From:	Dominika Phillips
To:	Hornsea Project Three; Kay Sully; KJ Johansson
Cc:	Andrew Guyton; Stuart Livesey
Subject:	Hornsea Project Three (UK) Ltd response to Deadline 4 (Part1)
Date:	15 January 2019 22:52:57
Attachments:	image001.png D4_HOW03_Add_Land.pdf D4_HOW03_BoR_Tracked.pdf D4_HOW03_Cover_Letter.pdf D4_HOW03_DCO_Clean.pdf D4_HOW03_DCO_Schedule of changes.pdf D4_HOW03_DCO_Tracked.pdf D4_HOW03_ExASecondWQ.pdf D4_HOW03_IP_WR.pdf HOW03 Guide to the application.pdf

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Dear Kay, K-J

We are pleased to enclose Ørsted Hornsea Project Three (UK) Ltd ("the Applicant") response to Deadline 4, Friday 15 Jan 2019. These documents have been prepared by the Applicant and have been produced in response to the Examining Authority's (ExA) letter of 9 October 2018 ("the Rule 8 letter") as well as the Hearings (03-07 December 2018). The documents are pursuant to Rules 10(1) and (2) of the Infrastructure Planning (Examination Procedure) Rules 2010 and are in connection with the Development Consent Order application for the proposed Hornsea Project Three Offshore Wind Farm (hereafter referred to as "Hornsea Three").

These documents are being issued over a series of emails, each email containing a pdf file or files. The **last** email to be issued by the Applicant will contain a supporting file tracking sheet – to help the ExA ensure that it has received each email transmission.

Please acknowledge safe receipt of these documents. If we can be of any assistance in that regard, please do not hesitate to contact myself or Andrew Guyton.

Best regards,
Dr Dominika Chalder PIEMA
Environment and Consent Manager

[redacted]

Environmental Management UK | Wind Power
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Hornsea Project Three
Offshore Wind Farm

Hornsea Project Three

Offshore Wind Farm

Applicant Responses to the ExA's Second Written Questions

Date: 15th January 2019

Hornsea 3
Offshore Wind Farm

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

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1. Applicant's responses to the Second Written Questions

1.1.1.1 Following the issue of Second Written Questions by the Examining Authority outlined in the Rule 8 Letter of 9th October 2018 to the Applicant and other Interested Parties, the Applicant has subsequently responded to each of those questions. Details of Applicant's responses are set out within this document in subsequent sections below.

1.1 Written Question 2.1 Alternatives and Design Flexibility

PINS Ref. No.	Question is addressed to:	ExA Question	Response
Q2.1.1	**Applicant**	At Issue Specific Hearing 1 (ISH1) the Applicant referred (in general terms) to challenges and delays in the delivery of high voltage direct current (HVDC) transmission systems serving offshore wind farms (OWF) in Germany. A) Please provide further details of the reasons for these challenges and/or delays (to the extent that this information is in the public domain).	Whilst numerous press reports are available highlighting the challenges and delays faced within the German HVDC market, there are (due to the obvious commercial sensitivity of such information) limited publicly available, technical reports which detail the specific reasons for such challenges. The applicant understands that it is not a single factor which has caused problems to the German HVDC market, rather a number of technical, commercial and external factors which have led to the observed delays and system 'teething problems'. Notwithstanding this, the Applicant would like to refer the Examiners to Appendix 52 to this submission "*Synergies at Sea Feasibility of a combined infrastructure for offshore wind and interconnection*"; specifically, section 3.2.5 on Page 26 where certain issues are described in greater detail. The Applicant would also highlight that they operate several projects in the German North Sea region which connect to shore via HVDC links, and therefore have direct exposure to these issues which has informed their technology position.
		B) Insofar as these challenges and/or delays resulted from a lack of experience of delivering such transmission systems, would the experience gained from those projects inform future projects, thereby reducing the risks of delay?	As described in the previous answer to question A), the Applicant understands that there is not one single reason for the challenges encountered in the German HVDC market. That said, it is considered that the experience gained is valuable and will assist in mitigation of certain risks, and that HVDC technology will continue to mature and become more reliable over the coming years.

			However, it is conceivable that new and unforeseen challenges will be encountered deploying the technology into a new market (that of the United Kingdom) with new Clients, project delivery models, regulatory regimes, technical standards etc. Until further experience is gained (in the UK market specifically) HVDC technology cannot be considered fully matured and delivery risks will need to be carefully managed.
Q2.1.2	**Applicant**	At ISH1 the Examining Authority (ExA) asked about the difference of approach (in relation to transmission systems) as between the Applicant and the promotors of Norfolk Vanguard OWF who have committed to HVDC. It is appreciated that the Applicant cannot speak on behalf of Norfolk Vanguard and that other comparator projects may be relevant. Nevertheless, Norfolk Vanguard is being promoted at the same time, in a broadly similar location and is of comparable scale. Please identify any factors that might explain the difference of approach between the Applicant and the promotors of Norfolk Vanguard OWF in relation to the ability to commit to a specific transmission system.	As the Examining Authority identifies, the Applicant cannot comment directly on the reasons for another developer's decisions, and cannot know all of the influencing factors upon these. In the Applicants submission REP1-164 'Appendix 22 Transmission System (HVAC/HVDC) Briefing Note', the Applicant documented our stance on HVDC technology. Section 7 and Section 9 of which identified a number of factors which may be evaluated when making a decision on transmission technology selection, in the Applicant's view. The Norfolk Vanguard project may have weighed similar considerations in making their decision.
Q2.1.3	**Applicant**	At ISH1 the Applicant explained that (if the works were phased) ducting for the phase 2 onshore cables would be installed as part of the phase 1 works provided that a final investment decision covering phase 2 had been made at that time. The Applicant's rationale for this approach was that the scale of phase 2 and the design of the transmission system might still be unknown. A) Having chosen either high voltage alternating current (HVAC) or HVDC for phase 1, would not that decision weigh strongly in favour of using the same system in phase 2, in the interests of providing a consistent scheme design which would (presumably) benefit the ultimate owner of the transmission system?	When considering the choice of transmission technology for Phase 2, many of the same characteristics which determined the Phase 1 selection will apply, which would lend weight to the use of the same technology for Phase 2. That said, there may also be key differences between the projects which could favour an alternate transmission technology to be selected; e.g. project size/generation capacity and supply chain availability for the required delivery years or, in the case of HVDC transmission a more mature market readjusting its risk profile. If delivered as separate phases, it is likely that separate OFTO tender rounds will be run and therefore the transmission systems may ultimately be owned by separate entities, negating any synergies through common ownership. As such, the applicant is not presently able to confirm that the same transmission technology would be used across the project in the event of a phased build out.
		B) Please provide a schematic drawing of HVAC and HVDC cables within ducting, indicating the size of the components likely to be used.	Please refer to Appendix 53 of the Applicant's Deadline 4 submission for schematic trench cross sections for a ducted cable installation. The maximum design scenario for cable and duct diameter can be found in Table 3.55 of Volume 1, Chapter 3: Project Description of the Environmental Statement. The maximum cable diameter assessed is up to 220mm, and the maximum duct diameter is 330mm. The size of these components within this envelope will vary depending

			upon system voltage, cable conductor cross section, transmission technology choice, among other factors.
		C) Having regard to the likely range of cable circuits that might be required, what effect would this have on the size and design of the ducting?	Please refer to the following response (D, below) for examples of the extent to which the design of the overall cable system would be affected by the installation design of Phase 2 ducts in Phase 1.
		D) To the extent that pre-ducting could result in some over-engineering of the phase 2 ducting, what evidence is there that this would be a significant factor (in relation to cost and/or environmental impacts) having regard to the cost savings and reductions in environmental impacts that would result from carrying out excavation and ducting works for the entire project during phase 1?	When designing the ducted installation for Phase 2, factors beyond simply the size of the ducts must be considered. The primary consideration associated with installing Phase 2 ducting during Phase 1 would be uncertainty over the chosen transmission technology associated with Phase 2 with respect to the declared Phase 1 method. Ducts installed for Phase 2 on the same basis as Phase 1, either as an HVAC or HVDC arrangement would be compromised if the chosen technology for Phase 2 was the alternative to Phase 1. This is particularly pronounced in going from DC to AC, where if the ducts were installed for a DC arrangement and AC was subsequently installed, then there would simply not be sufficient ducts for all the required cables, either in terms of the number of circuits (up to 6 total for HVAC, compared to up to 4 total for HVDC) or the number of cables in a circuit (3 for HVAC, 2 for HVDC). It would therefore be required to install the maximum number of duct circuits in the available space, which could lead to ducts being redundant and never used, with the obvious costs, environmental impacts and additional land requirements associated with that. Similarly, if the transition is HVAC to HVDC, the normal duct arrangement for DC cables is two ducts laid in a flat formation with a defined spacing between the circuits. By contrast, ducted HVAC cables are generally laid as close trefoil groups. In the event that DC cables were installed in the HVAC arrangement, there would be one duct left redundant and the two ducts containing the cables would then be installed in non-optimal arrangement from a cable thermal design perspective, and consequently larger, more expensive cables may be required. This potential technology mismatch is even more pronounced at HDD locations where all 3 AC cables would generally be installed in a single drill, compared to separate drills for the 2 HVDC cables in order to minimise their thermal interaction. Therefore for 4 HVDC circuits there would be 8 HDD drills at each location, where as for 4 HVAC circuits there would be only 4.

			Therefore, installing HDDs in Phase 2 in either an HVAC or HVDC format could result in significant redundant drills, not enough drills, or drills too small to accommodate all of the required cables. With the number of required drills and the associated costs, environmental impacts and schedule impact associated with HDDs, as well as the potential for redundant drills compromising the ability to install additional drills at certain or all locations. It would therefore not be appropriate to undertake the HDD works for Phase 2 without the technology decision being made and the HDD designs taking full account of this. As there are over 100 HDD drill locations along the cable route which are required to pass under a variety of obstacles, a significant amount of work would be required, subsequent to any Phase 2 pre-ducting being installed in Phase 1, to allow cables to be installed in Phase 2. This would substantially add to the overall time scale for the Phase 2 works and substantially increase the overall project timescale for both Phase 1 and Phase 2. Beyond the technology choice aspect between HVAC and HVDC transmission, the following general considerations would have to be considered: • The risk of inefficient cable system design, as the thermal installation conditions are predetermined with respect to depth of installation, depth of stabilised backfill and cable spacing. This could result in the need to oversize subsequent cables (larger cross section or changing conductor material from aluminium to copper) to account for poor thermal conditions, increasing the depth of thermally stable backfill, or (as a worst case) limiting the transmission capacity through each circuit constraining wider wind farm design; • Overengineering the duct system; both in terms of duct sizing and number (for example should fewer cables be required for the second phase, if a higher transmission voltage were chosen); • If future works are carried out in an earlier phase, the site establishment, construction compounds and other working areas would need to be larger to deal with the larger scope of works. If the works are done in phases, then it would be assumed that smaller compounds would be required which would be re-used for subsequent phases;

			• The installation of additional ducts within the first construction phase will require more time and contractor resources. This could impact the delivery schedule of the first phase through inclusion of a larger scope of anticipatory works; • Incorporating future works would generally limit implementing lessons learned and incorporating improvements into future works. If the works are phased, there is the potential for benchmarking of the works in terms of cost, quality, timescales etc. into future works, but if all the works are incorporated into one phase it would be more difficult to incorporate these. • Subsequent contractors may apply cost and risk premiums to account for uncertainty adopting part finished works from another party, with the potential for substantially more contract variations and claims. • Any cost inefficiency, overdesign, or risk to the cable from improperly specified components or thermal conditions would create a risk to future transmission asset divestment (as required by UK regulations) both in terms of cost recovery and potential indemnities to a future OFTO. Furthermore, whilst pre-ducting will reduce the scale of works within the subsequent phase, invasive construction activities will still be required along the cable corridor. This will include: • Reestablishment of logistics compounds and welfare facilities; • Excavation of jointing pits and link boxes; • Cleaning, proving and possible repair of ducting; • Delivery of cable drums; • Cable pulling; • Intermediate pits may be required between each joint bay to assist in the cable pulling; • Cable jointing activities; • Potential grout filling at certain HDD locations; • Inspection and testing; and • Installation of site access and roadway to facilitate the above activities.
Q2.1.4	**Applicant**	The Norfolk Vanguard project proposes to include ducts to house the Norfolk Boreas cables along the entirety of the onshore cable route from the landward side of the transition pit at the landfall to the onshore project substation [REP1-222]. Presumably the Norfolk Boreas project is currently at	The Applicant does not contest that it is impossible to install cable ducts for Phase 2 within the construction program for Phase 1, however it is highly undesirable if the system design parameters for Phase 2 are unknown at the time, for the reasons outlined in the response to Q2.1.3 D.

		an earlier stage of design development than Hornsea Project Three would be when a final investment decision is made in respect of phase 1. How is it possible for Norfolk Vanguard to install cable ducts for Norfolk Boreas when Hornsea Project Three (phase 1) is unable to commit to installing cable ducts for Hornsea Project Three (phase 2)?	Furthermore, it should be noted that both the Norfolk Vanguard project and Norfolk Boreas project have committed to using HVDC transmission technology, removing a significant variable in the design of the system installation.
Q2.1.5	**Applicant**	The cable route cross section at Appendix 2 to your Deadline 3 submissions [REP3-011] indicates a total corridor width of 68m, of which 28m would be required temporarily. The corridor includes 4m wide strips between the outer edge of the cable trenches and the inner edge of the soil storage areas on either side. Figure 3.32 in the ES [APP- 058] does not appear to show similar strips. Why does the Appendix 2 section include these 4m strips?	The Applicant would consider both the HVAC and HVDC cross sectional diagrams to be indicative rather than definitive, and the final layout would change based on factors including soil management best practice, phasing, the technology used and safety/logistics considerations. There is a 4m gap shown between the soil storage areas and the outer edges of the cable trenches not because there needs to be a specific gap in that location, but because the additional 8m is required for a fully phased build out due to the reduced flexibility of the narrower overall working area compared with the 80m temporary HVAC corridor.
Q2.1.6	**Applicant**	The Vattenfall and Orsted Circuit Crossing - EMF Information [appended to REP1-222] states that if different technologies were used (HVAC and HVDC) the magnetic fields would not interact with one another. Accordingly the document does not consider the scenario of HVAC cables crossing HVDC cables. Nevertheless, at the Open Floor Hearing on 3 December 2018, Mr Pearce commented that HVAC cables would induce currents in HVDC cables. A) Please provide further information on any electrical effects that would result from a scenario with HVAC cables crossing HVDC cables.	Appendix 19 to the Applicant's submission to deadline 1 consists of an independent report, authored by National Grid, and commissioned by the Applicant and the Norfolk Vanguard project which evaluated the electromagnetic fields at the proposed point of their crossing under a number of conservative design scenarios. In this report, it is stated that HVDC and HVAC fields do not interact with one another in the manner of two HVAC, or two HVDC circuits (where magnetic fields are superimposed can add together or cancel one another out), and where a HVAC cable crosses a HVDC cable the fields can be considered separately in their effects, and compliance with National health policy. Electromagnetic induction is a phenomenon which can be treated separately in this context. Where a HVDC cable (or indeed, any metallic object such as buried pipelines) pass through an alternating magnetic field, a small voltage can be induced, and where a continuous current path exists a current may flow as a result of this induced voltage. This effect only becomes pronounced for longer, parallel runs rather than 90 degree crossings such as the Hornsea 3/Vanguard crossing, and even then the magnitude of induced current is such (relative to the primary current) that the resultant fields are negligible in human health terms. It should be further noted that the Applicant and Norfolk Vanguard project have introduced a significant degree of conservatism into the modelling to ensure that

			the final project designs will be well within the calculated field strengths, themselves well within National guideline levels.
		B) Would there be any significant effects on people or the environment?	No; see above.
		C) In this scenario, would any effects vary depending on which system was above the other?	No; the magnetic fields can be treated separately where different transmission technologies are concerned.
		D) What is the maximum burial depth likely to be required to achieve an adequate separation between the two sets of cables?	The burial depth is not defined by EMF, and it has been demonstrated that for all foreseeable scenarios EMF remains well within the guideline levels set by Public Health England. The burial depth and separation between projects will be determined in the detailed design phase.
Q2.1.7	**Applicant**	The design flexibility sought by the Applicant, in respect of phasing and the choice of transmission systems, would have implications for the amount of land required and/or the times at which land would be used. The Applicant seeks to mitigate the impact of uncertainty on landowners through the communication plan framework set out in appendix A to the outline code of construction practice [REP1-142]. A) Given the amount of land involved and the timescale for the implementation of the project, is a code of practice sufficient to mitigate the effect of uncertainty on landowners?	A) And B) As the Outline CoCP forms part of the approved project and secured by Requirements 12, 15 and 17 of the Draft DCO [APP-027] the Applicant is of the view that the Outline CoCP is the appropriate place within which to secure the provision of information in a timely manner. To ensure that any commitments around communication of timeframes are clear and robust, the Applicant has proposed further changes to the Outline CoCP - see part C).
		B) Alternatively, would it be appropriate to secure a commitment to providing timely information on the choice of transmission system and the approach to phasing and land take within the Order itself?	

		C) The communication plan framework states that the first newsletter would be issued at least four months prior to the commencement of works. Is it envisaged that the proposed phasing and timing of the project, the choice of transmission system, the amount of land required and the period of the construction works would be communicated at that time?	The Communication Plan Framework of the Outline CoCP does provide for this information to be communicated at least four months prior to commencement of works. Whilst seeking to maintain flexibility within the application - The Applicant recognises the value of communicating its plans, when the details are known as soon as is practical to the local authorities, landowners and the wider community. The Applicant therefore proposes the following further amendments to the Outline CoCP. It is noted that there is nothing that prohibits this information being communicated earlier under the current drafting of the Outline CoCP – but rather the Outline CoCP provides a "backstop" when such matters must be communicated. This approach is considered reasonable at this time when detailed construction programmes or exact makeup of the phasing are not known. Appendix A Communication Plan Framework of the Outline CoCP amended as follows:- … • *Newsletters will be published and distributed to advise of the proposed phasing of the authorised project, ~~the use of HVAC or HVDC transmission system to be used for that phase, land take and period of construction works and the details of the body responsible for carrying out those works. The first newsletter is to be issued at least four months in advance of commencement of works.~~* … *Timeframe for the publication of key project communications.* *As soon as practical after Financial Investment Decision or Award of Contract for Difference (or confirmation of other appropriate funding mechanism), which ever is the latter*.* *A) For the purposes of communicating the approach to onshore construction:-* *i) If to be delivered in a single phase (and therefore could include all works required to support a second phases which may come on line at a later date), including the use of HVAC or HVDC transmission system to be used;* *ii) Two phases – with the first phase including ducting for the second phase (but with a requirement to return to the land at a*

			later date to pull through the export transmission cables); including the use of HVAC or HVDC transmission system to be used for the first phase, and second phase if known or iii) Two distinct separate phases (but continuing to advise of the use of HVAC or HVDC transmission system to be used for the first phase. Advice as to the timing expectations for any second phase. (*At this consenting stage – when any programme post consent is not fixed, it is anticipated that these decision points would be in the order of one year prior to commencement of works onshore) First newsletter (issued at least four months prior to the commencement of onshore works) Clarify project assumptions, including but not limited to:- i) expected land take; ii) period of construction works; and iii) details of the body responsible for carrying out those works. Prior to commencement on each parcel of land, clarify project assumptions, including but not limited to:- i) expected land take; ii) construction programme (as applied to each landowner); iii) proposed location of link boxes and joint bays; and iv) construction access points.

Q2.1.8	**Applicant, NFU**	Requirement 6 (phases of the authorised development) requires a phasing scheme to be approved before commencement. One way of ensuring that there is early awareness of the approach to phasing might be to require that the phasing scheme is approved no later than a specified period before commencement. A) What would be the advantages and disadvantages of such an approach?	The response to Q2.1.7 advises that as soon as practical after Financial Investment Decision or Award of Contract for Difference (or confirmation of other appropriate funding mechanism), whichever is the latter, the Applicant, for the purposes of communicating the approach to onshore construction – in particular the approach to be deployed on phasing. This will help ensure that the Applicant gives as much early awareness of the approach to phasing as possible. The principal advantages being that it maximises the timeframe within which the LPAs, landowners and community know of the broad approach the Applicant is taking to phasing. The disadvantages being, that at that early point in the post consent / pre-commencement of works period the exact land take required on each parcel of land (i.e. the detailed design) will not be known as this communication is likely to occur before the cable installation and specifications have been defined and prior to the appointment of a construction contractor.
		B) What would be an appropriate period to specify?	Whilst the proposed approach to notify as soon as practical after FID or CfD does not established a prescribed period – this is typically a year prior to any commencement of the first works.
Q2.1.9	**Applicant**	Requirement 6 (phases of the authorised development) requires a phasing scheme to be approved before commencement. The NFU submission for Deadline 3 [REP3-105] suggests that it should be clear within Requirement 6 that there should be no more than two main phases of construction. This would be to ensure consistency with the ES which assessed the proposals on this basis. A) Does the applicant have an objection in principle to this approach?	The Applicant has amended Requirement 6 in the dDCO submitted at DL4 to refer to two phases of construction.
		B) Would it be possible to draft the requirement in a way which allowed some flexibility, for example if there were a need for a staged approach within the main phases of construction?	
Q2.1.10	**Applicant**	If the project is implemented in phases, the full corridor width of 80m may not be required in phase 1 (unless pre-ducting were taking place). Presumably the phase 1 cables would need to be laid on one side of the 80m corridor in order to leave space for the phase 2 cables. Would it be practical for the Applicant to identify land that would not be required until phase 2 as part of the phasing plan approved under Requirement 6?	The Applicant has proposed a timeline for the identification of such land under the phasing plan, as outlined in Q2.1.7.
Q2.1.11	Applicant, Norfolk County Council	In NNDC's submission for Deadline 3 [REP3-103] a requirement is suggested to the effect that the method of electrical transmission within each	Question targeted to NNDC

	(NCC), North Norfolk District Council (NNDC)	phase of the authorised development shall be via HVDC unless there are clear and compelling technological reasons as to why HVDC transmission cannot be provided. A) Please can NNDC clarify whether it is proposing a decision making role under this requirement or the provision of information about a choice that has been made by the developer.	
		B) If NNDC is seeking a decision making role, given the linear nature of the project how would NNDC intend to cooperate with other affected local planning authorities?	
		C) Given the linear nature of the project it appears that the appropriate determining body may be NCC. What is NCC's view on taking on such a role?	
		D) If the Secretary of State finds that the degree of design flexibility sought by the Applicant is justified, would it then be reasonable to impose a second tier of in-principle decision making in relation to a major element of the Nationally Significant Infrastructure Project under the terms of a requirement?	No. In accordance with the relevant legal and policy tests applicable to design flexibility and the imposition of requirements on DCOs, if the SoS is satisfied with the degree of flexibility sought by the Applicant, and that flexibility has been adequately assessed in the Environmental Statement (as amended and supplemented by evidence submitted in the Examination) then it would not be necessary or reasonable to impose a second tier of in-principle decision making in relation to a major element of the Nationally Significant Infrastructure Project under the terms of a requirement. The principle for the inclusion of flexibility would be established by the SoS's decision and so that decision should not be duplicated or revisited by the local authorities under the terms of a Requirement – in those circumstances the terms of the Requirement would derogate from the terms of the DCO and would be unlawful.
		E) It appears to the ExA that the underlying concern being expressed by NNDC may be that there should be a clear and transparent explanation and justification for the ultimate choice of transmission system. If the Secretary of State were to conclude that this is a legitimate concern, does the Applicant have any alternative suggestions as to how to address this matter?	Without prejudice to the Applicant's case that no subsequent approval or justification of the choice of transmission system is necessary or required, to assist the ExA it is suggested that Requirement 7 (Detailed design approval onshore) could be amended to require the undertaker to confirm its choice of transmission system and justification for that choice to [Norfolk County Council/the relevant planning authority] when submitting other details pursuant to that Requirement. However, for the reasons set out above and in the Applicant's evidence before the Examination, the Applicant submits that if the SoS imposes such an amendment it should not be coupled with the need for the local authority's approval. That would be a step too far and would likely cause delay to the implementation of this NSIP counter to the urgent need set out in National Policy Statements.

1.2 Written Question 2.2 Ecology – Offshore

Ornithology

PINS Ref. No.	Question is addressed to:	ExA Question	Response
Q2.2.1	Applicant, Natural England (NE)	Please produce a draft Statement of Common Ground (SoCG) for ornithology at Deadline 6 that includes but is not limited to the following headings: Baseline Characterisation, Collision Risk Model, Band Model Options, Maximum Likelihood Estimates, Nocturnal Activity Factors, Avoidance Rates, Flight Height Estimation, Flight Speed Estimation, Biological Seasons, Migratory Species, Predicted Displacement Mortality, Likely Significant Effects In Combination Screening, Population Viability Assessment, Impact Apportioning Where you cannot reach agreement you should state that your position is final and will not be resolved.	The Applicant acknowledges the request from the Ex.A and will work to produce a Statement of Common Ground with Natural England on the topic of Ornithology for Deadline 6.
Q2.2.2	NE, Royal Society for the Protection of Birds (RSPB)	Notwithstanding the use of two out of four cameras, do you agree that the digital aerial survey data forms an adequate ornithological baseline for the months where data were collected over two separate years?	The Applicant notes that this question is directed at Natural England and the RSPB but would draw the Examining Authority's attention to the agreement between the Expert Working Group (comprised of the Applicant, Natural England and the RSPB) stated in paragraph 4.3.2.3 of the Evidence Plan: "*The baseline has been agreed for the months of which two years of site specific surveys have been carried out (see Figure 4.1). The baseline remains under discussion for the months December – March.*" This agreement was reached as part of the EWG meeting undertaken on the 27th February 2018 with the meeting minutes contained within Section D.8 of Appendix D of Consultation Report Annex 1 (APP-035).
Q2.2.3	Applicant	The HiDef contractor methodology indicated that a 10% coverage (using two cameras) is generally sufficient for achieving a coefficient of variation of 16% or better for abundance estimates. In evidence submitted at	The Applicant has provided a response to this question at Appendix 77 to the Applicant's response to Deadline 4.

		Deadline 3, NE has highlighted that the coefficient of variation is greater than 16% for most months and for most species. You highlighted in ISH2 that 10% coverage had been sufficient in other projects. What evidence do you have that the coefficient of variation was actually 16% or less in aerial surveys for those other projects to justify the use of two cameras instead of four? Are there any reasons, other than cost, that led you to analyse 50% of the data? Please provide copies of any publications you wish to rely upon in evidence that have not already been provided.	
Q2.2.4	NE	It was highlighted at ISH2 that you have assessed the likely significant impact of other offshore wind farm (OWF) projects with less than two years baseline data. How were you able to advise on potential adverse effects on European sites under these circumstances? If you were able to do this for previous projects why are you unable to provide the necessary advice in this instance?	The Applicant notes that this question is directed at Natural England but draws the Examining Authority's attention to Table 1.3 in Appendix 8 to the Applicant's submission at Deadline 1 (REP1-141) which provides a list of all projects in UK waters that have been consented using less than two years baseline data. Of particular note are Burbo Bank Extension, the consent for which was based on only 12 months of data, and Galloper which had a consecutive four months of 'missing' data.
Q2.2.7	Applicant	If the Secretary of State were to conclude that there may be an adverse effect on the integrity of the Flamborough and Filey Coast SPA, either alone or in combination, then what alternative solutions and compensatory measures have you considered? Please set out your case for Imperative Reasons of Overriding Public Interest.	The Applicant has provided a response to this question at Appendix 63 of the Applicant's submission to Deadline 4.
Q2.2.9	Applicant	In ISH2 it was established that it would assist the examination if the Collision Risk Model (CRM) is run in strict accordance with the recommended Statutory Nature Conservation Body (SNCB) parameters using only the Digital Aerial Survey data (DAS). Please run the model according to the parameters advised by NE using the mean, upper and lower confidence intervals as derived from the DAS. Please provide comparative tables that show the requested outputs alongside the outputs that have been used to inform the ES and RIAA.	The Applicant has provided the requested collision risk modelling as part of Appendix 28 of the Applicant's submission to Deadline 4.

<table>
<tr>
<td>Q2.2.10</td>
<td>Applicant</td>
<td>In your Deadline 3 comments [REP3-002] you stated that it is widely accepted that most parameters used for collision risk modelling have been conservatively estimated and overestimate the collision risk calculated by CRM.

Please provide any independent documentary evidence that supports this view.</td>
<td>The Applicant would point to various studies currently investigating the behaviour of birds at offshore wind farms which have all provide information on parameters relevant to collision risk modelling and show that parameters used historically have over-estimated collision risk. These include:
- Bowgen, K. & Cook, A. 2018. Bird Collision Avoidance: Empirical evidence and impact assessments. JNCC Report No. 614, JNCC, Peterborough, ISSN 0963-8091 (Submitted at Appendix 14 to the Applicant's response to Deadline 4);
- Skov, H., Heinänen, S., Norman, T., Ward, R.M., Méndez-Roldán, S. & Ellis, I. 2018. ORJIP Bird Collision and Avoidance Study. Final report – April 2018. The Carbon Trust. 247 pp. (REP1-149)
- NIRAS, BTO & Marine Scotland. (2018) Estimating Seabird Flight Height Using LiDAR. Scottish Marine and Freshwater Science Vol 9 No 14 (REP2-018)
- Furness et al. (2018) Nocturnal flight activity of northern gannets Morus bassanus and implications for modelling collision risk at offshore wind farms (REP1-143)
Parameters used historically have been defined taking a precautionary approach ensuring that these parameters are not under-estimated and therefore resulting parameters are more likely to represent over-estimates to allow for a suitable level of precaution when good empirical evidence is unavailable. The Applicant would also highlight the use of updated parameters for collision risk modelling in Scotland, including nocturnal activity factors (with SNH and Marine Scotland advising lower nocturnal activity factors than those used historically including at Neart na Gaoithe, Inch Cape, Seagreen and Moray West) and flight speed (with SNH having accepted the results of collision risk modelling using lower flight speeds than those used historically at Moray West).

The documents detailed in the below table provide recent examples of where it is acknowledged that the parameters used for collision risk modelling have been conservatively estimated and overestimate the collision risk calculated by CRM:

<table>
<tr><th>Document</th><th>Information</th><th>Reference</th></tr>
<tr><td>The Habitats Regulations Assessment Hornsea Project Two</td><td>No adverse effect on integrity conclusions were based upon a consideration of over-estimation in certain parameters incorporated into collision risk modelling</td><td>See, for example, paragraph 6.34 in Appendix 67 to the Applicant's submission to Deadline 4 which states which quotes the conclusion of the Examining Authority for Hornsea Project Two:
"The ExA states that it has 'some concern that some parties are being</td></tr>
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					over-precautionary, particularly in relation to: the appropriate AR to use for the Basic Band model, where the SNCBs do not fully accept the findings of the MSS report; DD versus DI PVA approaches; approaches to apportionment; and some residual questions on the stability or otherwise of trends in the pSPA kittiwake population' (ExA 6.7.48)." Paragraph 6.46 provides a similar statement in relation to in-combination impacts on kittiwake at Hornsea Project Two.
				Considered that certain parties were being over-precautionary in relation to certain parameters incorporated into CRM. No adverse effect on integrity conclusions were based upon a consideration of over-estimation in certain parameters incorporated into collision risk modelling	See, for example, paragraph 6.7.48 in Appendix 66 to the Applicant's submission at Deadline 4 which states the following: *"The ExA does have some concern that some parties are being over-precautionary, particularly in relation to: the appropriate AR to use for the Basic Band model, where the SNCBs do not fully accept the findings of the MSS report; DD versus DI PVA approaches; approaches to apportionment; inclusion of the full buildout of all projects in the in-combination assessment, when several are highly unlikely to be fully built-out; and some residual questions on the stability or otherwise of trends in the pSPA kittiwake population."*
			Natural England's Written Representations	Natural England suggest that a range of nocturnal activity factors should be	See REP1-211

			for Hornsea Three	used due to emerging evidence in contrast to the single values that would have originally been used for collision risk modelling at previous offshore wind farm projects	
			Furness et al. (2018)	States that the current nocturnal activity factor for gannet (i.e. 25%) is 'highly precautionary'	See REP1-143
			The Examining Authority's Recommendation Report and the Habitats Regulations Assessment for Dogger Bank Creyke Beck A&B	Considered that advised avoidance rates for gannet (i.e. 98%) were not appropriate and that a 99% avoidance rate would be more appropriate with integrity conclusions based on collision risk estimates using a 99% avoidance rate	See, for example, paragraph 7.25 in Appendix 64 to the Applicant's submission at Deadline 4 which states in relation to the appropriate avoidance rates to use for gannet: "Given the available evidence which documents greater avoidance of OWFs by gannets than for many other species and estimates an overall avoidance rate of 99.1% for this species (Krijgsveld et al 2011), the SoS is of the opinion that the use of an avoidance rate of 99% for gannets is appropriate for this species." With this avoidance rate higher than that advocated by interested parties at this project.
			The East Anglia Three Habitats Regulation Assessment	The Applicant for the project considered that the collision risk estimates were over-estimates with this documented in the HRA	See, for example, paragraph 6.26 in Appendix 68 to the Applicant's submission at Deadline 4 which outlines the view that: "*…collision risk estimate values could be overly precautious because an apparent lower risk of collision at night for this species had not been accounted for."*

			The Offshore Ornithology Environmental Statement Chapter for Norfolk Vanguard	Considers that the nocturnal activity factors for gannet and kittiwake are over-estimates and applies nocturnal activity factors derived from a review of evidence	See, for example, paragraph 349 to 353 in Appendix 69 to the Applicant's submission at Deadline 4 which outlines the Applicant's position that nocturnal activity factors have been over-estimated.
			Scoping Opinions for projects in the Firth of Forth (Inch Cape, Seagreen and Neart na Gaoithe)	SNH and Marine Scotland advise the use of nocturnal activity factors lower than those used previously	See, for example, paragraphs 5.7.1 in Appendix 70 to the Applicant's submission at Deadline 4 which states: *"The Scottish Ministers advise that CRM is required for gannet, herring gull and kittiwake. The nocturnal activity scores of 2 (25%) should be used for herring gull and kittiwake and 1 (0%) for gannet."*
			SNH response to the Moray West consent application	SNH state that they are content with lower flight speeds than those used previously to be used in collision risk modelling	See, for example, paragraphs 5 in Appendix 6 to the Applicant's submission at Deadline 4 which states: *"Moray West has used different species-specific flight speed parameters (from the ORJIP Thanet project) to those usually recommended for CRM. Although no agreement was reached in pre-application discussions about whether these flight speeds are appropriate, we are content for these updated flight speeds to be used in the CRM. This is based on the very low sample sizes (n=2-32) used to inform the recommended flight speeds (which until now have represented the best available evidence), compared to the sample sizes used to inform the more*

					recent flight speed estimates (n=287-790)."
Q2.2.11	Applicant	In its Deadline 3 submission [REP3-075], NE pointed out that the estimates of parameters such as flight speed and height presented in Skov et al (2018) come from a single site during the non-breeding season (Thanet Offshore Windfarm). It also highlights an issue with the avoidance rates relating to the incorporation of model error. Given the influence of site-specific factors on estimated collision rates, how can the conclusions of this paper be applied to other sites or to the breeding season in a robust manner?	The Applicant has not proposed using the flight height data or the avoidance rates presented in Skov *et al.* (2018) and so Natural England's criticisms only apply to flight speed in the context of the collision risk modelling conducted for Hornsea Three. In respect of the flight speed data collected in Skov *et al.* (2018), Skov *et al.* (2018) represents the most comprehensive study of flight speed that has been undertaken collecting large sample sizes of representative flight speed in the offshore environment with the information presented below clearly illustrating that it represents the best available evidence for flight speed. Data presented in Skov *et al.* (2018) were collected between July 2014 and April 2016 as illustrated in Figure 3.4 of Skov *et al.* (2018) with 250 survey deployment days in this period. The Applicant is therefore unclear as to why Natural England (and the RSPB) are suggesting that data were only collected in the non-breeding season. It is unlikely that breeding adult gannet would be recorded at Thanet given the distance of that wind farm from the nearest breeding colonies, however, this is also true for the flight speed data presented in Pennycuick (1987). However, it is possible that breeding adult kittiwake, herring gull and lesser black-backed gull could occur at Thanet due to the presence of breeding colonies along the East Anglian coast (large gulls) and in Suffolk (kittiwake). It is important to understand that the criticisms raised by Natural England in relation to the flight speed data presented in Skov *et al.* (2018) are equally applicable, if not more so, to the data presented in Alerstam et al. (2007) or Pennycuick (1987), which are the only other data to use, if it is considered that the flight speed data from Skov *et al.* (2018) are not suitable for use in the CRM for Hornsea Three,. The flight speeds presented in these studies are based on very small sample sizes ranging from 32 individuals (gannet) down to as few as 2 (kittiwake).		

			In addition, the following issues exist in relation to the flight speeds from these papers (Alerstam et al. (2007) or Pennycuick (1987)) that indicate that these data are not representative of the behaviour of birds at Hornsea Three: 1. The flight speed data used for all three gull species considered for collision risk modelling at Hornsea Three (kittiwake, lesser black-backed gull and great black-backed gull) (from Alerstam et al., 2007) was restricted to radar recordings from migration flight which are expected to be birds flying at an airspeed close to that associated with maximum lift-drag ratio. These data, unlike those from Skov *et al.* (2018) are therefore solely collected during the non-breeding season only; 2. The flight speed for gannet calculated in Pennycuick (1987) is based on a small sample size with these data having been collected from birds flying at a breeding colony (Foula, Shetland). It is therefore possible that the flight speeds recorded are not representative of the flight speeds of birds that may occur at Hornsea Three due to the proximity of birds to the breeding colony. Flight speed data presented in Skov *et al.* (2018) is supported by a large sample size; and 3. The birds observed by Alerstam et al. (2007) were located either in southern Sweden or within the Arctic circle and no determination is given between migratory or foraging birds from colonies. Indeed, the large range of species included in Alerstam et al. (2007) suggests that non-breeding and/or migratory flights comprised a significant component of the data set. Data from Skov *et al.* (2017) was collected between July 2014 and April 2016 and potentially includes both non-breeding and breeding birds. The criticisms in relation to Skov *et al.* (2018) provided by Natural England (and the RSPB) are even more applicable to the data presented by Alerstam et al. (2007) and Pennycuick (1987) with these studies having considerably lower associated sample sizes (see Table 1.1 in Appendix 10 to the Applicant's submission at Deadline 1 (REP1-188). However it was necessary, before the publication of Skov *et al.* (2018), to use these data for collision risk modelling as these were the only data available. Any limitations previously accepted as an inherent source of uncertainty as the values presented in those studies represented, at that time, the best available evidence. The flight speed data presented in Skov *et al.* (2018) clearly represent the best empirical evidence available to inform collision risk modelling at Hornsea Three with any criticisms of

<table>
<tr><td></td><td></td><td></td><td>these data equally applicable, if not more so to the data presented in Pennycuick (1987) or Alerstam et al., (2007)</td></tr>
<tr><td>Q2.2.13</td><td>Applicant</td><td>Whilst you weighed Alerstam et al (2007) and Pennycuick et al (1987) against the empirical evidence in Skov et al (2018) in your Deadline 3 submission [REP3-002], NE have also highlighted Pennycuick (1997) and Johnston et al (2014).

Do you still maintain that Skov et al (2018) offers, on balance, the best available evidence for CRM parameterisation?

Please provide a copy of Pennycuick et al (1987) if you wish to rely upon it as evidence.</td><td>The Applicant maintains that Skov et al. (2018) provides the best available empirical evidence in relation to the flight speeds of seabirds (gannet, kittiwake, lesser black-backed gull, herring gull and great black-backed gull) to use in collision risk modelling. The best available evidence for other parameters is presented in the below table.

<table>
<tr><td>Parameter</td><td>Gannet</td><td>Kittiwake</td><td>Lesser black-backed gull</td><td>Herring gull</td><td>Great black-backed gull</td></tr>
<tr><td>Bird length</td><td colspan="5">Robinson (2017)</td></tr>
<tr><td>Wingspan</td><td colspan="5">Robinson (2017)</td></tr>
<tr><td>Flight speed</td><td colspan="5">Skov et al. (2018)</td></tr>
<tr><td>Nocturnal activity</td><td>Furness et al. (2018)</td><td>MacArthur Green (2018)</td><td>Garthe and Hüppop (2004)</td><td>Garthe and Hüppop (2004)</td><td>Garthe and Hüppop (2004)</td></tr>
<tr><td>Flight height data</td><td colspan="5">Site-specific</td></tr>
</table>
</td></tr>
<tr><td>Q2.2.14</td><td>RSPB, NE</td><td>The Applicant has advised that the nocturnal activity factors (NAF) historically used for collision risk modelling are not taken directly from Garthe and Hüppop (2004) but are instead based on an incorrect representation of the scores by Band (2012). The Applicant goes on to state that Band (2012) recommends that empirical data should be used when available, as has been the case for gannet and kittiwake.

Please comment on these views and the empirical robustness of the</td><td>The Applicant notes that this question is directed at Natural England and the RSPB however, would highlight that some of the studies used by the Applicant are incorporated into the nocturnal activity rates presented in Garthe and Hüppop (2004) and are those used by Furness et al. (2018).</td></tr>
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<table>
<tr><td></td><td></td><td>studies that were used to justify the use of different NAF by the Applicant, as set out in [REP1-188].

Please provide copies of any publications you wish to rely upon in evidence that have not already been provided.</td><td></td></tr>
<tr><td>Q2.2.16</td><td>RSPB</td><td>The Applicant has stated in [REP1-122] that peaks in abundance that may occur at first light should not be accounted for by increasing the NAF which is used in the CRM to calculate the collision risk at night. The Applicant notes that the nocturnal activity rate used represents the activity expected as a proportion of daylight activity and, as such, the application of a nocturnal activity factor does not require consideration of peaks in activity that may occur at first light as the amount of nocturnal activity is the same regardless of the activity that occurs in daylight hours.

How do you respond?

Please provide copies of any publications you wish to rely upon in evidence that have not already been provided.</td><td>The Applicant notes that this question is directed at RSPB but would highlight that the criticisms levelled by the RSPB towards the empirical nocturnal activity factors would apply equally to those suggested by Band (2012). The Band model is not designed to capture the levels of activity that may occur at different times of day with this representing part of the uncertainty that would require correction as part of the avoidance rate or through the use of confidence metrics around appropriate input parameters</td></tr>
<tr><td>Q2.2.17</td><td>NE, Applicant</td><td>In ISH2, NE highlighted the fact that tagging studies show different activity levels during the day.

Please can NE provide copies of the relevant publications and a table that summarises daytime activity levels for all the species for which you have identified a likely significant effect.

Please can the Applicant provide information on when the DAS was undertaken that includes the transect start and finish times.</td><td>The transect start and finish times for the Hornsea Three digital aerial surveys are provide in the table below. All of the flight times are concentrated around the middle of the day. This is inevitable for any digital method where the surveys need to be carried out at times of day when there is sufficient light and the risk of sun glare is minimised.

<table>
<tr><th>Survey date</th><th>Start time</th><th>End time</th></tr>
<tr><td>19/04/2016</td><td>12:50</td><td>16:10</td></tr>
<tr><td>04/05/2016</td><td>11:35</td><td>14:35</td></tr>
<tr><td>28/06/2016</td><td>11:00</td><td>14:00</td></tr>
<tr><td>15/07/2016</td><td>12:20</td><td>15:50</td></tr>
<tr><td>15/08/2016</td><td>12:15</td><td>15:20</td></tr>
<tr><td>05/09/2016</td><td>11:15</td><td>15:05</td></tr>
<tr><td>24/10/2016</td><td>10:30</td><td>13:20</td></tr>
<tr><td>24/11/2016</td><td>09:30</td><td>12:35</td></tr>
<tr><td>04/12/2016</td><td>09:35</td><td>12:15</td></tr>
<tr><td>17/01/2017</td><td>10:30</td><td>13:40</td></tr>
<tr><td>14/02/2017</td><td>10:20</td><td>13:40</td></tr>
<tr><td>10/03/2017</td><td>10:00</td><td>13:30</td></tr>
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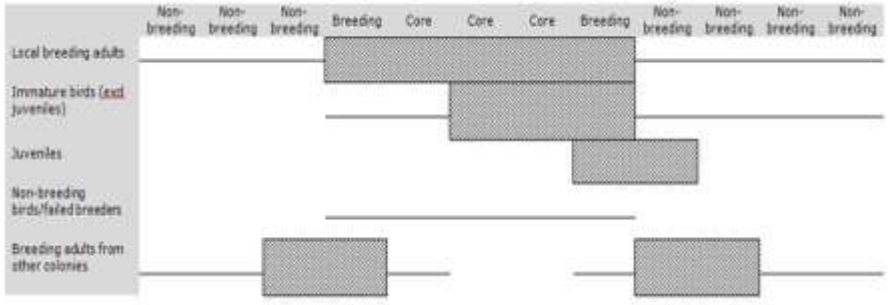
			11/04/2017 | 11:50 | 14:40 05/05/2017 | 10:30 | 13:30 12/06/2017 | 11:25 | 14:25 27/07/2017 | 11:55 | 15:00 10/08/2017 | 12:25 | 16:10 02/09/2017 | 11:00 | 14:15 25/10/2017 | 09:55 | 14:00 24/11/2017 | 10:05 | 14:00
Q2.2.18	RSPB, NE	Cook et al (2018) recommends avoidance rates for kittiwake and lesser black-backed gull that are different to those proposed by JNCC et al (2014) and the RSPB. Please comment on the results of the additional modelling, its empirical basis and the implications for the ES and HRA as set out by the Applicant in Appendix 10 at Deadline 1[REP1-188].	The Applicant notes that this question is directed at Natural England and the RSPB has provided a comparison of the avoidance rates presented in Cook et al. (2018) with those presented in the original Cook et al. (2014) report and those avoidance rates advocated by JNCC et al. (2014) for use with the Basic Band model (see table below). Species | Cook et al. (2018) | Cook et al. (2014) | JNCC et al. (2014) Gannet | 0.989 | 0.989 | 0.989 Kittiwake | 0.992 | 0.992 | 0.989 Lesser black-backed gull | 0.998 | 0.995 | 0.995 Herring gull | 0.995 | 0.995 | 0.995 Great black-backed gull | 0.995 | 0.995 | 0.995 The Applicant would also highlight the report recently published by JNCC, Bowgen and Cook (2018), which provides avoidance rates for use in the Band (2012) CRM using empirical data collected as part of the ORJIP project. The Applicant has included this report as Appendix 14 to its response to Deadline 4 and a summary of this report is provided below. Species specific generic avoidance rates currently used in collision risk models (CRMs) are mostly based on mortality rates observed at onshore wind farms with no consideration of actual avoidance behaviour. The ORJIP BCA study, 2014 – 2017 (Skov *et al.* 2018), was designed to improve the evidence base for seabird avoidance behaviour and collisions around offshore wind farms. This study generated the most extensive dataset of observations of seabird behaviour in and around an operational offshore wind farm (Thanet Offshore Wind Farm, off the Kent coast) that is currently available. A bird monitoring system was developed for the study, that allowed detecting and tracking bird movements at the

			species level in and around an operational offshore wind farm. Bird behaviour was monitored by the study at Thanet Offshore Wind Farm, deploying a multiple sensor monitoring system partly operated by experienced seabird observers (laser rangefinders and radar equipment), and partly automated through the collection of video evidence, with a focus on five target species: gannet, kittiwake and three species of large gulls (lesser black-backed gull, herring gull, great black-backed gull). Over the course of the ORJIP BCA study, it became apparent that the data collected in relation to avoidance behaviour, termed empirical avoidance rates, may not be directly comparable to the avoidance rates as presently used by CRMs, such as the Band model (Band 2012). This was discussed in Appendix 7 to the Applicant's submission at Deadline 1 (REP1-139) The differences between avoidance rates and empirical avoidance rates as quantified by Skov *et al.* (2018), are mainly driven by the fact that the former have been developed from land-based studies using the Band model to fit the observed number of collisions from carcass surveys while assuming flight speeds through the wind farm as linear flight patterns. In doing so, the avoidance rate corrects for the uncertainty introduced by the CRM through the use of summarised data on e.g. flight activity, and by simplifications and assumptions in the modelling process. To address these concerns, JNCC commissioned the BTO to consider how best to use the data collected as part of the ORJIP BCA study in order to inform pre-construction assessments of collision risk at offshore wind farms (Bowgen and Cook, 2018). To understand how applicable the empirical avoidance rates derived from the ORJIP BCA study are to CRMs, Bowgen and Cook (2018) sought to understand the magnitude of the uncertainty remaining once behaviour, and other measurable factors, had been accounted for. A comparison was made of the predicted number of collisions when using the Band model in the absence of avoidance behaviour, based on pre-construction density estimates of bird abundance and generic data describing bird behaviour, to estimates refined through introduction of site-specific data collected as part of the ORJIP BCA project. The CRM estimates were further refined using post-construction density estimates from Thanet Offshore Wind Farm. As the data collected by the ORJIP BCA study describing collisions were from cameras within the wind farm, the study area was wholly within the area covered by the cameras. Bowgen and Cook (2018) approach was to run the Band model, introducing with each re-run site-specific information at an additional step in order to understand how estimates of collision change as the parameters used by the model are refined. Initially, the Band model

			was run using pre-construction density estimates, generic bird data (Alerstam *et al.* 2007, Johnston *et al.* 2014) and parameters based on the turbines installed, as it would be carried out to inform an Environmental Impact Assessment (EIA), but for the purposes of this study, assuming no avoidance behaviour. Then the predictions were refined by introducing: (i) post-construction density data, (ii) site-specific information on flight behaviour (height and speed) and (iii), finally, site-specific information on avoidance behaviour (meso and micro). As the study area was within the Wind Farm, only meso- and micro-avoidance considered and not, macro-avoidance. As avoidance rates are typically applied in a pre-construction context, the study also estimated predicted collision rates based on the pre-construction estimates of bird density data and site-specific estimates of flight speed and height measured as part of the ORJIP BCA project. Taking the above predicted collisions, avoidance rates were calculated by comparison with the number of observed collisions recorded by the ORJIP BCA study in the October-March period i.e. observed divided by predicted collision rate, subtracted from one. Within this period, five birds were recorded colliding with turbines, one kittiwake and four birds not identified to species level, which were grouped as large gulls for the purpose of the analysis. By comparing changes in the predicted collision rate for a species/species group as model assumptions and parameter are refined and the avoidance rates predicted, Bowgen and Cook (2018) were able to recommend avoidance rates for use in the Band model developing upon existing guidance (Cook *et al.* 2014) including existing evidence on levels of macro-avoidance. **Recommendations** Based on the data collected as part of the ORJIP BCA study and their subsequent analysis, as described above, Bowgen & Cook (2018) recommended a total avoidance rate suitable for use in the basic Band model Option 1 of: • 0.995 for gannet; • 0.990 for kittiwake; and, • 0.995 for all three large gull species (great black-backed gull, herring gull and lesser black-backed gull) Consequently, for the basic Band model, Bowgen and Cook (2018) recommendation of using avoidance rates of 0.995 for gannet and 0.990 for kittiwake, reflects an increase in the rate recommend from 0.989 for both species in previous guidance (JNCC *et al.* 2014).

			Based on the data collected as part of the ORJIP BCA study and their subsequent analysis, as described above, Bowgen & Cook (2018) recommended a total avoidance rate suitable for use in the extended Band model Option 3 of: • 0.980 for kittiwake; and, • 0.993 for all three large gull species (great black-backed gull, herring gull and lesser black-backed gull) Consequently, for the extended Band model, Bowgen and Cook (2018) recommendation of using avoidance rates of 0.993 for large gulls and 0.980 for kittiwake, reflects an increase in the rate recommend for large gulls in previous guidance (0.989 – 0.990; JNCC *et al.* 2014) and is the first time it has been possible to calculate a total avoidance rate for kittiwake for Option 3 of the Band model based on empirical data. However, based on the data collected as part of the ORJIP BCA project, Bowgen and Cook (2018) were unable to calculate an avoidance rate suitable for use in Option 3 of the Band CRM for gannet as no collisions were recorded.
Q2.2.20	Applicant	Figure 4 in Cleasby et al (2018) [REP1-144] seems to suggest that the array area is in a SPA colony hotspot when two different geostatistical analyses were applied. You stated at ISH2 that the paper indicated low usage. Could you clarify this seemingly contradictory evidence? Does the analysis weigh in favour of using colony specific data for kittiwake?	The figures presented in Appendix 30 to the Applicant's submission at Deadline 4 use the data presented in Cleasby et al. (2018) which is available from the Open Data Portal on the Royal Society for the Protection of Birds' website. These data have been reproduced alongside the location of Hornsea Three to show the overlap between kittiwake hotspots around the UK coast and the Hornsea Three array area. As stated by the Applicant at the Issue Specific Hearing for Hornsea Three, there is no overlap between these hotspots and the Hornsea Three array area. The figures presented in Appendix 30 to the Applicant's submission at Deadline 4 clearly indicate that there is no overlap between foraging hotspots of kittiwake from FFC SPA and Hornsea Three when using either of the modelling techniques applied in Cleasby et al. (2018). Also of importance if the lack of foraging hotspots beyond Hornsea Three which further suggests that any adult kittiwake observed at Hornsea Three are likely to be older immature birds (which are indistinguishable from adult birds) or sabbatical birds. The information presented in Cleasby et al. (2018) therefore provides further confidence to the apportioning approach used by the Applicant in the breeding season and suggests that the apportioning value applied is precautionary.
Q2.2.22	RSPB	In [REP2-025] you note that kittiwake productivity has been in decline at the Flamborough and Filey Coast SPA since 2009 as set out in Aitken et al (2018).	The Applicant would welcome any further submissions from the RSPB in relation to the productivity of breeding birds at FFC SPA.

		Please provide a copy of this publication if you wish to rely upon it as evidence.	
Q2.2.23	RSPB	During ISH2 there was some discussion concerning the evidence underpinning the differences of opinion over how breeding seasons were defined. NE suggested that it had relied on an internal RSPB report. Please confirm the details with NE and submit the report as evidence at Deadline 4.	The Applicant would welcome any further submissions from the RSPB in relation to the phenology of breeding birds at FFC SPA but would highlight that this information has not been provided during the pre-application or application phase despite extensive consultation
Q2.2.24	Applicant	NE notes [REP1-211] that colony observations of kittiwake, gannet and puffin at Flamborough and Filey Coast SPA are 'closely aligned' to the breeding seasons described in Furness (2015). You have chosen to use offshore observations that define a shorter breeding season which has reduced the predicted collision impacts. It has been pointed out that lower apportioning rates were assigned for the months when breeding birds may have been present in the array area. For example, gannet apportioning for the SPA is: 40.4% (breeding season), 4.8% (post-breeding) and 6.2% (pre-breeding). The breeding season used in the modelling was defined as being April-August. Colony attendance data showed that this was actually March-September. Consequently, the apportioning and resultant impact of the proposal in March and September would appear to be significantly underestimated. The result is that only 6.2% of the population would be potentially affected in March and 4.8% in September. It follows that collision risk would increase by 34.2% in March and 35.6% in September if colony attendance data and/or Furness (2015) were used to define the breeding season for this species. Leaving aside your stated position that colony specific data is not relevant to the biological seasons in the array area, why would the approach you have taken not lead to significantly lower apportioning rates and thus a reduced collision risk?	The approach used by the Applicant could result in a lower annual collision rate than that proposed by Natural England, however it is considered that this rate calculated by the Applicant better reflects the risk to the key species in the breeding season in this case. Any apportioning values calculated using the seasons defined by Natural England could be significantly influenced by either an increased abundance of immature/juvenile birds towards the end of the breeding season, which would decrease any associated apportioning value, or by migrating adult birds, which would increase the apportioning value, although this would then provide an erroneous apportioned mortality as that value would include a proportion of mortality that would not be attributable to the local breeding colony. This is especially relevant for the species at Hornsea Three with tracking data suggesting limited or no connectivity between birds from FFC SPA and Hornsea Three (Langston et al., 2013; Cleasby et al., 2018). The risk assessment (for, say, collision mortality) involves 2 steps: first the collision rate is estimated for each species calculated (by month) using the collision risk model and assumptions about the density of birds, their physical characteristics and the design of the wind farm etc. The second step is to 'apportion' these collisions to specific populations. In this case it is the breeding population that is a qualifying feature of the FFC SPA that is of interest. The proportion of FFC SPA breeding birds that will be present within the population of birds observed at the wind farm site will vary through the year. Collisions occur at the wind farm, which is located 150km from the breeding colony. So, seasons and associated apportioning rates have been defined which reflect the likely presence of breeding FFC SPA breeding adult birds at the wind farm. The Applicant has sought to define a 'core' breeding season, as freely as possible, from confounding influences, such as migration, during which all, or a very large proportion of, the adult birds present at the proposed wind farm site can be assumed to be part of the qualifying breeding population of the FFC SPA. The apportioning value for this core

			breeding season is higher than would be assumed if the breeding season were extended to include months when it is known that adults not associated with the FFC SPA will be present, i.e. during migration, which overlaps with the beginning and end of the season during which breeding birds are likely to start attending of departing the breeding colony itself. Failing to account for these migrants would over-estimate the collision rate apportioned to the SPA. Outside of the core breeding season, breeding adult birds that are migrating to other breeding colonies, immature birds, non-breeding birds and breeding adult birds that may be loosely associated with FFC SPA (when compared to the core breeding season) may occur at Hornsea Three. The likely proportion of adult birds associated with the breeding population of the SPA during these periods has been calculated in accordance with Furness (2015). A very simplified figure showing how the proportion of certain components of the population at Hornsea Three varies is presented below using a core breeding season and a generic breeding season.  The basis upon which a core breeding season is used, in relation to kittiwake, was previously outlined by Natural England in their Deadline 5 submission during the examination of Hornsea Project Two (included as Appendix 71 to the Applicant's submission at Deadline 4). The information provided by Natural England outlined the timing of migration of breeding birds from other colonies and concluded that April to July was the appropriate season for kittiwake with this conclusion based partly on information provided by colony managers at Bempton Cliffs.

Q2.2.25	Applicant	Please comment on the email correspondence in Appendix 3 of the NE Deadline 3 submission [REP3-075] regarding colony specific breeding seasons.	At the first Issue Specific Hearing it was requested that Natural England provide the information supporting their definition of seasonal extents for the species presented in Table 7.1 of Natural England's Written Representation (REP1-211) The Applicant notes that Natural England have provided some of this information in the email correspondence contained within Appendix 3 of Natural England's Deadline 3 submission (REP3-075) in relation to gannet however the following information is still outstanding: • How the information for gannet presented in Appendix 3 of Natural England's Deadline 3 submission was interpreted to provide seasonal definitions; • Information in relation to the seasonal definitions defined in Natural England's Written Representation's for kittiwake and how this information was interpreted to define seasonal extents; • Information in relation to the seasonal definitions defined in Natural England's Written Representation's for guillemot and how this information was interpreted to define seasonal extents; • Information in relation to the seasonal definitions defined in Natural England's Written Representation's for razorbill and how this information was interpreted to define seasonal extents; • Information in relation to the seasonal definitions defined in Natural England's Written Representation's for puffin and how this information was interpreted to define seasonal extents; and • How does all of the information relate to Hornsea Three especially when considering the limited connectivity suggested by the foraging range of certain species. The Applicant therefore reiterates the request made at the first Issue Specific Hearing and requests that Natural England provide this information to allow the Applicant to consider this in the assessments for these species. The Applicant notes that the email correspondence presented in Appendix 3 of Natural England's Deadline 3 submission (REP3-075) also included an attachment titled 'Evidence base for breeding season de…'. The Applicant requests that this be submitted into the examination. The following part of this response is provided in the absence of having received the table of relevant breeding season information that was part of the email correspondence. Adult gannets are constrained when foraging temporally and spatially by the need to be in attendance at their breeding colony most, during incubation and, in particular, chick rearing.

			It's at this time Hornsea Three has a greater likelihood to represent a proportionally larger part of the foraging resource available to an individual, in particular during chick rearing. It is therefore pertinent when considering Hornsea Three, to differentiate clearly between the various stages of colonial attendance by age cohorts and not, as presented by Natural England, occupation of the colony by gannet per se. The mean laying date at Flamborough and Filey Coast SPA can be expected to be mid-April centred within a three week period, as established based on the observations at the next nearest colony at Bass Rock, Firth of Forth (Nelson 1978). Incubation is for 42-46 days (Robinson 2018) with the chick fledging at about 13 weeks old (84-97 days; Robinson 2018) The majority of Bass Rock and Flamborough and Filey Coast SPA young fledge in late August or very early September, peaking in the last week of August (Nelson 1978). Adults do not go with the chick which in its initial few days swims away from the colony until able to take flight from the sea. Many adults remain at their colony, including Flamborough and Filey Coast SPA (Langston et al. 2013) for a while after their chicks have fledged, continuing to attend their nest site and displaying (Nelson 1978). From about mid-September, observations from Bass Rock have shown the colony can be deserted by large numbers of parents during unfavourable weather, and can be thinly attended by late September (Nelson 1978). Breeding colonies are not completely deserted until mid-November, but modal departure occurs in late September (Furness 2015). Tracking studies in 2011 and 2012 indicated that most adults departed Bempton Cliffs (Flamborough and Filey Coast SPA) during mid/late September to early October (Langston & Teuten 2018). Though the departure of the chick is not the end of the breeding season for the parents, these individuals with no dependant young have regained greater flexibility temporally and spatially when foraging. Moreover, immature birds would be expected to begin leaving the colony in August, and in non-breeding birds or failed breeders, temporary desertion of the colony to occur during unfavourable weather from early September onwards (Nelson 1963). Thus given these events in-combination with the onset of migratory movement of birds from other colonies though the North Sea during September (Furness 2015), the Applicant concludes that the breeding season ends in August with respect to the vast majority of birds with connectivity to the Project site. At the other end of the season, gannets may be present at the breeding colony from the end of January, but through into March visits may be intermittent (Nelson 1963). Though most birds at Bempton Cliffs (Flamborough and Filey Coast SPA) are back at their nests during March (Langston et al. 2013), the absence of dependant egg/young allows for as previously

			stated greater flexibility in foraging of breeding birds. The lower likelihood of any dependency of breeding birds on Hornsea Three in-combination with on-going migratory movement of birds from other colonies though the North Sea during March (Furness 2015), leads the Applicant to conclude that the breeding season starts at incubation in April with respect to birds with connectivity to the Project site. The Applicant also notes that the RSPB have submitted information in relation to the presence of kittiwake, guillemot and razorbill at Bempton Cliffs as part of their submission at Deadline 3 (REP3-101). Kittiwakes return to coastal waters and to the colonies at very much the same time (Coulson 2011). They do not spend much time in waters close to the colonies before reoccupying nesting sites (Coulson 2011). At Tynemouth to the north of FFC SPA, no birds have been reoccupying nesting sites until the second half of March since 1999, with such a historically late arrival, in recent years occurring in the other colonies in north-east England (Coulson 2011). There is increasing diurnal occupation of the nest sites from around dawn towards the time of egg laying which at Flamborough and Filey Coast SPA has a mean date of mid-May (RSPB). Up to a few days before egg laying birds have vacated the colony by dusk, with radar studies in Shetland and Tynemouth suggesting birds move 50-60 km from the coast to feed and roost (Coulson 2011). The Applicant is led to conclude that when birds do return to reoccupy nesting sites from North Atlantic waters in March, regular connectivity with Hornsea Three, 150 km offshore, is likely to be limited at a time when passage migrants from other colonies are still moving through offshore waters (Furness 2015). On this basis and with respect to birds with connectivity to Hornsea Three, the Applicant would conclude March does not fall within the breeding season of the majority of birds using offshore waters at 150 km or more from Flamborough and Filey Coast SPA. In relation to the information provided by the RSPB for kittiwake the RSPB has identified the mean laying date at Flamborough and Filey Coast SPA as mid-May. Nest building will be occurring during the preceding 10 days or so, though for well-established pairs it may be up to a three week period (Coulson 2011). This period is encapsulated by April and early May for the majority of the breeding population, which has been included as part of the breeding season for Hornsea Three. This information therefore suggests that April is the start of the core breeding season for kittiwake at FFC SPA and does not appear to support the inclusion of March as part of this period. The Applicant maintains that the behaviour of kittiwake in March would be very different to that exhibited from April onwards, when birds are more constrained and therefore these months should form part of different seasons when apportioning impacts from Hornsea Three.

			Kittiwakes are 'central place foragers' with the need to optimise their time spent away from the nest and energy expended in foraging. Breeding adults are constrained when foraging temporally and spatially by the need to be in attendance at their breeding colony most, during incubation and, in particular, chick rearing. It is therefore pertinent when considering Hornsea Three, to differentiate clearly between the various stages of colonial attendance by age cohorts. Immediately on fledging, the young are independent of their parents, this calculated to be from late July into August at Flamborough and Filey Coast SPA as hatching is centred upon late June (RSPB) with chicks fledging at 33 – 54 days old (Robinson 2018). Thus into early August, the increasing absence of dependant egg/young allows for greater flexibility in foraging of the breeding adults. Cleasby et al. (2018) has shown from the tracking of breeding kittiwake at Flamborough and Filey Coast SPA, that the array area lies outwith of colony specific hotspots during chick rearing irrespective of which of the two different geostatisical analyses were applied. Therefore what connectivity that may have existed between the colony and Hornsea Three will by early August be minimal with the lower reduction in likelihood of occurrence of breeding birds feeding unfledged chicks, whilst coinciding at Hornsea Three with the migratory movement of birds from other colonies through the North Sea during August (Furness, 2015). This leads the Applicant to conclude that although the breeding season at FFC SPA may not end until August, the breeding season with respect to connectivity between breeding adult birds from FFC SPA and Hornsea Three ends by July based on the findings of Cleasby *et al.* (2018). In defining April to July as the breeding season at Hornsea Three, the Applicant is consistent with Natural England's definition of the breeding season at the colony at Flamborough and Filey Coast SPA, as stated in their written submission for Deadline 5 for Hornsea Project Two (12th November 2015).

Q2.2.27	RSPB	You have stated that support vessels for servicing the turbines during the operational phase may cause displacement of divers and that a distance of 4km should be considered as the minimum distance within which impacts during this phase should have been considered. You cite a paper by Mendel et al (unpublished) in support of this view. As there are no loons off the north Norfolk coast you appear to be making a generalisation between this species and the red throated diver. What evidence do you have to suggest that their ethology and mortality risk are the same in all respects? Given that this is unpublished work that cannot be submitted to the examination library how can the ExA give it any weight? Please provide copies of any publications you wish to rely upon in evidence that have not already been provided.	The Applicant notes that this question is directed at RSPB but would highlight that there is unlikely to be any red-throated diver present at Hornsea Three. Red-throated diver are largely coastally distributed and do not use offshore areas, such as Hornsea Three in significant numbers. Only eight red-throated divers were recorded during aerial surveys at Hornsea Three with these birds occurring in April and May and therefore highly likely to have been migrating birds.
Q2.2.30	Applicant	NE has provided a response to your population viability assessment in Appendix 2 of its Deadline 3 submission [REP3-075]. Please comment on the points raised. Please provide copies of any publications you wish to rely upon in evidence that have not already been supplied.	The Applicant welcomes Natural England's response to the additional PVA modelling conducted to address issues raised during Expert Working Group meetings undertaken as part of the Hornsea Three Evidence Plan process. The advice of the PVA model author (Dr Mark Trinder) has been sought and a detailed response to each point is attached at Appendix 73. Prior to submission of the application neither Natural England nor the RSPB proposed re-running the model during the Evidence Plan process. The only issues raised prior to submission were in relation to the use of matched-pairs runs and the extrapolation of model predictions to 35 years. The PVA work presented at Deadline 1 (REP1-135) was commissioned in response to these specific points and to demonstrate the continuing utility of the predictions presented in MacArthur Green (2015), specifically in relation to a comparison of outputs obtained with matched pairs of simulations with unmatched outputs. It was not considered necessary for this purpose (nor was it suggested by Natural England in discussions prior to the work being undertaken) to update demographic rates.
Q2.2.33	Applicant	NE requested age class data [REP1-211] but digital aerial survey age class data for puffin, kittiwake, gannet, razorbill and guillemot and boat based survey age class data for guillemot and razorbill is yet to be provided.	The Applicant has provided the data requested by Natural England in Appendix 17 to the Applicant's submission at Deadline 3 (REP3-026). The Applicant would highlight that it is not possible to age guillemot or razorbill in either boat-based or aerial surveys (with the exception of juvenile birds which are not incorporated into any apportioning approach) or

		Please provide this information.	puffin during aerial surveys (as the relevant features used for aging are not visible from above).
Q2.2.34	Applicant	Article 6(3) of the Habitats Directive states that likely significant effects should be considered "either individually **or** in combination with other plans or projects". Regulation 63(1)(a) of the Habitats Regulations states that they should be considered "either alone **or** in combination with other plans or projects". Whilst it is possible to undertake one without the other, NE has pointed out that you have precluded in combination effects for species where likely significant effects have been discounted on an individual basis, i.e. alone. Given that the underlying intention of the in combination provision is to take account of cumulative effects when individual effects may not be present, please clarify your reasoning as to why there would not be in combination effects on tern species associated with the North Norfolk Coast SPA and Greater Wash SPA as well as non-breeding auk species associated with the Farne Islands SPA, Croquet Island SPA and Forth Islands SPA.	The Applicant has provided a response to the question as part of Appendix 62 to the Applicant's submission at Deadline 4.
Q2.2.35	Applicant	NE highlighted concerns in [REP3-075] regarding the cumulative, in combination collision risk assessments as presented in [REP1-148]. Please respond to the matters raised and provide additional information as requested.	Notwithstanding Natural England's comments, the Applicant considers that the analysis presented in Appendix 4 to the Applicant's submission at Deadline 1 (REP1-148) clearly illustrates that there is considerable over-estimation in the collision risk estimates used in Volume 2, Chapter 5: Offshore Ornithology (APP-065) and the RIAA (APP-051). The use of collision risk estimates associated with an assessed or consented turbine scenario where the as-built scenario (which does not allow for further development) at the relevant project is different represents a fundamental over-estimate. This should not be a matter for debate, especially for those projects that are operational and for which no further development is possible, as it is clearly evident that there are differences between assessed and as-built scenarios. Even if there are disagreements with the actual figures calculated, the over-estimation in collision risk figures should be acknowledged as part of any assessments undertaken. This source of over-estimation has previously been highlighted by the Examining Authority for the Hornsea Project Two offshore wind farm (see paragraph 6.4.78 of the Hornsea Project Two Examining Authority's recommendation report (Appendix 66 to the Applicant's submission at Deadline 4)). The Applicant would highlight that this note (REP1-148) builds on the approach applied by the Applicant in Volume 2, Chapter 5: Offshore Ornithology (APP-065) and the RIAA (APP-051). The type of analysis provided in this clarification note is no different to information

			provided in the examination phase of multiple offshore wind farms and therefore the Applicant does not consider this to be a new assessment as described by Natural England. In response to the individual comments raised by Natural England: 1. The collision risk estimates for each wind farm are taken from relevant project documentation and are consistent with those figures used as part of the applications for Hornsea Project Two and the Dogger Bank projects. It is worth noting that, for these projects the Applicant is unaware of Natural England requesting a similar audit trail. Information on the turbine specifications for relevant projects are taken either from MacArthur Green (2017) or where differences arise are presented in Appendix 1 of the note (REP1-148). This is made clear in the note. Additionally the correction factors used for relevant projects are provided in Table 1.5 and Table 1.6 for relevant projects of Appendix 4 to the Applicant's submission at Deadline 1 (REP1-148). To obtain turbine specifications for all projects, the information in Trinder (2017) was first consulted and checked. Where the information obtained by the Applicant agreed with that in Trinder (2017) no changes were made. For projects where differences arose the turbine parameters used by the Applicant are presented in Table 1.29 in Appendix A of Appendix 4 to the Applicant submission at Deadline 1 (REP1-148); 2. The Applicant has not assumed that the turbine parameters for all projects are legally secured. Consideration has been given in Appendix 4 to the Applicant submission at Deadline 1 (REP1-148) to the legal status of each project in relation to the potential for further development. For projects where further development was possible any reductions were not incorporated into the final cumulative/in-combination numbers presented in the Appendix which are used to highlight the inherent over-estimation in these types of assessment. 3. The consented design envelopes are those included as part of the Marine Licences for each project or associated variations for relevant projects. 4. The approach applied by Trinder (2017) and the Applicant does not require changes to density data as a correction factor is applied which assumes that density remains constant.
Q2.2.37	Applicant	The revised CEA, as set out in [REP1-005], is noted but this does not include cumulative impacts on herring gull or the revised CRM analysis as set out in a preceding question. Please use the outputs from the revised CRM analysis that you will be undertaking to produce a revised CEA that includes herring gull impacts.	Appendix 28 to the Applicant's submission at Deadline 4 provides the information requested alongside a comparison with the results used to inform the assessments presented in Volume 2, Chapter 5: Offshore Ornithology (APP-065) and, for relevant species, the RIAA (APP-051).

Q2.2.38	Applicant	NE has highlighted a number of issues relating to Trinder 2017 in its submission at Deadline 3 [REP3-075]. Please comment on the matters raised.	The Applicant welcomes the statement by Natural England that the approach applied in Trinder (2017) and subsequently by the Applicant in Volume 2, Chapter 5: Offshore Ornithology (APP-065), the RIAA (APP-051) and Appendix 4 to the Applicant's submission at Deadline 1 (REP1-148) is valid. In response to the individual comments: 1. The Applicant has provided references to where turbine specifications have been obtained (Appendix A of Appendix 4 to the Applicant's submission at Deadline 1 (REP1-148)) for relevant projects. Where parameters are unavailable, expert judgement has been applied utilising parameters from projects using comparable turbines or information from turbine manufacturers to provide as accurate an appraisal of collision risk as possible. This is considered to represent a suitably precautionary approach that is unlikely to provide collision risk estimates that are significantly different to those that would be obtained if actual turbine parameters were available. This issue is not considered to have any significant effect on the conclusions reached in Appendix 4 to the Applicant's submission at Deadline 1 (REP1-148); 2. The Applicant has ensured that the turbine parameters used in Appendix 4 to the Applicant's submission at Deadline 1 (REP1-148) were those used to calculate the collision risk estimates for relevant projects. This resulted in the use of Approach 3 in Appendix 4 to the Applicant submission at Deadline 1 (REP1-135), which updates the parameters in MacArthur Green (2017) due to this very issue. This issue therefore does not affect the conclusions in Appendix 4 to the Applicant's submission at Deadline 1 (REP1-148); 3. The Applicant has ensured that the number of turbines used is consistent with the modelling used to calculate collision risk estimates for each project. This issue therefore does not affect the conclusions in Appendix 4 to the Applicant's submission at Deadline 1 (REP1-148); 4. The Applicant has not assumed that all turbine parameters presented in Trinder (2017) are legally secured and has provided consideration of this in Appendix 4 to the Applicant's submission at Deadline 1 (REP1-148). This issue therefore does not affect the conclusions in Appendix 4 to the Applicant's submission at Deadline 1 (REP1-148); 5. The Applicant would welcome further clarification on Natural England in relation to this point with this identifying those parameters that Natural England believe do not have sufficient confidence. The Applicant considers that this does not affect the conclusions reached in Appendix 4 to the Applicant's submission at Deadline 1 (REP1-148) as it was not assumed that the parameters in the TCE were correct and all parameters were checked for their accuracy.

			The Applicant would draw Natural England's attention to Table 1.29 in Appendix A of Appendix 4 to the Applicant's submission at Deadline 1 (REP1-148) which provides the turbine parameters and associated sources for those projects for which turbine parameters were updated from Trinder (2017).
Q2.2.39	Applicant	In its submission at Deadline 3 [REP3-075], NE notes that Rate Set 2 will relate to Flamborough/ Bempton productivity for 2009-2014 and that there will be more up to date productivity data available which may be more appropriate to use for colony population viability assessment. NE highlights the fact that you have applied the original model because you have assumed that none of the key model parameters have changed. Please explain why you have not used the most recent demographic rates in this model. Why you have not accepted that the model should be re-run in your Deadline 3 response to the RSPB comments?	Please see response to Question 2.2.30 and Appendix 73. The updated PVA work submitted at Deadline 1 (REP1-135) addressed the points raised during pre-application in relation to the use of matched pairs and extrapolation of model predictions to 35 years. As the issue of demographic rates was not raised by either Natural England or RSPB these were not updated. It should be noted in any case that the intention, as with other areas of evidence, was to build on agreements reached at the conclusion of Hornsea Project Two. As there was agreement on the PVA outputs used in that application, then it was considered appropriate to retain them, to the extent possible.
Q2.2.40	Applicant	Please provide the following publications that you have relied upon in evidence: Efron and Tibshirani (1993) [REP1-122] Furness (2015) [APP-065] Cook et al (2014) [APP-065] Dierschke and Garthe (2006) [APP-065] Garthe and Hüppop (2004) [APP-065] Lawson et al (2015) [APP-065] Masden (2015) [APP-065] Wade et al (2016) [REP2-005] Desholm (2005) [APP-065] Welcker et al (2017) [APP-065] Cook, A. S., Humphreys, E. M., Bennet, F., Masden, E. A., & Burton, N. H. (2018) [REP1-111]	The Applicant has provided the requested publications at the following Appendices to the Applicant's response to Deadline 4: Efron and Tibshirani: This is a textbook. The applicant can purchase the book for the Examiners if required. Furness (2015): Appendix 15 Cook et al (2014): Appendix 16 Dierschke and Garthe (2006): Appendix 17 Garthe and Hüppop (2004): Appendix 18 Lawson et al (2015): Appendix 19 Masden (2015): Appendix 20 Wade et al (2016): Appendix 21 Desholm (2005): Appendix 22 Welcker et al (2017): Appendix 23 Cook, A. S., Humphreys, E. M., Bennet, F., Masden, E. A., & Burton, N. H. (2018):

Benthic

PINS Ref. No.	Question is addressed to:	ExA Question	Response
The Applicant would like to draw the Ex.A's attention to a number of additional commitments in relation to the benthic ecology topic, to address concerns raised by Natural England in their submissions during the Examination Phase. **Decommissioning** Following concerns raised specifically in relation to the Hornsea Three project by Natural England on the implications of rock protection placement within designated sites and perceived residual risks which Natural England feel Hornsea Three poses to designated features associated with permanent loss of these features, the Applicant is prepared to make a commitment (subject to agreement with the SNCB and MMO) to decommission any remedial cable and or scour protection within designated sites at the end of the operation and maintenance phase, subject to agreement from regulatory and nature conservation bodies at that time. If deemed necessary by the regulatory and nature conservation bodies at the time of decommissioning, a survey would be conducted prior to decommissioning to assess the integrity and condition of the protection. With a project lifetime of circa 35 years it is expected that the seabed and condition of the protection will have changed, and therefore the most appropriate method for decommissioning should be determined after the pre-decommissioning survey has been undertaken. For areas inside SACs and MCZs, where it is determined that there has been loss of designated habitat features as a consequence of installing the rock protection and where pre-decommissioning survey demonstrates that removal is technically feasible, a commitment will be made to decommission the rock protection at the end of cable life, subject to securing the necessary consents and licences and pending the outcome of any environmental assessment process that may be required at the time. The Applicant will discuss this with stakeholders (e.g. MMO and Natural England) to understand if this commitment is deemed appropriate and if so, how best this should be secured. The Applicant will provide evidence of the feasibility of decommissioning of rock protection at Deadline 6, based on current technology, noting that decommissioning for Hornsea Three is expected to occur over 35 years in the future and technological advances in this field would be expected in the intervening period. **Cable Specification and Installation Plan** The Applicant has considered the submissions made to date (both in writing and orally) from Natural England with regard to their concerns relating to sandwave clearance (as part of site preparation), cable burial and cable protection matters. One of the key messages that the Applicant has taken from these submissions is the need to provide Natural England with as much clarity as possible as to how and when detailed information relating to the cable installation process (including site preparation and remedial cable protection works) will come forward and how the specific activities are controlled within the DCO, so that they can have greater confidence in the Applicant's assumptions relating to site preparation, cable burial and deployment of cable protection measures. As such, the Applicant is in the process of producing an outline Cable Specification and Installation Plan (CSIP) for submission at Deadline 5, which will include a draft Sandwave Clearance Plan and draft Cable Protection Plan. This document will provide the outline CSIP structure and engagement plan, and also early detail on the approach to sandwave clearance and cable protection within designated sites. These will be live documents to be used post consent and the purpose of these will ultimately be to demonstrate compliance with the consent with regard to			

the extent, nature and location of any sandwave clearance activity within designated sites. In addition, the purpose of these will be to facilitate communication between Hornsea Three and SNCBs with regard to these activities and associated monitoring within designated sites, allowing for decisions to be clearly communicated to SNCBs early in the process and to ensure that the such activities within designated sites are reported to SNCBs in an auditable manner, within limits set out in the DCO, Environmental Statement and the Report to Inform Appropriate Assessment (RIAA). This will ensure SNCBs have a better understanding of cable installation activities within designated sites, allowing them to manage activities within the sites and gain a better understanding of the effects of these activities on designated features. **Ecological Clerk of Works** Due to the need for ongoing dialogue between the Project and the relevant SNCB as the CSIP is developed, particularly within the areas where the cables intersect with designated sites, the Applicant proposes that an Ecological Clerk of Works (ECoW) will be responsible for ensuring this coordinated approach to the development of the plan. The ECoW will be the main point of contact for SNCBs throughout the pre-construction, construction and post-construction phases of the project. The ECoW will form an interface between the Hornsea Three engineering and consents teams, as well as briefing contractors to ensure compliance with the DCO and any further measures agreed through this plan. All consultation on the aforementioned Sandwave Clearance Plan and Cable Protection Plan will be led by the Hornsea Three ECoW.			
Q2.2.42	Applicant, NE	Please produce a draft Statement of Common Ground for benthic ecology at Deadline 6 that includes but is not limited to the following headings: Baseline Characterisation Biotope Classification Sandwave Levelling Cable Burial and Protection Micro-Siting Potential Biogenic and Geogenic Reefs Markham's Triangle pMCZ Where you cannot reach agreement you should state that your position is final and will not be resolved.	The Applicant acknowledges the request from the Ex.A and will work to produce a Statement of Common Ground with Natural England on the benthic ecology topic for Deadline 6.
Q2.2.44	Applicant	If the Secretary of State were to conclude that there may be an adverse effect on the integrity of the North Norfolk Sandbanks and Saturn Reef SAC and/or The Wash and North Norfolk Coast SAC, either alone or in combination, then what alternative solutions and compensatory measures have you considered? Please set out your case for Imperative Reasons of Overriding Public Interest.	The Applicant has provided a response to this question at Appendix 63 to the Applicant's response to Deadline 4.

Q2.2.46	Applicant	If the Secretary of State were to conclude that the proposal would lead to a significant risk of hindering the conservation objectives of the Cromer Shoal Chalk Beds MCZ or Markham's Triangle pMCZ what other means are there for proceeding within the project design envelop that would create a substantially lower risk to these sites? Please consider how you might proceed in another manner or at a different location. Please set out how you would undertake or make arrangements for delivering measures of equivalent environmental benefit to the harm that could be caused.	**Markham's Triangle pMCZ – Other means of proceeding** The Applicant's primary case remains that the maximum design scenario would not lead to a significant risk of hindering the achievement of the conservation objectives of Markham's Triangle pMCZ and there is therefore no need to consider if there are other means of proceeding which would substantially lower the risk of hindering achievement of the conservation objections for this site. The Applicant's confidence in this conclusion is increased in light of the recent reduction in the maximum design envelope as outlined in Appendix 14 to the Applicant's response to Deadline 3 (REP3-023). The Applicant has reduced the project design envelope within Markham's Triangle pMCZ, with a maximum of 10.5% of array infrastructure to be placed within the boundary of the pMCZ (reduced from 24% in Volume 5, Annex 2.3: MCZ Assessment of the Environmental Statement; APP-104). This commitment is secured within Schedule 11, Part 2, Condition 2(9) and Schedule 12, Part 2, Condition 2(11) of the latest draft DCO presented within the Applicant's response to Deadline 4. This maximum design scenario assumes that all offshore structures (i.e. turbines, accommodation platforms and substations) are placed on gravity base foundations (i.e. the maximum design scenario for seabed impacts). Other foundation types would result in a lesser impact on features proposed for designation within the pMCZ, both during the construction phase (e.g. due to the footprint of seabed clearance disposal activities) and during operation and maintenance phase (e.g. due to the footprint of the foundation and associated scour protection). The Applicant would note, however, that flexibility to include gravity based foundations in the design of foundation structures is required at this stage of the project with further justification of the need for such design flexibility provided in the Applicant's response to Q1.1.2 of the Ex.A's first written questions (REP1-122). In addition, decommissioning of rock protection (i.e. cable protection and scour protection around foundations) would reduce the impact on features following decommissioning of Hornsea Three (i.e. the MCZ Assessment assumed permanent habitat loss following the decommissioning phase within the areas where these protection measures were left in situ during decommissioning). Following feedback from Natural England on the implications of rock protection placement of MCZs and SACs and perceived residual risks to designated features, the Applicant is now pleased to confirm that remedial cable protection and scour protection within designated sites will be decommissioned at the end of the operation and maintenance phase, subject to agreement from regulatory and nature conservation

			bodies at that time. This will substantially reduce the permanent habitat loss effects post decommissioning (see Table 1.1 of the Markham's Triangle pMCZ Lifetime Effects Assessment; REP3-023). **Cromer Shoal Chalk Beds MCZ – Other means of proceeding** The Applicant's primary case is that the maximum design scenario would not lead to a significant risk of hindering the achievement of the conservation objectives of the Cromer Shoal Chalk Beds MCZ and there is therefore no need to consider if there are other means of proceeding which would substantially lower the risk of hindering achievement of the conservation objections for this site. As outlined in the Cable Protection in Designated Sites Clarification Note (REP1-138), the Preliminary Environmental Impact Report (PEIR) considered an alternative offshore cable corridor with a substantially greater impact on the designated features of the Cromer Shoal Chalk Beds MCZ. In the context of cable routing, the Applicant has therefore already considered if it is possible to proceed at a different location, having regard to constraints on the landfall location. The decision to re-route the offshore cable corridor (i.e. resulting in the final offshore cable corridor included within the DCO application) resulted in a large reduction in the footprint of Hornsea Three within the MCZ and substantially reduced the risk to the site. As part of the MCZ Assessment, the effects of both cable installation methodologies at the landfall (i.e. open cut and trenchless installation, via Horizontal Directional Drilling) were considered as both scenarios could be interpreted as representing the maximum adverse scenario. In other words, preferring one installation technique over the other would not *substantially* reduce the risk of hindering the conservation objectives. The MCZ Assessment also considered maximum adverse scenarios for sandwave clearance and cable protection, both of which are likely to be conservative, although at this stage, the Applicant does not consider that these can be refined further. In addition, as outlined for Markham's Triangle rMCZ above, decommissioning of cable protection would reduce the impact on features following decommissioning of Hornsea Three (i.e. the MCZ Assessment assumed permanent habitat loss following the decommissioning phase within the areas where these protection measures were left in situ during decommissioning). As stated above, in response to feedback from Natural England on the implications of rock protection placement of MCZs and SACs

			and perceived residual risks to designated features, the Applicant is now pleased to confirm that remedial cable protection within designated sites will be decommissioned at the end of the operation and maintenance phase, subject to agreement from regulatory and nature conservation bodies at that time. This will reduce the permanent habitat loss effects post decommissioning.
			Measures of Equivalent Environmental Benefit It is the Applicant's primary position that Hornsea Three would not represent a significant risk of hindering the achievement of the conservation objectives of either the Cromer Shoal Chalk Beds MCZ or Markham's Triangle pMCZ. As such, a Stage 2 MCZ Assessment is not considered to be necessary, including consideration of measures of equivalent environmental benefit. The Applicant considers it important to note, however, that there are differences between MEEB and compensation for effects on Natura 2000 sites and, as noted (for example) in the MMO guidance (on page 8 of REP3-093), while the types of compensatory measures and approach that might be considered under the Habitats Directive may also be appropriate to put forward as MEEB, but consideration is not be confined to those. There is, in general, more flexibility. For example, the MMO guidance acknowledges that the reasons why an affected MCZ was designated (in addition to the features it was designated for) could be relevant in the context of MEEB as this may offer a broader ecosystems context for the consideration of measures. Similarly, DEFRA guidance (Guidance on the duties on public authorities in relation to Marine Conservation Zones (Note 2), November 2010; presented at Appendix 51 to the Applicant's response to Deadline 4) recognises that the measures might involve monitoring and survey work (either within the same MCZ or elsewhere, perhaps to help identify areas for future designation) or other suitable financial contributions. It is further noted that section 126(7) of the Marine and Coastal Access Act 2009 (the "MCAA 2009") requires that the relevant authority (in this case, the Secretary of State) is "satisfied" that the person seeking authorisation (in this case, the Applicant) "will undertake or make arrangements for the undertaking of" the MEEB. The legislation uses the future tense. In contrast to the Habitats Regulations provisions on compensation, the term "secure" is not used and there is no legal basis for the proposition that the MEEB must be secure and functioning in order for the decision-maker to be satisfied in granting authorisation under section 126 of the MCAA 2009.

			Where there is uncertainty about the level of impact or the level of impact is difficult to predetermine, Defra acknowledge (Defra guidance Note 2, November 2010) that an approach based on variable risks may help evaluate possible damage to the environment and the equivalent environmental benefit required. If there is agreement that a risk exists (or disagreement about the likelihood and scale of the risk) it may be appropriate to negotiate and sign up to a graduated range of MEEB, reflecting the scale of possible impacts on qualifying habitats and based on a monitoring programme which would determine the actual level of impact. Therefore, MEEB does not necessarily need to be delivered prior to the activity taking place, although it is envisaged that agreement on the range of MEEB which may be delivered would be in place. It is noted that section 127(9) of the MCAA 2009 provides a power to attach conditions which make it a condition to the relevant authorisation that the MEEB "are undertaken". Again this does not state that the MEEB are undertaken before the activity commences and it would be possible to have a requirement as part of a pre-commencement condition relating to agreement of a plan for the delivery of MEEB, for example. Should MEEB be required, the Applicant would envisage that an in-principle commitment to delivery of MEEB could be agreed with the MMO, via an in-principle plan agreed at the time of consent determination, but implemented in a staged manner post consent. This in-principle plan would detail the types of measures which could be delivered if MEEB was required and give clear thresholds for the levels of impact which would require delivery of MEEB. This would be linked to the level of impact on designated features within the relevant MCZ, as determined through the amount of infrastructure (e.g. rock protection) placed within the MCZ and evidence from pre and post construction monitoring. The in-principle plan would set out clear, agreed thresholds under which circumstances MEEB would be necessary and may also include further thresholds, if applicable, where the level of MEEB could be scaled according to the level of actual impact on the MCZ. This would therefore be an iterative process to ensure any MEEB requirements are proportionate to the scale of the actual impact on designated features.
Q2.2.49	Applicant	NE states in [REP1-216] that the additional information you provided in relation to the impact of hard substrates did not relate directly to the three Marine Protected Areas (MPA) that may be affected by the	The Cable Protection in Designated Sites clarification note (REP1-216) provides additional evidence (from the field and from the laboratory) to further validate process and theory based assessments of the potential for cable protection

		proposal. Are the sediment composition and dynamics of Inner Dowsing North Ridge and Race Bank the same in all respects? Are the hydrodynamics sufficiently similar to other sites for your infill and sediment transport arguments to hold true?	measures to cause an obstruction or blockage to sediment transport, as presented within Volume 2, Chapter 1: Marine Processes of the Environmental Statement (APP-061). The relevant conclusions of the report are that: 1) the interaction between the cable protection and any sediment in transport can be reliably described by sediment transport processes and theory; 2) the nature and magnitude of the impact may vary depending on the ambient local sediment transport rate; and, 3) the potential blockage effect is fundamentally limited in proportion to the height of the obstacle (which in the case of cable protection is relatively small and so at most only a small magnitude local effect is anticipated). Regarding Inner Dowsing North Ridge and Race Bank, it should be noted that the evidence presented within the Cable Protection in Designated Sites clarification note did not include any examples from within the Inner Dowsing, North Ridge and Race Bank SAC as stated in Natural England's comments on this clarification note (REP1-216), with Table 4.1 presenting some of the sources of evidence considered within the clarification note. The sediment composition and dynamics at the case studies considered within the clarification note have different degrees of similarity to the Hornsea Three offshore cable corridor (specifically the Wash and North Norfolk Coast SAC and the North Norfolk Sandbanks and Saturn Reef SAC) but are not exactly the same in all respects, due to natural variability within and between the relevant areas and Hornsea Three. Table 4.1 of the Cable Protection in Designated Sites clarification note outlines the degree of similarity to the Hornsea Three offshore cable corridor for each of the case studies considered, e.g. Borssele and Burbo Bank Extension were both in areas of mobile sediments and bedforms, and are therefore similar to the designated sites relevant to Hornsea Three. It should be noted, however, that the theoretical basis of the impact assessment does not require these to be identical, as it is validated (by the evidence presented from both case studies presented and laboratory studies referred to in the clarification note) to be applicable within a wide range of environmental settings, including Hornsea Three. The hydrodynamics (and sedimentary environment) at the locations considered by the Applicant are therefore sufficiently similar to other sites where direct evidence is available, for the infill and sediment transport arguments to hold true
Q2.2.50	NE, MMO	Paragraph 2.87 of [REP2-004] states that a Cable Burial Risk Assessment would be produced post consent and paragraph 2.88 goes	To address these concerns, the Applicant is in the advance stage of producing a Preliminary Trenching Assessment which will be submitted at deadline 5.

		on to state that this would be secured as part of the Cable Burial Plan through Schedule 11, Condition 13(1)(h) (generation assets DML) and Schedule 12, Condition 14(1)(h) (transmission assets DML) of the dDCO. You highlighted the lack of adequate sampling along the inshore cable corridor re-route in relation to MPAs in ISH2 and the need for an early Cable Burial Risk Assessment to avoid problems that have arisen elsewhere. Please elaborate on the problems that have occurred elsewhere. What practical steps could be taken to avoid such problems in this project? How could adequate mitigation be secured through the dDCO?	
Q2.2.52	Applicant	In relation to Race Bank OWF please confirm how much of the reburial works and proposed cable protection is within MPAs. What is the nature and extent of the designated features that will be affected? Please confirm how much of the 6% protection lies within the MPAs.	There is currently no rock protection on Race Bank export cables within the Wash and North Norfolk Coast (WNNC) SAC. In August 2018 Race Bank applied for a Marine Licence for remedial cable protection within the Wash and North Norfolk Coast SAC as the original licence did not include any cable protection within the Wash (which was not unusual in consent applications for Round 1 and Round 2 offshore wind farms). It is also worth noting that this original application was by another Applicant, not Orsted. The Race Bank Marine Licence application proposed that up to 2,351 m of export cables within the WNNC SAC may require rock protection, comprising rock placed on discrete stretches of cable ranging from 32 m to 991 m length. This would represent 3.5% of the total length of export cables within the SAC (i.e. 66,775 m) and 1.7% of the total length of offshore export cables (i.e. 140,647 m). It should be noted, however, that within the Marine Licence Application, an alternative method of providing protection to exposed cables was identified via backfilling trenches where there was insufficient sediment cover. If this is successful, rock protection would only be required over 1,241 m of export cable within the SAC (i.e. 1.8% of the total length of export cables within the SAC). Assuming that up to 2,351 m of export cable could be affected, this would result in loss of up to 24,132 m2 due to rock protection. The implications of this habitat loss in-combination with the maximum design scenario for cable protection at Hornsea Three is considered in REP3-024. The Race Bank Marine Licence was able to provide detailed information on the designated features affected by rock placement. The rock protection will be placed

			within the following sub-features of the Annex I sandbanks feature of the SAC: Subtidal Sand; Subtidal Mixed Sediment; Subtidal Coarse Sediment; Mosaic habitat (including mixed and stony sediment) and S. spinulosa Core Reef. The relative proportions of the Subtidal Sand, Subtidal Mixed Sediment and Subtidal Coarse Sediment sub-features of the Annex I sandbank affected by Race Bank cable protection, in combination with the maximum design scenario for Hornsea Three are set out in Table 3-1 of REP3-024. The Applicant would note that although comparisons have been made between Hornsea Three and Race Bank (due to both being Orsted projects and Natural England concerns in relation to Race Bank cable installation), comparison to the Sheringham Shoal and Dudgeon export cables, adjacent to Hornsea Three, may be more applicable. As set out in the Applicant's Deadline 2 comments (REP2-004) on The Wildlife Trust Written Representation (REP1-023), the Applicant's understanding is that the adjacent Sheringham Shoal export cables have not required any cable protection, while the Dudgeon export cables required only 70 m of cable protection between the HDD exit pits and the offshore cable corridor.
Q2.2.53	Applicant	Following questions raised by NE [RR-097] in response to the maximum design scenario for cable protection, you stated in [REP1-122] that you were reconsidering the precautionary assumption that 25% cable protection replenishment would be required in the project design envelope. REP2-004 does not conclude on this point. What was the outcome of the reconsideration? What evidence do you have to support your assertions regarding replenishment rates? Please provide copies of any publications you wish to rely upon in evidence that have not already been provided.	Following further consideration the Applicant has determined that the figure of 25% is a suitable assumption for cable protection replenishment. Recent research (Roulund et al., 2018a) and field observations (Roulund et al., 2018b) indicate that scour may develop at some rock berm features under certain conditions. In such an instance there is a risk that the integrity of the cable protection may be compromised and an additional remedial volume of rock at such locations may be required to stabilise the berm. Given that this is an emerging area of study, that the effect develops over long time periods and that the detailed design of cable protection measures has not been finalised, exact determination of the remedial rock volume that may be required is not possible. The Applicant has assessed a further 25% of the maximum design scenario of total installed rock protection as additional rock volume to be deployed in the operations phase to mitigate this phenomenon should it be necessary to do so. This is considered to be realistically conservative based upon the Applicant's experience and as detailed in the papers referenced. Roulund et al., 2018a and Roulund et al., 2018b are submitted at Appendix 49 and 50 to the Applicant's response to Deadline 4.
Q2.2.54	Applicant	You have provided an overview of your position with respect to *Sabellaria* reefs and the applicability of the 'core reef approach' in [REP2-004] and are satisfied that micro-siting would provide adequate	As outlined in the Applicant's comments on Natural England's Written Representation (REP2-004), the Applicant has reviewed the figure provided by Natural England/JNCC in REP1-217 and maintains the position that the assessment

		mitigation. In the light of figure 2 of [REP1-217] do you still maintain that there is adequate room within the cable export corridor to allow micro-siting?	presented in Table 2.21 of Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement (APP-062) demonstrates that there is sufficient space in the remaining offshore cable corridor to allow for micrositing around Annex I reef features should they be present prior to construction. Therefore the primary mitigation which has been proposed by the Applicant (i.e. to undertake pre-construction surveys to delineate the extent of Annex I reefs at the time of construction and to develop mitigation measures, such as micrositing, to avoid these features) remains appropriate for avoiding direct impacts to ephemeral habitats such as Annex I *Sabellaria spinulosa* reef as discussed in the Applicant's response to Q1.2.20 as submitted at Deadline 1. The Applicant considers that the use of detailed pre-construction Annex I habitat surveys will ensure high confidence Annex I reefs can be avoided, thereby reducing the need to precautionary buffers to be applied for Hornsea Three (discussed further below). The Applicant notes that Natural England/JNCC submitted responses at Deadline 3 (REP3-077) to the Applicant's comments in REP2-004 with respect to reef features and has provided information to support the use of the buffers around Annex I reefs as shown in Figure 2 of Annex D4 of the Natural England Deadline 2 response. The Applicant would take the opportunity to provide clarification on a number of points raised. • Natural England/JNCC suggest that the term 'established reef' is a new term which has been introduced by the Applicant. The Applicant would however respectfully point out that this term was only adopted for use by the Applicant on the basis that it is used throughout the JNCC (2018) Supplementary Advice on Conservation Objectives (SACO) for North Norfolk Sandbanks and Saturn Reef Special Area of Conservation (Appendix 29 to the Applicant's response to Deadline 4). The SACO document clarifies the meaning of 'established reef' as meaning areas of reef that persist over time and form more elevated structures or consistently recolonise the same areas and that these are especially important for conservation of the feature's extent, referring to the Roberts *et al.* (2016) report '*Core reef approach to Sabellaria spinulosa reef management in The Wash and North Norfolk Coast SAC and The Wash approaches*'. Noting however Natural England's preference for the term 'high confidence reef' (defined as *Broadly, areas mapped as high confidence reef are a result of surveys that used a combination of remote sensing and ground truthing and/or were specifically designed to identify Annex I habitats*), the Applicant will adopt the term 'high confidence reef'

			going forward in all Hornsea Three examination material, as defined above, for the avoidance of doubt or further confusion. • In REP3-077, Natural England disagree with the use of Figure 2.9 of Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement as a baseline for *Sabellaria* presence within the North Norfolk Sandbanks and Saturn Reef SAC. The Applicant would however clarify that the purpose of the assessment presented in paragraph 2.11.1.43 *et seq*. and Figure 2.9 of Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement was to present an assessment of effects on potential future Annex I *S. spinulosa* reef as recommended by the Marine Processes, Benthic Ecology and Fish and Shellfish Ecology Expert Working Group (EWG), noting that *S. spinulosa* reef is ephemeral and was not recorded during the Hornsea Three characterisation surveys, thereby future-proofing the assessment. The Applicant would also clarify that the Hornsea Three commitment is to microsite around any *S. spinulosa* reef recorded during the pre-construction surveys, rather than the historic extents shown in Figure 2.9 of Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement. As outlined above, the Applicant's position is that the offshore cable corridor is of sufficient width to microsite around such features, as they are identified during pre-construction surveys. • The Applicant acknowledges the 2016 Natural England and JNCC joint Technical Guidance Note submitted by Natural England at Deadline 3 (REP3-077) in justification of the use 500 m buffers around reef features. The Applicant would highlight that the pre-construction Annex I reef surveys proposed by the Applicant will fulfil the same ecological/conservation objective proposed by Natural England/JNCC for the 500 m buffers (i.e. to account for the ephemerality of these features and the potential for their movement between examination and the pre-construction activities) thereby reducing the need for margins and buffers. The approach proposed by the Applicant to undertake pre- and post-construction surveys of Annex I habitats will provide the necessary time series data outlined in the guidance note as being required for the optimum approach to mapping ephemeral features. The Applicant notes that the guidance has been specifically developed for the management of fisheries in areas where there is uncertainty about the extent of a feature's distribution. The Applicant would note that there are important differences between fishing and the installation of cables which, in the Applicant's

			opinion, affect the applicability of the use of the proposed margins to cabling activities for Hornsea Three, notably that the activities associated with cabling will be highly targeted, following pre-identified and pre-agreed routes, and will be undertaken within areas which will have been subject to remote sensing surveys and drop down video ground truthing, specifically designed to identify Annex I habitat (i.e. high confidence reefs as defined above). The same is not true for fishing activities and on this basis the Applicant confirms that the use of margins and buffers is not appropriate for Hornsea Three where detailed site-specific and targeted Annex I habitat survey data will be available. • The Applicant is pleased that Natural England/JNCC are in agreement that the mitigation measures proposed by the Applicant may decrease impacts on individual reefs and are standard across industries. On their point that most activities are not proposed within an SAC with a restore objective for which there is 'little evidence', the Applicant would argue that there is evidence for the North Norfolk Sandbanks and Saturn Reef SAC, including historic JNCC and Cefas surveys and Hornsea Three site specific geophysical and seabed imagery surveys (see paragraph 2.11.1.50 of Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement; APP-062). As outlined below, the pre- and post-construction monitoring proposed for Hornsea Three offers the opportunity to gain a much better understanding of *Sabellaria* reefs in this part of the SAC. • The Applicant notes the Natural England/JNCC comments regarding the frequency that *S. spinulosa* reef is recorded in this part of the NNSSR SAC and the need for precaution when managing this Annex I feature. The proposed Hornsea Three monitoring (i.e. both pre and post construction monitoring of Annex I reefs using a combination of remote sensing and drop down video ground truthing to identify and map Annex I reef habitat) will increase the understanding, and confidence in the distribution and extents, of high confidence Annex I reef in part of the SAC. The main purpose of these surveys will be to ensure direct impacts on Annex I reef features are avoided and demonstrate effectiveness of the mitigation applied. The Applicant would, however, welcome discussion with Natural England and JNCC on how these survey data could be used by JNCC to ensure more effective management of these designated features of the SAC. The proposed monitoring surveys will provide JNCC with a time series of highly comparable datasets to build on the datasets already

			available in this part of the SAC. This would enable JNCC to increase the confidence in condition assessments for this part of the SAC and therefore have greater confidence in conservation objectives of the SAC. • In reference to Natural England/JNCC's point regarding the Area 484 exclusion zone, the Applicant would be interested to see further information on this given the high degree of overlap between this licensed aggregate extraction area and records of *S. spinulosa* within this part of the SAC.
Q2.2.55	Applicant	You agree in [REP1-122] that pre-construction surveys should be scheduled within an appropriate timeframe to ensure they are fit for purpose, to allow for direct impacts on Annex I reefs to be avoided. How would this mitigation be secured in the dDCO if construction occurs in two phases?	Condition 11 (1) of the DML in Part 2 of Schedule 11 (and Condition 12 (1) of the DML in Part 2 of Schedule 12) states that "*The licensed activities or any phase of those activities must not commence until the following (insofar as relevant to that activity or phase of activity) has been submitted to and approved in writing by the MMO— (f) proposed pre-construction monitoring surveys, construction monitoring, post-construction monitoring and related reporting in accordance with condition 15 [16].*" [emphasis added]. Therefore, in the event the authorised development is undertaken in phases, the draft DCO/DMLs already provide that licensed activities in each phase must not start until the pre-construction surveys relating to that phase have been approved. The timescales for submission of the surveys for approval are set out in Conditions 12 and 13 respectively of the DMLs in Schedules 11 and 12.
Q2.2.57	Applicant	Please provide a copy Sotheran et al. (2017) if you wish to rely upon it as evidence.	This paper has been provided at Appendix 26 to the Applicant's response to Deadline 4.
Q2.2.59	NE	Paragraph 4.4.5 of your representation [RR-097] stated that the consideration of each phase in isolation failed to consider cumulative impacts over time. The Applicant has concluded in [REP2-005] that a phased build would not affect recoverability of the relevant features as it would not result in repeat physical disturbance of the same area of seabed across different phases, due to the risk this would pose to the integrity of installed export cables. It is said that the operation and maintenance activities would be highly localised and intermittent. Can you list which impacts are most likely to have a residual effect between each phase, the species and sites affected and your degree of certainty? Are you suggesting that the Applicant has failed to meet the requirements of paragraph 2.6.64 of National Policy Statement (NPS) EN-3?	While this question is directed at Natural England, the Applicant would note that as per Table 2.1 of Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement (APP-062), the requirements of paragraph 2.6.64 of NPS EN-3 have been met, with consideration of all stages of the lifespan of Hornsea Three. Volume 5, Chapter 12: Inter-related effects (Offshore) of the Environmental Statement (APP-072) also gives full consideration of the potential for effects that occur throughout more than one phase of the project (i.e. construction, operation and maintenance and decommissioning) to interact to potentially create a more significant effect on a receptor than if just assessed in isolation in these three key project stages. Paragraph 12.7.2.5 *et seq*. of Volume 5, Chapter 12: Inter-related effects (Offshore) of the Environmental Statement considers the potential inter-related effects of Hornsea Three on benthic ecology receptors, with the conclusion that across the project lifetime, the effects on benthic ecology receptors are not predicted to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase.

		Does this apply to any other cumulative effects? Are you satisfied that the information supplied by the Applicant at Deadline 2 is sufficient or do you still maintain your original position?	The approach taken has been applied to multiple offshore wind farms in the UK, including previous former Hornsea zone projects.
Q2.2.62	Applicant	Please provide the following publications that you have relied upon in evidence: Parry (2015) [REP2-005]	This paper has been provided at Appendix 25 to the Applicant's response to Deadline 4.

Marine Mammals

PINS Ref. No.	Question is addressed to:	ExA Question	Response
Q2.2.65	TWT	You stated in [REP1-023] that it was not appropriate to use the Booth et al (2017) paper as the basis for determining the significance of cumulative underwater noise impacts on harbour porpoise because the model heavily relies upon expert opinion rather than empirical data. The Applicant has since run an updated version of the iPCoD model, incorporating all available empirical information on harbour porpoise energetics, diet and responses to piling noise. The Applicant has stated in [REP2-004] that this has a similar or lower magnitude of effect for an equivalent scenario. Consequently, the appellant maintains that the ES outcomes that were based upon Booth et al (2017) remain valid and no long term population level impact is expected. What are your views on this additional analysis and how does it affected your stated position? Please provide copies of any publications you wish to rely upon in evidence that have not already been provided.	The Applicant has provided further evidence to validate its confidence in the existing conclusions on this matter – see Appendix 45 which details the results of the revised iPCoD model and the comparison to the outcomes from the earlier version as presented in Booth *et al* (2017). A report detailing how the revised iPCoD version was updated taking into account updated understanding of harbour porpoise responses and effects is currently in draft and under review by BEIS, the Applicant expects this report to be available within the coming weeks.
Q2.2.66	Applicant, Whale and Dolphin Conservation (WDC)	In [REP1-022] WDC have pointed out that the boat-based cetacean surveys are out of date, having been conducted between 2010 and 2013, and that no survey was undertaken along the export cable corridor. WDC also note that passive acoustic monitoring and aerial surveys, when the sea state is categorised as 3 or above, lead to acknowledged under recording and that SCANS data is only a snapshot with a 10 year interval.	The Applicant highlights that agreement was reached with Natural England, the MMO and The Wildlife Trusts through the Evidence Plan process in the pre-application phase, and reflected within the SoCG submitted at Deadline 1, that sufficient baseline data had been collected and collated to appropriately characterise the baseline and inform the impact assessment.

		WDC concluded that the baseline survey had failed to detect representative numbers. The Applicant's response in [REP2-004] was that it was a scientifically robust methodology that was approved by the SNCB. Notwithstanding the Statements of Common Ground [REP1-218], [REP1-224] and [REP1-227], please can the Applicant explain how the baseline survey is representative having regard to the issues that WDC have raised. What other data are available that WDC consider ought to be included in the baseline analysis? Please provide copies of any publications you wish to rely upon in evidence that have not already been provided.	Regarding whether the baseline survey is representative, the Applicant confirms that extensive surveys of the Hornsea Three site have been undertaken by the Applicant, using a variety of methods, all of which it considers to be scientifically robust means of collecting data on marine mammal abundance and distribution for the purposes of EIA baseline characterisation (these included distance based visual line transect surveys and towed acoustic hydrophone surveys over the Hornsea Zone over a period of 3 years, in addition to 20 months of digital aerial survey data). With respect to the visual and acoustic boat based surveys, together these two methods provided a means to correct measures of relative abundance to measures of absolute abundance, which is more robust than either survey method alone. WDC correctly highlighted that animals may be missed by either method; visual methods that rely on human observers can miss animals, waves can obscure animals and a proportion of animals will be underwater and unable to be detected. Acoustic methods can miss animals as a result of the directionality of vocalisations relative to the hydrophones, and because of animals not vocalising. These limitations are well understood and the techniques employed in the analysis of the Hornsea Zone boat surveys were designed to address and minimise these. WDC also point out that there were gaps in survey coverage. However, as the analysis process resulted in density surface models which interpolated between surveyed transects, this is not considered a significant limitation. WDC also raised a concern that the methodology that was used for the boat-based surveys was designed for ornithology surveys, not for marine mammals. A dedicated marine mammal observer was used on surveys where suitable weather conditions (i.e. sea state 3 or less) indicated that conditions would be suitable for marine mammal observations. The survey design (in terms of the spatial extent of the survey area) was designed with the potential extent of disturbance of birds in mind, as coverage of the whole extent of the area of potential disturbance to marine mammals was not feasible. The use of ornithology surveys to collect data on marine mammals to assist in characterising the marine mammal baseline and to provide quantitative estimates of cetacean density is standard practice in the UK. Furthermore, the issue of survey coverage was addressed through consultations with the SNCBs and it was agreed that in combination with other, wider scale data sources on marine mammal density beyond the area surveyed, and as long as the highest density estimates were used to underpin the quantitative assessment, the combined data would provide a suitable baseline.

			The boat surveys were completed in 2013, and therefore the Applicant acknowledges that there is the possibility for changes in the baseline abundance and distribution of marine mammals in the intervening period. This is why these data were augmented by more recent aerial surveys of the site. Comparison of these two data sets indicated no significant change in spatial or temporal patterns in distribution of sightings between the two surveys, furthermore, comparison of the results of the SCANS II surveys from 2005 with the SCANS III surveys from 2017 indicate that there have been no significant changes in the distribution or abundance of harbour porpoises in this area. Therefore the use of the densities derived from the boat based surveys were considered appropriate for use in the impact assessment, and as a worst case, were assumed to be representative of densities across the whole site and cable corridor. WDC have expressed concerns that the site specific survey data would underrepresent cetacean presence in the area. The density estimates derived from the site based boat surveys that have informed the assessments are much higher than density estimates derived from any other surveys in this location or in close proximity to the Hornsea Three site, and are at the upper end of the range of harbour porpoise density estimates from anywhere in the North Sea so it is extremely unlikely that these data underrepresent harbour porpoise density in the Hornsea Three site and surrounding area. In their Written Representation, WDC expressed concerns that only 10% of the data were analysed – this is a slight misunderstanding, it is that the video footage analysed, represents coverage of 10% of the whole survey area. As is the case for ornithology, 50% of all video footage was processed and analysed (data from two out of four cameras). This is also discussed in the Applicant's response to Q2.2.3 to Deadline 4 with regards to Ornithology. As a sampling fraction, 10% is not considered a low sampling fraction. For context, the SCANS III surveys, which are large scale, continental shelf wide surveys carried out on a decadal basis to provide estimates of abundance for all small cetacean species (which are used for population assessment and management), have a coverage fraction of less than 1%. Therefore a coverage of 10% is not considered insufficient for a common species such as harbour porpoise.

			Based on the clarifications provided above, we believe that the data used to characterise the area of potential impact, and the use of the associated density estimates in the impact assessment was entirely appropriate and allowed for a robust assessment, a view which is supported by all other interested parties on this matter.
Q2.2.67	Applicant	You stated in [REP1-122] that there was a large degree of variability between surveys in the overall distribution of sightings of harbour porpoise and it is highly likely that patterns were driven by variables that were not able to be included in the modelling, such as prey availability. If you have not taken account of key feeding area locations how have you met the requirements of 2.6.92 of NPS ENS-3?	In the absence of corroborating evidence that the high density areas of harbour porpoise are likely feeding areas, the assessment assumes that they are important feeding areas, and that displacement from them will result in temporary reductions in foraging efficiency leading to effects on energy balance. As such, we have met the requirements of 2.6.92 of NPS ENS-3.
Q2.2.68	WDC, Applicant	The Deadline 1 response [REP1-022] from WDC has highlighted a number of papers suggesting that pile driving can cause long term displacement of harbour porpoise from feeding areas. To what extent are these studies comparable with the present situation in terms of the duration and intensity of piling and prey availability? Do they enable valid comparisons to be drawn? Please can WDC submit copies of the following papers: Synder & Kaiser (2009), Teilmann & Carstensen (2012), Wisniewska et al (2018), Carstensen et al (2006) and Brandt et al (2011). The Applicant has challenged WDC's interpretation of the scientific literature in [REP2-004] and has highlighted a number of papers to the contrary. How does WDC view the empirical balance of evidence in the light of the additional papers that have been cited? Please can the Applicant submit copies of the following papers: Scheidat et al (2011), Brandt et al (2018) and Nabe-Nielsen et al (2018).	The Carstensen et al., 2006, Teilmann and Carstensen, 2012 and Snyder and Kaiser (2009) papers cited by WDC as evidence that that pile driving can cause long term displacement of harbour porpoise from feeding areas actually refer to a single study site; that of Nysted Offshore Wind Farm in Denmark. WDC also cited Brandt et al (2011) in relation to this point. The Applicant would point out that Brandt et al (2011) does not provide evidence that porpoise are displaced in the long term. Brandt et al (2011) describes the study at the Horns Rev wind farm in Denmark referred to above and states that: "At the closest distance studied (2.5 km), porpoise activity was reduced between 24 to 72 h after pile driving activity, and the duration of this effect gradually declined with distance." This indicates that porpoise activity 2.5 km from the pile driving returned to baseline levels after 72 hours. The Applicant does not believe that the Nysted study provides sufficient evidence that porpoises are displaced in the long term as a result of pile driving at offshore wind farm sites. The authors of the Nysted study speculated in a review report (Teilmann, Tougaard and Cartensen, 2006[1]) that the difference between the responses observed at Nysted compared to those at the Horns Rev offshore wind farm was that Nysted was a relatively unimportant area for porpoises and that they would be more motivated to return to find food at Horns Rev due to it being a good quality feeding area. The inference being that Nysted was poor quality habitat and that porpoises were not motivated to return after a period of disturbance. If this interpretation were correct, in the context of the Hornsea Three site potentially being a good quality feeding area for

			porpoises, the expectation would be that porpoises would return shortly after the end of pile driving. Regardless of the reasons for the differences, the comparison of these two studies indicate that porpoises may react differently to similar disturbances. However all of the studies on porpoise responses to pile driving carried out since these early studies, have indicated that disturbance effects are relatively short lived. The additional papers cited by the Applicant in REP2-004 indicate that in a number of studies, harbour porpoise recovery after pile driving occurs within a matter of a few days, and in some cases hours after the end of piling activity. Appendix 44 provides further detail on these studies with specific reference to piling parameters in comparison with HOW03 parameters. These studies provide evidence that porpoise displacement is likely to be short term, lasting between a period of a few days to a few hours after the cessation of piling. The referenced and requested papers are provided at Appendices 10, 11 and 12 to this response. [1] Jonas Teilmann, Jakob Tougaard and Jacob Cartensen (2006) Summary on harbour porpoise monitoring 1999-2006 around Nysted and Horns Rev Offshore Wind Farms Report to Energi E2 A/S and Vattenfall A/S. Ministry of the Environment, Denmark.
Q2.2.69	WDC, NE	In [REP1-022] WDC highlighted a concern about the impact of increased vessel activity throughout the life of the development because increased vessel noise can interrupt harbour porpoise foraging behaviour and echolocation, which can lead to significantly fewer prey capture attempts. Please can WDC submit a copy of Wisniewska et al (2018). In [REP2-004] the Applicant has suggested a methodology for the assessment of vessel movements and the associated ES conclusions have been agreed in the SoCG [REP1-218]. Does WDC concur with this view? Do the findings of Wisniewska et al (2018) change what NE has concluded in the SoCG?	The Applicant notes this Question is directed at WDC and NE but would take this opportunity to comment on the study by Wisniewska et al (2018). Wisniewska et al (2018) describes data from seven tagged porpoises demonstrating that the animals were exposed to vessel noise between 17% and 89% of the time, depending on the individual. Behavioural responses of individual porpoises to close range vessel passages were described. The assessment undertaken for Hornsea Three recognises that there is the potential for porpoises to be disturbed and reduce feeding in the presence of vessel noise, and therefore these impacts were assessed accordingly in the ES and RIAA. It is important to note the following points with respect to the Wisniewska study: • Tagged animals chose to remain in locations where exposure to shipping noise was high; • Tagged porpoises did not avoid highly trafficked areas, perhaps because these overlapped with important foraging habitats;

			• There was no clear relationship between levels of exposure and the percentage buzz positive minutes – this indicates no evidence of reduced foraging activity as a result of increased exposure to shipping noise. • Vessel noise occurred primarily in the daytime whereas porpoises foraged more in the night-time, again indicating that foraging may not be affected; • Most of the noise was of relatively low level and there was lots of foraging detected in the presence of vessels; It was demonstrated that high level exposure led to behavioural responses, however only 2 such instances were provided. It is unclear how frequent such exposures would be in the general population. The authors state in the paper:
			"the fact that relatively few disturbances were recorded by the tags would suggest a minimal fitness cost of exposure." And go onto say: "In the consistently noisy inner Danish Waters, porpoises may have developed behavioural strategies and/or compensatory mechanisms." It is also important to note that as high-frequency echo-locators, porpoises use signals well beyond the low frequencies predominantly produced by vessels. In summary, there was no indication provided in the paper that this wasn't 'business as usual' for these animals and that they were in anyway compromised. It is also important to consider that porpoise density in the North Sea is highest where shipping density is also highest, analysis by Heinanen and Skov (2016) demonstrated that porpoise density was not reduced until shipping density was increased above 80 ships per day – the increase in vessel activity as a result of the wind farm construction and operation will not take shipping levels anywhere near this level.
Q2.2.70	NE	The Applicant has stated [REP1-122] that it was not possible to quantitatively predict vessel impact exposure, in terms of the number of marine mammals affected, unlike piling noise disturbance. The Applicant went on to note that it has not been possible to provide any meaningful combined assessment of both activities and it has therefore relied upon a qualitative assessment. Are you satisfied with the qualitative in combination assessment that has been provided. If not, how could it be improved?	The Applicant notes this Question is directed at NE and does not have any further comment to make at this juncture.
Q2.2.71	TWT	You highlighted a methodology in Heinänen & Skov (2015) [REP1-023] that could be used to assess the cumulative impacts of shipping. You	The Applicant notes this Question is directed at TWT and does not have any further comment to make at this juncture.

		then concluded that this would not be possible here because of a lack of appropriate detail on other projects. Under these circumstances how do you suggest the approach is used? Please submit a copy of Heinänen & Skov (2015).	
Q2.2.72	TWT, NE	In [RR-047] TWT stated that fishing activity should be included in the in combination assessment rather than in the ES baseline. Paragraph 4.4.3 of EU guidance[1] suggests that completed plans or projects do not form part of the in combination assessment required by Article 6(3) but that their effect should still be considered if they have continuing effects on the site. Even if TWT considers fishing as a plan or project that has not been completed why would an in combination assessment not result in double counting if fishing has been included in the baseline? What legislative purpose does TWT think would be served by assessing the effects of the continuing existing activity, i.e. fishing, a second time? Has a distinction been made between existing and future fishing activity in any of the Hornsea Project Three evidence? How can future fishing be taken into account before the outcome of any future licensing is known? What evidence does TWT have to suggest that the outcome of future licensing will intensify or extend fishing? [1] Managing Natura 2000 Sites. The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC (2000)	The Applicant notes this Question is directed at TWT and NE and, does not have any further comment to make at this juncture.
Q2.2.73	NE	You stated in [REP1-212] that where there is ongoing fishing activity on the site, it is appropriate to consider the effects of the plan or project that is the subject of the assessment in the context of those prevailing conditions, of which fishing impact may be one.	The Applicant notes this Question is directed at NE and does not have any detailed comment to make at this juncture other than to refer the Ex.A and NE to its responses on this matter at Deadline 1 (as detailed within the SoCG with TWT and in its comments on the TWT Relevant Representation).

		Does you consider that fishing should have been included in the ES as an in combination effect?	
Q2.2.74	NE	In [RR-097] you stated that you did not agree with the approach of averaging the number of piling days per season when considering effects on the Southern North Sea candidate SAC (cSAC). You went on to suggest that work is more likely to occur during the summer months. The Applicant has since clarified in [REP1-131] that construction activity is likely to occur throughout the year and noted that the most weather sensitive component of the installation process is the blade lift with foundation installation commonly scheduled during the winter months to ensure that the installation of blades can occur during calmer, summer conditions. Please comment on the Applicant's response. Do you have any evidence to the contrary?	The Applicant notes this Question is directed at NE and does not have any further comment to make at this juncture.
Q2.2.75	TWT	In [REP1-023] you highlight the fact that you are advocating an approach to underwater noise management that is used in other countries and that you do not support the SNCB advice. If the Applicant has acted on SNCB advice and concluded that there would not be a likely significant effect on harbour porpoise populations in the cSAC as set out in [APP-051], why is more strict mitigation at source necessary? What scientific evidence do you have to suggest the existing SNCB advice or current industry standards are inadequate? Please provide copies of any publications you wish to rely upon in evidence that have not already been provided.	The Applicant notes this Question is directed at TWT and does not have any further comment to make at this juncture.
Q2.2.76	NE	In [REP1-023] TWT states that there is no understanding as to what the carrying capacity of harbour porpoise is in the Southern North Sea SCI. Therefore, in the opinion of TWT there is weak scientific information underpinning any area-based approach to management and SNCB advice. Please respond to this point and provide any additional information that you wish to rely upon in evidence that has not already been provided.	The Applicant notes this Question is directed at TWT and does not have any further comment to make at this juncture.

Q2.2.77	NE, MMO	WDC have stated in [REP1-022] that they wish to see temporary threshold shift as well as permanent threshold shift evaluated as an alone or in combination piling noise impact. The Applicant has indicated that in [REP1-218] you agreed that this is not required. Do you agree that an evaluation of temporary threshold shift is not required to inform the ES and HRA?	The Applicant notes this Question is directed at NE and MMO but would highlight that the approach to evaluating TTS (presenting the modelled impact ranges within the assessment) was agreed with NE and Cefas during the Evidence Plan process.
Q2.2.78	WDC, TWT	The Applicant has submitted a Site Integrity Plan for the Southern North Sea SCI [REP1-181] that would be secured via Condition 13(5) in the generation assets DML and 14(5) in the transmission assets DML. The Applicant goes on to state [REP2-005] that the final assessment of the effectiveness of the various mitigation options can only be carried out once the final design is decided. The Applicant notes that the MMO is now satisfied that this approach will provide appropriate control measures to mitigate effects on marine mammals when used alongside the Marine Mammal Monitoring Plan which would also be secured via the dDCO. Is there now sufficient detail to address your concerns on this matter? If not what changes do you suggest?	The Applicant notes that this question is directed at WDC and TWT and has no further comment to make at this juncture.
Q2.2.79	NE, MMO	WDC have pointed out [REP1-022] that an EPS license would be required for any pile-driving activity. With the Morge case in mind, is the project likely to infringe Article 12 of the Habitats Directive? If so, is it likely that a derogation, in the form of an EPS licence, would be granted?	The Applicant notes that ExA Question 2.2.79 refers to *R (Morge) v Hampshire County Council* ([2011] UKSC 2), an appeal heard by the Supreme Court concerning a judicial review of a local planning authority's decision to grant planning permission for a busway development which could affect certain species of European protected bats (the felling of trees would deprive bats of foraging habitat). The two principal issues before the Supreme Court were: i. The scope of the system of strict protection for European protected species (EPS) and the meaning of "deliberate disturbance" of the species for the purposes of Article 12 of the Habitats Directive 92/43/EEC and transposing provisions of the relevant UK Habitats Regulations, which (amongst other things) prohibit "deliberate disturbance" of EPS. ii. The approach to be taken by competent authorities in respect of their general duty 'to have regard to the requirements of the Habitats Directive' when exercising other functions and in particular when granting a development consent. In other words, does the decision-maker on an application for development consent need to step into Natural England's

			shoes and reach a positive conclusion as to whether a derogation case exists to justify the grant of an EPS licence before consent may be granted? <u>The meaning of "deliberate disturbance of the species"</u> Article 12(1)(b) of the Habitats Directive requires that Member States take requisite measures to establish a
			system of strict protection for EPS "*in their natural range…prohibiting….deliberate disturbance of these species, particularly during the period of breeding, rearing, hibernation and migration*." A precise definition of "disturbance" has not been expressly considered by the ECJ. Therefore in Morge, the Supreme Court considered the meaning of "disturbance" as used within Article 12(1)(b) principally by reference to European Commission guidance from 2007 in order to provide some clarification. The lead judgement was given by Lord Brown [see paragraphs 19 – 24] and sets out the following basic principles: 1. Article 12(1)(b) relates to the protection of "species", not (e.g. in contrast to Article 12(1)(a)), the protection of "specimens of these species" (i.e. individuals). Therefore, the concern is with disturbance of the species (i.e. impacts on the population), not disturbance of any one individual per se. 2. The word "significant" is not used in Article 12(1)(b). Therefore, in principle, effects which are not necessarily "significant" can amount to "disturbance". However, the court equally rejected a 'hair trigger' approach whereby any impact which is not de-minimis amounts to "disturbance" within the Article 12. An example given in the EC guidance (of an impact which is not "disturbance" within Article 12) is sporadic disturbance. So, whilst the prohibition is not limited to significant disturbance, there must be a sufficient negative impact likely to be detrimental to the species population. 3. The effect on the conservation status of the species at population and biogeographic level is an important consideration. Impacts not affecting the conservation status of the species can be "disturbance" within Article 12.
			However, the objective of the Directive is to preserve the conservation status of the species concerned in their natural range and that provides the important context within which a judgement is made as to whether a given level of impact constitutes "disturbance" of the species. Impacts which would or are likely to affect the conservation status of the species concerned are more likely to be "disturbance" than impacts which would not.

			4.Related to the above, consideration should be given to the rarity and conservation status of the species in question and the impact of the disturbance on the local population of a particular protected species. Individuals of a rare species are more important to a local population than individuals of more abundant species. Similarly, disturbance to species that are declining in numbers is likely to be more harmful than disturbance to species that are increasing in numbers. 5. While it is possible for "disturbance" to occur outside periods of breeding, rearing, hibernation and migration, it is clear that impacts during those periods are of "particular" (i.e. greater) concern and more likely to amount to "disturbance" of the sort the Directive is concerned with. In summary, there is no universal definition of threshold for "disturbance". A "species by species approach" is required where essentially one must consider the nature and extent of the impact in the given case (e.g. sporadic, temporary, prolonged or permanent?), the effect on the population of the particular protected species locally and potentially further afield, taking into account the specific characteristics of the species concerned (sensitivity, mobility etc.) and their conservation status (rarity, is the population in decline, stable or increasing?).
			<u>Extent to which the need for and availability of an EPS license must be considered</u> In relation to the second issue, in Morge the Supreme Court found that the decision maker for a development consent application is not expected to duplicate the licensing role of Natural England (NE). While the decision maker must have regard to the Habitats Directive, NE is the body responsible for policing the relevant species protection provisions of the Habitats Directive, breach of which is an offence. A subsequent case R (Prideaux) v Buckinghamshire County Council and FCC Environment UK Ltd [2013] EWHC 1054 (Admin) helpfully summarised the Supreme Court's position in Morge as follows: *"As the final decision in Morge makes clear, regulation 9 (5) does not require a planning authority to carry out the assessment that Natural England has to make when deciding whether there would be a breach of article 12 of the Habitats Directive or whether a derogation from that provision should be permitted and a licence granted. If a proposed development is found acceptable when judged on its planning merits, planning permission for it should normally be given unless in the planning authority's view the proposed development would be likely to offend article 12(1) and unlikely to be licensed under the derogation powers (see paragraph 29 of Lord Brown's judgment in Morge)."*

			Therefore the decision-maker is not expected to duplicate or pre-empt the licensing role of NE. Furthermore, Article 12 requirements do not preclude the grant of a development consent application except potentially in circumstances where (a) a criminal offence relating to EPS is likely to result from the development, AND (b) where there is evidence that a licence from NE would not be or is unlikely to be granted. In all other cases (e.g. including where there is uncertainty
			as to whether disturbance may result, and cases where there may be doubt as to whether NE would grant a licence), there is no bar to the grant of development consent. The ExA does not therefore need to establish that disturbance is unlikely. Equally, if disturbance is considered likely, the ExA does not need to establish that an EPS is likely to be granted, only that it is not an impossibility or unlikely scenario. The Applicant agrees that an EPS licence will be required for any pile driving activity but it is the Applicant's position that Hornsea Three (post-mitigation) is not likely to infringe Article 12 alone or in combination with other projects having regard to the characteristics of the species, the conservation status of the population, the sporadic and temporary nature of the impact etc. and the fact that problematic in-combination scenarios are considered highly unlikely, particularly in light of the protection afforded by the SIP. Previous discussions with NE have indicated that there is no reason that EPS licence wouldn't be granted.
Q2.2.80	NE	In [REP1-212] you state that the JNCC piling mitigation protocol is out of date and that a range of other mitigation measures used in other European countries should have been detailed in the ES. You welcomed the DML conditions but needed further discussion of mitigation options. If revised piling mitigation protocol guidance is yet to be consulted upon what guidance should be used and given weight in this examination? The Applicant has made a commitment to a Marine Mammal Monitoring Plan and Site Integrity Plan. Why do you consider that these measures would be insufficient. The SoCG with WDC [REP1-219] establishes a 20% increase in piling duration, cost escalation and only limited benefit. How effective would at-source mitigation be under these circumstances?	As made clear within its Deadline 1 and 2 submissions, the Applicant has committed to a robust MMMP in the DML(see conditions 13(1)(g) and 14(1)(g) of Schedules 11 and 12 respectively of the draft DCO (Version 2, as submitted for Deadline 4)) that will ensure PTS effects mitigated to negligible levels and will be informed by the most up to date guidance (noting that the Applicant is aware that JNCC are updating the current guidance but that this will not be done in the timeframe of the Hornsea Three examination).

		Please provide copies of any publications you wish to rely upon in evidence that have not already been provided.	
Q2.2.81	WDC	You stated in [REP1-022] that the CEA did not consider concurrent piling at two locations and that you do not agree that minor adverse impacts would result. The worst case scenario as set out in paragraph 4.13.1.5 of the ES [APP-064] is based on two concurrent piling events. Please clarify your position in the light of this.	The Applicant can confirm that concurrent piling figures have been presented in ES as the worst case for Hornsea Three being two concurrent piling events (multiple piling vessels). The Applicant would also highlight that it is highly unlikely that every other wind farm within the North Sea under construction would also be constructing using multiple vessels at the same time as Hornsea Three, as piling vessels are highly specialist, and there are currently not enough available for this to happen. In terms of overall cumulative impact across all projects across the North Sea the most realistic worst case scenario would be for each project to be installing using a single vessel, as this would result in an a longer period of construction and a longer period of disturbance with minimal overlap in disturbance areas between projects. It is this scenario that ultimately formed the basis of the CEA conclusions.
Q2.2.82	WDC	In [REP1-022] you stated that East Anglia One North, East Anglia Two and Norfolk Boreas should have been included in the in combination assessment of windfarm cetacean impacts. In [REP2-005] the Applicant has highlighted the fact that no detailed information is available beyond the scoping reports and that this would not facilitate any meaningful consideration of their impact. Bearing in mind the above and the fact that they remain Tier 3 projects, do you still maintain this position? What other information would be available to support an in combination assessment? Please provide copies of any publications you wish to rely upon in evidence that have not already been provided.	Since this response [REP2-005] was drafted, Norfolk Boreas has compiled a Preliminary Environmental Information Report. Including the magnitude of impact reported therein in the Hornsea Three CEA, this increases the proportion of the North Sea harbour porpoise population potentially affected from 11.9% to 12.3%, which is not a material difference, especially considering the degree of spatial overlap in affected area with neighbouring Norfolk Vanguard. East Anglia One North and East Anglia Two remain at scoping stage. Natural England agree that the worst case theoretical combination of projects is unlikely to occur, however they retain a concern with regard to the assessment conclusion of no long term population level effects. As highlighted in REP2-005, there have been several expert led attempts to quantify the effect of large scale offshore wind farm development on the North Sea harbour porpoise population, none of which have indicated a significant risk of an adverse effect. Notwithstanding this, it is important to note that the Site Integrity Plan commitment (as outlined in condition 13(5) of the generation assets DML and 14(5) of the transmission assets DML (Schedule 11 and 12 respectively of the draft DCO)) whilst established to deal with HRA related risk on the SNS SCI, will ensure that significant cumulative disturbance effects on marine mammal populations will be avoided. Natural England's position on this, as detailed in the SoCG, is that therefore "in EIA terms, long term population level effects are unlikely".

Q2.2.83	Applicant	Please provide the following publications that you have relied upon in evidence: Booth et al (2017) [APP-064] Wisniewska et al (2016) [APP-064]	The requested papers are presented at Appendices 9 and 13 to the Applicants Deadline 4 response

1.3 Written Question 2.3 Marine Processes

PINS Question number:	Question is addressed to:	Question:	Applicant's Response:
n/a	n/a	The ExA has no questions on this issue at this stage. Effects on receptors affected by marine processes are covered in other sections.	Noted

1.4 Written Question 2.4 Ecology - Onshore

PINS Ref. No.	Question is addressed to:	ExA Question	Response
Q2.4.1	**Applicant**	In [REP1-142] you state that an outline bentonite break-out plan included in Appendix C of the Outline CoCP would be updated as required during detailed design in consultation with the Environment Agency (EA). A) Has the EA been consulted in relation to the contents of the outline break-out plan?	The Applicant can confirm that the Environment Agency (EA) were specifically consulted on the contents of the bentonite break-out plan. Bentonite break-out and the management of the risks were discussed with the EA in December 2017. Further to this, all application materials were discussed and agreed as part of the Statement of Common Ground between the Applicant and the EA (REP1-203). The EA proposed some minor changes to the Outline CoCP and Outline EMP wording, however this did not require any changes to the bentonite break-out plan.
		B) Does the outline break-out plan follow any established guidance?	There is no established guidance on the scope of bentonite break-out plans in the UK. In the absence of established guidance, as set out in the response to Q2.4.1A, the Applicant consulted the Environment Agency as the key regulator for surface and groundwater protection on what measures they would expect the break-out plan to include. The outline break-out plan was also based on the Applicant's technical experience on other offshore wind farm cable installations, the Hornsea Three design information on the crossings at the time of the application and a review of relevant plans prepared for similar projects.
Q2.4.2	Applicant	In [REP1-218] you state that a Pink-Footed Goose (PFG) Management Plan would be prepared and submitted to NE for approval after development consent had been granted in the 12 months preceding commencement of onshore works. In its Deadline 3 submission [REP3-074] NE argues that there should be an in-principle mitigation plan to inform the consenting process. To enable the ExA to consider this point further, please provide a draft outline PFG Management Plan.	The Applicant has included a draft outline PFG management plan as Annex F to the version of the CoCP submitted at Deadline 4.
		If it were appropriate to secure such a plan through the dDCO could this conveniently be done by way of an addition to requirement 10 (ecological management plan)?	The Pink-footed Goose management plan (PFGMP) has been appended to the CoCP as the Applicant considers this to be the most appropriate place to secure potential restrictions to the construction schedule at a particular location. Requirement 17 of the draft DCO, which secures the CoCP, states that the final CoCP must be in accordance with the outline CoCP. The Applicant considers that this sufficiently secures the development and implementation of the PFGMP.

1.5 Written Question 2.5 Navigation and other offshore operations

1.5.1.1 Due to the nexus between the ExA Questions and the ongoing work being undertaken by the Applicant to respond to the material submitted by Spirit Energy in a bid to continue to resolve matters, a summary statement for Spirit Energy is set out below.

Spirit Energy Summary

1.5.1.2 The Applicant advises that following the meeting with Spirit Energy on 17 December 2018 the Applicant made a conditional proposal regarding the two new well locations, without prejudice to the evidence the Applicant has submitted to the examination of its DCO application for Hornsea Project Three and subject to approval by the Applicants senior management. The proposal is for 1 nm buffer zones around the planned wellhead locations C6 and C7, centred on the specific co-ordinates referred to in Spirit Energy Written Submission at Deadline 1 (REP1-041).

1.5.1.3 The Applicant has made the proposal in the spirit of coexistence and goodwill. Upon acceptance by Spirit Energy, and the withdrawal of all objections and representations, including the request for protective provisions from the DCO process, the Applicant would seek internal approvals for its incorporation into the proposed Cooperation Agreement.

Spirit Energy Aviation Summary Statement

1.5.1.4 The Applicant has undertaken aviation assessments within the Environmental Statement that comply with the EIA regulations and have regard for the Overarching National Policy Statement for Energy (EN-1), National Policy Statement for Renewable Energy Infrastructure (EN-3) and CAP 764.

1.5.1.5 The aviation assessments undertaken by the Applicant have been prepared by a team of appropriately experienced EIA practitioners supported by high calibre aviation experts with extensive experience of helicopter operations in the North Sea and underpinned by the Applicants industry leading aviation expertise (see Appendix 72 to the Applicant's Response at Deadline 4).

1.5.1.6 The Applicant has considered the effect on helicopter operations in regard to EN-1 part 5.4, EN-3 part, section 2.6, and CAP 764 and it is the Applicant's case that these policies do not impose an "additional test" on the Applicant to undertake an "ALARP assessment" as asserted by Spirit Energy (see the Applicants response to ExA Q2.5.13 at Deadline 4).

1.5.1.7 Section 8.11, Volume 2, Chapter 8: Aviation, Military and Communication of the Environment Statement (APP-113) presents an assessment of whether the project results in a change to the ability to carry out operations safely, and has taken consideration of EN-3, paragraphs 2.6.183 and 2.6.184, in that no unacceptable risk has been introduced by Hornsea Three.

1.5.1.8 The Applicant has identified a restriction in the ability to conduct straight in Air Borne Radar (ARA) approaches (including the ability to carry out a Missed Approach Procedure (MAP) or One Engine Inoperative (OEI) in certain weather conditions to the Spirit Energy operated assets. Air regulations ensure risk is managed for each planned flight path and the helicopter operator will only fly within these air regulations. The project may result in the requirement not to fly, or to fly a different flight path, but always within the regulations, therefore resulting in no change to safety risk. The expectations on the Applicant in paragraph 2.6.183 of EN-3 to reduce risks to as low as reasonably practicable, and paragraph 2.6.18 of EN-3 not to pose unacceptable risks to safety, are met because the project does not impose a change to aviation risk associated with each flight. It is the potential for an operational effect (i.e. whether the flight can proceed or not) that is relevant here and this has been assessed.

1.5.1.9 The Applicant has responded to the safety concerns that Spirit Energy has in regard to helicopter operations as stated at paragraph 3.2.1, 3.2.2, 3.4 and 5.3 of Spirit Energy Helicopter Technical Note submitted at Deadline 3 (REP3-063). In relation to each of the concerns raised by Spirit Energy, the Applicant has applied and met the relevant and specific policy tests. Moreover, the Applicant clearly sets out the nature, purpose, design and funding of the energy NSIP proposed, the urgent need and presumption in favour of which is established in the National Policy Statements. This enables that the Secretary of State may comfortably determine the Application in accordance with section 104(3) of the Planning Act 2008.

1.5.1.10 The Applicant has progressed consultation with Spirit Energy to work towards both a common understanding of the respective parties' assessments and to provide assurance to Spirit Energy that the two companies can mutually co-exist.

1.5.1.11 The Applicant met with Spirit Energy on 17 December 2018 to progress the technical discussions in regard to aviation (see Applicants response to ExA Q2.5.17). One of the outcomes was a table of the fundamental aviation assumptions used to underpin both the Applicant's and Spirit Energy's assessments which was provided to Spirit Energy in order to facilitate agreement on the aviation assessments (see Appendix 31 to the Applicant's response to Deadline 4). Another outcome of the meeting was a similar table but including all of the aviation assumptions used by the Applicant to be used as a comparative tool against the assumptions used by Spirit Energy in each party's respective assessment, to again facilitate agreement on the aviation assessments, which was shared with Spirit Energy (see Appendix 54 to the Applicant's response to Deadline 4).

1.5.1.12 A list of actions also arose from the meeting including an action on the Applicant to consult with the North Sea helicopter operators to discuss the Applicant's assessment and the helicopter approaches that can be used to access the Spirit Energy platforms. The Applicant is progressing a meeting with CHC (the current helicopter operator for Spirit Energy's platforms in the Markham Complex). It is intended that these discussions will provide further assurance to Spirit Energy regarding the conclusion of the Applicant's assessment.

1.5.1.13 The Applicant has sought to explain why their assessment and that of Spirit Energy differ so significantly (see the Applicants response to Ex.A Q2.5.14) and has explained the basis of the 5% used in the aviation assessments (see Applicants response to ExA Q2.5.14).

1.5.1.14 The Applicant advises that the fundamental differences between the aviation assessment for the potential effect of Hornsea Three on helicopter approaches to the Spirit Energy operated platforms conducted by the Applicant and Spirit Energy is due to:

- A difference in the application of the regulations and the assumptions used to underpin the assessments, fundamentally the application of the European Aviation Safety Agency (EASA) regulations by the Applicant, which provide the legal basis for aviation operations in Europe, as opposed to the Oil and Gas helicopter guidance document referred to by Spirit Energy, the International Oil and Gas Aviation Management Guide (IOGP AMG);
- A difference of opinion that there are alternative flights to a straight in ARA that can be flown within the EASA regulations; namely an en route descent and a shuttle flight which both can be used to provide safe access to the destination platforms; and
- A difference in the consideration of the actual operational effect of the Instrument Meteorological Condition (IMC) restrictions to flights in certain weather conditions, considering the normal operational requirements to these assets and the restrictions imposed on them already.

1.5.1.15 The Applicant notes that the Instrument Flight Rule (IFR) criteria provided at paragraph 2.9 (Appendix ZG of Spirit Energy submission at Deadline 3; REP3-063) is for visibility of 5000 m and cloud base of 1000 ft. These criteria do not relate to EASA guidance for Visual Meteorological Conditions (VMC) (Visibility greater than 4 km, flying clear of cloud (below a cloud base of not less than 600 ft) and in visual contact with the surface. CAT.OP.MPA.247). The application of this different criteria has resulted in Spirit Energy calculating a greater number of days that an ARA is required. The Applicant notes that Spirit Energy do not consider a common procedure, the en route descent, a typical approach currently used every day in the North Sea, and which is considered to be safer than an ARA in some conditions. A descent using the radar for obstacle avoidance whilst IMC in the cloud, is made to 500 ft below a cloud base of 600 ft and flown in VMC. This enables an approach to be made from any wind direction to the Chiswick and Grove Platforms in IMC, as long as there is VMC between 600 ft and the surface. By not considering en route flights Spirit Energy have calculated a greater number of days that flights are restricted.

1.5.1.16 The Applicant notes that Spirit Energy do not consider a common procedure, the en route descent, a typical approach currently used every day in the North Sea, and which is considered to be safer than an ARA in some conditions. A descent using the radar for obstacle avoidance whilst IMC in the cloud, is made to 500 ft below a cloud base of 600 ft and flown in VMC. This enables an approach to be made from any wind direction to the Chiswick and Grove Platforms in IMC, as long as there is VMC between 600 ft and the surface. By not considering en route flights Spirit Energy have calculated a greater number of days that flights are restricted.

1.5.1.17 The Applicant notes that Spirit Energy make no provision for shuttle flights in their assessments. The Applicant advises that ARA can also be made in IMC to the J6A platform and from there, shuttle flights can be flown to the Chiswick and Grove platforms as these platforms are less than 10 nm from the J6A platform and so are within the regulations for shuttle flights. The IMC conditions for shuttle flights are for a cloud base as low as 300 ft and visibility of 2 km (during daylight) (EASA SPA.HOFO.130). By not considering shuttle flights Spirit Energy have again calculated a greater number of days that flights are restricted.

1.5.1.18 With regard to Missed Approach Procedure (MAP), the Applicant notes that Spirit Energy's consultants have conducted a missed approach by flying an offset from 1.5 nm which results in an initial 10-degree turn, followed by a 30-degree turn. They then climbed on track to Minimum Safe Altitude (MSA). They did not consider the potential to make a further turn once established in the climb and once go-around checks were complete (Paragraph 10.4.2 of the Flight Evaluation Report submitted by Spirt at Deadline 1; REP1-193). This is not how a missed approach would be conducted knowing the location of the turbines.

1.5.1.19 The Applicant also notes that Spirit Energy's consultants have conducted an OEI scenario in a straight line (with one maximum turn of 30^{o}) and again not considered the potential to make an initial turn stabilise and make further turns (Paragraph 10.3.1 of the Flight Evaluation Report submitted by Spirit Energy at Deadline 1; REP1-193).

1.5.1.20 The applicant has identified that there are restrictions on conducting a straight-line ARA and MAP in certain IMC conditions. There are however alternative ways to approach these platforms other than a straight-line ARA which Spirit Energy have not considered such as en route descent as discussed above. Spirit Energy's Aviation advisor, AviateQ, has not been flexible in the application of IMC approaches either in type or using an off-set destination with a VMC transit below a cloud base.

1.5.1.21 The Applicant notes that Spirit Energy's consultants have not considered the operational requirements to the Chiswick and Grove platforms. The Applicant notes that the assets are not considered to require 24/7/365 helicopter access, the helidecks were not certified for night operations, and as Normally Unmanned Installation (NUI) are unmanned fail-safe platforms which can be controlled remotely.

1.5.1.22 Spirit Energy has advised (Paragraph 6.6 of their Written Representation submitted at Deadline 1; REP1-041) that in a normal month there are ten infield flights from the J6A platform to the Chiswick platform and ten infield flights to the Grove platform. This means the helicopters fly from Den Helder airport to the J6A platform and then onward to the satellite platform, as required. If a helicopter is flying infield from the J6A platform to either the Chiswick or Grove platforms, it will endeavour to fly in VMC underneath any cloud (i.e. conduct shuttle flights) without gaining unnecessary height and the requirement to conduct an ARA to Chiswick or Grove platforms. This will be an expected preferred approach requiring the shortest flight time to the satellite platforms from Den Helder airport to the East.

1.5.1.23 The Applicant can advise that that the Hornsea Three array area would not compromise stabilised approaches to the platforms in good weather (See Applicants response to ExA Q2.5.15).

1.5.1.24 The outcome of the assessments carried out by the Applicant (Paragraph 8.11.2.43 of Volume 2, Chapter 8: Aviation Military and Communication of the Environmental Statement) indicate that there would be no restrictions to the Chiswick platform in VMC and restriction in IMC on only a few days per year.

1.5.1.25 There would be no restrictions to the Grove platform in VMC and restriction in IMC up to 2.18 days per year).

1.5.1.26 The Applicant has assessed the concerns raised by Spirit Energy within the Environmental Statement and has reviewed the technical information in the Flight Evaluation report submitted by Spirit Energy at Deadline 1 and in the Addendum to AviateQ report at Deadline 3 (REP3-062). The Applicant concludes that the scope of the flight evaluation report and addendum so provided is too narrow and is deficient, e.g. it fails to consider alternative means of approach to platforms and the operational requirements of the platforms. Safe helicopter access to Spirit Energy's platforms can be maintained in nearly all-weather conditions utilising approaches defined within the (EASA) regulations. The Applicant's position is that Hornsea Three will restrict straight in ARA approaches for a very small number of days on certain wind directions and in certain weather conditions.

1.5.1.27 The Applicant's position is that the overall impact of these restrictions will not have a significant effect on the operational requirements to assets which already have a degree of restricted access (e.g. day light flying, and weather restrictions) (see the Applicants response to Ex.A Q2.5.14) and which are not considered to require 24/7/365 helicopter access (e.g. normally unmanned installations which must have fail safe procedures in place) (see the Applicants response to Ex.A Q.2.5.17).

1.5.1.28 The Applicant considers that the number of days that flights could potentially be affected (in certain wind directions and when IMC conditions are below 600 ft) cannot have a significant effect on operations in the Markham Field. In addition, an IMC approach to the J6A platform followed by a visual transit below a 300 ft cloud base, and visual with the surface to Chiswick or Grove platforms remains available.

1.5.1.29 Regarding future activity in the Markham field, the Applicant is aware of a current well programme at the Chiswick platform. This programme will be complete prior to the construction of Hornsea Three. The Applicant has been made aware of two new well locations to the west of the Chiswick platform. The Applicant has not been made aware of any other drilling programmes planned in the Markham field which could potentially be affected by Hornsea Three. The Applicant also advises that Spirit Energy have noted that access to their subsea wells is by vessel (paragraph 4 of Spirit Energy written submission at Deadline 3; REP3-030).

1.5.1.30 Spirit Energy have presented an inflexible approach to helicopter operations which is not in line with the spirit of coexistence between the two industries. There are alternative ways to approach platforms within the EASA regulations other than a straight-line ARA which Spirit Energy have not considered, such as an en route approach or a shuttle flight from J6A platform. As discussed earlier the Applicant intends to progress discussion with the helicopter operators to provide further assurance to Spirit Energy of these approaches.

PINS Ref. No.	Question is addressed to:	ExA Question	Response
Q2.5.1	Applicant, Maritime and Coastguard Agency (MCA)	The Applicant [REP2-005] and the MCA [REP3-084] disagree as to whether the Design Principles should require at least two lines of orientation. Please explain why you come to different conclusions on this matter. Are there examples of comparable OWFs which do not have at least two lines of orientation? If so, what is the typical spacing of Wind Turbine Generators (WTG) in those examples?	The MCA's Marine Guidance Note (MGN) 543 states that '*developers should plan for at least two lines of orientation unless they can clearly demonstrate that fewer is acceptable*'. The Navigational Risk Assessment (NRA; APP-112) therefore makes a safety case based on the following factors (see section 22.13.3 of the NRA) that one line of orientation is acceptable for Hornsea Three as: • Commercial vessels are unlikely to transit through the Hornsea Three array area given there are no distance/time benefits to doing so. • Predicted levels of transiting vessels through the Hornsea Three array area (recreational and commercial fishing) will be low compared to other constructed and/or consented wind farms due to the distance offshore. • Historic data indicate vessels that do choose to navigate through arrays do not typically do so in straight lines (see section 23.13.3.8 of the NRA). • Consultation feedback from commercial, recreational and fishing operators demonstrated no significant concerns about the indicative layouts that had a single line of orientation. • Minimum internal spacing committed to by the Applicant is larger than other Round Three developments giving vessels more sea room to navigate and manoeuvre within the Hornsea Three array area (when considering turning circles and rates of turn). • Single line of orientation layouts were discussed at a consultation meeting in December 2017 including the proposed safety case for them. It was noted that the NRA and Environmental Statement included layouts that committed Hornsea Three to a single line of orientation (as its maximum design scenario) and at the time the MCA noted the new layouts (from those shown in the PEIR) were a positive step forward and the Layout Principles would work well as part of the DCO process. • SAR helicopter specialist consider there not to be a risk to SAR operations associated with one line of orientation when considering the 1,000 m minimum spacing. Both Hornsea Project One and Hornsea Project Two* have layouts agreed with the MMO (in conjunction with the MCA and Trinity House) that include a single line of

			orientation. Minimum consented spacing for those projects are 924 m and 810 m, respectively. It is noted that Hornsea Project One and Hornsea Project Two are some of the first Round Three sites to be developed and it is likely that future projects will continue to develop Layout Principles. *Note: Hornsea Project Two's layout has been agreed in-principle by the MCA.
Q2.5.2	Applicant	The MCA response to Q1.5.4 [REP1-093] suggests that the Design Principles for the array should allow a tolerance of 50m from lines of orientation for siting WTG. The MCA submission for Deadline 3 [REP3-084] sets out reasons why the navigation systems used by Search and Rescue (SAR) helicopters would not (in the opinion of the MCA) remove the need to limit the tolerance to 50m. Please comment on the MCA's response to this point.	The MCA's response (REP3-084) is understood to be related to the ability of the SAR helicopters to be able to search within the Development Lane whilst transiting the SAR access lane. The MCA's response implies that the only effective search is a visual search and does not take account of the actual capability of the suite of sensors fitted to their SAR contractor's helicopters. Degradation of the Infra-Red sensor depends on the droplet size and is not degraded "with any moisture"; for example, it can provide useful imagery in conditions of fog and mist. The MCA's statement that the cameras are "generally only used when stationary" is understood to be incorrect by the Applicant and they are routinely used during a search pattern. It is also the Applicant's understanding that pilots do not use the Electro-optical (EO) / Forward Looking Infra-Red (FLIR) imagery during a search; that role is undertaken by the crewmen in the cabin. Therefore, the pilots will not become disorientated when the EO sensor is scanning during a search. The ability to "search behind turbines" will also not be degraded by a development lane of ±150m compared to a lane of ±50m, as noted, due to the suite of sensors fitted to the SAR contractors' helicopters (see SAR Technical Note presented at Appendix 11 to Deadline 2; REP2-022). It is the Applicant's opinion based on SAR technical expertise that the widely spaced turbines will allow for the same or better search capability and will not result in 23% of the Hornsea Three array area being unsearchable. Whilst there may be periods when a certain piece of equipment is not available for use, given the importance of SAR helicopters' role and the technical specification of the equipment it is understood that these periods would be of a short duration and mitigated by the functionality of other equipment on board.
Q2.5.3	Applicant	At ISH1 you explained that, whereas a tolerance of 50m is typically allowed to avoid seabed features, the tolerance of 150m sought is intended to allow layout flexibility with a view to maximising wind	A) Although it is correct that the ±150 m tolerance is being sought to maximise wind energy capture (and therefore provide lower cost to the end user) it will also provide mitigation to avoid existing features (for example, seabed

		capture. Your Deadline 3 submission [REP3-003] states that two OWFs have been consented with a 150m tolerance. A)Please supply any relevant layout plans or design principles for the consented schemes which are in the public domain. B)Please provide typical illustrative layouts showing how this approach might work in practice for Hornsea Project Three. C)Does this approach to layout design mean that the WTG would not be laid out in straight lines, regardless of seabed conditions? D)Are there any OWFs under construction which have taken the approach you are suggesting here? If so, please provide layout plans and/or aerial photographs to illustrate the approach taken. E)What evidence is there that the 150m tolerance you are suggesting would lead to material benefits in terms of the generation of renewable energy? Is it possible to quantify any such benefits?	conditions) in the same way 50 m micrositing does. As noted by the Applicant at the ISH there are two consented wind farms (Dogger Bank Creyke Beck and Dogger Bank Teesside A&B) that have development rules agreed. As part of the development rules for these projects a tolerance of ±150 m was agreed in consultation with the MCA and Trinity House. The agreed development rules for the Dogger Bank Developments can be found in Chapter 5 project descriptions on the respective PINs website. B) Please see Appendix 58 to the Applicants response to Deadline 4. C) Wind capture in a wind farm is determined by several factors, primarily by the WTG technology and wind resource at the site. Another important factor is quantified as array losses. A discussion of array losses is given in Section 9.4.2.1 of Manwell et. al, in *Wind Energy Explained: Theory, Design Application – 2nd Ed.* (Appendix 56 to the Applicants response to Deadline 4), Wind capture can be described as the conversion of the kinetic energy in the wind to electrical energy. This results in lower wind speeds behind a WTG and less energy capture by the downstream turbines in an array. Thus, a wind farm will not produce 100% of the energy that a similar number of isolated turbines would produce in the same prevailing wind. This loss is a function of several factors, including spacing between and the rotor diameter of WTGs, WTG technology, the wind speed and direction distribution at the site and the turbulence in the wind regime. The wind in the wake of a WTG will regain kinetic energy over a certain distance by interacting with the surrounding wind field. The larger the spacing is between two WTGs in the direction of the wind, the more the kinetic energy in the wind will be replenished. With the aim of designing an efficient wind farm, the Applicant will seek to minimize array losses described above. There may be scenarios where it would be possible to minimize array losses and create a layout in straight lines and the Applicant will take this into consideration while creating the layout design. However, due to the selection of the WTG and its rotor diameter, and other constraints on the array area due to environmental or other factors, there may be cases where the full 150 m tolerance would be utilised to ensure optimum efficiency. D)There are not currently any wind farms post consent and within the public domain that have taken this approach. However, Hornsea Project One and Hornsea Project Two are some of the first Round Three projects to be developed within a Contract for Difference (CfD) framework whereby value for the end user is a key consideration in layout design, alongside ensuring safety for all users.

			E) The Applicant described array losses and the factors that influence these losses in part C of this response. These array, or wake losses can account for as much as 10% of loss in energy yield within a wind farm, depending on the proposed layout and wind conditions. The flexibility of being able to manoeuvre the WTG positions within 150 m allows the project to maximise wind capture that may be hindered by the placement of WTGs around each position which may reduce the efficiency through wind loss – the material benefits here are increased efficiency of WTG use and wind capture, maximising the availability of the WTG array to winds, and thus increasing renewable energy production. In addition, detailed geophysical and geotechnical investigations are typically undertaken post FID due to the large costs involved and the need to inform detailed design which is not necessary at this stage. Those undertaken for previous projects have, shown that due to glacial features historically present in this area of the southern North Sea have led to higher than expected spread and density of boulders (clearing boulders comes at an increased cost for site preparation). Having the ability to site WTGs away from such glacial geological features mitigates the need to clear wider areas of boulders and reduce interactions with the seabed and costs to the project.
Q2.5.4	Applicant	At ISH1 the Applicant stated that, whilst the minimum spacing between WTG would be 1km, for an array of 300 WTG the typical spacing would be around 2km. This appears to be a wider spacing than the 1 nautical mile (nm) which the MCA suggests is the required width for a helicopter refuge area. On that basis, the provision of a refuge area may place only a minor constraint on the layout of the array. Why is it that the Applicant does not feel it is appropriate to include a helicopter refuge in the Layout Design Principles? MGN543 suggests that there may be requirement for a helicopter refuge – is the generality of that advice affected by the spacing of WTG contemplated here?	The Applicant has made the application for consent using a Project Envelope; subsequently the Development Principles need to consider all scenarios including the development of a layout in which turbines are more densely packed (1 km spacing). With this type of layout the Helicopter Refuge Area of 1 nm would represent a significant constraint and the Applicant cannot see a justification for its inclusion when technical and safety evidence (SAR report) suggest that SAR helicopters are able to make turns in less than 0.5 nm and the low likelihood of a Helicopter Refuge Area being located near to a rescue make the requirement unnecessary (see the Applicants response to Ex.A Q 2.5.5). The Applicant does note that MGN 543 is a guidance document intended to cover multiple wind farms in varying locations and conditions; however, the Development Principles are intended for Hornsea Three only and have been specifically tailored to its location to ensure marine navigation and operational safety along with project viability.
Q2.5.5	Applicant	The MCA submission for Deadline 3 [REP3-084] argues that the provision of automatic identification technology on certain turbines would not remove the need for a helicopter refuge area. It also states that a refuge area would improve SAR scene access times and facilitate hoist transfers from vessels engaged in two phase rescues.	In poor visibility at low speed the SAR helicopters can manoeuvre within a SAR lane and transit between lanes. This can be done using the helicopter's automatic flight control system and set of integrated sensors.

		Please comment on these points.	The Applicant notes that the issue of disorientation is not quoted as a reason for a Helicopter Refuge Area in MGN 543 guidance. However, fitting Automatic Identification System (AIS) transmitters at key points will help with orientating the helicopter crew as it is displayed to the pilots in the cockpit and to the crewmen in the cabin. AIS would also assist surface craft. The AIS would help with orientation at key points throughout the Hornsea Three array, rather than having a single lane which is not likely to be near the scene of any SAR incident. In poor visibility (<1,000 m) a Helicopter Refuge Area is highly unlikely to assist with orientation as spacing of the turbines will be such that they will be out of sight; therefore, the only means of distinguishing the Helicopter Refuge Area will be by using the helicopter's onboard sensors. The 1 nm wide SAR lane would only enhance the ability to winch during a two-phase rescue if it was aligned with the wind direction, which again is not probable. The widely spaced turbines and the SAR lanes throughout the Hornsea Three array will provide adequate areas to winch during a two-phase rescue. SAR crews are trained to winch from a wide variety of vessels underway or still in the water. A two-phase rescue is most likely to occur from one of the Applicant's support vessels such as the Service Operations Vessel (SOV) which can set course as directed by the SAR crew or remain in a static position using their Differential Positioning (DP) system and thrusters; or using their engines on a complimentary course to the helicopter.
Q2.5.6	MCA	The Applicant's Appendix 11 (to Deadline 2 submissions) SAR Technical Note [REP2-022] suggests that your analysis of the searchable area is overly pessimistic due to the various navigational systems that the SAR helicopters are fitted with. Your submission for Deadline 3 [REP3-084] states that a wider spacing would not affect the area impeded by the development lane. Given the typical spacing between WTG referred to at ISH1, would it be possible for SAR helicopters to operate within a development lane? What is your response to the Applicant's point that the navigational systems fitted to SAR helicopters would enable safe operation within the array?	Please see Applicant response to Ex.A Q2.5.2 where the effectiveness of the SAR helicopters equipment is discussed. It is noted that the intention is not for the helicopters to transit within the development lanes but to transit within the neighbouring SAR access lanes searching the area around them with the high specification equipment they carry onboard.
Q2.5.7	MCA	The Applicant's Appendix 11 (to Deadline 2 submissions) SAR Technical Note [REP2-022] states that in an emergency a SAR helicopter could climb out of the array within 2.5nm. Consequently it is	The Applicant would refer to the SAR Technical Note, presented at Appendix 11 to Deadline 2 (REP2-022).

		said that any refuge would need to be relatively close to the location of an emergency to be of any assistance. What is your response to this comment?	
Q2.5.8	Spirit Energy	At ISH1 you expressed a concern that shipping movements in the vicinity of your installations may be increased by vessels on broadly north/south passages diverting around the northern and eastern side of the array in order to join the traffic separation scheme. The baseline shipping routes are shown in figure 3.3 of the Applicants Appendix 13 (to Deadline 1 submissions) Racon and AIS Review J6A Platform Technical Note [REP1-177]. Having regard to that plan it is not clear why such vessels would not pass to the west of the array, in the lane between Hornsea Project Two (not shown on that figure) and Hornsea Project Three. Your Deadline 3 submission [REP3-060] states that ships may divert to the east of the array during a westerly gale. Is your concern on this matter specific to periods of westerly gales? In conditions where there is not a westerly gale, what is your evidence that significant numbers of north/southbound vessels would divert around the eastern side of the array? Please provide illustrative vessel tracks to demonstrate how/why shipping would take the route you suggest.	Figure 3.3 in the Applicant's Racon and AIS Technical Note (REP1-177) shows the pre-construction main routes identified in the NRA alongside identified routes used by offshore vessels visiting Spirit Energy platforms east of the Hornsea Three array area. Excluding the Spirit Energy routes, the number of north-south commercial routes (and traffic levels) is low and consists primarily of offshore support vessels visiting other gas platforms in the region. Such routes pass towards the western extent of the Hornsea Three array area and given the navigational corridor between the Hornsea offshore wind farms it is anticipated that vessels on these routes would utilise the corridor. It is noted that Great Yarmouth is generally their base port and such traffic does not utilise the Off Botney Ground Traffic Separation Scheme (TSS) at present. Re-routeing east of the Hornsea Three array area would represent an inefficient and unnecessary detour for such traffic with significantly increased transit time and distance. Hence it is not considered to be realistic for a significant volume of the current north-south traffic to be re-routed east of the Hornsea Three array area into the vicinity of the Spirit Energy installations. With regard to adverse weather, e.g., westerly gales, the navigational corridor between the Hornsea offshore wind farms has been designed for use by vessels heading in a northwest-south east direction in all weather conditions and was agreed with the MCA and Trinity House prior to the start of the NRA process.
Q2.5.9	Spirit Energy	At ISH1 you expressed a concern that shipping movements in the vicinity of your installations may be increased by ferry traffic diverting around the south eastern corner of the array then altering course to the north east in order to cross the traffic separation scheme at an appropriate angle. This would appear to be a longer and more complex route that diverting to the north of the array as predicted in figure 3.4 of the Applicants Appendix 13 (to Deadline 1 submissions) Racon and AIS Review J6A Platform Technical Note [REP1-177]. Your Deadline 3 submission [REP3-060] refers to potential diversions to the south during a northerly gale. Is your concern on this matter specific to periods of northerly gales?	Figure 3.4 in the Applicant's Racon and AIS Technical Note (REP1-177) shows the post-construction main routes predicted during the NRA alongside identified routes used by offshore vessels visiting Spirit Energy platforms east of the Hornsea Three array area. Those east-west ferry routes which intersected the Hornsea Three array area in the pre-construction scenario are anticipated to re-route to the north. In the pre-construction scenario these routes (primarily headed to and from German ports such as Cuxhaven) joined the Off Botney Ground TSS around the section where the TSS turns to an east-west orientation. By passing north of the Hornsea Three array area

		In conditions where there is not a northerly gale, what is your evidence that significant numbers of eastbound ferries would divert around the south eastern corner of the array and, having done so, alter course towards your installations? Please provide illustrative vessel tracks to demonstrate how/why ferries would take the route you suggest.	these routes are able to continue joining the TSS at the same section. It is noted that the volume of ferry traffic on these routes is relatively low. Re-routeing south of the Hornsea Three array area and then joining the TSS sooner would result in longer transit distances and times. Furthermore, altering course at the southeast corner of the Hornsea Three array area would add unnecessary complexity to a vessel's passage. Hence there is not anticipated to be an increase in ferry traffic at the southeast corner of the Hornsea Three array area and thus there is not expected to be an increased risk of interaction between a passing vessel and a Spirit Energy installation. With regard to adverse weather routeing, from passage plans provided by DFDS Seaways and presented in Figure 16.1 of the NRA (APP-112), the current adverse weather routes used by ferries that pass to the south of the Hornsea Three array area avoid joining the Off Botney Ground TSS and do not pass in proximity to Spirit Energy installations located east of the Hornsea Three array area. Moreover, DFDS Seaways did not express any concerns with respect to routeing and the Spirit Energy installations during consultation in the NRA process.
Q2.5.10	Applicant, Spirit Energy	At ISH1 the Applicant referred to 10 years of traffic surveys which indicated that commercial ships do not generally pass through OWF arrays. Spirit Energy has pointed out that MCA advice does not preclude vessels from navigating through OWF arrays and that this may become more common in future [REP1-102]. Please can the Applicant provide further detail as to when and where these surveys were carried out and what the results were? Does Spirit Energy have any evidential basis for the suggestion that commercial ships (other than fishing vessels) would pass through the array?	Anatec has undertaken numerous dedicated vessel traffic surveys encompassing a large number of offshore wind farm projects over the last ten years as well as carrying out research projects into the effects of offshore wind farms on shipping navigation. One such example is a study reviewing changes in vessel traffic movements pre and post wind farm construction undertaken in 2016 as part of the Department of Energy and Climate Change (DECC) offshore energy Strategic Environmental Assessment (Anatec, 2016) (see Appendix 74 to Applicants response at Deadline 4). This report reviewed substantial traffic survey data sets over prolonged periods of time in the vicinity of offshore wind farm developments in the Northern and Southern Irish Sea, Humber Area and the Thames Estuary & Kent Coast. In each region it was observed that, following construction of wind farms, commercial traffic opted to re-route around the arrays rather than pass through. For example, Figure 2.2 of Appendix 74 within the report illustrates the vessel movement for the north Irish Sea where several offshore wind farms have been

			developed. This includes commercial ferries which over time have adapted their routes to pass around the offshore wind farm sites as they have evolved. This is in-line with MCA guidance to mariners in MGN 372 which, whilst listing three options including navigating with caution through an array, concludes that where there is sufficient sea room it is prudent to avoid the area completely. There is ample sea room around Hornsea Three for this action, more so in fact than established areas such as the north Irish Sea where ships are already observed to avoid wind farms.
Q2.5.11	Applicant, Spirit Energy	At ISH1 Spirit Energy accepted that an estimated speed of 4 knots for a drifting vessel (not under command) would be an extreme situation. The Applicant's Deadline 3 submission [REP3-003] stated that the drift time from the eastern edge of the array to the nearest platforms would be 30 minutes to 2 hours. Spirit Energy's Deadline 3 submission [REP3-060] gave an example of a vessel drifting at 9 knots (albeit in a location where tidal conditions may be different). Specifically in relation to windfarm support vessels, what would be the likely speed of a drifting vessel driven by wind and tide? Specifically in relation to a construction barge, which may be loaded with large WTG components, what would be the likely speed of a drifting vessel driven by wind and tide? vessel driven by wind and tide? Specifically in relation to a construction barge, which may be loaded with large WTG components, what would be the likely speed of a drifting vessel driven by wind and tide? How long would it take for such vessels to drift from the eastern edge of the array to the Chiswick or Grove Platforms? How long would it take for such vessels to drift from the eastern edge of the array to the Chiswick or Grove Platforms?	The Marine Accident Investigation Branch (MAIB) *Saga Sky* incident referred by Spirit Energy (REP3-060) at 9 knots was during *Storm Angus* with hurricane force winds (80 knots) and rough seas (6 m wave height). The vessel was in the Dover Strait within a few miles of the Kent coast which resulted in tidal currents acting in combination with winds. The vessel was propelled beam onto the wind direction at speeds of "up to 9 knots" at times. However, based on the MAIB commentary, the average drift speed during the incident was around 4 knots. A ship will drift due to the combined effects of wind, waves, current, trim and ballast. In more open waters such as the North Sea (Markham area) wind will tend to dominate although all the factors will have an effect. Tide could be acting with or against the wind. Various theories and models have been developed to estimate drift speeds. A frequently referenced study by the Oil Companies International Marine Forum, based on questionnaires returned by members of the International Chamber of Shipping, found a loose linear relationship between drift speed and wind speed, with the ship drift speed averaging 3% of the wind speed, and generally bounded between 2% and 10%. It is expected a wind farm support vessel and construction barge would be well within these bounds as they are not high-sided compared to, e.g., a car carrier, container or passenger ship. Based on the NRA metocean data, the area has an annual mean wind speed of 8 m/s (16 knots), giving a ship drift speed at 3% of wind speed (typical vessel) of 0.47 knots. Using the upper bound value of 10%, which might apply to a high windage vessel, the drift speed would be 1.57 knots. It can be seen that both of these values are well below four knots. Based on a vessel breaking down at the extreme eastern edge of the array, 1.5 knots from Chiswick, and drifting in a straight line directly towards Chiswick,

			the time to allision would be 3 hours 11 mins (typical vessel) and 57 minutes (high windage vessel). Based on the NRA metocean data, only 0.2% of the year are wind speeds above 20.8 m/s (41 knots) corresponding to Beaufort Force 9 (Strong Gale). This extreme case would generate ship drift speeds at 3% (typical vessel) of 1.2 knots and at 10% (high windage vessel) of 4.0 knots. The time to allision based on the vessel starting at 1.5nm from Chiswick would be 74 minutes and 23 minutes, respectively. Even in the extreme case of a 0.2% per year storm, a high windage vessel (which a windfarm support vessel or construction barge would not be) and a breakdown at 1.5 nm from Chiswick, all vessels would be more than 20 minutes away from allision with the platform when they started to drift, which provides sufficient warning time to muster personnel and evacuate the platform as specified in the Platform Safety Cases. This also provides time for the NUC vessel to restart engines and/or anchor to stop the drift, and worst case it may be able to use rudder and other measures to avoid an allision by slightly altering the drift angle. It is important to note that marine operations within the wind farm will be subject to allowable weather limits. These will limit the wind speed (and wave heights) that vessels can work, which in turn will limit the potential drift speeds should a vessel lose power. Therefore, it is highly unlikely 4 knots will be experienced in practice, and in all cases at least 20 minutes warning should be available, and usually several hours.
Q2.5.12	Applicant	Spirit Energy's Deadline 3 submission [REP3-060] states that the ES did not assess the risk of allision by vessels not under command with their infrastructure. Please respond to this comment.	As previously stated, based on the re-routeing assessment taking into account the shielding afforded by the wind farm, third-party vessel traffic is expected to reduce in the vicinity of the Spirit Energy assets. Therefore, the risk of allision from not under command third party vessels is also expected to reduce. No such incidents have occurred in the history of oil & gas operations on the UKCS, i.e., involving 3rd party vessels. Exposure from Spirit Energy vessels, e.g., supply vessels working alongside, will not be affected by the wind farm. There will be additional exposure due to wind farm vessel traffic, in particular during construction but also during O&M. However, these vessels will be ultimately under the

			control of the Applicant. Such vessels are used to working surrounded by turbines and are required to operate to a high standard and with strict procedural controls, such as allowable weather limits. Relatively speaking, the Spirit Energy platforms will be remote (external and standalone), even when vessels are at the eastern fringe of the Hornsea Three array area. Again, it is noted that no 3rd party vessels (which the wind farm vessels would be with respect to the Spirit Energy assets) have drifted into oil & gas assets on the UKCS to date, which indicates this is generally a low probability event due to the chain of events that would have to occur, as well as the good prospects for recovery in the time before allision, e.g., start engine, deploy anchor, be taken in tow, use rudder to avoid allision, etc. We note that Spirit Energy was represented at the Hazard Workshop undertaken at the Applicants offices in London in February 2017 as part of the Navigational Risk Assessment and made no reference to concerns regarding allision with the Spirit Energy installations located east of the Hornsea Three array area.
Q2.5.13	Applicant	Spirit Energy's Deadline 3 submission [REP3-030] states that the ES did not assess whether risks relating to helicopters would be managed such as to be As Low As Reasonably Practicable. Please respond to this comment.	The Applicant has considered the effect on helicopter operations in regard to EN-1 part 5.4, EN-3 section 2.6, and CAP 764. In particular, the Applicant has had regard to paragraphs 2.6.183 and 2.6.184 of EN-3, which state: "*Where a proposed offshore wind farm potentially affects other offshore infrastructure or activity, a pragmatic approach should be employed by the IPC. Much of this infrastructure is important to other offshore industries as is its contribution to the UK economy. In such circumstances the IPC should expect the applicant to minimise negative impacts and reduce risks to as low as reasonably practicable*." "*As such, the IPC should be satisfied that the site selection and site design of the proposed offshore wind farm has been made with a view to avoiding or minimising disruption or economic loss or any adverse effect on safety to other offshore industries. The IPC should not consent applications which pose unacceptable risks to safety after mitigation measures have been considered*." It is the Applicant's position that these policies do not impose an "additional test" on the Applicant to undertake an "ALARP assessment" as asserted (without reference to any authority on the point) by Spirit Energy. It is a well-established principle of planning law that policy should not be interpreted in the same way as legislative or contractual

			drafting, as Spirit Energy has stated in its Deadline 3 submission (REP3-030). The ordinary meaning of paragraph 2.6.183 of EN-3 is that there is an expectation that the Applicant should minimise negative impacts and reduce risks to as low as reasonably practicable, which it has satisfied through the assessments in the Environmental Statement, as amplified by evidence the Applicant has submitted to the Examination. Furthermore, an ALARP assessment is an economic consideration (consideration of ALARP as defined by HSE (2018) involving weighing a risk against the resource, time and money needed to control it). Therefore, it is not a judgement that the Applicant is able to make. Section 8.11, Volume 2, Chapter 8: Aviation, Military and Communication of the Environment Statement (APP-113) presents an assessment of whether the project results in a change to the ability to carry out operations safely and has taken consideration of EN-3, paragraph 2.6.183 and 2.6.184, in that no unacceptable risk has been introduced by Hornsea Three. The methodology used for the assessment of potential impacts on aviation operations has been consulted on at an aviation workshop during Hornsea Project One. It was subsequently applied in the assessments for Hornsea Project One, Hornsea Project Two and Hornsea Three (having been submitted to PINS in the scoping report). At no point was it suggested to the Applicant that an ALARP assessment should be undertaken in addition to the EIA proposed. The Applicant is not aware of an ALARP assessment being included in the Environmental Statement or other application documents, with regard to oil and gas helicopter operational requirements for other offshore wind farm DCO submissions. There are three potential effects on helicopter operations which the Applicant has assessed and to which this question can be applied. • Ability of helicopters to access Spirit Energy operated assets; • Ability of helicopters to transit to an installation; and • Availability of airspace to conduct helicopter operations. The Applicant has assessed the significance of effect of the project on the ability of helicopters to access Spirit Energy operated assets in Section 8.11, Volume 2, Chapter 8: Aviation, Military and Communication of the Environment Statement. The

			approach considers any project induced change in the ability to continue to carry out helicopter operations to these assets. The Applicant has identified a change (a restriction) in the ability to conduct straight in Air Borne Radar (ARA) approaches (including the ability to carry out a Missed Approach Procedure (MAP) or One Engine Inoperative (OEI)) in certain weather conditions to Spirit Energy's assets. Air regulations ensure that risk is ALARP for each planned flight path. The helicopter operator will only fly within these air regulations. The project may result in the requirement not to fly or to fly a different flight path, but as it will still be planned within the regulations, that flight path will remain ALARP. If ALARP is not met in the flight path, the pilot will not fly. There is, therefore, no change to aviation safety risk (ALARP) as a result of Hornsea Three, but instead an operational effect. In other words, the expectations on the Applicant in paragraph 2.6.183 of EN-3 to reduce risks to as low as reasonably practicable, and paragraph 2.6.18 of EN-3 not to pose unacceptable risks to safety, are met because the project does not impose a change to aviation risk associated with each flight. It is the potential for an operational effect that is relevant here and this has been assessed within Section 8.11, Volume 2, Chapter 8: Aviation, Military and Communication of the Environment Statement. The Applicant has assessed the significance of the effect of the project on the ability of helicopters to transit the Hornsea Three array area within Section 8.11, Volume 2, Chapter 8: Aviation, Military and Communication of the Environment Statement. The North Sea helicopter providers were invited to a workshop to discuss this issue and all the helicopter operators present stated that they had no concerns in regard to continuing to fly directly over the Hornsea Three array area, and in the event that a lower Minimum Safe Altitude (MSA) was required they would deviate around the array area. Those helicopter providers did not identify the need for an ALARP assessment to be undertaken by the Applicant. This again is an operational effect (not a change to safety risk (ALARP)). This operational effect has been assessed within Section 8.11, Volume 2, Chapter 8: Aviation, Military and Communication of the Environment Statement. The tests in paragraphs 2.6.183 and 2.6.184 of EN-3 are satisfied. The Applicant has assessed the significance of the effect of the project on available airspace in Section 8.11, Volume 2, Chapter 8: Aviation, Military and Communication of the Environment Statement. NATS provide a deconfliction service to all oil and gas

			helicopter operators which ensures that helicopters maintain safe distances from each other. The project has no effect on the ability of NATS to continue to provide this service (see Table 8.4 of Volume 2, Chapter 8: Aviation, Military and Communication of the Environment Statement), and therefore there is no change to the safety risk (ALARP). Again, the tests in paras 2.6.183 and 2.6.184 of EN-3 are satisfied. Spirit Energy have acknowledged that they no longer consider this a significant effect (para 6.7.5 of Spirit Energy Written Representation at Deadline 3; REP3-057). In regard to Spirit Energy's Written Representation at Deadline 3, paragraph 2 (REP3-030), the Applicant advises that there is no statement in their Deadline 1 submission (REP1-041) stating that Risk should not see the "light of day". The Applicants position as stated at Deadline 1 (REP1-007) was to note that Spirit Energy "*use a risk assessment matrix which is a commonly used method for assessing operational risk looking primarily at the probability of an unintended event occurring."* The Applicants position as stated at Deadline I remains that "*both methodologies are relevant and applicable for the intended purpose"* (with reference to the EIA methodology and a risk assessment methodology). The Applicant is aware of the application of operational risk as a tool for developing and managing a safety case, for example. Spirit Energy are required to have a safety case for each platform and to demonstrate ALARP for helicopter operations to that platform (paragraph 3.4 of the Spirit Energy Written Representation at Deadline 3). The Applicant notes that this is the duty of Spirit Energy and cannot be undertaken by the Applicant, because it requires operational information which is not available to the Applicant. The application of ALARP will need to consider helicopter specifications and pilot competence for example which are commercial considerations between Spirit Energy and their helicopter service provider. It would also need to consider the condition of the platform's helideck, the platform orientation, lighting and emergency response provision and operational considerations specific to Spirit Energy's assets. If a judgement were to be made using information that has been provided or can be obtained from the public domain, this would suggest the Chiswick and Grove platforms are not presently operating to ALARP. No automatic fire-fighting facilities have been fitted to either the Chiswick or Grove platforms (Helideck Certification Agency, 2018 (Appendix 57 of Applicants response to deadline 4), which restricts the number of flights to the facility (Appendix D CAP 437). Further, there is no Touchdown

			(TD)/Positioning Marking (PM) circle and Heliport Identification (H) lighting on the Chiswick platform (Appendix 57 of Applicants response to deadline 4) which restricts flights to daylight only. The Applicant also wishes to respond to the two main safety concerns that Spirit Energy have in regard to helicopter operations as stated at paragraph 3.2.1 and 3.2.2 of Spirit Energy Technical Note submitted at Deadline 3 (REP3-063): *3.2.1 The significantly increased likelihood of placing people on a NUI and then not being able to recover them at the end of their shift requiring them to stay overnight in the Temporary Refuge;* The Applicant is of the opinion that there is not a significant increase in the likelihood of people remaining on either the Chiswick or Grove platforms as a result of Hornsea Three (see response to ExA Q2.5.17; REP1-005). Furthermore, the Applicant advises that staying overnight in the Temporary Refuge may be a comfort issue but cannot be a safety issue. The Temporary Refuge must comply with HSE regulations (in particular PFEER Regulation 13 (HSE 2019). *3.2.2 In the event of an emergency evacuation being required (from any of the facilities or vessels, not just the NUIs), helicopter flights not being possible at that time and thus requiring a secondary form of evacuation into the water.* The Applicant is of the opinion that in the event of emergency evacuation helicopter flights will not be adversely affected. SAR helicopters are able to access platforms in weather limits below CAT limits. SAR helicopters, such as Coast Guard Helicopters, are frequently used to support oil and gas operations such as the recent down manning of the Brent Delta (28 November 2018) after it lost power. No emergency was declared but the comfort of the non-essential crew led them to being transferred (Energy Voice, November 2018 (Appendix 75 to Applicants response at Deadline 4)). In addition, in the event of any fire or gas leak on the platforms, helicopters would not be allowed to approach the platforms for safety reasons.

			The Applicant wishes to respond to other safety concerns that Spirit Energy has raised in regard to helicopter operations as stated at paragraph 3.4 and 5.3 of Spirit Energy Technical Note submitted at Deadline 3: *3.4 Helicopters are integral to each safety case because these aircraft are used as the primary method of emergency evacuation as they provide a relatively safe and efficient method of transferring people from an installation. An evacuation by a secondary means (lifeboat or other escape to sea) from a platform is inherently more risky and introduces the added problem of subsequently recovering personnel from the water.* The Applicant advises that helicopters cannot be used when there is a hydrocarbon release or a fire, i.e. the two major types of emergency on a NUI. In the event of an injury, personnel can be rescued by SAR helicopters, which have appropriately trained and equipped crewmen. CAT helicopters cannot be used to transport seriously injured personnel as they do not have the trained crew or equipment. The limited number of days when a CAT helicopter cannot recover injured personnel after being placed on the platform in deteriorating weather conditions will have no impact on the ability of a SAR helicopter to rescue them. *5.3 If a helicopter were to ditch close to Chiswick or Grove then it would require a search and rescue (SAR) helicopter to be mobilised to recover personnel. The nearest SAR helicopter is based at Humberside. The presence of the wind farm in the path of the SAR helicopter will increase the time taken to reach personnel (either due to a need to circumnavigate the wind farm – depending on weather conditions, or the additional height to safely fly over the array), exposing them to additional risk.* The Applicant advises that helicopters are not used to show compliance with PFEER 17 at a NUI as their response time, unless based offshore, is not sufficiently quick. The standby vessel at the J6A platform will be Spirit Energy's means of showing a "good prospect of rescue" under PFEER 17 (HSE 2019). In conclusion, in relation to each of these concerns raised by Spirit Energy, the Applicant has applied and met the relevant and specific policy tests. Moreover, the Application clearly sets out the nature, purpose, design and funding of the energy NSIP proposed, the urgent need and presumption in favour of which is established in

			the National Policy Statements – there is no requirement on the Applicant to make out or amplify that need in relation to this NSIP. Consequently, the Secretary of State may comfortably determine the Application in accordance with section 104(3) of the Planning Act 2008.
Q2.5.14	Applicant, Spirit Energy	The ES [APP-068] states that helicopter flights are conducted using instrument approaches to oil and gas platforms 5% of the time. Spirit Energy's Deadline 3 submission [REP3-069] states that instrument approaches would be required on 88 days per year. Please can the Applicant explain the basis for the figure of 5% in the ES? Please can the Applicant and Spirit Energy explain why their respective assessments differ so significantly? Please can Spirit Energy confirm whether Chiswick and Grove platforms have any restrictions in terms of instrument approaches at present?	The figure of 5% used in the aviation assessments in Volume 2, Chapter 8: Aviation, Military and Communication of the Environmental Statement (APP-113), defines the percentage of time that weather conditions dictate a straight in airborne radar approach (ARA) is required (this is equivalent to the time that alternative flight approaches such as an en route descent and a shuttle cannot be flown). During Hornsea Project One pre-application consultation (see Table 8.1 of Volume 2, Chapter 8: Aviation, Military and Communication of the Environmental Statement) the Applicant was advised by helicopter operators that instrument meteorological conditions (IMC) typically occurred for 15% of the time in the Southern North Sea. For the assessment, IMC conditions were used to define the potential time that helicopter flights would be deviated due to the presence of Hornsea Three. For the assessment of IMC conditions in which a straight in ARA would need to be flown this value was refined by the Applicant's aviation experts to 5%, to allow for circling approaches, en route approaches (for which a cloud base of 600 ft and 4,000 m visibility is required) and for shuttle flights (for which a cloud base of 300 ft and 2,000 m visibility is required). The Applicant verified these figures against a five year Met Office data set, providing cloud and visibility frequency tables for the period between January 2010 to December 2016 at location Southern North Sea 53.1 N and 0.28 E. Generally, visual meteorological conditions (VMC) is defined as a cloud base of 600 ft and 4 km visibility, although lower figures are permitted when shuttling over a distance less than 10 nm. This is also the criteria required for en route descents. The cumulative percentage of time for a one year period when this criteria was not met was 8.1%. For shuttle flights a minimum cloud base of 300 ft and 2 km visibility is required. The cumulative percentage of time that this criteria was not met was 4%. The application of 5% by the Applicant was therefore considered acceptable. The wind

			data was then applied in the assessments to ascertain within this 5%, when the wind direction would result in a restriction of ARA approaches to the platforms. The Applicant advises that the fundamental differences between the aviation assessment for the potential effect of Hornsea Three on helicopter approaches to the Spirit Energy operated platforms conducted by the Applicant and Spirit Energy is due to: • A difference in the application of the regulations and the assumptions used to underpin the assessments; • A difference of opinion that there are alternative flights to a straight in ARA that can be flown within the European Aviation Safety Agency specifications (EASA) regulations; and • A difference in the consideration of the actual operational effect of the IMC restrictions in certain weather conditions. The Applicant and Spirit Energy met on 17 December 2018 to progress the technical discussions in regard to aviation. An outcome of the meeting was to identify the assumptions used to underpin the assessments carried out by both the Applicant and Spirit Energy's consultant, AviateQ. This resulted in a table of aviation assumptions used by the Applicant and provided to Spirit Energy to complete, as presented at Appendix 54 of the Applicants response to Deadline 4. The Applicant awaits Spirit Energy's completion of the table, however, fundamental differences were identified and discussed between the parties at the 17 December meeting and summarised below. <u>Assumptions used in the Assessments</u> The Applicant notes that the aviation assessment reports (Appendix Y; REP3-055, and Appendix ZE; REP3-061, of Spirit Energy submission at Deadline 3) have not taken account of EASA Regulations, but instead used information from the International Oil and Gas Aviation Management Guide (IOGP AMG). The IOGP AMG is a guidance document without legal basis, whilst EASA Regulations provide the legal basis for aviation operations in Europe. Where Spirit Energy's consultants have made reference to the EASA Regulations this is not always correct (for example Note 2 of page 6 of Appendix Y of Spirit Energy Submission at Deadline 3 implies that minimum height for shuttling is 400 ft, but in fact the rule says 300 ft cloud base).

			The Applicant notes that the IFR criteria provided at paragraph 2.9 is for visibility of 5000 m and cloud base of 1000 ft. These criteria do not relate to EASA guidance for VMC (Visibility greater than 4 km, flying clear of cloud below a cloud base of not less than 600 ft) and in visual contact with the surface (CAT.OP.MPA.247). On this basis, Spirit Energy's assessments will provide a greater (excessive) number of restricted days, as asserted by Spirit Energy. As well as not considering the possibility of doing routine en route descents no consideration is given to the lower limits of visibility of 2 km cloud base 300 m required for shuttle flights (day) and so again Spirit Energy assert a greater (excessive) number of restricted days <u>Airborne Radar Approach (ARA) assessment</u> The Applicant carried out an assessment on helicopter access to the Spirit Energy operated platforms using aviation specialists Osprey, following guidance presented in Civil Aviation Authority Publication (CAP) 764 (Volume 5, Annex 8.1: Aviation, Military and Communications Technical Report of the Environmental Statement). The EIA methodology used in Volume 2, Chapter 8: Aviation, Military and Communication of the Environmental Statement satisfies the requirements of the Environmental Impact Assessment regulations. The EIA methodology has been used to consider aviation interests and uses an approach developed and implemented in the Hornsea Project One and Hornsea Project Two Environmental Statements to support their respective DCO applications and refined through consultation. The Applicant notes an important confusion in the use of the terms instrument flight rules (IFR), visual flight rules (VFR), IMC and VMC in section 4.2 of the AviateQ Flight Evaluation Report submitted by Spirit Energy at Deadline 1 (REP1-192). IFR, predominantly in VMC, is flown offshore by helicopters in the UK sectors to satisfy the Air Traffic Service (ATS) provision by NATS Aberdeen (under Memoranda of Understanding (MoU) signed by all operators). Flights under IFR offshore are planned under the NATS MoU; in VMC helicopters avoid surface obstacles, vessels and other aircraft by visual minima whilst flying in accordance with the NATS MoU. Under IFR, a VMC approach is still available from over the windfarm whilst an IMC approach might be restricted due to wind direction. An IMC approach, currently flown as an ARA procedure, requires the approach path and go-around path to be clear of obstacles. The proximity of the wind farm will restrict the available approach directions under some wind conditions.

			The Spirit Energy Technical note (REP3-063) assumes that approaches via a 4 nm FAF are not available. The Applicant and Spirit Energy agree (SOCG submitted at Deadline 1 (REP1-007) that the main parameters used to inform the assessment have been agreed to be appropriate by the helicopter service provider for Spirit Energy, and that any restrictions to helicopter operations serving Spirit Energy operations will be greater in IMC rather than in VMC. Wind speed and direction was modelled from a 10-year data set taken at the Schooner A platform (Section 7.44 of Volume 5, Annex 8.1: Aviation Military and Communication Technical Report of the Environmental Statement; (APP-113)). The Applicant notes that due to the maximum height of the turbines (325 m), Airborne Radar approaches have the potential to be affected at a distance of 7 nm (Paragraph 8.11.2.32 of Volume 2, Chapter 8: Aviation Military and Communications of the Environmental Statement). However, this is only if a straight-line approach is flown from the Minimum Safe Altitude (MSA) to the platform, and such an approach is not necessary. The Applicant advises that an airborne radar approach is composed of three approach segments and it is only the final segment which is required to be flown substantially into wind. It is this final approach point that will determine the minimum distance that will allow 24/7/365 access to the platforms. This has not been considered in the flight evaluation report presented by Spirit Energy at Deadline 1 (REP1-192). The Final Approach point is 4 nm (as provided in the EASA an extract of which was submitted by Spirit Energy at Deadline 1 (REP1-196), so allowing 1 nm separation distance from the turbines and room to arc in to the final approach point a radius of 6 nm (at the Intermediate Approach Fix) would be sufficient from the turbines for unrestricted straight in airborne radar approach access in all wind directions. However, the Applicant advises that a radius of 6nm is not required because a straight-line ARA approach is not always necessary and there are other means of conducting an ARA to a platform such as using a circling manoeuvre. This is cited in the EASA guidance as an alternative means of approach.

			Furthermore, a more common procedure, the en-route descent, can be used. This is a typical approach currently used every day in the North Sea, and is considered to be safer than an ARA in some conditions. A descent using the radar for obstacle avoidance whilst IMC in the cloud, is made to 500ft below a cloud base of 600 ft and flown in VMC. This enables an approach to be made from any wind direction to the Chiswick Platform in IMC, as long as there is VMC between 600ft and the surface. Direct flights are, therefore, only restricted to the Chiswick and Grove platforms in IMC and when cloud base is lower than 600ft. The Applicant advises that ARA can also be made in IMC to the J6A platform and from there, shuttle flights can be flown to the Chiswick and Grove platforms as these platforms are less than 10 nm from the J6A platform and so are within the regulations for shuttle flights. The IMC conditions for shuttle flights are for a cloud base as low as 300 ft and visibility of 2 km (during daylight)(EASA SPA.HOFO.130). As discussed below conducting a shuttle is considered to be the preferred operational approach for Spirit Energy when conducting in-field flights from the J6-A platform. Spirit Energy in their submissions at Appendix Y (REP3-055) and Appendix ZE (REP3-061) have only taken account of a straight in ARA, and not considered en-route flights. They have discounted shuttle flights stating that if the weather restrictions require an ARA to be made it is highly unlikely that a shuttle flight can be made (paragraph 4.3.3 of Appendix Y submitted by Spirit Energy at Deadline 3 (REP3-055)) and gone on to incorrectly claimed a minima of 1000 ft cloud is required for shuttles. The Applicant asserts that shuttle flights can be flown under the cloud base (with cloud as low as 300ft by day (EASA SPA.HOFO.130). <u>Missed Approach Point (MAP)</u> When approaching a platform at the Missed Approach Point, 0.75 nm from the destination, a decision must be made to conduct a visual landing, or a go-around must be flown. The helicopter must therefore have a safe path to conduct the MAP and must also be able to conduct the MAP considering one engine inoperative. The initial MAP is a turn up to 45 degrees in either direction. The Applicant has considered missed approaches within their assessments (Section 7.4.3. of Volume 5, Annex 8.1: Aviation Military and Communications of the

			Environmental Statement. It must be remembered that a helicopter pilot will not approach a platform without knowing it is able to conduct a MAP so the final approach and MAP cannot be considered separately. Considering the final approach fix can be flown offset to the wind and conducting a turn away of initially up to 45 degrees, with a further turn down-wind (sometimes achieving a total 180-degree change in direction), will in all instances provide sufficient room for the pilot to turn away, with 1 nm buffer, from the turbines. The Applicant notes that Spirit Energy's consultants have conducted a missed approach by flying an offset from 1.5 nm which results in an initial 10 degree turn, followed by a 30 degree turn. They then climbed on track to MSA. They did not consider the potential to make a further turn once established in the climb and once go-around checks were complete (Paragraph 10.4.2 of the Flight Evaluation Report submitted by Spirt at Deadline 1 (REP1-192). This is not how a missed approach would be conducted knowing the location of the turbines – the pilot would perform the final approach to the platform at a small offset to the prevailing wind so that a turn away could be achieved and then make a further turn once established in the climb after the go-around checks had been completed. The Applicant notes that Spirit Energy's consultants have conducted One Engine Inoperative (OEI) in a straight line (with one maximum turn of 30o) and again not considered the potential to make an initial turn stabilise and make further turns (Paragraph 10.3.1 of the Flight Evaluation Report submitted by Spirit Energy at Deadline 1 (REP1-192). OEI is flown along a similar path as the MAP at a lower rate of climb. The Applicant considers therefore that the MAP cannot be considered as a separate requirement. A pilot will only conduct an ARA if they can perform a MAP under all conditions. In regard to the simulation flight assessments presented in the Flight Evaluation Report submitted by Spirit Energy at Deadline 1 (REP1-192), the profiles appear wedded to the straight-in (line) approach and similar undeviating departure which are not the norm, for example turns are frequently required during onshore missed approaches. Flight simulations are flown directly towards the wind farms and do not consider the ability of the helicopter to be able to offset, depending on the wind strength.

			Alternative approaches The applicant has identified that there are restrictions on conducting a straight-line ARA and MAP in certain IMC conditions. There are however alternative ways to approach these platforms other than a straight-line ARA which Spirit Energy have not considered such as en route descent as discussed above. AviateQ has not been flexible in the application of IMC approaches either in type or using an off-set destination with a VMC transit below a cloudbase. The Applicant has agreed with Spirit Energy to consult with the helicopter operators as to the ability to fly alternative approaches (within the regulations) other than a straight in ARA to the Chiswick and Grove platforms. A meeting is being progressed with the helicopter operator CHC to discuss these approaches to provide assurance to Spirit Energy. Operational requirements The applicant advises that the operational requirements to Spirit Energy assets have been assessed. The Applicant notes that Spirit Energy's consultants have not considered the operational requirements to the platforms. The assets are not considered to require 24/7/365 helicopter access, as the helidecks were not certified for night operations, and as Normally Unmanned Installation (NUI) are unmanned fail safe platforms. The J6A platform, at a distance of 6.9 nm from Hornsea Three, is the manned accommodation hub for the Chiswick and Grove satellite platforms, which are both NUIs. Spirit Energy has advised (Paragraph 6.6 of their Written Representation submitted at Deadline 1; REP1-041) that in a normal month there are ten infield flights from the J6A platform to the Chiswick, and ten infield flights to the Grove platform in a month. This means the helicopters fly from Den Helder airport to the J6A platform and then onward to the satellite platform as required. Abnormal flights have been occurring recently due to a scheduled drilling campaign however this is not considered normal and will be complete far in advance of Hornsea Three construction. So, if a helicopter is flying infield from the J6A platform to either the Chiswick or Grove platforms, it will endeavour to fly in VMC underneath any cloud (i.e. conduct shuttle flights as described above with a cloud base 300ft and visibility 2km) without gaining unnecessary height and the requirement to conduct an ARA to Chiswick or Grove platforms. This will

			always be a preferred approach requiring the shortest flight time to the satellite platforms from Den Helder airport to the East. Spirit Energy has not adequately considered alternative means of access to a platform for planned maintenance activities such as walk to work vessels. The Applicant has been advised by another oil and gas operator during consultation (Table 8.4 of Volume 2, Chapter 8: Aviation, Military and Communication of the Environmental Statement) that this method is becoming increasingly popular in the North Sea as it is cost effective. Walk to work Industry guidance, by Det Norske Veritas Ltd, 2015 states that in the very first paragraph: "The manning and transfer of personnel to and from offshore facilities by a marine vessel via a gangway system provides an alternative to other means, such as by helicopter...this approach can offer significant benefits including, improved manning flexibility, reduced lifecycle costs and improved safety". Spirit Energy have advised (Paragraph 4.4 of Technical Note, Appendix ZG of Spirit Energy submission at Deadline 3 (REP3-063) that in summer months these vessels (walk to work) are in very short supply and it is likely that it would not be possible to secure such a vessel for unplanned work in the summer leading to extensive loss of production. The Applicant notes that this implies they can be used for planned maintenance on the platforms. The number of days of unplanned work at a NUI is considered to be considerably lower than the planned maintenance requirements. It is noted that Spirit Energy already use walk to work vessels on other operations within their portfolio. In regard to the questions "*Please can Spirit Energy confirm whether Chiswick and Grove platforms have any restrictions in terms of instrument approaches at present?"* the Applicant wishes to provide the following response. The helicopter landing area certificate (Helideck Certification Agency, 2018) (as presented at Appendix 57 to the Applicants response to Deadline 4) for the Chiswick and Grove platforms identify that the helidecks have been restricted to daylight flights only due to the Touchdown(TD) /Positioning Marking (PM) circle and Heliport Identification (H) lighting not being fitted, which in accordance with Appendix D of CAP 437, restricts flights to daylight flights only. The Grove platform has recently been upgraded and a new helicopter landing area certificate issued on 19 November 2018 which has lifted the night flight restriction to this platform. The helicopter landing area certificates also indicate that the automatic fire fighting facilities have not been fitted,

			which in accordance with Appendix D of CAP 437 restricts the number of flights to the facilities. The total number of flights to each platform is restricted to 120 unattended (200 attended and unattended) for 2018, decreasing to 120 unattended (160 attended and unattended) for 2019 and 120 unattended (120 unattended and attended) for 2020 (Appendix D CAP 437) which considering drop off and pick up, equates to 80 days at present decreasing to 60 days (2020). In addition, helicopters are not cleared to fly in all weather conditions, the restrictions are dependent on the aircraft being flown. The EC155 quoted in paragraph 10.2.1 of the Flight Evaluation Report submitted by Spirit Energy at Deadline 1 (REP1-192) is certified for flight in icing conditions, the AW139 in the oil and gas role is only certified for flight in limited icing conditions. Other weather conditions such as high sea state, strong winds and lightning will restrict flights as well. There are usually additional restrictions imposed on helicopter landings to NUI's in regard to the weather conditions and sea state. The restrictions will be identified in the platform safety case. This information has been requested by the Applicant but has not been made available to date by Spirit Energy.
Q2.5.15	Spirit Energy	Your submission for Deadline 3 [REP3-061] refers to the importance of stabilised helicopter approaches both in poor visibility and in good weather. Do you consider that the proposed array would compromise stabilised approaches to your platforms in good weather? If so, why?	The Applicant has assessed the effect of Hornsea Three on approaches to the Spirit Energy operated platforms (Paragraph 8.11.2.40 of Volume 2, Chapter 8: Aviation Military and Communication of the Environmental Statement; APP-113) and can advise that that the Hornsea Three array area would not compromise stabilised approaches to the platforms in good weather. European Aviation Safety Agency (EASA) regulations do not define what is considered a "stable approach" however this is considered in (Annex B of HeliOffshore Approach Path Management Guidelines 2017) (Appendix 76 of Applicants Response to Deadline 4). A helicopter is considered to be on a stable approach when the following has occurred: *The aircraft is on the correct flight path and the correct navigational data has been confirmed as entered into the navigation system for final approach to the desired airport, heliport, or helideck and the aircraft is stabilised for the approach.*

			Only small changes in heading/power are normally required to maintain the correct flight path, unless the environmental conditions on a particular day may require power changes larger than normal. *All briefings and checklists have been completed, except for the final landing check. The aircraft is in the correct landing configuration.* *In VMC the final point at which the approach has to be stabilised is 0.5nm.* The Applicant notes that the information submitted by Spirit Energy in regard to stabilised approaches (section 5 of Appendix ZE is not consistently aligned with the guidelines. At paragraph 5.3 the final approach fix is at 4 nm (EASA.SPA. HOFO) with the IAF 2 nm before this (not 5 nm to 7 nm). At paragraph 5.4 airspeed is mentioned however the Applicant advises this is not cited in the guidance. At paragraph 5.5 the 0.5 nm gate is the point at which the helicopter needs to be stabilised (not prior to this) Paragraph 5.5 goes on to state that all IFR approaches shall be stabilised by 500 feet above the point of landing, however the Applicant notes there are exceptions to this quoted in the guidance Good weather is defined in aviation as visual meteorological conditions (VMC). VMC is established by day when visibility is greater than 4 km , flying clear of cloud (below a cloud base of not less than 600 ft) and in visual contact with the surface (CAT.OP.MPA.247). AviateQ quote the International Oil and Gas Aviation Management Guide (IOGP AMG) criteria (for Paragraph 4.3.3 of Appendix Y of Spirit Energy submission at Deadline 3; APP3-055) and advise that the cloud base of 1000 ft should be applied. The same VMC criteria (visibility greater than 4 km and cloud base 600 ft) is required for conducting an en route descent (CAT.OP.MPA.247). When conducting a shuttle flight between two installations, VMC criteria changes and a minimum cloud base of 300 ft is required and a minimum visibility 2 km by day, and a minimum cloud base of 500 ft and visibility 5 km by night (EASA SPA.HOFO.130). When flying in VMC the helicopter can comply with Visual Flight Rules (VFR). The surface obstacle avoidance criteria are less in VFR than in Instrument Flight Rules

			(IFR) and so potential proximity issues fall away in VFR. VFR requires surface obstacle avoidance requirements of 500 ft horizontal separation and 500 ft lateral separation (i.e. a 500 ft semi-bubble surrounding the obstacle) unless the 'obstacle' is the landing area (platform/installation). The Applicant can therefore advise that a stabilised flight can be flown to the Spirit Energy platforms in good weather (as defined above). In IMC an en Route descent can still be flown as long as cloud base is greater than 600 ft and visibility greater than 4 km below the cloud, as the helicopter effectively descends below the cloud to make a VFR approach. The Applicant notes the IFR criteria provided at paragraph 2.9 of Appendix ZG is for visibility of 5000 m and cloud base of 1000 ft. These criteria do not relate to EASA guidance for VMC (Visibility greater than 4 km, flying clear of cloud (below a cloud base of not less than 600 ft) and in visual contact with the surface (CAT.OP.MPA.247). Spirit Energy did not consider the ability to do routine en Route descents in their aviation assessment submitted at Deadline 1 (REP1-196). They have added some text in this regard to the report addendum (section 6 of Appendix ZE of Spirit Energy submission at Deadline 3; REP3-061) which is confused and whilst titled en Route Descents continues to discuss an airborne radar approach (ARA). A shuttle flight can be flown in VFR when the cloud base is 300 ft and visibility 2 km, as the helicopter can make an ARA approach in IMC to one installation, and then effectively shuttles across to the next installation under VFR. Conducting an approach to one installation and then shuttling to the final destination is common practice in congested oil and gas fields. Spirit Energy have dismissed the ability to do shuttle flights from the J6A platform to the Chiswick and Grove in their submission as an ARA mitigation and have misquoted the regulations by citing IOGP AMG guidance (paragraph 4.3.3 of Appendix Y of Spirit Energy submission at Deadline 3 (REP3-055)). The applicant advises that a shuttle flight is not a mitigation flight but is a routine flight that is commonly used in the oil and gas industry between adjacent platforms, and as the normal operational procedures is for helicopters to approach or land on the J6A platform and to then fly in field to

			Chiswick and Grove platforms (Paragraph 6.6 of Spirit Energy Written Submission at Deadline 1; REP1-041) this will, when weather permits, be the preferred approach. The Applicant advises that in IMC when the VMC criteria cannot be met, an ARA can still be made to the Chiswick and Grove NUIs under many conditions, taking into account a safe approach direction and go-around, down to a Minimum Descent Height of 200 ft. The number of occasions when an ARA can be made to the NUIs will be restricted by a combination of the wind direction, cloud base and visibility.
Q2.5.16	**Spirit Energy**	Your Deadline 3 submission [REP3-061] explains why, in your view, certain helicopter operations could not be carried out safely. At ISH1 you explained that, typically, personnel are taken to/from Grove and Chiswick Platforms during the same day. On the assumption that you would not carry out flights assessed to be unsafe, is it reasonable to assume that the main impact would be on your ability to access Grove and Chiswick platforms rather than an impact on the safety of personnel? Is it reasonable to assume that you would not transfer personnel to Grove and Chiswick platforms if you were not confident that they could be transferred back to J6-A later that day?	The ExA's assumptions are correct. The project does not impose a change to aviation risk associated with each flight. It is the potential for an operational effect that is relevant here and this has been assessed within Section 8.11, Volume 2, Chapter 8: Aviation, Military and Communication of the Environment Statement (APP-113).
Q2.5.17	**Applicant, Spirit Energy**	Please provide an update on your discussions regarding helicopter operations. Please provide your respective assessments of the number of days per year helicopters can (or could) serve Grove and Chiswick platforms now and with the proposed array in place. Having regard to the fact that Grove and Chiswick platforms are not routinely staffed, what is your overall assessment of the impact of any restrictions on helicopter flights on Spirit Energy's operations in the Markham field?	The Applicant and Spirit Energy met on 17 December 2017 with their respective helicopter advisors to progress technical discussions in regard to helicopter operations. There were a number of outcomes from this meeting as detailed below One of the outcomes was a table of the fundamental regulatory assumptions used to underpin both the Applicants and Spirit Energy's assessments which was provided to Spirit Energy in order to facilitate agreement on the aviation assessments (Appendix 31 to the Applicant's response to Deadline 4). Another outcome of the meeting was a similar table but including all of the aviation assumptions used by the Applicant to be used as a comparative tool against the assumptions used by Spirit Energy, to again facilitate agreement on the aviation assessments, which was shared with Spirit Energy Appendix (Appendix 54 to the Applicant's response to Deadline 4). A list of actions also arose from the meeting which could be used to progress understanding of each parties' assessments. This included an action on the Applicant to consult with the North Sea helicopter operators to discuss the Applicant's

			assessment and the helicopter approaches that can be used to access the Spirit Energy platforms. The Applicant is progressing a meeting with CHC (the current helicopter operator for Spirit Energy's platforms in the Markham Complex). It is intended that these discussions will provide further assurance to Spirit Energy regarding the conclusion of the Applicant's assessment. The Applicant provided their assessment of the impact of the restrictions on helicopter flights to the Chiswick and Grove platforms in Paragraph 8.11.2.40 of Volume 2, Chapter 8: Aviation Military and Communication of the Environmental Statement; APP-113). The Applicant advises that the assessment of number of days per year that helicopters can access the Grove and Chiswick platforms has not changed from that submitted in Volume 2, Chapter 8: Aviation Military and Communications of the Environmental Statement taking account of IMC days and wind direction. The outcome of the assessments carried out by the Applicant (Paragraph 8.11.2.43 of Volume 2, Chapter 8: Aviation Military and Communication of the Environmental Statement) indicate that there would be no restrictions to the Chiswick platform in visual meteorological conditions (VMC) and restriction in instrument meteorological conditions (IMC) on approximately 0.17 to 0.40 days per month (up to 3.49 days per year) with the greatest impact seen in April when 1.35% of flights may be precluded and the lowest impact seen in August when 0.56% of flights may be precluded. The outcome of the assessments carried out by the Applicant (Paragraph 8.11.2.44 of Volume 2, Chapter 8: Aviation Military and Communications of the Environmental Statement) indicate that there would be no restrictions to the Grove platform in VMC and restriction in IMC on approximately 0.12 to 0.25 days per month (up to 2.18 days per year) with the greatest impact seen in April when 0.83% of flights may be precluded and the lowest impact seen in August when 0.39% of flights may be precluded. VMC requires the following conditions to be flown: • Visual approaches when visibility greater than 4 km, flying clear of cloud (below a cloud base of not less than 600 ft) and in visual contact with the surface. CAT.OP.MPA.247. • En route descents when cloud base not less than 600 ft and visibility of 4km. CAT.OP.MPA.247

			• Shuttle flights can be flown when the following conditions are met: In Class G airspace when flying between offshore locations where the overwater sector is less than 10 nm, VFR flight may be conducted when the limits are at, or better than, the following: Two pilots: Day 300 ft cloud base 2 km visibility; and Night 500 ft cloud base 5 km visibility. (EASA SPA.HOFO.130). IMC conditions are defined when it is not VMC and for the purpose of this assessments when none of the conditions for visual approaches, en route or shuttle approaches, are met. The Applicant has assessed the concerns raised by Spirit Energy within the Environmental Statement and has reviewed the technical information in the Flight Evaluation report submitted by Spirit Energy at Deadline 1 (REP1-192) and in the Addendum to AviateQ report at Deadline 3 (REP3-062). The Applicant concludes that the scope of the flight evaluation report and addendum so provided is too narrow and is deficient, e.g. it fails to consider alternative means of approach to platforms and the operational requirements of the platforms. Safe helicopter access to Spirit Energy's platforms can be maintained in nearly all-weather conditions utilising approaches defined within the European Aviation Safety Agency specifications (EASA) regulations. The Applicant's position is that Hornsea Three will restrict straight in airborne radar approaches for a very small number of days on certain wind directions and in certain weather conditions. The Applicant provided their assessment of the impact of the restrictions on helicopter flights to the Chiswick and Grove platforms in Paragraph 8.11.2.40 of Volume 2, Chapter 8: Aviation Military and Communication of the Environmental Statement). The Applicant's position is that the overall impact of these restrictions will not have a significant effect on the operational requirements to assets which already have a degree of restricted access (e.g. day light flying, and weather restrictions) and which are not considered to require 24/7/365 helicopter access (e.g. normally unmanned installations which must have fail safe procedures in place). The Applicant considers that the number of days that flights could potentially be affected (in certain wind directions and when IMC conditions are below 600 ft) cannot

			have a significant effect on operations in the Markham Field. In addition, an IMC approach to the J6A platform followed by a visual transit below a 300 ft cloud base, and visual with the surface to Chiswick or Grove platforms remains available. The access requirements to the Chiswick and Grove platforms has varied in each of Spirit Energy's submissions: During pre-application consultation with Centrica, the Applicant was advised that routine operations took place on over 40 days a year to the Chiswick and Grove platforms. This changed to 120 in field round trips a year (Paragraph 6.6 of Spirit Energy's written submission at Deadline 1) and to typically 60 flights a year (maximum of 120 flights; Paragraph 1.7 of Appendix ZG of Spirit Energy Deadline 3 submission; REP3-063). Whichever of these numbers is correct, the Applicant notes that the routine flights are in-field round trips from the J6A (Paragraph 6.6 of Spirit Energy's written submission at Deadline 1) which can be conducted by day with cloud base as low as 300 ft and visibility as low as 2 km. Regarding future activity in the Markham field, the Applicant is aware of a current well programme at the Chiswick platform. This programme will be complete prior to the construction of Hornsea Three. During a consultation meeting during November the Applicant was made aware of two new well locations to the west of the Chiswick platform. The Applicant has not been made aware of any other drilling programmes planned in the Markham field which could potentially be affected by Hornsea Three. Spirit Energy have presented an inflexible approach to helicopter operations which is not in line with the spirit of coexistence between the two industries. There are alternative ways to approach platforms within the EASA regulations other than a straight-line airborne radar approach (ARA), which Spirit Energy have not considered, such as an en-route approach or a shuttle flight from J6A platform. As discussed at the 17 December meeting and agreed with Spirit Energy the Applicant will consult with helicopter operators to provide further assurance to Spirit Energy of these approaches. The Applicant notes that Spirit Energy have presented a large amount of information at Deadline 3 in regard to the high safety risk of using helicopters for personnel transfer. It is surprising therefore that such emphasis is being placed on the continued use of helicopters as the primary means of personnel transfer when there is an alternative (walk to work vessels) becoming increasingly more available to the industry.
Q2.5.20	**Applicant**	Spirit Energy's protective provisions [REP-032] state that part of the justification for a 2nm exclusion zone is to provide sufficient sea room for the operation of anchor spread vessels.	It is appreciated that a large exclusion zone is convenient beyond the standard legal exclusion of 500 m (safety zone) that applies to all oil & gas platforms. Spirit Energy has acknowledged this is a commercial issue as safety will not be compromised.

		What is your response on this matter?	Experience has shown that the operation of anchor spread vessels can take place within restricted waters, whether the restriction is caused by nearby platforms, nearby turbines or even within wind farm arrays, surrounded by turbines. One example is the Rhyl subsea well (operated by Spirit Energy) in the Irish Sea which is within 1.1 nm of a Walney Extension turbine. Another example is the *Stanislav Yudin* Heavy Lift Vessel (with anchor spread) which has carried out operations in the Dudgeon and Beatrice Wind Farms, as well as oil & gas decommissioning operations where there are other platforms in proximity. There is available industry experience and guidance, such as the Guidelines for Marine Operations (GOMO) guidance (referenced by DNV; REP1-246), for planning these types of operations that can be followed, taking into account restrictions, to help ensure safe and efficient operations. Ultimately rigs can be positioned within metres of existing assets when required.
Q2.5.22	**Applicant**	Spirit Energy has drawn attention to protective provisions in favour of oil and gas operators included in the East Anglia Three Offshore Wind Farm DCO [REP3-049]. These require a proximity agreement to be completed before works can commence within a defined protected zone. The provisions appear to cover proposed oil and gas infrastructure as well as existing infrastructure. Please comment on the extent to which the circumstances of this application are comparable with the situation which these protective provisions sought to address.	The Applicant does not hold detailed information on the discussions between the East Anglia Three Offshore Wind Farm and ENI UK Ltd. although the situation is comparable in so far as it relates to the overlapping areas of a windfarm Agreement for Lease (AfL) and an Oil and Gas licence area. (The Applicant has undertaken a high level review of the documents submitted as part of the EA3 Examination). The Applicant notes that ENI UK Ltd. held the P.1964 licence which had an initial term of four years in which ENI were required to drill an exploration well. The well had to be drilled by 31 December 2017 under the term of that licence. There was therefore more certainty on the timings of ENI's potential drilling activities whereas Spirit Energy have not committed to any firm timeframes for their proposed drilling activity. As far as the Applicant is aware, ENI UK Ltd. did not have any firm prospect or drilling locations whereas Spirit Energy have suggested some provisional locations but have not provided any coordinates for these locations. It is standard industry practice to enter into a proximity agreement once plans are sufficiently progressed and detailed technical design has been undertaken. The Applicant would hope to enter into a proximity agreement on reasonable terms with

			Spirit Energy should it wish to install infrastructure within the AfL area in order that the parties have due regard for each other's respective developments. If the parties are unable to reach an agreement on reasonable terms then Spirit Energy can apply to the Secretary of State who will in turn instruct the Crown to relinquish part of the AfL area pursuant to the Oil and Gas clause.
Q2.5.23	**Applicant**	Please comment on the extent to which your proposals accord with Policies GOV2, GOV3, OG1 and OG2 of the East Inshore and East Offshore Marine Plans.	**Policy GOV2** specifies that "Opportunities for co-existence should be maximised wherever possible". The Applicant referred to Policy GOV2 within Table 6.3 of Volume 2, Chapter 6: Commercial Fisheries of the Environmental Statement (APP-066), which noted that Hornsea Three, is, and will continue to, take steps to minimise the effects upon the local fishing industry through appropriate mitigation where required. Designed-in measures related to commercial fisheries include commitment to developing a Fisheries Coexistence and Liaison Plan (REP1-154). The Applicant has identified opportunities for co-existence with oil and gas activities throughout Volume 2, Chapter 11: Infrastructure and Other Users of the Environmental Statement (APP-071) and during the Examination process. The Applicant has conducted early and informative engagement with all oil and gas stakeholders in order to understand their issues and to seek ways to maximise the potential to co-exist with the industry (Table 11.4 of Volume 2, Chapter 11: Infrastructure and Other Users). The Hornsea Three offshore cable corridor submitted at PEIR was, on consideration of consultation advice from oil and gas stakeholders, refined to reduce as far as possible the number of crossings that would be required with oil and gas pipelines. The Applicant has given consideration to oil and gas activity being able to continue coincident with and proximate to the project Agreement for Lease. In relation to potential effects on seismic survey activities within the Hornsea Three array area, the Applicant noted that more recent methods of seismic survey (including the use of ocean bottom cables or fixed vertical cables) provide an opportunity to work in a more congested field (see Paragraphs 11.11.1.35 and 11.11.2.20 of Volume 2, Chapter 11: Infrastructure and Other Users). In relation to potential effects on drilling and the placement of infrastructure within the Hornsea Three array area, the Applicant noted that drilling may be able to proceed prior to construction or during the construction period depending on the required

			location, and that due to the relatively small area that is required by a drill rig and the ability of an operator to directionally drill if required, drilling activity may be able to take place in the remaining areas of the licence blocks not affected by the Hornsea Three array area throughout the construction phase (see Paragraph 11.11.1.53 of Volume 2, Chapter 11: Infrastructure and Other Users), and that drilling may still take place by means of directional drilling along the offshore cable corridor (see Paragraph 11.11.1.80 of Volume 2, Chapter 11: Infrastructure and Other Users). During the operational phase the Applicant identified that there is potential for a well to be drilled within the Hornsea Three array area, and that it is possible to directionally drill if required, with such activities subject to consultation and agreement between both interested parties (see Paragraph 11.11.2.36 of Volume 2, Chapter 11: Infrastructure and Other Users). Drilling may also take place by means of directional drilling along the Hornsea Three offshore cable corridor (see Paragraph 11.11.2.63 of Volume 2, Chapter 11: Infrastructure and Other Users). Consultation between the operators of the licence blocks in proximity to the Hornsea Three array area has aimed to address any future operational issues and establish a line of communication to ensure coexistence between both activities can be achieved with minimal disruption (see Paragraphs 11.11.1.45, 11.11.1.57, 11.11.2.28 and 11.11.2.41 of Volume 2, Chapter 11: Infrastructure and Other Users). In relation to activities along the Hornsea Three offshore cable corridor the Applicant identified that that there is the potential to coexist through ongoing consultation and promulgation of information, and that sufficient information exchange between parties and continued consultation will be in place to avoid conflicting interactions (see Paragraphs 11.11.1.70, 11.11.1.81, 11.11.2.54 and 11.11.2.64 of Volume 2, Chapter 11: Infrastructure and Other Users). The Applicant has recognised that it is of particular importance for oil and gas operators to be able to continue to access their pipelines and is progressing discussions with relevant oil and gas operators in regard to establishing pipeline crossing agreements with applicable parties (see Table 11.27 of Volume 2, Chapter 11: Infrastructure and Other Users). The Applicant has also recognised that it is of particular importance for oil and gas operators to be able to progress decommissioning plans in this area (see Paragraph 11.7.11.5 of Volume 2, Chapter 11: Infrastructure and Other Users) and has continued to consult and ensure sufficient information exchange with the relevant operators in this regard.

			Policy GOV3 specifies that *"Proposals should demonstrate in order of preference:* *a) that they will avoid displacement of other existing or authorised (but yet to be implemented) activities* *b) how, if there are adverse impacts resulting in displacement by the proposal, they will minimise them* *c) how, if the adverse impacts resulting in displacement by the proposal, cannot be minimised, they will be mitigated against or* *d) the case for proceeding with the proposal if it is not possible to minimise or mitigate the adverse impacts of displacement"* The Applicant referred to Policy GOV3 within Table 6.3 of Volume 2, Chapter 6: Commercial Fisheries, which noted that Hornsea Three, is, and will continue to, take steps to minimise the effects upon the fishing industry in the area through appropriate mitigation where required. Designed-in measures related to commercial fisheries include commitment to developing a Fisheries Coexistence and Liaison Plan. The Applicant has taken all due consideration in the siting of the Hornsea Three offshore cable corridor to avoid as far as possible the displacement of other existing or authorised but yet to be implemented activities. This has included consideration of recreational activities, the presence of existing cables and pipelines, oil and gas platforms, carbon capture and storage, disposal sites and aggregate extraction areas, commercial fishing and shipping lanes. The Applicant has identified within the Environmental Statement that Hornsea Three may displace commercial fishing activity, existing shipping traffic, helicopter flights, and recreational activities. Effects have been assessed as negligible to moderate adverse and are described, alongside measures for minimising and mitigating these effects, in Volume 2, Chapter 6 : Commercial Fisheries; Volume 2, Chapter 7: Shipping and Navigation (APP-067); Volume 2, Chapter 8: Aviation, Military and Communication (APP-068); and Volume 2, Chapter 11: Infrastructure and Other Users. Mitigation includes: advance warning and accurate location details of construction and maintenance activities and ongoing liaison with all fishing fleets (including regular Notices to Mariners) (see Table 6.18 of Volume 2, Chapter 6: Commercial Fisheries); lighting and marking, Aids to Navigation and promulgation of information and warnings via Notices to Mariners and other appropriate media (e.g. Admiralty Charts and fishermen's awareness charts) to enable vessels to effectively and safely navigate around Hornsea Three (see Table 7.14 of Volume 2, Chapter 7: Shipping and

			Navigation); appropriate aviation lighting to facilitate aeronautical safety and consultation with oil and gas operators and licensees (see Table 8.13 of Chapter 8: Aviation, Military and Communication); and promulgation of information via Notices to Mariners to ensure other marine users are aware of Hornsea Three operations (see Table 11.27 of Volume 2, Chapter 11: Infrastructure and Other Users). Hornsea Three will not displace any existing or authorised (but yet to be implemented) oil and gas activities. There are no platforms, active subsea structures, or completed, drilling or suspended wells located within the Hornsea Three array area or offshore cable corridor (see Paragraphs 11.7.11.2, 11.7.11.3, 11.7.12.1 and 11.7.13.2 of Volume 2, Chapter 11: Infrastructure and Other Users). In assessing effects on licensed blocks overlapping with the Hornsea Three array area or offshore cable corridor, the Applicant has taken into account whether the licence terms overlap with the construction and/or maintenance and/or decommissioning phases of Hornsea Three, whether the licence operator has the appropriate licences and consents needed to undertake a specific activity and whether there is sufficient information in the public domain regarding this activity (see Paragraph 11.9.2.7 of Volume 2, Chapter 11: Infrastructure and Other Users). The Applicant has not identified any other authorised (but yet to be implemented) activities within the Hornsea Three array area or offshore cable corridor (see Paragraphs 11.11.1.58 - 59, 11.11.1.69, 11.11.1.79, 11.11.2.26 - 27, 11.11.2.42, 11.11.2.53 and 11.11.2.62 of Volume 2, Chapter 11: Infrastructure and Other Users). **Policy OG1** specifies that *"Proposals within areas with existing oil and gas production should not be authorised except where compatibility with oil and gas production and infrastructure can be satisfactorily demonstrated".* The Applicant referred to Policy OG1 within Table 11.3 of Volume 2, Chapter 11: Infrastructure and Other Users, which noted that effects on oil and gas production are considered within Section 11.11 of Volume 2, Chapter 11: Infrastructure and Other Users and that consultation with oil and gas operators is presented in Table 11.4 of Volume 2, Chapter 11: Infrastructure and Other Users. Hornsea Three is coincident with licenced acreage however as noted above, there are no platforms, active subsea structures, or completed, drilling or suspended wells located within the Hornsea Three array area or offshore cable corridor (see Paragraphs 11.7.11.2 - 3, 11.7.12.1 and 11.7.13.2 of Volume 2, Chapter 11:

			Infrastructure and Other Users). The Applicant has not identified any other authorised (but yet to be implemented) activities within the Hornsea Three array area or offshore cable corridor (see Paragraphs 11.11.1.58 - 59, 11.11.1.69, 11.11.1.79, 11.11.2.26 - 27, 11.11.2.42, 11.11.2.53 and 11.11.2.62 of Volume 2, Chapter 11: Infrastructure and Other Users). The Applicant is progressing discussions with relevant oil and gas operators in regard to establishing pipeline crossing agreements with applicable parties (see Table 11.27 of Volume 2, Chapter 11: Infrastructure and Other Users). **Policy OG2** Proposals for new oil and gas activity should be supported over proposals for other development. As noted above, the Applicant has not identified any other authorised (but yet to be implemented) oil and gas activities within the Hornsea Three array area or offshore cable corridor (see Paragraphs 11.11.1.58, 11.11.1.59, 11.11.1.69, 11.11.1.79, 11.11.2.26, 11.11.2.27, 11.11.2.42, 11.11.2.53 and 11.11.2.62 of Volume 2, Chapter 11: Infrastructure and Other Users). There are specific provisions within the Hornsea Three Agreement for Lease (AfL) for terminating parts of the AfL required for certain oil and gas activities. In the event an oil or gas operator wishes to drill within the AfL areas they must obtain approval from the Secretary of State for those works. Each AfL provides that following a request from the Secretary of State in order to allow oil or gas works to proceed, the Commissioners (of The Crown Estate) are entitled to terminate the relevant part of the AfL area that is required for the relevant works (see Paragraphs 11.7.14.1 and 11.7.14.2 of Volume 2, Chapter 11: Infrastructure and Other Users of the Environmental Statement).

1.6 Written Question 2.6 Commercial fishing

PINS Ref. No.	Question is addressed to:	ExA Question	Response
Q2.6.1	**Applicant, National Federation of Fishermen's Organisations (NFFO)**	Your Statement of Common Ground [REP1-220] notes that the ES approach to cumulative effect assessment is under discussion. Please provide an update on those discussions.	The Applicant would direct the Ex.A to section 4.8 of the Statement of Common Ground (SoCG) with the NFFO and VisNed (REP1-220). This outlines that the Applicant and NFFO do not agree on the impact assessment methodology used, with the NFFO maintaining residual concerns as outlined in section 4.9 of the SoCG. While there are differences in opinion on the approach to the CEA, the measures outlined in the Fisheries Coexistence and Liaison Plan (REP1-154) are sufficient to address these concerns and demonstrates the Applicant's commitment to co-existence with commercial fisheries throughout the project lifetime. The SoCG will be updated to reflect this and will be submitted at Deadline 5.
Q2.6.2	**Applicant**	Please provide further information on the circumstances in which a 1000m safe passing distance would be required. What would be the frequency of these circumstances arising?	As outlined in the Issue Specific Hearing 1 (REP3-003), safe passing distances would apply to cable laying vessels with a Restricted Ability to Manoeuvre (RAM) and these vessels will be displaying the associated lights and markers to show this. This does not apply to safety zones around structures; safety zones will be maximum 500 m. Safe passing distances are recommended for all vessels, not solely commercial fishing vessels. These are targeted more at those vessel operators who may be less aware of safety issues related to vessels towing equipment, deep draft vessels etc. These are likely less relevant to commercial fishing vessels whose operators are aware of the need for safe passing distances for vessels with RAM. The 1,000 m safe passing distances was a maximum design scenario for safe passing distances in Volume2, Chapter 6, Commercial Fisheries of the Environmental Statement (APP-066). From the Applicant's experience in the southern North Sea and Irish Sea, the normal, standard safe passing distances are 500 m from a cable installation vessel. The 1,000 m safe passing distances is unlikely to be used, in all but exceptional circumstances. Such circumstances may include the instance of cable laying vessels towing significant lengths of equipment behind them when actively constructing or maintaining cables or for hazardous operations such as dealing with unexploded ordinance.

		How would the impacts on fishing of the need for safe passing distances around construction vessels be minimised?	Information on construction, maintenance and decommissioning activities which will require safe passing distances will be promulgated to commercial fisheries vessels principally via Notices to Mariners (NtMs) and informing the Kingfisher Information Service (see paragraph 2.1.1.3 of the outline Fisheries Co-existence and Liaison Plan (FCLP); REP1-154). Other means of communication will also be used including VHF broadcasts and lights and markers on RAM vessels. This will allow commercial fisheries operators to plan their activities in advance of mobilising to avoid the relevant areas temporarily affected by cable laying operations. It should be noted, however, that these areas are limited in extent, representing a roaming 3.1 km^2 area along the offshore cable corridor, and temporary in nature. As such, the significance of effect of cable installation activities (including implementation of safe passing distances of up to 1,000 m) on commercial fishing vessels was considered to be negligible to minor adverse significance, which was not significant in EIA terms (see paragraph 6.11.1.48 to 6.11.1.53 of Volume 2, Chapter 6: Commercial Fisheries of the Environmental Statement; APP-066) for all fleets, with the exception of the UK potting fleet. In this case, further mitigation has been proposed as outlined in Section 3.2 of the FCLP (REP1-154).
		How would that be secured in the dDCO?	Notifications (including NtMs and informing the Kingfisher Information Service) are secured within Schedule 11, Part 2, Condition 7(7 and 8) (generation assets DML) and Schedule 12, Part 2, Condition 8(7 and 8) (transmission assets DML) of the draft DCO. Details of communication and liaison with the fishing industry is also outlined in the outline FCLP (REP1-154) and Schedule 11, Part 2, Condition 13(4) (generation assets DML) and Schedule 12, Part 2, Condition 14(4) (transmission assets DML) of the draft DCO, specifies that a final FCLP will be submitted and approved by the MMO and this will be in accordance with the current outline FCLP.
Q2.6.3	**Applicant, NFFO**	Please provide an update on the way in which the mitigation of risks to fishing vessels from exposed cables would be secured in the dDCO.	As outlined in the Issue Specific Hearing 1 (REP3-003), the Applicant has agreed to update the outline FCLP (REP1-154) to specifically include communication of exposed cables to the fishing industry. As outlined in Schedule 11, Part 2, Condition 13(4) (generation assets DML) and Schedule 12, Part 2, Condition 14(4) (transmission assets DML) of the draft DCO, a final FCLP will be submitted and approved by the MMO and this will be in accordance with the current outline FCLP. The Applicant does not intend to have reporting of exposed cables secured separately within the dDCO as the securing of the FCLP within the dDCO is considered to be adequate.

1.7 Written Question 2.7 Landscape, seascape and visual impacts

PINS Ref. No.	Question is addressed to:	ExA Question	Response
Q2.7.1	Applicant	A) The Applicant's response to Q1.12.4 [REP1-122] states that noise mitigation measures for the HVDC converter/HVAC substation are likely to include acoustic enclosures. What would be the maximum height of any proposed acoustic enclosure?	The Applicant confirms that the maximum height of any proposed acoustic enclosures at the onshore HVDC converter/HVAC substation would be within with the maximum height of buildings defined in the Onshore Limits of Deviation Plan (APP-026 and updated for Deadline 4). Therefore, the maximum height for any proposed acoustic enclosures is 25 m should the HVDC transmission system be used, and 15 m should the HVAC transmission system be used.
		Please provide illustrative details of the materials, colour and appearance of the acoustic enclosures.	As set out in Chapter 8: Noise and Vibration of the Environmental Statement (Table 8.21), consideration of the need for, and thereafter the type of acoustic mitigation will be developed during the detailed design stage of the onshore HVDC converter/HVAC substation once a final design and layout have been determined. The type of mitigation is likely to include the use of acoustic enclosures, placing equipment inside buildings, or other potential measures to be agreed prior to the commencement of works. The mitigation will be designed such that a noise rating level not exceeding 34 dB LAr,Tr can be achieved at any surrounding residential noise sensitive receptor. Design principles for the buildings of the onshore HVDC converter/HVAC substation are set out in Appendix 5 of the submission at Deadline 4. With the exception of where functionality prevails, these principles also apply to acoustic enclosure. Furthermore, Requirement 7 of the draft DCO [APP-027] requires that details including the layout, scale, finished ground levels, external appearance, materials, access and circulation areas, and timetables for the landscaping works at the HVDC converter/HVAC substation will be submitted to the relevant planning authority for approval prior to commencement of construction.
		Based upon the maximum height of the acoustic enclosure, what would its implications be in terms of landscape, visual and heritage impacts?	The visual and heritage impacts of the proposed HVDC converter/HVAC substation have been assessed in Volume 3, Chapter 4: Landscape and Visual Resources [APP-076] and Chapter 5: Historic Environment of the Environmental Statement [APP-077]. The assessments are based on the maximum design scenario, which included the potential for acoustic enclosures up to the maximum heights sets out in the Applicant's response to (A). The assessments are supported by visualisations of the HVDC converter/HVAC substation provided in Volume 6, Annex 4.5: Photograph Panels, Wirelines and Photomontages [APP-146] and Annex 5.7: Historic Environment Visualisations [APP-155]. Mitigation in the form of

			landscape planting to supplement natural screening is proposed to reduce the potential for visual impacts to the surrounding area and setting impacts to surrounding heritage receptors (further details provided in the updated Outline Landscape Management Plan submitted at Deadline 4). Outside of the site boundaries, landscape and visual effects were assessed within APP-076 to be not significant once planting has matured. Impacts on heritage receptors were assessed to be moderate adverse at their greatest, which is significant in EIA terms. Notwithstanding this, the harm caused to the assets would be less than substantial based on the NPPF test (as there would be no physical harm to the designated asset) and thus this harm should be weighed against the public benefits of the proposal. This position is agreed with South Norfolk Council as set out in the Statement of Common Ground between both parties to be submitted at Deadline 4.
		Should a maximum height for the acoustic enclosure be included in the design parameters of the proposed development?	A maximum height for any installations at the onshore HVDC converter/HVAC substation is defined in the Onshore Limits of Deviation Plan (APP-026 and updated for Deadline 4). This is considered sufficient to secure the maximum height of all installation on the site, including any proposed acoustic enclosures.
Q2.7.2	Applicant	The vehicular access to the onshore HVDC converter/HVAC substation is shown in Annex A of [REP2-14]. It would appear to require the removal of a substantial section of existing hedgerow, a matter which has been raised by Mulbarton Parish Council in its Deadline 3 submission [REP3-086]. Given that the construction access would include provision for the frequent use of large HGVs, would the space to be taken up (including for visibility splays) for both the construction access and permanent access be the same, or would the safe access requirements differ between the construction and the permanent access requirements? Should the access requirements differ, what works (including landscaping works) would be required following the completion of the construction works?	During the construction phase, the access to the onshore HVDC converter/HVAC substation has been designed such that it provides sufficient access, and visibility, to large HGVs, as well as abnormal load vehicles (to allow for the delivery of transformers). The design of the construction access (allowing for access by abnormal loads) requires approximately 50 m of hedgerow removal and removal of a single tree. However, as set out in updated paragraph 4.1.1.3 of the Outline LMP submitted at Deadline 4 (new text shown in underline), *"all sections of hedgerow removed to enable construction of the onshore cable corridor (or construction accesses) will be replanted as soon as practicable after each phase of cable installation (or as a construction access is no longer required). Replacement planting will comprise native shallow-rooting hedgerow species typical of the area, planted as 40 – 60 cm high whips, protected with spiral rabbit guards or other forms of protection from grazing."* As such the loss of the hedgerows will be temporary, with reinstatement following the construction, regardless of whether this is delivered in a single or two phases. During the operational phase, a permanent gap would be required at the site entrance on the B1113, but its width would be the minimum required for safe access and egress to the site by maintenance vehicles in order to maximise screening of the onshore HVDC converter/HVAC substation. Approximately 12 m of hedgerow would be permanently lost as a result of the permanent site entrance. Hedgerow maintenance and trimming would also be required to maintain visibility during the construction and operational phase.

Q2.7.3	Applicant, SNC and NNDC	The design parameters of the onshore HVDC converter/HVAC substation set out in table 3.63 of the ES [APP-058] include a proposed maximum height of 25m. The maximum height of the onshore booster station set out in table 3.62 of the ES [APP-058] would be 12.5m. From the information provided by the Applicant, what confidence can the ExA have that the proposed woodland planting would reach a height where it would achieve the levels of mitigation required in relation to both landscape/visual impacts and the impacts upon the setting of heritage assets? Based on the minimum size of trees to be planted (set out in Appendix A of the first iteration of the Outline Landscape Management Plan [APP -181] for the HVDC converter/HVAC substation), the Applicant is requested to provide evidence of the expected rate of growth that would be achieved throughout the anticipated lifetime of the development for the woodland planting areas.	The sites for the onshore HVAC booster station and HVDC converter/HVAC substation lie on productive farmland currently or previously used for arable crops, within areas containing established woodland, tree, hedge and scrub. Without any human management the land proposed for planting would naturally revert to woodland by natural succession over time, and is ideally suited to the woodland planting proposed. Soil survey data presented in Volume 6, Annex 6.2 – Soil Survey Data [APP-157], derived from boreholes at locations illustrated in Volume 6, Annex 6.3 – Land Classification and Farm Holdings Figures [APP-158] show that the soils are as follows. <u>HVAC booster station</u> Soils are Agricultural Land Classification Grade 2 (west) and Grade 3a (east) as shown on Figure 1.2 Sheet 3 of APP-158. Tables 1.6 and 1.7 of Volume 6, Annex 6.2 – Soil Survey Data [APP-157] show that soils at boreholes close to the areas proposed for planting (boreholes 205, 222 and 223) are medium sandy loam between approximately 37 and 45 cm depth over loamy medium sand. <u>HVDC converter/HVAC substation</u> Soils are Agricultural Land Classification Grade 2 (northeast) and Grade 3a (west and south) as shown on Figure 1.2 Sheet 10 of APP-158. Table 1.17 of Volume 6, Annex 6.2 – Soil Survey Data [APP-157] shows that soils at boreholes close to the areas proposed for planting (boreholes 603, 606 and 617) are sandy clay loam and medium clay loam between approximately 35 and 40 cm depth over chalky medium clay loam or clay. Soils of these types, profiles and depths, that have been cultivated for arable production and have a history of productive plant growth, are suitable for the woodland planting proposed. Suitability is also indicated by the presence of existing trees, hedgerows and woodland growing in the vicinity of both sites, similar to the planting proposed. Establishment will be ensured by management measures set out in Section 5 of the Outline Landscape Management Plan (OLMP) [submitted for Deadline 4]. The measures to ensure successful establishment and growth include: 1. Inspection and if necessary, repair of rabbits, deer or livestock protection fencing, which will be provided as specified on drawings 6117_500 (note 5) and 6117_510 (note 4). 2. Maintaining the ground around each plant weed free for the first five years to minimise competition allowing plants to grow unimpeded.

			3. Replacing plants that die annually for the first five years, or when it is agreed that the woodland has established effectively and individual plant replacement is unnecessary. After five years plants are expected to have established and no longer require weed control. It is expected that growth rates set out in the Institute of Environmental Assessment and Management (IEMA) EIA Quality Mark Article 'Predicting the growth of tree and hedge planting when determining the effectiveness of mitigation' attached at Appendix 40 to the submission at Deadline 4 will be achieved. IEMA's web site states that the EIA Quality Mark scheme is committed to delivering high quality assessments and reports and to improve practice, and that the library of articles act to: • Set out advice on core stages in the EIA process; • Explore long standing challenges that need to be debated to be advanced; • Discuss new issues faced by practitioners; and • Set out concerns on difficulties that hold back effective EIA. The sites of the onshore HVAC booster station and HVDC converter/HVAC substation are not in exposed locations and growth rates given in the last paragraph of the article in Appendix 40 of Deadline 4 are expected to be achieved: an average annual growth of 30 cm/year for the first 5 years followed by 50 cm per year for following years. This would result in growth of 6.5 m over the first 15 years following planting. Plant schedules for woodland planting on drawings 6117_500 (HVAC booster station) and 6117_510 (HVDC converter/HVAC substation) show that the illustrative proposals are for the majority of woodland plants (Woodland Mix) to be planted as 40-60 cm high whips, with approximately 16% planted as 145-175 cm high feathers. Based on the above plant heights at planting (year 1) and the average annual growth rates set out in IEMA's EIA Quality Mark Article, 40 cm high plants can be expected to reach 6.9 m height, and 150 cm high feathers 8 m height, by year 15. Tables 2.2 and 3.2 in Volume 6, Annex 4.5 – Photograph Panels, Wirelines and Photomontages [APP-146] states that mitigation planting has been modelled into the photomontages at 4.9 m high at year 15, based on of the smallest proposed starting height of 40 cm and a conservative annual average growth rate of 30 cm per year. This is the height of planting at year 15 shown in Volume 6, Annex 4.5 – Photograph Panels, Wirelines and Photomontages [APP-146] and also in Volume 6, Annex 5.7 – Historic Environment

			Visualisations [APP-155]. It is also the height of mitigation planting that the assessment of effects in Volume 3, Chapter 4 - Landscape and Visual Resources [APP-076] and Volume 3, Chapter 5 – Historic Environment [APP- 077] are based on. 30 cm growth per year was used to ensure that the assessments used conservative tree heights which could potentially occur if, for example, weather conditions are inclement for plant growth, particularly during early years while plants are becoming established. In reality, it is likely that higher growth rates and greater mitigation will be achieved. The Applicant considers that proposed planting will achieve the levels of mitigation required in relation to both landscape/visual impacts and the impacts upon the setting of heritage assets, and that it is likely to achieve a greater level of mitigation than assessed in the Environmental Statement.
Q2.7.4	Applicant	The Outline Landscape Management Plan (Rev 1) [REP1-145] does not include the listed Appendix A Drawings (page 10). Please ensure these are included within the next iteration of the plan.	This was an error in the Deadline 1 submission. Appendix A Drawings have been included in the updated version of the Outline LMP at Appendix 4 submitted at Deadline 4.
Q2.7.5	Applicant	At ISH4 NNDC, SNC and NE set out several concerns regarding detailed landscaping matters including the maintenance of landscaping and hedgerow removal/replanting. Please provide an update on the various landscaping matters referred to at ISH4.	At ISH4 the following matters were raised, and are addressed in turn below: • Impacts on the AONB; • Impacts of a phased construction on landscaping; • Timings of the landscaping implementation; • Appropriate maintenance period for landscape planting; and • Landscaping protection measures to be applied as part of the main construction compound access strategy. <u>Impacts on the AONB</u> At ISH4 Natural England (NE) stated that they had reviewed the Applicant's Appendix 23 to Deadline 1 submission – Impacts on the Qualities of Natural Beauty of the Norfolk Coast AONB [REP1-167] but that they still had concerns and that they would put these in writing for Deadline 3. The Applicant has reviewed NE's submission for Deadline 3 [REP3-079] and a full response is provided to this representation by the Applicant at Deadline 4. In summary, these comprise the following issues in relation to the onshore cable corridor: 1. NE consider effects in the AONB will be significant, due to hedgerow removal and replacement. The Applicant disagrees and stands by its assessment in Volume 4, Chapter 4 – Landscape and Visual Resources of the Environmental Statement that effects will not be significant [APP-076 paragraph 4.7.5.2].

			2. If Hornsea Three is constructed in two phases, NE is concerned that hedgerows will be removed and reinstated twice, once at each phase, and the duration and significance of effects that would result. 3. NE is seeking imaginative landscape enhancement to provide a long term net environmental gain for the AONB for effects due to construction and has cited two other projects where financial contributions to potential projects were considered. 4. The Applicant considers that all reasonable efforts are being made to minimise the extent of vegetation removal, and the extend of reinstated vegetation that needs to be removed and replaced a second time at phase 2, and that a relatively small amount of hedges and trees will need to be removed. 5. The Applicant considers that the proposed planting measures will provide long term net environmental gain in relation to hedgerows by replacing species poor or defunct hedges with species rich mixes, and by potential hedgerow enhancement within the 100m wide corridor outside the 80m wide working corridor as noted in the Applicant's Appendix 23 to Deadline 1 submission [REP1-167]. 6. The Applicant considers that further mitigation and enhancement to that proposed is unnecessary. <u>Impacts of a phased construction on landscaping</u> The Applicant refers to paragraph 3.1.2.4 and 3.1.3.5 of the Outline LMP (submitted at Deadline 4) which set out the proposals for the implementation and phasing of landscape planting under a two-phase construction scenario. Additional text has also been provided under paragraph 4.1.1.4 of the same document to set out that, should Hornsea Three be delivered in two phases, the contractor would seek to minimise the area which would be disturbed twice, once during the construction of each phase. In practice, only the area which is required to construct both phases (e.g. the haul road) would be disturbed during the construction of both phases. Thus, the majority of hedgerows across the onshore cable corridor would only be removed and replaced once regardless of whether Hornsea Three is delivered in one or two phases. <u>Timings of the landscaping implementation</u> The Applicant would refer to the response to ExA's first written questions (REP1-122), Q1.7.10, which confirms that the Applicant has committed to implementing sections of the mitigation planting at the commencement of works at the onshore HVAC booster station and onshore HVDC converter/HVAC substation, which could be up to two years or three years (respectively) ahead of the planned completion of construction works, in order to maximise the screening provided during construction and in the early years of operation. This

			commitment is included in paragraphs 3.1.2.3 and 3.1.3.4 of the Outline CoCP (Appendix 2 submitted at Deadline 4) and thus will be secured in the dDCO through Requirement 17 (Version 2, submitted at Deadline 4). <u>Appropriate maintenance period for landscape planting</u> The Applicant considers it appropriate to manage any new or replacement hedgerows planted for a period of 5 years beginning at the point of planting. Based on the species and age of the woody species selected (as noted in the outline LMP), this would give time for a hedge to establish to a height of approximately 2m (accounting for 40-60cm high whips planted and 30cm average growth per year for the first 5 years, according to an EIA quality mark article from the Institute of Environmental Management and Assessment) which would provide full landscape mitigation. As the species-rich mix of plants would be established at this point, this would also be full ecological mitigation. After 5 years, for all locations where hedges may be removed as part of Hornsea Three construction works, failure is very unlikely and the hedges will be restored back to an improved baseline status (species rich and gap filled). Any ongoing maintenance would be comparable to that existing prior to construction and therefore does not need to be secured through the DCO. This is in line with the arrangements in place for restored agricultural land – the responsibility passes back to the landowner. In addition, the below DCO developments are in Norfolk and have a 5 year landscaping maintenance period: • The Norfolk County Council (Norwich Northern Distributor Road) (A1067 to A47(T))) Order 2015; • The National Grid (King's Lynn B Power Station Connection) Order 2013 (Requirement 5(3)); and • Dudgeon offshore wind farm onshore substation and cable application under the Town and Country Planning Act 1990 (Condition 6(iv) of appeal decision). The Applicant is continuing to engage with the relevant stakeholders in respect to this matter, with the current status of discussions reflected in relevant Statements of Common Ground (as appropriate). Growth rate for the proposed planting is discussed in the Applicant's response to the ExA's second written questions submitted at Deadline 4, Q2.7.3. <u>Landscaping protection measures to be applied as part of the main construction compound access strategy</u> The Applicant would refer to the Outline Ecological Management Plan which has been updated for Deadline 4 which sets out the measures to be applied along The Street as a

			result of Option 1: Passing Places. These measures will be reflected or cross-referenced within the Outline CTMP as part of the main construction access strategy to be included at a later Deadline.

1.8 Written Question 2.8 Historic environment

PINS Ref. No.	Question is addressed to:	ExA Question	Response
Q2.8.1	**Applicant**	The Written Representation submitted by Historic England (Hist E) at Deadline 1 [REP1-107] includes comments on the offshore Outline Written Scheme of Investigation [APP-115]. Please provide an update on your discussions with Hist E and submit an updated offshore Outline Written Scheme of Investigation.	The Applicant and Historic England (Hist E) met on the 12 December, 2018. The Outline WSI was discussed and it was agreed between the parties that an update to the Outline WSI is not required. Hist E stated preference for the Applicant to incorporate Hist E comments on the Outline WSI provided at Deadline 1 (REP1- 107) into a final WSI for approval by MMO and Hist E post consent, nearer to the time of construction. The Applicant will continue to consult with Hist E through examination and post consent to ensure the WSI is submitted for approval within the timeframes required by Hist E. Following the meeting a Statement of Common Ground was provided to Hist E for review with an aim for submission by Deadline 6.
Q2.8.2	**Applicant**	In response to Hist E's Written Representation [REP1-107] the Applicant stated in [REP2-004] that an onshore Outline Written Scheme of Investigation will be submitted at Deadline 3. However, this document has not yet been provided. Please provide the onshore Outline Written Scheme of Investigation.	A draft outline onshore WSI has been prepared by the Applicant and provided to Norfolk County Council and Hist E for comment. The Applicant intends to submit that document once it has been agreed with those parties. Hopefully that will be achieved by Deadline 6, if not before.

Q2.8.3	**Applicant**	At ISH4 the Applicant explained that the design parameters for the HVDC converter/HVAC substation had been based on technical requirements taking into account land take and topography. Please provide further technical evidence to justify the maximum proposed design parameters for the HVDC converter/HVAC substation, including but not limited to the maximum height of 25m.	Detailed design of Hornsea Three has not yet been undertaken and as such there are a variety of technical details which remain uncertain, for example the use of HVDC or HVAC, each of which will determine the size, layout and shape of the onshore HVDC converter/HVAC substation (although all scenarios would remain within the parameters as set out in the Onshore Limits of Deviation [APP-026]). As a result of this uncertainty, the design of the onshore HVDC converter/HVAC substation has been designed to facilitate a variety of voltage levels, different electrical configurations (monopoly or bipol), different suppliers and different technologies (HVAC and HVDC). In respect to HVAC and HVDC technologies, one of the main physical differences in the equipment is that the HVAC components housed within buildings are normally compact, gas insulated switchgear (GIS). In the case of HVDC, gas insulated systems are not available, therefore the main, indoor HV components (specifically the power electronics valves responsible for conversion from HVDC to HVAC power) must be air insulated. This necessitates large air clearances between the valve stacks and building structure creating the need for large 'valve halls' which typically drive the largest dimensions of the buildings. These clearances, as well as the height of the valve stacks themselves, are dependent upon the voltage of the HVDC system, with higher system voltages resulting in taller valve stacks and larger internal air clearances. The Applicant has allowed for a maximum design scenario of 600kV HVDC voltage which represents the highest HVDC submarine cable voltage currently available worldwide. As the final design of the system (and voltage level) is yet to be determined, the Applicant has allowed for a building height of up to 25 m in height for the HVDC transmission scenario.
		How have the maximum design parameters (including both size and positioning) evolved in order to minimise the impacts upon the setting of heritage assets along with landscape and visual impacts?	B) As set out in the Application (Volume 1, Chapter 4 - Site Selection and Consideration of Alternatives [APP-059] and Annex 4.3 – Refinement of the Onshore Cable Corridor and Associated Infrastructure (Stages 5-7 Scoping to PEIR)) [APP-094]) the Applicant has located the onshore HVDC converter/HVAC substation in a location which meets required technical criteria, whilst is also sensitive to the surrounding context by meeting certain guiding principles (as set out in paragraph 4.10.7.11 and 4.10.7.15 of APP-059). In this regard, two options previously considered for the onshore HVDC converter/HVAC substation were not taken forward for reasons which included impacts on heritage assets. Both Option C and Option D identified in Figure 3.7 of APP-074 would have located the onshore HVDC converter/HVAC substation closer to designated assets (Gowthorpe Manor and Mangreen Hall/Dunston Hall respectively).

			Option B, which is the site proposed within the Application for the onshore HVDC converter/HVAC substation was considered to benefit from a greater opportunity to utilise and reinforce existing vegetation such as screening in order to minimise potential impacts on heritage assets as well as landscape and visual receptors. The size and orientation of the site was further optimised following PEIR to minimise impacts on the receiving environment including heritage assets. As set out in paragraph 3.2.1.2 of Annex 4.4 – Post PEIR Changes to Hornsea Project Three (Stages 8-9) [APP-095], the permanent footprint of the onshore HVDC converter/HVAC substation site and associated construction compound were rationalised and substantially reduced, from the larger search areas identified at PEIR. Additionally, following detailed electrical substation design, although the footprint of the HVDC converter/HVAC substation itself slightly increased, this was undertaken to provide increased landscaping and rationalise the volume of ground works that would be required. Landscape mitigation around the site has sought to minimise impacts on heritage assets, including Keswick Hall, Mangreen Hall and Gowthorpe Manor, as well as landscape and visual receptors. As the substation site is still subject to detailed design (and appropriate requirements added into the Draft DCO) limits of deviation have been established alongside areas set aside for landscaping solutions to assist in mitigating the visual impact of the structures. These are set out in the Onshore Limits of Deviation Plan [APP-026 and updated for Deadline 4].
Q2.8.4	**Applicant**	At ISH4 the Applicant agreed to submit further information regarding the design intentions for the HVDC converter/HVAC substation. Please submit this information.	The Applicant has provided Design Objectives and Principles for the onshore HVDC converter/HVAC substation and the onshore HVAC booster station at Appendix 5 of the submission at Deadline 4. This sets out the objectives and principles which will be applied when developing the detailed design for the aesthetics of the buildings of the onshore HVDC converter/HVAC substation and onshore HVAC booster station. The Applicant notes that should the Development Consent Order (DCO) be consented, Requirement 7 'Detailed Design approval onshore' of the Draft DCO (submitted for Deadline 4) requires that work must not commence until details of the layout, scale and external appearance of the work, which must be substantially in accordance with the Design Objectives and Principles, have been submitted to and approved by the relevant local authority.

1.9 Written Question 2.9 Land use and recreation

PINS Ref. No.	Question is addressed to:	ExA Question	Response
Q2.9.1	Applicant	Written Representations from the National Farmers Union and the Hornsea Three Agents [for example REP1-066, REP3-104 & REP3-105] include concerns regarding the potential impacts of link boxes on agricultural operations. Please provide typical illustrative layouts of link boxes for both HVAC and HVDC technology. Would link boxes always be grouped together? Under a phased scenario would link boxes for phase two be sited alongside link boxes for phase one?	Link box layouts and locations will be determined by the specifications of the cables used, which will only be known when a cable contractor is appointed and the detailed design of the cable specifications, including length of cables per cable drum are known. More detailed cable design is wholly reliant on refined understanding of the scale of the generation assets being connected in that phase and the capacity of cables required, transmission technology to be deployed and appointed contractors cable design. Once detailed design for Hornsea Project Three has commenced it may be possible to site link boxes in areas which reduce interference with farming operations, noting that the cable corridor has already been defined to follow field boundaries etc. where possible in order to minimise any impacts to landowners' use of their land. However, given the number of technological and environmental constraints it is not possible to confirm the joint bay (and thus link box) locations ahead of the detailed design process. It is possible that there could be no correlation between the location of the link boxes between Phase 1 and Phase 2. Whilst it is anticipated that if the project is delivered over two phases and both phases would deploy similar cable specification / roll lengths etc and therefore joint bays and link boxes deployed over the two phases could be similar, at this early design development stage, it must be assumed for consideration of the "worst case" that each phase may need to rely upon different cable specifications as each phase will look to provide an optimised solution.

		Taking account of the potential impact upon farm machinery, what is the maximum area of agricultural land that would be taken out of operation by link boxes for: - each set of link boxes; and - the cable route as a whole?	The Applicant has assessed the maximum design scenario that all the link boxes would be located on agricultural land and that each link box would occupy an area of 9m^2. The Applicant would direct the Examining Authority to paragraph 6.11.1.4 of Volume 3, Chapter 6: Land Use and Recreation (APP-078), which identifies that approximately 0.4 hectares of land would be required for the link boxes along the length of the onshore cable corridor. This area was included in the total area of permanent agricultural land take required for Hornsea Three (as assessed in Volume 3, Chapter 6: Land Use and Recreation (APP-078). Notwithstanding the above, as noted in the Applicant's comments to Relevant Representations (Annex 12 – Full Response to National Farmers Union, RR-146) [REP1-131], land above link boxes will be reinstated following the completion of construction works, although they may require manhole covers (see paragraph 3.7.3.14 of Volume 1, Chapter 3: Project Description of the Environmental Statement [APP-058]). Manhole covers are required to provide access at all link boxes for the purpose of cable integrity testing during the operations and maintenance phase of Hornsea Three except where it is only the fibreoptic cables which are jointed, as these do not require regular operations and maintenance access.
		In what ways could the layout and design of link boxes be optimised to minimise the impact upon agricultural operations?	Once detailed design for Hornsea Project Three has commenced it may be possible to design and locate link boxes in areas which reduce interference with farming operations, noting that the cable corridor has been defined to follow field boundaries etc. where possible in order to minimise any impacts to landowners' use of their land. However, given the number of technological and environmental constraints there is no way to confirm the joint bay (and thus link box) locations at this stage. Link box covers/manholes (where required) will be installed at up to 200mm below surface level in order to minimise the potential impact on farming machinery. Compensation for link boxes has been agreed in voluntary agreements with landowners and if voluntary agreements are not in place then it would be covered under compulsory compensation provisions.
		What are the implications of phasing for the location and layout of link boxes?	The Applicant would refer to the response under part A.

		Please provide further detail in the Outline Code of Construction Practice on the layout and design of link boxes with a view to mitigating the impact upon agricultural operations.	As noted in the Applicant's comments to Relevant Representations (Annex 12 – Full Response to National Farmers Union, RR-146) [REP1-131], the Applicant has made amendments to the Outline CoCP to mitigate potential impact on agricultural operations as a result of link boxes. The Applicant has committed to placing marker posts on each corner of the surface feature, if requested by the landowner to do so as part of the voluntary Option and Lease agreement. This is captured in updated paragraph 6.8.1.3 in the Outline CoCP (updated version submitted at Deadline 4) as follows (new text shown in underline): 6.8.1.3 *"Appropriate fencing of the construction corridor will be provided per the nature of the individual farm holding affected. <u>Where requested to do so by the landowner, markers posts will be placed on the corner of manhole covers associated with link boxes to clearly demarcate their location</u>."* Given the constraints referenced in part A of the Applicant's response, it is not possible at this stage to provide any additional detail on the locations of the joint bay (and thus link box) locations at this stage.
		What provision would there be for consultation with landowners on the location and layout of link boxes?	The Applicant would refer to the response to Q2.1.7, part C, which sets out text updates to be made to the Outline CoCP Communication Plan Framework.

Q2.9.2	Applicant and National Farmers Union (NFU)	At ISH4 both the Applicant and the NFU provided updates on impacts upon agricultural operations. It is understood that discussions are continuing. Please provide an update on these discussions, including details of any matters where further measures may be added to the Outline Code of Construction Practice and any issues where there remains disagreement.	The Applicant has reviewed the representations submitted by NFU at Deadline 3, in particular the final Construction Environmental Management Plan associated with the Richborough Connection (REP3-108) and Outline Soil Management Plan associated with Triton Knoll (REP3-107). Many of the provisions within these documents reflect those captured in the Outline Soil Management Strategy which has been submitted by the Applicant as Appendix G of the updated Outline CoCP submitted at Deadline 4. In particular • The location of soil heaps away from surface watercourses; • Confirmation that the soil surveys would be undertaken by a competent person; and • Monitoring during the aftercare period. The Applicant's discussions with the NFU as part of the Land Interest Group, remain ongoing, with key points of disagreement comprising: • Some compensation provision (which are not a part of the consideration of PINS) • Provisions relating to working on and reinstating the cable route in specified sections Discussions continue to be held on a regular basis and it is anticipated that solutions will be agreed on these matters.

Q2.9.3	Applicant, NCC and NNDC	The Statement of Common Ground between the Applicant and NCC [REP1-232] states that discussions are continuing regarding management measures relating to the Norfolk Coast Path. Please provide an update on the discussions between the two parties in relation to the Norfolk Coast Path, including any matter of disagreement which remains outstanding.	Norfolk County Council have confirmed within the Statement of Common Ground submitted at Deadline 4 that the proposals for the Norfolk Coast Path are considered acceptable in planning terms and that site-specific management issues relating to the temporary diversion of the Norfolk Coast Path can be resolved through the Requirements included in the DCO. In particular, this relates to the detailed measures to be implemented to manage the interface between users of the Norfolk Coast Path and the construction workforce pursuant to Requirement 17. As set out in the Statement of Common Ground between both parties submitted at Deadline 4, it has been agreed that feedback from NCC and NNDC will, in due course, inform the detailed design of the proposed diversion, including management measures, to be provided as part of the PRoW Management Plan to be developed post-consent as part of the final Code of Construction Practice. As such, the matters relating to the Norfolk Coast Path are now considered agreed between both parties (NCC and the Applicant). In respect to discussions with NNDC, discussions regarding the Norfolk Coast Path are ongoing, although the Applicant is confident that a position similar to that described for NCC above can be reached (without prejudicing NNDC's preference for the use of HDD technology at landfall, see RR-133).
		The Applicant is requested to submit an up to date outline framework of measures that would be included within the Public Rights of Way (PRoW) Management Plan required by paragraph 6.8.1.22 of the Outline Code of Construction Practice [REP1-142].	The Applicant has provided an outline framework of measures that would be included within the PRoW Management Plan in Appendix 48 to the ExA's Second Written Questions at Deadline 4.
		Paragraph 6.8.1.22 of the Outline Code of Construction Practice [REP1-142] states that the PRoW Management Plan would be submitted for the approval of both NNDC and NCC. Do the respective Council's agree that both parties should be responsible for its approval?	The Applicant has included both parties as approval bodies for the Public Right of Way Management Plan in response to consultation with both parties, as set out in the Applicant's Responses to the ExA's First Written Questions (Q1.9.3) at Deadline 1 (REP1-122).

1.10 Written Question 2.10 Socio-economic

PINS Ref. No.	Question is addressed to:	ExA Question	Response
Q2.10.1	**Applicant**	Requirement 22 of the dDCO requires the submission of a Skills and Employment Plan. Please provide an Outline Skills and Employment Plan setting out a framework of the types of measures that would be expected to be included in the more detailed plan that would be submitted for approval post consent. Would it be appropriate to include measures such as employment and business opportunities, access to training, apprenticeships, internships, skills initiatives, liaison with local enterprise partnerships and local business groups?	The Applicant has prepared an Outline Skills and Employment Plan "The Outline Plan" Appendix 43 to the Applicant's Deadline 4 submission. The Outline Plan proposes a three-staged approach: I. Communicate demands; II. Identify needs and intervention; and III. Promote opportunities. Given the current uncertainty about the scale and timings of the local economic opportunities likely to arise from Hornsea Three, direct actions to be undertake by the Applicant cannot be specified at this stage. However, as the local economic opportunities associated with Hornsea Three become clearer, the Applicant will: • Ensure that it communicates effectively with the relevant stakeholders, including the local authorities and public-sector agencies, as well as business groups; • Work with the New Anglia and Humber LEPs and other local stakeholders to assess whether there is a case for targeted actions; and • Seek to identify other opportunities to help maximise the potential for local economic benefits. In the Humber region, Ørsted has prepared and is in the process of implementing the Employment and Skills Plan for Hornsea Projects One and Two.
Q2.10.2	**Applicant**	The Applicant's response to question Q1.10.2 refers to socio economic benefits arising from other OWF projects. Please provide a copy of the Orsted Socio Economic Study Report (2015) referred to in this response. What evidence can be provided of socio economic benefits arising from comparable OWF projects, including local and regional benefits relating to employment, training and skills?	The Applicant has provided a copy of the "Impact of DONG Energy Investments in the Humber Area" (Regeneris, November 2015) as Appendix 41 to the Applicant's Deadline 4 submission. A similar study was also carried out exploring the economic impact of Ørsted's (formerly DONG Energy) investments in the East Irish Sea (Regeneris, June 2016), and is included as Appendix 42 to the Applicant's Deadline 4 submission. This study showed that over the period 2005-2019, Ørsted's sustained

			pipeline of offshore wind farms in the region represents a £5.4 billion investment, estimated to generate £2.7 billion Gross Value Added across the UK by 2025. Ørsted's projects have created long-term, highly skilled jobs in coastal regions. Ørsted has invested in state-of-the-art Operation & Maintenance (O&M) facilities in the areas where it operates. For example, at the Royal Docks in Grimsby, Ørsted appointed local construction firm Hobson & Porter as the principle contractor for its operations centre – the "East Coast Hub". The East Coast Hub will be the UK's largest O&M facility and will be the base for hundreds of workers constructing and operating Ørsted's wind farms in the area. To maximise local benefits, Ørsted has prepared and is in the process of implementing several Skills and Employment Plans. These plans promote pro-active and regular sharing of knowledge regarding local employment opportunity during both the construction and O&M phases. Ørsted also commits to engaging with the local authorities and relevant LEP in employment and skills related activities. At present, over 80% of employees based at the East Coast Hub live in the region, of which 44% are based in Grimsby. Ørsted's offshore wind farm projects have also enabled Ørsted to contract and support several new and existing suppliers to build capacity in the UK, delivering wider economic benefits. For example, Ørsted was instrumental in working with Siemens Gamesa Renewable Energy (SGRE) to bring forward the SGRE blade facility in Hull, which created over 1,000 jobs in the area. In recognition of the importance of skills and training, Ørsted is investing in skills and training across its projects to meet the future skills requirements. For example, Ørsted is: • Working with local training and education providers, who have invested significantly over the past few years in state-of-the-art training facilities. For example, in 2017 Ørsted partnered with the Grimsby Institute to deliver a three-year Wind Turbine Apprenticeship Scheme. Following a successful first year, Ørsted has expanded the scheme to include Furness College in Barrow, and in September 2018, welcomed a further two apprentices in Grimsby and four new apprentices in Barrow. • Partnering with educational charities such as Teach First and Achievement for All, which aim to address educational inequality.

			• Committing support and time to local University Technical Colleges (UTCs) and collaborating with universities, including supporting students through Bachelor and Masters student projects. • Ring-fencing funds from its Walney Extension and East Coast Community Benefit Funds (CBFs) to support skills initiatives (with a focus on Science, Technology, Engineering and Maths (STEM)) such as hardship funds, Engineering Courses and Education Funds. See the Applicant's response to Q.1.10.3 at Deadline 1. • One of the leading industry partners in Aura – a collaborative innovation and skills initiative led by the University of Hull. The size and location of Hornsea Three make it integral to these plans and will enable Ørsted to further develop and expand its skills offering.
Q2.10.4	**Applicant**	At ISH4 the Applicant referred to research that has been undertaken on the impacts of offshore and onshore projects on tourism economies. Please provide evidence which supports the Applicant's conclusions in the ES [APP-082] on the impact upon visitor volumes and activity during the construction process?	The available published research examining the relationship between onshore and offshore wind farms (and associated infrastructure) and the visitor economy is varied in terms of its focus, methods and conclusions. Studies which examine these issues, as well as providing comprehensive reviews of the literature, include: • The Tourism Impact of Wind Farms, Submitted to Scottish Government's Renewables Inquiry. Professor Cara Aitchison, University of Edinburgh (2012) [Appendix 36 to the Applicant's Deadline 4 submission]. • The Economic Impact of Wind Farms on Scottish Tourism. Glasgow Caledonian University (2008). [Appendix 37 to the Applicant's Deadline 4 submission] • Study into the Potential Economic Impact of Wind Farms and Associated Grid Infrastructure on the Welsh Tourism Sector. Regeneris Consulting and the Tourism Company, for Welsh Government (2014). [Appendix 38 to the Applicant's Deadline 4 submission]] • A Study into the Effect of National Grid Major Infrastructure Projects on Socio-economic Factors: Business and Recreational User Surveys Report. ERM for National Grid (2014). [Appendix 39 to the Applicant's Deadline 4 submission] There are a number of points to note about the literature. The focus of the research has tended to be on the wind turbines, rather than the onshore transmission and grid infrastructure unless developments are using pylons in areas which are sensitive due

			to landscape designations or tourism activity. This is due to the concerns of stakeholders typically being around the visual impacts of the turbines, with less concern about the transmission infrastructure, unless it relies on pylons. The notable exception to this is the ERM /National Grid study noted above. The research typically finds that a large majority of visitors and tourism related businesses in the local areas affected by potential development do not expect any impact. The ERM / National Grid's empirical study states "A clear finding is that the majority of recreational users on ex-post and ex-ante projects perceive that the project will have 'no impact' on their personal behaviour and spend" (page 53). Likewise, the proportions of visitors reporting that they were more or less likely to visit as a consequence of a wind farm development are typically small. The proportion expecting negative impacts, in terms of the visitor economy or their own behaviour, is usually marginally greater than those expecting positive impacts, but this latter proportion typically falls between the pre and post construction periods. The research points relating to visitor and tourism related businesses usually recognise the potential for positive impacts associated with extra expenditure in the sector and local economy arising from the construction activity, or in some instances the additional interest in seeing the development. Therefore, the available research typically focuses on ex-ante perceptions of impacts on the visitor economy, with research being undertaken with a mix of visitors, tourism businesses, local residents and other stakeholders. However, there are few ex-post empirical studies identifying negative impacts on local visitor economies post completion. The Glasgow Caledonian University study suggests that even where there have been negative effects, these often occur in the form of displaced tourism with visitors diverting to neighbouring areas. Aitchison's assessment for the Scottish Government's Renewables Inquiry (2012) concludes "In conclusion, the findings from both primary and secondary research relating to the actual and potential tourism impact of wind farms indicate that there will be neither an overall decline in the number of tourists visiting an area nor any overall financial loss in tourism-related earnings as a result of a wind farm development." Nevertheless, the Regeneris/Welsh Government study notes the importance of assessing potential impacts on the visitor economy on the basis of three inter-related

			factors: the characteristics of the development and related infrastructure, the characteristics of the tourism area and the characteristics of tourists (see page 53). Consequently, the assessment of the visitor and visitor economy receptors in Chapter 10 Socio-economics of the Environmental Statement has considered these factors. However, it is worth bearing in mind, in the context of these three factors that the proposed onshore infrastructure for Hornsea Three does not include pylons and the route and location of substations has been selected to avoid sensitive tourism locations and resources.

1.11 Written Question 2.11 Transport and highway safety

PINS Ref. No.	Question is addressed to:	ExA Question	Response
Q2.11.1	**Applicant**	Section 7.7.9 of the ES [APP-079] provides personal injury accident data for the study area. However, this does not appear to include details of accident data for the junction of the B1149 with Oulton Street. Please provide comparable personal injury accident data for this junction along with a commentary of its implications in relation to the proposed main construction compound at Oulton Street.	The Applicant would refer the ExA to Appendix 1 to the Deadline 3 submission (REP3-010), in particular Annex A: Main Construction Compound Access Strategy – Safety Review. This provides a Stage 1 Road Safety Audit, including personal injury accident data, for The Street, including the junction with the B1149. It also sets out how the design of Option 1: Passing Places has been refined to take account of the findings of the safety review.
Q2.11.2	**Applicant**	Paragraph 2.1.4.4 of the Outline Construction Traffic Management Plan (CTMP) [REP1-146] states that during peak holiday seasons the approved routing of heavy goods vehicles in the final CTMPs, if practical, may need to avoid routes marked on the Norfolk County Council Route Hierarchy Map. The Applicant's response to Q1.11.7 [REP1-122] states that it is premature to identify circumstances for possible re-routes until there is further certainty as to the construction programme. Notwithstanding this answer, with specific reference to the A149 'The Coastal Road', based on the information on HGV movements in the revised Transport Assessment [REP1-162], what is the likelihood of re-routing being required during the peak holiday season?	The A149 is a coastal road along the northern periphery of the Norfolk highway network; it routes to several small coastal towns and villages and, in this location, is not a key commuter road from one large population centre to another. The only tourist route and special route identified by the NCC Route Hierarchy map that will have Hornsea Three traffic along it is the A149 at and to the east of Weybourne. The Norfolk Coast Transport Strategy 2006-2011, which has not been replaced, provides context to changes in traffic flows for sections of the A149 for daily peak tourist traffic flows in comparison to periods outside of the tourist season. Paragraph 1.16 states: *"On the A149 at Morston, there is an annual average weekday flow of 4100 vehicles in August, over four times the winter flow (1000). Peak flows on bank holiday weekends can be higher still. At peak flows, serious delays to tourist traffic and buses can occur at particular pinch points"*. Paragraph 3.3.2 goes on to state "*Traffic congestion in the Norfolk Coast Area is generally confined to the peak tourist season. The worst spots can be the A149 between Kings Lynn and Hunstanton and through Cromer. Elsewhere, there is little congestion in the traditional sense of lengthy traffic queues although at particular pinch points like Holkham, Cley and Stiffkey, traffic volumes can cause delay for general traffic as well as buses"*.

			Volume 6, Annex 7.3: Base Traffic Flows of the Environmental Statement (APP-161) sets out that traffic flows on the A149 to the east of Weybourne are 4390 vehicles per day outside of the peak tourist season. Based upon an increase of 3,000 vehicles per day during the peak tourist season, there would be 7,390 vehicles per day on the A149 to the east of Weybourne during this period. These traffic flows are all substantially lower than traffic flows on the A149 at Hunstanton outside of the peak tourist period when congestion does not occur (12,010 vehicles per day). Hornsea Three construction traffic flows are small in comparison to base traffic flows along the A149 at and to the east of Weybourne outside of the peak tourist period and even smaller during the peak tourist period. Thus, although it is feasible for delays to occur along this section of the A149 during the peak tourist season (particularly at the narrowest point at Weybourne), the change in traffic flows caused by Hornsea Three would be of such a level that any such change in delays would be difficult to perceive. Based on this, in combination with the fact that the A149 in the vicinity of landfall is not specifically identified in the Norfolk Coast Transport Strategy 2006-2011 as an area where delay or congestion is observed, it is considered that re-routing is unlikely to be required during the 'standard' peak holiday season. However, as set out in the outline CoCP (updated and submitted at Deadline 4), it remains possible that the approved routing of HGVs documented in final CTMPs, if practical, may need to avoid routes marked on the Norfolk County Council Route Hierarchy Map and be programmed outside of specific tourist events (such as Cromer Fair, Sheringham County Show) which occur through the Summer season. The timing and movement of construction traffic will be a matter for the detailed CTMP in discussion with NCC to agree how movements could be managed to avoid impacts on such events.
		In the event that re-routing is required from the A149, please provide details of: - the alternative routes that may be used; and - the periods of time when re-routing is likely to occur. Should paragraph 2.1.4.4 of the Outline CTMP define the peak holiday seasons?	Route choice could be considered via the A148 and B1158 for light vehicles, however the Applicant would expect during specific tourist summer events when re-routing would be most likely (see part A), that the routes in the vicinity of the landfall would be subject to congestion and therefore the most likely management would be to restrict the movement of construction traffic outside the operating time of any specific events which NCC considered necessary. Agreement of such instances will be a matter for the detailed CTMP. The most likely periods of time when management (re-routing or movement restrictions) would occur is between the months of mid-July – late August, which is considered the peak tourist season. Paragraph 2.1.4.4 of the Outline CTMP (updated and submitted at Deadline 4) has been updated to reflect this.

Q2.11.3	**Applicant**	The Statement of Common Ground [REP1-099] between the Applicant and Broadland District Council states that work is ongoing to develop traffic management measures to be included within the final CMTP in respect of the road link through Cawston. Cawston Parish Council has also set out its concerns regarding the impacts of construction traffic in Cawston in its Deadline 3 submission [REP3-087], including the need to consider alternative routes Please provide an update on such work including any traffic management measures that may be required and the potential for alternative routes to be used.	The development of management measures to be included within the Outline CTMP in respect to the B1145 road link through Cawston Village (link 88 and link 89) needs to be informed by the refinement of the construction traffic flows as set out in Appendix 7 of the Applicant's submission at Deadline 4. Once agreed with NCC, work will be progressed to develop traffic management measures to be included within the Outline CTMP in respect to the B1145 through Cawston Village to facilitate the movement of construction vehicles associated with Hornsea Three along these links. An assessment of construction traffic flows with Norfolk Vanguard and Norfolk Boreas is also ongoing based on these revised flows and will inform the measures to be applied along the B1145 through Cawston. These measures will be presented to NCC for approval, in consultation with BDC and the Cawston Parish Council Working Group. The Applicant is confident that a scheme of management measures can be developed which are acceptable to NCC. Once agreed the outline scheme will be included within the Outline CTMP, and submitted into the Examination no later than Deadline 7.

Q2.11.4	**Applicant and Highways England**	Highways England's Deadline 2 response [REP2-029] sets out the issues that it still considers to be outstanding. These relate to: - A47/Taverham Road (east of Honingham) junction; - A47/A140 and A47/A1074 junctions; and - A140/B1113 junction. Please provide an update on your discussions on these matters.	The Applicant has had ongoing consultation with Highways England, and can provide the following update in respect to the matters identified: • A47/Taverham Road junction - Ongoing discussion with HE and NCC has identified a need for intervention measures at this location. The Applicant is developing an outline scheme to be discussed with HE and NCC at a meeting on 25th January. The agreed outline scheme will be included within the Outline CTMP, with the detailed design to be developed as part of the final CTMP (secured under Requirement 18 of the DCO). HE have confirmed they welcome this approach and accept, in principle, that it should be possible to find a satisfactory solution at the A47/ Taverham Road junction. However, until such a solution is agreed by both HE and NCC, this aspect of the response remains 'Work in Progress. • A47/A140 and A47/A1074 – The Applicant has undertaken additional baseline traffic link surveys at the A47 / A140 junction and A47 / A1047 junction to define the existing hourly traffic levels through these locations to inform any time use restrictions at these junctions by the construction workforce and deliveries, (automatic traffic count survey completed week commencing 3rd December). No significant effects are expected at this location, but the need for any management measures are currently under discussion with HE. The principles of any agreed measures will be included within the Outline CTMP before the end of the Examination, with the details to be developed as part of the final CTMP (secured under Requirement 18 of the DCO). HE have confirmed they agree with this approach and acknowledges that the additional baseline data has been collected. However, at the time of writing, the analysis has not been presented for scrutiny. This aspect therefore remains 'Work in Progress. • A140/B1113 junction - The Applicant has received agreement from NCC that in regard to the A140/B1113 junction, no significant effects are anticipated and that any impacts can be managed through measures to be developed within the detailed CTMP (this position will be set out in the NCC SoCG to be submitted at Deadline 4). HE have confirmed that they understand that agreement has now been reached between the Applicant and NCC that no significant effects are anticipated and that any impacts can be managed through measures to be developed within the detailed CTMP. HE intend to discuss this point with NCC at the meeting to be held on 25th January. Once HE have fully understood NCC's position, HE do not expect to have any further concerns about the operation of this junction.

Q2.11.5	**Applicant and NCC**	Please provide an update on the following transport and highways matters: - A140/B1113 junction (taking account of [REP1-157] and the concerns of Swardeston Parish Council [REP3-085]); - The proposed permanent access for the onshore HVAC Booster Station[REP1-156]; - Access for abnormal loads to the HVAC Booster Station; - The access strategy for the proposed Oulton construction compound; and - Cumulative impacts in relation to the access to the proposed Oulton construction compound.	The Applicant has had ongoing consultation with NCC, and can provide the following update in respect to the matters identified: • A140/B1113 junction - The Applicant has received agreement from NCC that in regard to the A140/B1113 junction, no significant effects are anticipated and that any impacts can be managed through measures to be developed within the detailed CTMP (this position is set out in the Statement of Common Ground between both parties submitted at Deadline 4). It is considered that this addresses the concerns set out in REP1-157 and REP3-085. • The proposed permanent access for the onshore HVAC Booster Station [REP1-156] – NCC have confirmed that the permanent access to the onshore HVAC booster station indicated in drawing 03/202 version B, submitted at Deadline 2) is considered appropriate with a visibility splay of 120 m provided the raised land mound to the north of the access is removed in accordance with para 3.11 of Appendix *3 to deadline 2 submission – addendum to appendix 30 (REP1-156). However, the Applicant continues to engage with NCC to agree final plans, including land levels. This position is set out in the NCC SoCG submitted at Deadline 4. In relation to this, it is noted that the Applicant has now reached agreement with NCC in respect to the wording of Requirement 11, which will be amended in the next draft DCO as follows:* *"11.—(1) Construction of any new permanent or temporary means of access to a highway, or alteration, or use of an existing means of access to a highway, shall not commence until an access plan for that access has been submitted to and approved by the relevant planning authority.* *(2) The access plan must include details of the siting, design, layout, visibility splays, access management measures and a maintenance programme relevant to the access it relates to.* *(3) The highway authority must be consulted on the access plan before it is submitted for approval.* *(4) The highway accesses (including visibility splays) must be constructed and maintained in accordance with the approved details."*

			• *Access for abnormal loads to the HVAC Booster Station – The Applicant highlights that it intends, through the development of the final CTMP (APP-176), to continue to monitor and consider the impact of Abnormal Indivisible Loads associated with the transformers and reactors to the onshore HVDC converter/HVAC substation and onshore HVAC booster station. The Applicant will also give due consideration within the final CTMP (to be prepared post-consent) to the feasibility of access along the local road network to the onshore HVAC booster and onshore HVDC converter/HVAC substation*. The commitments contained within paragraphs 2.1.6.2 and 2.1.6.3 of the Outline CTMP (updated and submitted as Appendix 2 at Deadline 4) provides sufficient comfort that the weight, length and width of AILs, as well as the timing of their deliveries and routing, will be agreed with NCC prior to any AIL movements associated with the construction of Hornsea Three. NCC have confirmed that they are agreeable for detailed site-specific management measures to be included within the final CTMP post-consent both at the site access and within the surrounding road network prior to any attempt being made to deliver these loads and this is set out in the Statement of Common Ground between both parties submitted at Deadline 4. • The access strategy for the proposed Oulton construction compound – As noted within the updated Statement of Common Ground between both parties submitted at Deadline 4, an acceptable and workable option for the access to the main construction compound (Option 1: Passing Places) has been identified subject to NCC's final review of information contained within Appendix 1 submitted at Deadline 3 (REP3-010). Additional information, including pavement construction and design for the grading of the road hump, has also now been shared with NCC and provided in Appendix 32 of the Applicant's submission at Deadline 4. Notwithstanding this, and as noted in ISH4, in response to concerns raised by Oulton Parish Council (OPC), the Applicant has considered an alternate 'Option R' access strategy to the main construction compound (Options R 'A'; Option R 'C1'; Options R 'C2'). NCC have confirmed that taking into account the potential interaction with cumulative projects (Norfolk Vanguard/Norfolk *Boreas, who are planning to utilise The Street), Option R "B" and Option E "C1" and "C2" are unacceptable on highways safety grounds and thus, Option R "A" would be the only Option R strategy acceptable to NCC for Hornsea Three, subject to minor amendments as a result of Stage 1 Road Safety Audit. The Applicant has contacted landowners and feedback has indicated that at least one landowner would not accept any of the alternate Option R solutions, given the existing roadway and site entrance. The Applicant awaits feedback from BDC in respect to their position on the main construction compound access strategy, including Option R. Given the feedback from NCC and landowners, the availability of an existing road, the potential environmental impacts associated with any of the Option 'R' scenarios and the interaction*

			with other cumulative projects, the Applicant considers that, although Option R may provide some benefits associated with redirecting Hornsea Three project traffic away from The Street, Option 1: Passing Places is the most suitable and preferred access option to the main construction compound. • *Cumulative impacts in relation to the access to the proposed Oulton construction compound.- Although no significant cumulative effects have been identified in EIA terms (based on Norfolk Vanguard PEIR material), consultation between Hornsea Three and Norfolk Vanguard continues in order to ascertain the cumulative impacts of traffic on shared roads. Following refinement of the construction traffic flows by Hornsea Three (see Appendix 7 of Deadline 4), both parties continue to work together to ensure alignment of highway threshold levels applied by each project and alignment as to the scope of appropriate traffic management measures that may be required as thresholds are reached. Hornsea Three and Norfolk Vanguard will be looking to reach an agreement on these matters and engage with Norfolk County Council as the highways authority to reach a shared common point of agreement. This workstream is ongoing, but material headway has been made and both projects are confident that agreement can be reached in the short term. Hornsea Three is committed to continuing regular dialogue with NCC in respect to cumulative traffic and transport impacts and expects to be in a position to submit the information info the Examination at Deadline 6."*

1.12 Written Question 2.12 Living conditions for local residents

PINS Ref. No.	Question is addressed to:	ExA Question	Response
Q2.12.1	**Applicant**	The assessments of noise impacts from onshore construction works in the ES [APP-080] are made on the assumptions that "significant noisy works" would be unlikely to occur for the period of 10 or more days in any 15 consecutive days, or for 40 or more days in any 6 consecutive months (paragraph 8.12.1.3). What confidence is there that these thresholds would not be exceeded, taking account of the nature and the proposed time period of works for the different parts of the onshore construction process? Please explain what would comprise the "significantly noisy works". Would any of the "significantly noisy works" be carried out under continuous working hours? Please provide details of how the noise from the onshore construction works would fluctuate throughout the construction period for each part of the construction works. How would this be controlled by the dDCO to ensure that the relevant time periods are not exceeded?	The assumption referred to by the Examining Authority (taken from Paragraph 8.12.1. 3 of Volume 3, Chapter 8: Noise and Vibration (APP-080)) relates to the temporary impact of cable installation by HDD (page 33). A similar assumption has also been made for the temporary impact of open cut cable installation (paragraph 8.12.1.13 on page 32). The assumption relates to the installation of the onshore cable corridor, which will comprise trenching works interspersed with HDDs and jointing bays and is based on a typical active construction duration of three months at any particular location as a maximum design scenario. Following the submission of the DCO application for Hornsea Three, the Applicant has committed to installing the onshore cable corridor using ducts rather than direct lay. The use of ducting will provide more flexibility in the installation process, the opportunity to optimise works and delivery of components, which will typically reduce the time that the trenches are open and consequently, the exposure of NSRs to noise. The Applicant has based this assumption on its experience of installing cables onshore for other offshore wind farm projects and is confident that the thresholds set out in Paragraph 8.12.1.13 of Volume 3, Chapter 8: Noise and Vibration (APP-080) will not be exceeded. Section 6.2 of the Outline CoCP (REP1-142) sets out the management measures that will be put in place to control and limit noise so far as is reasonably practicable. 'Significantly noisy works' are those which have the potential to result in a significant impact if not appropriately managed or mitigated. These activities would primarily occur during the core working hours. Some significantly noisy works may occur under the continuous working hours, for example where an HDD requires a longer drilling period than the core working hours, but such works will only be undertaken by prior agreement through the relevant local authority EHO (see paragraph 4.1.1.6 of the Outline CoCP). Other than where consent has been given by the EHO, significantly noisy works would not occur outside of the core working hours. The activities permitted during the continuous working hours pursuant to paragraph 4.1.1.5 of the Outline CoCP (generators/emergency backup supplies; remedial works; and security) are not considered to constitute significantly noisy works provided that they are appropriately managed.

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<td>The assessment set out in Volume 3, Chapter 8: Noise and Vibration (APP-080) considers the maximum design scenario construction noise levels for a range of activities. The variation in noise levels compared to that arising from the noisiest (worst-case) activity of HDD crossing are:
<table>
<tr><th>Work Activity</th><th>dB level difference with respect to the noisiest activity</th></tr>
<tr><td>Stripping of topsoil and installation of stone capping</td><td>-11 dB</td></tr>
<tr><td>Piling</td><td>-11 dB</td></tr>
<tr><td>Installation of equipment</td><td>-18 dB</td></tr>
<tr><td>Concrete pouring</td><td>-9 dB</td></tr>
<tr><td>Access road Construction</td><td>-11 dB</td></tr>
<tr><td>Cable corridor</td><td>-14 dB</td></tr>
<tr><td>Cable corridor with worksite</td><td>-10 dB</td></tr>
<tr><td>HDD crossing*</td><td>0 dB</td></tr>
</table>
*noisiest activity

In practice, noise levels would vary over time, up to a maximum of the reported worst-case impact (Appendix B of Volume 6, Annex 8.2: Construction Noise Model Output (APP-168)). The plant and operating conditions for these activities are provided in Appendix A of Volume 6, Annex 8.2: Construction Noise Model Output (APP-168) with the distances at which impacts would occur provided in Appendix B of Volume 6, Annex 8.2: Construction Noise Model Output (APP-168).

Construction noise management measures for specific construction activities will be agreed with the relevant local authorities as part of the development of the final CoCP.</td>
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<td>Q2.12.2</td>
<td>Applicant</td>
<td>Paragraph 5.11.8 of the Overarching National Policy Statement for Energy (EN-1) states that a project should demonstrate good design, including through selection of the quietest cost-effective plant available, containment of noise within buildings wherever possible and the optimisation of plant layout to minimise noise emissions.</td>
<td>The Applicant would refer to Appendix 35 of Deadline 4 which sets out how the project has demonstrated good design, particularly in respect to Work No. 9 and Work No. 10.</td>
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		In the context of paragraph 5.11.8 of EN-1, explain how good design has been demonstrated for Work No.9 (onshore HVAC booster station) and Work No.10 (onshore HVDC converter/HVAC substation).	
Q2.12.3	**Applicant**	Table 8.21 of the ES [APP-080] includes examples of measures to be adopted to mitigate the noise and vibration impacts of construction activities. For locations where cable construction activities would take place in particularly close proximity to residential properties (for example residential properties on Great Melton Road in Little Melton), please set out an example of the package of noise management measures that could be included within the final Code of Construction Practice.	The measures for managing construction noise would be identified based on the type of construction equipment to be used, the duration of the construction activity and the proximity of the noise sensitive receptor. This information would be confirmed during the detailed design stage. The measures would be agreed with the relevant local planning authority and set out in the final CoCP (Requirement 17 of the DCO). Where construction activities are located in close proximity to residential properties, the noise measures may include: • Restriction of works to core (daytime) working hours; • Selection of quiet plant, where available; • Temporary hoarding around the construction worksite or noisy plant; • Toolbox talks to construction staff as part of the Considerate Contractors' Scheme; and • Advance notice of the construction works through the communication plan framework.
Q2.12.4	**Applicant**	In relation to the onshore construction works, the ES [APP-080] states that at this stage, blasting or impact piling is considered unlikely or is not predicted (paragraphs 8.12.1.14 and 8.12.1.5). As such, the ES finds that construction vibration would be unlikely to be significant. Explain what factors would determine whether or not blasting or impact piling would be required for the different parts of the onshore works. If blasting or impact piling were required, what would be the effects upon residential living conditions and what mitigation measures might be needed? Would it change the findings of the ES?	The Applicant can confirm that blasting and impact piling would not be undertaken during the construction of Hornsea Three. The only exception is that piling may be required in order to construct the deep foundations of the onshore HVAC booster station and HVDC converter/HVAC substation however this would be confirmed during detailed design. Piling at these locations has been included in the assessment of noise and vibration impacts as reported in Volume 3, Chapter 8: Noise and Vibration (APP-080). Sheet piling may also be required at locations associated with excavations along the onshore cable corridor where the ground conditions determine that additional trench support is required to minimise the risk of trench collapse. Such locations are generally associated with the larger and deeper excavations such as: • Transition Joint Bays • HDD exit points on the beach or nearshore (if required); • Excavations at the landfall and beach foreshore associated with the offshore cable pull-in; • Joint Bays;

			• HDD entry/exit locations subject to ground conditions; and • Anywhere along the onshore cable corridor where a combination of ground conditions and depth of installation (such as ditch crossings) require additional trench support of this nature. Where construction activities are located in close proximity to residential properties, the noise measures may include: • Restriction of works to core (daytime) working hours; • Selection of quiet plant, where available; • Temporary hoarding around the construction worksite or noisy plant; • Toolbox talks to construction staff as part of the Considerate Contractors' Scheme; and • Advance notice of the construction works through the communication plan framework.
Q2.12.5	**Applicant**	With reference to the Planning Practice Guidance – Noise (Paragraph: 005 Reference ID: 30-005- 20140306) please set out clearly how the proposed construction works would: • mitigate and reduce to a minimum noise above the Lowest Observed Adverse Effect Level (LOAEL); and • avoid noise above the Significant Observed Adverse Effect Level (SOAEL).	The Applicant notes that section 5.11 of NSP EN1 deals with noise and vibration and paragraph 5.11.9 states that the Secretary of State must be satisfied that the proposals: ● avoid significant adverse impacts on health and quality of life from noise; ● mitigate and minimise other adverse impacts on health and quality of life from noise; and ● where possible, contribute to improvements to health and quality of life through the effective management and control of noise. As set out in paragraph 6.2.1.3 of the Outline CoCP (submitted for Deadline 4), Best Practicable Means (BPM), would be implemented for all construction activities to mitigate and reduce noise above the LOEL to a minimum and avoid noise above the SOEL . These BPM measures would be based on guidance in BS 5228: Code of practice for noise and vibration control on construction and open sites. Part 1: Noise +A1 (BSI, 2014). The measures would be discussed and agreed with the relevant local planning authority during the detailed design process and would be set out in the final CoCP. Such measures may include the specification of quieter equipment, and if required, localised noise barriers if further screening is beneficial.
Q2.12.6	**Applicant**	At ISH4 the Applicant referred to other nationally significant infrastructure projects where core working hours commence at 7.00am. Other than the Norfolk County Council (Norwich Northern	Numerous nationally significant infrastructure projects have accepted working hours commencing from 07:00AM. The majority of which identified below have similar circumstances to that of Hornsea Project Three – i.e. comprising linear works to install export

		Distributor Road) Order 2015 [REP2- 005], please provide details of other comparable projects. Explain whether the particular circumstances of such projects are similar to those of Hornsea Project Three (for example in relation to the type of construction works proposed and their proximity to sensitive receptors such as residential properties). Why is it necessary for the construction working hours at parts of the development where construction would be taking pace over a longer period of time (e.g. the HVDC converter/HVAC substation) to be consistent with those of other parts of the project such as the onshore cable route? Would an 8.00am core working hours commencement time not be more appropriate for such works?	transmission cables below ground in rural / semi-rural areas along with substation works. Generally these projects are located in close proximity to and separate from sensitive receptors such as residential properties. Within the eastern region, approved projects with a 07:00 commencement time include:- - The Galloper Wind Farm Order; - Palm Paper 3 CCGT Power station Kings Lynn; - East Anglia THREE Offshore Wind Farm; - The Progress Power (Gas Fired Power Station); and - Rookery South (Resource Recovery Facility). Other similar NSIP projects, outside the eastern region, but very similar to Hornsea Three which also facilitate a 07:00am start time include: - Hornsea Project One; - Hornsea Project Two; - Triton Knoll Electrical System; and - Dogger Bank Creyke Beck. In this regard Hornsea Three is not considered unique or subject to special circumstances which would lend itself to reduced construction working hours. The Applicant therefore considers that the principal of 7AM working start times is already established for other NSIP projects across the eastern region. Consistency of start time across the project also holds a number of advantages including consistent construction programming along the route, including the deployment of work fronts and deliveries and ability to utilise daylight hours. A construction start time of 7am (rather than 8am) also provides a mechanism for some of the workforce and vehicle movements to travel outside the standard peak AM traffic movements, helping to minimise impacts on the wider road network. These measures apply equally to the export transmission corridor, HVDC converter/HVAC substation and HVAC booster station sites. Specific to construction working hours at HVDC converter/HVAC substation, or HVAC booster station, the Applicant does not consider that the locality warrants reduced working hours. The site is already subject to background ambient noise generated by the A47. However, whilst the period of construction works for the HVDC converter/HVAC substation and HVAC booster

			station extends over a longer period of time than for the cable corridor, it is not anticipated that noise generating activities will occur from 07:00am every day for the full duration. It is also noted that for construction noise generating activities, South Norfolk District Council (www. https://www.south-norfolk.gov.uk/residents/neighbourhood-issues/noise-and-other-complaints/noise-complaints - accessed on 31/12/2018) notes that "a certain amount of noise is expected from any building or construction site but when this noise starts to affect you, we will investigate. Building activity is not restricted to set times or days. However, we suggest that where residents can be disturbed, sites should work from 7:00 to 18:00 Monday to Friday and 8:00 to 13:00 on Saturdays, with no noisy construction work on Sundays or public holidays."
Q2.12.7	**Applicant**	Paragraph 4.1.1.6 of the Outline Code of Construction Practice [REP1-142] sets out the activities which may be undertaken on a continuous working basis (subject to agreement with the relevant local authority Environmental Health Officer). For each of the listed activities, over what period of time would the continuous working take place?	Continuous activities are anticipated to occur over the following time period: Running of support generators or emergency backup supplies: This will be required throughout the construction period. At the main construction compound and substation sites this is likely to be for the full duration when works are ongoing. Along the export cable corridor this is anticipated to be 3 months at any one location as the work front passes through. If generators are required (for example to operate security measures) these would be selected to ensure that they operate quietly in accordance with best practicable means to manage noise that may be omitted. Remedial works (for example in the event of serve weather): Time frames cannot be provided as this category is designed to deal with particularly severe weather or other emergency events. However, it is noted that works sites are designed to withstand flooding and storm events and that as part of standard practice sites are left in a secure state suitable to withstand most weather events. Security of sites: This will be required throughout the construction period. At the main construction compound and substation sites this is likely to be for the full duration when works are ongoing. Along the export cable corridor this is anticipated to be 3 months at any one location as the work front passes through. Site security does not typically generate noise, but may comprise working personnel who patrol sites (the deployment of security is at the discrepancy of individual construction contractors and their own policies and is informed by the value of equipment left overnight).

			The following activities (which are subject to obtaining agreement with the relevant local authority Environment Health Officer (EHO)) are anticipated to occur over the following time period: • Horizontal Directional Drilling (HDD) operations (in order of up to 8 days of continuous activity per HDD crossing – see part C)): • Substation component installation is subject to localised restrictions to accommodate abnormal loads (often delivered at night) and where more complex assembly is required to make safe installations as they are installed this is likely to be limited to in order of 1 to 2 days a month: • (Substation) oil filling of transformers can required periods greater than those permitted in a single day – but this is likely to be limited to in order of 1 to 2 days: • Jointing operations along the onshore cable corridor (in order of up to 2 days of continuous activity per jointing crossing – see part C)):
		For the activities listed in paragraph 4.1.1.6 should additional restrictions be in place in the Outline Code of Construction Practice to prevent continuous working at the weekend and on public holidays?	The Applicant considers the need to secure agreement with the relevant local authority Environment Health Officer (EHO) is sufficient to control and the EHO will only permit the continuous working at the weekend and on public holidays if the Applicant can demonstrate that it is necessary and reasonable in the circumstances. For example, it may be preferable to transport and install a substation component at the weekend to minimise traffic impacts or a landowner may prefer jointing operations to continue over the weekend to reduce the overall impact on farming operations. To assist the EHO and other stakeholders understand expectations around the scope of any application, the following text has been added to paragraph 4.1.1.6 of the Outline CoCP submitted for Deadline 4 :- *"Any request to the relevant local authority EHO is to detail how noise is to be managed on-site, predicted noise levels at sensitive receptors (if applicable), total length of period over which continuous works are requested for and the anticipated length of time any noise generating equipment is to be used.*
		In the case of horizontal directional drilling, what is the likelihood of continuous working being required?	Continuous working would be the exception as the works are scoped and designed to be undertaken within the core hours. The need to extend into longer working hours is generally dependant locations where ground conditions are less favourable / stable and where risk to the integrity of the works may increase if left in a partially complete state overnight, or where an extended HDD is proposed. This is particularly relevant during the HDD pipe pull back, which would generally always be

			undertaken in a continuous operation to minimise the risk of the bore hole collapsing before the pipe is fully installed. These activities can often be programmed to be completed within day, but a longer period of time may be required at the more complex HDD locations if operations cannot be completed within the core hours. At a complex HDD location, if an extension to core hours was required then this could extend for up to eight days (if seeking to build out the whole project or approximately two days per export cable). Continuous, or extended working hours are also expected at significant crossings where completing the works in one occasion is considered to reduce any risks. This is often requested at railway or major highway crossings where the asset, such as the tracks or highway surface is required not to be in use or in reduced use for the duration of the works. Extended or continuous working may also be requested for jointing. Although the jointing process is well understood and can be programmed to occur within a day, working hour extensions may be requested to facilitate an efficient construction programme along the route and reduce impacts on landowners. These requests are likely to be limited to one to two days of extended working at any one location.
Q2.12.8	**Applicant**	Paragraph 4.1.1.5 of the Outline Code of Construction Practice [REP1-142] includes the running of support generators or emergency backup supplies as an activity that may be undertaken on a continuous cycle with no further consent required. It is assumed this would apply to both the construction work locations and the construction compounds/storage areas. In what circumstances would the running of support generators be required? What noise impacts (day time and night time) would result from support generators and emergency back-up supplies? What mitigation would be put in place to minimise the noise impacts and how would this be controlled through the Outline Code of Construction Practice?	Support / backup generators would be used where necessary, where a mains electricity supply was not available or practicable. Locations identified as likely to require support generators are: • Main and secondary construction compounds; • Jointing and splicing of cables at Joint Bays; • Remote security locations; • Landfall HDD compound; • At HDD locations along the onshore cable corridor, pipe welding, welfare etc.; • Night time working if required for lighting / welfare; and • Dewatering along the onshore cable corridor as required. Mitigation measures that would be put in place to minimise noise impacts; these may include: • The selection of generators with low noise emissions; • The location of generators away from sensitive receptors; and • Local noise screening.

			These measures are captured in the Outline CoCP (updated and submitted at Deadline 4) and will be agreed with the relevant local planning authority prior to construction commencing. Subject to implementation of the mitigation measures set out below, no additional significant impacts would result from the support generators.
Q2.12.9	**Applicant**	The Local Impact Report from Broadland District Council [REP1-053] and the Written Representation from Cawston Parish Council [REP1-004] refer to potential vibration impacts from HGVs upon existing residential properties (some of which are heritage assets). Please provide an update on the assessment of such potential impacts and any mitigation that may need to be included in the Outline Code of Construction Practice and/or the Outline Construction Traffic Management Plan.	In order to establish the prevailing acoustic and vibration environment, a baseline survey is planned to be undertaken at Cawston at the end of January, with the scope and methodology recently agreed with Broadland District Council. Based on this baseline data and the refined predicted traffic flows along the links at Cawston (link 88 and link 99, see Appendix 7 to the Applicant's submission at Deadline 4), the Applicant continues to consider potential noise and vibration effects on sensitive receptors within Cawston and expects to submit information at Deadline 6. Should a need for mitigation be identified (particularly in respect to associated impacts on the setting of heritage assets), these measures will be determined based on ongoing consultation with BDC and the property owner/resident, as appropriate. Such measures will be secured by means of the detailed CTMPs to be submitted and agreed with the local planning authority and Highways Authority prior to commencement (Requirement 18 of the draft DCO). The Applicant is committed to continuing the engagement with BDC and the Cawston Parish Council Working Group and is confident that a reasonable solution will be reached.
Q2.12.10	**Applicant**	Further to representations made regarding low frequency tonal noise at ISH4, NNDC has submitted at Deadline 3 [REP3-103] a report titled "Substation Noise Assessment Summary – Sheringham Shoal, Cawston, Norfolk". Please comment on this document. Please outline the noise monitoring measures that would be included in the Noise Management Plans for the operation of the HVAC Booster and the HVDC converter/HVAC substation.	NNDC provided the "Substation Noise Assessment Summary - Sheringham Shoal" report as an example of why they consider monitoring of operational noise is necessary at Hornsea Three's onshore HVAC booster station. In its written representation at ISH4, NNDC stated that tonal noise from the substation was not expected. The report summarises the findings of noise surveys undertaken following a complaint from a nearby resident regarding tonal noise from the existing substation. The survey reported that a 100Hz tone from the substation was audible outside the bedroom window of the property, however the tone was not detectable within the bedroom. The substation tonal noise was also detectable at a very low level at the junction of Chapel Street and High Street. However, the noise was at such a low level it was concluded that the noise would not be detectable inside a dwelling, even with a bedroom window open. The Applicant notes that the noise complaint was made before the retrofitting of harmonic filters had been completed at the Sheringham Shoal substation. The report recommends maximum noise levels at 5 m for the proposed harmonic filters, however, the report does not stipulate that testing will be undertaken following the installation of this equipment to ensure

			the noise levels are met. There is also no recommendation or commitment to regularly monitor operational noise following the complaint. The Applicant also notes the lack of baseline surveys of the noise environment prior to the operation of the Sheringham Shoal substation. In comparison, Hornsea Three has collected baseline data representative of the general surrounding area of the onshore HVAC booster station (see Volume 6, Annex 8.1: Baseline Noise Surveys (APP-167)), which will allow characterisation of existing and new noise sources and setting of appropriate monitoring requirements. The Applicant has amended Requirement 21 of the dDCO (Version 2 submitted at Deadline 4) to clarify the contents of the noise management plan. The noise management plan will set out the noise monitoring measures and will be agreed with the relevant local planning authority. As stated in the Applicant's response to Q1.12.5 of the Examining Authority's First Written Questions (REP1-122) monitoring will be undertaken as part of the site commissioning tests or as adaptive management should feedback be received from the local community through the established communication framework.
Q2.12.11	**Applicant**	At ISH4 Oulton Parish Council referred to issues in connection with a construction compound used for Hornsea Project One at Holton-Le-Clay in Lincolnshire. The Applicant is requested to comment on these concerns and set out how the construction mitigation and management measures that have been developed for Hornsea Project Three have sought to learn from the experience of Hornsea Project One and other previous projects.	Orsted operates a matrix organisation where project updates and lessons learnt on one project are continuously circulated and applied on other projects across the Orsted portfolio. The original draft Code of Construction Practices where drawn from previous projects and enhanced. The applicant has spoken to colleagues who work on both Hornsea Project One and Hornsea Project Two to obtain a more detailed update on any specific complaints that may have arisen, both in general and specifically at the main compound at Holton-Le-Clay to understand the scale of any issues and the actions the company have taken to resolve these. The number of complaints at Hornsea One and Two are relatively low for a project of their scale, with generally positive engagement between the project and the local communities within which Orsted operates. As broad principles all projects maintain open and transparent communication with the community throughout the construction process. This approach is both secured through each project's relevant Code of Construction Practice (and other management plans where appropriate) and a wider established approach to stakeholder engagement as a responsible developer. Lessons identified by Hornsea Project One and Project Two directly applicable to Hornsea Three include: - Ensure that residents have a point of contact to raise any concerns/issues. Hornsea Project One has appointed a Community Liaison Officer who acts as the link

			between the Project and local community. This commitment has been provided for in Hornsea Three Outline CoCP (submitted for Deadline 4) (paragraph A1.1.2). - Hornsea Project One and Two project teams attended parish council meetings when invited to do so, to provide an update on the construction process. This commitment has been provided for in Hornsea Three Outline CoCP (submitted for Deadline 4) (paragraph A1.1.4). Other instances that have arisen at Hornsea One and Two, and identification of any lessons that can be learnt for Hornsea Three include:- - Following an incident at the entrance point to the main construction compound where a collision occurred between a vehicle driven by a member of the public and vehicle being driven into the compound site entrance it was recognised that only vehicles associated with the project (and its subcontractors) are bound by the relevant Construction Traffic Management Plans (which for example may limit routing or travel times) and that other, non project traffic (which may also make use of that entrance point off the public highway) are only limited by adopted highway restrictions. As a result of this incident, Hornsea Three has recognised the importance of open and ongoing dialogue between the project and community, typically through the local Parish Council to ensure that local communities understand the scope of management measure that are applied to the project and expectations set on each contractor working on the project. - Hornsea Project One received a complaint regarding construction activity occurring outside of the consented working hours. On receipt of the complaint the Project investigated and reconfirmed with its contractors and sub-contractors that any works occurring beyond the approved scope are prohibited and stopped with immediate effect. More widely, the project teams encourage members of the local community to contact the Project directly through the projects appointed Community Liaison Officer if they have any further observations of non-compliance. These can be then investigated and appropriate steps taken to ensure an contractors comply with the applicable management plans.

1.13 Written Question 2.13 Content of the DCO

PINS Ref. No.	Question is addressed to:	ExA Question	Response
Q2.13.1	Applicant	At Issue Specific Hearing (ISH) 3 you explained your view that the reference to 'any dispute' as used in arbitration clauses in various DCOs would apply to decisions of the Secretary of State relating to the transfer of the benefit of the Order under Article 5. The ExA notes that this point is not agreed by all parties and we are not aware that is any specific legal authority on it. Assuming, for the purposes of this question, that your interpretation is correct, why is Article 5(6) necessary? In any event, why do you consider that it is appropriate for a decision of this nature to be transferred to an arbitrator, bearing in mind that the Secretary of State has considered it necessary to ensure in all made DCOs that the benefit cannot be transferred without his approval, other than in specific circumstances where the financial credibility of the transferee is assured and/or the time limit for compulsory acquisition has expired? Why do you consider that an arbitrator would be better placed to assess the suitability of a transferee than the Secretary of State?	The Applicant notes that there is no legal authority before the ExA to suggest that the Applicant's interpretation of arbitration clauses in made DCOs is incorrect. At ISH3 the ExA expressed its opinion that "any dispute" did not include decisions of the Secretary of State, but did not offer any legal authority for that position, nor did any IP. In contrast, the Applicant has directed the ExA to previous conclusions of Examining Authorities and decisions of the Secretary of State in relation to NSIP applications, where it has been found, without qualification that all parties and matters should be subject to arbitration. Therefore, it would be inconsistent for the ExA and Secretary of State to find otherwise in relation to this application. Article 5(6) provides clarity on the circumstances under which a referral to arbitration may be made, namely when the Secretary of State considers refusal of an application for a transfer, or when such an application is not determined within eight weeks (or such other period as agreed) of referral. An application for transfer would contain technical and financial information relating to the probity of the transferee. The Applicant is not suggesting that

			the Secretary of State is unsuitable to determine such an application. The point is that if the Secretary of State made an error or misinterpreted information of a technical nature, without the arbitration provisions the Applicant's only recourse would be to either submit a claim for judicial review or a fresh application for transfer. For the reasons explained in ISH3 a claim for judicial review is not an expeditious means of dispute resolution and would be costly in terms of time and resource for all parties. A fresh application would be unlikely to bring about a different result, unless the Secretary of State changed his mind. By applying the arbitration provisions to Article 5, there is an effective means of appeal/dispute resolution, which accords with previously made DCOs (see above) and principles of natural justice. The Applicant's response to Q1.13.14, oral submissions in ISH3, and summary of those submissions, set out the Applicant's view on the appropriateness and applicability of arbitration procedures. In brief, the Applicant considers that the Planning Act 2008 permits referral of disputes to arbitration.
Q2.13.2	Applicant	In Article 19(3) of the dDCO, should the reference in line 2 be to paragraph 10 of Schedule 7 rather than paragraph 9?	The reference should be to paragraph 10 of Schedule 7 and this has been corrected in the dDCO (Revision 2) submitted for Deadline 4.
Q2.13.3	Applicant	In Article 21(9) of the dDCO, should the reference in line 3 be to Article 22(3) rather than Article 25(3)?	The reference should be to Article 23(3) and this has been corrected in the dDCO (Revision 2) submitted for Deadline 4.
Q2.13.4	Applicant	Your response to question Q1.14.14 [REP1-122] indicated that provision would be made in Article 35 of the dDCO for the approved guarantee (or alternative form of security) to be made available to persons entitled to compensation by placing it on deposit with the documents certified in accordance with Article 35. This would not appear to be reflected in the current draft of Article 35. Your response also referred to an amendment to the Explanatory Note. There do not appear to be any changes in the tracked change version of the dDCO. Please review Article 35 and the Explanatory Note accordingly.	This was an omission from the submitted version and text has been added to the dDCO (Revision 2) submitted for Deadline 4. The Applicant is not intending for the document to be certified pursuant to Article 36 (previously Article 35), as the document must be approved by the Secretary of State pursuant to Article 43 (previously Article 42). However, a copy of the approved guarantee or alternative form of security will be placed with the certified documents and made available for inspection.
Q2.13.5	Applicant	Should the Outline Written Schemes of Investigation (for onshore and offshore archaeology) be added to the certified documents listed in Article 35?	The outline onshore written scheme of investigation has been added to Article 2 and Article 36 (previously Article 35) of the dDCO (Revision 2) submitted for Deadline 4. An onshore WSI is under discussion between the Applicant, NCC and HE. The outline written scheme of investigation (relating to offshore archaeology) was already referred to in the dDCO.

Q2.13.6	Applicant, The Crown Estate	The Applicant's response to Q1.13.33 [REP1-122] referred to discussions with The Crown Estate regarding the drafting of Article 40 (Crown Rights). Please provide an update on your discussions.	The Applicant can confirm that these discussions are still ongoing. The Applicant has seen a draft letter from the Crown in answer to question 2.14.4 which confirms that good progress is being made with the Crown so that the draft wording of Article 40 can be finalised prior to Deadline 6. Once agreement has been reached the Applicant will amend the drafting in Article 41 (Crown Rights) to be consistent with previous DCOs.
Q2.13.7	Applicant	The Applicant has agreed to include Historic England as a consultee for Requirement 8 (provision of landscaping). Please review the outline Landscape Management Plan with a view to ensuring that it captures any objectives which relate to mitigating impacts on heritage assets.	Requirement 8 of the dDCO (Revision 2) submitted for Deadline 4 has been updated to include Historic England as a consultee. The outline Landscape Plan has been amended at paragraphs 3.1.1.1 and 3.1.3.2, and an amended version has been submitted as Appendix 4 to Deadline 4.
Q2.13.8	NNDC	Your submission for Deadline 3 [REP3-103] includes a hyperlink to evidence in support of your argument that the maintenance period specified in Requirement 9 (implementation and maintenance of landscaping) should be 10 years. Please provide evidence which does not rely on a hyperlink.	The Applicant refers to its response to NNDC's Deadline 3 submission [REP3-103].
Q2.13.9	Applicant	Should Requirement 16 (onshore archaeology) be amended to refer to the Outline Written Scheme of Investigation?	Requirement 16 of the dDCO (Revision 2) submitted for Deadline 4 has been updated to refer to the outline onshore written scheme of investigation.

Q2.13.10	Applicant, NNDC, BDC, SNC and NCC	Requirement 22 (local skills and employment) states that a skills and employment plan shall be submitted to the relevant planning authority for approval. Given that the skills and employment plan would potentially relate to a wide area comprising the East Anglia and/or Humber regions, is it appropriate for it to be considered for approval by the relevant planning authority? Would it be more appropriate for it to be considered by NCC in consultation with the relevant planning authorities and Local Enterprise Partnerships? Who would be the appropriate determining authority in the Humber region? As the determining authority in the Humber region may not be an Interested Party, has there been any consultation to establish whether the authority would wish to have a determining role? Are there any other means for determining an application for approval under this requirement?	The Applicant has amended Requirement 22 in the dDCO (revision 4, as submitted for Deadline 4) so that the approving authority for the Skills and Employment Plan covering East Anglia would be NCC. The Applicant is currently in discussions with Humber LEP and North East Lincolnshire Council regarding their roles in the Skills and Employment Plan the covering Humber. The Applicant has added a requirement to the dDCO for NECL to have the power to sign off a separate Skills and Employment Plan for its area.
Q2.13.11	Applicant	In Schedule 7 of the dDCO: - should line 1 of paragraph 3(2) read "for (a), (b) and (c) substitute"? - should line 8 of paragraph 6 read "are so modified"?	In respect of the first point, the whole of section 5A(5A) is being replaced so the words "for (a), (b) and (c) substitute" are not required. In respect of the second point, line 8 of paragraph 6 of the dDCO (Revision 2) submitted for Deadline 4 has been updated.
Q2.13.12	Applicant	In Part 1 should the definition "statutory historic body" refer to the Historic Buildings and Monuments Commission for England (rather than Historic England)?	Part 1 of the dDCO (Revision 2) submitted for Deadline 4 has been updated to refer to the outline onshore written scheme of investigation.
Q2.13.13	Applicant	The MMO has suggested [REP3-092] that the dDCO should make reference to the total number of cable crossings required and the maximum volume and area of cable protection required for each crossing. Please comment on this suggestion.	The Applicant has updated the dDCO (Revision 2 submitted for Deadline 4) to confirm that the number of cable crossings must not exceed 44 unless otherwise agreed with the MMO (condition 2(8) of Schedule 11, and condition 2(10) of Schedule 11), and that the amount of cable protection for each shall be approved under the cable specification and installation plan (condition 13(1)(h)(v) of Schedule 11 and condition 14(1)(h)(v) of Schedule 12).

Q2.13.14	Applicant	At ISH3 you explained your view that the reference to 'any dispute' as used in arbitration clauses in various DCOs would apply to decisions of the MMO. The ExA notes that this point is not agreed by all parties and we are not aware of any specific legal authority on it. Assuming, for the purposes of this question, that your interpretation is correct, why is paragraph 10 necessary? Assuming (for the purposes of this question) that your interpretation is not correct, why do you consider that it would be appropriate for the statutory functions of the MMO to be transferred to an arbitrator? Why do you consider that the existing appeal mechanisms under the Marine and Coastal Access Act are not suitable?	Paragraph 10 sets out that the arbitration provisions shall apply to the DML and confirms the timing of the appointment of such arbitrator. This is required so the parties to a dispute under the terms of the DML know that provision has been made for its resolution. The Applicant's response to Q1.13.14, oral submissions in ISH3, and summary of those submissions, set out the Applicant's view on the appropriateness and applicablility of arbitration procedures. In brief, the Applicant considers that the Planning Act 2008 permits referral of disputes to arbitration. The existing appeal mechanisms under the MCAA 2009 and the Marine Licensing (Licence Application Appeals) Regulations 2011 would not apply to a DML or condition discharge application made pursuant to it without modification. The arbitration provisions (as amended) provide an effective means of dispute resolution, without the need to introduce an additional appeal mechanism to the DCO.
Q2.13.15	Applicant	The MMO has suggested [REP3-092] that Condition 4 should be expanded to specify a requirement for all phases to be completed within 7 years. Please comment on this suggestion.	The Applicant does not consider this to be required, as the condition requires the approval of the proposal for phasing from the MMO and hence the MMO has the ability to refuse to grant approval where phasing would take longer than assessed in the Environmental Statement. Further, there is a commercial impetus on the Applicant to ensure that the project is completed as quickly as possible.
Q2.13.16	Applicant	The National Federation of Fishermen's Organisations has suggested [REP3-089] that issuing notices to mariners and informing Kingfisher Information Service in case of exposure of cables (or damage to cable protection) should be secured by making an addition to Condition 7. Please comment on this suggestion.	The Applicant would advise that such an amendment is not necessary, as it intends that this issue is dealt with in the Fisheries Coexistence and Liaison Plan, which is consistent with the approach to other similar points raised by stakeholders.
Q2.13.17	Applicant	Should Trinity House and the Maritime and Coastguard Agency be added as consultees for Condition 13(1)?	The Applicant understands that the MMO would consult with these bodies as required anyway and so specifying them as consultees is not necessary.
Q2.13.18	Applicant	Should Condition 13(1)(f) refer to Conditions 18 and 19 (as well as 17)?	The Applicant has amended the dDCO accordingly (revision 2, submitted for Deadline 4).

Q2.13.19	Applicant, Hist E	Hist E has suggested [REP3-102] an additional paragraph (vii) in Condition 13(1)(d) relating to spatial data for Archaeological Exclusion Zones and application of a Protocol for Archaeological Discoveries. Condition 13(2)(h) relates to a protocol for reporting archaeological discoveries. Would the wording suggested by Hist E result in duplication? Would be the submission of spatial data relating to the Archaeological Exclusion Zones be covered by Condition 13(2)(d)? Are any amendments to Condition 13(2) needed to ensure that submission of spatial data is secured?	The Applicant has amended the dDCO accordingly to include wording on the archaeological exclusion zones (condition 13(1)(d)(vii), Schedule 11, and Condition 14(1)(d)(vii), Schedule 12, dDCO version 2, submitted for Deadline 4).

Q2.13.20	Applicant, MMO	Please provide an update on your discussions regarding the timescales set out in Condition 14.	Bearing in mind that Condition 14 references "any programme, statement, plan, protocol or scheme", the Applicant believes the timeframe of "at least four months" is reasonable and representative of the wider offshore wind energy position on MMO approval timescales. Generally, it has been the Applicant's experience that four months is a workable timescale for the bulk of MMO approvals required. As the Applicant stated at the ISH1 Hearing, plans, protocols and schemes requiring MMO agreement vary in content and complexity. Some protocols and plans are straightforward and administrative requiring minimal time and resource, whilst others require more extensive stakeholder consultation. In reality, plans requiring more resource is known and the Applicant frontloads engagement and consultation with the relevant statutory and other stakeholders prior to submission of the plan to MMO, ensuring the majority of issues are addressed to facilitate the approval process. As such, four months should provide sufficient time for approvals of plans. The provision within the condition, *"except where otherwise stated or unless otherwise agreed in writing by the MMO"* provides the needed flexibility that may be required of either party in order to work together to approve plans in the most effective and efficient way. The Applicant does not prescribe to the view that by bringing forward the date by which a document must be submitted leads to higher quality or submission which is satisfactory to decision maker. On the contrary it is imperative that the contractors who undertake the works or activity on behalf of the applicant have the opportunity to influence and inform these plans as they are prepared in advance of submission to approval authorities. By bringing forward documentation submission dates you risk reducing this engagement.

Q2.13.21	Hist E	You have suggested [REP3-102] that the timescale provided for in Condition 14(1) for the submission of plans, scheme and protocols should be amended to 6 months, to ensure alignment with the production of the Written Scheme of Investigation. Given that the Written Scheme of Investigation may inform the plans submitted, why is it appropriate for these time periods to be aligned?	The Applicant welcomes HE's confirmation on this point. It is the Applicant's understanding that HE would prefer a final WSI to be approved first, as any subsequent surveys (as part of plans) would be analysed by an archaeologist to determine the presence of potentially important archaeological features of interest and whether/what AEZs may need to be put in place. The above requirement would be stipulated in the WSI. Any additional AEZs or methodology statements resulting from surveys (including as part of plans) would then added as appendices to the approved WSI. It is the Applicants understanding that this is how HE would like the WSI updated, i.e., by appendices rather than revisions to the body of the WSI.
Q2.13.22	Applicant	The MMO has suggested [REP3-092] that the phrase "so far as applicable" should be removed from Conditions 17, 18 and 19 on the basis that it is unnecessary. Please comment on this suggestion.	The Applicant can confirmed that it has removed this phrase as requested.
Q2.13.23	MMO, NE	The MMO has commented [REP3-092] that it has received reports on Offshore Wind Farms (OWF) under construction which have cast doubt over the efficacy of soft-start mitigation measures relating to piling. In Condition 18, the MMO (supported by NE) suggests an amendment to the effect that, if monitoring shows significantly different impacts to those assessed in the ES, piling activity should cease until an update to the marine mammal monitoring plan and further monitoring requirements have been agreed. Please provide evidence of the need for this approach.	In line with the position stated within ISH3, the Applicant notes that if the noise monitoring showed that results were greater than presented in the Environmental Statement then the undertaker would cease piling until the matter was resolved (with the MMO) was not necessary or appropriate as the undertaker has to provide the MMO with the noise modelling reports within 6 weeks of the monitoring, at which point if the MMO have concerns they have the regulatory powers to stop piling until their concerns have been resolved should they deem it necessary. Therefore, the Applicant does not consider that any further modification of the dML is required in this regard.
Q2.13.24	Applicant	Hist E has suggested [REP3-102] an additional paragraph (f) in Condition 19(2) relating to the submission of bathymetric and side scan sonar coverage of Archaeological Exclusion Zones, together with an archaeological analysis of the data. Please comment on this suggestion.	The Applicant can confirm that it has updated the dMLs accordingly and also captured this AEZ monitoring commitment within the updated IPMP.
Q2.13.25	Applicant	Some of the questions relating to Schedule 11 raise similar points in connection with equivalent provisions in Schedule 12. Those points are not repeated here. Please identify any further or different responses which are specific to Schedule 12.	Noted, the Applicant has no further comments beyond those noted above.
Q2.13.26	Applicant	Given that cable installation may require foreshore excavation, should Condition 14(2)(f) include reference to the Relevant Local Authority?	The Applicant has amended the dDCO accordingly (revision 2, submitted for Deadline 4).

Q2.13.27	Applicant	Should Trinity House be added as a recipient of vessel traffic monitoring data under Condition 20(2)(d)?	The Applicant has amended the dDCO accordingly (revision 2, submitted for Deadline 4).

1.14 Written Question 2.14 Compulsory Acquisition

PINS Ref. No.	Question is addressed to:	ExA Question	Response
Q2.14.1	**Applicant**	At Issue Specific Hearing (ISH) 1 you referred to a cap of 6GW for the May 2019 round of the Government's Contract for Difference (CfD) process. At ISH3 you referred to a 4GW cap and your written submission for Deadline 3 [REP3-003] refers to a cap of 2 to 4GW. Please clarify what the cap will be in May 2019.	The cap for the upcoming auction in May 2019 is 6 GW. On 23 July 2018, Energy and Clean Growth Minister Claire Perry announced that the next CfD auction will open in May 2019 with subsequent auctions every 2 years after that. The Rt Hon Claire Perry suggested that this would result in 1-2 gigawatts of new offshore wind every year in the 2020s, which equates to 2-4GW for the delivery years 2023/24 and 2024/25 which are the relevant delivery years for the May 2019 auction. On 20 November 2018, the Department for Business, Energy and Industrial Strategy published its CfD Draft Budget Notice for the third allocation round, 2019. This confirms that the overall cap is 6GW and there are no minima or maxima for any technologies. This publication was made after the Applicant submitted its response to the ExA's first written question Q1.1.6 (REP1-122). In its response to Q1.1.6, the Applicant referred to a possible cap for offshore wind, based on the statements made by the Rt Hon Claire Perry in July 2018. However, the Government has since confirmed that no such cap has been included. Further information on the cap can be found in Appendix 60: CfD Draft Budget Notice.
		Does the cap apply just to Offshore Wind Farms (OWF) or to other renewable energy projects?	The 6GW cap does not just apply to offshore wind but to all 'lesser established technologies' that are eligible to compete in the next allocation round, to include: • Advanced Conversion Technologies; • Anaerobic Digestion (> 5MW); • Dedicated Biomass with CHP; • Geothermal; • Offshore Wind; • Remote Island Wind; • Tidal Stream; and • Wave.

Q2.14.2	**Applicant**	At ISH1 the Applicant explained that the CfD process is an important factor influencing the proposed approach to phasing Hornsea Project Three. The Applicant stated that Hornsea Project Three is unlikely to be in a position to bid in the 2019 round as it would not obtain development consent in time. Based on the information contained in Table 2 of Appendix 22 [REP1-164] it appears that the combined capacity for currently consented OWF may exceed the cap in the 2019 CfD round, assuming all of the consented schemes were to submit bids. In relation to the most recent round of the CfD process, what information is there about the combined capacity of the projects bidding for CfD as compared with the combined capacity of projects for which CfD was awarded?	The Applicant does not hold any information in relation to the total capacity of offshore wind that bid in Allocation Round 2 ("AR2") compared with the amount of offshore wind capacity awarded in AR2, as the identity and details of unsuccessful bidders are not disclosed publicly.
		Looking forward to the 2019 CfD round, how is the combined capacity of bids likely to compare with the anticipated cap?	Looking forward to Allocation Round 3 ("AR3"), it is not possible to accurately gauge the intentions of other developers and their likely bidding strategy. There is more than 6 GW of eligible offshore wind capacity that could bid in AR3, although the precise capacities, strike prices and delivery years will only be known to the bidding developer, if they chose to bid.
		Is it likely that projects that are not successful in the 2019 round will bid in the 2021 round together with Hornsea Project Three and other projects currently at application stage?	It is not possible for the Applicant to comment on the future bidding strategy of unsuccessful developers in AR3, however, if an unsuccessful project does not obtain a CfD and still meets all relevant eligibility criteria for the next auction then it would be permitted to submit bids into future auction rounds.
		If so, how is the combined capacity of bids likely to compare with the anticipated cap in 2021?	The Applicant has no information on the capacity cap in 2021 as the UK Government has not released this information.

		Having regard to the above factors, what are the prospects for Hornsea Project Three being awarded a CfD, either for the whole project or the first phase, in 2021?	Given that total remaining budget in the Levy Control Framework ("LCF") is £557m and only £60m was allocated for AR3, the Applicant is confident that there will be opportunity (and budget) for Hornsea Three to secure a CfD for either the whole project or the first phase in 2021. In any event, and as stated at ISH1 and in the Applicant's response Q2.14.3, there are other financial mechanisms to assist funding the project in the event that a CfD was not awarded.
Q2.14.3	**Applicant**	At ISH1 you made reference to potential alternative sources of funding such as power purchase agreements. Your submission for Deadline 3 [REP-003] states that there is a power purchase agreement in place for Hornsea Project One. Please provide further information about the power purchase agreement for Hornsea Project One.	Hornsea 1 has a CfD contract which will pay to Hornsea 1 Ltd the difference between the Intermittent Market Reference Price (i.e. wholesale price) and the agreed strike price within the CfD contract with the Low Carbon Contracts Company ("LCCC"). Hornsea 1 also has a Power Purchase Agreement ("PPA") for the balancing and sale of the electricity it generates at this Intermittent Market Reference Price. The precise terms of the PPA are subject to a confidentiality clause and therefore further information on this specific PPA cannot be provided.
		Aside from Hornsea Project One, are there any current or proposed examples of power purchase agreements being used to deliver OWFs either in the UK or elsewhere?	The Applicant is not aware of any current offshore wind projects that rely solely on a fixed price PPA. However, PPAs are typically commercially confidential so unless a press announcement has been made by the offshore wind farm operator the details of such a PPA would not be in the public domain.
		Assuming that the CfD process would secure a price for electricity which would exceed the anticipated market price, how is it that a power purchase agreement can be viable in the current energy market?	A PPA in the UK power market provides balancing services and access to the wholesale electricity market. On top of the PPA, the CfD is required to provide revenue certainty to generators and investors and the top up to the agreed strike price within the CfD contract. The degree to which an offshore windfarm is viable depends on the price it is able to sell its electricity at (from PPAs and other subsidised support systems) relative to its costs. This will differ from project to project, although it may be possible for an offshore windfarm to rely solely on a PPA at the wholesale market price in future.
Q2.14.4	**Applicant, The Crown Estate**	Please provide an update regarding consents under section 135(1) and 135(2) of PA2008.	Discussions with the Crown Estate are ongoing and the Applicant hopes to have reached an agreement with the Crown Estate and obtained consent pursuant to s135 of the PA 2008 prior to the end of the Examination.

Q2.14.5	**Applicant**	Please provide an update regarding any discussions with Statutory Undertakers and the requirements of sections 127 and 138 of PA2008.	An update on the status of discussions with statutory undertakers set out in the Updated Appendix C to the Statement of Reasons (submitted for Deadline 4) and referred to in Annex A – Schedule of Objection to Granting of Compulsory Acquisition Powers Revision 1 (submitted for Deadline 4).
		Please provide any information which may assist the Secretary of State in considering sections 127 and 138 in the event that there are representations from any Statutory Undertakers that have not been withdrawn before the end of the examination.	The Applicant notes that none of the Statutory Undertakers have objected to Hornsea Three in principle or made submissions raising any technical or safety concerns relating to the proximity of their apparatus to Hornsea Three. All of the Statutory Undertakers that have submitted representations have confirmed that any interaction between their apparatus and Hornsea Three can be effectively managed using protective provisions. For the reasons set out in Section 1.9.2 of the Statement of Reasons (APP-032) and the Updated Appendix B to the Statement of Reasons (submitted for Deadline 4), adequate protection for the Statutory Undertakers will be included within protective provisions in Schedule 9 of the Order and/or asset protection agreements between the parties. The Applicant therefore considers that the construction, operation and maintenance of Hornsea Three (subject to the protective provisions) can be undertaken without causing serious detriment to the carrying on of any Statutory Undertaker's undertaking. The Applicant considers that the tests set out in section 127(6)(a) of the PA 2008 are therefore satisfied.
			The Applicant is hopeful that it will reach agreement on the drafting of the protective provisions with each of the remaining Statutory Undertakers prior to the end of the Examination. In the event that agreement has not been reached, the Applicant will include its preferred protective provisions in the final version of the draft DCO to be submitted for Deadline 8 and set out why it considered the draft protective provisions to be adequate. In respect of s138 of the PA 2008, the construction of Hornsea Three will require interference with Statutory Undertakers' land and the possible relocation of their apparatus and electronic communications apparatus. However, the exercise of such powers will be carried out in accordance with the protective provisions which set out constraints on their exercise with a view to safeguarding the Statutory Undertakers' and electronic communications apparatus owners' interests. The Applicant therefore considers that the test set out section 138 of the PA 2008 is satisfied.

Q2.14.6	**Applicant**	Our written question Q1.14.48 referred to "landlocked plots". Please explain why it would not be appropriate to list all persons with interests in "landlocked plots" as Category 3 persons in Part 2b of the Book of Reference.	Part 2b of the Book of Reference includes the names of persons who do not have an interest in the Order limits who may be eligible to make a relevant claim. The Applicant is not aware of any persons with an interest in a "landlocked plot" that may be eligible to make a relevant claim who do not have an interest in the Order limits. Where the owner of a "landlocked plot" is also the owner of land within the Order limits then any claim for compensation would be for injurious affection and/or severance and not a relevant claim. For this reason, it would not be appropriate to list the owner in Part 2b of the Book of Reference as the owner is a Category 1 person listed in Part 1 of the Book of Reference. Where a person with an interest in a "landlocked plot" also has an interest in the Order land, for example the owner of the landlocked plot has a right of way across the Order land, then the person is a Category 2 person and is listed in Part 2a of the Book of Reference. For this reason, it would not be appropriate to list the owner in Part 2b of the Book of Reference as Part 2b is only for persons without an interest in the Order limits.

1.15 Written Question 2.15 General

PINS Ref. No.	Question is addressed to:	ExA Question	Response
Q2.15.1	**Applicant**	Questions Q2.15.1 Applicant Paragraphs 4.8.5 and 4.8.6 of the Overarching National Policy Statement for Energy (EN-1) state that Applicants must consider the impacts of climate change when planning the location, design, build, operation and, where appropriate, decommissioning of new energy infrastructure, having regard to the latest UK Climate Projections available at the time the ES was prepared. How has this requirement been addressed in the design of Hornsea Project Three, in relation to both the onshore and the offshore infrastructure?	Hornsea Three supports government policy to reduce greenhouse gas emissions and is a key instrument of implementing the policy by providing a source of renewable energy. The operation of Hornsea Three will bring climate change benefits. The vulnerability of Hornsea Three to climate change has been taken into account in the site selection process: electricity power generating stations are classified as "essential infrastructure" in the Technical Guidance to the National Planning Policy Framework. Both the onshore HVAC booster station and the onshore HVDC converter/HVAC substation are located in Flood Zone 1 (defined as land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding). In terms of surface water flooding, the majority of the onshore HVAC booster station and onshore HVDC converter/HVAC substation areas are at "very low risk": localised areas along the north eastern and north and western boundary are defined at being at "low risk" of surface water flooding.

			The detailed design of the onshore HVAC booster station and HVDC converter/HVAC substation will include measures to provide resilience to the impacts of climate change. For example, all surface water drainage features (including pipes, manhole chambers, attenuation system and/or infiltration features) will be sized to store surface water runoff generated on site for rainfall event up to 1 in 100 year including 40% climate change effect. The Environment Agency's latest advice on climate change allowances has been taken into account in the flood risk assessments undertaken for the onshore HVAC booster station, HVDC converter/HVAC substation and onshore cable corridor (see Volume 6, Annex 2.1: Onshore Infrastructure Flood Risk Assessments (Document Reference A6.6.2.1)). Attenuation requirements have been calculated and outline drainage strategies have been prepared based on the indicative layouts. These drainage strategies follow the SuDS hierarchy and are based on parameters agreed with the Lead Local Flood Authority. Detailed strategies will be prepared once the layout of the onshore HVAC booster station and HVDC converter/HVAC substation have been agreed.
			Schedule 4 (3) also states that the Environmental Statement should provide *"an outline of the likely evolution thereof without implementation of the development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge*". Climate change has been taken into account in the technical chapters of the Environmental Statement in terms of the characterisation of the baseline and future baseline scenarios. Where appropriate, receptors sensitive to climate change have been identified within the study areas of each chapter and the likely changes in the baseline scenario have been identified.

			From an offshore perspective, consideration has been given to the potential changes to the environment that may occur over the lifetime of the project due to climate change, as predicted by UKCOP09 (United Kingdom Climate Projections 2009). These potential changes are described within Volume 2, Chapter 1: Marine Processes of the Environmental Statement (APP-061). This includes consideration of the potential for changes to mean sea level, storm surges and the wave climate. These changes have been considered within the assessment of potential impacts where appropriate. In terms of the design of Hornsea Three's offshore infrastructure, the main implication of potential changes due to climate change occurs at the coastline, with the export cable landfall being particularly relevant in this regard. As described in the Applicant's response to Question 2.15.4 below and in Paragraph 1.7.1.67 of Volume 2, Chapter 1: Marine Processes of the Environmental Statement (APP-061) and Sections 6.4.7 and 6.4.8 of Volume 5, Annex 1.1: Marine Processes Technical Report of the Environmental Statement (APP-101), the Applicant has considered the envelope of historical morphological changes (such as coastal erosion and recession) experienced at the location of the landfall. This quantified understanding of past beach changes at the landfall will feed into the detailed engineering design, to minimise the risk of cable exposure. In addition, appropriate allowance will be made for the potential influence of climate change (which for example may lead to sea level rise and influence future rates of beach erosion).

Q2.15.2	**Applicant**	Paragraph 2.3.4 of the National Policy Statement for Renewable Energy Infrastructure (EN-3) considers climate change in the context of Offshore Wind Farms (OWF) and states that Applicants should set out how a proposal would be resilient to storms. In relation to the offshore infrastructure, how has this requirement been addressed in the design of Hornsea Project Three?	As noted within the Applicant's response to Question 2.15.1 above, the potential changes to the environment that may occur over the lifetime of the project due to climate change, as predicted by UKCOP09 (United Kingdom Climate Projections 2009). are described within the Volume 2, Chapter 1: Marine Processes of the Environmental Statement (APP-061). In terms of storms, the Applicant has noted (Volume 2, Chapter 1: Marine Processes of the Environmental Statement) the large degree of uncertainty that exists and the associated lack of consensus on future storm and wave climate. Notwithstanding this uncertainty, the Final design for Hornsea Three's offshore infrastructure will take into account the wind and wave climate, sea current, tidal and seabed and soil conditions. In order to gain as good an understanding as possible of the conditions at site; for this, the Applicant has commissioned an extensive and thorough measurement campaign, including wind, waves, currents, tides and ground conditions. In addition, the Applicant has strong experience in the general area and will benefit from measurement campaigns undertaken for nearby offshore windfarms. Finally, the Applicant has invested in developing in-depth expertise and experience of its engineering teams. These data and experience will then inform a model for the long term wind and metocean conditions at the Hornsea Three site. Hornsea Three's offshore infrastructure will then be designed to withstand any extreme events, such as storms, during the lifetime of the Project. Secondly the windfarm and wind turbines are designed to monitor and respond to extreme weather events in order to protect themselves. For example, the wind turbines shut down at high wind speeds, bearing in mind that modern wind turbines are able to successfully operate at windspeeds up to Storm Force 10 (when wave heights can be above 10m) hence this occurs relatively rarely. It should be noted that the electrical infrastructure is able to continue to operate under all weather conditions.

Q2.15.3	**Applicant**	Paragraph 4.5.3 of the Overarching National Policy Statement for Energy (EN-1) seeks to ensure that energy infrastructure developments are sustainable and as attractive, durable and adaptable as they can be, taking into account both functionality (including fitness for purpose and sustainability) and aesthetics. How has Hornsea Project Three demonstrated good design in terms of functionality, including fitness for purpose, sustainability and being durable and adaptable? (Please note that the ExA will consider aesthetics in the context of landscape and visual impacts).	The Applicant considers that the site selection process, design development, maximum design parameters, construction methodology and design principles and objectives for Hornsea Three demonstrate good design in accordance with paragraph 4.5.3 EN-1. The design of Hornsea Three, including all onshore and offshore elements, is set out in detail Volume 1, Chapter 3: Project Description of the Environmental Statement [APP-058]. The development of the design was informed by both statutory and non-statutory consultation from the earliest stages of the project, as detailed in the Consultation Report (APP-034), including a wide range of stakeholders and communities potentially impacted by the development. In terms of the overall project design for an energy infrastructure project, the siting of the required elements forms an important part of satisfying the requirement for good design. Onshore, site selection has been used to ensure that technical and other criteria are balanced against the objective for Hornsea Three to relate well to the receiving environment, such that careful site selection contributes to good design. With regard to the offshore design the siting of the offshore wind farm has been determined through an iterative process requiring both environmental and engineering input at an increasingly detailed scale, and was widely consulted upon at every stage. As referred to in paragraph 4.5.2 of EN1 good design in terms of "siting and use of appropriate technologies can help mitigate adverse impacts". This principle has been applied to the offshore elements of Hornsea Three where the process of identifying and reducing impacts on different ecological and human environmental receptors informed the development of the site boundary. This process will be taken further when undertaking the detailed design in respect of any micrositing to avoid ecological or archaeological features. Full detail on the site selection process presented in Volume 1, Chapter 4: Site Selection and Consideration of Alternatives of the Environmental Statement [APP-059] illustrates how policy, technical, commercial, environmental considerations and consultation feedback have been considered in detail, to identify the most suitable site taking into consideration the concept of good design as set out in EN-1.

			The offshore and onshore elements of Hornsea Three are defined and fixed in design as far as they can reasonably be at this stage. However, the components of the authorised development (as defined in Schedule 1 of the dDCO (submitted for Deadline 4)) and the maximum design parameters have been selected to ensure that Hornsea Three will be functional, fit for purpose and durable for the purpose of delivering renewable energy, while retaining the necessary degree of flexibility at this stage in the delivery of the project. As set out in the Applicant's response to the ExA's second written questions submitted at Deadline 4 (Q2.8.3), there are a variety of technical details which remain uncertain, for example the use of HVDC or HVAC, each of which will determine the size, layout and shape of the onshore HVDC converter/HVAC substation (although all scenarios would remain within the parameters as set out in the Onshore Limits of Deviation [APP-026]). As a result of this uncertainty, the onshore HVDC converter/HVAC substation has been designed to facilitate a variety of voltage levels, different electrical configurations (monopoly or bipol), different suppliers and different technologies (HVAC and HVDC). This flexibility ensures that the design of Hornsea Three will be fit for purpose regardless of the capacity or phasing that is ultimately selected. .

			The Applicant's response to the ExA's second written questions, Q2.15.1 and Q2.15.2, set out how Hornsea Three has been designed taking into account climate change, to ensure the project's durability, adaptability and sustainability during its proposed operational lifetime. The Applicant would note that although the functional relationship between the onshore HVDC converter/HVAC substation, onshore HVDC booster station and the onshore export cable, as well as the Norwich main substation, will significantly contribute to the design and orientation of buildings and equipment, particular attention has been given to the aesthetic design of the Hornsea Three where possible in order to minimise potentially adverse impacts and to seek to create a development which is sympathetic to its setting. Design measures have been adopted by Hornsea Three in relation to landscape character, as set out in section 4.10 of Volume 3, Chapter 4 of the Environmental Statement and the OLMP (Appendix 4, version 2 submitted at Deadline 4). Detailed design will commence post-consent, should the DCO be granted. To inform this detailed design, the Applicant has identified design objectives and principles for the above ground permanent infrastructure (the onshore HVDC converter/HVAC substation and onshore HVAC booster station) as set out in Appendix 5 of the Applicant's submission at Deadline 4. Application of these principles is considered to ensure the best possible design response (in respect to aesthetics) to the local context of the onshore HVAC booster station and onshore HVDC converter/HVAC substation. Under Requirement 7 of the dDCO (submitted for Deadline 4), details including the layout, scale, finished ground levels, external appearance, materials, access and circulation areas, and timetables for the landscaping works at the HVAC booster station and HVDC converter/HVAC substation respectively will be submitted to and approved by the relevant planning authority prior to commencement of construction of each element. The details submitted must be in accordance with the limits of deviation set out in Onshore Limits of Deviation [APP-026] and substantially in accordance with the design objectives and principles (Appendix 5 of the Applicant's submission at Deadline 4).

Q2.15.4	**Applicant**	NNDC suggests [REP3-103] that if the landfall cables were installed using open cut methods they would be at a relatively shallow depth and therefore liable to be exposed by coastal erosion. A) What assessment has been made of the amount of coastal erosion that may be expected during the lifetime of the project?	

			A) Paragraph 1.7.1.67 of Volume 2, Chapter 1: Marine Processes of the Environmental Statement (APP-061) and sections 6.4.7 and 6.4.8 of Volume 5, Annex 1.1: Marine Processes Technical Report of the Environmental Statement (APP-101) include assessments of changes to beach morphology (such as coastal erosion) at the nearshore and intertidal area. Due to the complexity of coastal systems generally and the long timescales associated with coastal change, numerical modelling was not considered likely to provide a reliable means by which to determine the envelope of morphological variation that might occur at the landfall during the lifetime of Hornsea Three. Instead, a quantitative analysis was undertaken to determine the range of historical natural variability experienced at the landfall, including patterns and trends of erosion and accretion. These patterns of variability are generally anticipated to continue for the lifetime of the development. The assessment involved analysis of recent and historic beach monitoring data in the form of beach profile data (1991 – 2011) and LiDAR data (1999 - 2014). The analysis enables evaluation of changes in beach elevation (vertical changes) and coastal recession (horizontal changes in the position of the Mean High Water Springs (MHWS) mark. In terms of beach elevation, changes of up to approximately 3 m were observed in the data, although this was highly spatially variable with the greatest changes occurring MHWS mark. In terms of coastal recession, the position of MHWS remained relatively constant through the data period reviewed (i.e. 1991 to 2011), with no clear year on year trend of erosion. However, it is known that the landfall area is characterised by ongoing cliff retreat with long term rates of approximately 0.5 m/yr along the frontage of the wider shoreline between Kelling to Sheringham (see Paragraph 1.7.1.67 of Volume 2, Chapter 1: Marine Processes of the Environmental Statement). The Environment Agency are in agreement with the Applicant on all points relating to marine processes within their remit (REP1-203). It is in the interests of the Applicant that the cables at the landfall remain sufficiently buried throughout the lifetime of the project and therefore the understanding of beach dynamics at the landfall (as derived from the

			aforementioned analyses) will feed into the detailed engineering design (for example deciding the exact burial depth), to minimise the risk of cable exposure.
		B) What level of confidence is there that open cut installation at the landfall would be a durable design solution?	B) The Applicant has a high level of confidence that the open cut installation of cables at the landfall is a durable design solution, as any design would account for beach morphology, marine processes and climate change. As the export cables will be buried at a sufficient depth below the base of the mobile beach sediment, they will be protected by the trench backfill and by existing beach gravel. Considering the evidence described in part A, which states that the variability observed in the 1991-2011 period is expected to continue through the lifetime of the project, it is unlikely that the cables will be exposed.
		C)In the event that cables were to become exposed due to coastal erosion, what mitigation measures may be required?	C) As demonstrated in parts A and B of this question, it is unlikely that the cables will become exposed due to coastal erosion. However, the Applicant has addressed this potential outcome in paragraph 6.4.7.8 of the Marine Processes Technical Report [APP-101]. *"If a section of cable does become exposed, it might locally influence beach processes and morphology at a scale proportional to the diameter of the cable (order of a few 10s of cm) and the length of the exposed section. If the exposure occurs due to a short-term localised lowering of the beach level (e.g in response to storm activity), it is also possible that the cable section will become naturally reburied by a similar process over time (order of hours during a storm or order of days to month during more benign conditions) as the beach returns to an equilibrium state. If the exposure is due to longer-term changes in wave climate, sediment supply or coastal morphology, the exposed cable section may need to be reburied (using similar methods to that used for the initial installation, with similar potential impacts). If more than one section of the Hornsea Three cable is exposed at any one time, the potential impacts of each cable are likely to be localised to a distance much smaller than the separation between them."*

		D)Would the landfall cables require any particular measures at the decommissioning stage?	D) The Applicant notes that a description of decommissioning plans, including the landfall area, are provided in Section 3.14 of 6.1.3 ES Volume 1 - Ch 3 - Project Description [APP-058]. To minimise the environmental disturbance during decommissioning, the preferred option is to leave cables buried in place in the ground with the cable ends cut, sealed and securely buried as a precautionary measure.
Q2.15.6	Applicant, NNDC, BDC and SNC	The Outline CoCP [REP1-142] includes several matters where agreement is required between the Applicant and other parties. For example, paragraph 4.1.1.6 requires that certain activities may take place on a continuous working basis subject to obtaining agreement with the relevant local authority Environmental Health Officer. Should details be provided within the Outline CoCP of what the procedure and timescales should be for the matters where such agreements are required?	The Outline CoCP references further agreement from authorities such as the highways authority (in this instance typically Norfolk County Council). In such instances, agreement will be secured through the various CTMPs in accordance with requirements under Section 59 of the Highways Act 1980. Where agreement is required for any works to or diversion to a public right of way, these will be secured through the various CTMPs. In relation to the example cited by the ExA, consent for continuous working (subject to obtaining agreement with the relevant local authority Environmental Health Officer) is secured under Section 61 'Prior consent for work on construction sites' of the Control of Pollution Act 1974 (or similar mechanism as deployed by each relevant authority). Section 61 provides a process for this agreement, as it prescribes that the local authority shall inform the applicant of its decision on the application within twenty-eight days from receipt of the application. The Applicant refers to its response to Q2.12.7 regarding amendments proposed to the Outline CoCP which lists activities which may be undertaken on a continuous working basis. If other agreements are required, perhaps from other agencies or authorities, these agreements will need to be secured by the Applicant or LPA before the final CoCP is approved by the relevant LPA.

Q2.15.7	**Applicant**	An onshore decommissioning plan would have to be submitted for approval pursuant to Requirement 23 of the dDCO [REP1-133]. Please provide an outline of the matters and measures that would be included in the onshore decommissioning plan.	The Applicant notes that a description of onshore decommissioning plans, including onshore export cables, joint bays, link boxes, and onshore HVDC converter/HVAC substation and HVAC booster station components, are provided in Volume 1, Chapter 3:- Project Description of the Environmental Statement [APP-058]. An onshore decommissioning plan will be submitted for approval to the local planning authorities post consent and before onshore construction commences. The decommissioning plan will be drafted in accordance with the latest guidance on decommissioning works at the time of submission, in consultation with the local planning authorities and relevant stakeholders and based on the technology available at the time of drafting of the plan. The onshore decommissioning plan will aim to maintain some flexibility so that any technological developments or changes in guidance at the end of the lifetime of the project can be accommodated in accordance with best practice.