine Mammal Consultation Responses

Environmental Statement

Volume 3

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Photo: Ormonde Offshore Wind Farm

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Glossary of Acronyms

ADD	Acoustic Deterrent Device
CIA	Cumulative Impact Assessment
DCO	Development Consent Order
EIA	Environmental Impact Assessment
EPP	Evidence Plan Process
EPS	European Protected Species
ES	Environmental Statement
ETG	Expert Topic Group
HRA	Habitats Regulation Assessment
IPMP	In Principle Monitoring Plan
MMO	Marine Management Organisation
MMOs	Marine Mammal Observers
MMMP	Marine Mammal Mitigation Plan
MU	Management Unit
NE	Natural England
NPS	National Policy Statement
PEIR	Preliminary Environmental Information Report
PEMP	Project Environmental Management Plan
PTS	Permanent Threshold Shift
RoC	Review of Consents
SAC	Special Area of Conservation
SCANS	Small Cetaceans in the European Atlantic and North Sea
SCI	Site of Community Importance
SIP	Site Integrity Plan
SMRU	Sea Mammal Research Unit
SNCB	Statutory Nature Conservation Body
SNS	Southern North Sea
SoS	Secretary of State
TTS	Temporary Threshold Shift
TWT	The Wildlife Trust
UK	United Kingdom
UXO	Unexploded Ordnance
VWPL	Vattenfall Wind Power Limited
WDC	Whale and Dolphin Conservation

Glossary of Terminology

Array cables	Cables which link wind turbine to wind turbine, and wind turbine to offshore electrical platforms.
Evidence Plan Process	A voluntary consultation process with specialist stakeholders to agree the approach to the EIA and information to support HRA.
Interconnector cables	Offshore cables which link offshore electrical platforms within the Norfolk Boreas site
Landfall	Where the offshore cables come ashore at Happisburgh South.
Norfolk Boreas site	The Norfolk Boreas wind farm boundary. Located offshore, this will contain all the wind farm array.
Norfolk Vanguard	Norfolk Vanguard offshore wind farm, sister project of Norfolk Boreas.
Norfolk Vanguard OWF sites	Term used exclusively to refer to the two distinct offshore wind farm areas, Norfolk Vanguard East and Norfolk Vanguard West (also termed NV East and NV West) which will contain the Norfolk Vanguard arrays.
Offshore cable corridor	The corridor of seabed from the Norfolk Boreas site to the landfall site within which the offshore export cables will be located.
Offshore electrical platform	A fixed structure located within the Norfolk Boreas site, containing electrical equipment to aggregate the power from the wind turbines and convert it into a suitable form for export to shore.
Offshore export cables	The cables which transmit electricity from the offshore electrical platform to the landfall.
Offshore project area	The area including the Norfolk Boreas site, project interconnector search area and offshore cable corridor.
Offshore service platform	A platform to house workers offshore and/or provide helicopter refuelling facilities. An accommodation vessel may be used as an alternative for housing workers.
Project interconnector cable	Offshore cables which would link either turbines or an offshore electrical platform in the Norfolk Boreas site with an offshore electrical platform in one of the Norfolk Vanguard sites.
Project interconnector search area	The area within which project interconnector cables would be installed.
Safety zone	An area around a vessel which should be avoided during offshore construction.
Scour protection	Protective materials to avoid sediment being eroded away from the base of the foundations as a result of the flow of water.
The Applicant	Norfolk Boreas Limited.
The project	Norfolk Boreas Wind Farm including the onshore and offshore infrastructure.

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1 Introduction

1. This Appendix summarises the consultation process that has been undertaken as part of the Norfolk Boreas consent application process. Vattenfall Wind Power Limited are also developing the Norfolk Vanguard project, located adjacent to the Norfolk Boreas site, therefore much of the consultation undertaken by Norfolk Vanguard is relevant to Norfolk Boreas, and as such, consultation has often been conducted for both projects at the same time.
2. To date, consultation regarding marine mammals has been conducted through the following key stages:
 - Norfolk Boreas Environmental Impact Assessment (EIA) Scoping Report (Royal HaskoningDHV, 2017);
 - Norfolk Boreas Scoping Opinion (the Planning Inspectorate, 2017);
 - EIA Marine Mammal Method Statement (Royal HaskoningDHV, 2018a) (Appendix 9.26 of the Consultation Report which has been submitted as part of the DCO application (document reference 5.1));
 - Norfolk Boreas Preliminary Environmental Information Report (PEIR) Chapter 12 Marine Mammals (Royal HaskoningDHV, 2018b)
 - Evidence Plan Process (EPP) marine mammal Expert Topic Group (ETG) meetings (12th March 2018 and 21st February 2019 for Norfolk Boreas and 15th February 2017 and 6th July 2017 for Norfolk Vanguard); and
 - EPP marine mammal ETG conference calls (26th March 2018 and 8th December 2017 for Norfolk Vanguard).
3. Relevant consultation responses, to date, from the Scoping Opinion, PEIR, and the EPP Marine Mammals Meetings for Norfolk Boreas and Norfolk Vanguard are presented in Table 1.1.

Table 1.1 Consultation Responses

Consultee	Date & Document	Comment	Response / where addressed in the ES (sections refer to the ES chapter)
Secretary of State	June 2017 (Scoping Opinion)	Where existing survey data is relied upon, their suitability for Norfolk Boreas should be agreed with relevant consultees; in particular the spatial and temporal scope of the surveys should be considered. The SoS expects and recognises that this is likely to be a key objective of the Evidence Plan Process.	The scope of Norfolk Boreas marine mammal surveys was discussed and agreed with Natural England and the Marine Management Organisation at a meeting in March 2016. The approach to site characterisation was further outlined in the Marine Mammal Method Statement (February 2017), and discussed and agreed during the March 2017 Norfolk Boreas ETG Meeting.
Secretary of State	June 2017 (Scoping Opinion)	The SoS considers that the environmental baseline be established having regard to conditions present at the time of surveys and that Norfolk Vanguard should be considered within the cumulative impact assessment(s) (CIA).	The environmental baseline will consider the existing conditions. Norfolk Vanguard is included within the CIA scenario in Appendix 12.6.
Secretary of State	June 2017 (Scoping Opinion)	The Applicant should ensure that all projects that have the potential interact with the Proposed Development are considered and should demonstrate that they have not focussed solely on offshore wind farms, for example by determining whether there are any other developments in the marine area with potential for cumulative impacts.	The CIA (section 12.8 of the Environmental Statement (ES)) considers all marine projects that could have the potential for cumulative impacts.
Secretary of State	June 2017 (Scoping Opinion)	The ES will also need to address this matter in each topic area and summarise the position on trans-boundary effects of the Proposed Development, taking into account inter-relationships between any Impacts in each topic area.	Transboundary impacts have been assessed in Chapter 12 section 12.9 of the ES, and the inter-relationships between any impacts have been section 12.10 of the ES.
The Planning Inspectorate	June 2017 (Scoping Opinion)	The Applicant's attention is drawn to paragraph 2.6.92 of NPS EN-3 and the need to provide details of likely feeding areas; known birthing areas/haul out sites; nursery grounds; and known migration or commuting routes.	The requirements of National Policy Statement (NPS)EN-3 are outlined in Chapter 12 Table 12.2 of the ES. Breeding/ haul out sites and telemetry studies are discussed for seals in Appendix 12.2.
The Planning Inspectorate	June 2017 (Scoping Opinion)	Where modelling is undertaken to determine the abundance of cetaceans, the ES should explain the methodology used.	Appendix 12.2 outlines the data analysis completed to determine site specific harbour porpoise density estimates.

Consultee	Date & Document	Comment	Response / where addressed in the ES (sections refer to the ES chapter)
The Planning Inspectorate	June 2017 (Scoping Opinion)	The Applicant's attention is drawn to the existence of the Defra Marine Noise Registry which could inform the baseline noise environment.	Baseline ambient noise is discussed in section 3 of Appendix 5.4.
The Planning Inspectorate	June 2017 (Scoping Opinion)	Paragraph 518 of the Scoping Report proposes to scope out disturbance to seal haul out sites from construction activity at the landfall given the distance of the landfall is a minimum of 8.5km from a significant haul-out site. However, the Applicant proposes to assess impacts of disturbance to seals from vessels during construction. The SoS agrees to this approach.	Acknowledged. The disturbance to seals from vessels during construction is assessed in section 12.7.3.7 of the ES.
The Planning Inspectorate	June 2017 (Scoping Opinion)	Similarly, paragraph 529 of the Scoping Report proposes to scope out disturbance to seal haul out sites during operation. This is on the basis that the landfall is a minimum of 8.5km from a significant haul-out site and as any vessel transits would be less than during construction and likely to be within current baseline vessel movements. The SoS agrees this can be scoped out.	Acknowledged.
The Planning Inspectorate	June 2017 (Scoping Opinion)	The Scoping Report proposes to scope out EMF impacts on marine mammals and provides references to literature demonstrating that there is no evidence to suggest that existing cables have influenced cetacean movements or that pinnipeds respond to electromagnetic fields. The SoS agrees this can be scoped out of the assessment.	Acknowledged.
The Planning Inspectorate	June 2017 (Scoping Opinion)	The SoS welcomes consideration of construction noise impacts on marine mammals. NE has provided advice on this matter in their consultation response (see Appendix 3 of this Opinion); specifically, the need to consult them regarding revised injury thresholds.	Acknowledged. The comments of Natural England (NE) in regards to the impact of construction noise on marine mammals have been taken into account. The impact of piling noise on marine mammals is assessed in Chapter 12 section 12.7.3.2 of the ES, the impact of other construction noise on marine mammals is assessed in section 12.7.3.3 of the ES. The impact of vessel noise on marine mammals is assessed in section 12.7.3.4 of the ES.

Consultee	Date & Document	Comment	Response / where addressed in the ES (sections refer to the ES chapter)
The Planning Inspectorate	June 2017 (Scoping Opinion)	The SoS welcomes the proposal for both soft-start piling and the preparation of a marine mammal mitigation plan (MMMP) in consultation with key stakeholders. However, the Applicant's attention is drawn to NE's comments (see Appendix 3 of this Opinion) regarding the potential need for additional measures beyond that of soft-start piling.	A Marine Mammal Mitigation Plan (MMMP) will be developed in consultation with key stakeholders, including Natural England. This will take account of the comments made by Natural England. A draft MMMP for piling is submitted with this Development Consent Order (DCO) application (document reference 8.13).
The Planning Inspectorate	June 2017 (Scoping Opinion)	The ES should set out in full the potential risk to European Protected Species (EPS) and confirm if any EPS licences will be required for example, for harbour porpoises and grey seals.	The requirements for an EPS licence application to the Marine Management Organisation (MMO), in consultation with NE, will be determined post-consent. At post-consent, the project design envelope will have been further refined through detailed design and procurement activities and hence further detail will be available on the techniques selected for the construction of the wind farm, as well as full consideration of the mitigation measures that will be in place following the development of the MMMP.
The Planning Inspectorate	June 2017 (Scoping Opinion)	The Applicant's attention is drawn to the comments of NE (see Appendix 3 of this Opinion).	Acknowledged. The comments of Natural England have been taken into account within this chapter
Natural England	June 2017 (Scoping Opinion)	<i>Noise assessment</i> 514: Piling has been identified as a key concern in relation to the effects on marine mammals and the applicant states "impacts associated with underwater noise will be considered fully during the EIA, taking into account the most recent and robust research available". Previous best practice has been to use injury thresholds proposed by Southall et al. 2007 when considering potential impacts to marine mammals. However, in 2016, the NOAA published revised injury thresholds. The SNCBs are currently evaluating the implications of the NOAA thresholds and how these may be incorporated into noise risk assessments. We recommend the developer engage with the SNCBs with regard their noise assessment and how this will inform the EIA and HRA.	The NOAA (NMFS, 2018) thresholds and criteria have been used in the assessment for Permanent Threshold Shift (PTS) and Temporary Threshold Shift (TTS) in this PEI chapter. The PTS/TTS thresholds from Southall et al. (2007) and Lucke et al. (2009) have been included in the additional assessments in Appendix 12.5.

Consultee	Date & Document	Comment	Response / where addressed in the ES (sections refer to the ES chapter)
Natural England	June 2017 (Scoping Opinion)	<i>European Protected Species and disturbance</i> The risk of a disturbance offence under The Offshore Marine Conservation Regulations 2007 (as amended), as a result of pile-driving during the installation of the wind farm should be assessed and if it cannot be mitigated and there are no satisfactory alternatives, we recommend the Applicant applies to the MMO for a disturbance licence.	As outlined, above, the requirements for an EPS licence application to the Marine Management Organisation, in consultation with NE, will be determined post-consent. At post-consent, the project design envelope will have been further refined through detailed design and procurement activities and hence further detail will be available on the techniques selected for the construction of the wind farm, as well as full consideration of the mitigation measures that will be in place following the development of the MMMP.
Natural England	June 2017 (Scoping Opinion)	<i>Marine mammal mitigation</i> 510: This paragraph states "With the application of soft-start piling protocol employed (whereby the energy of the hammer is slowly ramped up allowing marine mammals to flee the immediate area of piling) it is not anticipated that any marine mammals would be at risk of any physical injuries." This implies that only a soft-start is required to reduce the risk of injury. We highlight that current mitigation guidelines include additional measures which will need to be considered by the applicant and a marine mammal mitigation plan should be agreed prior to construction. Again, we welcome future discussions with the applicant regarding this.	As outlined in Chapter 12 section 12.7.1 of the ES, MMMPs for both UXO clearance and piling will be produced post-consent in consultation with Natural England. These will be based on the latest scientific understanding and guidance, pre-construction UXO surveys and detailed project design. The MMMPs will detail the proposed mitigation measures to reduce the risk of any lethal injury and permanent auditory injury to marine mammals from underwater noise.
Natural England	June 2017 (Scoping Opinion)	482: There appears to be a typo in the last-but-one bullet point. Presumably this is meant to include Harbour seal. Also, if the timeline allows, SCANS III survey data should be incorporated.	Amended. SCANS-III survey data has been included within the ES; see Chapter 12 section 12.6 and Appendix 12.2.
Natural England	June 2017 (Scoping Opinion)	486: This paragraph states that 12.5% of cetaceans sited were either identified as a porpoise or a dolphin, however, in the Norfolk Vanguard scoping report this figure in the same paragraph was 2.5%. Please could it be clarified which one is correct?	12.5% is the correct figure; see Chapter 12 section 12.6 and Appendix 12.2.
Natural England	June 2017 (Scoping Opinion)	502: Figures 2.8 and 2.9 appear to show grey and harbour seal mean at-sea usage estimates to be 0 – 1.0 individuals per km ² at the array and 0 – 5 individuals per km ² in the provisional offshore	Units from these figures have now been included which shows the numbers represent individuals per 25km ² (5 x 5km

Consultee	Date & Document	Comment	Response / where addressed in the ES (sections refer to the ES chapter)
		cable corridor for both species, not 0 – 0.2 individuals per km ² as stated here.	cells). See Figures 12.2 and 12.3 in Chapter 12 of the ES.
Natural England	June 2017 (Scoping Opinion)	518: Natural England is satisfied that given the distance to the nearest seal haul out at landfall is at least 10km, disturbance at seal haul outs may be scoped out of the assessment.	Acknowledged.
The Planning Inspectorate/ Norfolk County Council	November 2016 (Norfolk Vanguard Scoping Opinion)	The Scoping Report notes that there are no designated sites for grey seals in South-east England. Breeding grey seals on Norfolk Coast are a relatively recent phenomenon (first modern records from around 2001) but numbers have increased rapidly (2,342 pups born at Blakeney Point in 2015-16 and 1,116 at Horsey). These rookeries post-date the Natura2000 citations and, as such, grey seals were not included as designated features of the North Norfolk SAC or Horsey-Winterton SAC. Nevertheless, recent advice from Natural England is that if designated today, or if the citations are updated, the grey seal would certainly feature as a Conservation Objective of these sites. The County Council would suggest that they should be considered alongside the other Conservation Objectives.	In the ES all current seal haul-out sites at the closest point to the Norfolk Boreas site, cable corridor, landfall and vessel routes have been taken into account and any potential disturbance at seal haul-outs sites are assessed in section 12.7.3.7 for construction and section 12.7.4.5 for operation and maintenance. While grey seal are not currently a qualifying feature at the North Norfolk Special Area of Conservation (SAC) (which includes Blakeney Point) or Horsey-Winterton SAC, it is recognised that these sites are important (see section 12.6.2.2) for the population, as breeding, moulting and haul-out sites. Therefore, in the HRA consideration will be given to grey seal as part of the North Norfolk SAC or Horsey-Winterton SAC, to determine if there is the potential for any disturbance at these sites.
Natural England	November 2016 (Norfolk Vanguard Scoping Opinion)	NE advises that the impact assessment should take account of the Southern North Sea pSAC (now SAC) for harbour porpoise, not just the North Sea Management Unit. The information provided by the applicant in relation to potential effects on the pSAC (now SAC) from construction noise will form the basis for the Habitats Regulations Assessment (HRA). We also advise that the approach to assessing impacts on the Southern North Sea pSAC (now SAC) should be discussed and agreed with the relevant statutory bodies during the Evidence Plan process to ensure the most appropriate and up to date methods and information are incorporated.	The impact assessment considers impacts on the Southern North Sea (SNS) SAC, however, during the topic group meetings in February and July 2017 for Norfolk Vanguard, NE advised that the North Sea Management Unit should be the key focus when determining population level impacts on harbour porpoise from the SAC. Therefore, a similar approach has been undertaken for Norfolk Boreas; see Appendix 12.4.
Natural England,	15th February 2017 - Norfolk	The underwater noise thresholds for marine mammals as reported by NOAA (NMFS, 2016), Southall et al. (2007) and Lucke et al.	Section 12.7.3.2 of the ES and Appendix 5.1 provide details on the approach to the underwater noise thresholds for

Consultee	Date & Document	Comment	Response / where addressed in the ES (sections refer to the ES chapter)
WDC, TWT, Cefas	Vanguard Evidence Plan Process for Marine Mammals Meeting	(2009) should be used in the modelling and presented in the ES.	marine mammals used in the assessment.
Natural England, WDC, TWT	15th February 2017 - Norfolk Vanguard Evidence Plan Process for Marine Mammals Meeting	The tiered approach to CIA screening as detailed in the method statement is agreed upon.	Section 12.8.2 of the ES outlines the tiered approach used in the CIA screening.
Natural England	6th July 2017 - Norfolk Vanguard Evidence Plan Process for Marine Mammals Meeting	26km harbour porpoise disturbance range should be applied to the EIA.	Harbour porpoise disturbance, using an impact range of 26km is assessed in Chapter 12 section 12.7.3.2 of the ES.4.
Natural England, TWT, Cefas	8 th December 2017 - Norfolk Vanguard Evidence Plan Process for Marine Mammals conference call	Use NOAA thresholds for modelling PTS and TTS. Other PTS/TTS thresholds can be removed from the ES.	As agreed, the NOAA (NMFS, 2018) thresholds and criteria have been used in the assessment for PTS and TTS in the ES chapter. The PTS/TTS thresholds from Southall et al. (2007) and Lucke et al. (2009) have been included in the additional assessments in Appendix 12.5.
Natural England, TWT, Cefas	8 th December 2017 - Norfolk Vanguard Evidence Plan Process for	Use 26km for disturbance however present Lucke et al. 2009 thresholds in the ES for context as it is acknowledged that not all parties agree with the 26km disturbance range. Present a range of 50, 75 and 100% possible avoidance response.	As agreed, in the ES disturbance has been assessed based on 26km radius (see section 12.7.2.3.4 of the ES) and behavioural response (see section 12.7.3.2.5 of the ES) has been assessed based on Lucke et al. (2009). As agreed, a range (50%, 75% and 100%) in relation to the

Consultee	Date & Document	Comment	Response / where addressed in the ES (sections refer to the ES chapter)
	Marine Mammals conference call		proportion of the population impacted has been included in Chapter 12 section 12.7.2.3.5 of the ES for possible avoidance.
Natural England, TWT, Cefas	8 th December 2017 - Norfolk Vanguard Evidence Plan Process for Marine Mammals conference call	Check report by Heinänen and Skov (2015) which indicates a negative relationship between the number of ships and the distribution of harbour porpoises.	Reference to the threshold level of impact related to number of vessels (approximately 20,000 ships per year) in Heinänen and Skov (2015) has been used in the assessment in Chapter 12 section 12.7.3.4 of the ES.
Natural England, TWT, Cefas	8 th December 2017 - Norfolk Vanguard Evidence Plan Process for Marine Mammals conference call	The CIA in the PEIR is confusing with so many scenarios. <ul style="list-style-type: none"> - All agreed to put the discussion of scenarios in an appendix and leave only one assessment scenario in the CIA. Agreed that the 'likely scenario' presented in the PEIR is appropriate to take forward in the ES.	As agreed the most 'likely scenario' for the potential worst-case for the CIA has been assessed in the ES chapter. The 'theoretical' worst-case and other scenarios have been assessed in Appendix 12.6.
Natural England, TWT, Cefas	8 th December 2017 - Norfolk Vanguard Evidence Plan Process for Marine Mammals conference call	Agreed the assumptions of four UXO operations and four seismic operations in the North Sea at any one time is conservative and appropriate to use in the assessment for the ES and HRA.	As agreed the assessment has been based on the potential worst-case of a possible four UXO operations and four seismic operations in the North Sea at any one time.
Natural England	11/12/17 Norfolk Vanguard PEIR Response - Summary of comments	The Management Unit population is the appropriate population for percentage impacts to the population to be assessed against throughout the assessment. Following further discussion on the teleconference call on the 8 th December 2017 we will provide further confirmation as to whether the SCANS-III population is appropriate to use in our technical advice note that we will be	The North Sea MU population of 345,373 (CV = 0.18; 95% CI = 246,526-495,752; Hammond et al., 2017) based on the SCANS-III data, has been used as the reference population throughout the assessment. NE confirmed (letter date 03/01/18; Point 2) that it is

Consultee	Date & Document	Comment	Response / where addressed in the ES (sections refer to the ES chapter)
		<p>providing by 5th January 2018. It should also be noted that the site selection document for the Southern North Sea cSAC states it is estimated the site supports approximately 18,500 individuals and this number should not be referred to as an estimated population. Natural England also wish to highlight that the Lincolnshire Wildlife Trust conduct grey seal counts at Donna Nook annually and this data is widely available.</p>	<p>appropriate to use the SCANS-III population data (Hammond et al., 2017) as the same area is used as the Management Unit.</p> <p>It is acknowledged that, as outlined in Chapter 12 section 12.6.1.5 of the ES, it is not appropriate to use SNS SAC site population estimate in any assessments of effects of plans or projects, as these need to take into consideration population estimates at the MU level (JNCC, 2017b). However, as requested by The Wildlife Trust (TWT) and Whale and Dolphin Conservation (WDC), an additional assessment has been included in Appendix 12.4, for information, based on the estimate that the SNS SAC could support 29,384 harbour porpoise (SCANS-III data for 17.5% of the UK North Sea MU).</p>
Natural England	11/12/17 Norfolk Vanguard PEIR Response - Summary of comments	<p>UXO assessment: Further consideration is required regarding the UXO assessment, including the following:</p> <ul style="list-style-type: none"> • Consideration of a larger number/size of bombs; • The use of more appropriate examples of UXO assessments rather than the Beatrice Offshore Wind Farm (BOWL) i.e. East Anglia ONE; • Noise modelling should be undertaken and the NMFS (2018) unweighted Peak SEL metric be used to ascertain the potential zone of PTS; • Consideration of the UXO works within the RIAA, and <p>The design of a Marine Mammal Mitigation Protocol (MMMP) for UXO as well as the MMMP for piling.</p>	<p>Underwater noise modelling for UXO clearance at Norfolk Boreas has been conducted (see Appendix 5.5 for underwater noise modelling of UXO for Norfolk Boreas) and included in the ES (see section 12.7.3.1 of the ES).</p> <p>This includes the NMFS (2018) unweighted Peak SEL metric to assess the potential PTS range and impact area.</p> <p>The assessment of the potential UXO at Norfolk Boreas has included a strategic UXO risk management assessment (see Appendix 5.3) as outlined in section 12.7.3.1 clearance effects will be assessed in the information for the HRA.</p> <p>As outlined in Chapter 12 section 12.7.1 of the ES, a UXO clearance MMMP will be produced post-consent in consultation with Natural England and will be based on the latest scientific understanding and guidance, pre-construction UXO surveys at the Norfolk Boreas offshore project area, and detailed project design. The MMMP will detail the proposed mitigation measures to reduce the risk of any lethal injury</p>

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			and permanent auditory injury to marine mammals during any underwater detonations.
Natural England	11/12/17 Norfolk Vanguard PEIR Response - Summary of comments	Disturbance range of 26km for seals (para 462): Whilst Natural England are content for the proposals of a 26km disturbance range to be used for seals as well as harbour porpoise Natural England wish to highlight that further justification and clarification as to why this is being used would be helpful and advise that it is made clear within the application that this is not necessarily Natural England's advice.	Further justification based on Russell et al. (2016) has been included in Chapter 12 section 12.7.2.3.4 of the ES. It is acknowledged that this is not Natural England's current advice, but that its use is accepted.
Natural England	11/12/17 Norfolk Vanguard PEIR Response - Summary of comments	Density estimates of the MU ref population: (para 725): We advise that a range of density estimates should be presented. This will provide a greater level of confidence in the assessment acknowledging that the SCANS data provides just a snapshot in time and highlighting that the winter population of the cSAC could therefore be far higher than assessed.	A range of density and abundance estimates have been reviewed in Chapter 12 section 12.6.1.3 of the ES and Appendix 12.2 for harbour porpoise. Potential impacts have been based on the highest site specific survey density estimates and the SCANS-III survey density estimate, throughout the assessment.
Natural England	11/12/17 Norfolk Vanguard PEIR Response - Summary of comments	Underwater noise impacts: Following the call on the 8 th Dec 2017 we wish to reiterate that it would be most appropriate to present a range in relation to the proportion of the population impacted: for example, at 50%, 75% and 100%.	As agreed, a range (50%, 75% and 100%) in relation to the proportion of the population impacted has been included in Chapter 12 section 12.7.3.2.5 possible avoidance.
Natural England	11/12/17 Norfolk Vanguard PEIR Response – Point 13: Para 554	Natural England queries if the additional vessel movements could be represented as a percentage increase from baseline to allow a better understanding the level of increase.	Vessel movements as a percentage increase from baseline has been included in the assessment (section 12.7.2.4 of the ES).
MMO	11/12/2017 Norfolk Vanguard PEIR Response - Point 66: Underwater noise	The MMO has encountered a situation where soft starting procedures have not been possible where the piling operations have been interrupted. The MMO require that this issue is considered during the development of marine mammal mitigation. Likewise there have been issues with specific levels of soft start (10% of maximum hammer energy) not being feasible in practice and this should be taken in to account. The proposed mitigation	Marine mammal mitigation will be developed through the MMMP in consultation with the MMO.

Consultee	Date & Document	Comment	Response / where addressed in the ES (sections refer to the ES chapter)
		included in the Marine Mammal Protocol will need to be supported with robust evidence.	
MMO	11/12/2017 Norfolk Vanguard PEIR Response - Point 72: Marine Mammals	An embedded mitigation of soft start piling has been described. The MMO recommends that a soft start piling of 40 minutes be discussed with Natural England as this may not be appropriate in all circumstances. Details of hammer energy and feasibility of achieving the desired 10% of maximum should be discussed when details of the hammer are known.	The minimum potential soft-start and ramp-up period of 30 minutes has been used in the assessment (which is greater than the recommended minimum of 20 minutes). The soft-start will be 10% (or less) of the maximum hammer energy for a minimum of 10 minutes.
TWT	08/12/17 Norfolk Vanguard PEIR Response - 3.4: Cumulative impact assessment	Fishing must be included in the cumulative impact assessment. This is based on a precedent set when TWT began Judicial Review proceedings against the Department for Energy and Climate Change in August 2015 against the approval of Dogger Bank Offshore Wind Farm Order due to the exclusion of fishing from the in-combination assessment as part of the HRA. Fishing is a licensable activity and according to the Waddenzee case ¹ , the regular grant of licenses constitutes a plan or a project. Although our position remained, TWT withdrew the claim due to assurances given by the government regarding the management of fishing within Dogger Bank SAC. One of those assurances was that steps would be put in place to ensure that this scenario would not happen again and that Defra and DECC would work together to ensure fishing would be included in future offshore wind farm impact assessments. Although our challenge was in relation to the lack of inclusion of fishing as part of the HRA assessment, the same principle should apply to the EIA cumulative assessment.	Fishing activity is considered part of the existing baseline, as it has existed in the North Sea for a long time before any offshore wind farm construction, it is not a recent or an increasing activity (in most areas fishing is currently in decline). It is more appropriate for fishing to be assessed as part of a more strategic assessment rather than project / developer led assessment.
Natural England	03/01/2018 – Point 2: Technical Advice	Use of SCANS III population data: We can confirm that it is appropriate to use the SCANS III population data as the same area is used as the Management Unit. Vattenfall should ensure that the following abundances are used: North Sea MU harbour porpoise abundance 345,373 (CV – 0.18, CL low – 246,526 and CL high 495,752).	The North Sea MU population of 345,373 (CV = 0.18; 95% CI = 246,526-495,752; Hammond et al., 2017) based on the SCANS-III data has been used as the reference population throughout the assessment.

¹ C-127/02 Waddenzee [2004] ECR I-7405

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Natural England	03/01/2018 – Point 7: Technical Advice	Marine mammal swimming speed in response to proposed mitigation and PTS cumulative SEL exposure: We note that this is a different approach to other EIAs and HRAs, but we are content to consider the increased marine mammal swimming speed of 1.8m/s (rather than the standard 1.5m/s) providing adequate evidence is provided as justification supporting this approach and is not used for assessing disturbance in the EIA.	The SEL _{cum} in the noise modelling has been based on the average swimming speed of 1.5m/s (Otani et al., 2000), as a precautionary approach. However, where relevant the assessment also includes reference to a swimming speed of 1.8m/s, which is more representative of a fleeing animal (e.g. Kastelein et al. (2018) recorded swimming speeds of 1.97m/s during playbacks of pile driving sounds).
The Wildlife Trust	letter dated 7th December 2018 Comments on the Norfolk Boreas PEIR	<p>TWT consider that fishing should be included in both cumulative and in-combination assessments. Fishing is a licensable activity that has the potential to have an adverse impact on the marine environment. This is supported in the leading case C-127/02 Waddenzee [2004] ECR I-7405, the CJEU held at para. 6 “The act that the activity has been carried on periodically for several years on the site concerned and that a licence has to be obtained for it every year, each new issuance of which requires an assessment both of the possibility of carrying on that activity and the site where it may be carried on, does not itself constitute an obstacle to considering it, at the time of each application, as a distinct plan or project within the meaning of the Habitats Directive”</p> <p>This case law demonstrates that fishing is considered a plan or a project and therefore not part of the baseline.</p> <p>Current Defra policy is to ensure that all existing and potential fishing operations are managed in line with Article 6 of the Habitats Directive. The current, risk-based, ‘revised approach’ to fisheries management in European Marine Sites is a compromise agreed by all to prevent the closure of fisheries during assessment. This approach further supports that fishing is considered a plan or a project and therefore must be included in the in-combination assessment in line with Article 6(3) of the Habitats Directive.</p> <p>A precedent was set for the inclusion of fishing in in-combination</p>	<p>By-catch by commercial fisheries is recognised as a historic and continuing cause of harbour porpoise mortality in the SNS. This will therefore be a factor in shaping the size of the current North Sea (NS) Management Unit (MU) population.</p> <p>The available prey resource for harbour porpoise has also been influenced by historic and continuing commercial fishing. As a result, the Norfolk Boreas Cumulative Impact Assessment (CIA) and in-combination assessments considers commercial fisheries to be part of the baseline environment for marine mammals, including harbour porpoise.</p> <p>Noise from vessels associated with other, non-wind farm, plans or projects such as oil and gas, aggregates and commercial fisheries, are also considered to be part of the baseline conditions.</p> <p>This approach is in accordance with the Planning Inspectorate Advice Note 17 Cumulative Effects Assessment which states “Where other projects are expected to be completed before construction of the proposed NSIP and the effects of those projects are fully determined, effects arising from them should be considered as part of the baseline”.</p> <p>It is also noted that commercial fisheries impacts have been included in the recent draft HRA for the Review of Consents (RoC) (which was consulted upon in November 2018) (section</p>

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		<p>assessments when TWT began Judicial Review proceedings against the Department for Energy and Climate Change (DECC) in August 2015 against the approval of Dogger Bank Teesside A & B Offshore Wind Farm Order due to the exclusion of fishing from the in-combination assessment as part of the HRA. TWT withdrew the claim due to assurances given by the government regarding the management of fishing within Dogger Bank SAC. One of those assurances was that steps would be put in place to ensure that this scenario would not happen again and that Defra and DECC would work together to ensure fishing would be included in future offshore wind farm impact assessments.</p>	<p>19, page 2018). With regard to effects of habitats the draft RoC HRA states that</p> <p><i>“19.152 There have been no quantified assessments undertaken on the extent impacts from commercial fishing may have within the SAC and therefore information to inform this assessment is not available.</i></p> <p><i>19.154 Without knowing the extent of impact on the seabed arising from the fishing industry and aggregate extraction it is not possible to undertake an in-combination assessment that addresses all the potential impacts on the habitats within the SAC”</i></p> <p>With regard to direct effects on harbour porpoise the draft RoC HRA states that</p> <p><i>“19.213 Commercial fishing has occurred within the SAC for many years and has had, and will continue to have, direct and indirect impacts on harbour porpoise, their habitat and prey within the SAC. As the conservation status of harbour porpoise in UK waters and the SAC is considered favourable (JNCC 2016, 2017a) current and historical levels of fishing in the SAC are not considered to have affected the conservation status of the species.</i></p> <p><i>19.214 There are no known plans to suggest that the level of fishing within the SAC will significantly increase over the period the consented wind farms are planned to be constructed, such that, it is predicted that the current level of impacts from fishing on harbour porpoise within the SAC will not increase.”</i></p> <p>Therefore, whilst the draft RoC HRA potentially shifts the accepted position on fisheries impacts being part of the baseline, nevertheless the implication from the draft RoC</p>

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			<p>HRA is that this would have no effect on the conclusions reached in the Applicant’s CIA in the ES and in-combination assessments in the Information for the HRA.</p> <p>We also note the following from Natural England’s Deadline 4 Response to the Further Examiners’ Questions and Requests for information for Hornsea Project 3 (15th January 2019) (page 46, Q 2.2.73)</p> <p><i>“Where there is ongoing fishing activity in the site it is important that the impacts of the activity are captured within the assessment in the context of the conservation objectives of the affected designated site(s). This assessment will likely take place as part of the baseline characterisation of the development area, however, as fishing activity is mobile, variable and subject to change, there may be instances whereby fishing impacts are not adequately captured in the baseline characterisation and therefore may need to be considered as part of the in-combination assessment. This could be due to a change in effort; change in management; or a change in legislation amongst other things, and fishery managers (i.e. MMO and IFCAs) would be best placed to advise on this.</i></p> <p><i>In relation to the assessment of impacts on the SNS SAC, Natural England..... are not currently aware of anything that would have significantly altered the levels of fishing activity within the site; any current plans for new fisheries, or changes to existing fisheries that have not been captured, but we would look to fisheries managers to advise more definitively on these points.”</i></p> <p>Taken together the draft RoC HRA suggests that by-catch has not hindered the population achieving Favourable Conservation Status (FCS), whilst Natural England</p>

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			<p>acknowledge that there is no known change to the fishery which would alter this position.</p> <p>Any previous discussions between TWT and the government regarding the management of fishing within Dogger Bank SAC were specific to that site and are not applicable to Norfolk Boreas.</p>
The Wildlife Trust	letter dated 7th December 2018 Comments on the Norfolk Boreas PEIR	The PTS distance impacts for harbour porpoise as outlined in table 12.30 of the marine mammal chapter seem low, especially compared to Norfolk Vanguard. Further information on the reason for the difference would be useful e.g. ground conditions or water depth.	The main reason for the difference in the PTS impact ranges modelled for Norfolk Boreas compared to Norfolk Vanguard is the bathymetry surrounding the modelling locations; the deeper the surrounding water the further noise will propagate. The Norfolk Vanguard West SW location is surrounded by water depths of between 35 and 46m (mean tide) whereas the Norfolk Boreas site is surrounded by depths of 35 to 39m (mean tide). When an impact range is calculated through a particularly deep transect, such as south from the Vanguard West SW location, the maximum calculated ranges can be quite different to one calculated through shallower water. The deeper water immediately surrounding Norfolk Vanguard West leads to higher noise levels in the vicinity of that wind farm. It is worth noting that the modelling results from Norfolk Vanguard East SW compared with the Norfolk Boreas SW location. The depth and surrounding environmental conditions at the two locations are much more comparable and the calculated ranges reflect this. However, as the worst-case scenario based on the maximum possible impact ranges for each site is used in the assessments, this is reflected in the differences between the maximum PTS impacted ranges used in the Norfolk Boreas and Norfolk Vanguard assessments.
The Wildlife Trust	letter dated 7th December 2018 Comments on the Norfolk Boreas	TWT is pleased that Norfolk Boreas has considered the additive effect of all noise producing activities from construction on marine mammals. However, we note in table 12.77 that concurrent piling has not been taken into account. As the worst-case scenario, this	The approach to the summary and conclusions of the CIA, based on the five UK offshore wind farms single piling, would allow for some of these sites not to be piling at the same time while others, including Norfolk Boreas, could be concurrent

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	PEIR	<p>should be considered.</p> <p>Due to the difficulties in undertaking cumulative and in-combinations assessments, TWT advocates a strategic approach and we are pleased that Norfolk Boreas is also supportive of this. TWT would like to work with industry, SNCBs, regulators and government to develop the most appropriate approach.</p> <p>The BEIS draft HRA for the review of offshore wind farms consents in the Southern North Sea SAC has considered the effect of a loss of habitat due to infrastructure in relation to objective 3 for the site. This should be considered for the Norfolk Boreas assessment.</p>	<p>piling. This is considered the more realistic worst-case scenario, as even although the offshore wind farms have the potential for overlapping piling periods, it is highly unlikely that all five offshore wind farms could be concurrently piling at exactly the same time (i.e. all five offshore wind farms hitting two piles at exactly the same time).</p> <p>Norfolk Boreas is supportive of strategic initiatives, and will continue to work alongside other developers, Regulators and SNCBs in order to further understand the potential for significant cumulative impacts and in-combination effects.</p> <p>The effect of a loss of habitat due to infrastructure has been assessed in the ES and the Information to Support HRA in the assessment for any changes to prey availability. This is deemed the most appropriate approach to assessing habitat loss due to infrastructure and the potential impacts on marine mammals, including harbour porpoise in the SNS Special Area of Conservation (SAC).</p>
The Wildlife Trust	letter dated 7th December 2018 Comments on the Norfolk Boreas PEIR	TWT does not agree with the SNCB advice on underwater noise management. The proposed thresholds are not based on strong science and are therefore not precautionary enough. TWT advocate the management approach used in Germany.	This is the current SNCB advice for assessments on the SNS SAC and is therefore used in the assessments. However, it should be noted that in addition to the area based approach, assessments were also conducted on the harbour porpoise North Sea Management Unit population, with additional assessments on the estimated number of harbour porpoise that the SNS SAC site could support.
The Wildlife Trust	letter dated 7th December 2018 Comments on the Norfolk Boreas PEIR	TWT is pleased that Norfolk Boreas has committed to a piling and UXO MMMP and a Site Integrity Plan (SIP) for the Southern North Sea SAC. However, as detailed plans are not available at the time of consent, TWT wish to be named as a consultee in the development of the MMMPs and SIP. TWT also wish to continue the good relationship we have developed with Norfolk Boreas into the post-consent stage.	Acknowledged. The Wildlife Trust will be consulted on during the development of the final MMMP for piling and the SIP. A draft MMMP for piling and In-Principle SIP has been included with the DCO application (document reference 8.13 and 8.17).

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		TWT expect the MMMPs and the SIP to detail the effectiveness of the potential mitigation to ensure no adverse effect beyond reasonable scientific doubt.	
The Wildlife Trust	letter dated 7th December 2018 Comments on the Norfolk Boreas PEIR	TWT is pleased that Norfolk Boreas has committed to producing an in-principle monitoring plan. For the Southern North Sea SAC, we believe a strategic approach is the best way to produce meaningful data on the impact of offshore wind farm development on the site and to provide certainty that mitigation is effective. TWT has produced a draft working document on an approach to delivering strategic underwater noise monitoring and mitigation.	Acknowledged.
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	We have serious concerns about the potential impacts these developments, both individually and cumulatively, have on cetaceans. These concerns are detailed in our report "Marine Renewable Energy: A Global Review of the Extent of Marine Renewable Energy Developments, the Developing Technologies and Possible Conservation Implications for Cetaceans" available at http://uk.whales.org/sites/default/files/wdc-marine-renewable-energy-report.pdf	Acknowledged.
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	We recognise that the conclusions drawn are a theoretical / most likely worst-case scenario when assessing the impact on marine mammals, and believe this to be appropriate given the considerable unknowns surrounding the development of the wind farm. But, as they are deemed realistic, they should be treated accordingly.	Acknowledged.
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	WDC are glad to see that Chapter 12 Marine Mammal Ecology of the PEIR recognises the importance of the Norfolk Boreas area, and that the development is within the summer area of the SNS SAC for harbour porpoise. Due to its location in the SNS SAC, it is likely that the construction of Norfolk Boreas will impact the harbour porpoise population of the SNS SAC, particularly in-combination.	Acknowledged. Impacts to the SNS SAC population have been considered in Appendix 12.4.
Whale and Dolphin	letter dated 28th November 2018	Norfolk Boreas is located within the summer area of the SNS SAC, and is in close proximity (29 km) to the year round area. Due to the	The assessments have been conducted for both the winter and summer SNS SAC areas and seasons.

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Conservation	Comments on the Norfolk Boreas PEIR	range at which piling has been shown to impact harbour porpoises (see below), there is the potential to impact the year-round area of the SNS SAC if piling is used during construction.	
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	The results of the aerial surveys undertaken (Section 2.2.4 of Appendix 12.1 Marine Mammal Information and Survey Data), shows that for cetaceans identified as harbour porpoise that there is the highest peak in the summer months, but there are also smaller peaks in winter. Additionally for unidentified small cetaceans, which are being assumed to be harbour porpoises for the purpose of the impact assessment, there was a peak in winter with a smaller peak in summer “indicating that higher than normal numbers are seen in these summer months, but the highest peaks are seen in winter”. Whilst Norfolk Boreas area is within the summer area of the SNS SAC, there are harbour porpoise, potentially at significant number, in the winter. Therefore, construction at any time of the year will require proven mitigation methods to ensure there is no adverse impact on the population of harbour porpoise at the site.	The potential for impacts on the winter area of the SNS SAC have been fully considered within the Information to Support Habitats Regulation Assessment Report submitted as part of this application (Document reference 5.3), due to the proximity of the winter area to the Norfolk Boreas site.
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	One of our main concerns is that the assessment on the harbour porpoise population in the SNS SAC is based against the North Sea Management Unit. WDC acknowledges that this is following guidance from the SNCB’s, and within the SNS SAC Site Selection Document, it states “because this estimate is from a one-month survey in a single year it cannot be considered as a specific population number for the site. It is therefore not appropriate to use site population estimates in any assessments of effects of plans or projects (i.e. Habitats regulation Assessments), as these need to take into consideration population estimates at the MU level, to account for daily and seasonal movements of the animals” (JNCC, 2017). WDC strongly disagree with this advice. The European Commission guidance on managing Natura 2000 sites also states that the integrity of the site (habitat and species) must be maintained (European Commission and Office for Official Publications of the European Communities, 2000).	Assessments were conducted based on the current SNCB advice. As outlined in Chapter 12 section 12.6.1.5 of the ES, it is currently not advised to use the SNS SAC site population estimate in any assessments of effects of plans or projects, as these need to take into consideration population estimates at the MU level (JNCC, 2017b). However, an additional assessment has been completed, based on the estimate that the SNS SAC could support 29,384 harbour porpoise (SCANS-III data for 17.5% of the UK North Sea MU). This additional assessment which if for information only is provided in Appendix 12.4.

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Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	Any assessment on the SNS SAC must take into account the draft Conservation Objectives provided in the SNS consultation documents - that the site integrity must be maintained and there is no adverse impact on the population of harbour porpoise at the site (JNCC, 2016). Site based protection cannot be met by assessing the whole North Sea population, but only by assessing the impacts for the number of individuals that are supported by the site (Rees et al., 2013).	Assessments were conducted based on the current SNCB advice. As outlined in Chapter 12 section 12.6.15 of the ES, it is currently not advised to use the SNS SAC site population estimate in any assessments of effects of plans or projects, as these need to take into consideration population estimates at the MU level (JNCC, 2017b). However, an additional assessment has been completed, based on the estimate that the SNS SAC could support 29,384 harbour porpoise (SCANS-III data for 17.5% of the UK North Sea MU). This additional assessment which if for information only is provided in Appendix 12.4.
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	The case law supports an approach which looks at both the site-level population and the favourable conservation status within the species natural range (see e.g. Commission v Spain C 404/09). Commission Guidance (Managing Natura 2000 sites: The provisions of Article 6 of the Habitats Directive 92/43/EEC", European Commission, 2000, ISBN 92-828-9048-1) states at 2.3.2 that while favourable conservation status for species is defined by reference to its "natural range", the assessment of favourable conservation status at site level "will always be necessary". For the purposes of appropriate assessment, the focus is on the impact of the plan or project on the integrity of the site (for example, where article 6(4) is engaged, the damage to the site must be precisely identified (see Commission v Greece C43/10 at 114)).	Assessments were conducted based on the current SNCB advice. As outlined in Chapter 12 section 12.6.1.5 of the ES, it is currently not advised to use the SNS SAC site population estimate in any assessments of effects of plans or projects, as these need to take into consideration population estimates at the MU level (JNCC, 2017b). However, an additional assessment has been completed, based on the estimate that the SNS SAC could support 29,384 harbour porpoise (SCANS-III data for 17.5% of the UK North Sea MU). This additional assessment which if for information only is provided in Appendix 12.4.
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	During EWG meetings, WDC has previously raised concerns with the SNCB advice in paragraph 135 of Chapter 12 Marine mammal Ecology that "Displacement of harbour porpoise should not exceed 20% of the seasonal component of the SNS SAC at any one time and or on average exceed 10% of the seasonal component of the SNS SAC over the duration of that season". We do recognise that this is the current advice given by SNCBs and this is the guidelines that developers have to work within. However this threshold approach proposed by the SNCBs has not been agreed with the competent authorities and has not been consulted upon.	This is the current SNCB advice for assessments on the SNS SAC and is therefore used in the assessments. However, it should be noted that in addition to the area based approach, assessments were also conducted on the harbour porpoise North Sea Management Unit population, with additional assessments on the estimated number of harbour porpoise that the SNS SAC site could support.

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Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	WDC welcome the inclusion of Appendix 12.3 Additional Assessment for the Southern North Sea SAC, as discussed and agreed during the EWG meeting. We are pleased that that this document undertakes an additional assessment of the impacts of the development upon on the estimated number of harbour porpoise that the SNS SAC site could support. We agree with the approach of estimating the number of harbour porpoise the site could support, as laid out in the paragraph 6 of the above document.	Acknowledged.
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	The results of this assessment estimate that a significant area of the SNS SAC, and the harbour porpoise population supported by the site could be impacted by construction activities, particularly piling during construction when the data is extrapolated for 200 foundations required for Norfolk Boreas. As detailed below, pile driving during construction has been demonstrated to cause behavioural changes in harbour porpoises, and reduce abundance in the area during the entire construction window, and beyond (see section below on Potential Impacts).	The MMMP and SIP, will reduce the potential impacts of piling on harbour porpoise in the SNS SAC. A draft MMMP (document reference 8.13) and an outline SIP (document reference 8.17) are submitted as part of the DCO application.
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	We agree with the approach for the cumulative impact assessment (CIA) in paragraph 51, as this is the only way to ensure the cumulative impacts on the SNS SAC are adequately assessed. We agree with the other offshore wind farms that have been included in the CIA, however activities other than offshore wind farm construction within the SNS SAC, do not seem to be included e.g. oil and gas, marine aggregates etc.	The project and plans included in the CIA were determined in the CIA screening (Appendix 12.3), including marine aggregates etc. Seismic surveys from the oil and gas industry have been included in the CIA.
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	During piling activities it is possible that there could be two vessels driving piles at any one time, and that pile-driving will start at one site, and then continue at another. We recommend that the CIA includes pile driving commencing at a second location, whilst the first is still being driven. The impact of the second pile driving location on the harbour porpoise population of the SNS SAC is highly dependent upon the location of the second pile-driving site which is likely to have a different potential area of impact to the first. This second pile-driving location will increase the noise levels	An assessment of the potential effects of concurrent piling has been undertaken for both Norfolk Boreas alone (see Chapter 12 section 12.7.3.2.4 of the ES) and for concurrent piling at Norfolk Boreas cumulatively with other offshore wind farms (see Chapter 12 section 12.2.8.4.1 of the ES).

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		generated and have a cumulative impact.	
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	We recognise that the assessment has been undertaken with no mitigation measures applied, and we welcome the commitment to using mitigation methods to reduce the risk of piling activities on harbour porpoise and the SNS SAC. We also acknowledge that the full details of mitigation to be used are yet to be finalised in the MMMP, and the Site Integrity Plan (SIP) will set out the approach to deliver any project mitigation or management measures in relation to the SNS SAC. However, we have concerns over the embedded mitigation measures proposed and would like to see a commitment to using proven mitigation methods (see section below on Mitigation Methods). Until the details of the MMMP and SIP are finalised, it is impossible to conclude that there will be no Adverse Effect on Integrity (AEoI) on the SNS SAC.	Developing the MMMP and SIP in the pre-construction period will allow for a detailed review and assessment of the most effective and appropriate mitigation methods at that time, based on the latest scientific evidence to reduce underwater noise impacts, including embedded mitigation. A draft MMMP (document reference 8.13) and an outline SIP (document reference 8.17) are submitted as part of the DCO application.
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	WDC is pleased to see that two years of site surveys have been undertaken to understand the use of the area by marine mammals, and provide a baseline upon which to assess the impacts of the development. WDC believe that two years is the absolute minimum survey required to provide a reliable baseline data.	Acknowledged.
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	WDC agrees that high definition aerial surveys are suitable for surveying for marine mammals, and are pleased to see that the methodology used is suitable for collecting marine mammal data. However, only a buffer of 4 km around Norfolk Boreas was used when undertaking the surveys, we feel this is inadequate to assess the numbers of marine mammals that could be impacted by the development, given the distances at which construction noises can disturb porpoises, these distances are highlighted below.	The baseline survey methodology with 4km buffer was agreed with Natural England prior to the surveys commencing. This follows a standard procedure for most offshore wind farms. The area allowed the transects covering the Norfolk Boreas site and buffer zone to be conducted in one day. In addition, to the survey data for the Norfolk Boreas site, data from other nearby offshore wind farm surveys, SCANS and other surveys were also reviewed to provide additional information on the wider area.
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the	We agree with the approach that all images were analysed to species level to provide the best baseline data possible, and followed a robust quality control. Additionally that unidentified	Acknowledged.

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	Norfolk Boreas PEIR	small cetaceans were assumed to be harbour porpoises for the purpose of the impact assessment as the worst-case scenario.	
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	WDC are pleased to see the inclusion of other data sources in table 12.11 of Appendix 12.1 Marine Mammal Information and Survey Data, including recent aerial surveys of Norfolk Vanguard site and the use of the recent SCANS III data to assist with assessing marine mammal populations, and potential impacts on marine mammals. However, the SCANS surveys are only one seasonal snapshot in time, with a 10 year gap between datasets. It is not therefore appropriate to be used for estimates of density and finer-scale information is required where such data are not available (Green et al., 2012).	Acknowledged. The assessments for harbour porpoise have used the Norfolk Boreas site specific density estimates, as derived from the site specific surveys (see Appendix 12.2 for more information on how the site specific density was derived), to assess impacts, as well as the density estimate as reported by the SCANS-III survey (Hammond et al., 2017).
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	We are concerned that the other datasets used to provide a baseline for assessment are not recent, are ad-hoc data or are not dedicated marine mammals surveys, and some only cover small parts of the Norfolk Boreas area. Whilst useful information they cannot be relied upon to provide a reliable baseline for assessment.	Potential impacts have been based on the highest site specific survey density estimates and the SCANS-III survey density estimate throughout the assessment, as a precautionary approach to assessing impacts. All currently publicly available data has been referred to including surveys have been undertaken / currently underway at other offshore wind farm sites, for example, Norfolk Vanguard, East Anglia ONE North and East Anglia TWO.
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	WDC note that the foundation type has yet to be finalised, and are pleased to see that various foundation types are being considered for Norfolk Boreas. Section 241 of Chapter 12 Marine Mammal Ecology describes the various foundation types being considered for Norfolk Boreas. We are concerned to see that foundations requiring piling are being considered. Pile driving, even with the use of pin piles, has the potential to cause physical harm, as well as displacement.	Piling has been assessed as worst-case, but other foundation options are being considered. The requirement for pile driving will be based on the several factors, such as underlying ground conditions and the safest way to successfully install and operate the turbines. The most suitable foundation options for the site would be determined during final design, post consent, and would be informed by further site investigations.
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas	Our primary concern surrounds the intense noise pollution resulting from pile driving for all cetacean species and the harbour porpoise population supported by the SNS SAC. Reactions of harbour porpoises to the pile driving process have been recorded	Acknowledged. An assessment of the potential for disturbance from pile driving is included in section Chapter 12 12.7.3.2.4 of the ES.

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	PEIR	at distances many kilometres from the piling location (Brandt et al., 2018, 2011; Carstensen et al., 2006; Dähne et al., 2013; Thomsen et al., 2006). In some cases pile driving is audible by harbour porpoises beyond 80 km from the source and could mask communication at 30 – 40 km (Thomsen et al., 2006). Bottlenose dolphins (<i>Tursiops truncatus</i>) could exhibit behavioural responses at distances of up to 40 km from pile driving locations (Bailey et al., 2010).	<p>The assessments for the potential disturbance and possible behavioural response in harbour porpoise was based on the currently advised thresholds and criteria for underwater noise modelling, as well as the SNCB recommended 26km EDR. In addition, a review all relevant publications were conducted to put the assessment into context.</p> <p>There is no evidence that bottlenose dolphin would be present in the area of the Norfolk Boreas site, however, the MMMP and SIP (DCO document reference 8.13 and 8.17) although aimed primarily at harbour porpoise would provide mitigation for other cetaceans / EPS.</p>
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	Research has shown that pile driving causes behavioural changes in harbour porpoises which leave the area during construction and in some instances did not later return to their usual numbers (Brandt et al., 2011; Carstensen et al., 2006; Teilmann and Carstensen, 2012). Some studies have shown harbour porpoise start to return in one area, yet years later have not returned to other areas (Snyder and Kaiser, 2009). The longest running study into the effects of windfarms on harbour porpoises shows that ten years later, the population has only recovered to 29% of the baseline level (Teilmann and Carstensen, 2012). Even where areas have been recolonised, it is not clear if these are the same animals returning or new animals moving into the area, or if the animals are using the area in the same way.	<p>Acknowledged. An assessment of the potential for disturbance and behavioural response for harbour porpoise from pile driving is included in Chapter 12 sections 12.7.3.2.4 and 12.7.3.2.5 of the ES.</p> <p>Vattenfall has been heavily involved in the development of DEPONS (Disturbance Effects of Noise on the Harbour Porpoise Population in the North Sea), which used at a strategic level would allow consideration of the biological fitness consequences of disturbance from underwater noise, and the conclusions of a quantitative assessment to be put into a population level context.</p>
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	A paper analysing foraging rates in harbour porpoise found that they feed almost continuously to meet energy needs and are therefore highly sensitive to disturbance (Wisniewska et al., 2016). Loud noises, such as pile driving, can cause harbour porpoise to be displaced (Dähne et al., 2013) from potential important feeding grounds. Additionally harbour porpoise can lose 4% of their body weight in just 24 hours from starvation (Kastelein, 2018). Given the importance of the Norfolk Boreas area and the SNS SAC for harbour porpoise, most likely as prime foraging areas,	The displacement of harbour porpoise as a result of any changes in availability of prey species is assessed in section 12.7.3.8.

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		displacement from the area could be very significant.	
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	Section 12.7.2 of Chapter 12 Marine Mammal Ecology, details piling scenario for Norfolk Boreas. It states that the construction window is four years, and there are two different piling scenarios. We agree that for assessment purposes that consideration is given to the impacts on marine mammals over the full construction window.	Following the PEIR further work has been undertaken to better define the offshore construction programme. The new indicative programme considers that construction window under either a single phase or a two phase approach would last up to three years (Chapter 12 section 12.7.2 of the ES) therefore the first assessment has been updated (Chapter 12 section 12.8 of the ES) however the second assessment which assesses a CIA whereby construction could occur anywhere within the theoretical seven year consent window is also provided in Appendix 12.6
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	Either scenario is a significant period of time in a harbour porpoise life span (608 days for single phase, 243 days in each phase for the two phase approach, paragraph 405 Chapter 12 Marine Mammal Ecology), and with the potential for piling at more than one location at any one time, therefore the potential impact of pile-driving for Norfolk Boreas on the harbour porpoise population is high, covering the lifespan of a porpoise and with a high potential to affect breeding and feeding activity.	The assessment of disturbance to harbour porpoise as a result of pile driving, taking into account the total time that pile driving may be undertaken, is included in Chapter 12 section 12.7.3.2.4 of the ES.
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	Although it is likely that pile driving activity will not be constant, the installation of monopile foundations has been found to have a profound negative effect on harbour porpoise acoustic activity up to 72 hours after pile driving activity (Brandt et al., 2011). It is unlikely that harbour porpoises will return to an area during these gaps, resulting in them most likely being excluded from the area for the entire duration of construction.	Nabe-Nielsen et al. (2018) developed the DEPONS (Disturbance Effects of Noise on the Harbour Porpoise Population in the North Sea) model to stimulate individual animal's movements, energetics and survival for assessing population consequences of sub-lethal behavioural effects. The model was used to assess the impact of offshore windfarm construction noise on the North Sea harbour porpoise population, based on the acoustic monitoring of harbour porpoise during construction of the Dutch Gemini offshore windfarm. Local population densities around the Gemini windfarm recovered 2–6 hours after piling, similar recovery rates were obtained in the model. The model indicated that, assuming noise influenced porpoise movements as observed at the Gemini windfarm, the North Sea harbour porpoise population was not affected by

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			construction of 65 wind farms, as required to meet the EU renewable energy target (Nabe-Nielsen et al. 2018).
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	We are pleased that it is recognised in Chapter 12 Marine Mammal Ecology, section 12.7.3.2 that the impacts from piling include both physiological and behavioural impacts on marine mammals. We note that INSPIRE modelling has been used to predict underwater noise levels from the construction of Norfolk Boreas. Whilst we feel this is model will be helpful in the assessment, the model has been found to under predict noise levels (Spiga, 2015) which can potentially lead to underestimate the impact of piling on cetaceans. We are pleased that the National Marine Fisheries Service (NMFS) modelling (National Marine Fisheries Service (NMFS), 2016) is also used instead as agreed in the ETG.	Norfolk Boreas Limited are confident that the modelling used is appropriate for the purposes of this assessment. A precautionary approach has been used for the underwater noise modelling with the worst-case parameters used within the model, including piling hammer energies, soft-start and ramp-up scenarios, strike rate, duration of piling, receptor swim speeds and water depths. More information on the underwater noise modelling and INSPIRE model can be found in Appendix 5.4. During the development of the final MMMP for piling the underwater noise modelling will be reviewed, and updated, if required.
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	WDC is concerned about the impacts of increased vessel activity particularly during construction. Increased vessel noise can interrupt harbour porpoise foraging behaviour and echolocation, which can lead to significantly fewer prey capture attempts (Wisniewska et al., 2018). There is an increased risk of collision and disturbance to cetaceans from increased vessel activity (Dyndo et al., 2015; James, 2013). This is of particular importance as there are expected to be a large increase in the number of vessels in the Norfolk Boreas area during construction.	An assessment of the increase of collision risk to harbour porpoise has been included in Chapter 12 section 12.7.3.6 of the ES, and an assessment of the potential disturbance due to increased vessel presence is included in Chapter 12 section 12.7.3.4 of the ES.
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	WDC do not agree with the assumption in 12.7.3.6 Chapter 12 Marine Mammal Ecology that “Marine mammals in the Norfolk Boreas offshore project area would be habituated to the presence of vessels and would be able to detect and avoid vessels”; as there is no evidence to base these assumptions upon. We also disagree with paragraph 505 “In addition, based on the assumption that harbour porpoise would be disturbed from a 26km radius during piling, there should be no potential for increased collision risk with vessels at Norfolk Boreas during the construction period” as	Assessments on the potential impacts of vessels have been based on the worst-case scenarios. All vessel operators will use good practice to reduce any risk of collisions with marine mammals.

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		harbour porpoise may not move out of the area, especially if the area is important for feeding and breeding.	
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	We are pleased to see that at the moment there are no plans to use explosives during the decommissioning of the wind farm, and that instead decommissioning will most likely will involve cutting of piles and grinding or drilling techniques. We hope that this will continue to be the case when the detailed plan is drawn up because the use of explosives in decommissioning has the potential to cause physical harm or be lethal to cetaceans (Prior and McMath, 2008).	Acknowledged.
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	We do have concerns regarding the noise levels that may be generated by decommissioning, and recognise that this will be dependent on the methods used to remove the turbine foundations and mitigation methods used. Until methods of removal have been decided, it will be inaccurate to conclude that the impacts from decommissioning on marine mammals will be negligible.	The assessment for the proposed activities during construction are based on the worst-case scenario and it is anticipated that the potential impacts during decommissioning will be the same or less than those assessed for construction.
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	Section 12.7.1 of Chapter 12 Marine Mammal Ecology cover the embedded mitigation measures that have already been incorporated into the project design. As discussed at EWG meetings, WDC are pleased to see a commitment to mitigation measures however, we strongly disagree that these measures are appropriate mitigation methods.	Developing the MMMP and SIP in the pre-construction period will allow for a detailed review and assessment of the most effective and appropriate mitigation methods at that time, based on the latest scientific evidence to reduce underwater noise impacts, including embedded mitigation. A draft MMMP (document reference 8.13) and an outline SIP (document reference 8.17) are submitted as part of the DCO application.
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	We understand that the JNCC guidance for minimising the risk of injury to marine mammals from piling noise (JNCC, 2010) has been followed, with a more precautionary approach. We recognise that currently these are the only guidelines available to developers to use to minimise the impacts of piling activity on marine mammals, however it is widely known that these guidelines are outdated, and do not use the latest scientific evidence.	Reference to the JNCC guidance (JNCC, 2010) has been provided for context. Developing the MMMP in the pre-construction period will allow for a detailed review and assessment of the most effective and appropriate mitigation methods at that time, including the latest scientific evidence and guidance.
Whale and Dolphin Conservation	letter dated 28th November 2018	The in-situ methods in the JNCC guidelines have been widely criticised as arbitrary and with a lack of supportive evidence	The MMMP will be developed in the pre-construction period and based upon best available information, methodologies

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Conservation	Comments on the Norfolk Boreas PEIR	(Wright and Cosentino, 2015). Additionally the guidelines have not been updated for a number of years and therefore do not include the latest and increasing body scientific data of the impacts of noise on marine mammals (Wright and Cosentino, 2015).	and guidance.
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	In particular WDC have concerns over the guidance that soft-starts should be used and the use of Marine Mammal Observers (MMOs). WDC do not consider 'soft-start' to be an adequate mitigation measure as they are only a reduction in sound source at the initiation of a piling event. It cannot be assumed that cetaceans will leave an area during a soft-start as they may be remain the area due to prey availability or breeding despite the harmful noise levels (Faulkner et al., 2018). Whilst a common sense measure, soft-starts are not a proven mitigation technique and so cannot be relied upon to mitigate impacts, especially for developments within the SNS SCI.	Developing the MMMP in the pre-construction period will allow for a detailed review and assessment of the most effective and appropriate mitigation methods at that time, including the latest scientific evidence and guidance for 'soft-starts'.
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	We are concerned that acoustic deterrent devices (ADDs) such as pingers may be used to move marine mammals out of the area. Not only will this add another source of noise into the environment (Faulkner et al., 2018), the use of ADDs has not been proven as a mitigation for pile driving and cannot be relied upon for the range of species likely to be encountered in the wind farm region. The range of displacement from ADDs has the potential to exceed the range of displacement from pile driving itself when using bubble curtains (Dähne et al., 2017).	The potential disturbance from the proposed use of ADDs has been assessed in Chapter 12 section 12.7.3.2.4 of the ES. If the use of ADDs is proposed as a mitigation method the potential disturbance will be assessed against the risk of any physical or permanent auditory injury (PTS) to marine mammals. Examples of ADD use were included, but as outlined above all effective and appropriate mitigation methods will be reviewed during the development of the MMMP. The use of ADDs has been used as mitigation during piling at several European and UK offshore wind farms.
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	Our concerns with the SNCB guidance on noise management within mobile species marine protected areas (MPAs), and our views and recommendation are attached at the end of this document.	Acknowledged.
Whale and Dolphin Conservation	letter dated 28th November 2018	Due to Norfolk Boreas being located within the SNS SCI, WDC would like to see a commitment to using mitigation methods that	Norfolk Boreas Limited is committed to using effective, proven and appropriate mitigation methods based on the

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Conservation	Comments on the Norfolk Boreas PEIR	have been proven in both test scale (Diederichs et al., 2013; Wilke et al., 2012) and full-scale sites, in particular bubble curtains (Brandt et al., 2018; Dähne et al., 2017; Nehls et al., 2016).	latest scientific evidence as necessary to comply with the Conservation Objectives of the SNS SAC.
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	A study analysing the benefits of noise reduction to harbour porpoise during offshore wind construction found that if wind farms inside the SNS SCI reduced their noise levels by the equivalent of around 8dB, the risk of a 1% annual decline in the North Sea porpoise population can be reduced by up to 66% (WWF, 2016). Such an approach is the only way to reduce the far reaching avoidance distances for cetaceans	As outlined above all effective and appropriate mitigation methods will be reviewed during the development of the MMMP.
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	WDC are pleased to see a commitment to a MMMP to reduce noise from construction. We recognise that the MMMP will be designed closer to construction, once all details and plans are known, and that mitigation methods to be used will be decided at that time. We believe this to be appropriate as this enables the latest proven mitigation methods to be included in the MMMP.	Acknowledged.
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	However, until the details of the MMP are decided it is impossible to conclude that the MMMP will ensure that impacts from piling activity will be sufficiently mitigated. We are concerned that the MMMP currently only includes mitigation methods from the JNCC guidelines and would like to see a commitment to ensure that only proven mitigation methods are included in the MMMP.	Developing the MMMP in the pre-construction period will allow for a detailed review and assessment of the most effective and appropriate mitigation methods at that time, including the latest scientific evidence.
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	We are also pleased to see there will be a Site Integrity Plan (SIP). WDC request to be involved in the consultation of the MMMP and SIP.	Acknowledged. WDC will be consulted on during the development of the SIP.
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	WDC are pleased to see that that Cumulative Impact Assessment (CIA) includes a full range of projects that may overlap with impacts from other offshore activities. We agree with the listed projects and plans in Appendix 2.2 Marine Mammal Cumulative Impact Assessment (CIA) Screening, and believe these to be appropriate. We appreciate that the CIA has been based on the best available information, and that plans for any projects may	Acknowledged.

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		change at any time; we agree that the approach taken provides the best information to base the most reliable CIA assessment.	
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	WDC are pleased that other developments, including cross boundary developments are being taken into account when undertaking the assessment. We recognise that the impacts on transboundary sites will be included in the Report to inform the HRA, and we request to see a copy of this document for review once it is available. Cumulative effects from across marine boundaries need to be considered to consider all potential transient impacts across such boundaries, especially considering the mobile nature of cetaceans.	Acknowledged. A draft of the information to inform HRA was provided to the EPP for review on the 25 th March 2019.
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	WDC note that there could be two vessels driving piles at any one time, and that pile-driving will start at one site, and then continue at another (which may be adjacent to the pile already being driven or in another area of the wind farm). We are pleased to see that the CIA includes pile driving commencing at a second location, whilst the first is still being driven. The impact of the second pile driving location on cetaceans is highly dependent upon the location of the second pile-driving site which is likely to have a different potential area of impact to the first.	Acknowledged.
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	In addition, having a second pile-driving location will increase the noise levels generated and have a cumulative impact. We recommend that the same consideration is given to marine mammals when the second pile-driving occurs as is given to the first and that it is not assumed that animals have moved out of the area as pile driving has already commenced elsewhere.	An assessment of the potential effects of concurrent piling has been undertaken for both Norfolk Boreas alone (see Chapter 12 section 12.7.3.2.4 of the ES) and for concurrent piling at Norfolk Boreas cumulatively with other offshore wind farms (see section 12.8.4.1 of the ES).
Whale and Dolphin Conservation	letter dated 28th November 2018 Comments on the Norfolk Boreas PEIR	Due to the concerns over the embedded mitigation methods, and until the mitigation methods that are to be used are known, it is inaccurate to conclude that the mitigation measures will ensure that impacts from piling on harbour porpoise and the harbour porpoise population supported by SNS SCI will be reduced. WDC strongly disagrees with the conclusions in the PEIR that either stand-alone or in-combination, that impacts on the harbour porpoise will be negligible with or without embedded mitigation.	The MMMP and SIP will set out the approach to deliver any project mitigation or management measures in relation to harbour porpoise and the SNS SAC. Developing the MMMP and SIP in the pre-construction period will allow for a detailed review and assessment of the most effective and appropriate mitigation methods at that time, based on the latest scientific evidence to reduce underwater

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			<p>noise impacts.</p> <p>It is acknowledged that WDC disagree with the conclusions of the assessment that either stand-alone or in-combination, that impacts on the harbour porpoise will be negligible with or without embedded mitigation. However, we stand by the findings of the assessment and as previously outlined, Norfolk Boreas Ltd is committed to using effective, proven and appropriate mitigation methods based on the latest scientific evidence.</p>
Natural England	letter dated 27th November 2018 Statutory Consultation under Section 42 of the Planning Act 2008 and Regulation 11 of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009	<p>Ongoing issues for Vanguard Marine Mammals: The main issues are summarised as:</p> <ul style="list-style-type: none"> • In combination underwater noise • Mitigation • Soft start as mitigation • Risk of injury from UXO • Review of Consents strategic approach to noise • 20% of SAC disturbance threshold <p>Advise that there will be a requirement to provide 'a revised site integrity plan based on final project design including adoption of possible mitigation measures which confirms the proposed timeframes of both site preparation and construction activities which pose a disturbance risk to marine mammals' to the MMO 6 months prior to construction.</p>	<p>Norfolk Boreas Limited have had due regard to ongoing consultation between Natural England and Norfolk Vanguard, however due to the timescales of both projects it has only been possible to include all agreements or changes made until the 20th March 2019.</p> <p>It is acknowledged that Natural England's concern regarding the soft-start as mitigation has now been removed (Marine Mammal ETG, 21st February 2019).</p>
Marine Management Organisation	letter dated 7th December 2018 RE: Norfolk Boreas Offshore Wind Farm – Section 42 consultation	<p>1.3 Chapter 3 describes the potential scenarios for construction of the Norfolk Boreas OWF; in one single phase or 2 phases, both spanning 4 years. Chapter 3 includes provision for a multi-phase construction approach with the proposed Norfolk Vanguard OWF. In the event that the Norfolk Vanguard OWF development is consented, this would increase overall duration of the construction phase. Chapter 3 also acknowledges that if the proposed Norfolk Vanguard OWF is not progressed, the construction programme for the Norfolk Boreas OWF could be brought forward by up to one</p>	<p>Further work has been undertaken to better define the construction periods for both projects under single and two phased construction approaches. The revised indicative Norfolk Boreas programme (Chapter 12 Table 12.16 and Table 12.17 of the ES) show a three year construction programme. The most likely scenario would be that Norfolk Boreas is constructed approximately 1 year behind Norfolk Vanguard and therefore a the combined construction period would last for up to five years.</p>

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		year. In all scenarios, further consideration is required to demonstrate how the likely impacts will differ for each construction scenario, i.e. for a build scenario lasting 3 years compared to a build scenario lasting 7-10 years. If a multi-phase construction approach is to be adopted, then the MMO considers that the in combination impacts must be assessed accordingly.	
Marine Management Organisation	letter dated 7th December 2018 RE: Norfolk Boreas Offshore Wind Farm – Section 42 consultation	1.4 With regard to impact on designated sites, namely the Southern North Sea candidate Special Area of Conservation (cSAC) and the Haisborough, Hammond and Winterton Site of Community Importance (SCI), the MMO defers to Natural England, as the Statutory Nature Conservation Body (SNCB). However, the MMO expects that a more detailed assessment of the potential impacts of the Project, taking into account the conservation status and conservation objects of the site will be required.	Acknowledged. An assessment of designated sites has been undertaken within the Information to support Habitats Regulation Assessment (Document reference 5.3).
Marine Management Organisation	letter dated 7th December 2018 RE: Norfolk Boreas Offshore Wind Farm – Section 42 consultation	2.2 The underwater noise assessment should provide a plot showing the predicted received sound levels against range, for the single strike sound exposure level (SEL). This will facilitate and streamline the process of comparing predictions with any future construction noise monitoring data collected for compliance purposes.	The Underwater Noise report (Appendix 5.4) has been updated to include a plot showing the transects of the single strike SEL results, against range. See Section 5.1.1 of Appendix 5.4.
Marine Management Organisation	letter dated 7th December 2018 RE: Norfolk Boreas Offshore Wind Farm – Section 42 consultation	2.3 Section 6 of Appendix 5.4 considers noise impacts (aside from piling activity). The text refers to a simple modelling approach based on measured data scaled to relevant parameters for the site. The MMO requests further detail on the modelling used.	The Underwater Noise report (Appendix 5.4) has been updated to include information on the ‘SPEAR’ model used within this assessment.
Marine Management Organisation	letter dated 7th December 2018 RE: Norfolk Boreas Offshore Wind Farm – Section 42	2.4 It is noted from Chapter 12 that Norfolk Boreas has committed to embedded mitigation including the use of soft-start and ramp up protocol. A Marine Mammal Mitigation Protocol (MMMP) for piling will be developed in the pre-construction period (Section 12.7.1.2) and also for UXO clearance. The MMO supports the approach that noise reduction measures such as bubble curtains	Acknowledged. Developing the MMMP for piling and UXO clearance in the pre-construction period will allow for a detailed review and assessment of the most effective and appropriate mitigation methods at that time, based on the latest scientific evidence.

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	consultation	will be an option considered.	
Marine Management Organisation	letter dated 7th December 2018 RE: Norfolk Boreas Offshore Wind Farm – Section 42 consultation	2.5 Table 6.2 summarises the estimated unweighted source levels for the different construction noise sources considered, which are based on various datasets. The MMO requests that the references be provided for these datasets.	<p>The data sets used to estimate the unweighted source levels are not formally published, and so cannot be directly referenced.</p> <p>It should be noted that data from hundreds of datasets have been built into the model and it doesn't refer explicitly to any of them, they only identify trends. In addition, because of confidentiality it is not possible to specifically reference any other projects. The modelling has been used successfully at other offshore wind farms and shown to be accurate/conservative based on the measurements during construction.</p>
Marine Management Organisation	letter dated 7th December 2018 RE: Norfolk Boreas Offshore Wind Farm – Section 42 consultation	2.6 Section 6.3 focuses on the assessment of operational noise. The MMO requests further detail is provided on why the linear fit is considered to give a worst-case estimate, as shown in Figure 6.1 (Appendix 5.4).	<p>The Underwater Noise report (Appendix 5.4) has been updated to include the following information: <i>"This fit was applied to the data available for operational wind turbine noise as this was the extrapolation that would lead to the highest, and thus worst case, estimation of source noise level from the larger 15 MW turbine. This resulted in an estimated source level of 158.5 dB SPL_{rms}, 12 dB higher than the 6 MW turbine, the largest for which noise data existed. Alternatively, using a logarithmic fit (3 dB per doubling of power output) to data would lead to a source level of 149.8 dB SPL_{rms}. A more extreme and unlikely 6 dB increase per doubling of power output would lead to 154.5 dB SPL_{rms}. Thus, the linear estimate used is considerably higher than alternatives and is considered precautionary."</i></p>
Marine Management Organisation	letter dated 7th December 2018 RE: Norfolk Boreas Offshore Wind Farm – Section 42 consultation	2.7 In Table 6.5 of Appendix 5.4, it is not clear how the unweighted Root Mean Square source levels for operational wind farms have been derived. The MMO requests further clarification.	<p>The Underwater Noise report (Appendix 5.4) has been updated to include the following information: <i>"The operational source levels (as SPLRMS) for the measured sites are given in Table 6.5 (Cheesman, 2016), with an estimated source level for Norfolk Boreas in the bottom two rows. These were derived from measurement campaigns at each of the identified wind farm sites, based on data at</i></p>

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			<i>multiple distances to predict a source level."</i>
Eastern Inshore Fisheries and Conservation Authority	letter dated 7th December 2018 Response to Norfolk Boreas PEIR	<p>Whilst the East Marine Plans state that proposals that contribute to offshore wind energy generation within the Plan area should be supported, consideration needs to be given to the cumulative impacts that developments within the area and adjacent areas have on the ecosystem.</p> <p>The East Marine Plans support sustainably-developed offshore wind energy generation projects. There are many such projects in the southern North Sea, including Dudgeon, Sheringham Shoal, Scroby Sands, Race Bank, Triton Knoll, Lynn and Inner Dowsing, Lincs, East Anglia and Norfolk Vanguard offshore wind farms as well as other projects and plans. While Eastern IFCA appreciate that the cumulative impacts of Norfolk Boreas with Norfolk Vanguard, East Anglia THREE and aggregate extraction activities have been comprehensively assessed within this PEIR, Eastern IFCA do not agree with the cumulative impact approach taken, in particular the consideration that already operational offshore wind farms, active licenced activities and implemented measures form part of the existing environment. Eastern IFCA would encourage further assessment of the cumulative impacts of all Southern North Sea wind farm activity, licenced or otherwise, as well as other activities. The impacts of these projects on the marine environment and fisheries should be assessed in-combination, highlighting any potential cumulative effects associated with the licence application and guiding decision-making and plan implementation in a stepwise approach.</p>	<p>The project and plans included in the CIA were determined in the CIA screening (Appendix 12.3).</p> <p>The CIA for marine mammals has taken into account operational offshore wind farms (see Chapter 12 section 12.8.5.2 of the ES).</p>
Marine Management Organisation	letter dated 27th February 2019 UWN assessment	In Section 6.2 of the assessment, 'Other Construction Activities' are all continuous sources and source levels have been provided as root mean square (RMS) levels (which is appropriate), as summarised in Table 6-2 and 6-5 of the report. However, the National Marine Fisheries Service (NMFS) (2018) noise exposure criteria relevant for impulsive sources (for PTS) have been used, instead of the non-impulsive criteria. This should be corrected.	The impulsive criteria are stricter than the non-pulse. All of the results for the continuous noise using the impulsive criteria are low, less than 500m. Any ranges calculated using the non-pulse criteria will therefore be much smaller than this. Therefore, new modelling using the non-pulse criteria would not add anything further to the assessment.

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Marine Management Organisation	letter dated 27th February 2019 UWN assessment	Section 6.3 of the UWN assessment focuses on Permanent Threshold Shift (PTS) and there is no consideration of Temporary Threshold Shift (TTS) in marine mammals (see Table 6-3 and Table 6-6 in the report). The MMO acknowledges that to date it remains difficult for TTS to be quantified and to what extent TTS results in PTS for Cetaceans. The MMO recommends that the ES should reference TTS in a qualitative manor for context.	<p>TTS has not been modelled for other construction activities and operational turbines, but the ES provides an assessment of the possible behavioural response of harbour porpoise to underwater noise during other construction activities and from operational turbines based on the Lucke et al. (2009) Unweighted SEL 145 dB re 1 µPa criteria.</p> <p>Chapter 12 sections 12.7.3.3, 12.7.4.4 and 12.7.4.1 of the ES refers to TTS in a qualitative manor for context.</p>

2 References

Refer to Chapter 12 for full reference list.