



Hornsea Project Four: Preliminary Environmental Information Report (PEIR)

Non-Technical Summary

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Hornsea Four PEIR Non-Technical Summary



Table of Contents

Introduction	1
What Is this Document?	1
What is Hornsea Four?	1
Who Wants to Develop Hornsea Four?	1
Why do we need Hornsea Four?	2
What permissions are being sought and what legislations apply?	2
Project Overview	3
What will be built, where and how?	3
How did the site get selected and what alternatives have been looked at?	9
Environmental Impact Assessment Process.....	10
What is an Environmental Impact Assessment (EIA)?	11
How have the environmental impacts have been identified and assessed?	11
Summary of the Environmental Assessments	12
Document Map	23
Next Steps	25
Contact Us	25

Introduction

What Is this Document?

This is the Non-Technical Summary (NTS) of a preliminary Environmental Impact Assessment (EIA) that has been undertaken for the Hornsea Four offshore wind farm (hereafter Hornsea Four). It is provided as a stand-alone document with the full report of the assessment available in the Preliminary Environmental Impact Report (PEIR).

The PEIR provides the environmental information which has been gathered to carry out an assessment of the likely significant effects upon the receiving environment because of the construction, operation and decommissioning of Hornsea Four. This NTS presents a summary of the main findings of the EIA undertaken for Hornsea Four, in non-technical language, and a submission map of all documents being submitted for consultation.

The full PEIR can be downloaded from:

<https://hornseaprojects.co.uk/Hornsea-Project-Four/Documents-Library/Formal-Consultation>

What is Hornsea Four?

Hornsea Four will be an offshore wind farm, comprising up to 180 wind turbines in an area of seabed 600 km², located approximately 65 km due east of Flamborough Head, Yorkshire. The project includes wind turbines that generate the electricity, offshore substations and electrical export cables which extend from the array area in an east-west orientation, to a landfall near Fraisthorpe, East Riding of Yorkshire. The onshore cable corridor extends from the landfall to connect the generated electricity to the Hornsea Four electrical substation onshore, near Cottingham. A connection from the substation to the National Grid is also included in the proposals.

Hornsea Four is the fourth in a series of windfarms to be built and operated in the Former Hornsea Zone. Currently Hornsea One and Two are both under construction with Hornsea Three within the planning system and awaiting planning consent.

Who Wants to Develop Hornsea Four?

Hornsea Four is being developed by Orsted Hornsea Project Four Limited (the Applicant), a wholly owned subsidiary of the Danish renewable energy company Orsted.

Orsted is a renewable energy company with more than 25 years' experience and a strong track record delivering successful projects, having built more offshore wind capacity than any other company worldwide. The company has invested significantly in the UK, where it develops, constructs and operates offshore wind farms and innovative energy-to-waste technology. In the UK, Orsted's windfarms generate enough clean energy to power 3.2 million homes. By 2022, once Hornsea One and Two are operational this figure will have increased to 5.5 million UK homes.



Our offshore wind farms in the UK

11 operational
2 in construction
3 in development

Why do we need Hornsea Four?

Climate change, more recently referred to as a “climate emergency”, is a global issue resulting from emissions of carbon in to the atmosphere in part due to human activity. In October 2014, the EU Council agreed on a policy framework, including targets and policy objectives for the delivery of renewable energy for the period 2020 to 2030. The targets include:

- A 40% reduction in greenhouse gas emissions compared to 1990 levels;
- At least a 27% share of renewable energy consumption; and
- At least 27% improvement in energy efficiency.

To meet these targets, the European Commission published a proposal for a revised Renewable Energy Directive on 30 November 2016. The central aim of the renewable energy directive is to ensure the security of energy supply, whilst adapting to climate change by reducing carbon emissions. In response, the government has placed a greater emphasis on generating energy from low carbon sources, including renewables. Accordingly, the Energy Act 2013 includes provisions intended to incentivise investment in low carbon electricity generation, simultaneously helping to ensure the security of our energy supply whilst helping to ensure the UK meets its emissions reductions and renewables targets. More recently the UK government passed laws with a target requiring the UK to reduce all greenhouse gas emissions to net zero by 2020.

The North Sea provides one of the best environments for producing energy from offshore wind of anywhere in the world. As a low carbon, renewable source of energy, Hornsea Four would make a significant contribution to both the UK and global targets by reducing carbon emissions, as well as providing the energy security and self-reliance the UK increasingly requires.

What permissions are being sought and what legislations apply?

Hornsea Four is large enough to be considered a Nationally Significant Infrastructure Project (NSIP) due to it being an “offshore generating station with a capacity of greater than 100 megawatts (MW)”. Permission to build and operate an NSIP is given in a Development Consent Order (DCO), granted by the Secretary of State for Business, Energy and Industrial Strategy in accordance with the policy framework provided in the National Policy Statements (NPSs).

Under the Planning Act 2008, NPSs provide the primary basis for decisions regarding NSIPs made by the Secretary of State. The UK’s commitment to renewable energy has been captured in the publication of the following NPSs which are of direct relevance for the development of Hornsea Four:

- EN-1 Overarching Energy;
- EN-3 Renewable Energy Infrastructure; and
- EN-5 Electricity Networks.

The whole of the onshore project footprint lies within the boundary of East Yorkshire of Riding Council (i.e. the local authority) and relevant local development plans have been identified and consulted on so that policy conflicts can be avoided wherever possible. The PEIR takes full account of wider planning considerations at the national and regional level both on the land and at sea.

Project Overview

What will be built, where and how?

The location of Hornsea Four is shown on Figure 1 and specifically consists of:

Array area

The area where the offshore wind farm turbines will be located and additional infrastructure including the offshore substations, electrical cables to connect turbines and an offshore accommodation platform.

Offshore export cable corridor

The area where the offshore export cables that bring the power generated by the wind farm ashore will be installed, preferably buried below the seabed.

Landfall area

The area where the offshore export cables will be brought ashore and buried beneath Fraisthorpe Beach, to connect to the onshore transmission system for onward transmission to the onshore substation and ultimately to the National Grid.

Onshore export cable corridor

The area where the export cables will be placed in up to six trenches to transfer the power generated across east Yorkshire to the onshore substation. The corridor will also include eight temporary logistics compounds, storage areas and temporary access roads.

Onshore substation

The area where the permanent onshore electrical substation infrastructure will be located which includes Energy Balancing Infrastructure (EBI) and a short section of 400kV cables connecting to Creyke Beck National Grid substation.

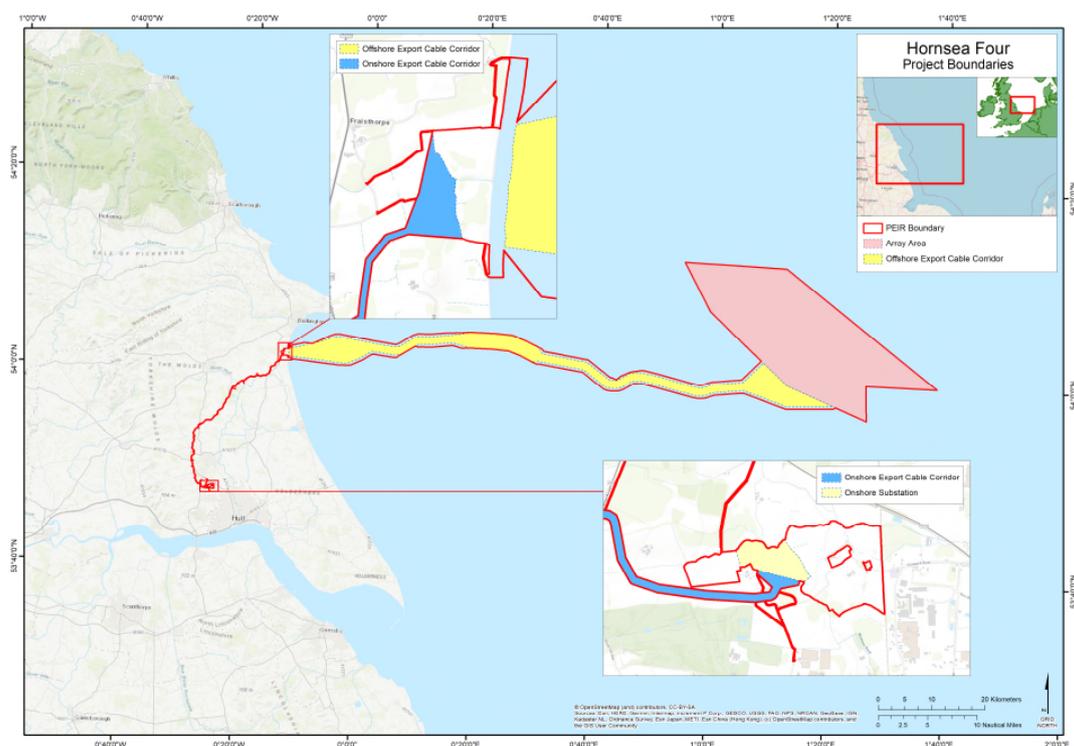


Figure 1: Location and overview of Hornsea Four

Components of Hornsea Four

Hornsea Four will comprise of up to 180 wind turbines and all infrastructure required to transmit the power generated by the turbines to the Creyke Beck National Grid substation, which is located near Cottingham, Humberside. It will also comprise of both offshore and onshore infrastructure required to operate and maintain the wind farm.

Hornsea Four incorporates Energy Balancing Infrastructure (EBI) which would be located at the new substation. The EBI helps smooth out energy going in to the National Grid, storing energy when production is high and releasing it in times of need.

Three differing types of electrical transmission systems are currently under consideration: High Voltage Alternating Current (HVAC); High Voltage Direct Current (HVDC); or a combination of both types in separate electrical systems. Figure 2 shows the main components of Hornsea Four incorporating HVAC infrastructure requirements.

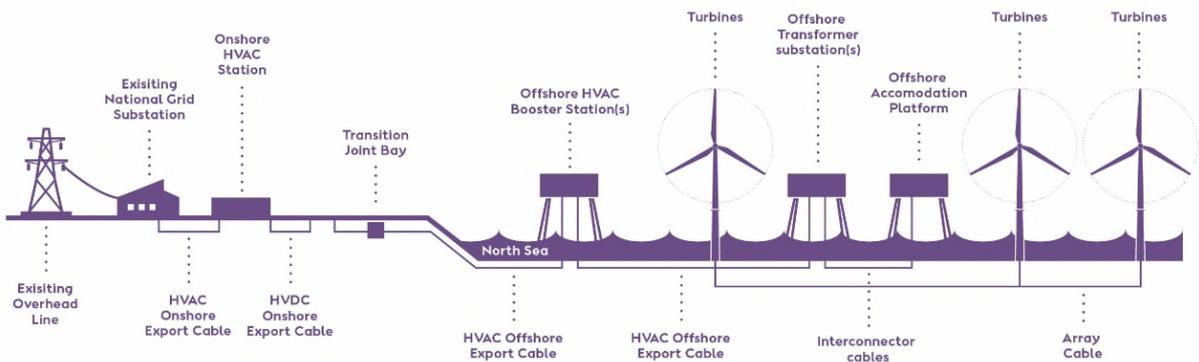


Figure 2: Main Components of Hornsea Four (HVAC Transmission System Only)

Construction Programme

Figure 3 illustrates the likely duration of installing the major project elements of Hornsea Four, and how they may relate to one another. The construction commencement date is dependent on several factors and the earliest possible date that onshore construction could commence is August 2023. The maximum total construction duration is four years and six months (54 months).

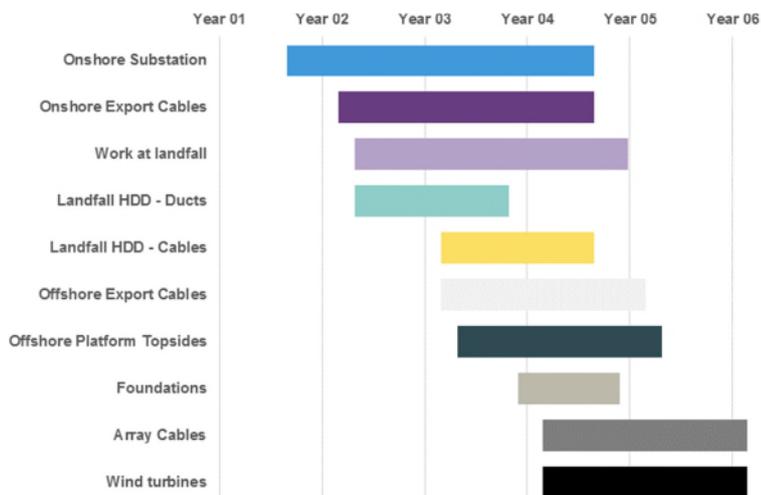


Figure 3: Indicative Construction Programme

Offshore Elements of Hornsea Four

Key Offshore Components of Hornsea Four

- Up to 180 wind turbine generators;
- Up to six offshore transformer substations;
- Up to three offshore converter substations (High Voltage direct Current (HVDC) system only);
- Up to one offshore accommodation platform to house operations and maintenance staff;
- Up to three HVAC booster stations (HVAC system only);
- Subsea inter-array cables linking wind turbines to each other and to offshore substations;
- Subsea interconnector cables linking the offshore substations to one another;
- Subsea export cables to connect the wind farm to landfall; and
- Cable protection.

Wind Turbine Generators

Wind turbine generators comprise of the tower atop a foundation, with a nacelle at its tip housing the electrical equipment, a gearbox and generator. The turbine blades are attached to the front of the nacelle and capture energy from the wind, transforming it via the generator into electricity. At Hornsea Four, the tips of the turbine blades will be no taller than 370 m above the sea, with a clearance between the lowest blade and the mean sea level of no less than 35 m. A typical turbine is shown in Figure 4.

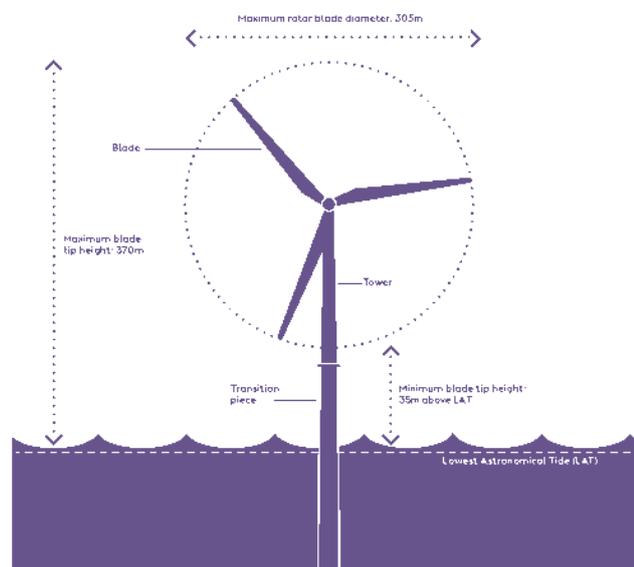


Figure 4: Typical Offshore Wind Turbine



Monopile

- Maximum diameter: 15m
- Maximum hammer energy: 5000 kJ



Piled Jacket

- Maximum numbers of legs: 3
- Maximum leg diameter: 4.6m
- Maximum pin pile diameter: 4m
- Maximum hammer energy: 2500 kJ



Mono Suction Bucket

- Maximum diameter: 40m
- No piling required



Suction Bucket Jacket

- Maximum number of legs: 3
- Maximum leg diameter: 30m
- No piling required

Figure 5: Foundation Options

Foundation Types

All wind turbines and other offshore structures will be secured to the seabed. The final design of these foundations depends on seabed conditions and the infrastructure being supported.

The foundation types being considered for wind turbines are presented in Figure 5. Each of these either relies on piling the foundation in to the seabed, or the pressure difference generated between the inside of an upturned bucket and the water surrounding it to secure the foundation. Additional foundation types are under consideration for the other offshore structures.

Offshore Substations

Offshore substations collect the electricity generated by the turbines, via electrical cables, so that it can be transmitted to National Grid. Hornsea Four may require up to nine substations. In the case of a HVDC transmission system being used, up to three substations may also be required to convert the electricity generated from HVAC to HVDC. These would be constructed within the extent of the array area.

Offshore Accommodation Platform

Due to the distance of Hornsea Four from the shore, a single offshore accommodation platform may be constructed within the array area to house operation and maintenance staff. This would reduce the need for crew transfers by boat or helicopter during the operational phase of the project.

HVAC Booster Stations

In the case of an HVAC transmission system, up to three HVAC booster stations may be required to compensate for transmission losses along the long export cable route. These would be located within the central part of the offshore export cable corridor.

Subsea Cables

Subsea cables are required to transmit the electricity generated by the wind turbines to the landfall. Cables will connect the wind turbines to substations (inter-array cables), and from offshore substations to shore (export cable). Additionally, in the case of a HVDC transmission system, interconnector cables will also be required to connect transformer substations to converter substations. Overall, Hornsea Four may require up to 1,344 km of subsea cables.

Cable Protection, Scour Protection and Cable Crossings

The preferred method of protecting the subsea cables will be to bury them within the sea floor. Where burial of cable is not possible cable protection such as rock placement may be required on the seabed. Cable protection will also be used where cables are required to cross existing cables or pipelines on the seabed.

Landfall

Once the offshore export cables reach the coastline, they will make landfall near Fraisthorpe where they will connect with the onshore export cables. The preferred option will be to use a drilling technique (such as Horizontal Directional Drilling (HDD)) to create a narrow tunnel under the beach through which the cable is pulled. However, it may be the case that this not possible (e.g. due to ground conditions), in which case open cut techniques would be required. A logistics compound will be required during construction and this will be located immediately landward of the beach.

Operation and Maintenance

Once construction is complete and the wind farm is fully commissioned Hornsea Four will enter its operation and maintenance phase. Upkeep of the infrastructure at sea may include routine servicing, component replacements, repairs, remedial works, and painting and cleaning.

Decommissioning

At the end of the operational lifetime of Hornsea Four (anticipated to be 35 years), it is expected that any infrastructure above the seabed will need to be completely removed. A decommissioning plan will be developed and agreed prior to decommissioning of the infrastructure, to take account of new techniques and technology.

Onshore Elements of Hornsea Four

Preparatory Works

Prior to the installation of infrastructure, it may be necessary to undertake site preparation works which may include:

- Pre-construction surveys (including ground investigations, soil surveys and archaeological surveys);
- Hedgerow removal and vegetation clearance; and
- Drainage management.

Onshore Export Cables, Corridor and Cable Crossings

The Hornsea Four onshore export cable corridor consists of an 80 m wide temporary construction corridor within which a 60 m permanent corridor will be located (possibly larger only where obstacles are encountered, such as the crossing of the National Rail Network at Beswick). Electrical export cables will be installed in separate trenches within the cable corridor. Small fibre optic cables may also be buried alongside the onshore export cables to allow for communication to the wind farm for the various control systems. The indicative cable layout is shown in Figure 6.

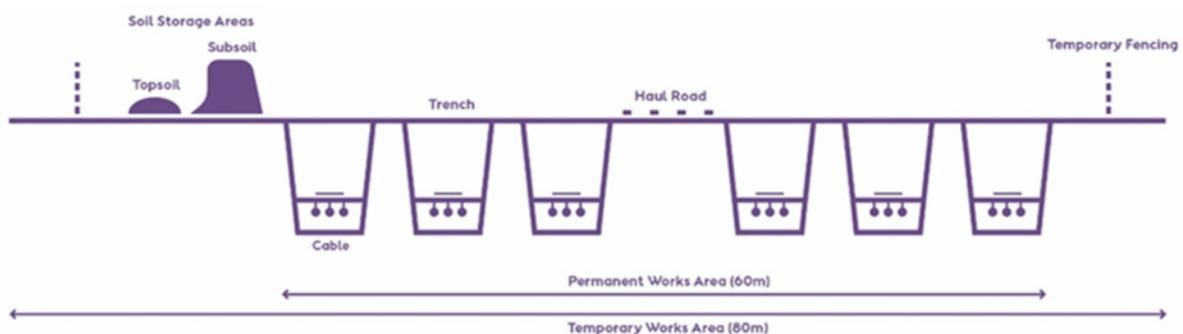


Figure 6: Onshore Export Cable Corridor Indicative Layout

During installation of the onshore cables, the topsoil and subsoil will be stripped and stored on site within the temporary working corridor and stored in separate stockpiles. The trenches will then be excavated using a mechanical excavator, and the export cables will be installed into the open trench. The cables are then buried by backfilling the trench with the excavated material before the land is reinstated to its previous use.

Where the onshore cable crosses main rivers, main roads and railways, HDD or other trenchless technology will be used where technically practical. A detailed methodology for all crossings will be agreed with the relevant stakeholders such as land owners.

A further section of buried onshore export cable is required to connect the onshore substation with the Creyke Beck National Grid substation. This will be similar in design to the export cabling to the substation but must be high voltage alternating current at 400 kV.

Logistics Compounds

During construction temporary logistics compounds of various sizes will be required along the cable corridor for laydown and storage of materials, plant and staff facilities. Where required they will also be used to house operations such as drilling works. All logistics compounds will be removed, and sites restored to their original condition when construction has been completed.

Access and Haul Roads

Access will be required from the public highway onto various parts of the Hornsea Four onshore site and temporary access points will be installed to facilitate vehicular access from the road during construction.

To limit damage to the surrounding agricultural land, a haul road will be installed at the start of the export cable construction. The haul road, typically 6 m wide, will extend the full length of the onshore export cable corridor and will provide vehicular access along the route for the duration of cable construction activities. Bridges will be installed where necessary (e.g. over drainage ditches) and following completion of works the haul road will be removed and the land reinstated.

Access to the onshore substation during construction will also be required and this will be achieved through creation of a temporary access of the northbound carriageway of the A1079 and a two-way access road to and from site. The construction access road may be removed on completion of the construction phase. Operational and potentially limited construction access is currently expected to be taken from the south using Park Lane Road. Accesses relevant to the Onshore Substation are shown in Figure 7.

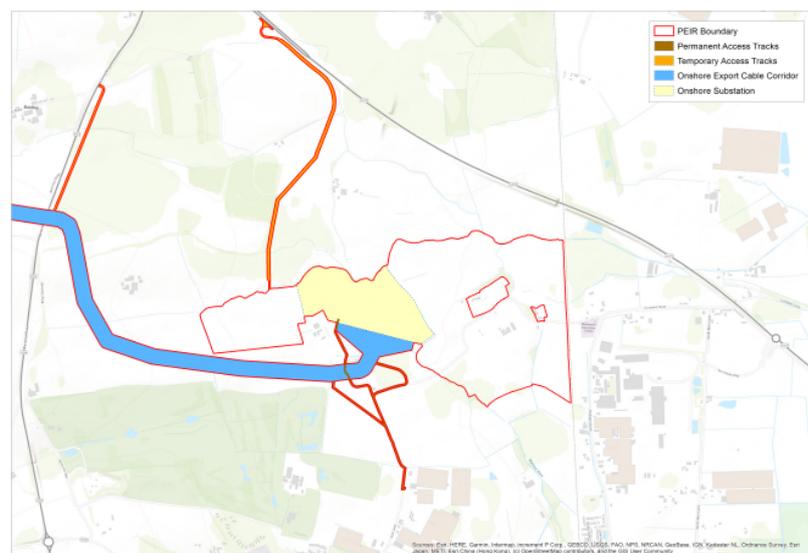


Figure 7: Onshore Substation and Access Roads

Onshore Substation

The onshore substation will be located to the north of Cottingham, approximately 175 m west of the existing Creyke Beck National Grid substation, covering an area of 155,000 m² (15.5 hectares). A temporary area immediately to the west of the site covering 130,000 m² (13 hectares) will also be required during construction.

The proposed footprint of the site is an irregular shape, following natural field boundaries and the substation will consist of a range of equipment for delivery of the power to the National Grid. The maximum height of any on-site building will be 25 m.

Energy Balancing Infrastructure

The onshore substation will include up to two separate energy balancing infrastructure plants, which will provide valuable services to the electrical grid, such as storing energy to meet periods of peak demand and improving overall reliability.

How did the site get selected and what alternatives have been looked at?

An important part of the project development process is the refinement, and subsequent selection of, the final configuration of all project infrastructure. Such decisions must take in to account the existing environment as well as wider engineering considerations. Well informed decisions on the siting of infrastructure and the underpinning process used to refine and finalise the project design are therefore critical to Hornsea Four.

Consideration has been given to reasonable alternatives at every stage of the process of developing Hornsea Four forming a fundamental driver for every decision within the project, from the technical options within the engineering side to the micro-siting and development of the cable routes.

Several guiding principles have directed site selection along with inputs from consultation, data collection and wider engineering considerations.

Example of the guiding principles for the selection of cable landfall location:

- Select the shortest route possible;
- Avoid key sensitive features where possible and where not, seek to mitigate impacts;
- Minimise disruption to sensitive areas; and
- Find a site large enough to accommodate the connection technology outlined within the design envelope.

Through consideration of the guiding principles, all other reasonable alternatives were considered as part of the selection process and the best identifiable option chosen. In addition, comparative environmental assessment has been undertaken in relation to various parts of Hornsea Four to refine, hone and ultimately select the least environmentally harmful locations and routes for the required infrastructure. Considerable emphasis has therefore been placed on the sustainable routing and location of infrastructure.

The BRAG Comparative Environmental Assessment Technique

Hornsea Four has implemented the BRAG technique where appropriate by using the following categories to identify environmental constraints:

- **B: Black** - Potential showstopper to development;
- **R: Red** - High potential to constrain development;
- **A: Amber** - Intermediate potential to constrain development; and
- **G: Green** - Low potential to constrain development.

When a specific option is being considered, (e.g. for routing of a cable or the site for the onshore substation) various environmental aspects (e.g. traffic, ecology, water resources) are identified and each component is assigned a BRAG category. A decision on the best option is made using a holistic view of the outcome noting any showstoppers (i.e. black) as well as the number of least impactful scores (i.e. green).

Hornsea Four will continue project development within the current defined Hornsea Four boundary and refinement of siting options through to DCO application (and beyond if micro-siting is required).

Environmental Impact Assessment Process

Who has been consulted on the plans?

Consultation and feedback on proposals is a key part of the Hornsea Four development process. A Statement of Community Consultation (SoCC) was produced in September 2018 which explained how Hornsea Four intended to consult with the public on the proposals for Hornsea Four.

Summary of groups to be consulted under the SoCC:

- People within the vicinity of the project and those who feel they may be affected;
- Relevant parish and town councils, area committees, community groups;
- East Riding of Yorkshire Council and neighbouring local authorities;
- Organisations representing local businesses, communities and tourist boards;
- Owners, tenants and occupiers of the land that are affected;
- Commercial stakeholders and environmental bodies.

Local Information Events were held in Foston on the Wolds, Barmston, Leconfield and Woodmansey in October 2018 to introduce the proposals. Consultation and engagement with the public is ongoing and a consultation timeline is set out below. Engagement with key and specialist stakeholders is another vital aspect of the work being undertaken and a formal evidence plan process has been followed, with regular meetings held to discuss specific environmental topics.



Figure 8: Consultation Timeline

What is an Environmental Impact Assessment (EIA)?

The purpose of EIA is to identify the potential environmental impacts from a development and then propose the means to avoid and reduce the significant impact. This information is then presented in an Environmental Statement to assist regulators in the decision-making process.

Assessments are made on the significance of an effect on a wide range of receptors, including physical, biological and human, and mitigation measures are proposed to reduce any significant effects. Effects that remain after mitigation are reported as 'residual effects'.

Assessment parameters and 'Rochdale Envelope' approach

The appointment of contractors for the construction of the development and the detailed project design will be undertaken in the post-consent phase for Hornsea Four. To ensure a robust EIA, a range of potential construction methodologies and infrastructure design options have been considered, and the 'Maximum Design Scenario' has been presented and assessed for each parameter. This approach (referred to as the 'Rochdale Envelope' is well-established for large scale infrastructure projects and ensures that the maximum design scenario is assessed and no adverse environmental effects will occur than those predicted in the EIA.

How have the environmental impacts have been identified and assessed?

Hornsea Four submitted an EIA Scoping Report to the Planning Inspectorate in October 2018. A response to this (the 'Scoping Opinion') was received from the Planning Inspectorate in November 2018 which included comments from a range of stakeholders. The Scoping Opinion has formed the basis of the EIA by identifying and confirming what topics require assessment. Consultation with the public, stakeholders, landowners and statutory bodies has also been undertaken throughout the EIA process to inform the approach to each assessment.

For each topic, a description of the current environmental baseline has been identified through a combination of desk-based study, environmental surveys and consultation. All potential significant impacts of the construction, operation and decommissioning of the project have been identified and are presented within an Impacts Register. An assessment has then been made on the severity of each potential impact and where significant environmental impacts are predicted, mitigation measures are proposed to reduce impacts to acceptable levels where possible. Hornsea Four has taken a proactive approach to avoid or minimise environmental effects and all mitigation measures (i.e. commitments) are presented within a Commitment Register.

Hornsea Four has taken a proportionate approach to the EIA which follows recent findings that overly long documentation can make understanding the key environmental impacts difficult and make the EIA findings inaccessible. The PEIR therefore concentrates on key issues (i.e. those where there is potential for likely significant effect), with issues of lesser concern scoped out and presented in a summarised format within the Impacts Register. This approach is specific to Hornsea Four and a "How to Read this PEIR" and "Four Step Guide" is available which provides further information on the PEIR.

Summary of the Environmental Assessments



Marine Geology, Oceanography and Physical Processes

Water depths across the array area vary between 40 m and 50 m. Around 20 km offshore, lies the Smithic Sands bank which is crossed by the offshore export cable corridor and here the depth reduces to 5 m. Tidal currents flow at a peak rate of 0.6 m/s, with wave heights typically less than 1 m, but up to 4.5 m during storm events.

Most of the Hornsea Four array area and offshore sections of the offshore export cable corridor are characterised by a sandy and muddy-sand seabed. Towards the landfall, more coarse sediments dominate. Beneath these surface sediments lies clay till on top of chalk bedrock, which may be exposed in some parts of the array area. Suspended sediment concentrations are naturally low in the array but increase towards shore.

In order to reduce impacts to physical marine processes, Hornsea Four has made commitments to develop a scour protection management plan prior to construction and have also committed to burying sub-sea cables wherever possible. With the incorporation of these commitments the potential impacts on marine geology, oceanography and physical processes are not predicted to be significant. Currently, a potential for a significant adverse effect on sediment transport pathways to Smithic Sands is predicted as a result of the cable crossing the Dogger Bank Creyke Beck offshore wind farm export cables. There is currently some uncertainty in the final cable crossing design and this conclusion will be reviewed in the final EIA and in light of refined project design information.



Benthic and Intertidal Ecology

The Hornsea Four study area is considered to have seabed (benthic) habitats typical of the wider southern North Sea. Analysis of samples collected across the array area has identified eight different animal community types (biotopes). The beach at the landfall is characterised by coarse sands, typical of this part of the coastline.

Hornsea Four does not overlap with any sites designated for nature conservation interest for seabed ecology, although the offshore export cable corridor does pass within 500 m of the Holderness Offshore and Holderness Inshore Marine Conservation Zones, designated for numerous habitats and species, including the ocean quahog – a type of clam.

The assessment has considered several possible environmental effects including the impacts of temporary habitat loss and increases in suspended sediment concentrations from construction activities, long term habitat loss/change, colonisation of subsea infrastructure and temporary disturbances from maintenance activities, as well as impacts arising during the decommissioning phase.

Several commitments have been made in order to reduce potential impacts to seabed and intertidal ecology, notably the commitment to micro-site cables and foundations to avoid sensitive habitat features. With such commitments in place, the assessment has concluded that there will be no significant effects upon benthic and intertidal ecology.



Fish and Shellfish Ecology

The fish communities in the vicinity of Hornsea Four are considered typical of this part of the southern North Sea, with an abundance of bottom-dwelling species such as whiting and plaice, as well as sprat and mackerel who prefer more open water. Hornsea Four overlaps with areas used as fish spawning and nursery habitats, including those used by herring and sandeel. Commercially important shellfish species are also present including brown crab, European lobster and whelk. A number of migratory fish species, some of which are of conservation interest, including Atlantic salmon, sea trout and European eel are known to inhabit the region.

Underwater noise generated during the installation of piled foundations together with those impacts arising from the disturbance of the seabed during construction have been assessed. A number of impacts during operation could also affect fish and shellfish have similarly been assessed, notably: habitat loss and/or change associated with the placement of infrastructure on the seabed; and changes due to a potentially reduced level of commercial fishing in the array area.

Hornsea Four has made a number of commitments to reduce impacts on fish and shellfish, the most relevant being to bury cables under the seabed wherever possible to reduce the need for additional cable protection such as rock dumping; and to restrict the number of foundations that could be installed at any one time to two, in order to reduce underwater noise impacts. With the incorporation of these commitments embedded into the project design no significant impacts on fish or shellfish are predicted.



Marine Mammals

The marine mammals most likely to occur in the vicinity of Hornsea Four are harbour porpoise, minke whale, white-beaked dolphin, and harbour and grey seals. Site-specific surveys have identified that harbour porpoise is the most commonly occurring species with the Hornsea Four array area which overlaps with the southern North Sea Special Area of Conservation (SAC), which is designated to help protect harbour porpoise.

During construction, the impact assessment considered the impacts of underwater noise arising from the piling of foundations on marine mammals, including the potential for auditory injury, temporary disturbance, vessel collisions, and disturbance from the clearance of UXO. Impacts have also been considered during the operation and decommissioning phases.

Hornsea Four has made a number of commitments relevant to marine mammals, notably in relation to the reduction of underwater noise levels. During piling operations, a soft-start procedure will be used where lower energy is applied to the hammer used for piling before increasing the hammer energy to its required level. Soft start allows marine mammals to move away from the sound source before it becomes damaging. Other protocols specific to piling and UXO detonation will also be implemented to protect marine mammals. With these commitments in place, no significant impacts on marine mammals are predicted to arise.



Offshore and Intertidal Ornithology

Digital aerial imagery has been collected monthly over a period of two years in order to determine the type and numbers of birds present in and around the wind farm. A total of 22 different bird species were identified, with the key species recorded in the greatest numbers being fulmar, gannet, kittiwake, great black-backed gull, guillemot, razorbill and puffin. On the beaches in the vicinity of the export cable landfall, species likely to be encountered include common scoter, red-throated diver, cormorant, shag, curlew, turnstone and numerous gull species, although they are found in very low numbers so the beach is not considered a key bird habitat.

A number of Special Protection Areas (SPAs) designated to protect birds have been identified as having potential relevance to Hornsea Four, the closest being the Greater Wash SPA and the Flamborough and Filey Coast SPA. Potential adverse effects on these internationally designated sites are considered through the Habitats Regulations Assessment process.

The assessment has considered impacts from disturbance and displacement of birds, and from effects on their prey species during the construction phase. Operational effects that have been assessed include collision risk and barrier effects (i.e. blocking of flight paths) from the wind turbines.

Hornsea Four has made a number of commitments relevant to offshore and intertidal ornithology, notably avoidance of the highest concentrations of birds within the larger developable area, avoiding any overlap with the SPAs, and increasing the gap between the sea and the lowest blade tip height to 35 m above mean sea level, in order to reduce the risk of bird collisions. With these commitments, no significant impacts to offshore and intertidal ornithology are predicted.



Commercial Fisheries

Hornsea Four lies within a wider region within which a variety of commercial fisheries operate. The value of landings in the wider region is dominated by herring and sandeels by non-UK vessels (caught by pelagic trawl and otter trawl, respectively). Other key species landed within the region include brown crab and king scallop, targeted mainly by UK potters and dredgers, as well as whiting, lobster, whelk, plaice and mackerel.

The impacts assessed primarily relate to the loss of, or exclusion from, established fishing grounds due to construction activities and the presence of the wind farm during operation. Displacement of fishing activity from the operational wind farm to other areas may also lead to increased pressure on neighbouring fishing grounds. Increased vessel traffic associated with Hornsea Four may cause interference with fishing activities.

The main commitments relevant to commercial fisheries are ongoing liaison with the fishing industry through the appointment of a Fisheries Liaison Officer and Fishing Industry Representative, as well as the development of a Fisheries Liaison and Co-Existence Plan, developed through consultation with the National Federation of Fishermen's Organisations. Procedures that align with the guidance produced by the Fishing Liaison with Offshore Wind and Wet Renewables Group will also be implemented to reduce any adverse effects and with these commitments, no significant adverse effects on commercial fisheries are predicted.



Shipping and Navigation

Hornsea Four is located near a number of major shipping routes, some of which pass through the array area. These are predominantly vessels transiting northeast/southwest between the Humber Estuary and the Baltic Sea, with other routes running between northeast England and mainland European ports in the southern North Sea. Shipping traffic is at its greatest density in the offshore export cable corridor, with some vessels anchoring in the nearshore section, behind the shelter of Flamborough Head.

A key shipping route is the Newcastle to Amsterdam ferry route, which operates daily, currently passing through the proposed array area. Oil and gas industry vessels also make up a large proportion of vessel traffic in and around the array area.

The impacts assessed primarily relate to the wind farm structures creating an obstacle to shipping, potentially having knock-on effects including increased collision risk outside the array area and a reduction in the search and rescue capabilities of other vessels. The offshore wind farm structures also present a risk for vessels, whilst cable protection may reduce the navigable water depth in some areas.

The main commitments relevant to shipping and navigation are the marking of all installed infrastructure on charts, marking and lighting of structures, and the commitment to agreeing wind farm layout principles with the Maritime and Coastguard Agency. With these commitments in place, no significant adverse effects on shipping and navigation are predicted.



Aviation and Radar

Analysis has indicated that the Hornsea Four turbines could be detected by air traffic control radar at Claxby, as well as by radar systems operated by the Ministry of Defence at Trimingham. In addition, the Hornsea Four wind farm area will be transited by helicopters, which could result in the need for them to fly higher when using this route. The assessment has also considered the potential for the wind farm to create an aviation obstacle to aircraft, including helicopters operating at adjacent oil and gas platforms, and the impact of increased air traffic associated with the construction and operation of Hornsea Four affecting the available airspace for other users.

Hornsea Four has committed to developing an Emergency Response Co-operation Plan prior to construction, as well as ensuring aviation lighting is fitted to all structures over 60 m in height. With these commitments in place, no significant effects on aviation and radar are predicted, noting that further assessments of the impacts on helicopter operations at specific oil and gas platforms are planned.



Marine Archaeology

There are a total of 25 known wrecks or obstructions within the Hornsea Four boundary, with the majority of these dated to the 20th century, as well as a number of targets identified during seabed surveys which may have further archaeological interest. In addition, there is the potential for the seabed to contain deposits of archaeological interest in the Northern part of the array. The marine archaeology assessment has considered the effects of the operation and decommissioning of Hornsea Four particularly through processes such as compression (crushing) on buried archaeology.

Hornsea Four has made a number of commitments relating to marine archaeology, notably to microsite infrastructure to avoid any wrecks or items of potential archaeological interest, as well as to develop a process to ensure archaeology is adequately considered throughout all activities. With these commitments in place, it is predicted that there will be no significant adverse effects on marine archaeology.



Seascape and Visual Resources

The existing seascape offshore can be described as open sea with occasional offshore structures, such as oil and gas platforms. Other wind farms (including the Hornsea Project One Offshore Wind Farm), lie to the east of the Hornsea Four array. Due to the distance of the offshore array from the coast, the development will be mostly visible to those present in the offshore environment. The impact assessment has considered the potential effects on the seascape due to the physical presence of construction vessels and the long-term effects from locations on the Flamborough Head Heritage Coast. Visual impacts for those on the coast are minimised as the location of the Hornsea Four array area lies at considerable distance from the coast and the location of HVAC booster stations are at least 25 km from shore. The assessment predicts that there will be no significant effects on seascape and visual resources as a result of the construction, operation and decommissioning of Hornsea Four.



Infrastructure and Other Users

Hornsea Four lies in an area which includes current and potential future activity by the oil and gas industry. There are currently seven oil and gas licence blocks that coincide with the Hornsea Four array area and eight that coincide with the offshore export cable corridor in addition to a number of wells and surface platforms. In terms of recreational activities, within the array this is mostly limited to sailing whilst in the nearshore water sports, angling and wildlife boat trips are also common.

Potential impacts on oil and gas activities include the interference with current or future development activity, and the safety and commercial operation of existing assets including helicopter operations to platforms, and risk of collision with platforms. Hornsea Four is working with the relevant oil and gas operators to assess the potential impacts arising from Hornsea Four with detailed assessments to be prepared to accompany the final DCO application.



Geology and Ground Conditions

The geology underlying Hornsea Four is made up of a range of near surface deposits including sand, gravel and silty clay with a predominantly chalk bedrock. Hornsea Four is not located within a coal mining area, however the Hornsea Four intersects a number of Mineral Safeguarding Areas. A number of aquifers underlie Hornsea Four with the chalk aquifers being the most important. Areas of high groundwater vulnerability risk are also present, and these indicate that the soil is easily able to transmit pollution to groundwater. No designated geological sites have been identified within Hornsea Four.

Construction phase effects including the exposure of the workforce to health impacts, encountering contamination during intrusive works, physical intrusion into groundwater, and dewatering of trenches and excavations have all been assessed. Longer term, the operational, effects on the Minerals Safeguarding Areas have been assessed.

Hornsea Four has made several relevant commitments to remove or reduce impacts (as far as possible) and best practice guidance has been adopted and embedded as an inherent aspect of the EIA process. These include avoiding a suite of sensitive sites (e.g. those designated for their ecological value), preparation of a pollution prevention plan and also the development of a contaminated land and groundwater scheme to identify any contamination and any remedial measures which may be required. Following the incorporation of such commitments no significant effects have been identified in relation to geology and ground conditions.



Hydrology and Flood Risk

Hornsea Four onshore infrastructure will be located within two main surface water drainage catchments; the Barmston Sea Drain, and the River Hull. There are also a number of other rivers and Internal Drainage Board (IDB) channels of importance, as well as many unnamed minor watercourses and agricultural drainage channels. Most of the channels have been extensively modified, with straight, uniform channels. However, parts of the River Hull catchment are sensitive chalk rivers and designated as part of the River Hull Headwaters SSSI. In general, the water quality in the area does not meet the required standards under the EU Water Framework Directive due to pressure from sewage and industrial discharges, and diffuse pollution from agriculture.

The flood risk assessment undertaken concludes that landfall is at low risk from flooding by rivers or the sea, as is the majority of the onshore cable corridor. Once operational there will be no flood risk posed to the onshore cable from surface water or groundwater flooding, mitigated through the use of suitable waterproofing of the onshore infrastructure. The onshore substation is at low risk of flooding from rivers. Other effects assessed include those relating possible disturbance to watercourses as a result of construction access requirements, disruption to agricultural land drainage, and effects on water quality.

Hornsea Four has identified a number of measures to reduce any adverse effects including through the crossing of main rivers by drilling underneath them and through the appropriate design of other crossings to specifically limit the flood risk. Post-construction, watercourses will be reinstated to pre-construction conditions wherever possible to ensure flood risk is not affected. Following the incorporation of such commitments no significant effects have been identified in relation to hydrology and flood risk.



Ecology and Nature Conservation

The predominant habitats within Hornsea Four include arable land with woodland, scrub, hedgerows, improved grassland, poor semi-improved grassland and freshwaters. Only one statutory site designated to protect nature (the River Hull Site of Special Scientific Interest (SSSI)) overlaps with Hornsea Four. As the most northerly chalk stream in Britain, the River Hull is valued for its clear water and the rich invertebrate, plant and fish life that it supports. Additionally, there are six non-statutory designated sites to protect wildlife proposed to be crossed by Hornsea Four.

Surveys are being undertaken to characterise the ecology of the area (including surveys for habitats, badgers, birds, bats, water voles, otters and Great crested newts). In order to coincide with accepted survey timings for these species, these surveys are currently ongoing. It was agreed with key stakeholders that potential impacts would only be assessed once each survey has been completed, and then reported within the final Environmental Statement.

Hornsea Four has made a number of commitments to reduce impacts including to avoid the River Hull SSSI by drilling the cable underneath it. Due to the incomplete surveys many of the species-specific ecology assessments have not been completed to date but no significant effects on ecology have been identified so far.



Landscape and Visual

There are no nationally designated landscapes such as Areas of Outstanding Natural Beauty (ANOB) within the Hornsea Four landscape and visual study area. The south-western extent of the Hornsea Four study area includes a small part of the locally designated Yorkshire Wolds Important Landscape Area (ILA). The majority of the study area lies in the Holderness National Character Area, a rural low-lying plain with open views and sparse woodland.

Assessments on temporary changes to the landscape at the landfall, along the cable route and at the onshore substation have all been undertaken for the construction phase. Assessment of long-term effects on landscape and views associated with the substation have also been undertaken.

No significant effects have been identified as a result of construction of the cable or at the landfall area, with the exception of localised effects of the landfall works on views experienced by the local community and visitors to the beach. Construction works at the substation are likely to have significant effects on the local landscape within the immediate vicinity of the site. During operation, significant effects of the substation on the landscape will be similarly localised. Beyond this local area there will be no significant effects on landscape character, including that of the Yorkshire Wolds ILA. Significant effects on views are predicted for a number of locations with clear views of the onshore substation from within 2 km. Beyond this distance, or from locations where intervening vegetation filters views, effects will be not significant.

A landscape plan and a design vision have been produced to reduce landscape and visual effects and to help absorb the substation into the landscape. As any proposed planting matures, the identified effects will be reduced, though some are predicted to remain significant in EIA terms.



Historic Environment

Hornsea Four is located within the East Riding of Yorkshire which has a rich historical and archaeological heritage. Settlement in the area began in the Mesolithic period and evidence from this period right through to the modern day can be found both from finds and from changes within the landscape (field layout/boundaries for example). No designated heritage assets (e.g. scheduled monuments and listed buildings) are located within the footprint of the Hornsea Four boundary but over 600 have been identified in the wider study area, mainly due to 450 listed buildings being present in the historical town of Beverley.

Data has been collected through desk studies, a setting and condition walkover survey and a geophysical survey (which to date only covers part of the Hornsea Four project area but will be completed, assessed and included in the final Environmental Statement). Designated and non-designated heritage assets, along with locally designated heritage assets, have been assessed.

No significant effects have been identified to onshore heritage following the application of mitigation. Notably, the route planning and site selection work has avoided direct effects on all designated heritage assets and Hornsea Four has also committed to develop and agree a process to ensure archaeology is adequately considered throughout all activities. The agreement will detail requirements for completion of geophysical survey and trial trenching evaluation surveys (where considered necessary) in advance of construction and the setting out archaeological mitigation requirements.



Land Use and Agriculture

Hornsea Four is located in an area of fertile soils where agriculture dominates the landscape. Soil types are mixed, and conditions enable the cultivation of cereals, root/fodder crops, potatoes and field vegetables. Some livestock grazing is also present. The onshore substation will be located on farmland but in close proximity to the Creyke Beck National Grid substation, to the north of Cottingham.

Impacts on agriculture are mainly restricted to the construction phase where temporary construction areas will be required and restrictions on access in place for up to a maximum of 36 months. Some agricultural land will therefore be taken out of active management for these periods, but permanent loss of agriculture is restricted to the substation site. There are 19 locations where a designated footpath, bridleway or cycle route will be crossed by the cable or at the substation site including two crossings of the National Cycle Network. The English National Coast Path will also be affected if it is designated by the time construction is due to take place. Other crossings relate to footpaths/bridleways used on a more local level. The onshore substation will require one footpath to be permanently diverted.

Hornsea Four has made a number of commitments to reduce impacts, the most relevant being to reinstate land back to its former use after construction and ensuring all public rights of way will be appropriately diverted and signposted. Following the incorporation of such commitments no significant effects have been identified in relation to land use or agriculture.



Traffic and Transport

An assessment of potential impacts associated with an increase in construction traffic has been undertaken in close consultation with the East Riding of Yorkshire Council to ensure that all road users are considered. The assessment considers construction impacts only, as once constructed there would be no significant levels of traffic movements.

The assessment work has been informed by site visits, a desk study and collection of existing traffic flow and collision data. The assessment takes into account forecast construction traffic generation (e.g. HGVs and construction personnel) and the proposed access locations required to construct Hornsea Four.

The assessment covers a range of issues including: driver delay; severance; pedestrian amenity; accidents and road safety; and abnormal loads. Ninety separate transport links, including both main A roads and more local routes have been assessed.

A range of mitigation will be committed to by Hornsea Four to manage the impact of construction traffic including committing to core working hours within defined times and the development of a Construction Traffic Management Plan (CTMP). The CTMP will define standards and procedures to manage the numbers and routing of HGVs and employees and identify local road improvements that will be required. Notably, a new access will be provided directly from the A1079 to route construction traffic (associated with the onshore substation) away from Cottingham and Dunswell. With the implementation of these mitigation measures, no significant effects on traffic and transport are forecast.



Noise and Vibration

The Hornsea Four baseline noise environment and conditions were set using a series of noise surveys undertaken in April 2019 at locations agreed with East Riding of Yorkshire Council at the landfall (3 locations), along the onshore cable route (3 locations) and near the onshore substation site (6 locations). Forecasts of increases to the current background levels of noise have been calculated using a sound model which uses predicted numbers of differing types of construction plant, and operational noise from the different parts of the onshore substation.

Hornsea Four has made several commitments to reduce or eliminate impacts as far as possible. A key part of the route planning and site selection work ensured that the onshore cable route avoided all noise sensitive properties by at least 50 m, with construction access roads along the cable route taking access from the highway network at least 150 m from such properties.

Other notable mitigation includes setting core construction working hours to minimise disturbance and also restrictions of vehicle movements associated with planned operation of the scheme. Given that during operation the onshore substation will emit noise a commitment has been made by Hornsea Four to limiting such noise to a level no greater than 5 dB above the representative background during day time and night at the sensitive locations (e.g. residences). Following the incorporation of such commitments no significant effects are predicted in relation to noise and vibration.



Air Quality and Health

The existing baseline for air quality was evaluated using data from publicly available sources. East Riding of Yorkshire Council has not declared any locations where air quality standards are unlikely to be achieved (i.e. Air Quality Management Areas (AQMAs)) but one such area is in place around the A63 trunk road which runs through the centre of Hull. In general background concentrations of pollutants (nitrogen dioxide and particulates) are well below the relevant objectives, with the Hull AQMA experiencing the highest nitrogen dioxide background concentrations, which is to be expected in this more urban area. Elsewhere, air pollution concentrations are lower, which is to be expected in a predominantly rural area away from localised pollution sources such as roads.

The air quality assessment was carried out using dispersion modelling using predicted traffic numbers for the construction of Hornsea Four and the effects of dust from construction activities were assessed. Operational effects of the scheme were not assessed as no likely significant effects are predicted due to the low levels of traffic required and the lack of other emissions to air. The air quality assessment showed that predicted pollutant concentrations were below the respective air quality objectives at all locations during construction. These objectives take in to account known health effects and as such, adverse health effects are not anticipated to arise as a result of Hornsea Four with regard to air quality.

Hornsea Four has made a number of commitments to reduce impacts on air quality, including adoption of a Construction Code of Practice (CoCP) which include measures to reduce temporary disturbance and incorporation of good practice measures to reduce dust from construction sites. Following the incorporation of such commitments no significant effects have been identified in relation to air quality and health.



Socio-Economic

The closest economic area to Hornsea Four is the Humber Local Enterprise Partnership (LEP) area. Employment and economic activity are policy priorities within the local area. There are existing strengths in industries related to offshore wind development both in the Humber LEP area and in the United Kingdom.

Impacts on socio-economics are largely dependent on the location of the port used for construction and operational activities. For the construction and operational phases, the procurement of activities (both on and offshore) will support jobs and economic activity locally but the scale of impacts depends mainly on the location of the port that supports the activities. There is capacity within the Humber LEP area for local residents to access substantial employment opportunities supported by Hornsea Four. The scale of these opportunities will depend largely on the location of the ports used to support construction and operations and maintenance activity.

There are no specific mitigation measures relating to socio-economics beyond the existing commitments. With no significant negative effects identified, there is the potential for beneficial effects on employment, economic activity and the ability for local residents to access employment opportunities in both the construction and operation and maintenance phase, dependent on the location of the port used to support each phase.



Document Map

Introductory Chapters

- A1.1 Introduction
- A1.2 Planning and Policy Context
- A1.3 Site Selection and Consideration of Alternatives
- A1.4 Project Description
- A1.5 Environmental Impact Assessment Methodology
- A1.6 Consultation

Offshore Environmental Assessment

- A2.1 Marine Geology, Oceanography and Physical Processes
- A2.2 Benthic and Intertidal Ecology
- A2.3 Fish and Shellfish Ecology
- A2.4 Marine Mammals
- A2.5 Offshore and Intertidal Ornithology
- A2.7 Commercial Fisheries
- A2.8 Shipping and Navigation
- A2.9 Aviation and Radar
- A2.10 Marine Archaeology
- A2.11 Seascape, Landscape and Visual Resources
- A2.12 Infrastructure and Other Users

Onshore Environmental Assessment

- A3.1 Geology and Ground Conditions
- A3.2 Hydrology and Flood Risk
- A3.3 Ecology and Nature Conservation
- A3.4 Landscape and Visual
- A3.5 Historic Environment
- A3.6 Land Use and Agriculture
- A3.7 Traffic and Transport
- A3.8 Noise and Vibration
- A3.9 Air Quality and Health
- A3.10 Socio-economics

Protocols, Plans and Strategies

- F2.2 Outline Code of Construction Practice
- F2.3 Outline Ecological Management Plan
- F2.4 Outline Marine Written Scheme of Investigation
- F2.5 Outline Marine Mammal Mitigation Protocol
- F2.6 Outline Onshore Infrastructure Drainage Strategy

Plans and Drawings

- D1.1.1 Location Plan Offshore and Onshore
- D1.1.2 Location Plan Offshore
- D1.1.3 Location Plan Onshore
- D1.4.1 Works Plan - Offshore (Draft)
- D1.4.2 Works Plan - Onshore (Draft)
- D1.9.1 Onshore Historic or Scheduled Monument Sites Plan
- D1.10.1 Onshore Statutory and Non-Statutory Nature Conservation Sites
- D1.10.2 Offshore Statutory and Non-Statutory Nature Conservation Sites
- D1.14.1 Indicative Extent of Marine Licenses

Introductory Annexes

- A4.3.1 Grid Connection and Refinement of the Cable Landfall
- A4.3.2 Selection and Refinement of the Offshore Infrastructure
- A4.3.3 Selection and Refinement of the Onshore Infrastructure

EIA Methodology Annexes

- A4.5.1 Impacts register
- A4.5.2 Commitments register
- A4.5.3 Offshore Cumulative Effects Screening Matrix
- A4.5.4 Location of Offshore Cumulative Schemes
- A4.5.5 Onshore Cumulative Effect Screening Matrix
- A4.5.6 Location of Onshore Cumulative Schemes

Project Description Annexes

- A4.4.1 Offshore Crossing Schedule
- A4.4.2 Onshore Crossing Schedule
- A4.4.3 EMF Compliance Statement
- A4.4.4 Dredging and Disposal (Site Characterisation)
- A4.4.5 Subsea Noise Technical Report
- A4.4.6 Outline Design Vision Statement
- A4.4.7 Layout principles

Offshore Annexes

- A5.1.1 Marine Processes Technical Report
- A5.2.1 Benthic and Intertidal Ecology Technical Report
- A5.2.2 Water Framework Directive Assessment
- A5.2.3 Marine Conservation Zone Assessment
- A5.3.1 Fish and Shellfish Ecology Technical Report
- A5.4.1 Marine Mammal Technical Report
- A5.5.1 Offshore & Intertidal Ornithology Baseline Characterisation
- A5.5.2 Offshore Ornithology Displacement Analysis
- A5.5.3 Offshore Ornithology Collision Risk Modelling
- A5.7.1 Commercial Fisheries Technical Report
- A5.8.1 Navigational Risk Assessment
- A5.9.1 Aviation and Radar Technical Report
- A5.10.1 Marine Archaeology Technical Report
- A5.11.1 Seascape, Landscape and Visual Resources Technical Report
- A5.11.2 Seascape, Landscape and Visual Resources Visualisations

Onshore Annexes

- A6.1.1 Land Quality Preliminary Risk Assessment
- A6.2.1 Geomorphological Baseline Survey Report
- A6.2.2 Onshore Infrastructure Flood Risk Assessment
- A6.2.3 Water Framework Directive Compliance Assessment
- A6.3.1 Extended Phase 1 Habitat Survey Report
- A6.3.2 Onshore Ornithology - Wintering and Migratory Birds Survey Report
- A6.3.4 Great Crested Newt Environmental DNA (eDNA) Survey Report
- A6.3.10 Badger Survey Report (Confidential)
- A6.4.1 Historic Environment Desk Based Assessment
- A6.5.1 Aerial Photographic and Lidar Map Books
- A6.5.2 Priority Archaeological Geophysical Survey
- A6.5.3 Geoarchaeological Desk Based Assessment
- A6.5.4 Landscape and Visual Resources: Wireframes and Photomontages
- A6.7.1 Traffic and Transport Technical Report
- A6.8.1 Baseline Noise Survey Report

Next Steps

All documentation provided for consultation is available to view on the link below:

<https://hornseaprojects.co.uk/Hornsea-Project-Four/Documents-Library/Formal-Consultation>

Hornsea Four will review all comments received in response to the PEIR consultation and address comments where possible within the final Environmental Statement. Hornsea Four expect to submit the Environmental Statement which will accompany the DCO application in the first quarter of 2020.

Contact Us

We want to hear your views on our proposals for Hornsea Four. There are a range of ways you can get in touch:



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