

Norfolk Boreas Offshore Wind Farm

Appendix 20.5

Norfolk Vanguard Water Resources and Flood Risk Consultation Responses

Environmental Statement

Volume 3

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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. As the Norfolk Boreas and Norfolk Vanguard projects are sister projects due to the proposed strategic development of both projects, much of the consultation undertaken as part of the Norfolk Vanguard Evidence Plan Process (EPP) is also relevant to the Norfolk Boreas project. Such consultation has directly influenced the Norfolk Boreas project and has been taken into consideration and integrated into the impact assessment for Norfolk Boreas.
3. This appendix contains the results of the Norfolk Vanguard consultation which have been used to inform the Norfolk Boreas assessment. In addition, where possible any comment received as part of the Norfolk Vanguard examination process, up to Deadline 5 (20th March 2019) have also been considered.

2 Consultation responses Norfolk Vanguard

4. Table 2.1 summarises the consultation and comments received for Norfolk Vanguard that are of relevant to and have informed the development of Chapter 20 Water Resources and Flood Risk of the Norfolk Boreas ES and provides details of how it has been taken into consideration.

Table 2.1 Norfolk Vanguard Consultation and Comments

Consultee	Date/ Document	Comment	Response / where considered in the Norfolk Boreas ES
Secretary of State	11 th November 2016 Scoping Opinion	<p>A WFD compliance assessment should form an appendix to the ES.</p> <p>The FRA should take into account the most up to date climate change allowances and should cover tidal flood risk as well as fluvial impacts under present and projected sea level scenarios.</p> <p>Consideration should be given to the potential impacts on the coastal defence works proposed around Bacton.</p> <p>In relation to trenchless crossing (e.g. HDD) activities, the ES should address potential risks to both groundwater resources and surface water bodies from leakage of drilling fluid and provide details of measures that will be implemented to address such risks.</p>	<p>Comments addressed in FRA (Appendix 20.1) and</p> <p>WFD Compliance Assessment (Appendix 20.2).</p> <p>Description of embedded mitigation measures (section 20.7.1 of Chapter 20 Water Resources and Flood Risk).</p> <p>Assessment of potential impacts (sections 20.7.3, 20.7.4 and 20.7.5 of Chapter 20 Water Resources and Flood Risk).</p>
Norfolk County Council	11 th November 2016 Scoping Opinion	<p>FRA's and surface water drainage strategies should address:</p> <p>Local sources of flood risk, including those from ordinary watercourses, surface runoff and groundwater</p> <p>How surface water drainage will be managed on the substation sites</p> <p>Post construction ground levels not disrupting current overland flow routes along and across the alignment of the proposed underground cables for land at risk of flooding.</p> <p>Temporary arrangements to maintain overland flow paths that cross the alignment of the proposed underground cables for land at risk of flooding.</p> <p>The requirement to seek consent from Norfolk County Council (NCC) for works that affect the flow in ordinary watercourses outside of the control of an IDB.</p> <p>The County Council note the following criteria from the Scoping report and welcome these considerations that are applicable to Flood and Water Management issues.</p> <p>Proximity to residential properties;</p>	<p>Comments addressed in FRA (Appendix 20.1).</p> <p>Description of embedded mitigation measures (section 20.7.1 of Chapter 20 Water Resources and Flood Risk).</p> <p>Assessment of potential impacts (sections 20.7.3, 20.7.4 and 20.7.5 of Chapter 20 Water Resources and Flood Risk).</p>

Consultee	Date/ Document	Comment	Response / where considered in the Norfolk Boreas ES
		<p>Proximity to Source Protection Zones (SPZ); Flood risk; Minimise requirement for complex crossing arrangements, e.g. road, river and rail crossings; and Avoiding ponds and agricultural ditches.</p> <p>Further to the criteria mentioned above it is noted the following settlements have historical flooding issues and are likely to be sensitive to disruptions to the wider drainage networks:</p> <p>North Walsham - Drains to the North east (North Walsham and Dilham Canal) and South West (Skeyton Beck); Dereham - Drains to the East (via Dereham Stream to Wending Beck); Necton - Drains to the South (River Wissey).</p> <p>In line with good practice, the Council seeks to avoid culverting, and its consent for such works will not normally be granted except as a means of access. It should be noted that this approval is separate from planning.</p> <p>Drainage strategy to assess and justify compliance with the SuDS hierarchy for surface water disposal location. This would include:</p> <p>(a) Demonstration of infiltration testing (b) If site wide infiltration is not appropriate due to unfavourable rates, demonstration with evidence as to why there cannot be a connection made to the nearest watercourse. (c) As a final option, demonstration with evidence that Anglian Water would accept a connection to a surface water sewer.</p> <p>The drainage strategy should also contain a maintenance and management plan detailing the activities required and details of who will adopt and maintain all the surface water drainage features for the lifetime of the development.</p>	

Consultee	Date/ Document	Comment	Response / where considered in the Norfolk Boreas ES
Environment Agency		<p>Raised concerns over the impact assessment methodology within the method statement regarding the sensitivity for surface water receptors. Table 4.1 within method statement.</p> <p>Highlighted risk of biosecurity and pollution which should be included within the assessment.</p>	<p>Wording for sensitivity updated (section 20.4 of Chapter 20 Water Resources and Flood Risk).</p> <p>Biosecurity risk is assessed in Chapter 22 Onshore Ecology and Chapter 21 Land Use and Agriculture.</p>
Norfolk County Council	25 th January 2017 (Topic Group Meeting 1)	<p>Agree with suggested approach for a proportionate catchment based assessment to focus the attention on the key areas for flood risk. Highlighted:</p> <p>Change in land use will increase surface flows Potential to alter existing drainage patterns Risks around temporary water crossings More risk in winter months and also intense summer storms Consent will be required for working in the watercourse How climate change will be assessed within the EIA Drainage strategy in relation to land use and inclusion of SuDS (sustainable Urban Drainage Devices)</p> <p>Also highlighted that the following need to be considered within the FRA:</p> <p>Surface catchments <3km² Flooding from pluvial (surface rainfall) sources Groundwater flooding</p>	<p>Comments addressed in:</p> <ul style="list-style-type: none"> FRA (Appendix 20.1). Assessment of potential impacts (sections 20.7.3, 20.7.4 and 20.7.5 of Chapter 20 Water Resources and Flood Risk).
Water Management Alliance (WLMA) (Internal Drainage Board)	20 th April 2017	<p>Confirmed that all works within 9m of an IDB watercourse will need to be consented by the IDB under Byelaw 10.</p> <p>Utilities would ideally be buried at least 2m below the hard bed of a watercourse, and would need to be able to withstand crossing by a 30t tracked excavator. Each watercourse crossing will also require a licence agreement.</p>	<p>Comments addressed in:</p> <ul style="list-style-type: none"> Description of embedded mitigation measures (section 20.7.1 of Chapter 20 Water Resources and Flood Risk). Assessment of potential impacts (sections 20.7.3, 20.7.4 and 20.7.5 of Chapter 20 Water Resources and Flood Risk).

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		<p>Sediment management is a significant issue. The timing of works will need to be considered, to avoid impacts from sediment supply on trout spawning habitats and dissolved oxygen levels in the water.</p> <p>The IDB use multiple silt curtains to contain fine sediments, as do the local Environment Agency teams. Sedimats have not been found to be effective.</p>	
Environment Agency	26 th May 2017	<p>Comfortable with the proposed trenchless crossing techniques (e.g. HDD for the River Wensum, River Bure, King's Beck and North Walsham & Dilham Canal), and trenched for the other watercourses (including Wendling Beck and the Blackwater Drain). Incision rates in the channels are low, and 1.5m should be regarded as a suitable minimum burial depth.</p> <p>Noted several issues that should be considered:</p> <p>River Wensum: The EA operate a rolling programme of restoration on the Wensum. The reach that will be crossed has not yet been restored. Although the proposed use of trenchless crossing techniques (e.g. HDD) will minimise potential for impact, it may be beneficial to discuss the plans with the EA PM.</p> <p>River Bure: Recovering habitats should be preserved where possible (also applies to other watercourses).</p> <p>Wendling Beck: The river reacts quickly to rainfall, and flood risk implications of trenching need to be considered (particularly in relation to the town of Dereham). The timing of trenching needs to be considered to minimise risks (e.g. during periods of higher flow).</p> <p>Asked whether there would be any scope for channel restoration as part of the reinstatement process, e.g. bank reprofiling, the introduction of gravel substrates.</p> <p>General pollution prevention measures should be sufficient in most cases.</p> <p>Cumulative impacts from multiple crossings in the same catchment should be considered.</p>	<p>The potential impacts of the proposed crossing techniques are discussed in section 20.7.5 of Chapter 20 Water Resources and Flood Risk. Specific discussions regarding each watercourse have also been taken into consideration in this section.</p> <p>Channel restoration will be considered, but any works would have to be limited to within the onshore project area DCO red line boundary.</p> <p>Pollution prevention measures embedded into the scheme design are discussed in Section 20.7.1 of Chapter 20 Water Resources and Flood Risk. Further discussion is provided in sections 20.7.3 – 5 of Chapter 20 Water Resources and Flood Risk.</p> <p>Cumulative impacts are assessed in section 20.8 of Chapter 20 Water Resources and Flood Risk.</p> <p>Cable burial depth shall typically be 1.5m for trench crossings and 2m for trenchless</p>

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			crossings. However, this is dependent upon geology and other associated risks.
Suffield Parish Council	December 2017 PEIR consultation	This is a very 'wet' area. We are concerned about the proposed works adversely affecting the already high water table. We want to be assured that all works carried out have adequately taken the water levels into account and that we will not suffer long term change as a result of these works.	Potential impacts on groundwater are addressed in sections 20.7.3 and 20.7.4 of Chapter 20 Water Resources and Flood Risk, and in Chapter 19 Ground Conditions and Contamination. Impacts on flood risk are assessed in Appendix 20.1.
Ørsted	December 2017 PEIR consultation	Hornsea Project Three would welcome information relating to assessments of field drainage and irrigation.	Comments addressed in section 20.7.3 of Chapter 20 Water Resources and Flood Risk.
Ørsted	December 2017 PEIR consultation	Hornsea Three is included in the cumulative assessment, albeit onshore construction is noted to be "2016-2019". This is incorrect and should be corrected.	Amended in section 20.8 of Chapter 20 Water Resources and Flood Risk.
NSAG	December 2017 PEIR consultation	Vattenfall have never fully investigated the historical flooding in the area. They have never consulted or listened to 'local knowledge'. Attached is a map provided by http://www.checkmyfloodrisk.co.uk/ which shows just how bad this site selection is. You can clearly see that the whole area of existing and proposed substations drains into one water course, which has regularly flooded historically. Local knowledge tells us that the land in this area does not allow water to soak through, and that disturbing all the drains, which reduced the flooding incidences, will create unacceptable far-reaching flooding risk in many local communities. Also attached are some photographs showing historical flooding in Ivy Todd and West End, before the farm drainage was installed. It can be seen that Dudgeon substation already uses the same watercourse as the new proposed substations. This watercourse cannot possibly take the extra run-off Vattenfall would create.	Potential impacts on water levels and flood risk are addressed in sections 20.7.3 and 20.7.4 of Chapter 20 Water Resources and Flood Risk. A detailed Flood Risk Assessment is provided in Appendix 20.1.

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		<p>Please see enclosed flooding map of the area and historical photographs. Vattenfall have said that the Environment Agency flood risk maps show a low risk at the connection but they do not appear to have consulted the maps with regard to the high risk of flooding on the land surrounding their selected substation site. Vattenfall appear to be using ambiguous language to disguise the fact they are building in a high flood risk area and we object to the proposal on the grounds of high flood risk.</p> <p>We object to this development as it does not follow Breckland policy and will undoubtedly make flooding worse in several areas.</p> <p>This information is not complete. It fails to state that the project substation land area does not flood at the moment, but that this is only because it had a field drainage system laid, probably more than 50 years ago. By definition, ‘the purpose of a land drain is to allow water in wet or swampy ground to rapidly drain away’. If this agricultural land was not artificially drained it would not grow crops, as it would be too wet, so would not be deemed low flood risk. The runoff from 37 acres of concrete created by the substations will inevitably cause the adjacent land mentioned by Vattenfall above, to flood. The next point shows that even climate change could be a threat to the efficiency of the land drainage. Important points are missing from the flood assessment because if land drainage couldn’t cope with climate change, any construction work will certainly destroy this established drainage pattern, destroy delicate eco systems and potentially cause flooding in other areas.</p> <p>Although the project substation is in a zone 1 low flood risk area, as artificially drained, it is very close to zone 3 high risk areas as stated in the next 2 points. We are concerned that these high-risk areas could be worsened by the nearby construction works.</p> <p>We object to this project on the grounds that flood assessments are muddled and incomplete and take no account whatsoever of local knowledge, which we have now supplied from people who were born in the area.</p>	

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Robert Scott MRICS FAAV Freelance Farm Business Consultant Working on behalf of Savills (UK) Ltd	December 2017 PEIR consultation	You'll note I represent both Dillington Hall Estate and Gorgate Limited (whom border each side of the Wendling Beck). Both are very anxious about how the river is to be crossed and the continued open-cut design.	Wendling Beck will be crossed using a trenchless technique, as outlined in section 20.7.1 of Chapter 20 Water Resources and Flood Risk. Potential impacts resulting from watercourse crossings are assessed in section 20.7.3 of Chapter 20 Water Resources and Flood Risk
Susan Falch-Lovesey Local Liaison Officer, Norfolk Vanguard and Boreas	December 2017 PEIR consultation	Issues noted in my briefing to the consents team; 1. Wendling beck, runs down valley and then between two SSSI's. Natural England have spent significant amount of money on the route that they feel could be wasted, should the 'open cut' method be used instead of HDD. Indeed, Natural England link was very concerned. NWT and NRT (Norfolk Rivers Trust) are supporting the estate to review this situation and prepare a plan to protect the improvements. 2. NRT are concerned that downstream there has also been work done on the Hoe Ruff (NWT) site and that any discharge of 'highly charged silt' will have a very negative impact. They want Vattenfall to confirm that this will not happen and if something does, that we will ensure it is restored to the current quality. 3. Finally, 3-4 km downstream the NRT have been engaged by Michael Goff to recreate a wetland (private funding). This is planned to take shape before our work would start... question is do we know about this and will we mitigate /restore if there is damage.	Wendling Beck will be crossed using a trenchless technique, as outlined in section 20.7.1. Potential impacts resulting from watercourse crossings are assessed in section 20.7.3. Sediment management measures are described in detail in section 20.7.1, and the potential impacts of increased sediment supply on surface watercourses are assessed in section 20.7.3.
Norfolk County Council	December 2017 PEIR consultation	The County Council would wish to see that any drainage strategies contain maintenance and management plans detailing the activities required and who will adopt and maintain the surface water drainage features for the lifetime of the development. Further detailed comments relating to flood and drainage issues are set out in the Appendix.	Drainage management measures are outlined in section 20.7.1. Potential impacts on flood risk, main rivers, IDB drains and ordinary

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		<p>The report indicates that the onshore project area will largely be located on rural, agricultural land. Therefore, the majority of the project shall be located within areas where there are no existing formal surface water drainage systems, other than agricultural land drains and ordinary watercourses. Risk to any nearby properties should also be considered – no reference to this was found in the submission.</p> <p>The CRS location options are located within Flood Zone 1, as defined by the Environment Agency online Flood Map for Planning. Flood Zone 1 is defined as land as having a less than 1 in 1,000 annual probability of river flooding (<0.1%). The onshore cable corridor is located within Flood Zones 1, 2 and 3 and the Happisburgh landfall location is located within Flood Zone 3 as defined by the Environment Agency online Flood Map for Planning. However, there are many ordinary watercourses within the proposal area and these also have a flood risk associated with them (equivalent to flood zone 2 and 3). These areas of risk are not shown on the Environment Agency Map as the catchments are smaller than 3km² and are not included on the national map. The proposal should consider this local source of flood risk to ensure that all sources of flooding have been assessed.</p> <p>The onshore cable corridor is influenced by three key hydrological catchments, and intersects significant watercourses at six key crossing points. In addition, there are a number of minor watercourses, land drains and ditches the onshore cable corridor will cross however, these have been reviewed using a high-level approach. Additionally, there are a number of Internal Drainage Board (IDB) channels which cross the onshore project area. Furthermore, there are a large number of ordinary watercourses and agricultural drainage channels.</p>	<p>watercourses are addressed in sections 20.7.3 and 20.7.4. A detailed Flood Risk Assessment is provided in Appendix 20.1.</p>
The local County Council for Necton and Lauditch	December 2017 PEIR consultation	Flood Risk and Drainage – further work is required by the applicant regarding the flood risk and drainage issues arising from the proposed new Vanguard sub-station. In particular the issue of potential run-off from the proposed new sub-station onto local country lanes in the area needs fully addressing;	Potential impacts on flood risk are addressed in sections 20.7.3 and 20.7.4 of Chapter 20 Water Resources and Flood

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division (Cllr Kiddle-Morris) (In Norfolk CC response)			Risk. A detailed Flood Risk Assessment is provided in Appendix 20.1.
Norfolk County Council	December 2017 PEIR consultation	The applicant is suggesting that trenchless crossing techniques will be used for the larger watercourse crossings (specifically the River Wensum, River Bure, King's Beck, Wendling Beck (downstream), and the North Walsham and Dilham Canal) - Paragraph 20.4.3.5 – 64 of the FRA indicates that this will be by passing under watercourses (at least 2m below the river bed). However, the project also includes numerous trenched watercourse crossings within river water body catchments, with one trenched crossing of the main Wendling Beck watercourse, also designated as a main river by the Environment Agency, and a trenched watercourse crossing of the Blackwater Drain main river. Where the proposals involve works to any ordinary watercourse a consent will be required. The number of these, where applicable, should be determined and applications for block, or phased consents should be made to the appropriate authority, including the flood and water management team at Norfolk County Council or the Internal Drainage Board.	Wendling Beck will be crossed using a trenchless technique, as outlined alongside other embedded mitigation measures in section 20.7.1 of Chapter 20 Water Resources and Flood Risk. Potential impacts resulting from watercourse crossings are assessed in section 20.7.3.
Norfolk County Council	December 2017 PEIR consultation	The assessment states that during the temporary damming and re-routing of watercourses required during the construction of the onshore cable corridor, the original flow volumes and rates need to be maintained to ensure flood risk is not increased at the construction site and elsewhere. Post-construction, watercourses should be reinstated to pre-construction channel depths and bank slopes as far as possible to ensure flood risk is not affected. Mitigation of the existing flood risk at key crossing points during the construction phase of the project will need to be managed. Any construction work located within Flood Zone 2 or 3, or within proximity to an ordinary watercourse should undertake suitable risk assessments, including the formation of site specific evacuation routes into areas of low flood risk. It is also advised that any temporary plant	Potential impacts on flood risk are addressed in sections 20.7.3 and 20.7.4 of Chapter 20 Water Resources and Flood Risk. A detailed Flood Risk Assessment is provided in Appendix 20.1. Embedded measures to prevent contamination are described in section 20.7.1, and potential impacts resulting from the accidental release of pollutants are assessed in sections 20.7.3 and 20.7.4

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		storage including potentially polluting substances e.g. oil storage is located above expected flood levels. On ordinary watercourses (where there are no formal flood warning systems in place) we suggest that the applicant consider signing up to available weather alerts from the Met office. This could help understand when significant rainfall may be expected and could go to provide onsite procedures to halt any works within watercourses to prevent an increased risk from in channel workings.	of Chapter 20 Water Resources and Flood Risk.
Norfolk County Council	December 2017 PEIR consultation	It states in paragraph 20.7.3 (Post construction), that following completion of the project the onshore cable corridor shall be located below ground level and as such would have no impact on surface water drainage. Temporary works and all access route surfacing shall be removed and would have no operational use. This risk of creating a 'conduit' should be considered when assessing any backfill materials to the trench, and how this could affect the local flow routes (i.e. changes to the permeability of the site). The surface water drainage requirements for the permanent compounds will be dictated by the final drainage study.	Potential impacts on water levels and flood risk are addressed in sections 20.7.3 and 20.7.4 of Chapter 20 Water Resources and Flood Risk. A detailed Flood Risk Assessment is provided in Appendix 20.1.
Norfolk County Council	December 2017 PEIR consultation	The FRA states that the SuDS philosophy will be employed to limit run-off, where feasible, through the use of infiltration techniques. Discharge should be limited to greenfield run off rates, where infiltration is not possible, by reducing rates and volumes of run off associated with the project during operation via the integration of effective surface drainage systems. In the submission it is proposed to limit post development off site run-off to the existing greenfield rate and provide sufficient onsite attenuation for rainfall events up to 1 in 100-year rainfall event, plus a 30% allowance for climate change over the lifetime of the development (however we would recommend that this be increased to 40%). However, there is no assessment of the current and proposed runoff rates to determine the surface water attenuation requirements for the sites in line with The SuDS Manual (2015), which should	Potential impacts on water levels and flood risk are addressed in sections 20.7.3 and 20.7.4 of Chapter 20 Water Resources and Flood Risk. A detailed Flood Risk Assessment is provided in Appendix 20.1.

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		<p>indicate that the flow rate discharged from the sites must not exceed that prior to the proposed development for the 1 in 1 year event; 1 in 30 year event; and 1 in 100 year event. The sites have not yet been assessed against a 'greenfield' baseline, assumed to be 100% permeable surfacing with areas of 2.5ha and 10ha respectively. Further information should be requested to be provided at design stage.</p> <p>The FRA and supporting documentation shows that the proposed development at present meets the requirements of the NPPF. At this stage it has not been determined what method of discharging surface water will be utilised in the final design and no assessment of the current or proposed runoff rates has been undertaken. The County would also wish to see that any drainage strategies contain maintenance and management plans detailing the activities required and who will adopt and maintain the surface water drainage features for the lifetime of the development.</p>	
National Farmers Union	December 2017 PEIR consultation	<p>The major potential lasting damage is to land drainage systems and soils structure. One of the main reasons for the productive land the cable duct route is going through is that the farms are very well drained by a network of clay or plastic land drains laid in parallel every 20 metres or so across the field at depths of up to 1.8 metres draining into a field edge ditch or dyke. These drainage systems prevent water pooling in fields and increase the productive capacity of the agriculture in the area. Good land drainage increases farm productivity by keeping waterlogging to a minimum, increasing soil strength by reducing water content, gives higher soil temperatures and leads to more efficient use of applied fertilisers. According to the Agricultural Notebook the yield advantage for most crops when comparing drained and undrained treatments is typically 10 to 25 per cent.</p> <p>Assuming land drains are laid every 20 metres in farmland (they are laid more closely in some cases) and assuming the whole route is farmland, which it is not,</p>	<p>Embedded mitigation measures to manage site drainage such as a Drainage Plan, selection of HVDC technology are described in section 20.7.1 of Chapter 20 Water Resources and Flood Risk.</p> <p>Potential impacts on water levels and flood risk are addressed in sections 20.7.3 and 20.7.4 of Chapter 20 Water Resources and Flood Risk. A detailed Flood Risk Assessment is provided in Appendix 20.1.</p>

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		<p>but it mainly is, the cable ducts/trenches will cut thousands of land drains in six places for each land drain. Major pipeline constructors will cut a trench and the land drains then place the pipeline in the trench and re-connect the land drains above the pipe. It is a drainage rule of thumb that with a major pipeline one in every six land drains does not work after the soil is replaced around the pipe. This will not just affect the 50 to 100 metre working width but could potentially affect the whole field where the cable duct goes through and therefore every arable field along the route.</p> <p>As highlighted above Vattenfall have stated that the ducts will be laid below field drainage at 1.05m. We are not sure that this will be possible and it might be that the ducting will have to be deeper if it is to be below field drainage.</p> <p>The NFU would like to agree standard terms of how field drainage will be treated in principle on every farm and for this wording to be taken forward and included in the Soil Management Plan and for this document to be certified as part of the Development Consent Order. The wording normally covers before, during and after construction. It will be important in places for field drainage to take place outside of the order limits and this will need to be agreed along with a local drainage consultant being taken on by Vattenfall at the pre –construction stage. The NFU is disappointed by the lack of information covering field drainage in the PIER. The only reference found is in table 21.13 Embedded Mitigation where it states that land drainage would be maintained during construction and reinstated on completion and that consultation will be carried out with landowners. Vattenfall must be prepared on behalf of all landowners and occupiers affected by the scheme to reinstate drainage systems to landowners’ reasonable satisfaction and to ensure that the drainage system is put back in a condition that is as least as effective as the previous condition.</p>	
Necton Parish Council	December 2017 PEIR consultation	Necton has a well-documented history of flood issues, the root cause lying in the topography of the area. Disturbance to large areas of agricultural land to the north of the village will increase the number and extent of flooding instances	Potential impacts on water levels and flood risk are addressed in sections 20.7.3 and 20.7.4 of Chapter 20 Water Resources

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		<p>within and around Necton and Ivy Todd. The presence of the Dudgeon Wind Farm is already identified as a likely cause for the increase of floodwater running down through Kett's Hill and Ramm's Lane – a matter that the Parish Council is currently discussing with Norfolk County Council Highways and Anglian Water. This is not only run off water, but sewage backing up through interior sanitary units and gardens being flooded with sewage.</p> <p>Chapter 20, Water Resource and Flood Risk, appears to be crafted simply from desk research and not local knowledge gleaned from Necton consultation events. There is no evidence of current water run-off measurements or other on-site analysis to identify existing water discharge patterns.</p> <p>The report speaks of 'the connection point' making it unclear if there has been adequate analysis of the two distinct proposed sites – National Grid extension and Vanguard and Boreas substations which are over 700 metres distant from each other. Between them during their approximate 18 months construction period, they will occupy a total of approx. 540,000 sq. metres of disturbed ground.</p> <p>The proposal does not provide enough consideration of the realistic flood risk impact or mitigation measures to help inform a view as to the suitability of this proposal on these identified sites.</p>	<p>and Flood Risk. A detailed Flood Risk Assessment is provided in Appendix 20.1.</p>
NRIDB	December 2017 PEIR consultation	<p>NRIDB have been involved in initial design and planning discussions and will continue to input into the project to ensure suitable drainage and environmental solutions are delivered.</p> <p>The crossing of every ordinary watercourse within the boards district will need to be consented at the cost of the applicant. An application for the relaxation of byelaw 10 and or an application to alter a watercourse will be required for each</p>	<p>Embedded mitigation measures to prevent impacts on IDB drains and other watercourses are outlined in section 20.7.1 of Chapter 20 Water Resources and Flood Risk. Potential impacts resulting from watercourse crossings are assessed in</p>

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		<p>structure in order for the works to be consented by Norfolk Rivers Drainage Board. Details regarding the consenting process can be found on our website http://www.wlma.org.uk/norfolk-idb/development. WMAs standard utility crossing detail for IDB Main watercourses (attached) must be followed unless alternative details have been agreed with a WMA Engineer. Each crossing affecting a IDB main drain will require a licence agreement. An example of which is attached.</p>	<p>section 20.7.3 of Chapter 20 Water Resources and Flood Risk.</p>
<p>Environment Agency</p>	<p>December 2017 PEIR consultation</p>	<p>Independent Drainage Board (IDB) managed water courses are Ordinary Watercourses and therefore the categories used in Table 20.10 are incorrect. The management body for those watercourses is not an indicator of their ecological value or sensitivity to change. IDB managed watercourses should not be routinely classified as 'low value and sensitivity' as stated at Section 20.7.3.1.2, many are free flowing chalk streams with gravel substrates; they are not necessarily low gradient pumped systems. However, even pumped IDB drains in Norfolk are a key freshwater habitat which support plants and animals of conservation importance e.g. sharp-leaved pondweed, stoneworts, little whirlpool ramshorn snail, Desmoulin's whorl snail and Norfolk hawker to name a few. As stated previously, a WFD classification is not a satisfactory indication of sensitivity to impacts such as used in paragraph 101, for example. To illustrate, a waterbody with a lower WFD class may be more sensitive due to existing problems such as low flows, low dissolved oxygen and siltation problems, but this does not mean that it will not suffer further from other impacts nor does it lessen the requirement to strive for 'good' status. All practicable steps must be taken to mitigate any adverse impacts caused by works on the status of the body of water. Where a waterbody is failing, we would encourage the applicant to look for mitigation and enhancement options. Because the premise of valuing the waterbody and sensitivity is incorrect this has implications for the impact assessment summaries this section, this needs to be reviewed. This approach to assessment has been applied to each type of watercourse throughout the</p>	<p>The approach to assigning sensitivity and value to surface water receptors has been updated, and is now based on hydrological catchments rather than type of watercourse. Full details are provided in section 20.6.4 of Chapter 20 Water Resources and Flood Risk.</p> <p>Sensitivity and value have been defined according to observed geomorphological characteristics and habitat value rather than WFD status, as outlined in section 20.6.4 of Chapter 20 Water Resources and Flood Risk.</p>

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		chapter which under-estimates the impacts and therefore, conclusions drawn from this cannot be relied upon. It follows then, that we cannot have confidence in the appropriateness of the techniques chosen nor mitigation that is recommended. It is important that any approach to assessing the impact upon watercourses recognises and accounts for the key requirement of WFD objectives that there should be 'no deterioration in overall WFD status or in the individual WFD elements.	
Environment Agency	December 2017 PEIR consultation	Catchment based approach In Section 20.7.3.1.3 it states that Ordinary Watercourses has negligible value due to "tolerance to changes to hydrology, geomorphology or water quality". This statement is incorrect. Taking a catchment based approach is a key government policy; 70% of a rivers length is within its headwaters (which are ordinary watercourses and ditches). These smaller watercourses are a significant freshwater habitat and it is important to recognise the contribution they make to water quality of the river as a whole. Smaller watercourses can be more sensitive to pollution because there are lower flows and a lower dilution factor compared to in the main rivers. Smaller watercourses are also very sensitive to geomorphology changes as because their small scale is more sensitive to over deepening and widening caused by work with excavators. Where WFD identifies that a waterbody is failing, this presents an opportunity for mitigation and enhancement.	The approach to assigning sensitivity and value to surface water receptors has been updated, and is now based on hydrological catchments rather than type of watercourse. Full details are provided in section 20.6.4 of Chapter 20 Water Resources and Flood Risk.
Environment Agency	December 2017 PEIR consultation	Section 20.7.3.3 refers to the Pollution Prevention Guidance Series, which was withdrawn in England. Please see http://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/ for more information. The embedded mitigation measures described in 20.7.1 for trenched crossings are inadequate, there should be measures to ensure continued flow e.g. by only damming part of the river or by over-pumping with measures in place to prevent fish kills. The timing of the works for the trenched crossings must not coincide with fish breeding season or key migratory periods.	Embedded mitigation measures are described in detail in section 20.7.1 of Chapter 20 Water Resources and Flood Risk.

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		The channel bed should be reinstated with the same substrate profile; that is making sure that gravels are put back on the top of the bed. Gravels are an important part of the river habitat, the well-oxygenated spaces in-between stones provide habitat and shelter for invertebrates as well as spawning sites for fish.	
Environment Agency	December 2017 PEIR consultation	Both during the works and immediately post works. Invasive non-native species are a significant concern in the aquatic environment – especially to WFD status and there is a risk of spreading crayfish plague – threatening our work to conserve the endangered white-clawed crayfish. Yet there are no control measures relating to preventing the spread of invasive species between crossing points and between catchments.	Embedded mitigation measures are described in detail in section 20.7.1 of Chapter 20 Water Resources and Flood Risk.
Environment Agency	December 2017 PEIR consultation	In table 20.2 the classification of Heavily Modified Waterbodies is not described correctly. E.g. the East Ruston Stream is at Moderate Potential due to dissolved oxygen and the mitigation measures which are not in place (mitigation measures assessment is moderate).	The water body data quoted in the ES and Appendix 20.2 was provided by the Environment Agency.
Environment Agency	December 2017 PEIR consultation	The control measures stated in 20.4.3.2 are not adequate, the temporary impacts of carrying out the works have not been considered, the difference between temporary and permanent impacts has not been made clear. The control measures are detailed in some areas e.g. use of drip trays for machinery but they are missing key actions to mitigate against impacts. We would expect control measures to address the following issues: <ul style="list-style-type: none"> · Maintaining flow e.g. partial coffer dams, · Preventing fish deaths from over-pumping · Minimising run-off from cable route (there will be a large area of land with bare soil immediately post completion, measures should be implemented to reduce run-off over key pathways e.g. slopes, onto roads, and directly into the watercourse, this could be through cutting small channels to intercept flow, retaining hedgerows and grass buffer strips or using shallow depressions (SuDS) 	Embedded mitigation measures are described in detail in section 20.7.1 of Chapter 20 Water Resources and Flood Risk.

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		<p>to contain sediment laden runoff). Likewise, the creation of woodland corridors and the retention, replacement and enhancement of hedgerows is a broader scale mitigation which reduces soil loss and sediment flow into watercourses.</p> <ul style="list-style-type: none"> · Timing of works to avoid fish breeding seasons and fish migration periods · Ensuring that gravels are retained in the channel bed, that is placed back on the surface · Ensuring that temporary impoundments do not have a negative impact on dissolved oxygen concentrations, water temperature · Minimising sediment disturbance within the channel and containing silt substrates to avoid causing low oxygen concentrations and thick silt deposits immediately downstream of works · Control measures for non-native and invasive species should be in place (this has been commented on in more detail in the ecology and biodiversity section) 	
Environment Agency	December 2017 PEIR consultation	The use of culverts is mentioned as a control measure in 20.4.3.2. However, it is not clear if these are existing, temporary or permanent. The impacts of the culverts need to be assessed.	Embedded mitigation measures are described in detail in section 20.7.1 of Chapter 20 Water Resources and Flood Risk. Potential impacts resulting from watercourse crossings, including culverts, are assessed in section 20.7.3 of Chapter 20 Water Resources and Flood Risk.
Environment Agency	December 2017 PEIR consultation	In paragraph 96 damming and diverting of the watercourses are mentioned as a control measure, these activities have an impact which needs to be assessed as part of the WFD compliance assessment. Damming watercourses have potential impacts for fish and diverting water can transfer of non-native invasive species.	Potential impacts resulting from watercourse crossings, including temporary works during the construction phase, are assessed in section 20.7.3 of Chapter 20 Water Resources and Flood Risk.

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			Potential impacts on WFD quality elements are discussed in Appendix 20.2 (WFD compliance assessment).
Environment Agency	December 2017 PEIR consultation	Paragraph 100 states that the impacts to the biology quality elements e.g. invertebrates and macrophytes will be prevented by the embedded mitigation. The embedded mitigation is not adequate, and there will be unavoidable localised impacts which may cause WFD deterioration.	<p>Embedded mitigation measures are described in detail in section 20.7.1 of Chapter 20 Water Resources and Flood Risk.</p> <p>Potential impacts on WFD quality elements are discussed in Appendix 20.2 (WFD compliance assessment).</p>
Environment Agency	December 2017 PEIR consultation	Paragraph 101 states there is no potential impacts on hydromorphology, physico-chemistry and biology quality elements at watercourse crossings. This is not correct. There are potential impacts on hydrology as the flow is not maintained. Also there are potential impacts on physchem, if sediment is not contained and if the water is impounded there could be impacts on dissolved oxygen and water temperature.	Potential impacts on WFD quality elements are discussed in Appendix 20.2 (WFD compliance assessment).
Environment Agency	December 2017 PEIR consultation	Paragraphs 123 and 124 contradict each other regarding potential impacts on physchem	Potential impacts on WFD quality elements are discussed in Appendix 20.2 (WFD compliance assessment).
Environment Agency	December 2017 PEIR consultation	No waterbodies or activities have been selected for further assessment at Stage 3 of WFD compliance assessment, yet the answer to the scoping questions is yes in Table 20.2.1. This doesn't follow the methodology properly which was set out in 20.3.3.3. Our guidance 488_10 which was referenced states that impacts on priority habitats and species must be considered, this is not addressed in the WFD compliance assessment. Opportunities to improve the water environment	<p>Potential impacts on WFD quality elements are discussed in Appendix 20.2 (WFD compliance assessment).</p> <p>Additional water bodies have been screened in to the detailed assessment stage.</p>

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		have not been sought as set out in 488_10. Creating a new cable route crossing on this scale, are not low risk activities and therefore, the impacts of these activities must be assessed at stage 3 – further assessment.	
Environment Agency	December 2017 PEIR consultation	Section 20.7 Potential Impacts. We are not agreement with the approach of considering the Poor chemical WFD status of the Broadland Chalk & Crag WFD groundwater body to be of low sensitivity because of its status. It is classified as Poor because it fails one of the qualitative tests – the test for nitrates; otherwise there is no issue with chemistry and the body is heavily used for abstraction and so of significant value to the area. The Poor status means that it should be treated as being of at least equal sensitivity; it is essential that no further deterioration occurs. The principal Crag and chalk aquifers are being treated as being as of high sensitivity. This is correct. These aquifers comprise the Broadland Crag and Chalk WFD groundwater body. It therefore seems incorrect to apply different levels of risk to essentially the same thing. We would suggest that this entire section needs to be re-considered to reflect the above points, treating both the groundwater body and its component aquifers in the same way in terms of sensitivity and risk. The assessment framework should also include the value of shallow aquifers and their role in supplying baseflow to watercourses as well as being exploited for water.	The approach to defining the sensitivity of groundwaters has been amended, as outlined in section 20.6.4.2 of Chapter 20 Water Resources and Flood Risk.
Environment Agency	December 2017 PEIR consultation	Table 20.2 p 15. The secondary aquifer definitions require clarification. If there is recharge and accessible pore space, this fulfils the function of an aquifer. We are uncertain about the discussion about recharge that states ‘Does not provide recharge to groundwater’. This statement should be clarified.	This statement has been removed from Table 20.4 of Chapter 20 Water Resources and Flood Risk.
Environment Agency	December 2017 PEIR consultation	Tables 20.3 and 20.4. We are uncertain whether these tables apply to groundwater as well as surface water. This should be clarified.	The tables apply to surface and groundwater. This has been clarified in section 20.4.1 of Chapter 20 Water Resources and Flood Risk.

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Environment Agency	December 2017 PEIR consultation	20.7.3.4.4. 168. The Crag should also be noted as a principal aquifer.	This has been clarified in section 20.7.4 of Chapter 20 Water Resources and Flood Risk.
Environment Agency	December 2017 PEIR consultation	20.7.3.4. 173. It is unclear whether or not the excavations be above the water table in the shallow aquifer which should be clarified. It will be necessary to assure there aren't any significant changes in shallow aquifer groundwater flow.	This has been clarified in section 20.7.4 of Chapter 20 Water Resources and Flood Risk.
Environment Agency	December 2017 PEIR consultation	20.7.4.1.4. This section should include consideration of the potential for adverse impacts on abstractions from the shallow aquifer within the cable corridor or within close proximity to it.	This has been clarified in section 20.7 4 of Chapter 20 Water Resources and Flood Risk.
Environment Agency	December 2017 PEIR consultation	We would like to remind you of our earlier point that the WFD status does not represent the Ecological value of a watercourse. Even Waterbodies which are not classified under the WFD may still be important for their ecology including IDB field drains and some field ditches. In addition, we would expect any work carried out to result in no overall deterioration in the existing condition of any waterbody, or in the WFD water catchments as a whole. Where WFD identifies that a waterbody is failing, this presents an opportunity for mitigation and enhancement.	The approach to assigning sensitivity and value to surface water receptors has been updated, and is now based on hydrological catchments rather than type of watercourse. Full details are provided in section 20.6.4 of Chapter 20 Water Resources and Flood Risk.
Environment Agency	December 2017 PEIR consultation	20.6.11 – Point 70 details a number of sub catchments. Of the 14 waterbodies listed, over half have records of Brown Trout, Bullhead and Brook Lamprey (Annex II species under the Habitats Directive). The EIA does not take account of the importance of these waterbodies for these species which require high dissolved oxygen (DO) levels, good water quality and access to gravel substrate for spawning or feeding. If trenched water crossings are to go ahead as planned, we will require detailed method statements which can clearly demonstrate what measures will be in place to protect water quality, turbidity, and DO levels, and what plans are in place to reinstate spawning gravels after excavation.	Embedded mitigation measures are described in detail in section 20.7.1 of Chapter 20 Water Resources and Flood Risk. Potential impacts resulting from watercourse crossings are assessed in section 20.7.4 of Chapter 20 Water Resources and Flood Risk.

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Environment Agency	December 2017 PEIR consultation	20.7.3.4.1-Point 156- North Walsham and Dilham Canal – WFD status does not equate to low sensitivity as a potential receptor site for pollutants. This misconception is repeated throughout the EIA. As discussed earlier, equal care needs to be taken where status is poor, as this poor status can leave the watercourse more vulnerable to the adverse effects of work. Where a waterbody is failing, we would encourage the applicant to look for mitigation and enhancement options.	The approach to assigning sensitivity and value to surface water receptors has been updated, and is now based on hydrological catchments rather than type of watercourse. Full details are provided in section 20.6.4 of Chapter 20 Water Resources and Flood Risk.
Environment Agency	December 2017 PEIR consultation	During the application stages we would expect to work with you to agree methodology to prevent leaks of drilling lubricant during HDD. Where this has occurred in the past, cracks in the underlying geology caused by drill vibrations have resulted in the release of lubricant (usually fine Bentonite clay) into sensitive receptors ('Frac out').	Embedded mitigation measures are described in detail in section 20.7.1. Potential impacts resulting from watercourse crossings are assessed in section 20.7.4 of Chapter 20 Water Resources and Flood Risk.
Environment Agency	December 2017 PEIR consultation	The landfall comprises a stretch of coastline approximately 1.5km from Beach Road in the north to just north of Cart Gap Road in the south'. We have therefore, assessed this landfall site option only, as part of this consultation. At the Happisburgh South landfall location shown in Figure 5.2, the proposed works are not adjacent to sea defences maintained by the Environment Agency and the boundary of the works are not within Flood Zone 2 or 3. On this basis, a Flood Risk Activity Permit will not be required for the works. We note that cable relay station and substations are located in flood zone 1 and so no further assessment of risk associated with tidal or fluvial sources is required. Where access routes cross flood zones 2 and 3, they are proposed to replicate existing ground levels. Where the provision of an access road will result in the raising of ground levels, the impact upon flood risks in the local area/within the flood cell will need to be considered and compensated for appropriately. In this instance, modelling will need to be provided to demonstrate that there will be no increase in flood risk to the site and surrounding area.	Potential impacts on flood risk are addressed in sections 20.7.4 and 20.7.5 of Chapter 20 Water Resources and Flood Risk. A detailed Flood Risk Assessment is provided in Appendix 20.1.

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CPRE	December 2017 PEIR consultation	<p>42. Table 20.1 The Secretary of State asks that the Flood Risk Assessment should take into account the most up to date climate change allowances and should cover tidal flood risk as well as fluvial impacts under present and projected sea level scenarios.</p> <p>Comment: The consideration of 'short HDD' as an option for the landing at Happisburgh South makes it seem that this advice has yet to be factored in. A tidal surge on the east coast as severe as that of the 5th December 2013 on the north coast could impact on cable relay stations if HVAC transmission were to be used.</p>	<p>Potential impacts on flood risk are addressed in sections 20.7.4 and 20.7.5 of Chapter 20 Water Resources and Flood Risk. A detailed Flood Risk Assessment is provided in Appendix 20.1.</p> <p>Embedded mitigation measures including the selection of HVDC technology and the long HDD option are discussed in section 20.7.1.</p>
CPRE	December 2017 PEIR consultation	<p>75. Table 20.7. We note the geomorphological overview of the Rivers Bure and Wensum and associated water bodies; and at 76 that the water quality data of the surface water bodies identified predominantly good physicochemical and chemical quality conditions across the main surface water catchments.</p> <p>Comment: the exceptions on phosphate level, one from sewage effluent discharges (77), and the other from arable run-off (78) – however these problems are widespread, albeit at a lesser degree than those mentioned here.</p>	<p>The information provided in section 20.6 is based on publicly available data and is intended to provide an overview of baseline conditions.</p>
CPRE	December 2017 PEIR consultation	<p>88. Table 20.8, Mitigation measures embedded for water resources and flood risk. We note the ten mitigation factors listed.</p> <p>Comment: The greatest mitigation measure of all for all would be the use of HVDC power transmission rather than HVAC. Apart from not requiring cable relay stations (two with Vanguard and Boreas) the whole cabling would see a much reduced amount of soil to be excavated and stored and back-filled along the 60 km length. In addition, because of that, there will be a greater chance of monitoring the construction work and assess the degree to which the codes of practice and mitigation measures are complied with. We make also make some specific comment. On the drainage plan it is good to maintain the duration for which trenches remain open by installing ducts in short sections and re-filling on the completion of each section. It is not clear though how the drainage plan to minimise water in the cable trench and ensure ongoing drainage of surrounding</p>	<p>As described in Chapter 5 Project Description, the HVDC option has been selected. Impacts associated with this option are assessed in sections 20.7.4, 20.7.5 and 20.7.6 of Chapter 20 Water Resources and Flood Risk. Further details of embedded mitigation measures are provided in section 20.7.1 of Chapter 20 Water Resources and Flood Risk.</p>

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		<p>land, how the water in general might be got away; nor where water does enter the trenches during installation, how this will be pumped via settling tanks or ponds to remove sediment and then be discharged into local ditches or drains via temporary interceptor drains. For trenched watercourse crossings the dams will be removed; but again, it is not clear on how the watercourse will be diverted and where; and what might happen in even a relatively minor rain event, such as dam failure and/or spill-over or failure in the diversion. Mention is made of the use of existing tracks and roadways for access where needed. However, no mention is made of the running tracks and the soil compaction caused by repeated use by heavy vehicles, far greater than occurs in agriculture, where it is a major factor in arable run-off. Mobilisation areas will comprise hardstanding to prevent soil erosion and increased surface runoff; will hardstanding really help, it may well depend on the nature of the top soil and underlying subsoil. For surface water drainage systems the SuDS philosophy will be employed to limit runoff, where feasible, and how often will that be? Foul drainage will be collected through a mains connection to existing local authority sewer system if available, and for rural Norfolk again how often will that be? The alternative would be a septic tank located within the onshore project area.</p>	
CPRE	December 2017 PEIR consultation	<p>89.This section establishes the Worst Case Scenario (WCS) for each key impact category and the construction scenario, as well as the particular design parameters (such as the maximum construction footprint at the landfall) that define the Rochdale Envelope.</p> <p>Comment: We finish where we began. The Worst Case Scenario is the use of HVAC instead of HVDC. However, this is 'lost' and not identified as such by the misuse of the Rochdale Envelope. This applies all along the cabling corridor. In our view this invalidates the process by which impact assessments are made and advantages and disadvantages are assessed as regards residents, farmers and wildlife. Further at Table 20.15, using HVAC and the WCS, the residual impact identified for water resources and flood risk on the various receptors is shown as</p>	As described in Chapter 5 Project Description, the HVDC option has been selected. Impacts associated with this option are assessed in sections 20.7.4, 20.7.5 and 20.7.6 of Chapter 20 Water Resources and Flood Risk.

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		12 negligible and 17 minor, nothing even as moderate adverse. Nothing is significant in EIA terms, and at face value there would be no taking forward to the Environmental Statement. The same methodology brings the same sort of result in other topic areas.	
CPRE	December 2017 PEIR consultation	58. The onshore cable corridor crosses four main catchment river catchments. Some tributaries and wetland areas for each river are listed. For the River Bure the most notable tributary is King's Beck. The downstream reaches of the river have a range of wetland features, including Hoveton Great Broad and Marshes, Woodbastwick Fens and Marshes, Bure Marshes. The River Wensum and several of its tributaries would be crossed, most notably Wendling Beck and the Blackwater Drain. The River Wissey headwaters fall within the area for the Necton National Grid substation extension. The North Walsham and Dilham Canal is crossed at North Walsham (see 41 above; note also a leisure interest). Comment: The tributaries and wetlands listed above and others should be considered for a trenchless crossing to minimise the risk of silt entering the river systems, and not adding to the loading caused by arable run-off, a major problem for all rivers entering the Broads (Bure, Wensum and Ant). Those running into the Wensum have the additional issue is that the whole upper reach of the river is designated SAC.	Trenchless techniques have been selected for the larger and most sensitive watercourses, as described alongside other embedded mitigation measures in section 20.7.1. Potential impacts resulting from watercourse crossings are assessed in section 20.7.4 of Chapter 20 Water Resources and Flood Risk.
CPRE	December 2017 PEIR consultation	59. The baseline hydrology is described in more detail in Chapter 20 Water Resources and Flood Risk, but we note Tables 19.10 and 19.13 which show the status of the Broadland Rivers Chalk and Crag groundwater body and that of the North Norfolk Chalk groundwater body. 114. It is anticipated that surface watercourses are in hydraulic connectivity with groundwater contained within superficial deposits throughout the study area. The River Wensum is a chalk river that is designated as an SAC and SSSI and is therefore considered to have high sensitivity. Tributaries of the Wensum such as Wendling Beck and the Blackwater drain are also considered to have high sensitivity, on the basis of their direct connectivity with the main River Wensum,	Embedded mitigation measures to prevent sediment entering the surface drainage network are described in detail in section 20.7.1. Potential impacts resulting from increases in sediment supply are assessed in section 20.7.4 of Chapter 20 Water Resources and Flood Risk.

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		<p>on their basis of their direct connectivity with the main River Wensum.</p> <p>Comment: A team at UEA shows that much of the silt getting into a river system does so in a heavy rain event; and that in a drainage ditch will move on in the next heavy rain event until it reaches the main river. As such ditches only periodically in hydraulic contact with the groundwater also pose a risk.</p>	
CPRE	December 2017 PEIR consultation	<p>116. The overall impact on indirect or contamination of surface watercourse based on the situation which includes the integration of measures adopted in section 19.7.1 is considered to be minor adverse which is not significant in EIA terms.</p> <p>Comment: We consider there is a divergence between the theory and what happens on the ground. As a marker consider the persistent and severe problems with agriculture and arable run-off, in spite of good practices ELS, etc. As well as the adverse impact on rivers, it can also result in flooding of property.</p>	Embedded mitigation measures to prevent contaminants entering the surface drainage network are described in detail in section 20.7.1. Potential impacts resulting from increases in the supply of sediment and other contaminants are assessed in section 20.7.4 and 20.7.5 of Chapter 20 Water Resources and Flood Risk.
Anglian Water	December 2017 PEIR consultation	In addition consideration should be given to whether there is a need for water and wastewater services both during construction and following construction.	The requirements for water and wastewater services has been clarified in section 20.7.1 of Chapter 20 Water Resources and Flood Risk.
Anglian Water	December 2017 PEIR consultation	Anglian Water is responsible for managing the risks of flooding from surface water, foul water or combined water sewer systems. It is assumed that Cable Relay Site site does not include any existing sewers therefore the risk of sewer flooding is considered to be low. However, no reference is made to existing sewers within the onshore cable route.	The requirements for water and wastewater services has been clarified in section 20.7.1 of Chapter 20 Water Resources and Flood Risk. A cable relay station is no longer required for the project.
Anglian Water	December 2017 PEIR consultation	At this stage it is unclear whether there is a requirement for wastewater services for the above site. It is suggested that the Environmental Statement should include reference to the foul sewerage network and sewage treatment as well as the management of surface water management.	The requirements for water and wastewater services has been clarified in section 20.7.1 of Chapter 20 Water Resources and Flood Risk.

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Planning Inspectorate	December 2018 ES Representations	On 26 November 2018, the UK Climate Projections 2018 (UKCP18) was published and is the first major update of climate projections in nearly 10 years, illustrating a range of future climate scenarios. How do the updated projections affect your flood risk assessment [APP-344]?	The approach adopted within Appendix 20.1 Flood Risk Assessment of Chapter 20 Water Resources and Flood Risk follows the guidance within the NPPF on how climate change implications should be assessed. This guidance is not directly aligned to the UK Climate Projections, and the update to UKCP18 does not therefore affect the results of the assessment presented in the FRA.
Planning Inspectorate	December 2018 ES Representations	Do you agree with the Environment Agency's comments [RR-117] that prior approval should be obtained for soil management, construction method statements, site and excavated waste management, and surface water drainage plans?	An Outline Code of Construction Practice (CoCP) will be produced and will include detailed soil management and construction method statements, site and excavated waste management plans and surface water drainage plans. As stated in Chapter 20 Water Resources and Flood Risk (20.7.4) the details of these plans will be agreed post-consent through further consultation with the Environment Agency.
Planning Inspectorate	December 2018 ES Representations	The Outline CoCP [APP-025] at paragraph 45 sets out measures for working in Flood Zones 2 or 3, including a proposal to leave gaps in stored spoil. Please review this proposal and comment in light of the response of the Environment Agency [RR-117] that spoil stored in a functional floodplain will take away the flood storage capacity for that area and so increase flood risk elsewhere.	The Applicant acknowledges the comments provided by the Environment Agency [RR-117] and will ensure that locations for spoil storage along the cable route are located at least 8m away from surface watercourses and, wherever possible, outwith Flood Zone 3b (functional floodplain). This will ensure

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			that there is no loss of flood storage capacity within functional floodplain.
Planning Inspectorate	December 2018 ES Representations	Do you agree that the choice of drilling fluid and HDD methodology should be agreed with the Environment Agency prior to the start of trenchless crossing works, including specific mitigation measures in addition to the 'embedded' measures presented? [APP-343]?	<p>Detailed Construction Method Statements will be developed by the Principal Contractor for relevant construction operations and will be included as part of the outline CoCP.</p> <p>The CoCP will include details of the detailed design for each trenchless crossing location, including proposed methodology (e.g. HDD) and drilling fluid (e.g. inert clay based fluids such as bentonite). The CoCP will also include appropriate pollution control plans, including measures for managing breakout of drilling fluid.</p> <p>The final CoCP for each stage of the works will be submitted by the Applicant to the Environment Agency for approval prior to works on that phase commencing. An assessment and monitoring process for the risk of bentonite or other drilling fluids release at trenchless crossings will be included in the final CoCP and be referenced in the Environmental Incident Response and Contingency Plan.</p>
Planning Inspectorate	December 2018 ES Representations	Section 19.7.5.8 [APP-343] suggests that works should have little effect on the hydraulic regime in shallow aquifers and therefore, little risk to local groundwater abstractors.	The impact assessment presented in Chapter 20 Water Resources and Flood Risk has considered potential for impact on

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		<p>Have all abstractions within the study area been assessed in detail to ensure that local water supplies are not compromised?</p>	<p>licensed and unlicensed abstractions during construction and operation. Abstractions were not considered individually but were instead considered as an integral part of the groundwater receptor and assigned a high value and sensitivity to ensure that they are adequately safeguarded (Section 20.6.5.2 of Chapter 20 Water Resources and Flood Risk). This approach was agreed following consultation with the Environment Agency (Rep1 - SOCG - 6.1). Landowners and local residents will be consulted to identify the location of private water supplies during the detailed design process to ensure the proper assessment and protection of shallow wells in proximity to the works. The Applicant notes the offer made by the Environment Agency [RR-117] to provide any data holdings on unlicensed abstractions and confirms that these data will also be considered alongside the outcomes of landowner consultation during detailed design .</p>
<p>Planning Inspectorate</p>	<p>December 2018 ES Representations</p>	<p>Would the Applicant please supply the ground investigation reports by Terra Consult (2017) and GHD (2018) referred to in [APP-343]. Please comment on whether a protocol could be agreed between the Environment Agency and the</p>	<p>As set out in Section 20.7.4.3.3 of Chapter 20 Water Resources and Flood Risk, the Construction Method Statement will stipulate that the best available techniques</p>

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		<p>Applicant for the use of HDD at each sensitive location to include site and ground investigations, risk assessment, appropriate mitigation and remediation?</p>	<p>are used for any installations in sensitive locations (e.g. SPZ1 or SPZ2), in accordance with the Energy Network Association Guidance and in agreement with the Environment Agency.</p> <p>A hydrogeological risk assessment will be undertaken which meets the requirements of Groundwater Protection Principles and Practice (GP3) (Environment Agency, 2017) for any trenchless crossing locations in SPZ1 or SPZ2. If significant risks are identified, alternatives including alternative trenchless drilling techniques (other than HDD) to cross the SPZ will be considered.</p> <p>This approach will therefore provide a mechanism for the Applicant and the Environment Agency to agree a protocol for the use of trenchless crossing techniques at each sensitive location.</p>
<p>Planning Inspectorate</p>	<p>December 2018 ES Representations</p>	<p>Section 19.6.2.4 [APP-343] notes that no information can be obtained on private groundwater abstractions. Have you taken up the Environment Agency's offer to provide information on aquifer geology and borehole depth for most groundwater abstractions licensed until 2002? If so, how does this information affect your assessment of groundwater vulnerability and consequential impact assessment and proposed mitigation for the construction, operation and decommissioning phases of the project?</p>	<p>Detailed borehole information from the Environment Agency was not available at the time of drafting Chapter 20 Water Resources and Flood Risk and has not therefore been considered in the assessment. However, the impact assessment presented in Chapter 20 Water Resources and Flood Risk has considered potential for impact on licensed and</p>

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			<p>unlicensed abstractions during construction and operation. Abstractions were not considered individually but were instead considered as an integral part of the groundwater receptor and assigned a high value and sensitivity to ensure that they are adequately safeguarded (Section 20.6.5.2 of Chapter 20 Water Resources and Flood Risk). This approach was agreed following consultation with the Environment Agency (Rep1 - SOCG - 6.1). The location of private water supplies will be identified during the detailed design process through consultation with landowners, local residents and analysis of data from the Environment Agency.</p>
<p>Planning Inspectorate</p>	<p>December 2018 ES Representations</p>	<p>[AS-001] With regard to the Whitewater River which is to be crossed by using open trench techniques, please describe as precisely as possible where drilling will start and end and whether or not it will be within the floodplain of the river in question.</p>	<p>As described in Appendix 20.4 Crossing Schedule of Chapter 20 Water Resources and Flood Risk, the Whitewater River will be crossed using an open cut trenching technique downstream of Reservoir Wood. The trench will traverse the river channel and its floodplain (including Flood Zones 2 and 3), as described in Chapter 20 Water Resources and Flood Risk Section 20.7.4.1. A final scheme for crossing all watercourses in advance of construction will be produced. This will include a detailed programme and confirmation of</p>

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			<p>methods for all watercourse crossings, will be developed through consultation with the Environment Agency for Main Rivers and the Local Authority (and, where appropriate, the Internal Drainage Board) for ordinary watercourses.</p>
<p>Planning Inspectorate</p>	<p>December 2018 ES Representations</p>	<p>Do you agree the Environment Agency should be consulted on any proposed monitoring schemes associated with river crossing and pollution remediation works (to ensure the protection of the Wensum SAC and Southern North Sea SAC)?</p>	<p>As stated in Section 20.7.3 of Chapter 20 Water Resources and Flood Risk, the Applicant is committed to undertaking further consultation with the Environment Agency to obtain agreement on the scope of proposed monitoring schemes associated with river crossings and pollution remediation works.</p> <p>The approach to sediment management and water quality will be described in the outline CoCP. No stage of the onshore transmission works will commence until for that stage a final CoCP has been submitted to and approved by the relevant regulators. This would provide site specific details for sediment management, based on the principles agreed in the outline CoCP and informed by the detailed design and appointment of the Principal Contractor.</p> <p>A scheme and programme for each watercourse crossing, diversion and reinstatement which will include site</p>

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			<p>specific details of the sediment management measures including their use and removal will be produced. This scheme will be submitted to and, approved by the relevant planning authority in consultation with the Environment Agency and Natural England.</p> <p>With these commitments in place there will be sufficient control measures to safeguard designated sites in relation to sediment control, pollution prevention and reinstatement of all work areas at watercourse crossings.</p>
Planning Inspectorate	December 2018 ES Representations	[APP-538] Do you agree that although Crag is referred to as a superficial deposit, it is a principal aquifer? Please comment on the suggestion [RR-117] that as a principal aquifer it must be accorded the protection warranted for such an important groundwater resources unit.	The Crag is classified as a superficial deposit on the BGS Geology of Britain Viewer, and was therefore referred to as such in Chapter 20 Water Resources and Flood Risk. However, the Applicant understands that the Crag is also a Principal Aquifer. The aquifer was assigned a high value and sensitivity in Section 20.6.4.2 of Chapter 20 Water Resources and Flood Risk to ensure that it was accorded the requisite level of protection.
Planning Inspectorate	December 2018 ES Representations	Please review NCC's requirements as LLFA in [RR-123] in the section "Flood and Drainage Issues and Comments" and respond to the matters requested to be clarified to ensure a deliverable surface water drainage strategy prior to the end of the Examination.	As set out in Section 20.7.5.1 of Chapter 20 Water Resources and Flood Risk, a Surface Water Drainage Plan (SWDP) will be produced in advance of constructio. The

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			<p>SWDP will be designed to meet the requirements of the NPPF and NPS EN-5, with runoff limited, where feasible, through the use of infiltration techniques which can be accommodated within the area of development. The drainage strategy will be developed according to the principles of the SuDS discharge hierarchy. Generally, the aim will be to discharge surface water runoff as high up the following hierarchy of drainage options as reasonably practicable: i) into the ground (infiltration); ii) to a surface water body; iii) to a surface water sewer, highway drain or another drainage system; or iv) to a combined sewer. The appropriate greenfield runoff rate will be agreed through consultation with the Lead Local Flood Authority and the Environment Agency during the detailed design stage.</p>
<p>Planning Inspectorate</p>	<p>December 2018 ES Representations</p>	<p>Several Relevant Representations for example [RR-011], [RR-015] and [RR-130] express concerns relating to flooding of roads around Ivy Todd, Chapel Road and West End.</p> <p>What land drains are proposed to be removed and what specific assessment been made of the effects of existing infrastructure such as Dudgeon substation on surface run-off?</p> <p>What assessment has been made of the tributaries and drains in this vicinity, and how is it proposed to ensure that the construction and operation of the</p>	<p>The location of existing land drains along the onshore cable route and at the onshore project substation will be confirmed during the detailed design process at the post consent stage. As described in Section 20.7.4.4 of Chapter 20 Water Resources and Flood Risk, a local specialised drainage contractor will undertake surveys to locate drains and</p>

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		substation and associated infrastructure does not worsen the flooding in this area?	create drawings both pre- and post-construction, and ensure appropriate reinstatement. The pre-construction drainage plan will include provisions to minimise water within the working area and ensure ongoing drainage of surrounding land. Existing land drains along the onshore cable route and at the onshore project substation will be reinstated following construction. Surface runoff from the areas affected by the proposed development will be collected within the site drainage network and discharged in accordance with the requirements of the NPPF and NPS EN-5. This means that there will be no net change in surface water flood risk as a result of the proposed development.
Planning Inspectorate	December 2018 ES Representations	Referring to Appendix 20.4 [APP-229] Table 20.1, it appears that the majority of ordinary watercourses are proposed to be crossed by open cut rather than Horizontal Directional Drilling for permanent works. Do you agree the County Council should have early consultation on the number of such crossings of Ordinary Watercourses and the required timeframes for approval?	As set out in Table 1.1 of Appendix 20.4 Crossing Schedule of Chapter 20 Water Resources and Flood Risk, the majority of ordinary watercourses would be crossed using open cut trenching techniques rather than Horizontal Directional Drilling. As summarised in the Norfolk Vanguard Statement of Common Ground with Norfolk County Council (Rep1 – SOCG – 15.1), it was agreed that this approach was appropriate.

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			<p>A final scheme for crossing all watercourses in advance of construction will be produced during detailed design, post-consent. This will include a detailed programme and confirmation of methods for all watercourse crossings, will be developed through consultation with the Environment Agency for Main Rivers and the Local Authority (and, where appropriate, the Internal Drainage Board) for ordinary watercourses.</p>
<p>Planning Inspectorate</p>	<p>December 2018 ES Representations</p>	<p>Comment on NCC's statement that it seeks to avoid culverting, and its consent for such works will not normally be granted except as a means of access.</p>	<p>Permanent culvert crossings will be considered only for crossings where the drainage channels are deeper than 1.5m. A cable route walkover survey conducted in October 2018 by civil and drainage engineers noted that the likelihood of any permanent culverted crossings is low with the majority of drainage channels being less than 1.5m in depth or already part of a committed trenchless crossing method. All watercourse crossing schemes will be submitted to and approved by the relevant planning authority in consultation with Natural England, prior to the onshore transmission works commencing. As stated in Section 20.7.4.1 of Chapter 20 Water Resources and Flood Risk, the use of permanent culverts will be avoided where</p>

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			<p>possible, and instead use the alternative dam and divert crossing techniques. If permanent culverts are required, however, their impacts would be mitigated by:</p> <ul style="list-style-type: none"> • Ensuring that the culvert is adequately sized to avoid impounding flows (including an allowance for potential increases in winter flows as a result of projected climate change); and • Installing the culvert below the active bed of the channel, so that sediment continuity and movement of fish and aquatic invertebrates can be maintained. <p>Furthermore, temporary culverts will be required to allow the running track to cross surface watercourses. These will be used at the majority of crossing locations (including Wendling Beck at Bushy Common but excluding all other watercourses crossed using trenchless techniques). The impacts of temporary culverts would be mitigated using the measures outlined above. In addition, alternative techniques such as temporary bridges will be considered where appropriate (e.g. where culvert installation is likely to have an impact on channel morphology and ecology).</p>

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			With these commitments in place, there will be sufficient control measures to prevent adverse impacts on ordinary watercourses through resulting from culvert installation.
Planning Inspectorate	December 2018 ES Representations	Please comment on NCC's requirements for infiltration testing [RR-123] and how they would be incorporated within the Surface Water Drainage Plan.	A SWDP will be developed prior to construction, which will be designed to meet the requirements of the NPPF and NPS EN-5, with runoff limited, where feasible, through the use of infiltration techniques. Infiltration will be undertaken to inform the development of the SWDP and detailed drainage design.
Planning Inspectorate	December 2018 ES Representations	Do you agree that greenfield run-off rates will need to be agreed with the LLFA at detailed design stage?	Table 20.14 of Chapter 20 Water Resources and Flood Risk (20.7.1) states that runoff from the development will be limited to the greenfield runoff rate. The greenfield runoff rate, alongside other surface water drainage requirements for operational onshore project infrastructure, will be presented in the final SWDP. The appropriate greenfield runoff rate will be agreed through consultation with the Lead Local Flood Authority and the Environment Agency during the detailed design stage.
Planning Inspectorate	December 2018 ES Representations	Where water enters the trenches during duct installation, this would be pumped via settling tanks or ponds to remove sediment and discharged into local ditches or drains. What contingency plan is there for any significant rainfall event that	The outline CoCP will specify the sectionalised duct installation method (excavate, lay and reinstate approximately

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		<p>may prevent the effective drainage of water from the trenches? Confirm how exceedance routes for flows in excess of a 1 in 100-year rainfall event will be provided at detailed design stage.</p>	<p>150m/week), which is designed to minimise water ingress to the trenches. A specialised drainage contractor, in engagement with landowners, will undertake surveys to locate drains and create drawings. The pre-construction drainage plan will include provisions to minimise water within the working area and ensure ongoing drainage of surrounding land. Any pumps, flumes or channels will be designed to have sufficient capacity to convey the required range of flows at each location. The SWDP will be submitted to and approved by the relevant planning authority prior to the onshore transmission works commencing. Modelling of exceedance flow routes will be undertaken during the detailed drainage design to ensure that there is no increase in surface water flood risk to downstream receptors as a result of the proposed development.</p>
<p>Planning Inspectorate</p>	<p>December 2018 ES Representations</p>	<p>Please comment on the requirements for a maintenance plan for all drainage features over the lifetime of the development as suggested by NCC in its RR [RR-123]</p>	<p>A SWDP will be developed prior to construction. Temporary drainage features along the cable route will be removed and original drainage reinstated once construction is complete, therefore no ongoing maintenance plan is required.</p>

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			<p>Maintenance of the permanent drainage features at the onshore project substation site would be retained by the Applicant during the lifetime of the project.</p>
<p>Planning Inspectorate</p>	<p>December 2018 ES Representations</p>	<p>NCC [RR-123] has identified omissions from the Flood Risk Assessment (S7, S8, S9). Please comment on whether these matters should be included and at what stage in the design process?</p>	<p>A SWDP will be developed during the detailed design process. This will include calculations to demonstrate that there will be no flooding on site from the proposed drainage scheme during the 1 in 30 year plus climate change rainfall event. The design of the drainage system and the need to design infrastructure such that it does not flood during the 1 in 100 year rainfall event will be considered. This will be confirmed as part of the detailed design process and demonstrated within the SWDP.</p> <p>The SWDP will be informed by modelling of exceedance flow routes (including flow depth and velocity where appropriate) to ensure that there is no increase in surface water flood risk to downstream receptors as a result of the proposed development.</p>

3 References

Royal HaskoningDHV (2016). *Norfolk Vanguard Offshore Wind Farm: Environmental Impact Assessment Scoping Report*. October 2016.

Norfolk Vanguard Limited (2018). Norfolk Vanguard Offshore Wind Farm Environmental Statement. Available online at:
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