

Hornsea 4



Hornsea Project Four: Preliminary Environmental Information Report (PEIR)

Volume 6, Annex 2.3: Water Framework Directive Compliance Assessment

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Glossary

Term	Definition
Dangerous Substance Directive	The Dangerous Substance Directive (67/548/EEC) was one of the main pieces of European legislation governing the use of chemicals, until it was revoked in 2015.
Development Consent Order (DCO)	An order made under the Planning Act 2008 granting development consent for one or more Nationally Significant Infrastructure Projects (NSIP).
Effect	Term used to express the consequence of an impact. The significance of an effect is determined by correlating the magnitude of the impact with the importance, or sensitivity, of the receptor or resource in accordance with defined significance criteria.
Energy balancing infrastructure (EBI)	Energy balancing Infrastructure provides valuable services to the electrical grid, such as storing energy to meet periods of peak demand and improving overall reliability.
Environmental Impact Assessment (EIA)	A statutory process by which certain planned projects must be assessed before a formal decision to proceed can be made. It involves the collection and consideration of environmental information, which fulfils the assessment requirements of the EIA Directive and EIA Regulations, including the publication of an Environmental Impact Assessment (EIA) Report.
Export cable corridor (ECC)	The specific corridor of seabed (seaward of Mean High Water Springs (MHWS)) and land (landward of MHWS) from the Hornsea Project Four array area to the Creyke Beck National Grid substation, within which the export cables will be located.
Haul road	The track along the onshore ECC which the construction traffic would use to access work fronts.
Hydromorphology	The hydrological (flow) and physical (bed, banks and substrate) characteristics of a body of water.
Landfall	The generic term applied to the entire landfall area between Mean Low Water Spring (MLWS) tide and the Transition Joint Bay (TJB) inclusive of all construction works, including the offshore and onshore ECC, intertidal working area and landfall compound.
Link boxes (LBs)	These are smaller pits, compared to JB, which house connections between the cable shielding, joints for fibre optic cables and other auxiliary equipment.
National Grid Electricity Transmission (NGET) substation	The grid connection location for Hornsea Four.
Ørsted Hornsea Project Four Ltd.	The Applicant for the proposed Ørsted Hornsea Project Four Ltd. offshore wind farm project.
Onshore export cables	Cables connecting the landfall first to the onshore substation and then on to the NGET substation at Creyke Beck.
Onshore substation / OnSS	Located as close as practical to the NGET substation at Creyke Beck and will include all necessary electrical plant to meet the requirements of the National Grid.

Term	Definition
Planning Inspectorate (PINS)	The agency responsible for operating the planning process for Nationally Significant Infrastructure Projects (NSIPs).
Trenchless techniques	Also referred to as trenchless crossing techniques or trenchless methods. These techniques include HDD, thrust boring, auger boring, and pipe ramming, which allow ducts to be installed under an obstruction without breaking open the ground and digging a trench.
Water Framework Directive	Directive of the European Parliament and of the Council 2000/60/EC establishing a framework for community action in the field of water policy (generally known as the Water Framework Directive (WFD)).

Acronyms

Acronym	Definition
AWB	Artificial Water Body
DCO	Development Consent Order
ECC	Export Cable Corridor
EC	European Commission
EIA	Environmental Impact Assessment
GEP	Good Ecological Potential
GES	Good Ecological Status
GWDTE	Groundwater Dependent Terrestrial Ecosystems
HDD	Horizontal Directional Drilling
HMWB	Heavily Modified Water Body
HGVs	Heavy Goods Vehicles
JB	Joint Bays
LB	Link Boxes
OnSS	Onshore Substation
PEIR	Preliminary Environmental Information Report
RBMP	River Basin Management Plan
WFD	Water Framework Directive

Units

Unit	Definition
kV	Kilovolt (electrical potential)

1. Introduction

1.1 Project background

1.1.1.1 Ørsted Hornsea Project Four Limited (hereafter the 'Applicant') is proposing to develop Hornsea Project Four offshore wind farm (hereafter Hornsea Four). Hornsea Four will be located approximately 65 km offshore the East Riding of Yorkshire in the Southern North Sea and will be the fourth project to be developed in the former Hornsea Zone. Hornsea Four will include both offshore and onshore infrastructure including an offshore generating station (wind farm), export cables to landfall, and connection to the electricity transmission network. The location of Hornsea Four is illustrated on [Figure 1](#).

1.1.1.2 Royal HaskoningDHV was commissioned by the Applicant to undertake a Water Framework Directive (WFD) compliance assessment on Hornsea Four

1.2 Aims and objectives

1.2.1.1 This assessment aims to determine whether the construction, operation or decommissioning of the onshore infrastructure associated with the Hornsea Project Four is compliant with the Directive of the European Parliament and of the Council 2000/60/EC (European Commission, 2000) (hereafter referred to as the WFD) which establishes a framework for community action in the field of water policy.

1.2.1.2 The objectives of this compliance assessment are to:

- Identify water bodies that could potentially be affected by Hornsea Four;
- Identify onshore Hornsea Four construction, operation and/or decommissioning activities that could affect these WFD water bodies;
- Assess the potential for the activities to result in a deterioration in the status of WFD water bodies, or prevent status objectives being achieved in the future; and
- Determine the compliance of Hornsea Four with the requirements of the WFD.

1.2.1.3 This report forms an appendix to [Volume 3, Chapter 2: Hydrology and Flood Risk](#), which presents any potential hydrology and flood risk effects and were required, related impact assessments for Hornsea Four. The following chapters should also be referred to:

- [Volume 3, Chapter 1: Geology and Ground Conditions](#), which provides further discussion on impacts on groundwater; and
- [Volume 3, Chapter 3: Ecology and Nature Conservation](#), which assesses potential impacts on ecological receptors.

1.2.1.4 Potential impacts of offshore activities are considered in a separate WFD assessment found in [Volume 5, Annex 2.2: Water Framework Directive Assessment](#).

1.3 Report structure

1.3.1.1 This report is divided into the following sections:

- **Section 1:** introduction to this report;
- **Section 2:** overview of the proposed development;
- **Section 3:** WFD compliance assessment methodology used to inform the assessment;
- **Section 4:** results of the WFD compliance assessment; and
- **Section 5:** summary of any proposed mitigation, improvements and monitoring requirements.

1.4 The Water Framework Directive

1.4.1 Overview

1.4.1.1 The WFD is transposed into national law by means of the Water Environment (WFD) (England and Wales) Regulations 2017 (UK Parliament, 2017). Unlike the EU Birds and Habitats Directives (EC Directive on the Conservation of Wild Birds (2009/147/EC) (European Commission, 2009) and EC Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC) (European Commission, 1992), respectively), which apply only to designated sites, the WFD applies to all bodies of water, including those that are man-made. These are broadly split into surface waters and groundwater:

1.4.2 Surface waters

1.4.2.1 The two separate classifications for surface water bodies (which includes rivers, lakes, transitional and coastal waters) are 'ecological' and 'chemical.' For a water body to be classified as having a 'good' status under the WFD, both ecological and chemical classification status must be at least 'good'.

1.4.2.2 The ecological status of a surface water body is assessed according to the condition of:

- biological elements (e.g. fish, benthic invertebrates and other aquatic flora);
- supporting physico-chemical elements (e.g. thermal conditions, salinity, concentrations of oxygen, ammonia and nutrients, and concentrations of river basin-specific pollutants such as copper and zinc); and
- the hydromorphological quality elements (e.g. morphological conditions and hydrological regime).

1.4.2.3 Ecological status under the WFD is recorded on the scale of 'high', 'good', 'moderate', 'poor' or 'bad.' A status of 'high' denotes largely undisturbed conditions and the other classes represent an increasing deviation from this natural condition. The target for all water bodies is a Good Ecological Status (GES). The ecological status classification for the water body is determined from the worst scoring quality element, which means that the condition of a single quality element can cause a water body to fail to reach its WFD classification objectives.

- 1.4.2.4 Where the hydromorphology of a surface water body has been significantly altered for anthropogenic purposes, it can be designated as an Artificial Water Body (AWB) or Heavily Modified Water Body (HMWB). An alternative environmental objective, Good Ecological Potential (GEP) applies to both AWBs and HMWBs.
- 1.4.2.5 Chemical status is assessed by compliance with environmental standards for chemicals that are listed in the European Commission (EC) Environmental Quality Standards Directive (2008/105/EC). These chemicals include priority substances, priority hazardous substances, and eight other pollutants carried over from the Dangerous Substance Daughter Directives. Chemical status is recorded as 'good' or 'fail' under the WFD. The chemical status classification for the water body is determined by the worst scoring chemical.
- 1.4.2.6 In addition, some surface waters require special protection under other European legislation. The WFD therefore brings together the planning processes of a range of other European Directives, such as the revised Bathing Waters Directive (2006/44/EC) and the Habitats Directive. These Directives establish protected areas to manage water, nutrients, chemicals, economically significant species and wildlife, and have been brought in line with the planning timescales of the WFD.

1.4.3 Groundwater

- 1.4.3.1 Groundwaters are assessed in a different way to surface waters. Instead of GES and GEP, groundwaters are classified as either 'poor' or 'good' in terms of quantity (i.e. groundwater levels, flow directions) and quality (i.e. pollutant concentrations and conductivity). UKTAG has provided guidance on how groundwater quantity and quality is assessed (UKTAG 2012a and 2012b).

1.4.4 Roles and responsibilities

- 1.4.4.1 The Environment Agency is the competent authority for WFD implementation in England, and therefore must assess schemes to ensure that they are compliant with the requirements of the WFD. The Environment Agency also acts as a consultee to other regulators (e.g. local planning authorities and the Planning Inspectorate) in relation to their obligations under the . Whilst current guidance (e.g. Planning Inspectorate, 2017) acknowledges that assessing schemes for WFD compliance is best aligned with the steps of an Environmental Impact Assessment (EIA), it is recommended that a separate WFD compliance assessment is undertaken by the Applicant to ensure all aspects of WFD are clearly and overtly considered.

2. Methodology

2.1 Study Area

- 2.1.1.1 The Hornsea Four WFD compliance assessment study area consists of the landfall, onshore export cable corridor (ECC) and onshore substation (OnSS), which together comprise the onshore Hornsea Four PEIR boundary. WFD surface water bodies up to 1 km from the Hornsea Four PEIR boundary have also been considered and are included in the Hornsea Four

WFD compliance assessment study area (see [Figure 1](#)). The location of Hornsea Four in relation to WFD water bodies is discussed in [Section 4.1](#), and for further details on the Hornsea Four parameters can be found in [Volume 1, Chapter 4: Project Description](#). The rest of [Section 2](#) summarises the relevant maximum design scenarios and activities relating to the construction, operation and decommissioning of Hornsea Four used to inform this assessment.

2.2 Construction

2.2.1 Landfall

2.2.1.1 The offshore export cables will make landfall north of Barmston ([Figure 1](#)). The offshore export cables will be connected to the onshore export cables via transition joint bays (TJBs). The TJBs are pits lined with concrete which protect the joints and allow the joining of the cables to take place in a clean and dry environment.

2.2.2 Onshore ECC

2.2.2.1 The onshore export cables will be installed within a 60 m permanent working area contained within an 80 m temporary working area, called the onshore ECC. In constructing the cable trenches the topsoil and subsoil will be stripped and stored separately on site within the temporary working area.

2.2.2.2 The trenches will be excavated, if required, using a mechanical excavator, and the export cables will be installed into the open trench from a cable drum delivered to site via Heavy Goods Vehicle (HGV). The cables will then be buried in multiple separate trenches (up to six trenches, each containing one circuit).

2.2.2.3 The onshore export cables will need to cross infrastructure and obstacles such as roads, railways and watercourses. Hornsea Four has committed to using trenchless techniques (e.g. Horizontal Directional Drilling (HDD)) to cross all main rivers and IDB maintained drains (see Commitment 1 (Co1) in [Volume 4, Annex 5.2: Commitments Register](#)).

2.2.2.4 It may be preferable for certain crossings, for example, for minor drainage ditches, to be carried out as an open cut crossing, rather than a trenchless method. These crossings could range from smaller drains, gas and power distribution infrastructure and small roads, to high pressure gas pipelines. The detailed methodology for all crossings will be agreed with the relevant stakeholders such as third-party asset owners, and other statutory stakeholders.

2.2.2.5 It is envisaged that only the larger HDDs will require a compound which will be used to contain the drilling rig, equipment and drill entry and exit pit. Compounds will be constructed with suitable surfacing in a similar way to the haul roads and will include appropriate drainage measures.

2.2.2.6 Joint bays (JB) also provide a clean and dry environment for jointing sections of cables, and are typically concrete lined pits, smaller than TJBs. Link boxes (LB), comprising smaller pits

than JB's, will also be required along the Hornsea Four onshore ECC. Land above the JB's and LB's will be reinstated. However, manhole covers above LB's may be required for access during the operational phase.

- 2.2.2.7 A haul road will be constructed to provide vehicular access along the onshore ECC. The haul road will be installed at the start of construction in that locality. It will be typically 6 m wide, will extend up to the full length of the Hornsea Four onshore ECC (except at gaps where Hornsea Four has committed to HDD only with no haul road crossing). Access across watercourses for as a part of the haul road may be required in the form of bailey bridges or culverts. Details of where these are likely to be required can be found in [Volume 4, Annex 4.2: Onshore Crossing Schedule](#). The haul road will be in place for a maximum of 30 months.
- 2.2.2.8 It may be necessary to install additional field drainage on either side of the cable trenches along the onshore ECC to ensure the existing drainage characteristics of the land are maintained. The nature and extent of these drains will be determined in consultation with the relevant landowners.

2.2.3 Onshore Substation

- 2.2.3.1 The OnSS will be constructed close to the Creyke Beck NGET substation to convert and deliver the power generated by Hornsea Four to the grid. The temporary and permanent works areas will have a maximum area of 130,000 m² and 155,000 m² respectively, in addition to both a temporary construction and permanent access track. The permanent works area will also include Energy Balancing Infrastructure (EBI)
- 2.2.3.2 Pre-construction activities will include the removal of vegetation among other activities including the reinstatement of all below-ground drainage. There will be separate drainage systems installed for different parts of the temporary and permanent parts of the OnSS including attenuation tank(s).

2.2.4 400 kV Connection Area

- 2.2.4.1 A further section of buried onshore export cabling is required to connect the Hornsea Four OnSS to the existing Creyke Beck NGET substation. This section of cabling will be similar in design to the remainder of the onshore export cabling and will house a maximum of four export cables installed in a 40 m permanent working area, within a 60 m temporary working area.

2.3 Operational Activities

- 2.3.1.1 Onshore operation and maintenance requirements for the landfall and onshore export cables will consist of infrequent on-site inspections of onshore export cables which will also be monitored remotely. It is not expected that the TJB's will need to be accessed during operational phase. However, the link boxes will require access via manholes.

2.3.1.2 The OnSS will also be monitored remotely with operation and maintenance staff visiting to undertake works regularly approximately every six months. The EBI will required a maximum of 10 visits per annum using 2 vehicles per day. This will occur via permanent access in a small technician's van.

2.4 Decommissioning

2.4.1 Landfall and onshore ECC

2.4.1.1 To minimise the environmental disturbance during Hornsea Four decommissioning the onshore export cables will be left in place in the ground with the cable ends cut, sealed and securely buried as a precautionary measure.

2.4.1.2 The structures of the jointing pits and link boxes will be removed only if it is feasible with minimal environmental disturbance or if their removal is required to return the land to its current agricultural use.

2.4.2 Onshore substation

2.4.2.1 In the event that complete decommissioning on the OnSS is required, then all the electrical infrastructure will be removed and any waste arising disposed of in accordance with relevant regulations. Foundations will be broken up and the site reinstated to its original condition or for an alternative use. For the purposes of the Environmental Impact Assessment (EIA), the impacts associated with the decommissioning of the OnSS is assumed to be similar to the construction and in reverse sequence.

3. Assessment Methodology

3.1 Overall Approach

3.1.1.1 There is no detailed published methodology undertaking WFD compliance assessments across all types of water bodies. However, the following relevant guidance for Hornsea Four exists to support the assessment of various water body types:

- **'Advice Note 18'** (Planning Inspectorate, 2017): This Advice Notes provides an overview of the WFD and provides an outline methodology for considering the WFD as part of the Development Consent Order (DCO) process;
- **'WFD risk assessment'** (Environment Agency,2016a): This provides information on how to assess the risk of your activity, as well as guidance for proposed developments planning to undertake activities that would require a flood risk activity permit;
- **'Clearing the waters for all'** (Environment Agency, 2017): Outlines a detailed methodology for assessing impacts on transitional and coastal water bodies; and
- **'Protecting and improving the water environment'** (Environment Agency, 2016b): Provides guidance on the WFD compliance of physical works (Environment Agency 2016c) and other activities in river water bodies.

3.1.1.2 For the purposes of this assessment, the broad methodologies outlined in the guidance documents listed above have been brought together to develop an assessment methodology that can be used for all types of water bodies. The methodology used in this assessment therefore covers the following three stages, which are described in more detail in the subsequent sections:

- Stage 1 ([Section 3.2](#)): Screening Assessment;
- Stage 2 ([Section 3.3](#)): Scoping Assessment; and
- Stage 3 ([Section 3.4](#)): Detailed Compliance Assessment.

3.2 Stage 1: Screening Assessment

3.2.1.1 The first stage consists of an initial screening exercise to identify relevant water bodies which have the potential to be affected by the construction, operation and decommissioning of Hornsea Four. Water bodies have been selected for inclusion in the early stages of the compliance assessment using the following criteria, with reference to the 2015 Humber River Basin Management Plan (RBMP) (as presented in the online Catchment Data Explorer; Environment Agency 2019):

- All surface water body catchments that contain Hornsea Four infrastructure;
- Any surface water bodies that have direct connectivity (e.g. upstream and downstream) that could potentially be affected by Hornsea Four (up to a maximum of 1 km from Hornsea Four); and
- Any groundwater bodies that directly underlie or are potentially hydrologically connected to Hornsea Four.

3.3 Stage 2: Scoping Assessment

3.3.1.1 This stage identifies whether there is potential for deterioration in water body status or failure to comply with WFD objectives for any of the water bodies identified in Stage 1: Screening Assessment. This stage considers potential non-temporary impacts and impacts on critical or sensitive habitats in relation to each water body and activity. At this stage, water bodies and activities can be scoped out of further assessment if it can be satisfactorily demonstrated that there will be no impacts. If impacts are predicted, it will be necessary to undertake a detailed compliance assessment (Stage 3: Detailed Compliance Assessment).

3.3.1.2 The Stage 2 assessment considers the potential for each activity planned as part of the proposed project to affect each quality element in turn, based on a series of scoping questions for the quality elements that are applicable in each type of water body. The scoping questions are set out in detail in [Table 2](#).

3.3.1.3 Where an activity and water body is not scoped out, they will be progressed to the detailed compliance assessment (Stage 3: Detailed Compliance Assessment), but only for those quality elements that could potentially be impacted.

3.4 Stage 3: Detailed Compliance Assessment

3.4.1 Overview

3.4.1.1 The Stage 3 assessment determines whether any project activities that have been put forward from Stage 2: Scoping Assessment will cause deterioration and whether this deterioration will have a significant non-temporary effect on the status of one or more WFD quality elements at water body level. For priority substances, the process requires the assessment to consider whether the activity is likely to cause the quality element to achieve good chemical status. If it is established that an activity or project component is likely to affect status at water body level (that is, by causing deterioration in status or by preventing achievement of WFD objectives and the implementation of mitigation measures for HMWBs), or that an opportunity may exist to contribute to improving status at a water body level, potential measures to avoid the effect or achieve improvement that can be reasonably delivered within the scope of the proposed project will be investigated. Where applicable to a development, this stage considers such measures and, where necessary, evaluates them in terms of cost and proportionality in relation to the scale of the project and the nature of any impacts. Note that this stage is referred to as a WFD Impact Assessment in the Planning Inspectorate guidance (Planning Inspectorate, 2017).

3.4.2 Determination of deterioration

3.4.2.1 The Environment Agency has not issued guidance on how deterioration in the status of water bodies should be assessed. The assessment therefore draws upon the following guidance documents:

- The WFD (Standards and Classification) Directions (England and Wales (2017): Provides the most up to date standards used to determine the ecological and chemical status of surface water bodies, and the quantitative and chemical status of groundwater;
- UKTAG (2011) Defining and Reporting on Groundwater Bodies: Provides information on the approaches used to classify groundwater bodies;
- Joint Defra / EA Flood and Coastal Erosion Risk Management Research and Development Programme (2009) WFD Expert Assessment of Flood Management Impacts: Provides a framework for the assessment of changes to hydromorphology;
- UKTAG (2003) Guidance on Morphological Alterations and the Pressures and Impacts Analyses: Provides additional information on hydromorphological pressures;
- Internal Environment Agency guidance on WFD deterioration and risk to the status objectives of river water bodies (Environment Agency, 2016c): Provides an assessment of the level of risk of deterioration in water body status associated with different activities, based upon activity type and risk screening thresholds; and
- Water Framework Directive Assessment: Estuarine and Coastal Waters (Environment Agency, 2017): Provides guidance on assessing the impact of activities in estuarine (transitional) and coastal waters for the Water Framework Directive (WFD). The guidance is also called 'Clearing the Waters for All'.

3.4.2.2 The assessment considers the potential for deterioration in water body status between classes, within classes, and including temporary deterioration. Where deterioration is not predicted, the activity will also be considered against the water body objectives to ensure status objectives (i.e. GES or GEP) will not be prevented. This assessment is informed by the baseline data and impact assessments provided in [Volume 3, Chapter 1: Geology and Ground Conditions](#) (for impacts on the quantity and quality of groundwater) and [Volume 3, Chapter 2: Hydrology and Flood Risk](#) (for impacts on surface water hydrology, geomorphology and water quality).

3.4.3 Article 4.7

3.4.3.1 In the unlikely event that no suitable measures can be identified to mitigate potential adverse impacts of Hornsea Four, it may be necessary to present a case for a derogation under Article 4.7 of the WFD. It should be noted that Hornsea Four would look to prevent deterioration in water body status in the first instance (e.g. through project design and, where necessary, the adoption of further mitigation measures) therefore avoiding the need for an application for an exemption under Article 4.7. To determine the scope of any assessment required to demonstrate compliance with the requirements of Article 4.7, consultation with the Environment Agency would be required. However, at this stage, it is envisaged that this assessment would include an assessment of whether:

- Hornsea Four can be classified as being of imperative overriding public interest and whether the benefits to society resulting from the project outweigh the local benefits of WFD implementation;
- All practicable steps to avoid adverse impacts have been taken. These steps are defined as those that are technically feasible, not disproportionately costly, and compatible with the overall requirements of the proposed project (as defined under the WFD); and
- Hornsea Four can be delivered by an alternative, environmentally better option (as defined under the WFD and discussed in the Planning Inspectorate (2017) guidance). This option will need to be technically feasible and not disproportionately costly to be feasible.

4. WFD Compliance Assessment

4.1 Stage 1: Screening Assessment

4.1.1.1 The onshore surface and ground water bodies that could potentially be affected by the proposed project have been identified using the method outlined in [Section 3.1](#). The water bodies identified using the Environment Agency's Catchment Data Explorer (Environment Agency, 2019) are described in [Table 1](#) and shown in [Figure 1](#) (surface waters) and [Figure 2](#) (groundwater). As such the following water bodies will be taken forward to Stage 2: Scoping Assessment of this WFD compliance assessment:

- Auburn Beck from Source to North Sea;
- Earl's Dyke from Source to North Sea;
- Gransmoor Drain (Burton Agnes to Lissett Area);
- Barmston Sea Drain from Skipsea Drain to North Sea;
- Barmston Sea Drain from Skipsea Drain to Confluence;
- Old Howe/Frodingham Beck to River Hull;
- Lowthorpe/Kelk/Foston Becks from Source to Frodingham Beck;
- West Beck Lower to River Hull;
- Driffield Navigation Canal;
- Scurf Dike from Source to River Hull;
- Middleton on the Wolds and Watton Beck;
- Bryan Mills Beck Source to Bryan Mills Farm;
- Scarborough Beck;
- Ella Dyke;
- High Hunsley to Arram Area;
- Beverley and Barmston Drain; and
- Hull & East Riding Chalk.

Table 1: WFD water bodies (Environment Agency, 2019) screened into the WFD compliance assessment (see Figure 1 and Figure 2).

Water body Name	Reference Number	Water Body Type	Overall Status (in 2016) and Description	Screen into Stage 2? (see Figure 1)
Auburn Beck from Source to North Sea	GB104026066650	River	'Moderate' due to pressures on invertebrates. Heavily modified water body.	Screened in to Stage 2 of the WFD compliance assessment because the proposed works will take place in the water body catchment.
Earl's Dyke from Source to North Sea	GB104026066640	River	'Moderate' due to poor concentrations of dissolved oxygen and pressures on invertebrates. Artificial water body.	Screened in to Stage 2 of the WFD compliance assessment because the proposed works will take place in the water body catchment.
Gransmoor Drain (Burton Agnes to Lisset Area)	GB104026066630	River	'Moderate' due to pressures on fish and elevated concentrations of phosphate and ammonia. The river is designated as artificial.	Screened in to Stage 2 of the WFD compliance assessment because the proposed works will take place in the water body catchment.
Barmston Sea Drain from Skipsea Drain to North Sea	GB104026077780	River	'Moderate' due to elevated concentrations of phosphate and ammonia. The river is designated as artificial.	Screened in to Stage 2 of the WFD compliance assessment because the proposed works will take place in the water body catchment.
Barmston Sea Drain from Skipsea Drain to Confluence	GB104026077770	River	'Moderate' because of high temperatures, poor phosphate levels, elevated concentrations of phosphate and ammonia and low dissolved oxygen. The river is not designated artificial or heavily modified.	Screened in to Stage 2 of the WFD compliance assessment because the proposed works will take place in the water body catchment.
Old Howe/Frodingham Beck to River Hull	GB104026067021	River	'Moderate' due to mitigation measures assessment being moderate or less. Heavily modified water body.	Screened in to Stage 2 of the WFD compliance assessment because the proposed works will take place in the water body catchment.
Lowthorpe/Kelk/Foston Becks from Source to Frodingham Beck	GB104026067101	River	'Poor' due to pressures on fish populations. The river is not designated artificial or heavily modified.	Screened in to Stage 2 of the WFD compliance assessment because the proposed works will take place in the water body catchment.

Water body Name	Reference Number	Water Body Type	Overall Status (in 2016) and Description	Screen into Stage 2? (see Figure 1)
West Beck Upper	GB104026067080	River	'Moderate' due to moderate Mitigation Measures Assessment, support for fish and dissolved oxygen. Heavily modified water body.	Screened out of Stage 2 of the WFD compliance assessment because the proposed works will not take place in the water body catchment.
Skerne Beck	GB104026067041	River	'Moderate' due to the Mitigation Measures Assessment being moderate or less. Heavily modified water body.	Screened out of Stage 2 of the WFD compliance assessment because the proposed works will not take place in the water body catchment.
Garton Wold / Water Forlorns	GB104026067130	River	'Good.' Heavily modified water body.	Screened out of Stage 2 of the WFD compliance assessment because the proposed works will not take place in the water body catchment.
Driffield Navigation Canal	GB70410028	Canal	'Good.' Artificial water body.	Screened in to Stage 2 of the WFD compliance assessment because the proposed works will take place in the water body catchment.
Nafferton Beck from source to Driffield Canal	GB104026067090	River	'Moderate' due to Mitigation Measures Assessment being moderate or less and phosphates being moderate. Heavily modified water body.	Screened out of Stage 2 of the WFD compliance assessment because the proposed works will not take place in the water body catchment.
Wellsprings Drain/Eastburn Beck/Driffield Trout Stream	GB104026067031	River	'Bad' due to pressures on fish populations. Not designated artificial or heavily modified.	Screened out of Stage 2 of the WFD compliance assessment because the proposed works will not take place in the water body catchment.
West Beck Lower to River Hull	GB104026067040	River	'Moderate' due to the Mitigation Measures Assessment being moderate or less. Heavily modified water body.	Screened in to Stage 2 of the WFD compliance assessment because the proposed works will take place in the water body catchment.
Scurf Dike from Source to River Hull	GB104026067010	River	'Good.' Artificial water body.	Screened in to Stage 2 of the WFD compliance assessment because the proposed works will take place in the water body catchment.
Mickley Dike Catchment	GB104026066990	River	'Moderate' due to the mitigation measures assessment being moderate or less. Artificial water body.	Screened out of Stage 2 of the WFD compliance assessment because the proposed works will not take place in the water body catchment.

Water body Name	Reference Number	Water Body Type	Overall Status (in 2016) and Description	Screen into Stage 2? (see Figure 1)
Hull from West Beck to Arram Beck	GB104026067000	River	'Moderate' due to mitigation measures being moderate or less. Heavily modified water body.	Screened out of Stage 2 of the WFD compliance assessment because the proposed works will not take place in the water body catchment.
Middleton on the Wolds and Watton Beck	GB104026066980	River	'Moderate' due to moderate phosphate concentrations. The river is not designated artificial or heavily modified.	Screened in to Stage 2 of the WFD compliance assessment because the proposed works will take place in the water body catchment.
Bryan Mills Beck Source to Bryan Mills Farm	GB104026066960	River	'Moderate' due to moderate Mitigation Measures Assessment and phosphates. Artificial water body.	Screened in to Stage 2 of the WFD compliance assessment because the proposed works will take place in the water body catchment.
Scorborough Beck	GB104026066901	River	'Moderate' due to moderate macrophytes and phytobenthos. The river is not designated artificial or heavily modified.	Screened in to Stage 2 of the WFD compliance assessment because the proposed works will take place in the water body catchment.
Ella Dyke	GB104026066941	River	'Moderate' due to poor phosphate levels, moderate dissolved oxygen concentrations and mitigation measures assessments. Heavily modified water body.	Screened in to Stage 2 of the WFD compliance assessment because the proposed works will take place in the water body catchment.
High Hunsley to Arram Area	GB104026066841	River	'Moderate' due to poor phosphate concentrations, moderate ammonia and mitigation measures assessment. Artificial water body.	Screened in to Stage 2 of the WFD compliance assessment because the proposed works will take place in the water body catchment.
High Hunsley to Woodmansey Area	GB104026066820	River	'Good.' Artificial water body.	Screened in to Stage 2 of the WFD compliance assessment because the proposed works will take place in the water body catchment.
Beverley and Barmston Drain	GB104026067211	River	'Moderate' due to moderate Mitigation Measures Assessment and phosphates, and bad dissolved oxygen. Artificial water body.	Screened in to Stage 2 of the WFD compliance assessment because the proposed works will take place in the water body catchment.
Leven Canal	GB70410003	Canal	'Good.' Artificial water body.	Screened out of Stage 2 of the WFD compliance assessment because there is no hydrological connectivity between the proposed works and the water body.

Water body Name	Reference Number	Water Body Type	Overall Status (in 2016) and Description	Screen into Stage 2? (see Figure 1)
Holderness Drain from Fordyke Stream to Humber	GB104026066800	River	'Moderate' due to poor dissolved oxygen concentration, moderate temperature, ammonia, pressures on invertebrates and mitigation measures assessment. The water body is artificial.	Screened out of Stage 2 of the WFD compliance assessment because the proposed works will not take place in the water body catchment.
Holderness Drain source to Fordyke Stream	GB104026066950	River	'Moderate' due to poor dissolved oxygen and ammonia concentrations. Moderate temperature, Biological Oxygen Demand (BOD) and mitigation measures assessment. The water body is artificial.	Screened out of Stage 2 of the WFD compliance assessment because the proposed works will not take place in the water body catchment.
Hull from Arram Beck to Humber	GB104026067212	River	'Moderate' due to moderate phosphate and dissolved oxygen concentrations and moderate mitigation measures assessment. The river is heavily modified.	Screened out of Stage 2 of the WFD compliance assessment because the proposed works will not take place in the water body catchment.
Fordyke Stream Lower to Holderness Drain	GB104026066910	River	'Moderate' due to bad support for fish, poor phosphate and dissolved oxygen concentrations. Moderate ammonia and mitigation measures assessment. Artificial water body.	Screened out of Stage 2 of the WFD compliance assessment because the proposed works will not take place in the water body catchment.
Lambwath Stream from source to Fordyke Stream	GB104026066860	River	'Moderate' due to poor dissolved oxygen concentrations, moderate phosphate concentrations, invertebrate support and moderate or less mitigation measures assessment. The river is heavily modified.	Screened out of Stage 2 of the WFD compliance assessment because the proposed works will not take place in the water body catchment.
Conistone Ganstead Area	GB104026066790	River	'Moderate' due to moderate Mitigation Measures Assessment and support for invertebrates. Artificial water body.	Screened out of Stage 2 of the WFD compliance assessment because the proposed works will not take place in the water body catchment.
Fleet Drain	GB104026066750	River	'Moderate' due to bad support for invertebrates, poor dissolved oxygen concentrations, moderate phosphate	Screened out of Stage 2 of the WFD compliance assessment because the proposed works will not take place in the water body catchment.

Hornsea 4



Water body Name	Reference Number	Water Body Type	Overall Status (in 2016) and Description	Screen into Stage 2? (see Figure 1)
			concentrations and mitigation measures assessment. Artificial water body.	
Hull & East Riding Chalk	GB40401G700700	Groundwater	'Poor' due to poor chemical saline intrusion, poor general chemical test, poor chemical drinking water protected area and poor quantitative saline intrusion. Artificial water body.	Screened into Stage 2 of the WFD compliance assessment because the proposed works will take place in the water body catchment.

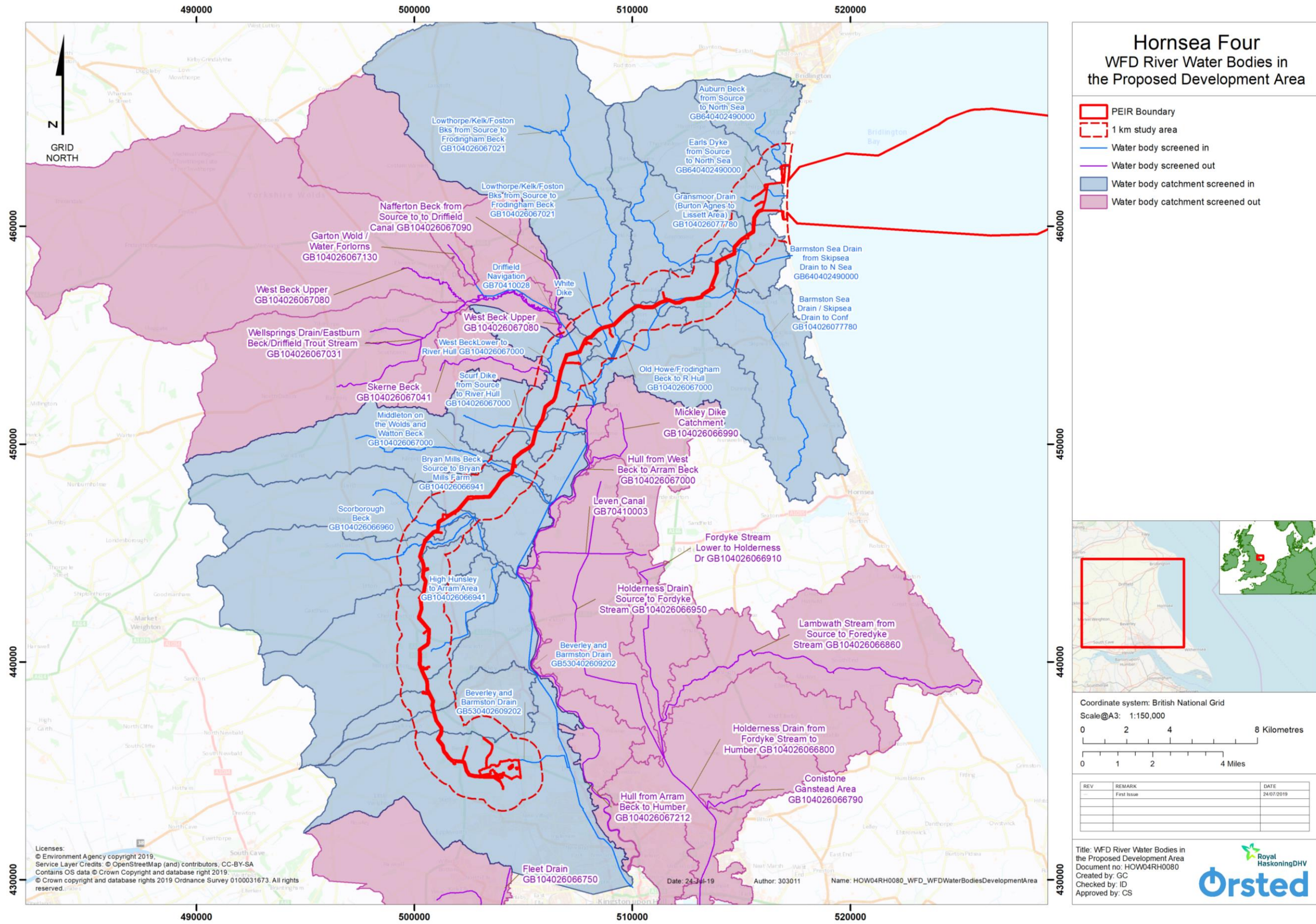


Figure 1: WFD river water bodies considered in the proposed development area (Not to Scale).

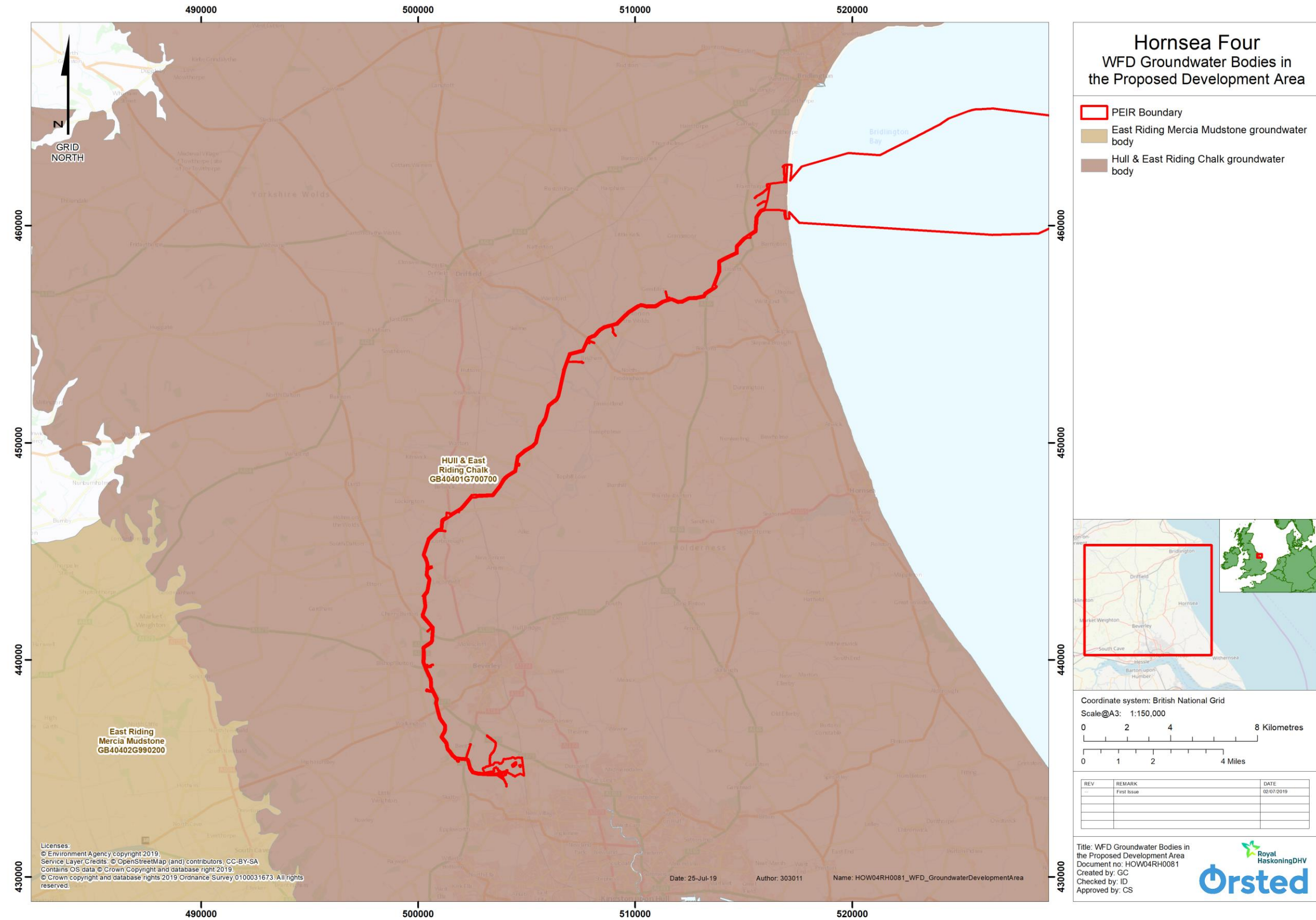


Figure 2: WFD groundwater bodies in the proposed development area (Not to Scale).

4.2 Stage 2: Scoping Assessment

- 4.2.1.1 The aim of this section is to highlight the quality elements within each water body that have the potential be impacted by the proposed works associated with Hornsea Four, as identified in [Stage 1: Screening Assessment](#) of the WFD compliance assessment (see [Table 1](#)). This stage therefore determines the scope for the detailed compliance assessment ([Stage 3: Detailed Compliance Assessment](#)) which may be required for the project.
- 4.2.1.2 This assessment considers the activities and maximum design scenarios for the construction, operation and decommissioning phases of Hornsea Four (as outlined in [Section 2](#)) and highlights potential impact mechanisms based on water body type. The results of the scoping assessment are presented in [Table 2](#) for surface water bodies and [Table 3](#) for groundwater bodies.

Table 2: Scoping of potential effects on river water bodies.

Parameters	Scoping Question	Potential for permanent effects on water body status?	Potential for impacts on WFD mitigation measures?	Potential for impacts on critical habitats?	Detailed assessment required?
Hydromorphology					
Hydrological regime	Could the activity change the volume, energy or distribution of flows in the water body?	Yes: Ground disturbance for cable trenching, open cut crossings of minor watercourses and access road culvert watercourse crossings during construction along with the presence of the permanent development could potentially alter surface drainage patterns. This could result in the creation of new impermeable surfaces and management of surface drainage which could affect the hydrological regime of all river water bodies to be crossed by Hornsea Four.	Yes	Yes	Yes
Morphological conditions	Could the activity change the width, depth, bank conditions, bed substrates and structure of the riparian zone?	Yes: The installation of temporary watercourse crossings to provide access during construction and the use of trenched crossing techniques for minor watercourses during construction could potentially affect the morphological conditions of all river water being crossed by Hornsea Four.	Yes	Yes	Yes
River continuity	Could the activity create a permanent barrier to the downstream movement of water and/or sediment, or the upstream movement of fish?	No: Any in-channel works necessary to facilitate construction(including access and trenched crossings of minor watercourses which may require the use of temporary dams) will be temporary and will not create a permanent barrier to river continuity.	No	No	No
Physico-chemistry					
General	Could the activity change the temperature, pH, oxygenation, salinity or nutrient concentrations in the water body?	No: Although temporary impoundments resulting from trenched crossings of minor watercourses during cable installation could result in localised changes to water temperature and oxygenation conditions, any changes will be reversed once the temporary impoundment has been removed and are therefore unlikely to result in permanent impacts.	No	No	No

Parameters	Scoping Question	Potential for permanent effects on water body status?	Potential for impacts on WFD mitigation measures?	Potential for impacts on critical habitats?	Detailed assessment required?
Specific pollutants	Could the activity release dangerous chemicals into the water body?	Yes: Construction and decommissioning (for the OnSS) activities in and adjacent to surface watercourses could potentially release dangerous chemicals from construction materials (e.g. concrete) and construction machinery (e.g. fuels and lubricants) into river water bodies.	Yes	Yes	Yes
Biology					
Aquatic flora	Could the activity change the hydromorphology and/or physico-chemistry of the water body, or lead to the direct loss or modification of habitats for aquatic plants?	Yes: Trenched crossings of minor watercourses and the use of temporary culverts for the haul road could potentially cause changes to the hydrological regime and morphological conditions of river water bodies during construction. This could subsequently lead to the loss or modification of habitats for aquatic flora. Furthermore, potential changes to physico-chemistry could also reduce the capacity of the water body to support aquatic flora.	Yes	Yes	Yes
Benthic invertebrates	Could the activity change the hydromorphology and/or physico-chemistry of the water body, or lead to the direct loss or modification of habitats for aquatic invertebrates?	Yes: Trenched crossings of minor watercourses and the use of temporary culverts for the haul road could potentially cause changes to the hydrological regime and morphological conditions of river water bodies during construction. This could subsequently lead to the loss or modification of habitats for benthic invertebrates. Furthermore, potential changes to physico-chemistry could also reduce the capacity of the water body to support benthic invertebrates.	Yes	Yes	Yes
Fish	Could the activity change the hydromorphology and/or physico-chemistry of the water body, or lead to the direct loss or modification of shelter, feeding and spawning habitats for fish?	Yes: Trenched crossings of minor watercourses and the use of temporary culverts for the haul road could potentially cause changes to the hydrological regime and morphological conditions of river water bodies during construction. This could subsequently lead to the loss or modification of shelter, feeding and spawning habitats for fish. Furthermore, potential changes to physico-chemistry could also reduce the capacity of the water body to support feeding and spawning fish.	Yes	Yes	Yes

Table 3: Scoping table of potential effects of Hornsea Four on the identified WFD groundwater bodies.

Parameters	Scoping Question	Answer	Potential for impacts on WFD mitigation measures?	Potential for impacts on critical habitats?	Detailed assessment required for water bodies?
Groundwater Quantity					
Groundwater dependent terrestrial ecosystems (GWDTEs)	Could the activity change groundwater levels, affecting GWDTEs or dependent surface water features?	No: Although subsurface activities such as HDD along the onshore ECC, 400 kV onshore ECC area during construction, and at the OnSS during construction and decommissioning could potentially result in localised changes to groundwater flows, these will not be sufficient to affect GWDTEs or other groundwater-dependent surface water features.	No	No	No
Saline intrusion	Could the activity lead to saline intrusion?	No: The construction, operation and decommissioning activities of Hornsea Four will not be abstractive and will not result in increased saline intrusion from coastal waters.	No	No	No
Groundwater abstraction	Could the level of proposed groundwater abstraction (dewatering) exceed recharge at a water body scale?	No: The construction, operation and decommissioning activities of Hornsea Four will not require the abstraction of groundwater.	No	No	No
Additional surface water body	Could the activity lead to an additional surface water body that will become non-compliant and lead to failure of the Dependent Surface Water test?	No: The construction, operation and decommissioning activities will not require the abstraction of groundwater.	No	No	No
Additional abstraction	Could the activity result in additional abstraction that will exceed any groundwater body scale headroom between the fully licensed quantity and the limit imposed by the total recharge?	No: The construction, operation and decommissioning activities will not require the abstraction of groundwater.	No	No	No

Parameters	Scoping Question	Answer	Potential for impacts on WFD mitigation measures?	Potential for impacts on critical habitats?	Detailed assessment required for water bodies?
Groundwater Quality					
Water body scale pollution	Could the activities have the potential to result in or exacerbate widespread diffuse pollution at a water body scale?	No: Project activities during construction, operation and decommissioning will be confined to a small proportion of the water body and will not therefore result in widespread diffuse pollution at a water body scale.	No	No	No
GWDTes	Could the activities have the potential to result in pollution of GWDTes or other dependent surface water features?	Yes: Activities such as HDD along the onshore ECC, within the onshore 400 kV ECC area, excavations and piling during the construction of the OnSS could potentially introduce contaminants into groundwater which could then be transferred to related GWDTes.	Yes	Yes	Yes
Saline intrusion	Could the activity lead to saline intrusion?	No: The construction, operation and decommissioning activities will not be abstractive and will not result in increased saline intrusion from coastal waters.	No	No	No
Deterioration in water quality	Could the activities have the potential to cause deterioration in the quality of a drinking water abstraction?	Yes: Construction activities such as HDD along the onshore ECC, within the onshore 400 kV ECC area, excavations and piling during the construction of the OnSS could potentially introduce contaminants into groundwater which could affect the quality of licensed and unlicensed abstractions.	Yes	Yes	Yes
Increasing pollutant concentrations	Could the activities have the potential to result in increasing trends in pollutant concentrations or reduce the ability of the water body being able to reverse significant trends in groundwater pollutants?	Yes: Construction activities such as HDD along the onshore ECC, within the onshore 400 kV ECC area, and excavations and piling during the construction of the OnSS could potentially introduce contaminants into groundwater which could result in increasing trends in pollutant concentrations.	Yes	Yes	Yes

4.2.1.3 The WFD assessment scoping presented in [Table 2](#) demonstrates that some activities related to Hornsea Four have the potential to impact upon the hydromorphology (hydrological regime and morphological conditions), physico-chemistry (general physico-chemistry and specific pollutants) and biology (aquatic flora, invertebrates and fish) supported in the river water bodies screened in to the assessment in Stage 1 ([Section 4.2](#)). Furthermore, [Table 3](#) demonstrates that potential impacts on groundwater are restricted to changes in quality rather than quantity. The potential implications of the proposed development for these quality elements will therefore be considered in more detail in Stage 3 of the assessment ([Section 4.3](#)).

4.3 Stage 3: Detailed Compliance Assessment

4.3.1.1 The aim of this stage of the assessment is to determine whether Hornsea Four could result in deterioration in the status of the WFD quality elements for all scoped-in water bodies identified at the end of Stage 2 ([Section 4.2](#)). This assessment is presented in [Table 4](#).

4.3.1.2 This stage of the assessment demonstrates that, following implementation of the mitigation measures set out in [Volume 4, Annex 5.2: Commitments Register](#), the proposed project activities during construction, operation or decommissioning will not result in the deterioration in the status of any surface or groundwater bodies and will not prevent status objectives being achieved in the future. The proposed development is therefore considered to be compliant with the requirements of the WFD.

Table 4: WFD compliance detailed assessment (refer to Figure 1 and Figure 2 for surface water and ground water bodies).

Water bodies	Quality element	Potential impacts	Compliant with WFD?
Surface water bodies			
<ul style="list-style-type: none"> Auburn Beck from Source to North Sea Earl's Dike from Source to North Sea Gransmoor Drain (Burton Agnes to Lissett Area) Barmston Sea Drain from Skipsea Drain to North Sea Barmston Sea Drain from Skipsea Drain to Confluence Old Howe/Frodingham Beck to River Hull Lowthorpe/Kelk/Foston Becks from Source to Frodingham Beck West Beck Lower to River Hull Driffield Navigation Scurf Dike from Source to River Hull Middleton on the Wolds and Watton Beck Bryan Mills Beck Source to Bryan Mills Farm 	<p>Hydromorphology: Hydrological regime, Morphological conditions</p>	<p>Construction: There is potential for the direct release of fine sediment during construction resulting from ground disturbance during cable trenching, open cut excavation of minor watercourses, and construction of the haul road (including watercourse access crossings). The potential release of fine sediments in the water bodies could result in increased sediment deposition and smothering of existing substrates (noting that clean, coarse substrates are a key feature of chalk rivers). However, given the construction works will be confined to a small proportion of each water body, the potential release of fine sediment is expected to be localised and temporary in nature, as all construction work will be undertaken in accordance with Volume F2, Chapter 2: Outline Code of Construction Practice (CoCP) (Co124), which will include the following good practice guidance:</p> <ul style="list-style-type: none"> Control of Water Pollution from Construction Sites – Guidance for Consultants and Contractors CIRIA (C650); and CIRIA – SuDS Manual (CIRIA, 2015); No discharge to surface watercourses will occur without permission from the Environment Agency; Regular cleaning of roads of any construction waste and dirt to be carried out during construction; and Surface water flowing into the trenches during the construction period will be pumped via settling tanks or ponds to remove sediment and potential contaminants, before being discharged into local ditches or drains via temporary interceptor drains. Where gradients on site are significant, cable trenches will include a hydraulic brake (bentonite or natural clay seals) to reduce flow along trenches and hence reduce local erosion. <p>Additionally, Hornsea Four has committed to preventing the release of sediment from working areas set out in the Volume 4, Annex 5.2: Commitments Register:</p> <ul style="list-style-type: none"> A Pollution Prevention Plan (PPP) will be developed in accordance with the outline PPP and will include details of an emergency spill procedures. Good practice guidance detailed in the Environment Agency's Pollution Prevention Guidance (PPG) notes (including PPG01, PPG05, 	<p>Yes</p> <p>Following suitable mitigation, any effects on hydromorphology will not be sufficient to result in deterioration in water body status or prevent status objectives being achieved in the future.</p>

Water bodies	Quality element	Potential impacts	Compliant with WFD?
<ul style="list-style-type: none"> Scorborough Beck Ella Dyke High Hunsley to Arram Area Beverley and Barmston Drain 		<p>PPG08 and PPG21) will be followed where appropriate, or the latest relevant available guidance (Co4);</p> <ul style="list-style-type: none"> A contaminated land and groundwater scheme will be prepared to identify any contamination and any remedial measures which may be required (Co77); Post-construction, the working area will be reinstated to pre-existing condition as far as reasonably practical in line with DEFRA 2009 Construction Code of Practice for the Sustainable Use of Soils on Construction Sites PB13298 (Co10); and A Construction Drainage Scheme will be developed for the temporary construction works, to ensure that existing land drainage is maintained during construction. Specific drainage measures for each area of land will be specified based on information identified and recorded by a land drainage consultant prior to construction. The Construction Drainage Scheme will be developed in consultation with landowners, the Lead Local Flood Authority, Environment Agency and relevant Internal Drainage Board.(Co14). <p>Additionally, works to install temporary access structures (e.g. bridges or culverts) across watercourse and trenched crossings (requiring temporary dams) over smaller ordinary watercourses could potentially impact upon the morphological conditions and hydrological regime of affected water bodies. These activities could result in the direct loss of natural geomorphological features (and associated habitat niches) within the footprint of temporary works. The presence of temporary structures in the channel could potentially result in reduced flow and sediment conveyance (particularly of coarse sediment), create upstream impoundment and fine sedimentation, and create bed and bank instability due to increased scour downstream. The removal of the temporary works could potentially temporarily increase the supply of fine sediment and cause a period of geomorphological adjustment as the river channel re-equilibrates. However, impacts will be mitigated through the following measures set out in the Volume 4, Annex 5.2: Commitments Register:</p> <ul style="list-style-type: none"> All main rivers, Internal Drainage Board (IDB) maintained drains, main roads and railways will be crossed by HDD or other trenchless technology (Co1); and The bed and banks of watercourses will be reinstated to their pre-construction condition following the removal of any temporary structures (Co172). 	

Water bodies	Quality element	Potential impacts	Compliant with WFD?
		<p>Additionally, as set out in with Volume F2, Chapter 2: Outline Code of Construction Practice (Co124), any culverts will be adequately sized to avoid impounding flows and are installed below the active bed of the watercourse so that sediment continuity and the movement of fish and aquatic invertebrates can be maintained as in CIRIA's Culvert design and operation guide (CIRIA 2010).</p> <p>The onshore construction phase is therefore considered to have minimal impacts on the hydromorphological quality elements of these river water bodies. Furthermore, there will be minimal risk of causing deterioration in water body status or the prevention of achieving GEP or GES in the water bodies.</p> <p>Operation:</p> <p>Potential changes in surface water drainage patterns resulting from the permanent onshore infrastructure could affect the hydrological regime and morphological conditions of surface waters, particularly those located in the vicinity of the OnSS. However, as stated in Volume 4, Annex 5.2: Commitments Register (Co19), an onshore infrastructure drainage strategy will be designed for all permanent onshore infrastructure and will include measures to ensure that existing land drainage is reinstated and maintained to retain pre-development discharge rates. so that the existing run-off rates to the surrounding water environment are maintained at pre-development rates.</p> <p>All construction work will be undertaken in accordance with Volume F2, Chapter 2: Outline Code of Construction Practice (CoCP) (Co124), which will outline that the detailed design of the surface water drainage scheme will be based on a series of infiltration/soakaway tests carried out on site and the attenuation volumes outlined in supporting Flood Risk Assessments. The tests will be undertaken prior to construction and in accordance with the BRE Digest 365 Guidelines.</p> <p>The onshore operation phase is therefore considered to have minimal impacts on the hydromorphological quality elements of these river water bodies. Furthermore, there will be minimal risk of causing deterioration in water body status or the prevention of achieving GEP or GES in the water bodies.</p>	

Water bodies	Quality element	Potential impacts	Compliant with WFD?
		<p>Decommissioning: The effects of decommissioning will be less than or equal to those associated with construction. At landfall and the onshore ECC the infrastructure will be left in situ with the ends cut, sealed and securely buried. The jointing puts and link boxes will only be removed only if feasible with minimal environmental disturbance. At the OnSS all electrical infrastructure will be removed, and any waste will be disposed of in accordance with relevant regulations. The same mitigation and commitments will also apply for decommissioning, and as such the onshore decommissioning phase is therefore considered to have minimal impacts on the hydromorphological quality elements of these river water bodies. Furthermore, there will be minimal risk of causing deterioration in water body status or the prevention of achieving GEP or GES in the water bodies.</p>	
	<p>Physico-chemistry: General physico-chemistry Specific pollutants</p> <p>Chemistry: Priority substances Priority hazardous substances</p>	<p>Construction: Onshore construction activities could potentially release fine sediments and contaminants from construction machinery and materials into surface water bodies. However, all construction work will be undertaken in accordance with Volume F2, Chapter 2: Outline Code of Construction Practice (CoCP) (Co124), which will include the following good practice guidance:</p> <ul style="list-style-type: none"> • Control of Water Pollution from Construction Sites – Guidance for Consultants and Contractors CIRIA (C650); and CIRIA – SuDS Manual (CIRIA, 2015); • No discharge to surface watercourses will occur without permission from the Environment Agency; • Regular cleaning of roads of any construction waste and dirt to be carried out; • Surface water flowing into the trenches during the construction period will be pumped via settling tanks or ponds to remove sediment and potential contaminants, before being discharged into local ditches or drains via temporary interceptor drains. Where gradients on site are significant, cable trenches will include a hydraulic brake (bentonite or natural clay seals) to reduce flow along trenches and hence reduce local erosion; • A construction method statement to be submitted for approval by the responsible authority; • Oil, chemicals and other potentially harmful liquids will be handled in accordance with The Control of Pollution (Oil Storage) (England) Regulations 2001, refuelling of machinery would be undertaken within designated areas where spillages can be easily contained. Machinery would be routinely checked to ensure it is in good working condition; and any tanks and associated 	<p>Yes Following suitable mitigation, any effects on physico-chemistry will not be sufficient to result in deterioration in water body status or prevent status objectives being achieved in the future.</p>

Water bodies	Quality element	Potential impacts	Compliant with WFD?
		<p>pipe work containing oils and fuels would be double skinned and be provided with intermediate leak detection equipment; and</p> <ul style="list-style-type: none"> • Areas at risk of spillage, such as vehicle maintenance areas and hazardous substance stores (including fuel, oils and chemicals) will be bunded and carefully sited to minimise the risk of hazardous substances entering the drainage system or the local watercourses. Additionally, the bunded areas will have impermeable bases to limit the potential for migration of contaminants into groundwater following any leakage/spillage. Bunds used will store fuel, oil etc. to have a 110% capacity. Disturbance to areas close to watercourses reduced to the minimum necessary for the work. Excavated material will be placed in such a way as to avoid any disturbance of areas near to the banks of watercourses and any spillage into the watercourses. Construction materials will be managed in such a way as to effectively minimise the risk posed to the aquatic environment. All plant machinery and vehicles will be maintained in a good condition to reduce the risk of fuel leaks. Drainage works to be constructed to relevant statutory guidance and approved via the Lead Local Flood Authority prior to the commencement of construction. Consultation with the Environment Agency to be ongoing throughout the construction period to promote best practice and to implement proposed mitigation measures. <p>Additionally, Hornsea Four has committed to preventing changes to the chemistry and physico-chemistry of surface waters. These commitments are set out in the Volume 4, Annex 5.2: Commitments Register and include:</p> <ul style="list-style-type: none"> • A Pollution Prevention Plan (PPP) will be developed in accordance with the outline PPP and will include details of an emergency spill procedures. Good practice guidance detailed in the Environment Agency’s Pollution Prevention Guidance (PPG) notes (including PPG01, PPG05, PPG08 and PPG21) will be followed where appropriate, or the latest relevant available guidance (Co4); and • An Operational Drainage Scheme will be developed for the permanent operational development along the onshore cable corridor and the onshore substation and will include measures to ensure that existing land drainage is reinstated and maintained, and measures to limit discharge rates and attenuate flows such that pre-development run-off rates to surrounding land are retained. The Operational Drainage Scheme will be developed in 	

Water bodies	Quality element	Potential impacts	Compliant with WFD?
		<p>consultation with the Environment Agency, Lead Local Flood Authority and relevant Internal Drainage Board as appropriate (Co19).</p> <ul style="list-style-type: none"> • A contaminated land and groundwater scheme will be prepared to identify any contamination and any remedial measures which may be required (Co77); and • Post-construction, the working area will be reinstated to pre-existing condition as far as reasonably practical in line with DEFRA 2009 Construction Code of Practice for the Sustainable Use of Soils on Construction Sites PB13298 (Co10). <p>The onshore construction phase is therefore considered to have minimal impacts on the physico-chemical quality elements of these river water bodies. Furthermore, there will be negligible risk of causing deterioration in water body status or the prevention of achieving GEP or GES in the water bodies.</p> <p>Operation: There will be minimal requirements for routine maintenance along the onshore ECC, within the onshore 400 kV ECC area or at the OnSS, with activities limited to remote monitoring and infrequent site inspections using 4x4 vehicles through permanent underground access points (e.g. manholes at the landfall and along the onshore ECC). The onshore operation phase is therefore considered to have minimal impacts on the physico-chemical quality elements of these river water bodies. Furthermore, there will be minimal risk of causing deterioration in water body status or the prevention of achieving GEP or GES in the water bodies.</p> <p>Decommissioning: The effects of decommissioning will be less than or equal to those associated with construction. At landfall and the onshore ECC the infrastructure will be left in situ with the ends cut, sealed and securely buried. The jointing puts and link boxes will only be removed only if feasible with minimal environmental disturbance. At the OnSS all electrical infrastructure will be removed, and any waste will be disposed of in accordance with relevant regulations. The same mitigation and commitments will also apply for decommissioning, and as such the onshore decommissioning phase is therefore considered to have minimal impacts on the hydromorphological quality elements of these river water bodies. Furthermore, there will be minimal risk of causing deterioration in water body status or the prevention of achieving GEP or GES in the water bodies.</p>	

Water bodies	Quality element	Potential impacts	Compliant with WFD?
	<p>Biology: Aquatic flora, Benthic invertebrates, Fish</p>	<p>Construction: Based on the potential construction-stage impacts for the hydromorphological (e.g. release of fine sediment and changes resulting from temporary watercourse accesses) and physico-chemical elements (e.g. the release of fine sediment and contaminants) for the surface water bodies, there is the potential for a corresponding impact upon the biological elements that these quality elements support. Hornsea Four is committed to mitigating any effects on the biology of water bodies through the following commitments in the Volume 4, Annex 5.2: Commitments Register:</p> <ul style="list-style-type: none"> • All main rivers, Internal Drainage Board (IDB) maintained drains, main roads and railways will be crossed by HDD or other trenchless technology as set out in the Onshore Crossing Schedule. Where HDD technologies are not practical, the crossing of ordinary watercourses may be undertaken by open cut methods. In such cases, temporary measures will be employed to maintain flow of water along the watercourse (Co1); • Post-construction, the working area will be reinstated to pre-existing condition as far as reasonably practical in line with DEFRA 2009 Construction Code of Practice for the Sustainable Use of Soils on Construction Sites PB13298 or latest relevant available guidance (Co10); • A Construction Drainage Scheme will be developed for the temporary construction works, to ensure that existing land drainage is maintained during construction. Specific drainage measures for each area of land will be specified based on information identified and recorded by a Land Drainage Consultant prior to construction. The Construction Drainage Scheme will be developed in consultation with landowners, the Lead Local Flood Authority, Environment Agency and relevant Internal Drainage Board (Co14); • A Pollution Prevention Plan (PPP) will be developed in accordance with the outline PPP and will include details of an emergency spill procedures. Good practice guidance detailed in the Environment Agency’s Pollution Prevention Guidance (PPG) notes (including PPG01, PPG05, PPG08 and PPG21) will be followed where appropriate, or the latest relevant available guidance (Co4); • A contaminated land and groundwater scheme will be prepared to identify any contamination and any remedial measures which may be required (Co77); and • An Operational Drainage Scheme will be developed for the permanent operational development along the onshore cable corridor and the onshore substation, and will include measures to ensure that existing land drainage is reinstated and maintained, and measures to 	<p>Yes Following suitable mitigation, any effects on hydromorphology or physico-chemistry will not be sufficient to cause changes to biology and will not therefore result in deterioration in water body status or prevent status objectives being achieved in the future.</p>

Water bodies	Quality element	Potential impacts	Compliant with WFD?
		<p>limit discharge rates and attenuate flows such that pre-development run-off rates to surrounding land are retained. The Operational Drainage Scheme will be developed in consultation with the Environment Agency, Lead Local Flood Authority and relevant Internal Drainage Board as appropriate (Co19);</p> <p>Additionally, all construction work will be undertaken in accordance with Volume F2, Chapter 2: Outline Code of Construction Practice (CoCP) (Co124), which will include good practice guidance:</p> <ul style="list-style-type: none"> • Secondary containment system that can hold at least 110% of the oil volume stored will be used; • Oil, chemicals and other potentially harmful liquids will be handled in accordance with The Control of Pollution (Oil Storage) (England) Regulations 2001, refuelling of machinery would be undertaken within designated areas where spillages can be easily contained. Machinery would be routinely checked to ensure it is in good working condition; and any tanks and associated pipe work containing oils and fuels would be double skinned and be provided with intermediate leak detection equipment; • Surface water flowing into the trenches during the construction period will be pumped via settling tanks or ponds to remove sediment and potential contaminants, before being discharged into local ditches or drains via temporary interceptor drains. Where gradients on site are significant, cable trenches will include a hydraulic brake (bentonite or natural clay seals) to reduce flow along trenches and hence reduce local erosion; and • Areas at risk of spillage, such as vehicle maintenance areas and hazardous substance stores (including fuel, oils and chemicals) will be bunded and carefully sited to minimise the risk of hazardous substances entering the drainage system or the local watercourses. Additionally, the bunded areas will have impermeable bases to limit the potential for migration of contaminants into groundwater following any leakage/spillage. Bunds used will store fuel, oil etc. to have a 110% capacity. Disturbance to areas close to watercourses reduced to the minimum necessary for the work. Excavated material will be placed in such a way as to avoid any disturbance of areas near to the banks of watercourses and any spillage into the watercourses. Construction materials will be managed in such a way as to effectively minimise the risk posed to the aquatic environment. All plant machinery and vehicles will be maintained in a good condition to reduce the risk of fuel leaks. Drainage works to be constructed to 	

Water bodies	Quality element	Potential impacts	Compliant with WFD?
		<p>relevant statutory guidance and approved via the Lead Local Flood Authority prior to the commencement of construction. Consultation with the Environment Agency to be ongoing throughout the construction period to promote best practice and to implement proposed mitigation measures.</p> <p>As such the onshore construction phase is considered to have minimal impacts on the biological quality elements of these river water bodies. Furthermore, there will be minimal risk of causing deterioration in water body status or the prevention of achieving GEP or GES in the water bodies.</p> <p>Operation: There will be minimal requirements for routine maintenance along the onshore ECC, within the onshore 400 kV ECC area or at the OnSS, with activities limited to remote monitoring and infrequent site inspections using 4x4 vehicles and permanent underground access points (e.g. manholes at the landfall and along the onshore ECC). The onshore operation phase is therefore considered to have minimal impacts on the hydromorphological and physico-chemical quality elements of these river water bodies, or on the biological quality elements that they support. Furthermore, there will be minimal risk of causing deterioration in water body status or the prevention of achieving GEP or GES in the water bodies.</p> <p>Decommissioning: The effects of decommissioning will be less than or equal to those associated with construction. At landfall and the onshore ECC the infrastructure will be left in situ with the ends cut, sealed and securely buried. The jointing puts and link boxes will only be removed only if feasible with minimal environmental disturbance. At the OnSS all electrical infrastructure will be removed, and any waste will be disposed of in accordance with relevant regulations. The same mitigation and commitments will also apply for decommissioning, and as such the onshore decommissioning phase is therefore considered to have minimal impacts on the hydromorphological quality elements of these river water bodies. Furthermore, there will be minimal risk of causing deterioration in water body status or the prevention of achieving GEP or GES in the water bodies.</p>	
Groundwater bodies			
Hull and East Riding Chalk	<p>Quality: Chemical quality</p>	<p>Construction Underground works along the onshore ECC, within the onshore 400 kV ECC area and at the OnSS (including HDD to install cables beneath obstacles such as larger watercourses and roads, excavation of joint bays and pits for link boxes, and piling at the OnSS) could potentially introduce</p>	<p>Yes Following suitable mitigation, any effects</p>

Water bodies	Quality element	Potential impacts	Compliant with WFD?
		<p>new contaminants into groundwater. However, all construction work will be undertaken in accordance with Volume F2, Chapter 2: Outline Code of Construction Practice (CoCP) (Co124), which will include good practice guidance:</p> <ul style="list-style-type: none"> • Implementation of good environmental practices based on legal responsibilities and guidance on good environmental management in: CIRIA C532 Control of Water Pollution from Construction Sites – Guidance for Consultants and Contractors (Masters-Williams, 2001); and CIRIA C648 Control of Water Pollution from Linear Construction Projects (Murnane, Heap, and Swain, 2006); • Deep trenchless excavations and deep excavations for pile foundations to be mitigated by casing off perched groundwater units during construction works and sealing off once the casing is removed; • Refuelling of machinery will be undertaken within designated areas where spillages can be easily contained; and • Bunded areas will have impermeable bases to limit the potential for migration of contaminants into groundwater following any leakage/spillage; • Inert bentonite or natural clay seals may be used as a drilling fluid and to seal deep excavations where there is a risk that groundwater could be compromised, thereby reducing or eliminating the pathway whereby new contaminants can enter groundwater as a result of subsurface activities. <p>Furthermore, the Volume 4, Annex 5.2: Commitments Register sets out the following key measures for retaining the chemical quality of groundwater bodies:</p> <ul style="list-style-type: none"> • During construction of pile foundations, the following guidance will be used: Piling and Penetrative Ground Improvement Methods on land Affected by Contamination: Guidance on Pollution Prevention (Environment Agency, 2001), or latest relevant available guidance (Co6); • Cabling to be thermally insulated (Co13); • A contaminated land and groundwater scheme will be prepared to identify any contamination and any remedial measures which may be required (Co77); and 	<p>on groundwater quality will not be sufficient to result in deterioration in water body status or prevent status objectives being achieved in the future.</p>

Water bodies	Quality element	Potential impacts	Compliant with WFD?
		<p>A Pollution Prevention Plan (PPP) will be developed in accordance with the outline PPP and will include details of an emergency spill procedures. Good practice guidance detailed in the Environment Agency’s Pollution Prevention Guidance (PPG) notes (including PPG01, PPG05, PPG08 and PPG21) will be followed where appropriate, or the latest relevant available guidance (Co4).</p> <p>The onshore construction phase is therefore considered to have minimal impacts on the quality of the underlying groundwater body. Furthermore, there will be minimal risk of causing deterioration in water body status or the prevention of achieving good status in the future.</p> <p>Operation:</p> <p>There will be minimal requirements for routine maintenance along the cable corridor or at the OnSS, with activities limited to remote monitoring and infrequent site inspections using 4x4 vehicles and permanent underground access points (e.g. manholes at the landfall and along the onshore ECC). The onshore operation phase is therefore considered to have negligible impacts on the quality of the underlying groundwater body. Furthermore, there will be negligible risk of causing deterioration in water body status or the prevention of achieving good status in the future.</p> <p>Decommissioning:</p> <p>The effects of decommissioning will be less than or equal to those associated with construction. At landfall and the onshore ECC the infrastructure will be left in situ with the ends cut, sealed and securely buried. The jointing puts and link boxes will only be removed only if feasible with minimal environmental disturbance. At the OnSS all electrical infrastructure will be removed, and any waste will be disposed of in accordance with relevant regulations. The same mitigation and commitments will also apply for decommissioning, and as such the onshore decommissioning phase is therefore considered to have minimal impacts on the hydromorphological quality elements of these river water bodies. Furthermore, there will be minimal risk of causing deterioration in water body status or the prevention of achieving GEP or GES in the water bodies.</p>	

5. Summary and Conclusions

5.1 Summary

5.1.1.1 The compliance assessment presented in [Section 4](#) has demonstrated that Hornsea Four has the potential to affect a number of river and groundwater bodies:

- Auburn Beck from Source to North Sea;
- Earl's Dyke from Source to North Sea;
- Gransmoor Drain (Burton Agnes to Lissett Area);
- Barmston Sea Drain from Skipsea Drain to North Sea;
- Barmston Sea Drain from Skipsea Drain to Confluence;
- Old Howe / Frodingham Beck to River Hull;
- Lowthorpe / Kelk / Foston Becks from Source to Frodingham Beck;
- West Beck Lower to River Hull;
- Driffield Navigation Canal;
- Scurf Dike from Source to River Hull;
- Middleton on the Wolds and Watton Beck;
- Bryan Mills Beck Source to Bryan Mills Farm;
- Scarborough Beck;
- Ella Dyke;
- High Hunsley to Arram Area;
- Beverley and Barmston Drain; and
- Hull & East Riding Chalk.

5.1.1.2 However, following implementation of the mitigation measures set out in [Volume 4, Annex 5.2: Commitments Register](#) and summarised in [Table 4](#), there will be no permanent impacts on the status of any river or groundwater bodies that are sufficient to result in deterioration in status of these water bodies. Furthermore, Hornsea Four will not prevent water body status objectives from being achieved in the future and is therefore considered to be compliant with the requirements of the WFD.

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