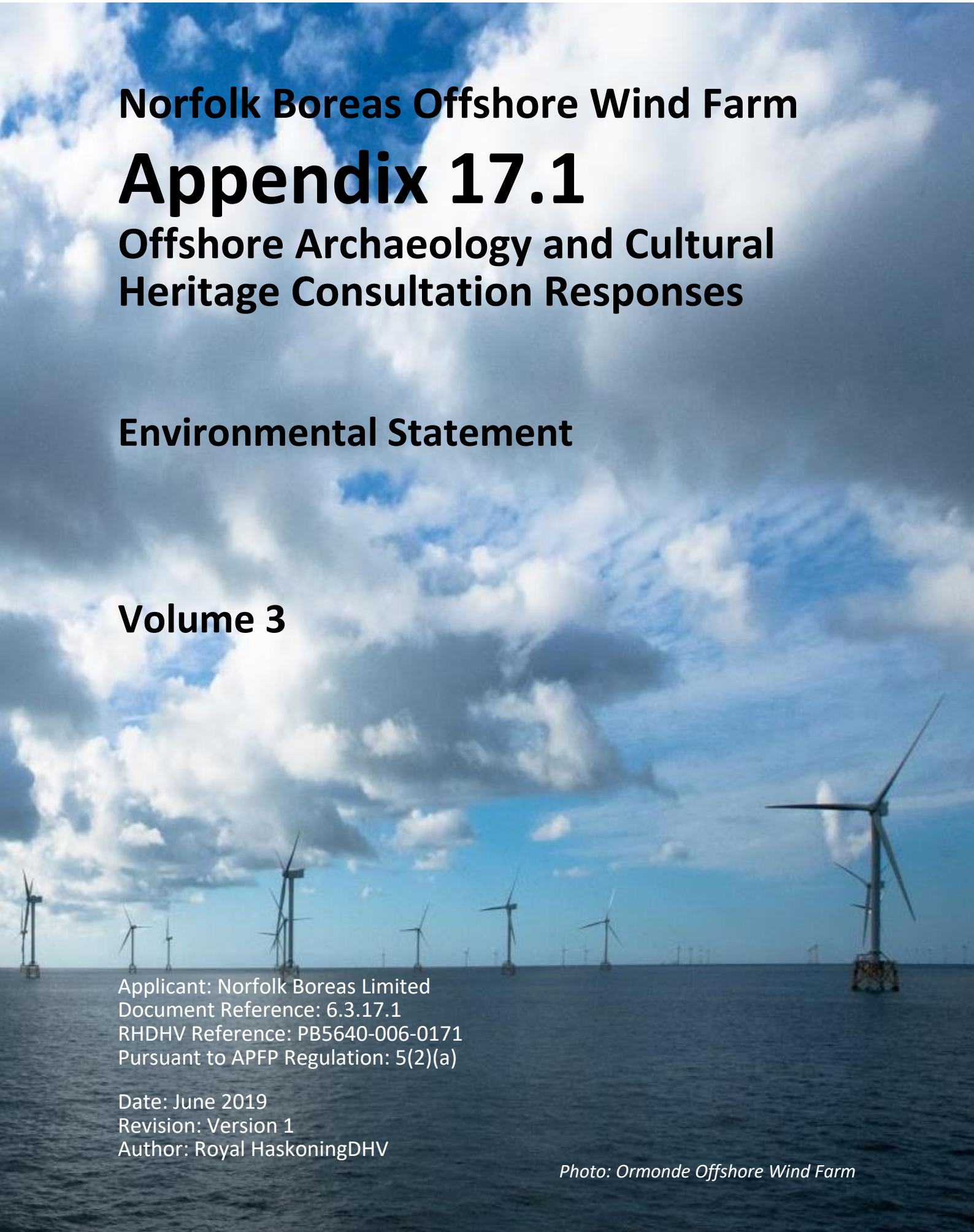
Norfolk Boreas Offshore Wind Farm

Appendix 17.1

Offshore Archaeology and Cultural Heritage Consultation Responses

Environmental Statement

Volume 3



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27/03/2019	02D	Second draft for Norfolk Boreas Limited review	VC	DT	JL
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Glossary of Acronyms

AEZ	Archaeological Exclusion Zones
AHOB	Ancient Human Occupation of Britain
EIA	Environmental Impact Assessment
ES	Environmental Statement
ETG	Expert Topic Group
HDD	Horizontal Directional Drilling
LVIA	Landscape and Visual Impact Assessment
MMO	Marine Management Organisation
PAB	Pathways to Ancient Britain
PEIR	Preliminary Environmental Information Report
UXO	Unexploded Ordnance
WCS	Worst Case Scenario
WSI	Written Scheme of Investigation

Glossary of Terminology

Norfolk Boreas site	The Norfolk Boreas wind farm boundary. Located offshore, this will contain all the wind farm array.
Norfolk Vanguard OWF sites	Term used exclusively to refer to the two-distinct offshore wind farm areas, Norfolk Vanguard East and Norfolk Vanguard West (also termed NV East and NV West).
Offshore cable corridor	The corridor of seabed from the Norfolk Boreas site to the landfall site within which the offshore export cables will be located.
Offshore project area	The area including the Norfolk Boreas site, project interconnector search area and offshore cable corridor.
Palaeogeographic features	Features seen within sub-bottom profiler data (buried) and multibeam bathymetry data (sea floor) interpreted as representing prehistoric physical landscape features such as former river channels (palaeochannels).
Project interconnector cable	Offshore cables which would link either turbines or an offshore electrical platform in the Norfolk Boreas site with an offshore electrical platform in one of the Norfolk Vanguard sites.
Project interconnector search area	The area within which the project interconnector cable would be buried.
Seabed features	Features seen on the seafloor in the sidescan sonar or multibeam bathymetry data which are interpreted to represent heritage assets, or potential heritage assets. Also includes magnetic anomalies which may represent shallow buried ferrous material of archaeological interest.

1 Introduction

1. Consultation is a key driver of the Environmental Impact Assessment (EIA) process, and throughout the lifecycle of the project, from the initial stages through to consent and post-consent.

2. This appendix contains the results of all the consultation responses which have been used to inform the Norfolk Boreas assessment for offshore archaeology and cultural heritage. Norfolk Boreas Limited is in the process of conducting ongoing EIA consultation on the project. This ongoing process is documented in full in the Consultation Report which forms part of this DCO submission and has been submitted alongside this Environmental Statement (ES).

2 Consultation responses

3. Consultation specific to offshore archaeology and cultural heritage which has informed the preparation of this ES is detailed in Table 2.1. Specific consultation responses comprise:

   - Consultation with Historic England on the scope and methods used for collecting survey data (2017) during which Historic England confirmed that they had no comment to make on the proposed methodology;
   - The Planning Inspectorate Scoping Opinion to the Norfolk Boreas Scoping Report (Royal HaskoningDHV 2017);
   - Consultation with Historic England on the Norfolk Boreas Offshore Archaeology Method Statement (Royal HaskoningDHV, 2018 unpublished);
   - The Expert Topic Group (ETG) meeting held 8th March 2018; and
   - Consultation undertaken by the Norfolk Vanguard Offshore Archaeology ETG

4. Feedback received during this consultation process to date has been incorporated into the ES wherever possible. Within Table 2.1, consultation responses and discussion points are paraphrased as necessary and not produced verbatim.

5. Furthermore, account has also been taken of consultation for Norfolk Vanguard, including Historic England's Written Representation to the DCO submission. These are also included in Table 2.1.

6. Full details of the project consultation process are presented within Chapter 7 Technical Consultation.

Table 2.1 Offshore Archaeology and Cultural Heritage Consultation Responses

Consultee	Date & Document	Comment	Response/where addressed in the ES
The Planning Inspectorate (Secretary of State)	June 2017/Scoping Opinion	The Scoping Report proposes to scope out impacts to the setting of onshore heritage assets from the offshore elements of the Proposed Development during construction and operation. This is because the turbines would be located approximately 72km from the coast and would not be viewed from the shore. The SoS agrees that this can be scoped out.	Scoped out of onshore assessment in Chapter 28 (Onshore Archaeology and Cultural Heritage)
The Planning Inspectorate (Secretary of State)	June 2017/Scoping Opinion	The SoS welcomes the proposed production of a project Written Scheme of Investigation (WSI) and recommends that a draft WSI is provided with the DCO application.	An Outline WSI is provided (document reference 8.6).
Historic England via The Planning Inspectorate (Secretary of State)	June 2017/Scoping Opinion	The Protection of Military Remains Act 1986 will have specific relevance to this project should the project encounter any military aircraft or vessels either within the electricity export cable corridor or offshore turbine array area.	There are no sites within the study area that are subject to statutory protection from the Protection of Military Remains Act 1986. It is understood that aircraft lost while in military service are automatically protected under this Act (Chapter 17 section 17.6.2).
Historic England via The Planning Inspectorate (Secretary of State)	June 2017/Scoping Opinion	To address impacts as might be associated with long HDD in the intertidal and shallow subtidal areas such matters as relevant to the historic environment would need to be considered within the offshore Archaeology and cultural heritage chapter.	The intertidal baseline is set out in Chapter 17 section 17.6.3 and the impacts of long Horizontal Directional Drilling (HDD) considered n section 17.7.6.
Historic England via The Planning Inspectorate (Secretary of State)	June 2017/Scoping Opinion	At the proposed landfall location coastal erosion (10m per year at Happisburgh) needs to be further explored.	Baseline erosion conditions are considered in Chapter 8 Marine Geology, oceanography and physical processes and Chapter 19 Ground conditions and Contamination.
Historic England via The Planning Inspectorate (Secretary of State)	June 2017/Scoping Opinion	Historic characterisation indicates the presence of prehistoric landscape features and the potential for the presence of prehistoric sites and finds. Furthermore, the potential also exists to encounter vessels and aircraft through the identification of specific spatial locations	Each of these topics is discussed as part of the existing environment in Chapter 17 section 17.6. The assessment of geophysical and geotechnical data has been undertaken by Wessex Archaeology.

Consultee	Date & Document	Comment	Response/where addressed in the ES
		that merit further attention as part of the EIA exercise for this proposed development including corroboration with geophysical and geotechnical survey data.	
Historic England via The Planning Inspectorate (Secretary of State)	June 2017/Scoping Opinion	We agree that avoidance is the most appropriate strategy and support the use of defined Archaeological Exclusion Zones (AEZs). However, should the project inadvertently encounter any features of possible archaeological or historic interest the Offshore Renewables Protocol for Archaeological Discoveries (ORPAD), as published by The Crown Estate, in 2014 would need to be employed.	The use of AEZs and a formal protocol for archaeological discoveries forms part of the embedded mitigation set out in Chapter 17 section 17.7.2.
Historic England via The Planning Inspectorate (Secretary of State)	June 2017/Scoping Opinion	Matters to do with potential cumulative impacts with specific reference to Norfolk Vanguard should also be considered further through the PEIR especially as and when geophysical and geotechnical survey interpretation can support desk-based sources of information.	Cumulative impacts are discussed in Chapter 17 section17.8.2.
Historic England via The Planning Inspectorate (Secretary of State)	June 2017/Scoping Opinion	Potential cumulative impacts would need to include reference to other offshore wind farms where relevant to this project, specifically other offshore arrays such as the East Anglia series.	Cumulative impacts are discussed in Chapter 17 section 17.8.2.
Historic England via The Planning Inspectorate (Secretary of State)	June 2017/Scoping Opinion	A WSI should be directly produced in reference to geophysical and geotechnical surveys as planned for summer/autumn 2017 as supplemented by suitable data as might have been acquired previously for the Norfolk Vanguard project. An outline WSI would need to be included within the PEIR. We add also that all new programmes for data acquisition must ensure that archaeological objectives are included as part of project planning.	Consultation with Historic England on the scope of geophysical and geotechnical surveys was carried out prior to surveys commencing in 2017. At that stage Historic England confirmed they had no comment on the scope or methods used in the surveys. An Outline WSI is provided (document reference 8.6).

Consultee	Date & Document	Comment	Response/where addressed in the ES
Historic England via The Planning Inspectorate (Secretary of State)	June 2017/Scoping Opinion	The design of the proposed development needs to be sensitive to the potential and significance of the archaeology in the area of the landfall at Happisburgh and investigate it appropriately in order to mitigate any potential damage. Given the significance and age of the archaeological finds and associated Cromer Forest Bed (CF-bF) deposits further assessment and consultation with the appropriate specialists may be needed in order to determine the level of impact and whether this would be harmful to the significance of these deposits.	A specific independent academic steering group has been established, including members of the Ancient Human Occupation of Britain (AHOB) project and Pathways to Ancient Britain (PAB) research teams. The selection of the long HDD option means that there will be no effect upon the beach and nearshore zone.
Historic England via The Planning Inspectorate (Secretary of State)	June 2017/Scoping Opinion	Indirect impacts may occur through changes to the hydrodynamic and sedimentary processes, which will be modelled and assessed in terms of the likely impacts. This may require a programme of on-going monitoring to be implemented in the area of the proposed development to ensure that any negative impacts are identified. If these impacts exceed an agreed threshold, a mitigation strategy would then need to be implemented to ensure that any vulnerable assets are investigated appropriately.	Impacts associated with changes to the hydrodynamic and sedimentary processes are discussed in Chapter 17 sections 17.7.6.3, 17.7.7.3 and 17.7.8.3. Provisions for monitoring are discussed in Chapter 17 section 17.7.3.
Historic England via The Planning Inspectorate (Secretary of State)	June 2017/Scoping Opinion	Details will need to be provided as to the percentage coverage of the development area that the surveys will investigate and the depth of penetration that the sub-bottom profiler technique will achieve.	Details of the survey are summarised in Chapter 17 section 17.5.2 and detailed in Appendix 17.2 and Appendix 17.4.
Historic England via The Planning Inspectorate (Secretary of State)	June 2017/Scoping Opinion	Cores will need to be investigated using a combination of palaeoenvironmental and dating techniques; it would be useful for Historic England to review the WSI that would be prepared for this work in order to understand the strategies and techniques that will be employed, and to allow for specialist comment and peer review.	The results of geoarchaeological assessment are presented in Appendix 17.5, Appendix 17.6, Appendix 17.7 and Appendix 17.8. Consultation with Historic England on the scope for this work was carried out prior to surveys commencing.

Consultee	Date & Document	Comment	Response/where addressed in the ES
Historic England	March 2018/Response to Offshore Archaeological Method Statement	The section on Significance includes useful reference to both “negative magnitude” and “positive magnitude” and it is of interest to us how such matters are determined through the assessment exercise. For example, if positive actions are identifiable, how subsequent action could be taken through community funded projects or programmes of professional research, should this project be successful in securing consent.	The realisation of positive benefits through further research and publication, for example, will be addressed post-consent through the delivery of mitigation where necessary and as specified in the outline WSI.
Historic England	March 2018/Response to Offshore Archaeological Method Statement	We appreciate the attention to Potential Transboundary Impacts and add that this aspect of the assessment will require careful consideration about interpretation and evidences for palaeolandscapes and what collaborative networks exist that could support research between States. Furthermore, analysis will be required to determine how any interpretation of what we consider to represent historic seascape is compatible with or at variance with any comparable initiative used by any neighbouring maritime State.	Transboundary impacts are assessed in Chapter 17 section 17.9. It is considered beyond the scope of this ES to consider comparable initiatives beyond methods and guidance from the UK.
Historic England	March 2018/Response to Offshore Archaeological Method Statement	We note the inclusion of further work to produce an Outline WSI and add that such work should look to engage with Historic England and produce a version of an outline document as part of the PEIR consultation exercise.	An Outline WSI is provided (document reference 8.6).
Historic England/Norfolk County Council Historic Environment Service	March 2018/ETG Offshore Archaeology Meeting Log	A2 anomalies should be analysed for clustering as this could indicate an old or buried wreck.	This has been carried out as part of the assessment of geophysical data undertaken by Wessex Archaeology (Appendix 17.2, Appendix 17.3 and Appendix 17.4)
Historic	March 2018/ETG Offshore	Is Brown Bank Formation exposed within Norfolk Boreas	There are areas where Brown Bank outcrops at the

Consultee	Date & Document	Comment	Response/where addressed in the ES
England/Norfolk County Council Historic Environment Service	Archaeology Meeting Log	as it is in areas to the south?	surface as discussed in Chapter 17 section 17.6.1.
Historic England/Norfolk County Council Historic Environment Service	March 2018/ETG Offshore Archaeology Meeting Log	If there is a separate engineering deposit model can there be consistency between the two deposit models when naming the layers.	Inconsistencies have been resolved for the purpose of this ES in Chapter 17 section 17.6.1.
Historic England/Norfolk County Council Historic Environment Service	March 2018/ETG Offshore Archaeology Meeting Log	We appreciate the use of a narrative approach to describe possible negative and beneficial effects, although such detail must be substantiated by action to explain mechanisms for delivery should the project be successful in securing consent.	An Outline WSI is provided (document reference 8.6) which sets out the mechanisms for delivery post-consent.
Historic England/Norfolk County Council Historic Environment Service	March 2018/ETG Offshore Archaeology Meeting Log	The onshore geoarchaeological data demonstrates the presence of a 'sinkhole' at the landfall and Cromer Forest Bed Formation has not been seen. If it is present, this will be at significant depth (> 20mbgl). Therefore, HE are happy that the impacts at landfall will not be significant. This combined with the fact that the long HDD will be employed, means that there will be no impact.	Noted, see Chapter 17 section 17.7.6.
Historic England/Norfolk County Council Historic Environment Service	March 2018/ETG Offshore Archaeology Meeting Log	Agreed that the study area will correspond to the red line boundary.	Noted, see Chapter 17 section 17.5.1.
Historic England/Norfolk County Council	March 2018/ETG Offshore Archaeology Meeting Log	Agreed that there will be no separate desk-based assessment issued as a new technical report for Norfolk Boreas. The Vanguard desk-based assessment/technical	Noted, see Chapter 17 section 17.6.

Consultee	Date & Document	Comment	Response/where addressed in the ES
Historic Environment Service		report will be used for the cable corridor and the desk based assessment for the site will be brought into the chapter.	
Historic England/Norfolk County Council Historic Environment Service	March 2018/ETG Offshore Archaeology Meeting Log	Documentation to support positive impacts should be provided if they are predicted. There needs to be a link between the DCO and the WSI to ensure realisation of potential beneficial impacts.	The realisation of positive benefits through further research and publication, for example, will be addressed post-consent through the delivery of mitigation as specific in the outline WSI.
Historic England/Norfolk County Council Historic Environment Service	March 2018/ETG Offshore Archaeology Meeting Log	We would wish to see articulation of spatial extent of the Paleoenvironment within the Norfolk Boreas and Norfolk Vanguard projects and other projects to assess potential impacts.	The results of the palaeolandscape assessments for Norfolk Boreas and for Norfolk Vanguard are detailed in Appendix 17.1 and Appendix 17.4 respectively. Assessments of prehistoric landscapes undertaken for other projects have been used as reference material to inform interpretation. The spatial articulation of work undertaken for other developments is beyond the scope of this ES.
Historic England/Norfolk County Council Historic Environment Service	March 2018/ETG Offshore Archaeology Meeting Log	For cumulative impact there needs to be reference to other industries that are interested in shallow areas of the North Sea (i.e. the minerals industry). The spatial footprint of projects is not the only consideration but the palaeolandscape or historic materials which would be impacted and how this [Norfolk Boreas] project compounds the impacts.	The results of cumulative impact assessment, including consideration of all other relevant industries, are discussed in Chapter 17 section 17.8.2.
Historic England	Section 42 Consultee Response (Introduction) (07/12/2018)	Overall we are broadly supportive of the approach taken to the PIER. It is detailed and provides a thorough analysis of the historic environment in relation to this development. In particular there are good summaries of what has been identified to date and the approaches taken to produce initial impact assessments as required by the Environmental Impact Assessment (EIA) Directive	Noted, approach taken forward through to the ES (Chapter 17).

Consultee	Date & Document	Comment	Response/where addressed in the ES
		(85/337/EEC) (as amended).	
Historic England	Section 42 Consultee Response (The proposed project) (07/12/2018)	There is an area of cross over between onshore and offshore methodologies and heritage and visual impact methodologies and the LVIA report needs to consider cumulative impacts as well as the differences between landscape and seascape where it is relevant to a heritage asset, and how this will be delivered in the resulting ES.	Cross references are made throughout Chapter 17 and Chapter 28 as to where the cross over exists. Heritage setting and character considerations are presented in Chapter 28 (Onshore Archaeology and Cultural Heritage) rather than Landscape and Visual Impact Assessment (LVIA) Chapter 29.
Historic England	Section 42 Consultee Response (PEIR Chapter 3 Policy and Legislative Context) (07/12/2018)	We noted outline detail was provided about the Marine and Coastal Access Act 2009, and we suggest in reference to Marine Licensing provisions in the 2009 Act that mention is made of how the environment is defined and what it is considered to include, such as provided through section 115(2) of the 2009 Act.	This is now defined in Table 3.1 of Chapter 3 Policy and Legislative context.
Historic England	Section 42 Consultee Response (PEIR Chapter 5 Site Description) (07/12/2018)	Given the clear construction relationship between this project and the proposed Norfolk Vanguard project, any project design envelope used within the EIA exercise should be focused matters as relevant to the two implementation scenarios.	While Norfolk Vanguard may undertake some enabling works for Norfolk Boreas, these are only relevant to the assessment of impacts onshore (Chapter 28) where the two different scenarios (see Chapter 5 project description) are assessed independently. For offshore archaeology, the worst case does include project interconnector cables which could only be required if Norfolk Vanguard is constructed.
Historic England	Section 42 Consultee Response (PEIR Chapter 5 Site Description) (07/12/2018)	In our view more analysis needs to be undertaken in relation to the cumulative impact of multiple planned offshore arrays and the overall numbers of turbines.	It is acknowledged that strategic analysis in relation to the cumulative impact of multiple constructed and planned projects would facilitate greater understanding of the cumulative effect of offshore wind development within the North Sea. Although this is considered beyond the scope of an individual project Norfolk Boreas Limited are committed to making data from the Project available should a request for data be made to

Consultee	Date & Document	Comment	Response/where addressed in the ES
			them for such a strategic study.
Historic England	Section 42 Consultee Response (PEIR Chapter 5 Site Description) (07/12/2018)	Section 5.4.2.2 (Installation process) describes pre-installation works inclusive of preconstruction surveys (paragraphs 58-61), although the need for seabed preparation to facilitate construction appears to focus on risks associated with Unexploded Ordnance (UXO) and boulders without any specific reference to survey data interpretation to deliver archaeological objectives whereby identifiable anomalies of possible (or even known) archaeological interest are avoided. This same comment is applicable to Section 5.4.13 (Cable installation methods) and any ES prepared for this project must include direct consideration of this matter. The ES must assess all proposed construction methods in terms of risk of impact on any buried or near-surface archaeology and detail any suitable mitigation strategies that should be adopted as a condition of consent.	The Worst Case Scenario (WCS) for offshore archaeology (Chapter 17 section 17.7.4, Table 17.16) includes consideration of all proposed construction methods including seabed preparation (which includes UXO and boulder clearance) and the installation of offshore cabling and cable installation at the landfall. Mitigation strategies are addressed in Chapter 17 section 17.7.2 (Embedded Mitigation) and through the Outline WSI (document reference 8.6).
Historic England	Section 42 Consultee Response (PEIR Chapter 5 Site Description) (07/12/2018)	Similar analysis and strategies will be needed for the areas where it is not possible to bury the cables, and where cable protection is needed (Section 5.4.14). This is particularly important for any cable protection required at the landfall HDD exit points, when considering the potential for internationally significant archaeological remains to be present in this area.	The WCS for offshore archaeology (Chapter 17 section 17.7.4, Table 17.16) includes consideration of cable protection, including that which may be required at the landfall.
Historic England	Section 42 Consultee Response (PEIR Chapter 5 Site Description) (07/12/2018)	Any of the possible options suggested in Section 5.4.14 (Cable protection) also need to consider changes to the coastal processes, which may lead to the increased erosion of material in adjacent areas and therefore the exposure and loss of potentially significant archaeology.	The effects of cable protection are considered in detail in Chapter 8 (Marine Geology, Oceanography and Physical Processes) section 8.7.7 with specific reference to Impact 5 (Morphological and sediment transport effects due to cable protection measures within the Norfolk Boreas site and Project interconnector search area) and Impact 6 (Morphological and sediment

Consultee	Date & Document	Comment	Response/where addressed in the ES
			transport effects due to cable protection measures within the offshore cable corridor). Within the Norfolk Boreas site and Project interconnector search area it is concluded that there will be no impact from cable protection (and consequently no impact on potentially significant archaeology). Similarly, there would be no impact on coastal morphology at the cable landfall and a negligible impact upon the Haisborough, Hammond and Winterton Special Areas of Conservation (SACs), and specifically the sandbanks within the SAC.
Historic England	Section 42 Consultee Response (PEIR Chapter 5 Site Description) (07/12/2018)	We add that anchorage factors also require consideration as might be required during construction process for foundations or cables, which may impact on any near-surface or buried archaeology that is present and designated anchorages will need to be subject to analysis and mitigation.	Seabed contact by legs of jack-up vessels and / or anchors on vessels during installation are considered as part of the WCS for offshore archaeology (Chapter 17 section 17.7.4, Table 17.16) and any anchoring strategy will necessary incorporate the principles of avoidance as set out in the Embedded Mitigation (section 17.7.2) and the Outline WSI (document reference 8.6).
Historic England	Section 42 Consultee Response (PEIR Chapter 5 Site Description) (07/12/2018)	We appreciate that turbine foundation type and construction method of the offshore electrical platforms has not yet been finalised, and so a number of options are presented (see Sections 5.4.3 and 5.4.4). Information is therefore required regarding the potential impact on any buried or near-surface archaeology. Likewise scour protection may be required for the different foundation options, which would also have the potential to affect, through erosion or construction, any sea bed deposits in the adjacent areas. This in turn may result in archaeological deposits or features becoming exposed or buried. The impacts of this work will need to be discussed for the chosen option and if necessary a mitigation strategy agreed in a WSI.	Foundation options and associated scour protection requirements are considered as part of the WCS for offshore archaeology (Chapter 17 section 17.7.4, Table 17.16). Any mitigation requirement for the chosen option would be established through the mechanism of the WSI and associated Method Statements to be prepared and agreed in consultation with Historic England post-consent.

Consultee	Date & Document	Comment	Response/where addressed in the ES
Historic England	Section 42 Consultee Response (PEIR Chapter 8 Marine Geology, Oceanography and Physical Processes) (07/12/2018)	Sandbank features may contain presently unknown archaeological materials and it is therefore a relevant matter that contemporaneous survey data remains a priority requirement to determine change and potential (or burial) of sites of known or possible archaeological interest.	A requirement for the archaeological analysis of pre-construction marine geophysical data forms part of the Embedded Mitigation (Chapter 17 section 17.7.2) and is captured through the Outline WSI (document reference 8.6).
Historic England	Section 42 Consultee Response (PEIR Chapter 8 Marine Geology, Oceanography and Physical Processes) (07/12/2018)	It is relevant to note that the comments we offer here support the advice provided for the Norfolk Vanguard PEIR (our letter dated 11/12/2017) in that the shallow geology for the proposed development and electricity export cable corridor have significant potential to support palaeo-environmental objectives. We will expand on such matters further in our review of Chapter 17 (Offshore and Intertidal Archaeology).	The results of the palaeolandscape assessments for Norfolk Boreas and for Norfolk Vanguard are detailed in Appendix 17.1 and Appendix 17.4 respectively. This has been supported by geoarchaeological assessment detailed in Appendix 5, Appendix 6, Appendix 7 and Appendix 8.
Historic England	Section 42 Consultee Response (PEIR Chapter 8 Marine Geology, Oceanography and Physical Processes) (07/12/2018)	However, an additional matter to be highlighted is the possible interconnector search area which occupies the southern half of Norfolk Vanguard West (and its connection to the cable corridor) and the north-west portion of Norfolk Vanguard East. We therefore require any ES produced following this PEIR consultation exercise to include further survey methodologies as might be employed for any interconnector between Norfolk Boreas and Norfolk Vanguard.	A requirement for the archaeological analysis of pre-construction marine geophysical data forms part of the Embedded Mitigation (Chapter 17 section 17.7.2) and is captured through the Outline WSI (document reference 8.6). This would include data within the footprint of any interconnector which may be required between Norfolk Boreas and Norfolk Vanguard.
Historic England	Section 42 Consultee Response (PEIR Chapter 17 Offshore and Intertidal Archaeology and Cultural Heritage) (07/12/2018)	Table 17.8 summarises the geophysics data acquired as part of the project so far, classified as being either of Good, Average or Variable quality. A comment has been included in the 'Suitability' column regarding the potential of the results to resolve archaeological features/remains of interest, which we are pleased to see. However, the line spacing used is generally much larger than is recommended in the Historic England	It is the position of Norfolk Boreas Limited that the geophysical data acquired in support of this ES is sufficient to provide an accurate characterisation of the archaeological potential of the study area. Additional explanation is provided in Chapter 17 section 17.5.3 (Assumptions and Limitations)

Consultee	Date & Document	Comment	Response/where addressed in the ES
		Marine Geophysics guidance published 2013). We are concerned that the resolution of the resulting surveys would not be able to identify feature/deposits of archaeological interest.	
Historic England	Section 42 Consultee Response (PEIR Chapter 17 Offshore and Intertidal Archaeology and Cultural Heritage) (07/12/2018)	We accept the geophysical surveys carried out to date were intended to be preliminary surveys only, with further higher resolution and full coverage surveys planned for later on in the development process. It would therefore be appropriate to have further discussion with regards to the appropriate level of survey in relation to the above guidance and to ensure that we receive method statements for all further surveys undertaken.	The requirement to consult with Historic England on the scope of surveys post-consent to ensure that the data generated are sufficiently robust to meet archaeological objectives and to enable professional archaeological interpretation and analysis is captured through the Outline WSI (document reference 8.6).
Historic England	Section 42 Consultee Response (PEIR Chapter 17 Offshore and Intertidal Archaeology and Cultural Heritage) (07/12/2018)	The discovery of a terrestrial peat deposit in Unit 7 that covers as much as 3,500 years from the Late Devensian to the Early Holocene is potentially of great archaeological significance (paragraph 91) and therefore warrants additional work.	Following PEIR, additional work has been undertaken (Stage 4 palaeoenvironmental assessment) and the results are included as Appendix 17.8.
Historic England	Section 42 Consultee Response (PEIR Chapter 17 Offshore and Intertidal Archaeology and Cultural Heritage) (07/12/2018)	A very strong relationship and coordinated programme of delivery must exist between the IPMP and WSI, so that all post-consent data acquisition programmes are effectively synchronised.	The In principal Monitoring Plan states that the principal mechanism for delivery of monitoring for offshore archaeology is through agreement on the offshore Written Scheme of Investigation.
Historic England	Section 42 Consultee Response (PEIR Chapter 17 Offshore and Intertidal Archaeology and Cultural Heritage) (07/12/2018)	A strategy is presented in Section 17.7.5 (paragraph 169) to assess the heritage significance of each heritage asset, which states that each individual discovery will be considered independently in terms of its heritage significance and that any requirements for further data gathering or analysis would be considered on a caseby-case basis. This approach seems appropriate and we broadly agree with the results of the assessment of	Noted, approach taken forward through to the ES (Chapter 17).

Consultee	Date & Document	Comment	Response/where addressed in the ES
		importance presented in Table 17.18.	
Historic England	Section 42 Consultee Response (PEIR Chapter 17 Offshore and Intertidal Archaeology and Cultural Heritage) (07/12/2018)	Section 17.7.6.1 discusses the potential impacts to known heritage that may occur during the construction activities. We agree that it may be possible to adjust the proposed AEZs where necessary if further relevant information becomes available. It is noted thought that AEZs will not be recommended for inclusion in the "A2" category of anomalies, although the position of the anomalies will be avoided through a scheme of micro-siting. If the anomalies cannot be avoided then they will be investigated and recorded further prior to their removal.	Noted, approach taken forward through to the ES (Chapter 17).
Historic England	Section 42 Consultee Response (PEIR Chapter 17 Offshore and Intertidal Archaeology and Cultural Heritage) (07/12/2018)	In terms of the direct impacts to potential heritage assets, it is stated in Section 17.7.6.2 that additional information will be gathered as part of the embedded mitigation strategy. This will include a programme of geoarchaeological assessments (paragraph 185), the further examination of geotechnical and geophysical data (paragraphs 186 & 187), and the reception of prompt archaeological advice in the event of any discoveries (paragraph 188). We broadly agree with this approach, but suggest that the line spacing used in any subsequent geophysical work will need to consider the scale of the archaeological features that are being investigated and the resolution required to understand them in more detail.	Noted. The requirement to consult with Historic England on the scope of surveys post-consent to ensure that the data generated are sufficiently robust to meet archaeological objectives and to enable professional archaeological interpretation and analysis is captured through the Outline WSI (document reference 8.6).
Historic England	Section 42 Consultee Response (PEIR Chapter 17 Offshore and Intertidal Archaeology and Cultural Heritage) (07/12/2018)	It is noted that there will be changes to the physical processes during the construction phase of the proposed project, which will potentially result in increased sediment concentrations and have the potential to deposit sediments and hence raise the	Noted, approach taken forward through to the ES (Chapter 17).

Consultee	Date & Document	Comment	Response/where addressed in the ES
		seabed elevation (Section 17.7.6.3). We broadly agree with the how sediment deposition is classified as a beneficial effect upon archaeological receptors.	
Historic England	Section 42 Consultee Response (PEIR Chapter 17 Offshore and Intertidal Archaeology and Cultural Heritage) (07/12/2018)	Section 17.7.6.5 includes important detail about the potential impact of bentonite fluid outbreak occurring during the HDD process on heritage assets. It is also noted that CF-bF deposits were not recorded within the top 20m below ground level, and that if present they are expected to occur beneath the glacial tills at significant depth and beneath the HDD target depths. We therefore agree that the potential for drilling fluid outbreak to impact on archaeological materials is negligible (paragraph 209).	Noted, approach taken forward through to the ES (Chapter 17).
Historic England	Section 42 Consultee Response (PEIR Appendix 17.4: Marine Archaeological Technical Report) (07/12/2018)	The line spacings used during the surveys are predominantly at the very limit that is recommended in the Historic England guidance, or they exceed them. It is therefore possible that features of archaeological interest may not be resolved to a point that they can be adequately interpreted. We note that high precision geophysical surveys will be carried out pre-consent for the purposes of UXO identification (Section 17.7.6.2); ideally the strategy for the survey should be developed with the help of an archaeological geophysicists to ensure that the data is suitable for archaeological purposes as well, allowing any gaps in the current understanding to be filled. We recommend that such details are specified within the outline In Principle Management Plan to ensure effective coordination.	It is the position of Norfolk Boreas Limited that the geophysical data acquired in support of this ES is sufficient to provide an accurate characterisation of the archaeological potential of the study area. Additional explanation is provided in Chapter 17 section 17.5.3 (Assumptions and Limitations). The requirement to seek archaeological advice during planning offshore surveys and a recommendation to undertake a data review in order to qualify the continued suitability of the existing data and assessment (including the identification of any data gaps) is captured through the Outline WSI (document reference 8.6).
Historic England	Section 42 Consultee Response (PEIR Appendix 17.4: Marine Archaeological	It would be useful to understand how much of this data was classed as being “below average” quality, and if it is felt that any parts of this survey need to be repeated	This will be addressed post-consent as captured through the Outline WSI (document reference 8.6) which recommends that, prior to the acquisition of further

Consultee	Date & Document	Comment	Response/where addressed in the ES
	Technical Report) (07/12/2018)	(post-consent) in order to fully understand the potential for archaeological remains to be present.	survey data during the pre-construction phase, a data review be undertaken by a suitability qualified and experienced archaeological contractor in order to qualify the continued suitability of the existing data and assessment to the project, including the identification of any data gaps.
Historic England	Section 42 Consultee Response (PEIR Appendix 17.4: Marine Archaeological Technical Report) (07/12/2018)	Some of the issues with the data were caused by poor weather conditions at the time the surveys were carried out, by environmental conditions (e.g. weather noise and shallow water depths), or due to issues with data that was handed to Wessex Archaeology to process. It was subsequently stated that "it cannot be guaranteed all palaeogeographic features of archaeological potential have been identified within the areas covered by these datasets" (Section 3.3.26). The uncertainty and lack of confidence in the conclusions drawn from this data begs the questions of whether additional surveys will be required in order to fully understand the potential for archaeological remains to be present in these areas. Some of the issues noted as having a detrimental effect on the resulting data will need to be kept in mind during subsequent surveys to ensure the areas have been adequately surveys to allow archaeological features to be identified.	It is the position of Norfolk Boreas Limited that the geophysical data acquired in support of this ES is sufficient to provide an accurate characterisation of the archaeological potential of the study area. Additional explanation is provided in Chapter 17 section 17.5.3 (Assumptions and Limitations). The recommended data view captured in the Outline WSI (document reference 8.6) will inform the scope of subsequent surveys to ensure that areas have been adequately surveyed to allow archaeological features to be identified.
Historic England	Section 42 Consultee Response (PEIR Appendix 17.4: Marine Archaeological Technical Report) (07/12/2018)	65 geotechnical sampling locations have been investigated so far, but it would be useful to know if the cores still exist intact, or if they have been extruded. If the samples have been extruded, then the resolution to which this was carried out should be stated in any ES produced.	23 of the vibrocores identified as having geoarchaeological interest are stored intact at Wessex Archaeology, although they have been opened and five have been sub-sampled to inform the geoarchaeological assessment for Norfolk Vanguard.
Historic England	Section 42 Consultee	Nearly 1,400 anomalies have been classed as "A2s", and	As part of the Embedded Mitigation (Appendix 17.7.2)

Consultee	Date & Document	Comment	Response/where addressed in the ES
	Response (PEIR Appendix 17.4: Marine Archaeological Technical Report) (07/12/2018)	so a strategy will need to be developed that will mitigate the impacts that the proposed developments would have on them.	all "A2s" will be avoided where possible through design. Those which cannot be avoided will be subject to further investigation as specified in the Outline WSI (document reference 8.6).
Historic England	Section 42 Consultee Response (PEIR Appendix 17.4: Marine Archaeological Technical Report) (07/12/2018)	The early Pleistocene hominin footprints are mentioned in Section 6.1.4, as well as the archaeological material from other nearby sites. The evidence from these sites is of international significance, and so if similar features/remains are identified through works carried out as part of the Vanguard project, they will need to be assessed in an appropriate manner.	Noted. The selection of the long HDD option means that there will be no effect upon the beach and nearshore zone.
Historic England	Section 42 Consultee Response (PEIR Appendix 17.4: Marine Archaeological Technical Report) (07/12/2018)	The assessment of the finds recovered from the intertidal area demonstrated the importance and continued use of the area over time, with artefacts being recovered from the Pleistocene to the Modern day periods (Sections 6.1.4 to 6.1.15). The quantity of material recovered from the intertidal area suggests that the area is of high archaeological potential, with archaeology of international significance being recorded in the area (Section 6.2.2). We agree with this statement and would expect to see an appropriate mitigation strategy to deal with any findings, whether this involves avoidance or investigation (preservation by record) included in the ES.	Noted. The selection of the long HDD option means that there will be no effect upon the beach and nearshore zone.
Historic England	Section 42 Consultee Response (PEIR Appendix 17.4: Marine Archaeological Technical Report) (07/12/2018)	Section 9, Table 18 presents the (research) value of the seabed prehistory, highlighting that any information is of high value, with the exception of isolated discoveries of artefacts or palaeoenvironmental remains. We would agree with this statement.	Noted, approach taken forward through to the ES (Chapter 17).
Historic England	Section 42 Consultee Response (PEIR Appendix	It is stated in Section 9.1.28 that although 35 find spots have been recorded in the intertidal area dating from	The potential further material to be present within the

Consultee	Date & Document	Comment	Response/where addressed in the ES
	17.4: Marine Archaeological Technical Report) (07/12/2018)	the Palaeolithic to the Bronze Age, these artefacts have been removed and therefore will not be affected by the development. This statement is true for the artefacts that have been recovered, but the finds do highlight the potential for further material to be recovered from this area, as well as providing information on the anthropogenic activity in the area over these broad timescales.	intertidal zone is discussed in Chapter 17 section 17.6.3.
Historic England	Section 42 Consultee Response (PEIR Appendix 17.4: Marine Archaeological Technical Report) (07/12/2018)	Section 9.1.29 discusses the value of the Early Pleistocene hominin footprints discovered at Happisburgh in 2013 and the potential for further similar remains to be uncovered, which would be of high value. We would agree with this statement, as similar finds would be of international importance.	Noted, approach taken forward through to the ES (Chapter 17).
Historic England	Section 42 Consultee Response (PEIR Appendix 17.4: Marine Archaeological Technical Report) (07/12/2018)	We agree that avoidance should be used as the primary mitigation strategy for the marine archaeological resource (Sections 10.2.3 & 10.2.7). It is noted that AEZs will not be implemented for “A2” and “A3” anomalies, but that an avoidance strategy with respect to these features will be advised where possible. We feel that this approach is sensible, but the reassessment of the “A2” anomalies should occur in a timely manner to allow any additional discoveries to be taken into account when designing the development: the high resolution surveys proposed may result in some “A2” anomalies being upgraded to “A1” anomalies, or new “A1” anomalies may be identified. The resulting AEZs would therefore need to be taken into account in terms of positioning the array and cable corridor and spatial data for any agreed AEZs included within other relevant project documentation as will accompany any	Noted, approach taken forward through to the ES (Chapter 17). The final avoidance strategy in terms of the application of AEZs and micrositing to avoid A2 anomalies and A3 recorded sites will be informed by further survey to be undertaken post-consent, as captured through the Outline WSI (document reference 8.6).

Consultee	Date & Document	Comment	Response/where addressed in the ES
		subsequent DCO application.	
Historic England	Section 42 Consultee Response (PEIR Appendix 17.6: Outline Written Scheme of Investigation (Offshore)) (07/12/2018)	The outline written scheme of investigation presented in this document is generally good, being thorough, sensible and appropriate. It states the need for collaboration and communication with non-archaeological specialists. We were pleased to see this as it will ensure that a joined-up and efficient approach is maintained that maximises opportunities whilst minimising the risk of duplication of effort.	Noted. This is maintained in the Outline WSI submitted as part of the DCO application (document reference 8.6).
Historic England	Section 42 Consultee Response (PEIR Appendix 17.6: Outline Written Scheme of Investigation (Offshore)) (07/12/2018)	The embedded mitigation approaches that will be employed as part of the project (Section 7.1) are proportionate, as they are focused on avoidance of archaeological remains where possible by including archaeologists at the planning and execution stages of each phase of works.	Noted. This is maintained in the Outline WSI submitted as part of the DCO application (document reference 8.6).
Historic England	Section 42 Consultee Response (PEIR Appendix 17.6: Outline Written Scheme of Investigation (Offshore)) (07/12/2018)	We are also pleased to see that key guidance documents are cited within the document, such as the Model Clauses for Archaeological Written Schemes of Investigation (Crown Estate, 2010) and the Historic England Marine Geophysics guidance (2013).	Noted. This is maintained in the Outline WSI submitted as part of the DCO application (document reference 8.6).
Historic England	Section 42 Consultee Response (PEIR Appendix 17.6: Outline Written Scheme of Investigation (Offshore)) (07/12/2018)	We note that method statements for each package of works will be prepared under the requirements of the final Offshore WSI (paragraph 41), which will be agreed in consultation that Historic England, as provided for through any DCO.	Noted. This is maintained in the Outline WSI submitted as part of the DCO application (document reference 8.6).
Historic England	Section 42 Consultee Response (PEIR Appendix 17.6: Outline Written Scheme of Investigation (Offshore)) (07/12/2018)	It is stated in Section 9.1, paragraph 45 that each archaeological report will include a statement regarding the potential of the results, but it would also be useful to understand any limitations as well. For example, did bad weather impact the resolution available from the	The Outline WSI has been amended to incorporate a requirement to identify limitations in the data.

Consultee	Date & Document	Comment	Response/where addressed in the ES
		geophysics surveys? Identifying limitations in the data will help identify gaps that currently exist in our understanding and knowledge for the sites in question.	
Historic England	Section 42 Consultee Response (PEIR Appendix 17.6: Outline Written Scheme of Investigation (Offshore)) (07/12/2018)	We are pleased to see that the planning of additional geophysics programmes will involve experienced archaeologists. This will ensure that the data will be collected with archaeology in mind and that the data will allow features of interest to be resolved.	Noted. This is maintained in the Outline WSI submitted as part of the DCO application (document reference 8.6).
Historic England	Section 42 Consultee Response (PEIR Appendix 17.6: Outline Written Scheme of Investigation (Offshore)) (07/12/2018)	A programme of geoarchaeological investigation has already been implemented as part of the works to define the baseline environment for the site. The results of this work and the generation of a deposit model will be of value to the wider archaeological community and should be published in an appropriate journal, so that the findings can be disseminated.	Noted. Publication recommendations are presented in Appendix 17.8 following completion of the Stage 4 paleoenvironmental assessment.
Historic England	Section 42 Consultee Response (PEIR Appendix 17.6: Outline Written Scheme of Investigation (Offshore)) (07/12/2018)	We are pleased that the need for additional geoarchaeological work is being considered, which may require “archaeology only’” cores to be collected and analysed (paragraph 88). We are also pleased to see the collaboration and communication between the geoarchaeological and geotechnical specialist as this will ensure that opportunities are maximised and reduce the risk of duplication of effort.	Noted. This is maintained in the Outline WSI submitted as part of the DCO application (document reference 8.6).
Historic England	Section 42 Consultee Response (PEIR Appendix 17.7: Stage 3 Geoarchaeological Assessment) (07/12/2018)	Section 4.2 discusses the Optically Stimulated Luminescence (OSL) approach used to date key deposits that have been investigated. Historic England have previously commented on the OSL approach utilised by the project (our letter dated 10th May and 11th June 2018), and how it deviates from the approaches discussed within the Historic England Luminescence Dating guidance document (2008). It was felt that the	Further details on how OSL has been undertaken, including consideration of partial bleaching, and inter-aliquot distribution studies, have been provided in the Stage 4 report (Appendix 17.8).

Consultee	Date & Document	Comment	Response/where addressed in the ES
		use of transparent liners and that OSL samples were collected from cores that had been split and exposed to light may add multiple layers of additional uncertainty to what is already an extremely complicated scientific process. Although the approach presented here is potentially hazardous, it is not impossible; we therefore highlighted that additional laboratory work may be required to investigate if the exposure to light resulted in the partial resetting (bleaching) of the luminescence signal, as this would affect the accuracy of the resulting dating evidence. Partial bleaching of the luminescence signal was investigated as part of this work using signal analysis, which was good to see, but a caution was placed on the results which are strongly dependent on the pre- and post-burial experience of a given sample (Section 5.1.4). Inter-aliquot distribution studies were also used to test for partial bleaching, but it was noted that the results were not conclusive and that additional, smaller aliquots may need to be analysed. It was not clear if this work would be carried out at Stage 4 and should therefore be clarified in any ES subsequently produced.	
Historic England	Section 42 Consultee Response (PEIR Appendix 17.7: Stage 3 Geoarchaeological Assessment) (07/12/2018)	A series of recommendations have been made in in Sections 6 and 7 for additional work to be carried out, which includes the need for greater age control and statistically valid palaeoenvironmental analysis to place the information generated through the geoarchaeological work into context (Section 6.2.4, 7.2.3 & 7.3.5, and Table 19). Additional OSL and Radiocarbon dates are therefore recommended as well as pollen, charcoal and diatom analysis (Section 7.3.5) which we would support. It was noted that the OSL result from	Following PEIR, additional work has been undertaken (Stage 4 paleoenvironmental assessment) and the results are included as Appendix 17.8.

Consultee	Date & Document	Comment	Response/where addressed in the ES
		VC047 could only be tentatively accepted at this stage, but it was not clear if additional work would be carried out to investigate the samples further, which should be clarified with the ES.	
Historic England	16th January 2019/ Written Representation for the Norfolk Vanguard Examinations	*We do not concur with the assessment regarding the assessment of character to accommodate change in reference to: "aquaculture"; inshore fisheries"; and "offshore fishing grounds" as the capacity to accommodate identified spatial historic character is considered to be dependent on agreeing access (during construction) in reference to "rolling, temporary safety zones". It would seem to us that a change in seascape will have occurred due to construction of an offshore wind farm which will, by definition, result in modification of behaviour among marine stakeholders and the activities (e.g. default exclusion of fishing techniques employing certain gear types) that they can legally, practically and economically practice; their perception of historic seascape character may therefore change*	The Norfolk Boreas ES does not make a judgement as to whether or not the character has capacity to accommodate the change. It is simply acknowledged that there will be a change. This is a narrative approach as set out in the methodology section 17.4 of the chapter was discussed and agreed during the ETG meeting on the 1st February.
Historic England	16th January 2019/ Written Representation for the Norfolk Vanguard Examinations	*section 17.7.7.4 (Impacts to the setting of heritage assets), it is an important matter to highlight (vis. paragraph 178) that we do not specifically identify the setting of a heritage asset as being impacted (i.e. "negligible"), but rather how the setting contributes to the significance of a heritage asset; therefore the matter in question is whether or not harm to the significance of the heritage asset has occurred given the design and position of the proposed development in what is considered to be its setting, see Appendix 17.01 (section 3.5 – Assessment of Setting) which explains this point.*	The assessment of changes to the setting of heritage assets and historic seascape character section 17.7.6.4 in chapter 17) describes that a change will occur but does not provide a judgement on the significance of that impact.
Historic England/Norfolk	February 2019/ETG Offshore Archaeology	Historic England recognise that Norfolk Boreas have undertaken the geophysical surveys in a way that sh	This has been acknowledged in the Norfolk Boreas ES in Section 17.5.3 of Chapter 17 (Assumptions and

Consultee	Date & Document	Comment	Response/where addressed in the ES
County Council Historic Environment Service	Meeting Log	ould be sufficient to characterise the site for this stage of the assessment, however there is a risk that as it is not as high resolution as is provided in Historic England guidance, not all anomalies will have been picked up. Norfolk Boreas should be aware of the risk and acknowledge it in the ES/WSI.	Limitations) which concludes that Norfolk Boreas's position is that confidence in the data is sufficient to provide an accurate characterisation of the archaeological potential of the study area. The acquisition of further pre-construction data (post-consent) will provide additional information at a greater resolution within areas where construction will take place and this is captured in the WSI.
Historic England/Norfolk County Council Historic Environment Service	February 2019/ETG Offshore Archaeology Meeting Log	The levels of importance assigned to intertidal assets in the PEIR (Table 17.18) attempt to capture too much and treat it all in the same way.	Additional wording added to the table in the ES (Table 17.17) to distinguish between isolated finds and primary context features and associated artefacts (in-situ or derived) associated with early prehistoric activity (as previously discovered at Happisburgh).
Historic England/Norfolk County Council Historic Environment Service	February 2019/ETG Offshore Archaeology Meeting Log	We understand from other offshore wind farm projects that when placing infrastructure there can be a margin for error.	Any anomalies within and in close proximity to construction areas will be taken account of in the scheme design, including due consideration of the positional accuracy of the post-construction geophysics data.
Historic England/Norfolk County Council Historic Environment Service	February 2019/ETG Offshore Archaeology Meeting Log	Historic England highlighted the importance of notifying the National Maritime Information Centre (NMIC) as fast as possible following new discoveries to try and protect any wreck site from salvage attempts – such procedures should be made clear within agreed documentation generated as part of archaeological assessment.	Noted with specific reference added to the WSI.
Historic England/Norfolk County Council Historic Environment Service	February 2019/ETG Offshore Archaeology Meeting Log	The ES should clarify that it is the contribution of an assets setting to its significance which is relevant to the assessment, rather than looking to express any changes to that setting as a measurable impact.	This has been amended in the ES (section 17.7.6.4).
Historic England	14th March Offshore order	It is our advice that any Environmental Statement (ES)	Analysis of the geophysical data covering the gap has

Consultee	Date & Document	Comment	Response/where addressed in the ES
	limits change report	prepared for this proposed project should include archaeological interpretation of geophysical data for the entire extent of the seabed “gap” to be included within the Order Limits. We therefore concur with the statements made in Section 3.6 (offshore archaeology) regarding amendment of the Outline (archaeological) Written Scheme of Investigation (WSI) as should be included within any Development Consent Order (DCO) submission. We also support your commitment that the DCO will include measures for preconstruction surveys to update the WSI should consent be obtained for this proposed project.	been undertaken and the results are reported in Appendix 17.3 which is an addendum to the main geophysical analysis report Appendix 17.2.

3 References

Royal HaskoningDHV (2017). Norfolk Boreas Offshore Wind Farm Environmental Impact Assessment Scoping Report.
Royal HaskoningDHV (2018). (unpublished) Norfolk Boreas Offshore Wind Farm Environmental Impact Assessment Offshore Archaeology Method Statement.
Royal HaskoningDHV (2018). Norfolk Boreas Offshore Wind Farm Preliminary Environmental Report