

Hornsea 4

Ørsted



Hornsea Project Four: Preliminary Environmental Information Report (PEIR)

Volume 4, Annex 5.1: Impacts Register

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Hornsea 4 How to read the Hornsea Four Impacts Register



Columns in Impact Register	Explanation	Worked example
ID	Unique Identification (ID) for each individual impact which can be used to refer between those impacts set out in the PEIR and ES and those in the Impact Register.	MM-C-1
Project Element	Identifies that part of the Hornsea Four development where the impact is anticipated to arise. Facilitates a search function for impacts and commitments in relation to key project elements (e.g. what commitments are in place for landfall)	Array Area
Original Project Phase	Identifies the phase of the Hornsea Four development (e.g. construction, operation etc) when the impact is anticipated to arise.	Construction
Project Activity and Impact	The impact and the activity that the impact arises from.	PTS from piling noise
Embedded Mitigation Measures	<p>Embedded Mitigation Measures are referred to as Commitments by Hornsea Four, and the terms are used interchangeably. Embedded mitigation measures (Commitments) are embedded within the assessment at the relevant point in the EIA (e.g. at Scoping or PEIR).</p> <p>At Scoping, embedded mitigation measures (Commitments) are either primary (design) and/or tertiary (guidance).</p> <p>At PEIR the embedded mitigation measures (Commitments) may also include secondary commitments (i.e. proposed mitigation measures to reduce significant impacts/effects to environmentally acceptable levels).</p> <p>NOTE: These embedded mitigation measures (Commitments) have been added to since Scoping in the next tab 'Newly approved commitments'. Once pre-PEIR commitments are approved they will be added to this tab at the point of PEIR. This process will repeat between S42/47 consultation on the PEIR and preparation of the ES and DCO. During Examination, any newly suggested commitments will be added to this tab for approval by Hornsea Four.</p>	<p>Tertiary: Co109 Co110</p>
Likely Significance of Effect at Scoping Stage and Justification	Provides the potential significance of effect predicted by professional judgement and drawing upon the Technical Consultant's experience of EIA in relation to developments of a similar size, nature (e.g. offshore wind farms) and location (Southern North Sea).	<p>Likely significant effect without secondary mitigation</p> <p>Recent expert elicitation for PTS as a result of pile driving resulted in agreement between experts that the predicted PTS effects from exposure to piling noise (defined as 6 dB PTS in the 2-10 kHz band) was unlikely to have a large effect on the survival or reproduction of the species of interest.</p>
Hornsea Four position	Defines what the proportionate approach to the assessment of this impact is, taking account of the Hornsea Four position at Scoping, the Scoping Opinion and subsequent consultation. This has now evolved in some cases from the Hornsea Four position presented at Scoping.	Scoped in
Further Evidence to Support "Scoping Out"	Where there is disagreement between Hornsea Four and the Planning Inspectorate in relation to Scoping, the further evidence required to support the Applicant's position is summarised here. The detailed evidence is provided to the stakeholder via the Evidence Plan and/or supplementary reports/documents and a cross-reference to that evidence is provided here.	<p>"Only for effects/impacts where there is uncertainty regarding Scoped out"</p> <p>A figure will be produced showing a 350m buffer area around the onshore works to highlight the receptors which may be affected by dust, and a cross-reference to the embedded mitigation measures to confirm that significant impacts would not occur.</p>

Maximum Design Scenario (MDS)	The Maximum Design Scenario (MDS) as defined by the technical consultant accounting for the Project Description at PEIR for the specific impact and activity.	<p>WTG MONOPILES: Number of WTG: 180 Number of piles: 180 Maximum hammer energy: 5,000 kJ Average maximum hammer energy: 2,500 kJ Maximum piling duration: 4 hours Average piling duration: 3 hours Simultaneous piling: maximum 2 vessels Maximum monopiles per 24 hours: 4 (assuming 2 vessels can install 2 piles each) Total piling days: 216 (assumes 1.2 days per monopile single vessel) OR 108 (assumes 1.2 days per monopile using 2 vessels) Ramp up: 30 minutes</p> <p>WTG PINPILE JACKETS: Number of WTG: 180 Number of piles: 720 Maximum hammer energy: 2,500 kJ Average maximum hammer energy: 2,500 kJ Maximum piling duration: 4 hours Average piling duration: 3 hours Simultaneous piling: maximum 2 vessels Maximum piles per 24 hours: 8 (assuming 2 vessels can install 4 piles each) Total piling days: 270 (assumes 1.5 days per jacket foundation single vessel) OR 135 (assumes 1.5 days per jacket foundation using 2 vessels) Ramp up: 30 minutes</p> <p>Medium OSS: 6 legs per jacket, 4 piles per leg Hammer energy: 2,500</p> <p>Large OSS: 8 legs per platform, total 16 piles per structure Hammer energy: 2,500 kJ</p>
Justification	The justification of why the MDS as defined is the MDS, providing reference to other development scenarios or options.	The maximum number of piled foundations would represent the temporal worst-case scenario. The maximum predicted impact range for underwater noise for piled foundations would represent the spatial worst-case scenario.

ID	Project Element	Original Project Phase	Project Activity and Impact	Embedded Mitigation Measures	Likely Significance of Effect at Scoping Stage and Justification	Hornsea Four Position	Further Evidence to Support "Scoping Out"	Maximum Design Scenario (MDS)	Justification
AV-C-1	Array Area	Construction	Wind turbine effects on civil and military radar systems during construction process	None	No likely significant effect	Scoped Out	Not required as agreement achieved during EIA Scoping	N/A as impact scoped out	N/A as impact scoped out
AV-C-2	Array Area	Construction	Creation of an aviation obstacle to fixed wing and rotary aircraft operating offshore	Tertiary Co93 Co99 Co102	Not considered at Scoping Stage - new impact	Simple Assessment	N/A as impact scoped in	Array area: - 190 positions at 370 m amsl (180 x WTGs and 10 x other electrical infrastructure). - Impact starting from a point of zero infrastructures present to full presence over an indicative maximum 3 year construction window.	Maximum number of wind turbines in the Hornsea Four array area. Maximum physical obstruction to aviation operations due to size and number of above sea level infrastructure within the Hornsea Four array area.
AV-C-3	Array Area	Construction	Increased air traffic in the area related to wind farm activities in the construction phase may affect the available airspace for other users.	Tertiary Co93 Co99 Co102	Not considered at Scoping Stage - new impact	Simple Assessment	N/A as impact scoped in	Array area: - 190 positions at 370 m amsl (180 x WTGs and 10 x other electrical infrastructure). - Impact starting from a point of zero infrastructures present to full presence over an indicative maximum 3 year construction window.	Maximum number of helicopter trips as a result of being engaged on works for Hornsea Four causing an increased possibility of aircraft to aircraft collision.
AV-O-1	Array Area	Operation	Creation of an aviation obstacle to fixed wing and rotary aircraft operating offshore	Tertiary Co93 Co99 Co102	Not considered at Scoping Stage - new impact	Simple Assessment	N/A as impact scoped in	Array area: - 190 positions at 370 m amsl (180 x WTGs and 10 x other electrical infrastructure). - Impact throughout the Operation phase of 35 years.	Maximum number of wind turbines in the Hornsea Four array area. Maximum physical obstruction to aviation operations due to size and number of above sea level infrastructure within the Hornsea Four array area.
AV-O-2	Array Area	Operation	Wind turbines causing permanent interference on civil and military radar systems.	None	Likely significant effect without secondary mitigation	Simple Assessment	N/A as impact scoped in	Array area: - 180 wind turbines with a maximum blade tip height of 370 m above LAT. - Impact throughout the Operation phase of 35 years.	ATC and Air Defence controllers may be unable to provide an effective surveillance service due to interference on radar displays. Impact duration present during operational period.
AV-O-3	Array Area	Operation	Wind turbines creating an impact to offshore helicopter operations to oil and gas platforms.	None	Likely significant effects without secondary mitigation	Simple Assessment	N/A as impact scoped in	Array area: - 180 wind turbines with a maximum blade tip height of 370 m above LAT. - Impact throughout the Operation phase of 35 years.	Wind turbines with the maximum possible blade tip height creating a physical obstruction to aviation operations due to size of above sea level infrastructure. Offshore platforms will be below the height of the wind turbines but may require aviation lighting.
AV-O-4	Array Area	Operation	Disruption to aircraft using HMRs.	Tertiary Co102	Not considered at Scoping Stage - new impact	Simple Assessment	N/A as impact scoped in	Array area: - 190 positions at 370 m amsl (180 x WTGs and 10 x other electrical infrastructure). - Impact throughout the Operation phase of 35 years.	Maximum number of wind turbines in the Hornsea Four array area. Maximum physical obstruction to aviation operations due to size and number of above sea level infrastructure within the Hornsea Four array area.
AV-D-1	Array Area	Decommissioning	Creation of aviation obstacle to fixed wing and rotary aircraft operating offshore.	Tertiary Co93 Co99 Co102	Not considered at Scoping Stage - new impact	Simple Assessment	N/A as impact scoped in	Array area: - 190 positions at 370 m amsl (180 x WTGs and 10 x other electrical infrastructure). - Impact starting from a point of full presence of infrastructure to zero presence over a decommissioning period of approximately 3 years.	Maximum number of wind turbines in the Hornsea Four array area. Maximum physical obstruction to aviation operations due to size and number of above sea level infrastructure within the Hornsea Four array area.

ID	Project Element	Original Project Phase	Project Activity and Impact	Embedded Mitigation Measures	Likely Significance of Effect at Scoping Stage and Justification	Hornsea Four Position	Further Evidence to Support "Scoping Out"	Maximum Design Scenario (MDS)	Justification
BIE-C-1	All-Offshore	Construction	Temporary habitat disturbance in the Hornsea Four array area and offshore ECC from construction activities.	Primary Co44 Co45 Co48 Co84 Co86	No likely significant effect	Simple Assessment	N/A as impact scoped in.	<p>Temporary habitat disturbance of 41,725,097 m²</p> <p>Array Area:</p> <ul style="list-style-type: none"> - Foundation seabed preparation = 680,294 m² - 180 suction bucket jacket foundations for WTGs = 511,379 m² - Six small OSS on GBS foundations and three large OSS on suction caisson jacket foundations = 156,594 m² - One accommodation platform on a suction bucket jacket foundation (small OSS) = 12,321 m² - Jack up and anchoring operations = 1,063,200 m² - WTG installation jack up vessel (JUV) footprint (six legs, 170m² per foot, 4 jack-up operations per turbine) = 734,400 m² - WTG installation vessel anchor footprints (100 m² per anchor, 8 anchors per vessel, 2 anchored vessels per turbine) = 288,000 m² - OSS and accommodation platform installation JUV footprint (six legs, 170 m² per foot, 4 jack-up operations per structure) = 40,800 m² - Cable seabed preparation and installation = 10,391,400 m² - Boulder clearance in array area - 30 m corridor = 20,700 m² - Sandwave clearance in array area – 30 m corridor = 20,700 m² - Burial of 600km of array cables (15 m width) = 9,000,000 m² - Burial of 90km of inter-connector cables (15 m width) = 1,350,000 km² <p>Offshore ECC:</p> <ul style="list-style-type: none"> - Foundation seabed preparation = 36,963 m² - Three small OSS on suction caisson jacket foundations = 36,963 m² - Jack up operations = 12,240 m² - OSS installation JUV footprint (six legs, 170 m² per foot, 4 jack-up operations per structure) = 12,240 m² - Cable seabed preparation and installation = 30,271,000 m² - Boulder clearance in offshore ECC - 30 m corridor = 19,620,000 m² - Sandwave clearance in offshore ECC – 30 m corridor = 757,000 m² - Burial of 654km of export cables (15 m width) = 9,810,000 m² - Cable jointing (4 joints per cable, 6 cables, 3,500 m² per joint) = 84,000 m² 	The temporary disturbance relates to seabed preparation and cable installation. The footprint of infrastructure is assessed as a permanent impact in O&M. It should be noted that the seabed preparation area for foundations is less than the footprint of the foundation scour protection.
BIE-C-2	Landfall	Construction	Temporary habitat disturbance in the intertidal area from export cable installation.	Primary Co44 Co84 Co86	No likely significant effect	Simple Assessment	N/A as impact scoped in.	<p>Intertidal open cut trenching:</p> <ul style="list-style-type: none"> - 6 cables within a 280 m corridor (40 m per circuit (6 × 40) with 20 m temporary works area either side (2 × 20) across 200 m long intertidal (MLWS to MHWS) = 56,000 m². - Excavation to a depth of 3 m. 	The MDS for temporary habitat disturbance in the intertidal area from the installation of cables has considered the installation of all cables via open cut trenching, as the total potential temporary disturbance associated with this method is greater than the potential temporary

BIE-C-3	All-Offshore	Construction	Temporary increase in SSC and sediment deposition in the Hornsea Four array area and offshore ECC.	Primary Co44 Co45 Co84 Co86	No likely significant effect	Simple Assessment	N/A as impact scoped in.	<p>Total volume 12,879,050 m³ (in the case of seabed preparation for suction caisson foundations).</p> <p>WTG Foundations: - 180 turbines on suction caisson jacket foundations requiring seabed preparation, resulting in the suspension of 2,134,440 m³ of sediment.</p> <p>OSS Foundations: - Nine suction caisson foundations requiring seabed preparation, resulting in the suspension of 737,130 m³ of sediment.</p> <p>Offshore Accommodation Platform Foundations: - One suction caisson foundation requiring seabed preparation, resulting in the suspension of 57,245 m³ of sediment.</p> <p>Sandwave Clearance: - Sandwave clearance across 18 km² of seabed with an impact width of 15 m per cable resulting in the suspension of 961,000 m³ of sediment.</p> <p>Cable Trenching: - Cable installation by MFE resulting in the suspension of 4,140,000 m³ of sediment.</p> <p>HVAC Booster Station Foundations: - 3 suction caisson foundations requiring seabed preparation, resulting in the suspension of 171,735 m³ of sediment.</p> <p>Sandwave Clearance: - Sandwave clearance across a 99 km corridor for 6 cables resulting in the suspension of 757,000 m³ of sediment.</p> <p>Cable Trenching: - Installation of 6 cables by MFE resulting in the suspension of 3,903,000 m³ of sediment (excluding the part of the export cable within the array) Cable Jointing. - Up to 17,500 m³ of sediment from up to four cable joints per export cable.</p>	The maximum design scenario for foundation installation results from the largest volume suspended from seabed preparation (suction caisson jackets) and the largest volume suspended from potential drilling of foundations (monopiles), both at the maximum number of foundations (180). For cable installation, the maximum design scenario results from the greatest volume from sandwave clearance and installation using energetic means (jetting). This also assumes the largest number of cables and the greatest burial depth.
BIE-C-4	Landfall	Construction	Temporary increase in SSC and sediment deposition in the intertidal area.	Primary Co44 Co84 Co86	No likely significant effect	Simple Assessment	N/A as impact scoped in.	<p>Intertidal Area: - 2,500 m³ excavated volume from HDD exit pits. - Material either taken away to a temporary stockpile, or stored adjacent to exit pit prior to backfilling. - Open cut trenching of 6 cables within a 280 m corridor (40 m per circuit i.e. 20 m either side $6 \times 40 + 2 \times 820 = 280$ m) across the intertidal (200 m) to a depth of 3 m. - All installation techniques described for export cable installation (except dredging) may be applied to installation within the intertidal. For MFE, an equivalent volume of 7,162 m³ of sediment may be dredged across a 200 m stretch of beach for six export cables.</p>	This scenario represents the maximum footprint from the greatest number of cables and the largest excavation volume from cofferdams.
BIE-C-5	Array Area	Construction	Impacts on benthic ecology from noise arising from foundation installation.	None	No likely significant effect	Scoped out	Not required as agreement achieved during EIA Scoping.	N/A as impact scoped out	N/A as impact scoped out
BIE-C-6	All-Offshore	Construction	Direct and indirect seabed disturbances leading to the release of sediment contaminants.	None	No likely significant effect	Simple Assessment	N/A as impact scoped in.	The MDS for seabed disturbance is presented in the rows above. The risk of release of contaminants will be assessed further within the PEIR.	This scenario represents the maximum total seabed disturbance and therefore the maximum amount of contaminated sediment that may be released into the water column during construction activities.
BIE-C-7	All-Offshore	Construction	Accidental release of pollutants (e.g. from accidental spillage/leakage) may affect benthic ecology.	Tertiary Co111	No likely significant effect	Scoped out	Not required as agreement achieved during EIA Scoping.	N/A as impact scoped out	N/A as impact scoped out

BIE-O-8	All-Offshore	Operation	Long-term habitat loss/change from the presence of foundations, scour protection and cable protection.	Primary Co44 Co45 Co83 Co84 Co86	No likely significant effect	Simple Assessment	N/A as impact scoped in.	<p>Temporary habitat loss/change of 3,707,730 m².</p> <p>Array Area:</p> <ul style="list-style-type: none"> - Turbine footprint with scour protection, based on 180 suction bucket jackets for WTG = 795,216 m² - Offshore transformer substation foundation footprint and scour protection, based on 6 small and 3 large OSS (HVDC: GBS (Box-type) & GBS (Large OSS)) = 371,250 m² - Offshore HVAC booster substations and associated scour, based on three subsea structures (GBS (Box-type)) = 91,875 m² - Offshore accommodation platform and associated scour protection (GBS (Box-type)) = 30,625 m² - Maximum rock protection area for array cable = 624,000 m² - Maximum rock protection area for interconnector cable = 94,000 m² - Pre- and post-lay rock berm area, based on 40 cable crossings within the array area = 255,000 m² <p>Offshore ECC:</p> <ul style="list-style-type: none"> - Maximum rock protection area for the export cable = 792,000 m² - Pre- and post-lay rock berm area, based on 10 cable crossings within the export ECC area = 268,000 m² 	The maximum adverse scenario is defined by the maximum area of seabed lost by structures, scour protection, cable protection and cable crossings.
BIE-O-9	All-Offshore	Operation	Colonisation of the WTGs and scour/ cable protection may affect benthic ecology and biodiversity.	None	No likely significant effect	Simple Assessment	N/A as impact scoped in.	<p>Array Area:</p> <ul style="list-style-type: none"> - Total area of introduced hard substrate = 3,707,730 m² (calculated from total of cell above). 	The maximum adverse scenario is defined by the maximum area of structures, scour protection, cable protection and cable crossings introduced to the water column,
BIE-O-10	All-Offshore	Operation	Increased risk of introduction or spread of Marine Invasive Non-Native Species (MINNS) due to presence of subsea infrastructure and vessel movements (e.g. ballast water) may affect benthic ecology.	None	No likely significant effect	Simple Assessment	N/A as impact scoped in.	<p>Array Area:</p> <ul style="list-style-type: none"> - Total area of introduced hard substrate = 3,707,730 m² (calculated from total of cell above) 	Defined by the maximum surface area introduced as described above.
BIE-O-11	All-Offshore	Operation	Direct disturbance to seabed from jack-up vessels and cable maintenance activities.	None	No likely significant effect	Simple Assessment	N/A as impact scoped in.	<p>Direct disturbance to seabed from jack-up vessels and cable maintenance activities = 3,252,500 m².</p> <p>WTG O&M activities:</p> <ul style="list-style-type: none"> - Component replacement = 378,000 m² - Access ladder replacement = 378,000 m² - Foundation anode replacement = 378,000 m² - J-Tube repair/ replacement = 108,000 m² <p>Array cable activities:</p> <ul style="list-style-type: none"> - Remedial burial of array cables = 200,000 m² - Array cable repairs = 200,000 m² - Cable protection replacement = 156,000 m² <p>OSS and accommodation platform activities:</p> <ul style="list-style-type: none"> - Offshore substation component replacement = 6,000 m² - Foundation anode replacement = 21,000 m² - J-Tube repair/ replacement = 6,000 m² <p>Offshore ECC:</p> <ul style="list-style-type: none"> - Cable remedial burial = 200,000 m² (per event) - Cable protection replacement = 198,000 m² - Array cable repairs = 700,000 m² <p>Interconnector cable activities:</p> <ul style="list-style-type: none"> - Cable remedial burial = 200,000 m² (per event) - Cable protection replacement = 23,500 m² - Array cable repairs = 100,000 m² <p>Vessel return trips per year:</p> <ul style="list-style-type: none"> - 2,580 for wind turbine visits - 780 for wind turbine foundation visits - 65 for platform visits - Structural Scope - 100 for platform visits - Electrical Scope - 260 crew shift transfer - 124 jack-up visits - 1,205 crew vessel wind turbine visits - 104 supply vessel visits to accommodation platforms 	Defined by the maximum number of jack-up vessel operations and maintenance activities that could have an interaction with the seabed anticipated during operation.
BIE-O-12	All-Offshore	Operation	Indirect disturbance to benthic species from EMF generated by inter-array and export cables.	Primary Co83	No likely significant effect	Scoped out	Not required as agreement achieved during EIA Scoping.	N/A as impact scoped out	N/A as impact scoped out

BIE-O-13	All-Offshore	Operation	Changes to seabed habitats arising from effects on physical processes, including scour effects and changes in the sediment transport and wave regimes resulting in potential effects on benthic communities.	None	No likely significant effect	Simple Assessment	N/A as impact scoped in.	<p>WTG Foundations:</p> <ul style="list-style-type: none"> - 40 m diameter mono suction bucket base proud of the seabed by 10 m before tapering into the main support column (unspecified width). - Suction bucket jacket has four 20 m buckets which reach 5 m above the seabed. - The total width of suction bucket foundations is wider at 65 m when face on and wider at 45° to flows when the equivalent width is 92 m. <p>OSS Foundations:</p> <ul style="list-style-type: none"> - Three large box-type GBS of 150 m width (150 * 150) has a greater seabed footprint than the Pontoon GBS (2 * 179 * 35). - Six 75 m GBS box-type small foundations. <p>Offshore Accommodation Platform:</p> <ul style="list-style-type: none"> - Six-legged suction bucket jacket (small) largest total width at seabed, although the total area of structures is less than the 75 m GBS (box-type) structure. <p>Cable Crossings:</p> <ul style="list-style-type: none"> - 34 potential crossings over new pipelines, potential for scouring dependent on rock size and grading to perimeter. - Some alignments may inhibit bedload transport. <p>Offshore ECC:</p> <ul style="list-style-type: none"> - HVAC booster area pre-scour protection period around a 75 m GBS (Box-type). - 10 rock berms at cable crossings over existing assets, potential for scouring dependent on rock size and grading to perimeter with heights of 1.5 m. 	<p>This impact is defined by any anticipated changes to physical processes as defined in the Marine Geology, Oceanography and Physical Processes assessment.</p> <p>The total structure footprint of these two foundation types is actually the same, however, group scour is probable around all suction buckets as well as local scour around any single bucket, making this option the MDS for scouring prior to placement of scour protection.</p> <p>The six-legged suction bucket is likely to have local scour around each leg and group scour around all legs, making scouring of the unprotected seabed larger than the 75 m GBS (box-type) which is likely to have edge scour at corners.</p>
BIE-O-14	All-Offshore	Operation	Accidental release of pollutants (e.g. from accidental spillage/leakage) may affect benthic ecology.	Tertiary Coll1	No likely significant effect	Scoped out	Not required as agreement achieved during EIA Scoping.	N/A as impact scoped out	N/A as impact scoped out
BIE-D-15	All-Offshore	Decommissioning	Temporary habitat disturbance from decommissioning of foundation substructures and cables	None	No likely significant effect	Simple Assessment	N/A as impact scoped in.	<p>Foundations:</p> <ul style="list-style-type: none"> - Total disturbance from removal of all foundations = 1.93 km² <p>Cables:</p> <ul style="list-style-type: none"> - Total disturbance from removal of all cables = 102.6 km² 	<p>MDS is assumed to be as per the construction phase, with all infrastructure removed in reverse-construction order.</p> <p>The removal of cables is considered a MDS, however the necessity to remove cables will be reviewed at the time of decommissioning.</p> <p>Although it is expected that most array and export cables will be left in situ, it has been assumed that all cables will be removed during decommissioning, though any cable protection installed will be left in situ.</p>
BIE-D-16	All-Offshore	Decommissioning	Increased SSC and sediment deposition from removal of foundations and cables.	None	No likely significant effect	Simple Assessment	N/A as impact scoped in.	This impact is a subset of MP-C-2 for structures that are removed from the seabed. The impacts are expected to be equivalent to MP-C-2 apart from the structures that may remain (e.g. cables to be removed but not cable protection measures).	<p>MDS is assumed to be as per the construction phase, with all infrastructure removed in reverse-construction order.</p> <p>The removal of cables is considered the MDS, however the necessity to remove cables will be reviewed at the time of decommissioning.</p>
BIE-D-17	All-Offshore	Decommissioning	Loss of introduced habitat from the removal of foundations.	None	No likely significant effect	Simple Assessment	N/A as impact scoped in.	MDS based on the removal of all foundations = 1.67 km ²	Defined by the maximum surface area introduced as above. Some materials may be left in situ and this will be reviewed closer to the time of decommissioning.
BIE-D-18	All-Offshore	Decommissioning	Accidental release of pollutants (e.g. from accidental spillage/leakage) may affect benthic ecology.	Tertiary Coll1	No likely significant effect	Scoped out	Not required as agreement achieved during EIA Scoping.	N/A as impact scoped out	N/A as impact scoped out

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CF-C-1	Array Area	Construction	Hornsea Four array area construction activities and physical presence of constructed wind farm infrastructure leading to reduction in access to, or exclusion from established fishing grounds.	Primary Co83 Co85 Tertiary Co81 Co89 Co90 Co95	Likely significant effect without secondary mitigation Effect likely to be of negligible to minor adverse significance, depending on fleet assessed. Potential for some loss of fishing opportunities over construction period, though effect is short-term and localised, and the operational range of fleets is typically not limited to the array area.	Detailed Assessment	N/A as impact scoped in	<p>Seabed Preparation:</p> <ul style="list-style-type: none"> - Method: works involving UXO, boulder, other debris and sandwave clearance, and seabed levelling. <p>Offshore Platforms:</p> <ul style="list-style-type: none"> - 10 foundations; and - Seabed total permanent area: 371,250 m² (for 6 small and 3 large OSS), plus 30,625 m² (for 1 accommodation platform). <p>Wind Turbines:</p> <ul style="list-style-type: none"> - 180 foundations; - 810 m minimum separation distance; - 45 m diameter footprint per foundation; - 85 m diameter scour protection footprint per foundation; - Seabed total permanent area: 795,216 m² (Suction bucket Jacket (WTG-type)); and - Turbines utilising the entire PEIR boundary (600 km²). <p>Cables:</p> <ul style="list-style-type: none"> - 600 km of inter-array cables; - 90 km of interconnector cables; - 10 km of export cables within the array area; - Cables buried, typically to between 1 and 2 metres but up to 3 m; - Total seabed potential disturbed: 9 km² for array cables, plus 1.4 km² for interconnector cables and 0.15 km² for the export cables within the array; - Cable protection for up to 10% of the inter-array cables and interconnector cables and export cables within the array; - 10.4 m width of rock protection; - Rock protection area 624,000 m² for array cable plus 94,000 m² for interconnector cables; and - Up to 40 cable crossings for array and interconnector cables. <p>Safety Zones:</p> <ul style="list-style-type: none"> - 500 m safety zones around infrastructure under construction; and - 50 m safety zones around incomplete structures. <p>Construction Duration:</p> <ul style="list-style-type: none"> - Total: 3 years, including; - Foundation installation: 12 months; - Turbine installation: 12 months; - Platform installation: 2 months for each platform; and - Cable installation: 12 months. <p>Exclusion Scenario:</p> <ul style="list-style-type: none"> - Localised exclusion from safety zones around construction activities and partially installed infrastructure within the PEIR boundary of 600 km² across up to a 3-year period. 	This represents the maximum duration and extent of fishing exclusion throughout the construction phase and hence the greatest potential to restrict access to fishing grounds.

CF-C-2	Offshore Export Cable	Construction	Hornsea Four offshore ECC construction activities leading to reduction in access to, or exclusion from established fishing grounds.	Primary Co83 Tertiary Co89 Co90 Co93 Co94 Co95	Likely significant effect without secondary mitigation Effect likely to be of negligible to minor adverse significance, depending on fleet assessed. Potential for some loss of fishing opportunities over construction period, though effect is short-term and localised, and the operational range of fleets is typically not limited to the offshore ECC.	Detailed Assessment	N/A as impact scoped in	Seabed Preparation: - Method: works involving UXO, boulder, other debris and sandwave clearance, and seabed levelling. Offshore Platforms: - 3 foundations; and - Seabed total permanent area: 91,875 m ² Cable: - Cable installation methods: Trenching, dredging, jetting, ploughing, mass flow excavation, vertical injection, rock cutting; and - 654 km of export cables, i.e. 6 cables, each of 109 km in length, laid in parallel. Cable Protection: - Cables buried, typically to between 1 and 2 metres; - Total seabed potential disturbed: 9.8 km ² for export cable; - 10% cable protection, up to 792,000 m ² area for export cables; - 10.4 m width of rock protection; and - 10 cable crossings. Safety Zones: - 500 m safety zones around infrastructure under construction; - 50 m safety zones around incomplete structures; and - Roaming 500m safe passing distance for mobile installation vessels, which may, in exceptional circumstances, be increased to 1,000 m dependant on the nature of the installation works. Construction Duration: - Total: 3 years construction window, including; - Foundation installation: 12 months; - Platform installation: 2 months per platform; and - Offshore export cable installation: 14 months. Exclusion Scenario: - Roaming and localised exclusion around construction activities within the ECC i.e. roaming 0.79 km ² exclusion across up to a 3-year period.	This represents the maximum duration and extent of fishing exclusion throughout the construction phase and hence the greatest potential to restrict access to fishing grounds.
CF-C-3	Array Area	Construction	Displacement from Hornsea Four array area leading to gear conflict and increased fishing pressure on adjacent grounds.	Tertiary Co89 Co90 Co93 Co94 Co95	Likely significant effect without secondary mitigation Effect likely to be of negligible to minor adverse significance, depending on fleet assessed. Potential for displacement of fishing	Detailed Assessment	N/A as impact scoped in	As per MDS for "Hornsea Four array area construction activities and physical presence of wind farm infrastructure leading to reduction in access to, or exclusion from established fishing grounds".	This represents the maximum duration and extent of fishing exclusion throughout the construction phase and hence the greatest potential for displacement.
CF-C-4	Offshore Export Cable	Construction	Displacement from the Hornsea Four offshore ECC leading to gear conflict and increased fishing pressure on adjacent grounds.	Tertiary Co89 Co90 Co93 Co94 Co95	Likely significant effect without secondary mitigation Effect likely to be of negligible to minor adverse significance, depending on fleet assessed. Potential for	Detailed Assessment	N/A as impact scoped in	As per MDS for "Hornsea Four offshore cable corridor construction activities leading to reduction in access to, or exclusion from established fishing grounds".	This represents the maximum duration and extent of fishing exclusion throughout the construction phase and hence the greatest potential for displacement.
CF-C-5	All-Offshore	Construction	Hornsea Four array area and offshore ECC construction activities leading to displacement or disruption of commercially important fish and shellfish resources.	N/A	No likely significant effects	Simple Assessment	N/A as impact scoped in	See Fish and Shellfish Ecology MDS.	The scenarios presented in Fish and Shellfish Ecology provide for the greatest disturbance to fish and shellfish species and therefore the greatest knock on effect to Commercial Fisheries.
CF-C-6	All-Offshore	Construction	Hornsea Four array area and Hornsea Four offshore cable corridor construction activities leading to additional steaming to alternative fishing grounds for vessels that would otherwise be fishing within the array and export cable areas.	N/A	No likely significant effects	Scoped Out	Not required as agreement achieved during EIA Scoping.	N/A as impact scoped out	N/A as impact scoped out

CF-C-7	All-Offshore	Construction	Increased vessel traffic within fishing grounds as a result of changes to shipping routes and transiting construction vessel traffic from Hornsea Four array area and Hornsea Four offshore cable corridor leading to interference with fishing activity	Tertiary Co89 Co90 Co93 Co94 Co95	No likely significant effects	Detailed Assessment	N/A as impact scoped in	<p>Wind Turbine Foundation Installation:</p> <ul style="list-style-type: none"> - 4 installation vessels (90 return trips); - 16 support vessels (360 return trips); - 40 transport / feeder vessels (incl. Tugs) (360 return trips); and - 12 months duration. <p>Wind Turbine Installation:</p> <ul style="list-style-type: none"> - 2 installation vessels (90 return trips); - 40 transport vessels (360 return trips); - 16 support (360 return trips); and - 12 months duration. <p>Offshore Platform Installation (all offshore substations and accommodation platform):</p> <ul style="list-style-type: none"> - 2 primary installation vessels (36 return trips); - 12 support vessels (162 return trips); - 4 transport vessels (72 return trips); and - 2 months duration. <p>Offshore Platform Foundation Installation (all offshore substations and accommodation platform):</p> <ul style="list-style-type: none"> - 2 primary installation vessels (24 return trips); - 12 support vessels (108 return trips); - 4 transport vessels (48 return trips); and - 2 months duration. <p>Inter-Array and Interconnector Cable Installation:</p> <ul style="list-style-type: none"> - 3 main cable laying vessels (204 return trips); - 3 main cable burial vessels (204 return trips); and - 12 support vessels (1,080 return trips). <p>Offshore Export Cable Installation:</p> <ul style="list-style-type: none"> - 3 main cable laying vessels (96 return trips); - 3 main cable jointing vessels (72 return trips); - 3 main cable burial vessels (96 return trips); - 15 support vessels (144 return trips); and - 14 months duration. <p>Total:</p> <ul style="list-style-type: none"> - Up to 8 vessels in any given 5 km² at any one time. 	The maximum number of turbines and associated infrastructure will lead to the highest level of construction activities and therefore highest level of construction vessel round trips. The maximum number of vessels transits and the maximum duration of the construction would result in the greatest potential for interference.
CF-O-8	Array Area	Operation & Maintenance	Physical presence of Hornsea Four array area infrastructure leading to reduction in access to, or exclusion from established fishing grounds.	Primary Co83 Tertiary Co81 Co89 Co90 Co93 Co94 Co95	Likely significant effect without secondary mitigation Effect likely to be of not significant to minor adverse significance, depending on fleet assessed. Assumes fishing can resume to a degree within the array area. Effect will be long-term but highly localised and operational range of most fishing vessels is not limited to the array area	Detailed Assessment	N/A as impact scoped in	<p>Duration:</p> <ul style="list-style-type: none"> - Anticipated design life for Hornsea Four of 35 years. <p>Offshore Platforms:</p> <ul style="list-style-type: none"> - 10 foundations; - Seabed total permanent area: 371,250 m² (for 6 small and 3 large OSS), plus 30,625 m² (for 1 accommodation platform); and - Minimum spacing of 100 m for HVAC booster stations. <p>Component Replacement:</p> <ul style="list-style-type: none"> - 300 m² jack-up footprint per replacement event; - 20 events over lifetime; and - 6,000 m² jack-up footprint per component replacement (20 x 300 m²). <p>Ladder Replacement:</p> <ul style="list-style-type: none"> - 300 m² jack-up footprint per ladder replacement event; - 70 ladder replacement events over lifetime; and - 21,000 m² total jack-up footprint per platform access ladder replacement (70 x 300 m²). <p>Anode Replacement:</p> <ul style="list-style-type: none"> - 300 m² jack-up footprint per anode replacement event; - 70 anode replacement events over lifetime; and - 21,000 m² total jack-up footprint per anode replacement (70 x 300 m²). <p>J-Tube Replacement:</p> <ul style="list-style-type: none"> - 300 m² jack-up footprint per J-tube replacement event; - 20 J-tube replacement events over lifetime; and - 6,000 m² jack-up footprint per J-tube replacement (20 x 300 m²). 	<p>This represents the maximum duration and extent of fishing exclusion throughout the operation and maintenance phase and hence the greatest potential to restrict access to fishing grounds.</p> <p>The smaller the spacing between turbines the greatest the potential for vessels to have restricted access to the site.</p>

CF-O-9	Offshore Export Cable	Operation & Maintenance	Physical presence of offshore export cable and infrastructure within the Hornsea Four offshore ECC leading to reduction in access to, or exclusion from established fishing grounds.	<p>Primary Co83</p> <p>Tertiary Co81 Co89 Co90 Co93 Co94 Co95</p>	<p>Likely significant effect without secondary mitigation</p> <p>Effect likely to be of not significant to minor adverse significance, depending on fleet assessed.</p> <p>Assumes fishing can resume to a degree within the array area. Effect will be long-term but highly localised and operational range of most fishing vessels is not limited to the offshore ECC</p>	<p>Detailed Assessment</p> <p>N/A as impact scoped in</p>	<p>Wind Turbines:</p> <ul style="list-style-type: none"> - 180 foundations - 810 m from minimum separation distance; - 45 m diameter footprint per foundation; - 85 m diameter scour protection footprint per foundation; and - Seabed total permanent area: 1,180,980 m² (Suction bucket Jacket (WTG-type)). <p>Component Replacement:</p> <ul style="list-style-type: none"> - 300 m² jack-up footprint per replacement event; - 7 events per turbine over lifetime; - 1,260 total replacement events over lifetime; and - 378,000 m² total jack-up footprint over lifetime (1260 x 300 m²). <p>J-Tube Replacement:</p> <ul style="list-style-type: none"> - 300 m² jack-up footprint per replacement event; - 360 replacement events over lifetime; and - 108,000 m² total jack-up footprint over lifetime (360 x 300 m²). <p>Remedial Cable Burial:</p> <ul style="list-style-type: none"> - 2 km length per remedial burial event; - 10 m width seabed disturbance per remedial burial event; - 20,000 m² temporary seabed disturbance per reburial event; - 42 remedial cable burial events over lifetime for array cables and 7 for interconnectors; and - 9,800,000 m² total seabed disturbance over lifetime (49 x 20,000 m²). <p>Cable Repairs:</p> <ul style="list-style-type: none"> - 20,000 m² temporary seabed disturbance per repair event; - 10 array cable and 5 interconnector cable repair events over lifetime; - 300,000 m² total seabed disturbance over lifetime (15 x 20,000 m²); - 300 m² jack-up footprint per repair event; and - 4,500 m² total jack-up footprint over lifetime (15 x 300 m²). <p>Safety Zones:</p> <ul style="list-style-type: none"> - 500 m safety zones around manned offshore platforms and temporary 500m safety zones around turbines and offshore platforms undergoing major maintenance. <p>Assumption:</p> <p>Assessment assumes that fishing will resume around and between infrastructure within the Hornsea Four array area where possible, with the exception of an assumed 50m operating distance from infrastructure, areas of cable protection, and safety zones around infrastructure undergoing major maintenance Y13ion replacement.</p>

CF-O-10	All-Offshore	Operation & Maintenance	Displacement from Hornsea Four array area and Hornsea Four offshore ECC leading to gear conflict and increased fishing pressure on adjacent grounds.	Primary Co83 Tertiary Co81 Co89 Co90 Co93 Co94 Co95	Likely significant effect without secondary mitigation Effect likely to be of not significant to minor adverse significance, depending on fleet assessed. Assumes fishing can resume to a degree in array area and in vicinity of export cables. Effect will be highly localised and operational range of most fishing vessels is not limited to the array area or offshore ECC.	Detailed Assessment	N/A as impact scoped in	As per MDS for "Physical presence of Hornsea Four array area infrastructure leading to reduction in access to, or exclusion from established fishing grounds" and "Physical presence of offshore export cable and infrastructure within the Hornsea Four offshore cable corridor leading to reduction in access to, or exclusion from established fishing grounds".	As per the justification for "Physical presence of Hornsea Four array area infrastructure leading to reduction in access to, or exclusion from established fishing grounds" and "Physical presence of offshore export cable and infrastructure within the Hornsea Four offshore cable corridor leading to reduction in access to, or exclusion from established fishing grounds".
CF-O-11	Array Area	Operation & Maintenance	Physical presence of Hornsea Four array area leading to gear snagging.	Primary Co83 Tertiary Co81 Co89 Co90 Co93 Co94 Co95	Likely significant effect without secondary mitigation Effect likely to be of not significant to minor adverse significance, depending on fleet assessed. Standard industry practice and protocol (i.e., seabed infrastructure will be buried and/or marked on charts) minimise this	Detailed Assessment	N/A as impact scoped in	As per MDS for "Physical presence of Hornsea Four array area infrastructure leading to reduction in access to, or exclusion from established fishing grounds".	This represents the maximum potential for interactions between infrastructure and fishing gear. Assessment assumes that fishing will resume around and between infrastructure within the Hornsea Four array area, with the exception of an assumed 50 m operating distance from infrastructure, areas of cable protection, and safety zones around infrastructure undergoing major maintenance.
CF-O-12	Offshore Export Cable	Operation & Maintenance	Physical presence of the export cable and associated infrastructure leading to gear snagging.	Primary Co83 Tertiary Co81 Co89 Co90 Co93 Co94 Co95	Effect likely to be of not significant to minor adverse significance, depending on fleet assessed Standard industry practice and protocol (i.e., seabed infrastructure will be buried and/or marked on charts) minimise this	Detailed Assessment	N/A as impact scoped in	As per maximum design scenario for "Physical presence of offshore export cable and infrastructure within the Hornsea Four offshore cable corridor leading to reduction in access to, or exclusion from established fishing grounds". Assessment assumes that fishing will resume along the Hornsea Four offshore cable corridor, with the exception of an assumed 50m operating distance from infrastructure, areas of cable protection and safety zones around infrastructure undergoing major maintenance.	This represents the maximum potential for interactions between infrastructure and fishing gear.
CF-O-13	All-Offshore	Operation & Maintenance	Hornsea Four operation and maintenance activities leading to displacement or disruption of commercially important fish and shellfish resources.	Primary Co83 Tertiary Co81 Co94	No likely significant effects	Simple Assessment	N/A as impact scoped in	See Fish and Shellfish Ecology MDS.	The scenarios presented in Fish and Shellfish Ecology provide for the greatest disturbance to fish and shellfish species and therefore the greatest knock on effect to Commercial Fisheries.
CF-O-14	All-Offshore	Operation & Maintenance	Physical presence of the Hornsea Four array area and export cable leading to additional steaming to alternative fishing grounds for vessels that would otherwise be fishing within the Hornsea Four array area and offshore cable corridor.	N/A	No likely significant effects	Scoped out	Not required as agreement achieved during EIA Scoping.	N/A as impact scoped out	N/A as impact scoped out

CF-O-15	All-Offshore	Operation & Maintenance	Increased vessel traffic within fishing grounds as a result of changes to shipping routes and maintenance vessel traffic from Hornsea Four array area and Hornsea Four offshore ECC infrastructure leading to interference with fishing activity.	Tertiary Co89 Co90 Co93 Co95	No likely significant effects	Simple Assessment	N/A as impact scoped in	<p>Vessel Trips:</p> <ul style="list-style-type: none"> - 3,525 return vessel visits per year; - 2,580 return visits to wind turbines per year; - 780 return visits to wind turbine foundations per year; - 65 return visits to offshore platforms (structural scope) per year; - 100 return visits to offshore platforms (electrical scope) per year; and - Vessels include: crew transport vessels (CTVs), Service Operation Vessels (SOVs), supply vessels, cable and remedial protection vessels and jack-up vessels. <p>Duration:</p> <ul style="list-style-type: none"> - Anticipated design life for Hornsea Four of 35 years. 	The maximum number of turbines and associated infrastructure will lead to the highest level of operation and maintenance activities and therefore highest level of operation and maintenance vessel round trips.
CF-D-16	Array Area	Decommissioning	Hornsea Four array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds.	Tertiary Co89 Co90 Co93 Co94 Co95 Co111	Likely significant effect without secondary mitigation	Detailed Assessment	N/A as impact scoped in	In the absence of detailed methodologies and schedules, decommissioning works and associated implications for commercial fisheries are considered analogous with those assessed for the construction phase.	<p>The scenario which represents the potential for the maximum level of infrastructure to be decommissioned.</p> <p>Decommissioning is likely to include removal of all of the wind turbine components and part of the foundations (those above seabed level) and removal of all other surface infrastructure. Some or all of the array cables, interconnector cables, and offshore export cables may be removed. Scour and cable protection would likely be left in situ.</p>
CF-D-17	Offshore Export Cable	Decommissioning	Hornsea Four offshore ECC decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds.	Tertiary Co89 Co90 Co93 Co94 Co95 Co111	Likely significant effect without secondary mitigation	Detailed Assessment	N/A as impact scoped in	As per MDS for "Hornsea Four array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds".	<p>The scenario which represents the potential for the maximum level of infrastructure to be decommissioned.</p>
CF-D-18	Array Area	Decommissioning	Displacement from Hornsea Four array area leading to gear conflict and increased fishing pressure on adjacent grounds.	Tertiary Co89 Co90 Co93 Co94 Co95 Co111	Likely significant effect without secondary mitigation	Detailed Assessment	N/A as impact scoped in	As per MDS for "Hornsea Four array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds".	<p>The scenario which represents the potential for the maximum level of infrastructure to be decommissioned.</p>
CF-D-19	Offshore Export Cable	Decommissioning	Displacement from the Hornsea Four offshore ECC leading to gear conflict and increased fishing pressure on adjacent grounds.	Tertiary Co89 Co90 Co93 Co94 Co95 Co111	Likely significant effect without secondary mitigation	Detailed Assessment	N/A as impact scoped in	As per MDS for "Hornsea Four array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds".	<p>The scenario which represents the potential for the maximum level of infrastructure to be decommissioned.</p>

CF-D-20	All-Offshore	Decommissioning	Physical presence of any infrastructure left in situ leading to gear snagging.	Primary Co83 Tertiary Co81 Co89 Co90 Co93 Co94 Co95 Co111	Likely significant effect without secondary mitigation As described for the operation and maintenance phase; effect likely to be of not significant to minor adverse significance, depending on fleet assessed. Standard industry practice and protocol (i.e., seabed infrastructure will be buried and/or marked on charts) minimise this risk, but it remains likely to be an area of industry concern.	Detailed Assessment	N/A as impact scoped in	As per MDS for "Hornsea Four array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds".	The scenario which represents the potential for the maximum level of infrastructure to be decommissioned.
CF-D-21	All-Offshore	Decommissioning	Decommissioning activities leading to displacement or disruption of commercially important fish and shellfish resources.	N/A	No likely significant effects	Simple Assessment	N/A as impact scoped in	As per MDS for "Hornsea Four array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds".	The scenario which represents the potential for the maximum level of infrastructure to be decommissioned.
CF-D-22	All-Offshore	Decommissioning	Decommissioning activities leading to longer steaming distances to alternative fishing grounds.	Tertiary Co89 Co90 Co93 Co94 Co95 Co111	No likely significant effects	Scoped Out	N/A as impact scoped out	N/A as impact scoped out	N/A as impact scoped out
CF-D-23	Array Area	Decommissioning	Increased vessel traffic within fishing grounds as a result of changes to shipping routes and transiting decommissioning vessel traffic from Hornsea Four array area and Hornsea Four offshore ECC leading to interference with fishing activity.	Tertiary Co89 Co90 Co93 Co94 Co95 Co111	No likely significant effects	Simple Assessment	N/A as impact scoped in	As per MDS for "Hornsea Four array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds".	The scenario which represents the potential for the maximum level of infrastructure to be decommissioned.

ID	Project Element	Original Project Phase	Project Activity and Impact	Embedded Mitigation Measures	Likely Significance of Effect at Scoping Stage and Justification	Hornsea Four Position	Further Evidence to Support "Scoping Out"	Maximum Design Scenario (MDS)	Justification
FSE-C-1	All-offshore	Construction	Direct damage (e.g. crushing) and disturbance to mobile demersal and pelagic fish and shellfish species arising from construction activities.	N/A	No likely significant effect	Scoped Out	Not required as agreement reached during EIA Scoping.	N/A as impact scoped out.	N/A as impact scoped out.
FSE-C-2	All-offshore	Construction	Temporary localised increases in SSC and smothering.	Primary Co44 Co45	No likely significant effect	Simple Assessment	N/A as impact scoped in.	<p>WTG Foundations:</p> <ul style="list-style-type: none"> - 180 turbines on suction caisson jacket foundations requiring seabed preparation, resulting in the suspension of 2,134,440 m³ of sediment; Or - 180 turbines on piled foundations with 10% of locations requiring drilling to the full length of the pile, resulting in a drill arising volume of 127,235 m³. <p>OSS Foundations:</p> <ul style="list-style-type: none"> - Nine suction caisson foundations requiring seabed preparation, resulting in the suspension of 737,130 m³ of sediment; Or - Nine piled foundations drilled to 10% of pile depth, resulting in a drill arising volume of 13,854 m³. <p>Offshore Accommodation Platform Foundations:</p> <ul style="list-style-type: none"> - One suction caisson foundation requiring seabed preparation, resulting in the suspension of 57,245 m³ of sediment; Or - One piled foundation drilled to 10% of pile depth, resulting in a drill arising volume of 1,540 m³. <p>Sandwave Clearance:</p> <ul style="list-style-type: none"> - Sandwave clearance across 18 km² of seabed with an impact width of 15 m per cable resulting in the suspension of 961,000 m³ of sediment. <p>Cable Trenching:</p> <ul style="list-style-type: none"> - Cable installation by MFE of array cables, interconnector cables, and part of the export cables within the array resulting in the suspension of 4,140,000 m³ of sediment. <p>HVAC Booster Station Foundations:</p> <ul style="list-style-type: none"> - 3 suction caisson foundations requiring seabed preparation, resulting in the suspension of 171,735 m³ of sediment; Or - 3 piled foundations drilled to 10% of pile depth, resulting in a drill arising volume of 4,618 m³. <p>Sandwave Clearance:</p> <ul style="list-style-type: none"> - Sandwave clearance across a 99 km corridor for 6 cables resulting in the suspension of 757,000 m³ of sediment. <p>Cable Trenching:</p> <ul style="list-style-type: none"> - Installation of 6 cables by MFE resulting in the suspension of 3,543,000 m³ of sediment (excluding the part of the export cable within the array) <p>Cable Jointing:</p> <ul style="list-style-type: none"> - Up to 17,500 m³ of sediment from up to four cable joints per export cable. <p>Total:</p> <ul style="list-style-type: none"> - In the case of seabed preparation for suction caisson foundations, a maximum volume of 12,879,050 m³. - In the case of drilling for piled foundations, a maximum volume of 9,925,747 m³. 	The MDS for seabed disturbance are presented in the rows above.
FSE-C-3	All-offshore	Construction	Direct and indirect seabed disturbances leading to the release of sediment contaminants.	Primary Co44 Co45	No likely significant effect	Simple Assessment	N/A as impact scoped in.		As above.

FSE-C-4	All-offshore	Construction	Mortality, injury, behavioural changes and auditory masking arising from noise and vibration.	Primary Co85 Tertiary Col10	Likely significant effect without secondary mitigation On the basis of potential subsea noise arising from piling activity and the presence of sensitive species (such as herring and sandeels within the Hornsea Four study area).	Detailed Assessment	N/A as impact scoped in.	<p>Spatial MDS:</p> <ul style="list-style-type: none"> - Monopile foundations - 180 WTGs - Six offshore transformer substations - Three offshore converter substations - One offshore accommodation platform - Maximum hammer energy 5,000 kJ - 4-hour piling duration - 1.2 days per monopile - 216 piling days (single vessel) - 106 piling days (2 vessels) <p>Temporal MDS:</p> <ul style="list-style-type: none"> - 180 WTGs on piled jacket foundations (3 piles per jacket) – 540 pin piles - Six offshore transformer substations on piled jacket foundations (6 legs per jacket and 4 piles per leg – 144 pin piles - Three offshore converter substations on piled jacket foundations (8 legs per jacket and 2 piles per leg – 48 pin piles - One offshore accommodation platform on a piled jacket foundation (6 legs and 4 piles per leg – 24 pin piles - Total of 756 pin piles in the array - Maximum hammer energy 2,500 kJ - 1.5 days per jacket foundation - 270 piling days (single vessel) - 135 days (2 vessels) <p>Spatial MDS:</p> <ul style="list-style-type: none"> - Three HVAC booster stations on monopile foundations - Maximum hammer energy 5,000 kJ - 4-hour piling duration - 1.2 days per monopile <p>Temporal MDS:</p> <ul style="list-style-type: none"> - Three HVAC booster stations on piled jackets (6 legs per jacket and 4 piles per leg – 72 pin piles Interconnector cable installation - 6 circuits/cables - Total length of interconnector cables: 90 km - Total duration of cable installation: 24 months <p>Export Cable Installation:</p> <ul style="list-style-type: none"> - Where possible, the export cables will be buried below the seabed through to landfall. - Total length of export cables: 654 km - Total duration of cable installation: 24 months <p>Vessel Disturbance:</p> <p>WTG Foundation Installation</p> <ul style="list-style-type: none"> - 4 installation vessels (90 return trips) - 16 support vessels (360 return trips) - 40 Transport / Feeder vessels (incl. Tugs) (360 return trips) <p>WTG Installation:</p> <ul style="list-style-type: none"> - 2 installation vessels (90 return trips) - 12 Support vessels (270 return trips) - 24 transport (540 return trips) <p>Substation Foundation Installation (Including Accommodation & HVAC Booster Station Foundations):</p> <ul style="list-style-type: none"> - 2 installation vessels (24 return trips) - 12 support vessels (108 return trips) - 4 transport vessels (48 return trips) <p>Substation Platform Installation (Including Accommodation & HVAC Booster Station Platforms):</p> <ul style="list-style-type: none"> - 2 installation vessels (36 return trips) - 12 support vessels (162 return trips) - 4 transport vessels (72 return trips) <p>Inter-Array and Interconnector Cable Installation:</p> <ul style="list-style-type: none"> - 3 Main cable laying vessels (204 return trips) - 3 Main burial vessels (204 return trips) - 12 support vessels (1,080 return trips) <p>Offshore Export Cable Installation:</p> <ul style="list-style-type: none"> - 3 main cable laying vessels (96 return trips) - 3 main cable jointing vessels (72 return trips) - 3 main cable burial vessels (96 return trips) - 15 support vessels (144 return trips) <p>Unexploded Ordnance (UXO) Clearance:</p> <ul style="list-style-type: none"> - Estimated 2,263 targets - 86 UXOs may require clearance. - One UXO will be cleared every 24 hours - 86 detonations in 86 days
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FSE-C-5	All-offshore	Construction	Accidental pollution events during the construction phase resulting in potential effects on fish and shellfish receptors.	N/A	No likely significant effect	Scoped Out	Not required as agreement reached during EIA Scoping.	N/A as impact scoped out	N/A as impact scoped out
FSE-O-18	All-offshore	Operation	Temporary localised increases in SSC and smothering.	Primary Co44 Co45	No likely significant effect	Simple Assessment	N/A as impact scoped in.	<p>Array and Interconnector Cables Remedial Burial:</p> <ul style="list-style-type: none"> - 2000 m per replacement - 10 m wide corridor - 49 km total lifetime replacement - Maximum volume of sediment from cable reburial over lifetime: 294,000 m³ <p>Array and Interconnector Cable Repairs:</p> <ul style="list-style-type: none"> - 20,000 m² per repair event - 15 repair events over lifetime - 3 m burial depth - Maximum volume of sediment from cable repairs over lifetime: 900,000 m³ <p>Export Cables Remedial Repair:</p> <ul style="list-style-type: none"> - 2000 m per replacement - 10 m corridor - 14 km replacement over lifetime - Maximum volume of sediment from cable reburial over lifetime: 88,624 m³ <p>Export Cables Repairs:</p> <ul style="list-style-type: none"> - 20,000 m² per event - 35 repair events over lifetime - 3 m burial depth - Maximum volume of sediment from cable repairs over lifetime: 2,100,000 m³ <p>Total volume of sediment from cable replacement and reburial in the array and offshore area: 3,382,624 m³</p>	The worst case impacts from remedial cable burial and cable repairs of array, interconnector and export cables result from the use of MFE. This assumes the largest number of cables, repair events, the greatest burial depth and greatest length/area of maintenance. This results in the worst case sediment volume disturbance of 3,382,624 m ³ .
FSE-O-6	All-offshore	Operation	Long-term loss of habitat due to the presence of turbine foundations, scour protection and cable protection.	Primary Co44 Co45 Co83	No likely significant effect	Simple Assessment	N/A as impact scoped in.	<p>WTG foundations, including scour protection:</p> <ul style="list-style-type: none"> - 180 WTGs - suction bucket jacket foundations = 795,216 m² <p>Offshore transformer substation foundations including scour protection:</p> <ul style="list-style-type: none"> - 6 small and 3 large OSS - HVDC: GBS (Box-type) & GBS (Large OSS) foundations = 371,250 m² <p>Offshore HVAC booster substations, including scour protection:</p> <ul style="list-style-type: none"> - GBS (Box-type) foundations = 91,875 m² <p>Offshore accommodation platform, including scour protection:</p> <ul style="list-style-type: none"> - GBS (Box-type) foundations = 30,625 m² <p>Cable Protection:</p> <ul style="list-style-type: none"> - Array cables = 624,000 m² (scour protection from construction phase) + 156,000m² (25% replenishment of scour protection during O&M phase) = 780,000 m² - Offshore interconnector cables = 94,000 m² + 23,500 m² (25% cable replenishment) = 117,500 m² - Offshore export cables = 792,000 m² + 198,000 m² (25% cable replenishment) = 990,000 m² - Total footprint = 1,887,500 m² <p>Cable crossings</p> <ul style="list-style-type: none"> - Cable crossings within the array area (Pre- and post-lay rock berm area) = 255,000 m² (40 crossings) - Cable crossings in the ECC area (Pre- and post-lay rock berm area) = 268,000 m² (10 crossings) - Total footprint = 523,000 m² <p>Worst case scenario total habitat loss/ change = 3,699,466 m²</p>	Cable protection (based on worst case scenario of rock berm) may be required in the unlikely event that cables cannot be buried (based on 10% of the length), in addition to this, cable replenishment may also be required (based on 25% of the cable protection area) resulting in a footprint of 1,887,500 m ² (based on a post lay protection width of 10.4 m). The maximum area of cable protection deployed will result in the greatest area of habitat loss.
FSE-O-7	All-offshore	Operation	Increased hard substrate and structural complexity as a result of the introduction of turbine foundations, scour protection and cable protection.	N/A	No likely significant effect	Simple Assessment	N/A as impact scoped in.	Total area of introduced hard substrate = 3,699,466 m ² (calculated from total of cell above)	Cable protection (based on worst case scenario of rock berm) may be required in the unlikely event that cables cannot be buried (based on 10% of the length) in addition to this, cable replenishment may also be required (based on 25% of the cable protection area) resulting in a footprint of 1,887,500 m ² (based on a post lay
FSE-O-8	Array area	Operation	Underwater noise as a result of operational turbines.	N/A	No likely significant effect	Simple Assessment	N/A as impact scoped in.	180 operational WTGs.	This results in the maximum potential for noise disturbance on fish and shellfish receptors during the operation and maintenance phase.

FSE-O-9	All-offshore	Operation	EMF effects arising from cables.	N/A	No likely significant effect	Scoped Out	Not required as agreement reached during EIA Scoping.	N/A as impact scoped out.	N/A as impact scoped out.
FSE-O-10	All-offshore	Operation	Direct disturbance resulting from maintenance during operation.	N/A	No likely significant effect	Scoped Out	Not required as agreement reached during EIA Scoping.	N/A as impact scoped out.	N/A as impact scoped out.
FSE-O-11	All-offshore	Operation	Indirect disturbance resulting from the accidental release of pollutants.	N/A	No likely significant effect	Scoped Out	Not required as agreement reached during EIA Scoping.	N/A as impact scoped out.	N/A as impact scoped out.
FSE-O-12	All-offshore	Operation	Potentially reduced fishing pressure within the Hornsea Four array area and increases fishing pressure outside the array area due to displacement.	N/A	No likely significant effect	Simple Assessment	N/A as impact scoped in.	- Project design life: 35 years - 500 m safety zone around infrastructure (construction and decommissioning) - 50 m safety zone around incomplete structures (construction and decommissioning) - 500 m safety zone around manned infrastructures (operation and maintenance) - 500 m safety zone around infrastructure undergoing major maintenance (operation and maintenance). - Total area reduced fishing pressure = 662,240 m ²	Assessment assumes that fisheries will not be excluded from the Hornsea Four proposed development area, however, due to logistical constraints, fishing pressure may be reduced.
FSE-D-13	All-offshore	Decommissioning	Direct damage (e.g. crushing) and disturbance to mobile demersal and pelagic fish and shellfish species arising from decommissioning activities.	N/A	No likely significant effect	Scoped Out	Not required as agreement reached during EIA Scoping.	N/A as impact scoped out.	N/A as impact scoped out.
FSE-D-14	All-offshore	Decommissioning	Temporary localised increases in SSC and smothering.	Primary Co44 Co45	No likely significant effect	Simple Assessment	N/A as impact scoped in.	MDS is identical (or less) to that of the construction phase.	WTGs will be removed by reversing the methods used to install them. Pile foundations will likely be cut approximately 1m below the seabed. The area of seabed impacted during the removal of the WTGs would be the same as the area impacted during installation. The OSSs will likely be a reverse installation. The area of the seabed disturbed by decommissioning activities will be the same as the area impacted during installation. If piled foundations are used, they will likely be cut approximately 1 m below the seabed. It is likely that equipment similar to that which is used to install the cables could be used to reverse the burial process and expose them. Therefore, the area of
FSE-D-15	All-offshore	Decommissioning	Direct and indirect seabed disturbances leading to the release of sediment contaminants.	Primary Co44 Co45	No likely significant effect	Simple Assessment	N/A as impact scoped in.	MDS is identical (or less) to that of the construction phase.	See row above.
FSE-D-16	All-offshore	Decommissioning	Mortality, injury, behavioural changes and auditory masking arising from noise and vibration.	Tertiary Co113	No likely significant effect	Simple Assessment	N/A as impact scoped in.	Maximum levels of underwater noise during decommissioning would be from underwater cutting required to remove structures. This is much less than pile driving and therefore impacts would be less than as assessed during the construction phase/ piled foundations would likely be cut approximately 1 m below the seabed.	This would result in the maximum potential disturbance associated with noise associated with decommissioning activities including foundation decommissioning.
FSE-D-17	All-offshore	Decommissioning	Accidental pollution events during the construction phase resulting in potential effects on fish and shellfish receptors.	N/A	No likely significant effect	Scoped Out	Not required as agreement reached during EIA Scoping.	N/A as impact scoped out.	N/A as impact scoped out.

ID	Project Element	Original Project Phase	Project Activity and Impact	Embedded Mitigation Measures	Likely Significance of Effect at Scoping Stage and Justification	Hornsea Four Position	Further Evidence to Support "Scoping Out"	Maximum Design Scenario (MDS)	Justification
IOU-AP-1	All Offshore	All phases	Aggregate dredging activities	N/A	No likely significant effect Given that there are no licensed aggregate dredging sites within 30+km to the Hornsea Four array area or offshore ECC, impacts	Scoped Out	Not required as agreement achieved during EIA Scoping.	N/A as scoped out	N/A as scoped out
IOU-AP-2	All Offshore	All phases	Disposal sites	N/A	No likely significant effect	Scoped Out	As there are no active, licensed sites within or within 2 km of the Hornsea Four array area (excluding the adjacent Hornsea One and Two sites) or offshore ECC, and significant effects are unlikely to occur at any phase of the project development on licensed disposal sites the receptor will be scoped out of any further consideration in the EIA process.	N/A as scoped out	N/A as scoped out
IOU-AP-3	All Offshore	All phases	Impacts on the proposed Endurance CCS Site	N/A	No likely significant effect Given the current status of the CCS projects in the UK (and the planning refusal of the White Rose CCS project), impacts on the Endurance CCS site will be scoped out of any further consideration in the EIA process.	Scoped Out	Not required as agreement achieved during EIA Scoping.	N/A as scoped out	N/A as scoped out
IOU-AP-4	All Offshore	All phases	Temporary loss of access to existing or proposed pipelines or cables for repair or maintenance.	Tertiary: Co89 Co107	No likely significant effect Restriction of access to the Viking Link for inspection and maintenance activities could be critical to the operator. The operators of active pipelines and cables are deemed to be of medium vulnerability, medium recoverability and high value.	Scoped Out	Not required as agreement achieved during EIA Scoping.	N/A as scoped out	N/A as scoped out
IOU-AP-5	All Offshore	All phases	Displacement of recreational craft and recreational fishing vessels resulting in a loss of recreational resource.	Tertiary Co89	No likely significant effect - new impact since Scoping	Scoped Out	Due to the relatively limited recreational activity in the nearshore and offshore areas in the vicinity of Hornsea Four and the temporal and spatial nature of the works proposed in the ECC, no likely significant effects are expected to occur on marine recreational users and will be scoped out of any further consideration in the EIA process.	N/A as scoped out	N/A as scoped out

IOU-C-6	Array Area	Construction	Conflicts with oil and gas seismic survey activity within the Hornsea Four array area.	<u>Secondary</u> Co139 <u>Tertiary:</u> Co89 Co93 Co94 Co96 Co102 Co107	No likely significant effect	To be assessed for final Application	N/A as impact scoped in	Construction of 10 offshore platforms in total: - Up to 6 small/medium offshore transformer substation platforms; - Up to 3 large offshore converter substation platforms; and - 1 offshore accommodation platform. Construction of 180 Wind Turbine utilising the entire array area (600 km²) Safety zones: - 500 m safety zones around infrastructure under construction; - 50 m safety zones around partially completed structures (for when construction has paused); Construction duration: Total duration of 54 months, but offshore construction likely to be approximately 3 years - Foundation installation: 12 months - Turbine installation: 2 years - Platform installation: 2-year window with 2 months for each platform - Cable installation: 14 months	Parameters that create the greatest disruption to seismic survey activities in terms of area affected and duration.
IOU-C-7	Array Area	Construction	Restriction on oil and gas drilling due to the placement of infrastructure within the Hornsea Four array area and within 500 m of the boundary of the Hornsea Four array area.	<u>Secondary</u> Co139 <u>Tertiary:</u> Co89 Co94 Co96 Co102 Co107	No likely significant effect	To be assessed for final Application	N/A as impact scoped in	As above	As above
IOU-C-8	ECC	Construction	Conflicts with oil and gas seismic activity along the Hornsea Four offshore ECC.	<u>Secondary</u> Co139 <u>Tertiary:</u> Co57 Co89 Co94 Co96 Co102 Co107	No likely significant effect	To be assessed for final Application	N/A as impact scoped in	Three offshore HVAC booster stations located within the HVAC booster area of search. Six export cables utilising the entire length of the offshore ECC Safety zones - 500 m safety zones around HVAC infrastructure under construction; - 50 m safety zones around partially completed HVAC structures for when construction has paused; Construction duration: Total duration of 54 months, but offshore construction likely to be approximately 3 years - Foundation installation: 12 months - Turbine installation: 2 years - Platform installation: 2-year window with 2 months for each platform - Cable installation: 14 months	Parameters that create the greatest disruption to seismic survey activities in terms of area affected and duration.
IOU-C-9	ECC	Construction	Restriction on oil and gas drilling due to the placement of infrastructure within the offshore ECC and within 500 m of the Hornsea Four ECC.	<u>Secondary</u> Co139 <u>Tertiary:</u> Co57 Co89 Co94 Co96 Co102 Co107	No likely significant effect	To be assessed for final Application	N/A as impact scoped in	As above	As above

IOU-C-10	All Offshore	Construction	The piling of wind turbines and substation foundations will generate underwater noise that may cause acoustic interference with oil and gas seismic survey operations.	<u>Secondary</u> Co139 <u>Tertiary:</u> Co89 Co94 Co96 Co102	No likely significant effect	To be assessed for final Application	N/A as impact scoped in	Array Area <u>The spatial MDS</u> - Monopile foundations - 180 WTGs - Six offshore transformer substations - Three offshore converter substations - One offshore accommodation platform - Maximum hammer energy 5,000 kJ - 4-hour piling duration - 1.2 days per monopile - 216 piling days (single vessel) - 106 piling days (2 vessels) <u>The temporal MDS</u> - 180 WTGs on piled jacket foundations (3 piles per jacket) – 540 pin piles - Six offshore transformer substations on piled jacket foundations (6 legs per jacket and 4 piles per leg – 144 pin piles - Three offshore converter substations on piled jacket foundations (8 legs per jacket and 2 piles per leg – 48 pin piles - One offshore accommodation platform on a piled jacket foundation (6 legs and 4 piles per leg – 24 pin piles - Total of 756 pin piles in the array - Maximum hammer energy 2,500 kJ - 1.5 days per jacket foundation - 270 piling days (single vessel) - 135 days (2 vessels) HVAC Booster Area of Search <u>The Spatial MDS</u> - Three HVAC booster stations on monopile foundations - Maximum hammer energy 5,000 kJ - 4-hour piling duration - 1.2 days per monopile <u>The Temporal MDS</u> - Three HVAC booster stations on piled jackets (6 legs per jacket and 4 piles per leg) – 72 pin piles <u>Interconnector cable installation</u> - 6 circuits/cables - Total length of interconnector cables: 90 km - Total duration of cable installation: 24 months <u>Export cable installation</u> - Where possible, the export cables will be buried below the seabed through to landfall. - Total length of export cables: 654 km - Total duration of cable installation: 24 months	Parameters that equates to the largest number of piling activities and for the greatest duration.
IOU-C-11	All Offshore	Construction	The potential impacts of piling at Hornsea Four on the safety of diving operations that may be required at oil and gas assets.	<u>Secondary</u> Co139 <u>Tertiary:</u> Co89 Co94 Co96 Co102	No likely significant effect	To be assessed for final Application	N/A as impact scoped in	As above	As above
IOU-O-12	Array Area	Operation and Maintenance	Conflicts with oil and gas seismic survey activity within the Hornsea Four array area.	<u>Secondary</u> Co139 <u>Tertiary:</u> Co57 Co89	No likely significant effect	To be assessed for final Application	N/A as impact scoped in	The presence of the installed Hornsea Four infrastructure: - Up to 10 offshore platforms: <ul style="list-style-type: none">• 3 small/medium offshore transformer substation platforms• 6 larger offshore converter substation platforms• 1 offshore accommodation platform - Up to 180 wind turbines utilising the entire array area (600 km ²) - 500 m safety zone around infrastructure undergoing maintenance - Anticipated design life: 35 years	Parameters that create the greatest disruption to seismic survey activities in terms of area affected and duration.
IOU-O-13	Array Area	Operation and Maintenance	Restriction on oil and gas drilling due to the presence of infrastructure within the Hornsea Four array and within 500m from the boundary.	<u>Secondary</u> Co139 <u>Tertiary:</u> Co57 Co89	No likely significant effect	To be assessed for final Application	N/A as impact scoped in	As above	As above
IOU-O-14	ECC	Operation and Maintenance	Conflicts with oil and gas seismic survey activity along the Hornsea Four offshore ECC.	<u>Secondary</u> Co139 <u>Tertiary:</u> Co57 Co89	No likely significant effect	To be assessed for final Application	N/A as impact scoped in	The presence of the installed Hornsea Four infrastructure: - Up to three offshore HVAC substations - Up to six export cables utilising the offshore ECC - 500 m safety zone around HVAC infrastructure undergoing maintenance; - Anticipated design life: 35 years	Parameters that create the greatest disruption to seismic survey activities in terms of area affected and duration

IOU-O-15	ECC	Operation and Maintenance	Restriction on oil and gas drilling due to the presence of infrastructure within the Hornsea Four offshore ECC and within 500 m from the boundary.	Secondary Co139 Tertiary: Co57 Co89	No likely significant effect	To be assessed for final Application	N/A as impact scoped in	As above	As above
IOU-O-16	Array Area	Operation and Maintenance	Interference with the performance of the REWS located on oil and gas platforms	Tertiary: Co89 Co93	No likely significant effect	To be assessed for final Application	N/A as impact scoped in	The presence of the installed Hornsea Four infrastructure within the array area: - Up to 180 wind turbines utilising the entire array area (600 km ²); The wind turbine dimensions are as follows: - Minimum height of lowest blade tip above Mean Sea Level (MSL): 35 m; - Maximum blade tip height above Lowest Astronomical Tide (LAT): 370 m; - Maximum rotor blade diameter: 305 m; - Up to 10 offshore platforms within the array area (up to 6 transformer substations, 3 converter substations & 1 accommodation platform); and Anticipated design life of 35 years.	Parameters that present the greatest radar cross section.
IOU-O-17	All Offshore	Operation and Maintenance	Wind turbines and associated infrastructure will form a physical obstruction and may disrupt vessel access to oil and gas platforms and subsurface infrastructure.	Secondary Co139 Tertiary: Co81 Co89 Co93	No likely significant effect	To be assessed for final Application	N/A as impact scoped in	The presence of the installed Hornsea Four infrastructure within the array area: - Up to 180 wind turbines utilising the entire array area (600 km ²); The WTG dimensions are as follows: - Minimum height of lowest blade tip above MSL: 35 m; - Maximum blade tip height above LAT: 370 m; - Maximum rotor blade diameter: 305 m; - Up to 10 offshore platforms within the array area (6 small transformer substations, 3 converter substations & 1 accommodation platform); Safety zones; - 500 m safety zones around infrastructure under construction; - 50 m safety zones around incomplete structures; Anticipated design life of 35 years.	Parameters that create the greatest disruption to vessel access in terms of area affected and duration.
IOU-O-18	Array Area	Operation and Maintenance	The presence of new wind turbines in previously open sea areas will deviate vessels which may cause a change in CPA alarms an oil and gas platforms protected by REWS.	Tertiary: Co89 Co93	No likely significant effect	To be assessed for final Application	N/A as impact scoped in	The presence of the installed Hornsea Four infrastructure within the array area: - Up to 180 wind turbines utilising the entire array area (600 km ²); The WTG dimensions are as follows: - Minimum height of lowest blade tip above MSL: 35 m; - Maximum blade tip height above LAT: 370 m; - Maximum rotor blade diameter: 305 m; Up to 10 offshore platforms within the array area (6 small transformer substations, 3 converter substations & 1 accommodation platform); 500 m safety zones around infrastructure undergoing maintenance; Anticipated design life of 35 years.	Parameters that create the greatest number of turbines with the greatest radar cross section.
IOU-O-19	All Offshore	Operation and Maintenance	Potential allision risk to oil and gas platforms due to vessels being deviated from existing routes due to the presence of the Hornsea Four infrastructure.	Secondary Co139 Tertiary: Co81 Co89 Co93	No likely significant effect	To be assessed for final Application	N/A as impact scoped in	- Up to 180 turbines within the array area (600 km ²) - Up to 10 offshore platforms within the array area (6 small transformer substations, 3 converter substations & 1 accommodation platform); - Up to three HVAC booster stations within the HVAC booster station area of search - 500 m safety zones around infrastructure undergoing maintenance; - Anticipated design life: 35 years	Parameters that create the greatest reduction in available sea room and are most likely to give rise to deviation of shipping from existing routes.
IOU-O-20	Array Area	Operation and Maintenance	Potential impacts on helicopter access to existing oil and gas platforms.	Tertiary: Co99	No likely significant effect	To be assessed for final Application	N/A as impact scoped in	The presence of the installed Hornsea Four infrastructure within the array area: - Up to 180 wind turbines utilising the entire array area (600 km ²); The WTG dimensions are as follows: - Minimum height of lowest blade tip above MSL: 35 m; - Maximum blade tip height above LAT: 370 m; - Maximum rotor blade diameter: 305 m; Up to 10 offshore platforms within the array area (6 small transformer substations, 3 converter substations & 1 accommodation platform); Anticipated design life of 35 years	The maximum number of wind turbines and other structures within the array area affecting the operation of helicopters approaching or departing from oil and gas platforms.
IOU-O-21	Array Area	Operation and Maintenance	Potential impacts on helicopter access to oil and gas vessels operating in the vicinity of platforms and/or subsea assets.	Tertiary: Co99	No likely significant effect	To be assessed for final Application	N/A as impact scoped in	As above	As above in relation to helicopter access to oil and gas vessels.
IOU-O-22	All Offshore	Operation and Maintenance	Potential impacts of Hornsea Four helicopter operations on the available airspace for oil and gas related helicopter operations.	Tertiary: Co99	No likely significant effect	To be assessed for final Application	N/A as impact scoped in	Hornsea Four Annual Helicopter Return Trips: - Wind turbine installation: 135 - Wind turbine foundation installation: 180 - Substation platform installation (all offshore substations and accommodation platform): 63 - Substation foundations installation (all offshore substations and accommodation platform): 42 - Offshore Export cable installation: 800 - Inter-array and offshore interconnector cables installation: 396 Anticipated design life of 35 years	Maximum number of helicopter operations at Hornsea Four restricting available airspace for use by helicopters servicing the oil and gas industry.

IOU-O-23	All Offshore	Operation and Maintenance	Potential impacts on HMRs used by helicopters supporting oil and gas operations.	Tertiary: Co99	No likely significant effect	To be assessed for final Application	N/A as impact scoped in	The presence of the installed Hornsea Four infrastructure within the array area: - Up to 180 wind turbines utilising the entire array area (600 km ²); The wind turbine dimensions are as follows: - Minimum height of lowest blade tip above MSL: 35 m; - Maximum blade tip height above LAT: 370 m; - Maximum rotor blade diameter: 305 m; Up to 10 offshore platforms within the array area (6 small transformer substations, 3 converter substations & 1 accommodation platform); Up to 4 HVAC booster stations within the HVAC booster station area of search Anticipated design life of 35 years.	The presence of the greatest number/size of infrastructure affecting use of the established HMRs (which may have consequential impacts on oil and gas operations).
IOU-O-24	Array Area	Operation and Maintenance	Potential interference of Hornsea Four turbines with microwave links disrupting oil and gas communications	Tertiary: Co89 Co93	No likely significant effect	To be assessed for final Application	N/A as impact scoped in	- 180 wind turbines with a maximum blade tip height of 370 m above LAT - One accommodation platform with max height above LAT of 64 m - Six small platforms with a height of 90 m - Three large offshore platforms with height of 100 m LAT - Anticipated design life of 35 years.	Parameters that create the greatest number of turbines with the greatest radar cross section.
IOU-D-25	Array Area	Decommissioning	Conflicts with oil and gas seismic survey activity within the Hornsea Four array area	Secondary Co139 Tertiary: Co89	No likely significant effect	To be assessed for final Application	N/A as impact scoped in	- Decommissioning of 180 wind turbines; - Decommissioning of 10 offshore platforms within the array area (6 small transformer substations, 3 converter substations & 1 accommodation platform); - 500 m safety zone around infrastructure being decommissioned; - Decommissioning period of 3 years	Parameters that create the greatest disruption to seismic survey activities in terms of area affected and duration.
IOU-D-26	Array Area	Decommissioning	Restriction on oil and gas drilling due to the removal of infrastructure from within the Hornsea Four array area and within 500 m of the boundary.	Secondary Co139 Tertiary: Co89	No likely significant effect	To be assessed for final Application	N/A as impact scoped in	As above	Parameters that represent the largest area within which decommissioning would occur thereby restricting drilling operations.
IOU-D-27	ECC	Decommissioning	Conflicts with oil and gas seismic survey activity along the Hornsea Four offshore ECC	Secondary Co139 Tertiary: Co89	No likely significant effect	To be assessed for final Application	N/A as impact scoped in	- Decommissioning of three HVAC substations; - Decommissioning of six export cables; - Removal of cables utilising the entire offshore ECC - 500 m safety zone around infrastructure being decommissioned; - Decommissioning period of 3 years.	Parameters that create the greatest disruption to seismic survey activities in terms of area affected and duration.
IOU-D-28	ECC	Decommissioning	Restriction on oil and gas drilling due to the removal of infrastructure from within the offshore ECC and within 500 m of the boundary of the ECC.	Secondary Co139 Tertiary: Co89	No likely significant effect	To be assessed for final Application	N/A as impact scoped in	As above	Parameters that represent the largest area within which decommissioning would occur thereby restricting drilling operations.
IOU-D-29	ECC	Decommissioning	The potential decommissioning at Hornsea Four on the safety of diving operations that may be required at oil and gas assets.	Secondary Co139 Tertiary: Co89 Co94 Co96 Co102	No likely significant effect	To be assessed for final Application	N/A as impact scoped in	As above	As above

ID	Project Element	Original Project Phase	Project Activity and Impact	Embedded Mitigation Measures	Likely Significance of Effect at Scoping Stage and Justification	Hornsea Four Position	Further Evidence to Support "Scoping Out"	Maximum Design Scenario (MDS)	Justification
MA-C-1	All-Offshore	Construction	Disturbance, removal, intrusion, compression and/or penetration of sediments containing archaeological receptors (material or contexts) leading to total or partial loss in Hornsea Four array area and offshore ECC from construction activities.	Primary Co46 Co140 Secondary Co166 Co167 Tertiary Co141	No likely significant effect	Scoped Out	Not required as agreement achieved during EIA Scoping.	N/A as scoped out	N/A as scoped out
MA-C-2	All-Offshore	Construction	Intrusion of piling foundations disturbing or destroying archaeological receptors in Hornsea Four array area and offshore ECC from construction activities.	Primary Co46 Co140 Secondary Co166 Co167 Tertiary Co141	No likely significant effect	Scoped Out	Not required as agreement achieved during EIA Scoping.	N/A as scoped out	N/A as scoped out
MA-C-3	All-Offshore	Construction	Compression of stratigraphic contexts containing archaeological material from combined weight of foundation, transition piece, tower, and wind turbines in Hornsea Four array area and offshore ECC from construction activities.	Primary Co46 Co140 Secondary Co166 Co167 Tertiary Co141	No likely significant effect	Scoped Out	Not required as agreement achieved during EIA Scoping.	N/A as scoped out	N/A as scoped out
MA-C-6	All-Offshore	Construction	Disturbance of sediment containing potential archaeological receptors (material and contexts) during inter-array cable laying operations and export cable laying operations.	Primary Co46 Co140 Secondary Co166 Co167 Tertiary Co141	No likely significant effect	Scoped Out	Not required as agreement achieved during EIA Scoping.	N/A as scoped out	N/A as scoped out
MA-O-7	All-Offshore	Operation	Scour, penetration, draw down and compression effects caused by (a) the presence of WTG substation foundations, and (b) the exposure of inter-array and export cables or the use of cable protection measures, impacting archaeological receptors and exposing such material to natural, chemical or biological processes and causing or accelerating loss of the same	Primary Co46 Co140 Secondary Co166 Co167 Tertiary Co141	Likely significant effect without secondary mitigation Potentially significant without secondary mitigation Currently only the broad locations of known wrecks and obstructions are available, with the position and extent of the marine archaeological resources at Hornsea Four not yet established.	Simple Assessment	N/A as impact scoped in	Array Area - 180 WTGs on suction bucket jacket foundations (WTG type), total seabed permanent area 795,216m ² - Up to six offshore transformer substations and three converter substations on gravity-base foundations (box type and large OSS type), total seabed permanent area 371,250m ² - One offshore accommodation platform on a gravity base foundation (box type), total seabed permanent area 30,625 m ² Array Cables Cable protection - 624,000 m ² cable protection - 40 cable crossings (including interconnector cables) with 255,000 m ² pre- and post-lay cable/pipeline crossing rock berms Remedial cable burial - 2,000 m length of cable per replacement - 10 m wide disturbance corridor per disturbance event - 42 km replacement over 35 year lifetime Cable repairs - 20,000 m ² temporary seabed disturbance per repair event - 10 repair events over lifetime - 200,000 m ² total seabed disturbance over lifetime (10 x 20,000) Interconnector Cables Cable protection - 94,000 m ² cable protection	Design scenario representing the maximum potential for interaction with archaeological receptors.

						<p>Remedial cable burial</p> <ul style="list-style-type: none"> - 2,000 m length of cable per replacement - 10 m wide disturbance corridor per disturbance event - 7 km replacement of 35 year lifetime <p>Cable repairs</p> <ul style="list-style-type: none"> - 20,000 m² temporary disturbance per repair event - 5 repair events over lifetime - 100,000 m² disturbance over lifetime (5 x 20,000) <p>Offshore ECC</p> <ul style="list-style-type: none"> - Up to three HVAC booster stations, total seabed permanent area 91,875 m² <p>Export Cables</p> <p>Cable protection</p> <ul style="list-style-type: none"> - 792,000 m² cable protection - 10 cable/pipeline crossings with 268,999 m² pre- and post-lay cable/pipelines crossing rock berms <p>Remedial cable burial</p> <ul style="list-style-type: none"> - 2,000 m length of cable per replacement - 10 m disturbance corridor - 14 km replacement over lifetime <p>Cable repairs</p> <ul style="list-style-type: none"> - 20,000 m² per repair event - 35 repair events over lifetime - 700,000 m² disturbance over lifetime (35 x 20,000) 		
MA-O-8	Array Area	Operation	Penetration and compression effects on seabed caused by corrective and preventative operation and maintenance activities (via jack-up vessels) leading to total or partial loss of archaeological receptors (material or contexts)	<u>Primary</u> Co46 Co140 <u>Secondary</u> Co166 Co167 <u>Tertiary</u> Co141	Likely significant effect without secondary mitigation Potentially significant without secondary mitigation Currently only the broad locations of known wrecks and obstructions are available, with the position and extent of the marine archaeological resources at Hornsea Four not yet established.	Simple Assessment N/A as impact scoped in	<p>WTGs</p> <ul style="list-style-type: none"> - 1,260 component replacement events over lifetime (jack-up), 300 m² disturbance per event - 1,260 access ladder replacements (jack-up), 300 m² disturbance per event - 1,260 anode replacements (jack-up), 300 m² disturbance per event - 360 J-tube repair/replacements (jack-up), 170 m² disturbance per event <p>Offshore platforms and accommodation platforms</p> <ul style="list-style-type: none"> - 20 component replacement events over lifetime (jack-up), 300 m² disturbance per event - 70 access ladder replacements (jack-up), 300 m² disturbance per event - 70 anode replacements (jack-up), 300 m² disturbance per event - 20 j-tube repair/replacements (jack-up), 300 m² disturbance per event 	Design scenario representing the maximum potential for interaction with archaeological receptors.
MA-D-9	Array Area	Decommissioning	Draw-down of sediment into voids left by removed turbine foundations or cables leading to loss of sediment, destabilising archaeological sites and contexts, and exposing such material to natural, chemical or biological processes, and causing or accelerating loss of the same.	<u>Primary</u> Co46 Co140 <u>Secondary</u> Co166 Co167 <u>Tertiary</u> Co141	Likely significant effect without secondary mitigation Potentially significant without secondary mitigation Currently only the broad locations of known wrecks and obstructions are available, with the position and extent of the marine archaeological resources at Hornsea Four not yet established.	Simple Assessment N/A as impact scoped in	<p>WTGs, offshore substations and accommodation platform</p> <ul style="list-style-type: none"> - 180 WTGs on suction bucket jacket foundations (WTG type), total seabed area 795,216m² - Up to six offshore transformer substations and three converter substations on gravity-base foundations (box type and large OSS type), total seabed area 371,250m² - One offshore accommodation platform on a gravity base foundation (box type), total seabed area 30,625 m² <p>Cables</p> <ul style="list-style-type: none"> - Total disturbance from removal of all cables = 102.6 km² - Although it is expected that most array and export cables will be left in situ, it has been assumed that all cables will be removed during decommissioning, though any cable protection installed will be left in situ). <p>Vessel jack-ups and anchor placements</p> <ul style="list-style-type: none"> - 170 m² per jack up operation - 2 jack up operations per WTG/platform (380 in array area total) - 100 m² per anchor (8 anchors per vessel) - 2 anchor vessels operations per structure 	Design scenario representing the maximum potential for interaction with submerged archaeological receptors.
MA-D-10	Array Area	Decommissioning	Draw-down of sediment into voids left by removed turbine foundations leading to loss of sediment and penetration and compression effects of jack-up barges and anchoring of decommissioning vessels leading to total or partial loss of archaeological receptors (material or contexts).	<u>Primary</u> Co46 Co140 <u>Secondary</u> Co166 Co167 <u>Tertiary</u> Co141	No likely significant effect	Scoped Out Not required as agreement achieved during EIA Scoping.	N/A as scoped out	N/A as scoped out

ID	Project Element	Original Project Phase	Project Activity and Impact	Embedded Mitigation Measures	Likely Significance of Effect at Scoping Stage and Justification	Hornsea Four Position	Further Evidence to Support "Scoping Out"	Maximum Design Scenario (MDS)	Justification
MP-C-1	All offshore	Construction	Seabed preparation activities	Primary Co44 Co45	Likely significant effect without secondary mitigation	Simple Assessment	N/A as impact scoped in	<p>Landfall area: Eight offshore cofferdam HDD exit pits require excavation of 2,500 m³ which will be side-cast onto the adjacent seabed. Backfilling of exit pits will recover a similar amount from the surrounding seabed, as required.</p> <p>Offshore ECC: Sandwave clearance - Total sandwave clearance of 757,000 m³ along a corridor of 99 km in length. HVAC foundations Seabed preparation for Suction Caisson Jacket foundations requires removal of 171,735 m³ for three HVAC booster station foundations.</p> <p>Offshore array area: Sandwave clearance –Total sandwave clearance of 961,000 m³ which includes 77,000 m³ for an additional 10 km of export cable within the offshore array. 180 WTG Foundations Seabed preparation for Suction Bucket Jacket foundations requires removal of 2,134,440 m³ for 180 wind turbine foundations. 9 OSS foundations Seabed preparation for Suction Caisson Jacket (Small OSS) & GBS (Large OSS) requires removal of 737,130 m³ of spoil for 9 offshore sub-station foundations. Offshore accommodation foundation Seabed preparation for Suction Caisson Jacket (Medium OSS) requires removal of 57,245 m³ of spoil for a single offshore accommodation platform foundation. Total spoil in offshore array area = 3,889,915 m³</p>	Seabed preparation (seabed levelling and sandwave clearance) assumes excavation using a trailer suction hopper dredger (TSHD) which collects a large volume of sediment and then releases this as spoil onto the seabed leading to the highest risk of smothering. These impact pathways are separated from seabed installation because they require disposal of spoil away from the point of excavation.
MP-C-2	All offshore	Construction	Seabed installation activities	Primary Co44 Co45	Likely significant effect without secondary mitigation Project description details to be developed for excavation quantities and construction rates. Sediment material is likely to fall out of suspension relatively quickly	Simple Assessment	N/A as impact scoped in	<p>Landfall area: Open cut trenching across the intertidal with tidal exchange (low water to high water to low water) flushing away loose materials determining a potential source of sediment from the trench and from any beach material cast aside.</p> <p>Offshore ECC: Cable trenching – Cable installation along a length of 109 km for up to 6 cables releasing 3,903,000 m³ into suspension by a Mass Flow Excavator (MFE). Values include the 10 km of export cable falling within offshore array area. Total duration of 24 months with a maximum trenching rate of 300 m/hr in soft soils. HVAC Booster area – drilling for Piled Jacket (Medium OSS) foundation option, releasing 4,618 m³ for 3 foundations, representing 10% (of depth).</p> <p>Offshore array area: Cable trenching - releasing 4,140,000 m³ into suspension by MFE for array and interconnector cables. Single trenching vessel assumed for a sequential activity. Drilling: 180 WTG Foundations – drilling for monopile foundation option, 127,235 m³ for 180 foundations, representing 10% (of sites). Drilling activity considered to be sequential between sites. 9 OSS foundations – drilling for Piled Jacket (Small OSS) 13,854 m³ for 9 foundations, representing 10% (of depth). Drilling activity considered to be sequential between sites. Offshore accommodation - drilling for Piled Jacket (Medium OSS) & Y5Piled Jacket (Medium OSS), 1,540 m³ for 1 foundation, representing 10% (of depth). Total drill cutting arisings in offshore array area = 142,629 m³</p>	All direct sediment disturbance activities that may lead to locally raised suspended sediment concentrations at source (e.g. drilling, cable trenching, etc). Largest disturbed volume and highest trenching rate produces the greatest rate of sediment release at source. MFE is selected as the MDS option for trenching due to similarities with jetting releasing sediments into the water column, but involving larger volumes of sediment. For drilling, the greatest amount of arisings represents the MDS irrespective of the foundation type. These impact pathways are separated from seabed levelling and sandwave clearance because they occur at source.

MP-O-3	Array and HVAC Booster Area	Operation	Scouring around foundations and rock berms	Tertiary Co82	No likely significant effect	Simple Assessment	N/A as impact scoped in	<p>Landfall: The MDS configuration for scour around the base of 8 cofferdams would be when they are closely spaced (at their minimum spacing of 10 m) with separate scour pits that also overlap to lead to wider group scour. The dimension of a single cofferdam is 10.6 by 10.6 m (square).</p> <p>Offshore ECC: Rock berms at nearshore cable crossings – Hornsea Four (up to 6 cables) will cross the export cable (up to 4 cables) for Cleyke Beck Offshore Wind Farm seaward of Smithic Sands. HVAC booster area – risk for scouring in pre-scour protection period around three 75 m wide GBS (Box-type) foundations. Rock berms at offshore cable crossings – 9 crossings over existing assets, potential for scouring dependent on rock size and grading to perimeter with heights up to 1.5 m.</p> <p>Offshore array area: 180 WTG Foundations – 3-legged suction bucket jacket with 20 m diameter buckets 5 m proud of seabed, with potential for group scour between legs. 9 OSS foundations – 150 m wide GBS (box-type). Offshore accommodation – 75 m wide GBS (box-type). Rock berms at cable crossings – 40 potential crossings over new pipelines, potential for scouring dependent on rock size and grading to perimeter. Some alignments may locally inhibit bedload transport.</p>	Installed foundation, or other sub-sea structures proud of the seabed (e.g. rock berms), may lead to local scouring around their base if scour protection has not already pre-armoured the seabed. Depending on the seabed material, the scouring process may erode material into bedload and/or suspended load transport until an equilibrium condition is reached. In general, the largest foundation with the greatest solidity ratio will have the largest blockage effect on flows and will develop the most amount of scour, rather than the greatest depth of scour.
MP-O-4	Array and HVAC Booster Area	Operation	Turbulent wakes from foundations interfering with remote receptors, e.g. Flamborough Front	N/A	Likely significant effect without secondary mitigation	Simple Assessment	N/A as impact scoped in	<p>Landfall: Wakes will form locally around the cofferdams used to protect offshore HDD exit pits. Wave and tidal flows will be longshore so the MDS arrangement is likely to be a closely spaced staggered arrangement leading to 8 independent wakes which also overlap. The equivalent dimension of a single pit is 10.6 by 10.6 m (square), providing a total area of 900 m² for all 8 pits..</p> <p>Offshore ECC: HVAC booster area – largest solid structure in the vertical plane is the 75 m width GBS (Box-type). The wake formation may depend on the orientation of this structure to incident flows and waves as well as the minimum spacing between structures and the layout of structures. A minimum separation distance of 100 m is likely to result in wake-wake interactions and a larger cumulative effect between all 3 structures. Rock berms – all in water depths between 40 to 50 m CD. No likely wake effects. +Y7 180 WTG Foundations – The foundation considered to have the greatest blockage effect for MDS is the 3-legged suction bucket jacket with 20 m diameter buckets 5 m proud of the seabed with a leg separation of 65 m at the seabed tapering to 25 m at the sea surface. 9 OSS foundations – 150 m wide GBS (box-type) foundation has the greatest blockage.. Offshore accommodation – 75 m wide GBS (box-type) foundation has the greatest blockage. The total blockage effect for the whole array is also a function of the number, spacing and layout of all 190 foundations. The principles for the array layout are based on a minimum WTG separation of 810 m.</p>	Typically, greatest amounts of turbulence will occur from the largest foundation width with the highest solidity ratio which blocks the passage of incident flows and waves (as well as sediment transport moved by these processes). For open structures like jacket foundations there is a reduced solidity and a reduced blockage for the equivalent width of a fully solid structure. Rock berms in deeper water are unlikely to have sufficient vertical profile to develop wakes, however, if there were equivalent structures in shallower water, they may have a proportionally larger influence and develop partial wakes.
MP-O-5	Array and HVAC Booster Area	Operation	Changes to waves affecting coastal morphology	N/A	Likely significant effect without secondary mitigation	Simple Assessment	N/A as impact scoped in	<p>Landfall: Coffer dams used to protect offshore HDD exit pits will have a temporary effect on waves reaching the coastline. The MDS configuration would be when they are at their minimum spacing of 10 m in a shore parallel arrangement that acts like a long, semi-permeable breakwater.</p> <p>Offshore ECC: Rock berms at nearshore cable crossings - Cleyke Beck Offshore Wind Farm cable crossing in around 20 m below CD. HVAC booster area – largest solid structure in the vertical plane is the 75 m width GBS (Box-type). These structures have the potential to block, reflect and scatter incident waves. A minimum separation distance of 100 m is likely to result in interactions and a larger cumulative effect between structures. Rock berms at offshore cable crossings – 9 pipeline crossings further offshore in water depths between 40 to 50 m below CD.</p> <p>Offshore array area: 180 WTG Foundations – The foundation considered to have the greatest blockage effect for MDS is the 3-legged suction bucket jacket with 20 m diameter buckets 5 m proud of the seabed with a leg separation of 65 m at the seabed tapering to 25 m at the sea surface. 9 OSS foundations – 150 m width GBS (box-type) foundation has the greatest blockage.. Offshore accommodation – 75 m width GBS (box-type) foundation has the greatest blockage.</p>	This is a specific impact related to blockage of waves on the coastline as a receptor prone to high cliff erosion rates and strong longshore transport. The previous selection of MDS for largest blockage related effects apply.

MP-O-6	All offshore	Operation	Changes to nearshore sediment pathways	N/A	No likely significant effect	Simple Assessment	N/A as impact scoped in	<p>Rock berms at cable crossings: - Hornsea Four will cross the export cable for Creyke Beck offshore wind farm seaward of Smithic Sands. Maximum berm height of 1.5 m placed in around 20 m CD.</p> <p>Rock protection along ECC: - Assumed for 10% of offshore ECC cable length in addition to any cable crossings.</p> <p>HVAC Booster area: - three (3) large BGS box-type foundations closely spaced at 100 m may modify nearshore waves and longshore transport.</p>	This issue relates to the consequence of changes to nearshore flows and waves that drive nearshore sediment pathways.
MP-O-7	All offshore	Operation	Changes to offshore sediment pathways	N/A	No likely significant effect	Scoped out	Not required as agreement achieved during EIA Scoping.	N/A as impact scoped out	N/A as impact scoped out
MP-D-2	All offshore	Decommissioning	Sediment disturbance - all direct sediment disturbance activities during decommissioning that may lead to locally raised SSC at source	N/A	No likely significant effect	Simple Assessment	N/A as impact scoped in	<p>The assumption is for comparable or lesser rates of sediment disturbance determined for installation of cables (trenching) and foundations (seabed levelling) but without any further requirements for spoil disposal.</p> <p>Removal of structures will also remove their blockage effects.</p> <p>Scour protection and rock berms at cable crossings are planned to remain in situ.</p>	The assumption is based on equivalent methods being used as those required for cable trenching. Foundation removal is likely to involve cutting off any piles and lift of the main structure and would involve a smaller footprint than any seabed preparation activity.

ID	Project Element	Original Project Phase	Project Activity and Impact	Embedded Mitigation Measures	Likely Significance of Effect at Scoping Stage and Justification	Hornsea Four Position	Further Evidence to Support "Scoping Out"	Maximum Design Scenario (MDS)	Justification
MM-C-1	Array Area	Construction	PTS from piling noise.	Tertiary Col10	Likely significant effect without secondary mitigation Recent expert elicitation for PTS as a result of pile driving resulted in agreement between experts that the predicted PTS effects from exposure to piling noise (defined as 6 dB PTS in the 2-10 kHz band) was unlikely to have a large effect on the survival or reproduction of the species of interest.	Simple Assessment	N/A as impact scoped in.	Array Area Spatial maximum design: <ul style="list-style-type: none"> - 180 WTGs on monopile foundations - 3 offshore converter substations on monopile foundations - 6 offshore transformer substations on monopile foundations - 1 offshore accommodation platform on a monopile foundation - Maximum design (~30% of WTG): 5,000 kJ hammer energy, 4 hours piling duration, 30 min ramp up - Most likely (~70% of WTG): 4,000 kJ hammer energy, 127.5 min piling duration, 52.5 min ramp up - Total WTG piling days: 216 assuming 1.2 days per monopile (151 days at most likely energy and 65 days at maximum design) over a 12 month piling period Temporal maximum design: <ul style="list-style-type: none"> - 180 WTGs on pin-piled jacket foundations, 3 piles per jacket (540 total) - 3 offshore converter substations on pin-piled jacket foundations (16 piles per structure (48 total), hammer energy: 2,500 kJ) - 6 offshore transformer substations on pin-piled jacket foundations (24 piles per structure (144 total), hammer energy: 2,500 kJ) - 1 offshore accommodation platform on a pin-piled jacket foundation (24 piles, hammer energy: 2,500 kJ) - Maximum design (~30% of WTG): 2,500 kJ hammer energy, 4 hours piling duration, 30 min ramp up - Most likely (~70% of WTG): 1,750 kJ hammer energy, 127.5 min piling duration, 52.5 min ramp up - Total WTG piling days: 270 assuming 1.5 days per jacket foundation (189 days at most likely energy and 81 days at maximum design) over a 12 month piling period HVAC Area of Search Spatial maximum design: <ul style="list-style-type: none"> - 3 HVAC booster stations on monopile foundations - Maximum design: 5,000 kJ hammer energy, 4 hours piling duration, 30 min ramp up - Most likely: 4,000 kJ hammer energy, 127.5 min piling duration, 52.5 min ramp up - Total piling days: 3.6 assuming 1.2 days per monopile over a 12-month piling period Temporal maximum design: <ul style="list-style-type: none"> - 3 HVAC booster stations on pin-piled jacket foundations (24 piles per structure (72 total), hammer energy: 2,500 kJ) - Maximum design: 2,500 kJ hammer energy, 4 hours piling duration, 30 min ramp up - Most likely: 1,750 kJ hammer energy, 127.5 min piling duration, 52.5 min ramp up - Total piling days: 4.5 assuming 1.5 days per jacket foundation over a 12-month piling period 	The piling scenario with the largest PTS impact ranges represent the maximum design scenario. This differs between species depending on the frequency characteristics emitted during installation of each pile type and the hearing of the species (e.g. for high frequency cetaceans such as harbour porpoise, pin piles have a larger PTS impact range whereas for low frequency cetaceans, monopiles have a larger PTS impact range). The maximum number of piled foundations would represent the temporal maximum design scenario for disturbance. The maximum predicted impact range for underwater noise for piled foundations would represent the spatial maximum design scenario for disturbance.
MM-C-2	Array Area	Construction	Disturbance from piling noise.	Tertiary Col10	Likely significant effect without secondary mitigation Evidence from telemetry and acoustic detection data at previous offshore wind farms show animals are displaced during piling but return after piling ceases.	Simple Assessment	N/A as impact scoped in.	As per MDS for "PTS (auditory injury) from piling noise".	As per justification for "PTS (auditory injury) from piling noise".
MM-C-3	Array Area	Construction	TTS from piling noise.	Tertiary Col10	No likely significant effect	Simple Assessment	N/A as impact scoped in.	As per MDS for "PTS (auditory injury) from piling noise".	As per justification for "PTS (auditory injury) from piling noise".

MM-C-4	Array Area	Construction	Vessel collision risk.	Tertiary Co108	Likely significant effect without secondary mitigation It is not expected that there will be a significant increase in vessel activity over the baseline levels.	Simple Assessment	N/A as impact scoped in.	<p>WTG Foundation Installation:</p> <ul style="list-style-type: none"> - 4 installation vessels (90 return trips) - 16 support vessels (360 return trips) - 40 Transport / Feeder vessels (incl. Tugs) (360 return trips) - Duration: 12 months <p>WTG Installation:</p> <ul style="list-style-type: none"> - 2 installation vessels (90 return trips) - 12 Support vessels (270 return trips) - 24 transport (540 return trips) - Duration: 24 months <p>Substation foundation installation (all offshore substations and accommodation platform):</p> <ul style="list-style-type: none"> - 2 installation vessels (24 return trips) - 12 Support vessels (108 return trips) - 4 transport (48 return trips) - Duration: 12 months <p>Substation installation (all offshore substations and accommodation platform):</p> <ul style="list-style-type: none"> - 2 installation vessels (36 return trips) - 12 Support vessels (162 return trips) - 4 transport (72 return trips) - Duration: 24 months <p>Inter-array and offshore interconnector cables installation:</p> <ul style="list-style-type: none"> - 3 main laying vessels (204 return trips) - 3 main burying vessels (204 return trips) - 12 support vessels (1,080 return trips) - Duration: 24 months <p>Offshore export cables installation:</p> <ul style="list-style-type: none"> - 3 main laying vessels (96 return trips) - 3 main jointing vessels (72 return trips) - 3 main burying vessels (96 return trips) - 15 support vessels (144 return trips) - Duration: 24 months 	The maximum numbers of vessels and associated vessel numbers represents the maximum potential for collision risk.
MM-C-5	Array Area	Construction	Disturbance from vessels.	Tertiary Co108	Likely significant effect without secondary mitigation It is not expected that there will be a significant increase in vessel activity over the baseline levels.	Simple Assessment	N/A as impact scoped in.	As per MDS for "Vessel collision risk".	As per justification for "Vessel collision risk".
MM-C-6	Array Area	Construction	Reduction in prey availability.	N/A	No likely significant effect	Simple Assessment	N/A as impact scoped in.	Assessment based on the MDS presented in Volume 2, Chapter 4: Fish and Shellfish Ecology.	Assessment based on the MDS presented in Volume 2, Chapter 4: Fish and Shellfish Ecology.
MM-C-7	Array Area	Construction	Reduction in foraging ability.	N/A	No likely significant effect	Simple Assessment	N/A as impact scoped in.	Maximum amount of suspended sediment released during construction activities and associated duration - see Volume 2, Chapter 1: Marine Geology, Oceanography and Physical Processes.	Maximum amount of suspended sediment released during construction activities and associated duration - see Volume 2, Chapter 1: Marine Geology, Oceanography and Physical Processes.
MM-C-8	Array Area	Construction	Toxic contamination.	N/A	No likely significant effect	Scoped Out	Not required as agreement achieved during EIA Scoping.	N/A as scoped out.	N/A as scoped out.

MM-C-9	All-offshore	Construction	Non-piling noise (e.g. cable laying, dredging).	N/A	Likely significant effect without secondary mitigation It is unlikely that these activities will impact marine mammal receptors at anything other than the immediate proximity.	Simple Assessment	N/A as impact scoped in	- Trenching, dredging, jetting, ploughing, mass flow excavation, vertical injection, rock cutting - Total length of array cables: 600 km - Total length of interconnector cables/circuits: 90 km - Where possible, the export cables will be buried below the seabed through to landfall. - Total length of export cables: 654 km (6 cables x 109 km cable length) - Total duration of cable installation: 36 months	Maximum potential for underwater noise impacts.
MM-C-10	Landfall	Construction	Disturbance to seal haul-outs.	N/A	No likely significant effect	Scoped Out	Not required as agreement achieved during EIA Scoping.	N/A as scoped out.	N/A as scoped out.
MM-C-11	All-offshore	Construction	PTS from UXO clearance.	Tertiary Co110	Likely significant effect without secondary mitigation Magnitude depends on charge size which is currently unknown. Hornsea Three predicted Negligible-Low magnitude impacts of PTS for charge sizes up to 260 kg	Simple Assessment	N/A as impact scoped in.	- Estimated 2,263 targets - 86 UXOs may require clearance. - One UXO will be cleared every 24 hours - 86 detonations in 86 days	Estimated maximum design based on data from other projects in the Hornsea Zone. A detailed UXO survey would be completed prior to construction. The type, size (net explosive quantities (NEQ)) and number of possible detonations and duration of UXO clearance operations is therefore not known at this stage.
MM-C-12	All-offshore	Construction	Disturbance from UXO clearance.	Tertiary Co110	Likely significant effect without secondary mitigation Magnitude depends on charge size which is currently unknown. Hornsea Three predicted Negligible-Low magnitude impacts of disturbance out to a 26 km radius due to the short-lived disturbance and low proportion of population predicted to be impacted.	Simple Assessment	N/A as impact scoped in.	As per MDS for "PTS from UXO clearance".	As per justification for "PTS from UXO clearance".
MM-C-13	Array Area	Construction	TTS from UXO clearance.	None	No likely significant effect	Simple Assessment	N/A as impact scoped in.	As per MDS for "PTS from UXO clearance".	As per justification for "PTS from UXO clearance".
MM-O-14	Array Area	Operation	Operational noise.	None	No likely significant effect	Simple Assessment	N/A as impact scoped in.	180 WTG (maximum rotor diameter 305 m)	The largest turbine will result in the highest levels of operational noise transmission.
MM-O-28	Array Area	Operation	Vessel collision risk.	Tertiary Co108	Likely significant effect without secondary mitigation It is not expected that there will be a significant increase in vessel activity over the baseline levels.	Simple Assessment	N/A as impact scoped in.	Vessel return trips per year: - 2,580 for wind turbine visits - 780 for wind turbine foundation visits - 65 for platform visits - Structural Scope - 100 for platform visits - Electrical Scope - 260 crew shift transfer - 124 jack-up visits - 1,205 crew vessel wind turbine visits - 104 supply vessel visits to accommodation platform	The maximum numbers of vessels and associated vessel numbers represents the maximum potential for collision risk.
MM-O-15	Array Area	Operation	Disturbance from vessels	Tertiary Co108	Likely significant effect without secondary mitigation It is not expected that there will be a significant increase in vessel activity over the baseline levels.	Simple Assessment	N/A as impact scoped in.	As per MDS for "Vessel collision risk".	As per justification for "Vessel collision risk".
MM-O-16	Array Area	Operation	Reduction in prey availability.	N/A	No likely significant effect	Simple Assessment	N/A as impact scoped in.	Maximum effect on fish prey species as detailed in the assessment in Volume 2, Chapter 4: Fish and Shellfish Ecology.	Maximum effect on fish prey species as detailed in the assessment in Volume 2, Chapter 4: Fish and Shellfish Ecology.

MM-O-17	Array Area	Operation	Reduction in foraging ability.	N/A	No likely significant effect	Simple Assessment	N/A as impact scoped in.	Maximum amount of suspended sediment released during construction activities and associated duration - see Volume 2, Chapter 1: Marine Geology, Oceanography and Physical Processes.	Maximum amount of suspended sediment released during construction activities and associated duration - see Volume 2, Chapter 1: Marine Geology, Oceanography and Physical Processes.
MM-O-18	Array Area	Operation	Toxic contamination.	N/A	No likely significant effect	Scoped out	Not required as agreement achieved during EIA Scoping.	N/A as scoped out.	N/A as scoped out.
MM-O-19	Array Area	Operation	EMF	N/A	No likely significant effect	Scoped out	Not required as agreement achieved during EIA Scoping.	N/A as scoped out.	N/A as scoped out.
MM-D-20	Array Area	Decommissioning	PTS from underwater noise.	Tertiary Col13	Likely significant effect without secondary mitigation Depends on the method used to remove structures. Methods such as hot cutting (Brocotorch), diamond wire cutting and abrasive water jet cutting are all expected to have negligible impact due to low noise levels and the temporary nature of the impact.	Simple Assessment	N/A as impact scoped in.	Maximum levels of underwater noise during decommissioning would be from underwater cutting required to remove structures. This is much less than pile driving and therefore impacts would be less than as assessed during the construction phase. Piled foundations would likely be cut approximately 1 m below the seabed.	Maximum levels of underwater noise during decommissioning would be from underwater cutting required to remove structures. This is much less than pile driving and therefore impacts would be less than as assessed during the construction phase. Piled foundations would likely be cut approximately 1 m below the seabed.
MM-D-21	Array Area	Decommissioning	Disturbance from underwater noise.	Tertiary Col13	Likely significant effect without secondary mitigation Depends on the method used to remove structures. Methods such as hot cutting (Brocotorch), diamond wire cutting and abrasive water jet cutting are all expected to have negligible impact due to low noise levels and the temporary nature of the impact.	Simple Assessment	N/A as impact scoped in.	As per MDS for "PTS from underwater noise".	As per MDS for "PTS from underwater noise".
MM-D-22	Array Area	Decommissioning	TTS from underwater noise.	Tertiary Col13	No likely significant effect	Simple Assessment	N/A as impact scoped in.	As per MDS for "PTS from underwater noise".	As per MDS for "PTS from underwater noise".
MM-D-23	Array Area	Decommissioning	Vessel collision risk.	Tertiary Col108	Likely significant effect without secondary mitigation It is not expected that there will be a significant increase in vessel activity over the baseline levels.	Simple Assessment	N/A as impact scoped in.	Assumed to be similar vessel types, numbers and movements to construction phase (or less).	Assumed to be similar vessel types, numbers and movements to construction phase (or less).
MM-D-24	All-offshore	Decommissioning	Disturbance from vessels.	Tertiary Col108	Likely significant effect without secondary mitigation It is not expected that there will be a significant increase in vessel activity over the baseline levels.	Simple Assessment	N/A as impact scoped in.	Assumed to be similar vessel types, numbers and movements to construction phase (or less).	Assumed to be similar vessel types, numbers and movements to construction phase (or less).
MM-D-25	Landfall	Decommissioning	Reduction in prey availability.	N/A	No likely significant effect	Simple Assessment	N/A as impact scoped in.	Dependant on results of Volume 2, Chapter 4: Fish and Shellfish Ecology.	Dependant on results of Volume 2, Chapter 4: Fish and Shellfish Ecology.

MM-D-26	All-offshore	Decommissioning	Reduction in foraging ability.	N/A	No likely significant effect	Simple Assessment	N/A as impact scoped in.	Maximum amount of suspended sediment released during decommissioning activities and associated duration - see Volume 2, Chapter 1: Marine Geology, Oceanography and Physical Processes.	Maximum amount of suspended sediment released during decommissioning activities and associated duration - see Volume 2, Chapter 1: Marine Geology, Oceanography and Physical Processes.
MM-D-27	Array Area	Decommissioning	Toxic contamination.	N/A	No likely significant effect	Scoped Out	Not required as agreement achieved during EIA Scoping.	N/A as scoped out.	N/A as scoped out.

ID	Project Element	Original Project Phase	Project Activity and Impact	Embedded Mitigation Measures	Likely Significance of Effect at Scoping Stage and Justification	Hornsea Four Position	Further Evidence to Support "Scoping Out"	Maximum Design Scenario (MDS)	Justification
ORN-C-1	Array Area	Construction	Construction activities within the array area associated with foundations and WTGs may lead to disturbance and displacement of species within the array and different degrees of buffers surrounding it.	Primary Co86 Co87 Tertiary: Co88	Likely significant effect without secondary mitigation LSE likely to be not significant to minor depending on species assessed. This is due to any potential impacts being minimised spatially to a small number of foundations and / or WTGs at any one time and temporally due to the construction phase being limited in time.	Simple Assessment	N/A as impact scoped in	<u>Construction vessels / helicopters within Array Area:</u> - 8 construction vessels within 3 to 4 blocks of 5km ² at one time. <u>WTG Installation:</u> - 2 installation vessels (JUV) (90 return trips) - 12 support vessels (270 return trips) - 24 transport vessels (540 return trips) - 135 helicopter return trips <u>WTG Foundation Installation:</u> - 4 installation vessels (2 JUV and 2 anchored) (90 return trips) - 16 support vessels (360 return trips) - 40 transport/feeder vessels (including tugs) (360 return trips) - 180 helicopter return trips <u>Offshore Substation Installation (including substations and accommodation platform):</u> - 2 installation vessels (36 return trips); - 12 support vessels (162 return trips) - 4 transport/feeder vessels (72 return trips) - 63 helicopter return trips <u>Offshore Substation Foundation Installation (including substations and accommodation platform):</u> - 2 installation vessels (24 return trips); - 12 support vessels (108 return trips) - 4 transport/feeder vessels (48 return trips) - 42 helicopter return trips <u>Inter-array and Interconnector cable installation:</u> - 3 main cable laying vessels (204 return trips) - 3 main cable burial vessels (204 return trips) - 12 support vessels (1,080 return trips) - 396 helicopter return trips	The maximum estimated number of blocks with vessels operating concurrently would cause the greatest disturbance to birds on site.
ORN-C-2	All-offshore	Construction	Indirect impacts during the construction phase within the array area through effects on habitats and prey species	N/A	No likely significant effect	Simple Assessment	N/A as impact scoped in	See MDS for Fish and Shellfish Ecology assessment (Volume 2, Chapter 3: Fish and Shellfish Ecology).	As per justification in Volume 2, Chapter 3: Fish and Shellfish Ecology.
ORN-C-3	ECC	Construction	Construction activities associated with export cable laying may lead to disturbance and displacement of species within the export cable corridor and different degrees of buffers surrounding it.	Tertiary: Co88	Likely significant effect without secondary mitigation LSE likely to be not significant to minor depending on species assessed. This is due to any potential impacts being minimised spatially to a single cable laying vessel and temporally due to the construction phase being limited in time. Also, the most sensitive species (divers) are not found in high densities within study area.	Simple Assessment	N/A as impact scoped in	<u>Construction vessels within ECC:</u> - 3 cable laying vessels (96 return trips) - 3 cable jointing vessels (72 return trips) - 3 cable burial vessels (96 return trips) - 15 support vessels (144 return trips) - 800 helicopter return trips	The assumption is that the vessel would be in situ from start to finish, so any disturbance events would be throughout entire period.

ORN-C-4	Landfall	Construction	Construction activities associated with trenching, laying and reburial of the export cable through the intertidal zone may lead to disturbance and displacement of waterbird species in close proximity to the works.	N/A	Likely significant effect without secondary mitigation LSE is not significant, as very few waterbirds reside within the intertidal area and most species are tolerant of disturbance activities that are limited spatially and temporally	Simple Assessment	N/A as impact scoped in	Open Cut Installation: - 1 to 3 m burial depth - Peak two-way daily Heavy Goods Vehicle (HGV) movements in one month: 1,097 - Peak two-way daily Large Goods Vehicle (LGV) movements: 368 Cable Laying: - Cable laying rate of 100 m per day	The assumption is that the trenching, cable laying and burial of the export cable would be throughout 32 consecutive months from the start to finish, so any disturbance events would be throughout the entire period.
ORN-O-5	Array Area	Operation	Operational activities associated with moving turbines and maintenance vessels may lead to disturbance and displacement of species within the array area and different degrees of buffers surrounding it	Primary Co87	Likely significant effect without secondary mitigation LSE likely to be not significant to minor/moderate depending on species assessed.	Detailed Assessment	N/A as impact scoped in	Array Area: - 600 km ² Wind Turbine Generators: - 180 WTGs - Minimum height of lowest blade tip above MSL (m): 35m - Maximum rotor blade radius: 152.5m Vessels during Maintenance: - 3,525 return vessel visits per year - 2,580 return visits to wind turbines per year - 780 return visits to wind turbine foundations per year - 65 return visits to offshore platforms (structural scope) per year - 100 return visits to offshore platforms (electrical scope) per year - Vessels include: CTVs, SOVs, supply vessels, cable and remedial protection vessels and JUVs	Displacement would be assumed from the entire Array Area that contains WTGs and other associated structures, which maximises the potential for disturbance & displacement. Assessment of extent / varying displacement from Array Area and a buffer is species specific due to their sensitivity levels.
ORN-O-6	Array Area	Operation	Seabirds flying through the array area during the operational phase are at risk of collision with WTG rotors and associated infrastructure. The result of such collisions may be fatal to the bird concerned.	Primary: Co87 Co138	Likely significant effect without secondary mitigation LSE likely to be between not significant and moderate / major, as initial consideration of collision risk highlighted as key consideration for the Hornsea Four project. Risk resulting from in-combination effects with other OWFs is greatest.	Detailed Assessment	N/A as impact scoped in	Array Area: - 600 km ² area Wind Turbines: - 180 WTGs - Minimum height of lowest blade tip above MSL (m): 35m - Maximum rotor blade radius: 152.5m	This represents the maximum number of the largest WTGs, which represents the greatest total swept area to be considered for collision risk.
ORN-O-7	Array Area	Operation	Migrant non-seabirds flying through the array area during the operational phase are at risk of collision with WTG rotors and associated infrastructure. The result of such collisions may be fatal to the bird concerned.	Primary Co87	Likely significant effect without secondary mitigation LSE likely to be not significant or minor as previous impact assessments conducted for OWFs in the North Sea have concluded negligible or minor. There are no reasons why this project would be deemed any different.	Simple Assessment	N/A as impact scoped in	Array Area: - 600 km ² area Wind Turbines: - 180 WTGs - Minimum height of lowest blade tip above MSL (m): 35m - Maximum rotor blade radius: 152.5m	This represents the maximum number of the largest WTGs, which represents the greatest total swept area to be considered for collision risk.
ORN-O-8	Array Area	Operation	Indirect impacts within the array area during the operational phase through effects on habitats and prey species.	N/A	No likely significant effect	Simple Assessment	N/A as impact scoped in	See MDS for Fish and Shellfish Ecology assessment (Volume 2, Chapter 3: Fish and Shellfish Ecology).	As per justification in Volume 2, Chapter 3: Fish and Shellfish Ecology.

ORN-O-9	Array Area	Operation	The presence of WTGs could create a barrier to the migratory or regular foraging movements of seabirds. This may result in permanent changes in flying routes for birds concerned and an increase in energy demands associated with those movements may result in a lower rate of breeding success or survival chances for individuals affected.	Primary Co87	Likely significant effect without secondary mitigation LSE likely to be not significant to minor. This impact is not widely assessed as being significant and displacement impacts are considered to be the more important focus	Simple Assessment	N/A as impact scoped in	Array Area: - 600 km ² area - 30 km north-south extent between the northernmost point of the array area and the southernmost point Wind Turbines: - 180 WTGs	The measurement would be North to South to define the additional effort required for birds to fly around Array Area to the North or South from FFC colony during the breeding season if assumed to be commuting to foraging areas beyond Array Area to the East.
ORN-O-14	Array Area	Operation	The impact of attraction to lit structures by migrating birds in particular may cause disorientation, reduction in fitness and possible mortality.	Primary Co87	Not considered at Scoping Stage -New Impact	Simple Assessment	N/A as impact scoped in	Wind Turbines: - 180 WTGs - Minimum height of lowest blade tip above MSL (m): 35m - Maximum rotor blade radius: 152.5m - Total array area of Hornsea Four of 600 km ² - Minimum 810 m spacing Offshore substations: - 6 offshore transformer substations - 3 offshore converter stations - 1 offshore accommodation platform - 3 HVAC booster stations (in the HVAC booster station area of search). Lighting outward and not directional on all structures, maximised intensity and range to provide best visibility for aviation and shipping purposes.	Provides the maximum number of structures in the wind farm, with maximum intensity and extent of red and white light sources to increase likelihood that birds will be attracted to structures and become disoriented or more susceptible to collision risk.
ORN-O-10	ECC	Operation	Potential for ad-hoc maintenance of export cable throughout operational phase may lead to disturbance and displacement of species within the export cable corridor and different degrees of buffers surrounding it.	N/A	No likely significant effect	Scoped Out	Not required as agreement achieved during EIA Scoping.	N/A as scoped out	N/A as scoped out
ORN-O-11	Landfall	Operation	Potential for ad-hoc maintenance of export cable through the intertidal zone during the operational phase may lead to disturbance and displacement of waterbird species in close proximity to the works.	N/A	No likely significant effect	Scoped Out	Not required as agreement achieved during EIA Scoping.	N/A as scoped out	N/A as scoped out
ORN-D-12	ECC	Decommissioning	Demolition activities associated with foundations and WTGs may lead to disturbance and displacement of species within the array area and different degrees of buffers surrounding it.	Primary Co86 Co87 Tertiary: Co88	Likely significant effect without secondary mitigation LSE likely to be not significant to minor as species are less sensitive to lower scale activities associated with decommissioning	Simple Assessment	N/A as impact scoped in	Impacts assumed as per construction (or less): - 3,525 return vessel visits per year - 2,580 return visits to wind turbines per year - 780 return visits to wind turbine foundations per year - 65 return visits to offshore platforms (structural scope) per year - 100 return visits to offshore platforms (electrical scope) per year - Vessels include: CTVs, SOVs, supply vessels, cable and remedial protection vessels and JUVs	Maximum estimated number of vessel movements would cause greatest displacement to birds on site.
ORN-D-13	ECC/Landfall	Decommissioning	Indirect impacts during the decommissioning phase within the offshore export cable corridor and landfall through effects on habitats and prey species.	N/A	Likely significant effect without secondary mitigation	Simple Assessment	N/A as impact scoped in	See MDS for Fish and Shellfish Ecology assessment (Volume 2, Chapter 3: Fish and Shellfish Ecology).	As per justification in Volume 2, Chapter 3: Fish and Shellfish Ecology.

ID	Project Element	Original Project Phase	Project Activity and Impact	Embedded Mitigation Measures	Likely Significance of Effect at Scoping Stage and Justification	Hornsea Four Position	Further Evidence to Support "Scoping Out"	Maximum Design Scenario (MDS)	Justification
SVR-C-1A	All-Offshore	Construction	Offshore construction activities of array area visible by day and night from offshore visual receptors	None	No likely significant effects	Scoped Out	Not required as agreement achieved during EIA Scoping.	N/A as scoped out	N/A as scoped out
SVR-C-1B	All-Offshore	Construction	Impact on seascape character of MCAs as a result of physical presence and views of all offshore project elements during construction.	None	Likely significant effect without secondary mitigation	Simple Assessment	N/A as impact scoped in	<p>Offshore Platforms 6 x HVAC transformer substations (maximum 90 x 100 x 90 m) in the array 3 x HVDC converter substations (maximum 180 x 180 x 100m) in the array 1 x accommodation platform (maximum 60 x 60 x 64m) attached to an offshore transformer substation by a 100m long bridge (in the array) 3 x offshore HVAC booster stations (maximum 90 x 100 x 90 m) located in the HVAC booster station area of search All structures on jacket foundations Sited along or near to western edge of array area 450 vessel return trips for substation foundation and topside construction (including all offshore substations and the accommodation platform) 105 helicopter return trips</p> <p>WTGs 180 jacket foundations located across 190 possible positions within the Hornsea Four array area 180 WTGs (maximum height 370m above LAT) located across 190 possible positions within the Hornsea Four array area All structures on 3-legged jacket foundations Spaced across the entire array area (810 m minimum spacing) 305m maximum blade diameter 1,710 return trips by vessels involved in WTG construction (including foundations) 315 helicopter return trips</p> <p>Structures Lighting CAA and MOD safety lighting of tall structures (200 and 2000 candela). Trinity House Lighthouse Service requirements for navigation lighting on structures.</p> <p>Cables 654 km of cables laid in the ECC (and extending 10km into the array area) 1.5 km maximum width of offshore cable corridor 600 km of inter-array and inter-connector cables in the Hornsea Four array area. 1,488 return trips by vessels involved in installation of inter-array and inter-connector cables the Hornsea Four array area. 408 return trips for vessels involved in installing offshore electrical export cables within the wind farm array area and the offshore export cable route area during construction. 800 return trips by helicopters involved in installation of electrical infrastructure within the offshore export cable route area. 396 return trips by helicopters involved in installation of inter-array and inter-connector cables within the offshore wind farm array area.</p>	<p>Widest possible effects in terms of the physical presence and the vertical and horizontal field of view affected as part of the perception of seascape character.</p> <p>Largest possible structures will have the largest physical presence and be visible from a greater distance and therefore have the most widespread impacts.</p>
SVR-C-2	All-Offshore	Construction	Impact on landscape character of FHHC as a result of views of HVAC booster station and cable construction	None	No likely significant effects	Simple Assessment	N/A as impact scoped in	<p>HVAC booster stations 3 x offshore HVAC booster stations (maximum 90 x 100 x 90 m) Jacket foundations Sited along the north western extent of HVAC booster station search area. Trinity House Lighthouse Service requirements for navigation lighting on structures.</p> <p>Cables 654 km of cables laid in the ECC (and extending into the array area) 408 return trips for vessels involved in installing offshore electrical export infrastructure within the wind farm array area and the offshore export cable route area during construction. 800 return trips by helicopters involved in installation of electrical infrastructure within the offshore export cable route area.</p>	Largest possible structures located closest to the FHHC

SVR-C-3	All-Offshore	Construction	Impact on the views and visual receptors located within the FHHC as a result of views of HVAC booster station and cable construction.	None	No likely significant effects	Simple Assessment	N/A as impact scoped in	<p>HVAC booster stations 3 x offshore HVAC booster stations (maximum 90 x 100 x 90 m) Jacket foundations Sited along the north western extent of HVAC booster station search area.</p> <p>Cables 654 km of cables laid in the ECC (and extending into the array area) 408 return trips for vessels involved in installing offshore electrical export infrastructure within the wind farm array area and the offshore export cable route area during construction. 800 return trips by helicopters involved in installation of electrical infrastructure within the offshore export cable route area.</p>	Largest possible structures located closest to the FHHC
SVR-C-4	All-Offshore	Construction	Impact on views and visual receptors located within FHHC as a result of HVAC booster station and cable corridor construction lighting	None	No likely significant effects	Simple Assessment	N/A as impact scoped in	<p>Civil Aviation Authority (CAA) and Ministry of Defence (MOD) safety lighting of tall structures (200 and 2000 candela) Trinity House Lighthouse Service requirements for navigation lighting on structures. Lighting on all vessels and cranes undertaking construction.</p>	Maximum intensity of lights
SVR-O-13	All-Offshore	Operation & Maintenance	Offshore array area, Offshore export cables and HVAC booster stations night-time impacts on seascape character effects.	None	No likely significant effects	Scoped Out	Not required as agreement achieved during EIA Scoping.	N/A as scoped out	N/A as scoped out
SVR-O-5A	All-Offshore	Operation & Maintenance	Impact on seascape character of MCAs as a result of physical presence and views of the array area and HVAC booster stations	None	No likely significant effects	Simple Assessment	N/A as impact scoped in	<p>Offshore Platforms 6 x HVAC transformer substations (maximum 90 x 100 x 90 m) in the array 3 x HVDC converter substations (maximum 180 x 180 x 100m) in the array 1 x accommodation platform (maximum 60 x 60 x 64m) attached to an offshore transformer substation by a 100m long bridge (in the array) 3 x offshore HVAC booster stations (maximum 90 x 100 x 90 m) located in the HVAC booster station area of search All structures on jacket foundations Sited along or near to western edge of array area</p> <p>WTGs 180 jacket foundations located across 190 possible positions within the Hornsea Four array area 180 WTGs (maximum height 370m above LAT) located across 190 possible positions within the Hornsea Four array area All structures on 3-legged jacket foundations Spaced across the entire array area (810 m minimum spacing) 305m maximum blade diameter</p> <p>Structures Lighting CAA and MOD safety lighting of tall structures (200 and 2000 candela). Trinity House Lighthouse Service requirements for navigation lighting on structures.</p>	<p>Widest possible effects in terms of the physical presence and the vertical and horizontal field of view affected as part of the perception of seascape character.</p> <p>Largest possible structures will have the largest physical presence and be visible from a greater distance and therefore have the most widespread impacts.</p>
SVR-O-5B	All-Offshore	Operation & Maintenance	Impact on landscape character of FHHC as a result of views of HVAC booster stations.	None	No likely significant effects	Simple Assessment	N/A as impact scoped in	<p>HVAC booster stations 3 x offshore HVAC booster stations (maximum 90 x 100m x 90 m) Jacket foundations Sited along the north western extent of HVAC booster station search area.</p>	<p>Largest possible structures located closest to the FHHC.</p> <p>Highest intensity lighting that may be required.</p>

SVR-O-6	All-Offshore	Operation & Maintenance	Impact on the views and visual receptors located within the FHHC as a result of views of HVAC booster stations.	None	No likely significant effects	Simple Assessment	N/A as impact scoped in	HVAC booster stations 3 x offshore HVAC booster stations (maximum 90 x 100m x 90 m) Jacket foundations Sited along the north western extent of HVAC booster station search area.	Largest possible structures located closest to the FHHC. Highest intensity lighting that may be required.
SVR-O-7	All-Offshore	Operation & Maintenance	Impact on views and visual receptors located within FHHC as a result of HVAC booster station lighting	None	No likely significant effects	Simple Assessment	N/A as impact scoped in	Trinity House Lighthouse Service requirements for navigation lighting on structures. Lighting to meet the requirements of the CAA, THLS and MOD. Medium intensity red located on uppermost location.	Maximum intensity of lights
SVR-D-9	All-Offshore	Decommissioning	Impact on seascape of MCAs as a result of physical presence and views of the array area and HVAC booster stations being decommissioned.	None	No likely significant effects	Simple Assessment	N/A as impact scoped in	Offshore Platforms 6 x HVAC transformer substations (maximum 90 x 100 x 90 m) in the array 3 x HVDC converter substations (maximum 180 x 180 x 100m) in the array 1 x accommodation platform (maximum 60 x 60 x 64m) attached to an offshore transformer substation by a 100m long bridge (in the array) 3 x offshore HVAC booster stations (maximum 90 x 100 x 90 m) located in the HVAC booster station area of search All structures on jacket foundations Sited along or near to western edge of array area 450 vessel return trips for substation foundation and topside construction (including all offshore substations and the accommodation platform) 105 helicopter return trips	Widest possible effects in terms of the physical presence and the vertical and horizontal field of view affected as part of the perception of seascape character. Largest possible structures will have the largest physical presence and be visible from a greater distance and therefore have the most widespread impacts.

ID	Project Element	Original Project Phase	Project Activity and Impact	Embedded Mitigation Measures	Likely Significance of Effect at Scoping Stage and Justification	Hornsea Four Position	Further Evidence to Support "Scoping Out"	Maximum Design Scenario (MDS)	Justification
SN-C-1	All-offshore	Construction	Construction activities associated with the Hornsea Four array area, offshore export cable corridor and HVAC booster station search area may cause vessels to be deviated leading to increased encounters and therefore may also lead to increased vessel to vessel collision risk for all vessels in all weather conditions.	Secondary Co139 Co179 Tertiary Co89 Co93 Co99 Co177	Likely significant effect without secondary mitigation	Detailed Assessment	N/A as impact scoped in	<p>Construction timeline:</p> <ul style="list-style-type: none"> - Single phase of offshore construction over approximately three years. <p>Buoyed construction areas:</p> <ul style="list-style-type: none"> - Buoyed construction area deployed around the maximum extent of the Hornsea Four array area including 500 m construction Safety Zones and 50 m pre-commissioning Safety Zones; and - Buoyed construction area deployed around the HVAC booster stations including 500 m construction Safety Zones. <p>Construction vessels:</p> <ul style="list-style-type: none"> - Up to 60 construction vessels for the WTG foundations engaged at any given time with up to 810 return trips; - Up to 38 construction vessels for the WTGs engaged at any given time with up to 900 return trips; - Up to 36 construction vessels for substation and accommodation platform foundations engaged at any given time with up to 210 return trips; - Up to 18 construction vessels for the inter-array and interconnector cables engaged at any one time with up to 1,488 return trips; - Up to 24 construction vessels for the export cables engaged at any given time with up to 408 return trips; and - Up to 18 construction vessels for the HVAC booster stations engaged at any given time with up to 90 return trips. 	Largest extent and maximum number of construction vessels over the longest construction period with highest level of vessel activity.
SN-C-2	All-offshore	Construction	Pre-commissioned structures within the Hornsea Four array area and HVAC booster station search area will create powered and drifting allision risk for all vessels.	Secondary Co139 Tertiary Co89 Co93 Co94 Co99 Co177	Likely significant effect without secondary mitigation	Detailed Assessment	N/A as impact scoped in	<p>Construction timeline:</p> <ul style="list-style-type: none"> - Single phase of offshore construction over approximately three years. <p>WTGs – suction caisson jacket or piled jacket foundations:</p> <ul style="list-style-type: none"> - Up to 180 pre-commissioned WTGs on suction caisson jacket or piled jacket foundations (foundation with largest surface area at sea level). <p>Offshore substations/booster stations – gravity base structure (GBS) foundations:</p> <ul style="list-style-type: none"> - Up to six pre-commissioned offshore transformer substations on GBS foundations (foundation with largest surface area at sea level); - Up to three pre-commissioned offshore High Voltage Direct Current (HVDC) converter substations on GBS (foundation with largest surface area at sea level); - Up to one pre-commissioned offshore accommodation platform on GBS (foundation with largest surface area at sea level); and - Up to three pre-commissioned HVAC booster stations on GBS foundations with minimum spacing of 100 m (foundation with largest surface area at sea level). 	Largest extent and maximum number of structures over the longest construction period.
SN-C-3	All-offshore	Construction	Pre-commissioned cables associated with the Hornsea Four array area and offshore export cable corridor may increase anchor snagging risk for all vessels.	Primary Co83 Secondary Co139 Tertiary Co81 Co89 Co99 Co176	Likely significant effect without secondary mitigation	Detailed Assessment	N/A as impact scoped in	<p>Construction timeline:</p> <ul style="list-style-type: none"> - Single phase of offshore construction over approximately three years. <p>Export cables:</p> <ul style="list-style-type: none"> - Maximum installation export cable length of approximately 654 kilometres (km) (six cables of 109 km) each, including within the Hornsea Four array area. <p>Inter array and interconnector cables:</p> <ul style="list-style-type: none"> - Maximum installation length of array cables, up to 600 km; and - Up to six pre-commissioned interconnector cables linking the offshore substations, up to 90 km (15 km in total length each). 	Largest extent and maximum number of structures over the longest construction period.
SN-C-4	All-offshore	Construction	Construction activities associated with the Hornsea Four array area and offshore export cable corridor may restrict the emergency response capability of existing resources.	Secondary Co179 Tertiary Co89	Likely significant effects without secondary mitigation	Detailed Assessment	N/A as impact scoped in	<p>Construction vessels and helicopters:</p> <ul style="list-style-type: none"> - Up to 60 construction vessels for the WTG foundations engaged at any given time with up to 810 return trips and up to 180 helicopter return trips; - Up to 38 construction vessels for the WTGs engaged at any given time with up to 900 return trips and up to 135 helicopter return trips; - Up to 36 construction vessels for substation and accommodation platform foundations engaged at any given time with up to 210 return trips and up to 70 helicopter return trips; - Up to 18 construction vessels for the inter-array and interconnector cables engaged at any one time with up to 1,488 return trips and up to 396 helicopter return trips; - Up to 18 construction vessels for the HVAC booster stations engaged at any given time with up to 90 return trips and up to 21 helicopter return trips; and - Up to 24 construction vessels for the export cables engaged at any given time with up to 408 return trips and up to 800 helicopter return trips. 	Maximum number of construction vessels over the longest construction period.

SN-O-5	All-offshore	Operation	Presence of structures within the Hornsea Four array area, offshore export cable corridor and HVAC booster station search area and activities associated with the Hornsea Four array area, offshore export cable corridor and HVAC booster station search area may cause vessels to be deviated leading to increased encounters and therefore increased vessel to vessel collision risk for all vessel in all weather conditions.	<u>Secondary</u> Co178 Co179 <u>Tertiary</u> Co89 Co94 Co99 Co177	Likely significant effects without secondary mitigation	Detailed Assessment	N/A as impact scoped in	Operational life: - Operational life of 35 years. Development area: - Structure deployment across full developable area; and - Maintenance Safety Zones of up to 500 m. Operation and maintenance vessels: - Up to 3,525 return trips by operation and maintenance vessels operational 24/7.	Largest extent over the longest operational period with most operational activity.
SN-O-6	All-offshore	Operation	Operational structures within the Hornsea Four array area and HVAC booster station search area may create powered and drifting allision risk for all vessels.	<u>Secondary</u> Co179 <u>Tertiary</u> Co89 Co93 Co94 Co96 Co99 Co177	Likely significant effects without secondary mitigation	Detailed Assessment	N/A as impact scoped in	Operational life: - Operational life of 35 years; Development area and WTGs – suction caisson jacket or piled jacket foundations: - Up to 180 WTGs on suction caisson jacket or piled jacket foundations (foundation with largest surface area at sea level); - Minimum spacing of 810 m between structures within Hornsea Four array area; - Minimum spacing of 100 m between offshore HVAC booster stations; and - Maintenance Safety Zones of up to 500 m. Offshore substations/booster stations – GBS foundations: - Up to six offshore transformer substations on GBS foundations (foundation with largest surface area at sea level); - Up to three offshore HDVC converter substations on GBS foundations (foundation with largest surface area at sea level); - Up to one offshore accommodation platform on GBS foundations (foundation with largest surface area at sea level); and - Up to three HVAC booster stations on GBS foundations (foundation with largest surface area at sea level).	Largest extent and maximum number of operation and maintenance vessels over the longest operational period
SN-O-7	All-offshore	Operation	Operational cables within the Hornsea Four array area and offshore export cable corridor may increase anchor snagging risk for all vessels and cable protection used may reduce navigable water depths for all vessels.	<u>Primary</u> Co83 <u>Secondary</u> Co139 <u>Tertiary</u> Co81 Co89 Co99 Co176	Likely significant effects without secondary mitigation	Detailed Assessment	N/A as impact scoped in	Operational life: - Operational life of 35 years. Export cables: - Maximum export cable length of approximately 654 km (six cables of 109 km each), including within the Hornsea Four array area. Inter array and Interconnector cables: - Maximum length of array cables, up to 600 km; and - Up to six interconnector cables linking the offshore substations, up to 90 km (15 km in total length each).	Largest extent and maximum number of structures over the longest operational period with use of cable burial protection.
SN-O-8	All-offshore	Operation	Operation and maintenance activities associated with the Hornsea Four array area and offshore export cable corridor may restrict the emergency response capability of existing resources.	<u>Secondary</u> Co179 <u>Tertiary</u> Co96 Co99	Likely significant effects without secondary mitigation	Detailed Assessment	N/A as impact scoped in	Operational life: - Operational life of 35 years. Operation and maintenance vessels: - Up to 3,525 return trips by operation and maintenance vessels and/or helicopters operational 24/7.	Maximum number of operation and maintenance vessels over the longest operational period
SN-O-9	All-offshore	Operation	Operational structures within the Hornsea Four array area and offshore export cable corridor may impact a vessel's use of its Radar, communications and navigation equipment during navigational transits.	<u>Tertiary</u> Co99	Likely significant effects without secondary mitigation	Detailed Assessment	N/A as impact scoped in	Operational life: - Operational life of 35 years. Development area and WTGs – suction caisson jacket or piled jacket foundations: - Maximum WTG deployment (up to 180) on suction caisson jacket or piled jacket foundations covering maximum sea area over a 35 year operational life; - Minimum spacing of 810 m between structures within Hornsea Four array area; - Minimum spacing of 100 m between HVAC booster stations; and - Maintenance Safety Zones of up to 500 m. Offshore substations/booster stations – GBS foundations: - Up to six offshore transformer substations on GBS foundations (foundation with largest surface area at sea level); - Up to three offshore HDVC converter substations on GBS (foundation with largest surface area at sea level); - Up to one offshore accommodation platform on GBS (foundation with largest surface area at sea level); and - Up to three HVAC booster stations on GBS foundations.	Largest extent and maximum number of structures over the longest operational period

SN-D-10	All-offshore	Decommissioning	Decommissioning activities associated with the Hornsea Four array area and HVAC booster station search area may cause vessels to be deviated leading to increased encounters and therefore increased vessel to vessel collision risk for all vessels in all weather conditions.	Secondary Co139 Tertiary Co89 Co93 Co99 Co177 Co181	Likely significant effects without secondary mitigation	Detailed Assessment	N/A as impact scoped in	Decommissioning timeline: - Single phase of offshore decommissioning over approximately three years. Buoyed decommissioning area: - Buoyed decommissioning area deployed around the maximum extent of the Hornsea Four array area including 500 m decommissioning Safety Zones; and - Buoyed decommissioning area deployed around the HVAC booster stations including 500 m decommissioning Safety Zones.	Largest extent over the longest decommissioning period
SN-D-11	All-offshore	Decommissioning	Decommissioning structures within the Hornsea Four array area and HVAC booster station search area will create powered and drifting allision risk for all vessels.	Secondary Co139 Tertiary Co89 Co93 Co94 Co99 Co177 Co181	Likely significant effects without secondary mitigation	Detailed Assessment	N/A as impact scoped in	Decommissioning timeline: - One phase of offshore decommissioning over approximately three years. Decommissioning structures: - Up to 180 pre-decommissioned WTGs on suction caisson jacket or piled jacket foundations (foundation with largest surface area at sea level); - Up to six pre-decommissioned offshore transformer substations on GBS foundations (foundation with largest surface area at sea level); - Up to three pre-decommissioned offshore HVDC converter substations on GBS (foundation with largest surface area at sea level); - Up to one pre-decommissioned offshore accommodation platform on GBS (foundation with largest surface area at sea level); and - Up to three pre-decommissioned HVAC booster stations on GBS foundations with minimum spacing of 100 m (foundation with largest surface area at sea level).	Largest extent and maximum number of structures over the longest decommissioning period
SN-D-12	All-offshore	Decommissioning	Decommissioned cables left in situ within the Hornsea Four array area and offshore export cable corridor may increase anchor snagging risk for all vessels.	Primary Co83 Secondary Co139 Tertiary Co81 Co89 Co99 Co176 Co181	Likely significant effects without secondary mitigation	Detailed Assessment	N/A as impact scoped in	Decommissioning timeline: - Single phase of offshore decommissioning over approximately three years Export cable, inter array and interconnector cables: - Maximum export cable length of approximately 654 km (six cables of 109 km each, including within the Hornsea Four array area) left in situ. Inter Array and Interconnector Cables: - Maximum length of array cables, up to 600 km left in situ; and - Up to six interconnector cables linking the offshore substations, up to 90 km (15 km in total length each) left in situ.	Largest extent and maximum number of structures over the longest decommissioning period. Cables left in situ.
SN-D-13	All-offshore	Decommissioning	Decommissioning activities associated with the Hornsea Four array area and offshore export cable corridor may restrict the emergency response capability of existing resources.	Secondary Co179 Tertiary Co99 Co181	Likely significant effects without secondary mitigation	Detailed Assessment	N/A as impact scoped in	Decommissioning timeline: - Single phase of offshore decommissioning over approximately three years. Decommissioning vessels: - Up to 60 decommissioning vessels for the WTG foundations engaged at any given time with up to 810 return trips and up to 180 helicopter return trips; - Up to 38 decommissioning vessels for the WTGs engaged at any given time with up to 900 return trips and up to 135 helicopter return trips; - Up to 36 decommissioning vessels for substation and accommodation platform foundations engaged at any given time with up to 10 return trips and up to 70 helicopter return trips; - Up to 18 decommissioning vessels for the inter-array and interconnector cables engaged at any one time with up to 1,468 return trips and up to 396 helicopter return trips; - Up to 18 decommissioning vessels for the HVAC booster stations engaged at any given time with up to 90 return trips and up to 21 helicopter return trips; and - Up to 24 decommissioning vessels for the export cables engaged at any given time with up to 408 return trips and up to 800 helicopter return trips.	Maximum number of construction vessels over the longest decommissioning period.

ID	Project Element	Original Project Phase	Project Activity and Impact	Embedded Mitigation Measures	Likely Significance of Effect at Scoping Stage and Justification	Hornsea Four position	Further Evidence to Support "Scoping Out"	Maximum Design Scenario (MDS)	Justification
GGC-C-1	Landfall	Construction	Damage to designated geological SSSIs: Construction phase Any ground breaking activities that directly overlap with them could affect geological designated SSSIs.	Primary: Co2	No likely significant effects Whilst the scoping assessment has identified two SSSIs, these features will be avoided as part of the routeing.	Scoped out	The Envirocheck Report obtained confirms that the Hornsea Four geology and ground conditions study area is not located within a geological SSSI. As such no significant direct or indirect impacts to designated geological sites are predicted to occur. See Volume 6, Annex 1.2: Envirocheck Report for further details. Available at: [https://hornseaprojects.co.uk/Hornsea-Project-Four/Documents-Library/Formal-Consultation]	N/A as impact scoped out	N/A as impact scoped out
GGC-C-2	All - Onshore	Construction	Indirect Effects: Damage to designated geological SSSIs: Construction phase Any ground breaking activities that directly overlap with them could affect geological designated SSSIs.	N/A	No likely significant effects	Scoped out	The Envirocheck Report obtained confirms that the 1km Hornsea Four geology and ground conditions study area is not located within a geological SSSI. As such no significant direct or indirect impacts to designated geological sites are predicted to occur. See Volume 6, Annex 1.2: Envirocheck Report for further details. Available at: [https://hornseaprojects.co.uk/Hornsea-Project-Four/Documents-Library/Formal-Consultation]	N/A as impact scoped out	N/A as impact scoped out
GGC-O-3	All - Onshore	Operational	Sterilisation of future mineral resources: Operational phase Where overlaps occur between the permanent ECC and regional geological sites and/or minerals safeguarding areas this could sterilise future resources.	Primary: Co2 Tertiary: Co7 Co10	Likely significant effects without secondary mitigation	Detailed Assessment	N/A as impact scoped in	Landfall - Transition Joint Bays (located within Landfall compound area): Number: 6, Depth 6 m - HDD cable ducts: Number: 8, Diameter: 1 m, Length: 1.5 km - HDD Entry Pits: Area: 125 m ² per entry pit, Depth: 6 m - HDD Exit Pits: Number: 8 m, Area: 900m ² per exit pit, Depth: 5 m - HDD burial depth: Maximum: 40 m, Minimum: 5 m - Temporary intertidal exit pit working area: 1,600 m ² per exit pit - HDD exit pit excavated material volume: 2500m ³ Onshore Export Cable Corridor: - ECC (temporary and permanent): Length: 40 km (approximate), Width: 80 m, Area: 3,200,000 m ² - Number of cable circuits (HVAC system): 6 - Number of cables (HVAC system): 18 - Diameter of cable: 220 mm per cable - Diameter of duct: 330 mm per cable - Joint Bays: Number: 240, Depth: 2.5 m, Width: 9 m, Length: 25 m per Joint Bay - Link Boxes: Number: 240, Depth: 2 m, Width: 3 m, Length: 3 m per Link Box - Cable trench: Depth of stabilised backfill: 1.5 m, Target burial depth: 1.2 m, Width at base: 1.5 m, Width at surface: 5 m Onshore substation: - Permanent infrastructure area: 155,000 m ²	These parameters represent the maximum footprint, and therefore the maximum reduction in mineral resource areas, of onshore infrastructure during the operation of Hornsea Four.

GGC-C-4	All - Onshore	Construction	Exposure of workforce to health impacts: Construction phase Construction activities (all project components), such as trenching, excavations and other earthworks could disturb contaminants where present, which could result in health risks to construction workers	Tertiary: Co76 Co77 Co124	No likely significant effects Pathway between receptor and source will be avoided through use of PPE.	Simple Assessment	N/A as impact scoped in	<p>Landfall:</p> <ul style="list-style-type: none"> - Construction duration: 32 months - Transition Joint Bays (located within Landfall compound area): Number: 6, Depth 6 m - HDD cable ducts: Number: 8, Diameter: 1 m, Length: 1.5 km - HDD Entry Pits: Area: 125 m² per entry pit, Depth: 6 m - HDD Exit Pits: Number: 8 m, Area: 900m² per exit pit, Depth: 5 m - HDD burial depth: Maximum: 40 m, Minimum: 5 m - Temporary intertidal exit pit working area: 1,600 m² per exit pit - HDD exit pit excavated material volume: 2500m³ <p>Onshore Export Cable Corridor:</p> <ul style="list-style-type: none"> - Construction duration: 30 months - ECC (temporary and permanent): Length: 40 km (approximate), Width: 80 m, Area: 3,200,000 m² - Number of cable circuits (HVAC system): 6 - Number of cables (HVAC system): 18 - Diameter of cable: 220 mm per cable - Diameter of duct: 330 mm per cable - Joint Bays: Number: 240, Depth: 2.5 m, Width: 9 m, Length: 25 m per Joint Bay - Link Boxes: Number: 240, Depth: 2 m, Width: 3 m, Length: 3 m per Link Box - Cable trench: Depth of stabilised backfill: 1.5 m, Target burial depth: 1.2 m, Width at base: 1.5 m, Width at surface: 5 m <p>Onshore substation:</p> <ul style="list-style-type: none"> - Construction duration: 36 months - Permanent infrastructure area: 155,000 m² - Temporary works area: 130,000 m² 	These parameters represent the maximum ground disturbance within the project area in which the potential disturbance of existing contamination could occur. They also represent the maximum construction duration which could affect human health.
GGC-C-5	Landfall	Construction	Encountering contamination during intrusive works: Construction phase Construction activities (all project components), such as trenching, excavations and other earthworks could disturb contaminants, which could result in impacts on soil / land use; and pollution of groundwater.	Tertiary: Co64 Co77 Co124	Likely significant effects without secondary mitigation Areas of potential contamination exist, some of which will be avoided as the route planning and site selection proceed. However some may be unavoidable and a residual risk of encountering contamination will remain.	Simple Assessment	N/A as impact scoped in	<p>Landfall:</p> <ul style="list-style-type: none"> - Landfall compound: Number: 1, Total Area: 40,000 m² - Transition Joint Bays (located within Landfall compound area): Number: 6, Depth: 6 m - HDD cable ducts: Number: 8, Diameter: 1 m, Length: 1.5 km - HDD Entry Pits: Area: 125 m² per entry pit, Depth: 6 m - HDD burial depth: Maximum: 40 m, Minimum: 5 m - HDD Exit Pits: Number: 8, Area: 900 m² per exit pit, Depth: 5 m, Excavated material volume: 2, 500 m³, Temporary onshore/intertidal working area: 1,600 m² - Temporary intertidal exit pit working area: 1,600 m² per exit pit <p>Onshore Export Cable Corridor:</p> <ul style="list-style-type: none"> - ECC: Length: 40 km (approximate), Max. Temporary Width: 80 m (excl. railway crossings), Area: 3,200,000 m² - Number of cable circuits (HVAC system): 6 - Number of cables (HVAC system): 18 - Diameter of cable: 220 mm per cable - Diameter of duct: 330 mm per cable - Cable trench: Number: 6, Depth: 1.5 m, Width at base: 1.5 m, Width at surface: 5 m, Depth of Stabilised backfill: 1.5 m - Cable Burial: Target Depth: 1.2 m - Distance between Joint Bay/ Link Box: Minimum: 750 m, Maximum: 3,000 m - Logistics compounds: Number: 8, Size of each: 140x140 m, Duration: 36 months - HDDs: Number 112, HDD compounds (entry and exit): 56 x 70x70m compounds - Joint Bays (JB): Total area: 39 150 m², Spoil volume per JB: 563 m³, Total Spoil volume 97 962 m³ - Link Boxes (LB): Total area: 1 566 m², Spoil volume per LB: 18 m³, Total Spoil volume 3 132 m³ <p>Onshore substation:</p> <ul style="list-style-type: none"> - Permanent infrastructure area: 155,000 m² 	These parameters represent the maximum ground disturbance within the project area in which the potential disturbance of existing contamination could occur.

GGC-C-6	Onshore ECC	Construction	Soil compaction: Construction phase Construction vehicle movements and the creation of haul routes could cause compaction of the subsoil, which would degrade soil quality.	Tertiary: Co10 Co64	No likely significant effects Standard industry practices for the protection of top and subsoils during construction and their reinstatement post construction will avoid compaction impacts	Scoped out	Not required as agreement achieved during EIA Scoping.	N/A as impact scoped out	N/A as impact scoped out
GGC-C-7	Onshore ECC	Construction	Dewatering of trenches and excavations: construction phase If required, dewatering perched water or groundwater could reduce groundwater flow and affect water quality and base flow of local watercourses and abstractions.	Tertiary: Co4 Co14 Co124	Likely significant effects without secondary mitigation At this stage the nature and value of the water resource is yet to be fully established.	Simple Assessment	N/A as impact scoped in	<p>Onshore Export Cable Corridor:</p> <ul style="list-style-type: none"> - ECC: Length: 40 km (approximate), Width: 80 m - Number of cable circuits (HVAC system): 6 - Number of cables (HVAC system): 18 - Diameter of cable: 220 mm per cable - Diameter of duct: 330 mm per cable - Cable trench: Depth: 1.5 m, Width at base: 1.5 m, Width at surface: 5 m, Target burial depth: 1.2 m - HDDs: Number: 112 - Number of crossings (HDD and Open Cut): 426 	These parameters represent the maximum ground disturbance conditions associated with the onshore ECC.
GGC-C-8	All - Onshore	Construction	Physical intrusion into groundwater resource: Construction phase Installation of foundations, ground preparation, below ground works and associated activities could lead to potential contamination of underlying groundwater resources.	Tertiary: Co4 Co14 Co76 Co77 Co124	Likely significant effects without secondary mitigation At this stage, the nature of the water resource is yet to be fully established in relation to where such works will occur	Simple Assessment	N/A as impact scoped in	<p>Landfall:</p> <ul style="list-style-type: none"> - Construction duration: 32 months* - Transition Joint Bays (located within Landfall compound area): Number: 6, Depth 6 m - HDD cable ducts: Number: 8, Diameter: 1 m, Length: 1.5 km - HDD Entry Pits: Area: 125 m² per entry pit, Depth: 6 m - HDD Exit Pits: Number: 8 m, Area: 900m² per exit pit, Depth: 5 m - HDD burial depth: Maximum: 40 m, Minimum: 5 m - Temporary intertidal exit pit working area: 1,600 m² per exit pit - HDD exit pit excavated material volume: 2500m³ <p>Onshore Export Cable Corridor:</p> <ul style="list-style-type: none"> - ECC: Length: 40 km (approximate), Max. Temporary Width: 80 m (excl. railway crossings), Area: 3,200,000 m² - Cable trench: Number: 6, Depth: 1.5 m, Width at base: 1.5 m, Width at surface: 5 m, Depth of Stabilised backfill: 1.5 m - Cable Burial: Target Depth: 1.2 m - Distance between Joint Bay/ Link Box: Minimum: 750 m, Maximum: 3,000 m - Joint Bays (JB): Total area: 39 150 m², Spoil volume per JB: 563 m³, Total Spoil volume 97 962 m³ - Link Boxes (LB): Total area: 1 566 m², Spoil volume per LB: 18 m³, Total Spoil volume 3 132 m³ <p>Onshore Substation:</p> <p>Type of foundations not yet known - in the absence of a geotechnical investigation, worst case assessed is piling.</p> <ul style="list-style-type: none"> - Permanent area of site for all infrastructure: 155,000m² - Maximum depth and extent of subsurface excavations or piling at OnSS: no geotechnical surveys have been carried out at this stage. Until these studies are complete the depth of any required piled foundations cannot be ascertained. - Maximum number of piles 500 (pre-cast or Continuous Flight Auger) 	These parameters represent the maximum ground disturbance conditions both in terms of potential area affected and in duration.
GGC-C/O-9	All - Onshore	Construction and Operation	Accidental spills: construction and Operation phase During both construction and operation, there exists the potential for accidental oil / fuel / hazardous substance spills from vehicles, contaminative equipment, storage containers / tanks and during maintenance operations (e.g. lubrication of electrical equipment). to contaminate the ground and groundwater, impacting the quality of local groundwater resources	Tertiary: Co4 Co6 Co8 Co13 Co65 Co77 Co124	No likely significant effects Whilst the scoping assessment has identified potential contaminative sources introduced by the construction and operation of Hornsea Four, embedded tertiary mitigation will be in place to avoid significant effects.	Scoped out	Not required as agreement achieved during EIA Scoping.	N/A as impact scoped out	N/A as impact scoped out

ID	Project Element	Original Project Phase	Project Activity and Impact	Embedded Mitigation Measures	Likely Significance of Effect at Scoping Stage and Justification	Hornsea Four Position	Further Evidence to Support "Scoping Out"	Maximum Design Scenario (MDS)	Justification
HFR-C-1	Onshore ECC	Construction	Disturbance of watercourses: Construction phase Works associated with cable crossings Main Rivers and IDB maintained watercourses may result in a reduction in water quality and channel hydro-morphology.	Primary: Co1 Co18 Co124	No likely significant effects	Scoped Out	Trenchless techniques will be adopted to cross all major watercourses along the cable route including main rivers, IDB drains (Co1). The entry and exit points will be located at least 9 m away from surface watercourses and the cabling will be installed at least 1.2 m beneath the watercourses (Co18) to minimise the likelihood of interaction. Where Hornsea Four may cross sites of particular sensitivity (e.g. SSSIs) a pre-construction hydrogeological risk assessment will be undertaken to inform a site-specific risk assessment (Co18). As such, there will therefore be no mechanisms for the direct disturbance of these watercourses during construction. Furthermore, the stability of the watercourses (as described in Section 2.7.2 of Volume 3, Chapter 2: Hydrology and Flood Risk) means that rates of lateral or vertical adjustment are unlikely to be sufficient to result in direct interactions with buried cable infrastructure in the future.	N/A as impact scoped out	N/A as impact scoped out
HFR-C-2	Onshore ECC	Construction	Access across watercourses: Construction phase Works associated with access track crossings of Main Rivers and IDB maintained watercourses may result in a reduction in water quality and channel hydro-morphology.	Secondary Co172 Co175 Tertiary • Ensuring culverts are adequately sized to avoid impounding flows (Co124); • Installing culverts below the active bed of the watercourse to ensure continuity for sediment, fish and aquatic invertebrates (Co124)	Minor – No likely significant effects	Simple Assessment	N/A as impact scoped in	Onshore ECC Construction Activities: - Duration of temporary watercourse crossings: 30 months. Onshore ECC: - Type of temporary watercourse crossing: Culvert - Maximum number of temporary watercourse crossings on EA Main Rivers and IDB maintained watercourses: 15 - Location of temporary watercourse crossings: See Figure 2.10 - Figure 2.14 in Volume 3, Chapter 2: Hydrology and Flood Risk . - Length of temporary crossings: 10m - Width of temporary crossings: 6m	These parameters represent the maximum potential for disturbance of surface watercourses from temporary crossings. The scale of impacts resulting from watercourse crossings is a product of the number of trenched crossings per catchment and the spatial extent and duration of disturbance.
HFR-C-3	Onshore ECC	Construction	Disturbance of minor drainage ditches: Construction phase Works associated with cable crossings of minor drainage ditches (as defined in the watercourses crossing schedule and agreed with EA, IDB and LLFA) may result in a reduction in water quality and channel hydro-morphology.	Tertiary Co14 Co19 Co124 Secondary Co157 Co172	No likely significant effects	Scoped Out	Minor drainage features will be crossed using an open trench technique following a methodology agreed in advance with the relevant consenting authority and developed in consultation with land owners once detailed land drainage surveys have been undertaken (Co14 and Co19). This will include details of the temporary works, including measures to maintain flows and reinstate the bed and banks of the watercourse. This is secured through the Outline Code of Construction Practice (Co124). All ditches and drainage outfalls will be retained where possible, and where it is not possible to retain them they will be repaired and reinstated (Co157). The bed and banks of watercourses will be reinstated to their pre-construction condition (Co172). These will prevent non-temporary effects on minor drainage features.	N/A as impact scoped out	N/A as impact scoped out
HRF-C-4	Onshore ECC	Construction	Access across minor drainage ditches: Construction phase Works associated with access track crossings of minor drainage ditches (as defined in the watercourses crossing schedule and to be agreed with EA, IDB and LLFA) may result in a reduction in water quality and channel hydro-morphology.	Secondary Co172 Tertiary • Ensuring culverts are adequately sized to avoid impounding flows (Co124); • Installing culverts below the active bed of the watercourse to ensure continuity for sediment, fish and aquatic invertebrates (Co124)	Minor – No likely significant effects	Simple Assessment	N/A as impact scoped in	Onshore ECC Construction Activities: - Duration of temporary watercourse crossings: 30 months. Onshore ECC: - Type of temporary watercourse crossing: Culvert - Maximum number of temporary watercourse crossings on minor drainage ditches: 14 - Location of temporary watercourse crossings: See Figure 2.10 - Figure 2.14 in Volume 3, Chapter 2: Hydrology and Flood Risk . - Maximum length of temporary crossings: 10m - Maximum width of temporary crossings: 6m	These parameters represent the maximum potential for disturbance of minor drainage features. The scale of impacts resulting from watercourse crossings is a product of the number of trenched crossings per catchment and the spatial extent and duration of disturbance.

HFR-C-5	Onshore ECC	Construction	Disruption of local land drainage: Construction phase Works associated with cable installation leading to impacts on the integrity of the local land drainage systems and potential flooding.	Tertiary Co14 Co19 Co157	No likely significant effects	Scoped Out	A construction phase drainage strategy will be prepared to support the DCO application, setting out the performance requirements of a temporary site drainage system to ensure there are no changes to surface runoff during the construction of the substation and cable route (Co14). The Outline Onshore Infrastructure Drainage Strategy (Co19) can be found in Volume F2, Chapter 6 . All ditches and drainage outfalls will be retained where possible, and where it is not possible to retain them they will be repaired and reinstated (Co157). The construction drainage strategy will be agreed in advance with the Lead Local Flood Authority (LLFA) and the EA (Co14).	N/A as impact scoped out	N/A as impact scoped out
HFR-C-6	Onshore ECC	Construction	Changes in water quality: Construction phase Works associated with cable installation leading to impacts on the water quality of watercourses and drainage systems local to the works.	Tertiary Co4 Co6 Co14 Co19 Co124	No likely significant effects	Scoped Out	A construction phase drainage strategy will be prepared to support the DCO application, setting out the performance requirements of a temporary site drainage system to ensure there are no changes to surface runoff during the construction of the substation and cable route (Co14). The Outline Onshore Infrastructure Drainage Strategy (Co19) can be found in Volume F2, Chapter 6 . A Construction Method Statement (CMS) will be developed as part of the Code of Construction Practice and secured as a certified document within the DCO. This is secured through the Outline Code of Construction Practice (CoCP) (Co124) (Volume F2, Chapter 2). The CMS will adhere to construction industry good practice guidance (e.g. the Environment Agency's Pollution Prevention Guidance notes, including PPG01, PPG05, PPG08 and PPG21 (which remain best practice despite no longer being statutory guidance) and CIRIA's 'Control of water pollution from construction sites: Guidance for consultants and contractors'), to include specific measures to prevent contamination of water receptors during construction (Co4). Guidance on pollution prevention will also be adhered to (Co6). This will involve measures to ensure there is no increase in the supply of fine sediment and other contaminants (e.g. from construction materials and machinery). The CoCP (Volume F2, Chapter 2) will involve measures to ensure there is no increase in the supply of fine sediment and other contaminants (e.g. from construction materials and machinery), including: <ul style="list-style-type: none">• Implement measures to protect groundwater during construction, including good environmental practices based on legal responsibilities and guidance on good environmental• Where oil could run over hard ground into a watercourse;• Secondary containment system that can hold at least 110% of the oil volume stored;- In accordance with The Control of Pollution (Oil Storage) (England) Regulations 2001. Refueling 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. Measures will be employed to intercept and treat run-off from the working width. After treatment, discharge of any waters will be carried out so as to minimise physical impacts on channel morphology. Discharges will not be made without prior agreement and appropriate consents and approvals from the Environment Agency and relevant IDB;- Control of Water Pollution from Construction Sites – Guidance for Consultants and Contractors CIRIA (C650);- CIRIA – SuDS Manual (CIRIA, 2015); No discharge to surface watercourses will occur without permission from the Environment Agency (SuDS Manual); regular cleaning of roads of any construction waste and dirt to be carried out (SuDS Manual); and - A construction method statement to be submitted for approval by the responsible authority (SuDS Manual).	N/A as impact scoped out	N/A as impact scoped out

HFR-O-7	Onshore Substation	Operation	Alteration in run-off characteristics at substation site: Operation phase The operational presence of the substation may alter surface run-off characteristics from the site and could lead to increased flood risk elsewhere.	Tertiary Co19	Likely significant effects without mitigation Increase in flood risk from surface water has the potential to affect the substation itself, and increase flood risk to sensitive receptors downstream which could have a significant effect if not mitigated.	Scoped Out	An operational drainage strategy will be prepared as a certified document to support the DCO application. This sets out the performance requirements of the site drainage system that are necessary to ensure that there are no changes to the surface runoff resulting from the substation development. This will be agreed with the LLFA and the EA. This is secured through Volume F2, Chapter 6: Outline Onshore Infrastructure Drainage Strategy (Co19).	N/A as impact scoped out	N/A as impact scoped out
HFR-C-8	Onshore ECC & Onshore Substation	Construction	Mobilisation of pollutants in the event of disturbance of contaminated soils: Construction phase Works associated with construction of the cable and substation may mobilise contaminants into surface water runoff from the site.	Tertiary Co4 Co6 Co124	No likely significant effects	Scoped Out	Impacts relating to disturbance of contaminated ground (the location of which will be identified as part of a Phase 1 Preliminary Risk Assessment (PRA)) will be considered in detail in Chapter 1: Geology and Ground Conditions. Impact pathways will then be evaluated on the basis of proximity to proposed ground disturbance; and specific measures will be included in the CMS (part of the CoCP (Co124)) to prevent the ingress of soils and sediment whether contaminated or uncontaminated. Guidance on pollution prevention will also be adhered to (Co6) and Pollution Prevent Plan will also be developed, to include adherence to good practice guidance (Co4). The outline CoCP (Volume F2, Chapter 2) also includes measures to: Implement measures to protect groundwater during construction, including good environmental practices based on legal responsibilities and guidance on good environmental management in: guidance 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) will be followed; - Avoidance of oil storage within 50 m of a spring, well or borehole; - Where oil could run over hard ground into a watercourse; - Secondary containment system that can hold at least 110% of the oil volume stored; In accordance with The Control of Pollution (Oil Storage) (England) Regulations 2001. Refueling 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. Measures will be employed to intercept and treat run-off from the working width. After treatment, discharge of any waters will be carried out so as to minimise physical impacts on channel morphology. Discharges will not be made without prior agreement and appropriate consents and approvals from the Environment Agency and relevant IDB.	N/A as impact scoped out	N/A as impact scoped out
HFR-D-9	Onshore ECC	Decommissioning	Impacts associated with decommissioning of the cable route: Decommissioning phase Decommissioning activities along the cable route could disturb watercourses and affect water quality.	Tertiary Co127	No likely significant effects	Scoped Out	Buried cables will be de-energised with the ends sealed and left in place, therefore no ground disturbance is required (see Volume 1, Chapter 4: Project Description for further details). All project mitigation and commitments apply for decommissioning and a decommissioning plan will be developed in line with the latest relevant available guidance (Co127).	N/A as impact scoped out	N/A as impact scoped out

HFR-D-10	Onshore Substation	Decommissioning	Impacts associated with the decommissioning of the Hornsea Four substation: Decommissioning phase Works associated with decommissioning of substation	Tertiary Co127	No likely significant effects	Scoped Out	Potential impacts resulting from decommissioning of the substation are considered to be equal to, or less than construction-stage impacts. All above ground infrastructure will be removed and the land reinstated (see Volume 1, Chapter 4: Project Description for further details). All project mitigation and commitments apply for decommissioning and a decommissioning plan will be developed in line with the latest relevant available guidance (Co127). Decommissioning practices will incorporate measures to prevent pollution, to include emergency spill response procedures, and clean up and remediation of contaminated soils. The measures will follow a similar approach to those set out for the construction phase.	N/A as impact scoped out	N/A as impact scoped out
HFR-O-11	All - Onshore	Operation	Impacts associated with operation: Operation phase Operational activities at the substation site and along the cable route could disturb watercourses and affect water quality.	Tertiary Co19	No likely significant effects	Scoped Out	Potential impacts on water quality during operation are scoped out of the assessment because there will be minimal requirements for routine maintenance along the cable corridor or at the onshore substation. Further information on the nature of any proposed operation and maintenance activities is provided in Volume 1, Chapter 4: Project Description to demonstrate that there will be no impacts on water quality. Necessary measures will be undertaken to ensure that there are no changes to surface runoff and adherence to SuDs hierarchies. This is secured through Volume F2, Chapter 6: Outline Onshore Infrastructure Drainage Strategy (Co19).	N/A as impact scoped out	N/A as impact scoped out
HFR-C-12	Onshore ECC	Construction	Hydrological and water quality effects on designated sites: Construction phase Ground disturbance during construction could increase the supply of sediment and contaminants to the River Hull SSSI and change its hydrology	Secondary Co18 Tertiary Co124	N/A	Scoped out	Trenchless crossing techniques will be adopted to allow the cable to cross all major watercourses along the cable route, including the River Hull Headwaters SSSI. The entry and exit points will be located a suitable distance away from the river channel (at least 9 m; Co18) and the cabling will be installed a suitable distance beneath the watercourses (at least 1.2 m; Co18) to minimise the likelihood of interaction. Suitable clearance distances from SSSI watercourses will be informed by a site-specific hydrogeological risk assessment (Co18) and agreed with Natural England and the Environment Agency in advance of construction. There will therefore be no mechanisms for the disturbance of the SSSI watercourses during construction. Furthermore, the stability of the watercourses means that rates of lateral or vertical adjustment are unlikely to be sufficient to result in direct interactions with buried cable infrastructure in the future. Because trenchless cable crossings will not themselves directly interact with surface watercourses, they are proposed to be scoped out. Further information regarding crossing techniques is provided in the Crossings Schedule and Commitments Register. It is also proposed that, due to the measures set out in the CMS (part of the CoCP, a certified document within the DCO) to control the supply of fine sediment and other contaminants into surface watercourses and groundwaters, potential impacts on water quality in designated sites will also be scoped out. The outline CoCP is provided to support the PEIR.	N/A as impact scoped out	N/A as impact scoped out
HFR-O-13	Onshore ECC	Operation	Thermal impacts on water resources: operational phase Thermal effects of the underground power cables along the cable corridor during operation could lead to potential impacts on groundwater quality and associated species / habitats. For example, a reduction in WFD status.	Secondary Co18	No likely significant effect	Scoped out	Potential impacts on water temperature during operation are scoped out of the assessment because cables will be buried at least 1.2 m beneath watercourses, and effects on the temperature of flowing water is therefore considered to be negligible. The optimal clearance depth beneath watercourses will be agreed with the relevant authorities prior to construction. Further details are provided in Co18 in Volume 4, Annex 5.2: Commitments Register. Note that potential effects on aquatic biota resulting from changes to water temperature are considered in Chapter 3: Ecology and Nature Conservation.	N/A as impact scoped out	N/A as impact scoped out

ID	Project Element	Original Project Phase	Project Activity and Impact	Embedded Mitigation Measures	Likely Significance of Effect at Scoping Stage and Justification	Hornsea Four Position	Further Evidence to Support "Scoping Out"	Maximum Design Scenario (MDS)	Justification
ENC-C-1	All - Onshore	Construction	Direct impacts on designated sites: Construction phase Temporary construction areas could occupy areas leading to loss and/or degradation of designated sites.	Primary Co1 Co2 Co7 Co26 Secondary Co18 Tertiary Co14	No likely significant effects	Simple Assessment	N/A as impact scoped in	Onshore Export Cable Corridor: <ul style="list-style-type: none"> - Construction duration: 30 months - Logistics compounds: Number: 8, Size: 140x140 m, Duration: 36 months - ECC: Length: 40 km (approximate), Width: 80m, Area: 3,200,000 m² - Haul Road: Number: 1, Width: 6m (with 7 m passing places), Length: 40km, Depth: 1m - Temporary access roads: Number: 24, Width: 6 m (with 7 m passing places), Total combined length (excluding existing paved sections): 10km, Depth: average of 0.5m - Joint Bays: Number: 240, Depth 2.5m, Area: 225m² per Joint Bay, Joint Bay compounds: 240 40x40m compounds - Link Boxes: Number: 240, Depth: 2m, Area: 9m² per Link Box - HDDs: Number: 112, HDD compounds (entry and exit): 56 70x70m compounds 	These parameters represent maximum ground disturbance conditions both in terms of potential size of area affected and in terms of duration of expected disturbance.
ENC-C-2	All - Onshore	Construction	Impacts on non-designated sites: Construction phase Construction compounds, access roads and other infrastructure will temporarily occupy areas leading to loss and/or degradation of non-designated habitat.	Primary Co1 Co2 Co7 Co26 Secondary Co18 Tertiary Co14 Co124 Co168	Likely significant effect without secondary mitigation Habitats could be temporarily lost, damaged or degraded as a result of construction activities.	Simple Assessment	N/A as impact scoped in	Landfall: <ul style="list-style-type: none"> • Construction duration: 32 months • Landfall compound: Number: 1, Total Area: 40,000 m², Duration: 32 months • Transition Joint Bays (located within Landfall compound area): Number: 6, Depth: 6m Onshore Export Cable Corridor: <ul style="list-style-type: none"> • Construction duration: 30 months • Logistics compounds: Number: 8, Size: 140x140 m, Duration: 36 months • ECC: Length: 40 km (approximate), Width: 80m, Area: 3,200,000 m² • Cable circuits (HVAC system): Number: 6 • Cable trench: Depth: 1.5 m, Width at base: 1.5m, Width at surface: 5m • Haul Road: Number: 1, Width: 6m (with 7 m passing places), Length: 40km, Depth: 1m • Temporary access roads: Number: 24, Width: 6 m (with 7 m passing places), Total combined length (excluding existing paved sections): 10km. • Joint Bays: Number: 240, Depth 2.5m, Area: 225m² per Joint Bay, Joint Bay compounds: 240 40x40m compounds • Link Boxes: Number: 240, Depth: 2m, Area: 9m² per Link Box • HDDs: Number: 112, HDD compounds (entry and exit): 56 70x70m compounds; HDD Compound Duration: 1 month (per compound) Onshore Substation and Energy Balancing Infrastructure: <ul style="list-style-type: none"> • Construction duration: 36 months • Temporary access road: Number: 1, Length: 1,600 m, Width: 15m (8m road, 7m soil storage) • Permanent infrastructure area: 155,000 m² • Temporary works area: 130,000 m² 400 kV ECC: <ul style="list-style-type: none"> • Cable circuits: Number: 4 • Cable trench depth: 1.5m • Length: 2,100m, Width: 60 m 	These parameters represent maximum ground disturbance conditions both in terms of potential size of area affected and in terms of duration of expected disturbance.

ENC-C-3	All - Onshore	Construction	Impacts on bat species: Construction phase	Primary Co2 Co26 Co36 Secondary Co69 Tertiary Co114 Co123 Co124 Co168	Likely significant without secondary mitigation Bat roosts and bat commuting and / or foraging habitat could be temporarily lost, damaged or degraded as a result of construction activities. Roosting, commuting and foraging bats could be disturbed by light, vibration and other activities associated with construction.	Detailed Assessment	N/A as impact scoped in	Landfall: - Construction duration: 32 months - Landfall compound: Number: 1, Total Area: 40,000 m2, Duration: 32 months - Transition Joint Bays (located within Landfall compound area): Number: 6, Depth: 6m Onshore Export Cable Corridor: - Construction duration: 30 months - Logistics compounds: Number: 8, Size: 140x140 m, Duration: 36 months - ECC: Length: 40 km (approximate), Width: 80m, Area: 3,200,000 m2 - Cable circuits (HVAC system): Number: 6 - Temporary access roads: Number: 24, Width: 6 m (with 7 m passing places), Total combined length (excluding existing paved sections): 10km. - Joint Bays: Number: 240, Depth 2.5m, Area: 225m2 per Joint Bay, Joint Bay compounds: 240 40x40m compounds - Link Boxes: Number: 240, Depth: 2m, Area: 9m2 per Link Box - HDDs: Number: 112, HDD compounds (entry and exit): 56 70x70m compounds; HDD Compound Duration: 1 month (per compound) - Crossings affecting potential bat commuting/ foraging or roosting habitats: Number: 324 Onshore Substation and Energy Balancing Infrastructure: - Construction duration: 36 months - Temporary access road: Number: 1, Length: 1,600 m, Width: 15m (8m road, 7m soil storage) - Permanent infrastructure area: 155,000 m2- Temporary works area: 130,000 m2 400 kV ECC: - Length: 2,100m, Width: 60 m	These parameters represent the maximum numbers of crossing, construction duration and building design parameters that could potentially disrupt bat commuting/foraging habitat and/or bat roosts. For further detail, see Volume 4, Annex 4.2: Onshore Crossing Schedule.
ENC-C-4	All - Onshore	Construction	Impacts on breeding and / or wintering bird species: Construction phase	Primary Co2 Co7 Co26 Tertiary Co33 Co114 Co124 Co168	Likely significant effect without secondary mitigation Breeding and wintering bird habitat could be temporarily lost, damaged, severed/ fragmented or disturbed as a result of construction activities. Nesting birds could be disturbed by increases in personnel on site, noise, vibration and other activities associated with construction.	Detailed Assessment	N/A as impact scoped in	Landfall: - Construction duration: 32 months - Landfall compound: Number: 1, Total Area: 40,000 m2, Duration: 32 months - Transition Joint Bays (located within Landfall compound area): Number: 6, Depth: 6m Onshore Export Cable Corridor: - Construction duration: 30 months - Logistics compounds: Number: 8, Size: 140x140 m, Duration: 36 months - ECC: Length: 40 km (approximate), Width: 80m, Area: 3,200,000 m2 - Cable circuits (HVAC system): Number: 6 - Temporary access roads: Number: 24, Width: 6 m (with 7 m passing places), Total combined length (excluding existing paved sections): 10km. - Joint Bays: Number: 240, Depth 2.5m, Area: 225m2 per Joint Bay, Joint Bay compounds: 240 40x40m compounds - Link Boxes: Number: 240, Depth: 2m, Area: 9m2 per Link Box - HDDs: Number: 112, HDD compounds (entry and exit): 56 70x70m compounds; HDD Compound Duration: 1 month (per compound) - Crossings: Number: 324 Onshore Substation and Energy Balancing Infrastructure: - Construction duration: 36 months - Temporary access road: Number: 1, Length: 1,600 m, Width: 15m (8m road, 7m soil storage) - Permanent infrastructure area: 155,000 m2 - Temporary works area: 130,000 m2 400 kV ECC: - Length: 2,100m, Width: 60 m	These parameters represent maximum ground disturbance conditions both in terms of potential size of area affected and in terms of duration of expected disturbance, alongside
ENC-C-5	All - Onshore	Construction	Impacts on otter and / or water vole: Construction phase	Primary Co1 Co34 Secondary Co18 Co175 Tertiary Co114 Co123 Co124 Co168	Likely significant without secondary mitigation Open-cut trenching and HDD used to cross watercourses with otter and / or water vole potential could lead to loss of habitat, disturbance and / or connectivity severance.	Detailed Assessment	N/A as impact scoped in	Landfall: - Construction duration: 32 months - Trench width per circuit: 15 m - Potential disturbance corridor from plant movements, excavation, etc.: 60 m per circuit Onshore Export Cable Corridor: - Construction duration: 30 months - ECC: Length: 40 km (approximate), Width: 80m, Area: 3,200,000 m2 - Cable circuits (HVAC system): Number: 6 - Cable trench: Depth: 1.5 m, Width at base: 1.5m, Width at surface: 5m - Temporary access bridges: Number: 24, Width: 6 m - Crossings: Number: 324 Onshore Substation and Energy Balancing Infrastructure: - Construction duration: 36 months - Temporary access road: Number: 1, Length: 1,600 m, Width: 15m (8m road, 7m soil storage) - Permanent infrastructure area: 155,000 m2 - Temporary works area: 130,000 m2 400 kV ECC: - Length: 2,100m, Width: 60 m	These parameters represent the maximum numbers of crossings that could potentially affect water vole and/or otter habitat.

ECN-C-6	All - Onshore	Construction	Impacts on great crested newt populations: Construction phase Works in or within 250 m of water bodies with great crested newt potential could cause habitat loss, degradation, habitat severance and harm or kill individual animals.	<u>Primary</u> Co2 Co7 Co26 Co78 <u>Tertiary</u> Co114 Co124 Co168	Likely significant effect without secondary mitigation Great crested newts (GCN) habitat (ponds and terrestrial) could be temporarily lost, damaged or severed/fragmented as a result of construction activities. Individuals could be harmed or killed during construction activities.	Detailed Assessment	N/A as impact scoped in	Landfall - Construction duration: 32 months - Landfall compound: Number: 1, Total Area: 40,000 m ² , Duration: 32 months - Transition Joint Bays (located within Landfall compound area): Number: 6, Depth: 6m Onshore Export Cable Corridor: - Construction duration: 30 months - Logistics compounds: Number: 8, Size: 140x140 m, Duration: 36 months - ECC: Length: 40 km (approximate), Width: 80m, Area: 3,200,000 m ² - Cable circuits (HVAC system): Number: 6 - Temporary access roads: Number: 24, Width: 6 m (with 7 m passing places), Total combined length (excluding existing paved sections): 10km. - Joint Bays: Number: 240, Depth 2.5m, Area: 225m ² per Joint Bay, Joint Bay compounds: 240 40x40m compounds - Link Boxes: Number: 240, Depth: 2m, Area: 9m ² per Link Box - HDDs: Number: 112, HDD compounds (entry and exit): 56 70x70m compounds; HDD Compound Duration: 1 month (per compound) Onshore Substation and Energy Balancing Infrastructure: - Construction duration: 36 months - Temporary access road: Number: 1, Length: 1,600 m, Width: 15m (8m road, 7m soil storage) - Permanent infrastructure area: 155,000 m ² - Temporary works area: 130,000 m ² 400 kV ECC: - Length: 2,100m, Width: 60 m	These parameters represent maximum ground disturbance conditions both in terms of potential size of area affected and in terms of duration of expected disturbance.
ENC-C-7	All - Onshore	Construction	Impacts on white-clawed crayfish and fish: Construction phase Open cut trenching, used to cross watercourses could lead to loss of habitat, disturbance and / or connectivity severance on white-clawed crayfish and fish.	<u>Primary</u> Co1 <u>Tertiary</u> Co1234	No likely significant effect	Scoped Out	PINS agreed that effects on white clawed crayfish can be scoped out of the EIAs. Stakeholders agreed to scope out at Ecology Technical Panel Evidence Plan Meeting #3 held on 8th April 2019 There is no evidence of white-clawed crayfish within the data search study area. All EA classified main rivers and IDB maintained drains will be crossed by HDD (Co1), mitigating any impacts on fish species that may be present. In addition, within smaller watercourses that are subject to open cut crossing methods, the following mitigations are proposed: - In channel activities that prevent upstream migration will be limited to the duration of open-cut trenching works; and - Any temporary culverts required will be constructed to ensure there is no barrier to upstream fish passage (Co124, Volume F2, Chapter 2: Outline Code of Construction Practice). To mitigate and avoid any adverse impacts to fish species, the following measures will be adhered to (further information is provided within Volume 1, Chapter 2: Hydrology and Flood Risk): - In-channel activities that prevent upstream migration (e.g. river and sea lamprey) will be limited to the duration of open-cut trenching works in any particular location; and - Any temporary culverts will be constructed to ensure they do not create a barrier to upstream fish passage. This will be undertaken following the best guidance practice set out in CIRIA C689 (CIRIA, 2010) Culvert design and operation guide, culverts will be adequately sized to avoid impounding flows. Furthermore, the culvert bed will be installed below the active bed of the watercourse to ensure that sediment continuity and the movement of aquatic organisms can be maintained, and the likelihood of upstream sedimentation and downstream scour is minimised (Co124, Volume F2, Chapter 2: Outline Code of Construction Practice). Further information can be found within, Chapter 2: Hydrology and Flood Risk	N/A as impact scoped out	N/A as impact scoped out

ENC-C-8	All - Onshore	Construction	Impacts on reptiles: Construction phase Construction activities will temporarily occupy areas leading to loss and / or degradation of habitat, loss of habitat connectivity and harm or mortality of individual reptiles.	Primary Co2 Co7 Co26 Tertiary Co114 Co124 Co168	Potentially significant without secondary mitigation. Reptile habitat could be temporarily lost, damaged or severed/fragmented as a result of construction activities. Individuals could be harmed or killed during construction activities.	Simple Assessment	N/A as impact scoped in	<p>Landfall:</p> <ul style="list-style-type: none"> - Construction duration: 32 months - Landfall compound: Number: 1, Total Area: 40,000 m², Duration: 32 months - Transition Joint Bays (located within Landfall compound area): Number: 6, Depth: 6m <p>Onshore Export Cable Corridor:</p> <ul style="list-style-type: none"> - Construction duration: 30 months - Logistics compounds: Number: 8, Size: 140x140 m, Duration: 36 months - ECC: Length: 40 km (approximate), Width: 80m, Area: 3,200,000 m² - Cable circuits (HVAC system): Number: 6 - Temporary access roads: Number: 24, Width: 6 m (with 7 m passing places), Total combined length (excluding existing paved sections): 10km. - Joint Bays: Number: 240, Depth 2.5m, Area: 225m² per Joint Bay, Joint Bay compounds: 240 40x40m compounds - Link Boxes: Number: 240, Depth: 2m, Area: 9m² per Link Box - HDDs: Number: 112, HDD compounds (entry and exit): 56 70x70m compounds; HDD Compound Duration: 1 month (per compound) <p>Onshore Substation and Energy Balancing Infrastructure:</p> <ul style="list-style-type: none"> - Construction duration: 36 months - Temporary access road: Number: 1, Length: 1,600 m, Width: 15m (8m road, 7m soil storage) - Permanent infrastructure area: 155,000 m² - Temporary works area: 130,000 m² <p>400 kV ECC:</p> <ul style="list-style-type: none"> - Length: 2,100m, Width: 60 m 	These parameters represent maximum ground disturbance conditions both in terms of potential size of area affected and in terms of duration of expected disturbance.
ENC-C-9	All - Onshore	Construction	Impacts on badgers: Construction phase Construction activities could disturb badger setts and / or lead to temporary severance of territories.	Primary Co2 Co7 Co26 Co35 Co36 Tertiary Co114 Co123 Co124 Co168	Likely significant without secondary mitigation. Construction will increase noise, vibration, light and personnel presence and could disturb badger setts. Badger habitat could be temporarily lost, damaged or territories severed/fragmented as a result of construction activities.	Detailed Assessment	N/A as impact scoped in	<p>Landfall:</p> <ul style="list-style-type: none"> - Construction duration: 32 months - Landfall compound: Number: 1, Total Area: 40,000 m², Duration: 32 months - Transition Joint Bays (located within Landfall compound area): Number: 6, Depth: 6m <p>Onshore Export Cable Corridor:</p> <ul style="list-style-type: none"> - Construction duration: 30 months - Logistics compounds: Number: 8, Size: 140x140 m, Duration: 36 months - ECC: Length: 40 km (approximate), Width: 80m, Area: 3,200,000 m² - Cable circuits (HVAC system): Number: 6 - Temporary access roads: Number: 24, Width: 6 m (with 7 m passing places), Total combined length (excluding existing paved sections): 10km. - Joint Bays: Number: 240, Depth 2.5m, Area: 225m² per Joint Bay, Joint Bay compounds: 240 40x40m compounds - Link Boxes: Number: 240, Depth: 2m, Area: 9m² per Link Box - HDDs: Number: 112, HDD compounds (entry and exit): 56 70x70m compounds; HDD Compound Duration: 1 month (per compound) <p>Onshore Substation and Energy Balancing Infrastructure:</p> <ul style="list-style-type: none"> - Construction duration: 36 months - Temporary access road: Number: 1, Length: 1,600 m, Width: 15m (8m road, 7m soil storage) - Permanent infrastructure area: 155,000 m² - Temporary works area: 130,000 m² <p>400 kV ECC:</p> <ul style="list-style-type: none"> - Length: 2,100m, Width: 60 m 	These parameters represent maximum ground disturbance conditions both in terms of potential size of area affected and in terms of duration of expected disturbance.
ENC-C-10	All - Onshore	Construction	Impacts on habitats or species: Construction phase Construction could cause damage to habitats or species from accidental release of pollutants	Tertiary Co65 Co124 Co168	No likely significant effects	Scoped Out	<p>PINS agreed that impacts from airbourne contaminants can be scoped out of the EIA.</p> <p>All construction activities will be undertaken in adherence to the project CoCP (Co124), EMP (Co168) and SWMP (Co65) to ensure no adverse effect on habitats or species from the accidental release of pollutants.</p> <p>Further information on baseline environment is presented PEIR Volume 3, Chapter 3 Ecology and Nature Conservation.</p>	N/A as impact scoped out	N/A as impact scoped out
ENC-O-11	Onshore Substation	Operation	Impacts on habitats or species: Operation phase Operation of the onshore substation will cause long-term habitat loss, degradation and potential displacement of protected species	Tertiary Co168 Secondary Co159	Potentially significant without secondary mitigation. The onshore substation will reduce the area of habitat for the duration of its operation	Detailed Assessment	N/A as impact scoped in	<p>Onshore Substation and Energy Balancing Infrastructure:</p> <ul style="list-style-type: none"> - Permanent infrastructure area: 155,000 m² - Noise output (Variable Shunt Reactor): 97 dB per unit - Number of variable shunt reactors: 12 	These parameters represent maximum land take and operational activities relevant to the OnSS.

ENC-O-12	Onshore ECC	Operation	Impacts on habitats: Operation phase Excavating a section of cable for maintenance or repair could cause temporary habitat loss or degradation	N/A	No likely significant effects	Scoped Out	Not required as agreement achieved during EIA Scoping. As discussed and agreed in principle with Natural England September 2018.	N/A as all effects scoped out	N/A as all effects scoped out
ENC-O-13	Onshore ECC	Operation	Impacts on protected species: Operation phase Operation and maintenance activities of the onshore cable route could cause disturbance to protected species	N/A	No likely significant effects	Scoped Out	Not required as agreement achieved during EIA Scoping. As discussed and agreed in principle with Natural England September 2018.	N/A as all effects scoped out	N/A as all effects scoped out
ENC-O-14	Onshore Substation	Operation	Impacts on protected species: Operation phase Operation and maintenance activities of the onshore substation could cause disturbance to protected species	Tertiary Co124 Co168 Secondary Co159	Likely significant without secondary mitigation. Depending on the onshore substation's final location, increases in noise and light emissions could disturb protected species e.g. bats in ancient woodland.	Detailed Assessment	N/A as impact scoped in	Onshore Substation and Energy Balancing Infrastructure: - Permanent infrastructure area: 155,000 m ² - Noise output (Variable Shunt Reactor): 97 dB per unit - Number of variable shunt reactors: 12	These parameters represent maximum land take and operational activities relevant to the OnSS.
ENC-O-15	All - Onshore	Operation	Impacts on habitats or species: Operation phase Operation and maintenance activities could cause damage to habitats or species from accidental release of pollutants	N/A	No likely significant effects	Scoped Out	Not required as agreement achieved during EIA Scoping.	N/A as all effects scoped out	N/A as all effects scoped out
ENC-D-16	Onshore ECC	Decommissioning	Impacts on habitats: Decommissioning phase Decommissioning of onshore cable could cause temporary loss or degradation to habitat	N/A	No likely significant effects	Scoped Out	Not required as agreement achieved during EIA Scoping.	N/A as all effects scoped out	N/A as all effects scoped out
ENC-D-17	Onshore Substation	Decommissioning	Impacts on habitats: Decommissioning phase Decommissioning of the onshore substation could lead to temporary habitat loss or degradation	Tertiary Co124 Co127 Co168	Likely significant without secondary mitigation.	Simple Assessment	Not required as agreement achieved during EIA Scoping.	The OnSS above ground electrical equipment and infrastructure will be removed, along with building foundations and security fencing. The site will be returned to its previous condition. The construction of Hornsea Four presents the highest potential for significant environmental effects. Impacts during decommissioning would result in an effect of equal significance, at worst.	The parameters selected set out the worst case spatial and temporal envelope for ground disturbance during decommissioning of the OnSS.
ENC-D-18	Onshore Substation	Decommissioning	Impacts on protected species: Decommissioning phase Decommissioning of the onshore substation could lead to temporary disturbance or displacement of protected species	Tertiary Co124 Co127 Co168	Potentially significant without secondary mitigation.	Simple Assessment	Not required as agreement achieved during EIA Scoping.	The OnSS above ground electrical equipment and infrastructure will be removed, along with building foundations and security fencing. The site will be returned to its previous condition. The construction of Hornsea Four presents the highest potential for significant environmental effects. Impacts during decommissioning would result in an effect of equal significance, at worst.	The parameters selected set out the worst case spatial and temporal envelope for ground disturbance during decommissioning of the OnSS.

ENC-D-19	Onshore Substation	Decommissioning	Impacts on habitats or species: Decommissioning phase Decommissioning of the onshore substation could lead to damage to habitats or species from accidental release of pollutants	Tertiary Co65 Co124 Co168	No likely significant effects	Scoped Out	The construction of Hornsea Four presents the highest potential for significant environmental effects. Impacts during decommissioning would result in an effect of equal significance, at worst. Primary, tertiary and secondary mitigation measures that are necessary to reduce significant effects during construction to acceptable levels would be secured for decommissioning activities, where relevant. All decommissioning activities to be undertaken following same guiding principles and commitments to working methodologies as those undertaken during construction activities, such as adherence to the project CoCP (Co124), EMP (Co168) and SWMP (Co65) to ensure no adverse effect on habitats or species from the accidental release of pollutants.	N/A as all effects scoped out	N/A as all effects scoped out
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ID	Project Element	Original Project Phase	Project Activity and Impact	Embedded Mitigation Measures	Likely Significance of Effect at Scoping Stage and Justification	Hornsea Four position	Further Evidence to Support "Scoping Out"	Maximum Design Scenario (MDS)	Justification
LV-C-1	Landfall and onshore ECC	Construction	Temporary effects: Construction phase Construction activity associated with the landfall and onshore ECC will temporarily occupy the landfall work area, the ECC working width, compounds and means of access, leading to loss of landscape features and a change to landscape character and to views. Temporary change to views in the landfall area and onshore ECC from construction activities	<u>Primary</u> Co1 Co2 Co7 Co25 Co26 Co27 Co28 Co49 Co79 Co133 Co134 Co135 <u>Tertiary</u> Co10 Co124 <u>Secondary</u> Co68 Co69 Co158 Co165	Likely significant effects without mitigation Temporary loss of landscape features such as hedgerows that will then require replanting.	Simple Assessment	N/A as impact scoped in	General: - All trees and hedgerows within the onshore ECC and landfall PEIR boundary will be removed. - Installation of temporary fencing (post and wire or similar) along the entire ECC and landfall boundary. - PRoW closure: not be closed for any longer than three months at any one time, or for six months in total over the whole construction period. Where closures are required for longer period, ERYC will be informed in writing. Landfall Open Cut: - Construction duration: 32 months - Landfall compound: Number: 1, Total Area: 40,000 m ² , Duration 32 months - Trench width per circuit: 15 m - All land within ECC red line will be disturbed, with the exception of sections where HDD is proposed. Onshore Export Cable Corridor: - Construction duration: 30 months, of which any one location experiences intermittent construction activity over the duration; - Logistics compounds: Number: 8, Size: 140x140 m, Duration: 36 months - ECC: Length: 40 km (approximate), Width: 80 m, Area: 3,200,000 m ² - Haul Road: Number: 1, Width: 6 m (with 7 m passing places), Length: 40 km, Depth: 1 m - Temporary access roads: Number: 24, Width: 6 m (with 7 m passing places), Total combined length (excluding existing paved sections): 10km, Depth: 1 m - Reinstatement: hedgerow can be planted over cables (60 m easement) but not trees.	These parameters present the worst case assessment with regards to the maximum loss of trees and hedgerows and/or area of landscape features to be disturbed.
LV-O-2	Landfall & onshore ECC	Operation	Permanent/long-term effects resulting from construction activities: Operational phase Permanent impact of the landfall and onshore ECC may affect designated and non-designated landscape receptors (including landscape features such as woodlands and hedgerows).	<u>Primary:</u> Co2 Co25 Co27 Co28 <u>Tertiary</u> Co10 Co124 <u>Secondary</u> Co30	No likely significant effects	Scoped Out	To address this, further detail is presented below on "what mitigation has been incorporated into the assessment and how it is to be secured" (Scoping Opinion 4.16.2). Landfall: The refined landfall location does not intersect with any sensitive landscape or visual features. The cabling at the landfall will be installed using trenchless or open cut techniques. Above ground disturbance will be seen in the landscape and in views during construction, and only for a short period of time after the work has been completed. However, upon completion the site will be cleared and reinstated (Co10), typically this would be to arable land. As a result, there will be no permanent loss of any valued landscape features. Once operational, the cables at landfall will be buried underground. As such, significant effects are not anticipated to arise during the operational phase. Onshore ECC: The proposed onshore ECC has been routed so that it avoids sensitive landscape and visual features including woodlands, wetlands, natural or semi-natural vegetation as far as possible (Co2).	N/A as impact scoped out	N/A as impact scoped out

LV-O-3	Landfall & onshore ECC	Operation	<p>Permanent /long-term effects resulting from construction activities: Operational phase</p> <p>Permanent impact of the landfall, and onshore ECC may affect visual receptors in settlements and at individual properties, along key routes (national trails and tourist routes), along other roads and public rights of way, and in accessible and recreational landscapes.</p>	<p>Primary: Co2 Co25 Co27 Co28</p> <p>Tertiary Co10 Co124</p> <p>Secondary Co30</p>	<p>No likely significant effects</p>	<p>Scoped Out</p> <p>Where it is necessary to remove short sections of hedgerow and occasional trees in order for the onshore ECC to pass through field boundaries, these will be reinstated and/or replaced where possible (Co10). Micrositing to avoid isolated mature trees will be undertaken where it is feasible (Co27).</p> <p>Species native and local to the area will be planted along or close to the line of the original hedgerow, typically using transplant stock which is three years old. Replacement trees will be planted within the Hornsea Four boundary, but not in locations where roots could damage the cables. Newly planted trees and sections of hedgerow will be protected within rabbit proof fencing or plant shelters until they are well established, when this will be removed (typically after 3-5 years). New planting will be apparent as minor changes in the landscape and views until they have grown to fill the gaps between the plants, which will typically occur within 5 years. This can vary depending upon growth rates. Other field boundaries comprising fences, walls and ditches will be reinstated prior to the land being returned to the farmers.</p> <p>Once operational, all aspects associated with the proposed onshore ECC will be buried underground. As such, significant effects are not anticipated to arise during the operational phase.</p> <p>Planting will be monitored to ensure it is successful and replacements provided where necessary during the defects and maintenance period. This is typically 3-5 years for the landfall and onshore ECC planting, which should be sufficiently established after no more than five years. After this time, necessary maintenance of trees and hedgerows will become the responsibility of the landowner, as it is at present. (Note that for planting associated with the OnSS, monitoring and management would be permanent.)</p> <p>The mitigation will be secured through the requirements of the DCO (DCO Requirements 16) through an Outline CoCP (Volume F2, Chapter 2: Outline Code of Construction Practice) (Co124) and/ or Outline Landscape Management Plan (Co30), with Conditions requiring details to be agreed prior to their discharge, before construction begins. The reinstatement of field boundaries including replanting of gaps in hedgerows is a standard requirement for cabling works of this nature.</p>	<p>N/A as impact scoped out</p>	<p>N/A as impact scoped out</p>

LV-C-4	Onshore Substation	Construction	Temporary effects on landscape and viewers of the onshore substation site: Construction phase Construction activity associated with the onshore substation will temporarily occupy the substation construction area and means of access, leading to loss of landscape features and a change to landscape character and to views. Changes to views may affect visual receptors in settlements and at individual properties, along key routes (national trails and tourist routes), along other roads and public rights of way, and in accessible and recreational landscapes.	Primary Co2 Co26 Co27 Co49 Co78 Co79 Co128 Co145 Co151 Co165 Tertiary Co7 Co10 Co124 Secondary: Co69 Co30	Likely significant effects without mitigation	Simple Assessment	N/A as impact scoped in	Onshore Substation and Energy Balancing Infrastructure: - Construction duration: 36 months - Permanent infrastructure area: 155,000 m ² - Temporary works area: 130,000 m ² - Temporary access road: Number: 1, Length: 1,600 m, Width: 15 m (8 m road, 7 m soil storage) - Fencing: To be erected around entirety of OnSS/EBI permanent and temporary works area, inclusive of access track.	These parameters present the maximum parameters for potential loss and/ or disturbance to landscape features, resulting in visual intrusion. Within these areas, it is assumed that all trees and other vegetation would be removed and all land would be disturbed.
LV-O-5	Onshore Substation	Operation	Permanent effects on landscape and viewers of the onshore substation site: Operational phase Operation of the onshore substation will permanently occupy land which is currently characterised by agricultural use, with hedgerows and woodlands beyond, leading to loss of landscape features, and a change to landscape character and to views.	Primary Co2 Co27 Co79 Co145 Co151 Secondary Co30	Likely significant effects without secondary mitigation	Detailed Assessment	N/A as impact scoped in	Onshore Operational life: 35 years Onshore Substation (HVAC option): - Permanent infrastructure area: 155,000 m ² - Main Buildings: Number: 2, Length: 240m (if single building), Width: 80m (if single building), Height: 25m - Secondary Buildings: Number: 15, Total Combined Area: 7,000m ² , Height: 15m - Height of lightning protection for main building: 30 m Energy Balancing Infrastructure: - Main and Secondary Buildings: Total Area (within permanent infrastructure area): 17,300 m ² - Main buildings: Height: 15 m - Secondary buildings: Height: 20 m (type one) - Height of fire walls: 25 m - Lightning protection: Height: 25 m Minimum landscape treatment as per PEIR Volume 1, Chapter 4: Project Description.	These parameters present the maximum parameters for both the HVDC and HVAC onshore options. Open equipment parameters are provided as they are considered likely to have greater effects and potentially less susceptible to mitigation.
LV-D-6	All- onshore	Decommissioning	Temporary effects on landscape and viewers: Decommissioning phase Decommissioning of all works could affect the landscape and views.	Tertiary: Co127	No likely significant effects	Scoped Out	Decommissioning of the onshore infrastructure for Hornsea Four will comprise the following activities: - Buried export cables left in situ, with cable ends cut, sealed and securely buried. Partial removal of cables at landfall occur for aluminium/steel recycling; - Joint Bays and Link boxes will typically be left in situ, or removed if feasible; and - The OnSS above ground electrical equipment and infrastructure will be removed, along with building foundations and security fencing. The site will be returned to its previous condition. Further details will be provided and secured within a Decommissioning Plan, agreed with stakeholders prior to decommissioning commencing. The effects on landscape and views arising from the decommissioning phase will be minimal because of the measures described below. Landfall and onshore ECC The onshore export cables will be left in place in the ground, therefore there will be no disturbance across the ECC or landfall area, other than removal of jointing pits if required.	N/A as impact scoped out	N/A as impact scoped out

OnSS:

The temporary impacts on landscape and viewers of the OnSS: during the decommissioning phase will be similar but not greater than to those which will occur during construction., but the works will be of shorter duration, as detailed in Volume 1, Chapter 4: Project Description

The effects of decommissioning on landscape and visual receptors can be scoped out because of the considerations set out below:

All above ground structures will be removed for recycling or reuse, and all hard standing and foundations will be removed completely.

Once all buildings and structures have been removed, the land will be cultivated and reinstated to its former use. For arable land, reinstatement is likely to be complete within a year. For woodland reinstatement will start to take effect within five years, given the time taken for trees to grow.

Planting and other landscape mitigation will be left in place and will not be disturbed as part of the decommissioning works. The screen planting will therefore reduce the visibility of disturbance and activity during decommissioning, reducing effects on landscape and views.

ID	Project Element	Original Project Phase	Project Activity and Impact	Embedded Mitigation Measures	Likely Significance of Effect at Scoping Stage and Justification	Hornsea Four Position	Further Evidence to Support "Scoping Out"	Maximum Design Scenario (MDS)	Justification
HE-C-1	All-Onshore	Construction	Direct (physical) impacts on designated heritage assets: Construction Phase Construction activities which may lead to the disturbance of or removal of assets.	Avoidance of designated heritage assets through design Primary Co2	No likely significant effects Due to avoidance of designated heritage assets	Scoped Out	All designated heritage assets have been avoided through the route planning and site selection process for landfall, the onshore ECC and OnSS. As such, no direct (physical) significant effects to designated heritage assets will occur. (see Co2 within the Volume 4, Annex 5.2: Commitments Register and Section 5.8.3) Email correspondence with Mr Keith Emerick at Historic England on 17.06.2019 has confirmed the following: <i>"we can agree that direct physical impacts on designated assets can be scoped out if you can demonstrate that the designated sites have been avoided. But I am concerned about the use of the word 'direct' as it is often used when discussing 'setting' and implies a lesser form of impact, when – in fact – the impact within setting can be 'direct' on the significance of the place."</i>	N/A as impact scoped out	N/A as impact scoped out
HE-C-2	All-Onshore	Construction	Indirect impacts on designated heritage assets: Construction Phase Construction activities which may lead a change in the setting of assets.	N/A Primary Co2 Co7 Co26 Co69 Co150 Co151 Tertiary Co10 Co124 Secondary Co69 Co160	Likely significant effect without mitigation	Simple Assessment	N/A as impact scoped in	<p>Landfall:</p> <ul style="list-style-type: none"> - Construction duration: 32 months - Landfall compound: Number: 1, Total Area: 40,000 m², Duration: 32 months - HDD: Number: 8 - HDD noise level: 120 dB <p>Onshore Export Cable Corridor:</p> <ul style="list-style-type: none"> - Construction duration: 30 months - Logistics compounds: Number: 8, Size: 140x140 m, Duration: 36 months - Noise levels during construction: Cable Installation: 108 dB, Construction of Joint Bays: 115 dB <p>Onshore Substation and Energy Balancing Infrastructure:</p> <ul style="list-style-type: none"> - Construction duration: 36 months - Permanent infrastructure area: 155,000 m² - Temporary works area: 130,000 m² - Height of viewing platform: 30 m - Noise levels during construction: 108 dB <p>400kV ECC:</p> <ul style="list-style-type: none"> - Number of cable circuits: 4 - Cable trench depth: 1.5 m - Length: 2,100m, Width: 60 m <p>Traffic Movements:</p> <ul style="list-style-type: none"> - Peak two-way daily HGV movements: 1,097 - Peak two-way daily LCV movements: 368 	These parameters present the maximum durations and disturbances which have the potential to indirectly impact upon designated heritage assets through an alteration to their setting.
HE-C-3	All-Onshore	Construction	Direct impacts on non-designated heritage assets: Construction Phase Construction activities which may lead to disturbance of or removal of assets.	Primary Co2 Co7 Co150 Co162 Tertiary Co10 Co124 Secondary Co160	Likely significant effects without secondary mitigation	Detailed Assessment	N/A as impact scoped in	<p>Landfall:</p> <ul style="list-style-type: none"> - Landfall compound: Number: 1, Total Area: 40,000 m², Duration: 32 months - Transition Joint Bays (located within Landfall compound area): Number: 6, Depth: 6m <p>HDD option (deeply buried archaeology MDS):</p> <ul style="list-style-type: none"> - HDD cable ducts: Number: 8, Diameter: 1m, Length: 1.5km - HDD Entry Pits: Area: 125 m² per entry pit, Depth: 6m - HDD burial depth: Maximum: 40 m, Minimum: 5m - HDD Exit Pits: Number: 8, Area: 900m² per exit pit, Depth: 5m - Temporary intertidal exit pit working area: 1,600 m² per exit pit <p>Open cut option (near surface archaeology MDS):</p> <ul style="list-style-type: none"> - Trench width per circuit: 15 m - Potential disturbance corridor from plant movements, excavation, etc.: 60 m per circuit - Maximum burial depth: 3m <p>Onshore Export Cable Corridor:</p> <ul style="list-style-type: none"> - Construction duration: 30 months - Logistics compounds: Number: 8, Size: 140x140 m, Duration: 36 months - ECC: Length: 40 km (approximate), Width: 80m, Area: 3,200,000 m² - Number of cable circuits (HVAC system): 6 - Cable trench: Depth: 1.5 m, Width at base: 1.5m, Width at surface: 5m - Haul Road: Number: 1, Width: 6m (with 7 m passing places), Length: 40km, Depth: 1m - Temporary access roads: Number: 24, Width: 6 m (with 7 m passing places), Total combined length (excluding existing paved sections): 10km, Depth: 1m - Distance between Joint Bay/ Link Box: Minimum: 750m, Maximum: 3,000m - Joint Bays: Number: 240, Depth 2.5m, Area: 225m² per Joint Bay, Joint Bay compounds: 240 40x40m compounds - Link Boxes: Number: 240, Depth: 2m, Area: 9m² per Link Box - HDDs: Number: 112, HDD compounds (entry and exit): 56 70x70m compounds 	These parameters present the maximum below ground disturbances which could occur on buried archaeological and gearchaeological remains at the landfall, onshore ECC, OnSS, Energy Balancing Infrastructure and 400 kV export cable including temporary compounds and access routes.

HE-D-7	All-Onshore	Decommissioning	Direct (physical) impacts on designated heritage assets: Decommissioning Phase Decommissioning activities which may lead to the disturbance of or removal of assets.	Avoidance of designated heritage assets through design <u>Primary</u> <u>Co2</u> <u>Tertiary</u> <u>Co181</u>	No likely significant effects Due to avoidance of designated heritage assets <u>Impacts are likely to be no higher than for construction.</u>	Scoped Out	<p>Decommissioning of the onshore infrastructure for Hornsea Four will comprise the following activities:</p> <ul style="list-style-type: none">- Buried export cables left in situ, with cable ends cut, sealed and securely buried. Partial removal of cables at landfall occur for aluminium/steel recycling;- Joint Bays and Link boxes will typically be left in situ, or removed if feasible; and- The OnSS above ground electrical equipment and infrastructure will be removed, along with building foundations and security fencing. The site will be returned to its previous condition. <p>Further details will be provided and secured within a Decommissioning Plan, agreed with stakeholders prior to decommissioning commencing.</p> <p>The decommissioning footprint is anticipated to be similar to the construction footprint and avoid all designated heritage assets.</p>	N/A as impact scoped out	N/A as impact scoped out
HE-D-8	All-Onshore	Decommissioning	Direct impacts on non-designated heritage assets: Decommissioning Phase Decommissioning activities which may lead to the disturbance of or removal of assets.	<u>Tertiary</u> <u>Co181</u>	Likely significant effect without mitigation Impacts are likely to be no higher than for construction.	Scoped Out	<p>removal, along with building foundations and security fencing. The site will be returned to its previous condition.</p> <p>Further details will be provided and secured within a Decommissioning Plan, agreed with stakeholders prior to decommissioning commencing.</p> <p>The decommissioning footprint is anticipated to be similar to the construction footprint and avoid all designated heritage assets.</p>	N/A as impact scoped out	N/A as impact scoped out
HE-D-9	All-Onshore	Decommissioning	Indirect impacts on designated heritage assets: Decommissioning Phase Decommissioning activities which may lead a change in the setting of assets.	<u>Tertiary</u> <u>Co181</u>	Likely significant effect without mitigation Impacts are likely to be no higher than for construction.	Scoped Out	<p>The construction of Hornsea Four presents the highest potential for significant environmental effects. Impacts during decommissioning would result in an effect of equal significance, at worst. Primary, tertiary and secondary mitigation measures that are necessary to reduce significant effects during construction to acceptable levels would be secured for decommissioning activities, if relevant, and noted within technical chapters. In line with the proportionate approach to EIA, effects during decommissioning are therefore scoped out of the EIA for Hornsea Four.</p>	N/A as impact scoped out	N/A as impact scoped out
HE-D-10	All-Onshore	Decommissioning	Indirect impacts on non-designated heritage assets: Decommissioning Phase Decommissioning activities which may lead to the disturbance of or removal of assets.	<u>Tertiary</u> <u>Co181</u>	Likely significant effect without mitigation Impacts are likely to be no higher than for construction.	Scoped Out	<p>EIA, effects during decommissioning are therefore scoped out of the EIA for Hornsea Four.</p>	N/A as impact scoped out	N/A as impact scoped out

ID	Project Element	Original Project Phase	Project Activity and Impact	Embedded Mitigation Measures	Likely Significance of Effect at Scoping Stage and Justification	Hornsea Four Position	Further Evidence to Support "Scoping Out"	Maximum Design Scenario (MDS)	Justification
LUA-C-1	All-Onshore	Construction	Temporary disruption / reduction in agricultural land: Impacts of construction on agricultural land and farm holdings resulting in temporary disruption or reduction in land available for farming activities.	Primary Co63 Tertiary Co8 Co10 Co19 Co124 Secondary Co68	Likely significant effects without secondary mitigation The scoping boundary includes agricultural land and areas considered "Best and most versatile" agricultural land (ALC Grades 1, 2 and 3a) may be affected.	Simple Assessment	N/A as impact scoped in	<p>Landfall:</p> <ul style="list-style-type: none"> - Construction duration: 32 months - Landfall compound: Number: 1, Total Area: 40,000 m², Duration: 32 months <p>Onshore ECC:</p> <ul style="list-style-type: none"> - Construction duration: 30 months - Logistics compounds: Number: 8, Size: 140x140 m, Duration: 36 months - ECC: Length: 40 km (approximate), Width: 80m, Area: 3,200,000 m² - Temporary access roads: Number: 24, Width: 6 m (with 7 m passing places), Total combined length (excluding existing paved sections): 10km, Depth: 1m <p>OnSS and Energy Balancing Infrastructure:</p> <ul style="list-style-type: none"> - Construction duration: 36 months - Permanent infrastructure area: 155,000 m² - Temporary works area: 130,000 m² - Temporary access road: Number: 1, Length: 1,600 m, Width: 15m (8m road, 7m soil storage) <p>400 kV ECC:</p> <ul style="list-style-type: none"> - Length: 2,100m, Width: 60 m 	These parameters represent maximum ground disturbance conditions both in terms of potential area affected and in duration for Hornsea Four project elements that have the potential to disrupt agricultural land and farm holdings. It is considered that details related to intertidal working, and specific details on project infrastructure within the working area is not relevant to this assessment. This is because the maximum extent of ground disturbance has been assessed.
LUA-C-2	Landfall / Onshore ECC	Construction	Temporary disruption to coastal recreation: Impacts of construction may affect recreational use of the coast through temporary disruption to beach access and coastal paths.	Primary Co79 Tertiary Co124 Secondary Co158 Co165	No likely significant effects Local recreational resources will only be affected for the duration of the construction works.	Simple Assessment	N/A as impact scoped in	<p>Landfall:</p> <ul style="list-style-type: none"> - Construction duration: 32 months - Landfall compound: Number: 1, Total Area: 40,000 m², Duration: 32 months - Beach closure: 6 months within the 32 months construction period - HDD Exit Pits: Number: 8, Area: 900m² per exit pit, Depth: 5m - Temporary intertidal exit pit working area: 1,600 m² per exit pit 	These parameters represent maximum amount of activity on the beach which could affect nearby recreational and other land use.
LUA-C-3	All- Onshore	Construction	Impacts on recreation and amenity: Impacts of construction may affect recreational resources and amenity (noise, dust, and traffic movements)	Primary Co133 Co134 Tertiary Co114 Co123 Co124	Likely significant effects without mitigation Local recreational resources and visitor attractions will only be affected for the duration of the works.	Simple Assessment Detailed Assessment provided within Air Quality, Noise and Vibration, and Traffic and Transport, where appropriate.. Impact to be assessed within Land Use and Agriculture Chapter within the 'Inter-related' effects section.	N/A as impact scoped in	<p>Landfall:</p> <ul style="list-style-type: none"> - Construction duration: 32 months - Landfall compound: Number: 1, Total Area: 40,000 m², Duration: 32 months - Beach closure: 32 months - Noise levels during construction of Transition Joint Bays: 115 dB <p>Onshore Export Cable Corridor:</p> <ul style="list-style-type: none"> - Construction duration: 30 months - Logistics compounds: Number: 8, Size: 140x140 m, Duration: 36 months - ECC: Length: 40 km (approximate), Width: 80m, Area: 3,200,000 m² - Temporary access roads: Number: 24, Width: 6 m (with 7 m passing places), Total combined length (excluding existing paved sections): 10km, Depth: 1m - Beach closure: 6 months within the 32 months construction period - Noise levels: Cable Installation: 108 dB, Construction of Joint Bays: 115 dB <p>Onshore Substation and Energy Balancing Infrastructure:</p> <ul style="list-style-type: none"> - Construction duration: 36 months - Permanent infrastructure area: 155,000 m² - Temporary works area: 130,000 m² - Noise levels during construction: 108 dB <p>400 kV ECC:</p> <ul style="list-style-type: none"> - Length: 2,100m, Width: 60 m <p>Traffic Movements:</p> <ul style="list-style-type: none"> - Peak two-way daily HGV movements in one month: 1,097 - Peak two-way daily LCV movements: 368 	The MDS represents the greatest extent of the proposed construction works which would result in noise, dust and traffic impacts. Further details are provided within the respective tabs for each topic area.

LUA-C-4	All- Onshore	Construction	Severance, temporary diversion or closure: Impacts of construction may affect National Cycle network Routes, other PRoW and promoted routes, resulting in severance, temporary diversion or closure.	Primary: Co79 Tertiary: Co124 Secondary: Co158 Co165	Likely significant effects without mitigation	Simple assessment	N/A as impact scoped in	<p>Landfall:</p> <ul style="list-style-type: none"> - Construction duration: 32 months - Landfall compound: Number: 1, Total Area: 40,000 m², Duration: 32 months <p>Onshore ECC:</p> <ul style="list-style-type: none"> - Construction duration: 30 months - Logistics compounds: Number: 8, Size: 140x140 m, Duration: 36 months - ECC: Length: 40 km (approximate), Width: 80m, Area: 3,200,000 m² - Temporary access roads: Number: 24, Width: 6 m (with 7 m passing places), Total combined length (excluding existing paved sections): 10km <p>OnSS and Energy Balancing Infrastructure:</p> <ul style="list-style-type: none"> - Construction duration: 36 months - Permanent infrastructure area: 155,000 m² - Temporary works area: 130,000 m² - Temporary access road: Number: 1, Length: 1,600 m, Width: 15m (8m road, 7m soil storage) <p>400 kV ECC:</p> <ul style="list-style-type: none"> - Length: 2,100m, Width: 60 m 	The MDS represents the greatest extent (spatial and temporal) of the proposed construction works which would result in the greatest disruption to users of PRoWs or cycle routes. It is considered that details related to intertidal working, and specific details on project infrastructure within the working area is not relevant to this assessment. This is because the maximum extent of ground disturbance has been assessed.
LUA-O-5	Onshore substation	Operation	Severance, temporary diversion or closure: Impacts of construction may affect National Cycle network Routes, other PRoW and promoted routes, resulting in severance, temporary diversion or closure.	Primary: Co79	Likely significant effects without mitigation	Simple assessment	N/A as impact scoped in	<p>OnSS and Energy Balancing Infrastructure:</p> <ul style="list-style-type: none"> - Construction duration: 36 months - Permanent infrastructure area: 155,000 m² - Temporary works area: 130,000 m² - Temporary access road: Number: 1, Length: 1,600 m, Width: 15m (8m road, 7m soil storage) <p>400 kV ECC:</p> <ul style="list-style-type: none"> - Length: 2,100m, Width: 60 m 	The MDS represents the greatest extent (spatial and temporal) of the proposed construction works which would result in the greatest disruption to users of PRoWs or cycle routes. It is considered that details related to intertidal working, and specific details on project infrastructure within the working area is not relevant to this assessment. This is because the maximum extent of ground disturbance has been assessed.
LUA-O-6	All-Onshore	Operation	Permanent disruption / reduction of land: Impacts of operation and maintenance of the cable route corridor and onshore substation may affect Agricultural Land and farm holdings, resulting in permanent disruption or reduction in land available for farming activities.	Tertiary: Co10	No likely significant effects	Scoped out	<p>Not required as agreement achieved during EIA Scoping.</p> <p><i>"The Inspectorate agrees that significant effects from disruption from reduction of land are not likely during the operational phase of Hornsea Four, subject to the implementation of the proposed reinstatement as described in Co10 to be secured by inclusion in the draft Code of Construction Practice and DCO</i></p> <p><i>Therefore, it is agreed that this matter can be scoped out of the ES". (PINS Scoping Opinion, November 2016, ID:4.18.2)</i></p> <p>The onshore ECC is on agricultural land and areas considered "Best and most versatile" agricultural land (ALC Grades 1, 2 and 3a) may be affected. Sections of the onshore ECC may also be affected temporarily if repair/investigation activities are required, although impacts would be minimal and likely short lived.</p> <p>The potential effects resulting from the Transition Joint Bays, Joint Bays s and Link Boxes would be fragmented and would not result in the direct loss or severance of fields used for agricultural use.</p>	N/A as impact scoped out	N/A as impact scoped out
LUA-D-7	Onshore Substation	Decommissioning	Temporary disruption / reduction in land: Impacts of decommissioning above ground installations may temporarily affect Agricultural Land and farm holdings, resulting in temporary disruption or reduction in land available for farming activities.	Tertiary: Co127	No likely significant effects	Scoped out	<p>Decommissioning of the onshore infrastructure for Hornsea Four will comprise the following activities:</p> <ul style="list-style-type: none"> - Buried export cables left in situ, with cable ends cut, sealed and securely buried. Partial removal of cables at landfall occur for aluminium/steel recycling; - Joint Bays and Link boxes will typically be left in situ, or removed if feasible; and - The OnSS above ground electrical equipment and infrastructure will be removed, along with building foundations and security fencing. The site will be returned to its previous condition. <p>Further details will be provided and secured within a Decommissioning Plan, agreed with stakeholders prior to decommissioning commencing.</p> <p>The construction of Hornsea Four presents the highest potential for significant environmental effects. Impacts during decommissioning would result in an effect of equal significance, at worst. Primary, tertiary and secondary mitigation measures that are necessary to reduce significant effects during construction to acceptable levels would be secured for decommissioning activities, if relevant, and noted within technical chapters. In line with the proportionate approach to EIA, effects during decommissioning are therefore scoped out of the EIA for Hornsea Four.</p>	N/A as impact scoped out	N/A as impact scoped out

ID	Project Element	Original Project Phase	Project Activity and Impact	Embedded Mitigation Measures	Likely Significance of Effect at Scoping Stage and Justification	Hornsea Four Position	Further Evidence to Support "Scoping Out"	Maximum Design Scenario (MDS)	Justification
TT-C-1	All- Onshore	Construction	Impact from transport of offshore project components on the road network: Construction Phase Pre-fabricated off-shore construction elements (wind turbines/foundations etc.) could affect traffic if transported by road.	All offshore project components are assumed to be fabricated off-site, stored at a suitable port facility and transported directly offshore as needed.	No likely significant effects	Scoped out	<p>Agreement with ERYC at the Technical Panel on the 1 May 2019 that offshore impacts can be scoped out.</p> <p>The Applicant is currently considering ports suitable for the construction base for the offshore elements of Hornsea Four but no decision has been made at this time. A wide area across the southern North Sea is being considered including ports such as Grimsby, Immingham, Hull, Felixstowe and Teesside. Other ports in the area may also be suitable for the construction port. Port selection will be dependent upon, and only take place following, grant of development consent for Hornsea Four, a Contract for Difference (CFD) and on the findings of further technical studies and commercial negotiations which are informed by the DCO and CFD. As such, the DCO application for Hornsea Four will not include development activities at potential construction ports. Where necessary, any such development activity would be subject to separate consent(s) such as a planning permission or a Harbour Revision Order.</p> <p>Some large electrical infrastructure for the Onshore Substation, such as transformers, could be delivered by sea to a construction port and transferred as an Abnormal Indivisible Load (AIL) via the local road network to the development site. For the purposes of assessment, the nearest such port (Green Port Hull) is assessed for impacts upon the local road network. The assessment will be subsequently updated upon the choice of a final port.</p>	N/A as impact scoped out	N/A as impact scoped out
TT-C-2	All- Onshore	Construction	Impact on Driver Delay on regionally, nationally or internationally significant roads: Construction Phase Additional construction traffic may influence driver delay.	Primary: Co1 Co150 Tertiary: Co124 Co144 Secondary: Co62	Likely significant effect without secondary mitigation Effects on the SRN due to construction traffic	Detailed Assessment	N/A as impact scoped in	<p>Construction commencement year: 2023</p> <p>Landfall:</p> <ul style="list-style-type: none"> - Construction duration: 32 months - Landfall compound: Number: 1, Total Area: 40,000 m², Duration: 32 months - HDD: Number: 8 - Transition Joint Bays (located within Landfall compound area): Number: 6, Depth: 6m <p>Onshore Export Cable Corridor:</p> <ul style="list-style-type: none"> - Construction duration: 30 months - Logistics compounds: Number: 8, Size: 140x140 m, Duration: 36 months - ECC: Length: 40 km (approximate), Width: 80m, Area: 3,200,000 m² - Cable circuits (HVAC system): 6 - Cable trench: Depth: 1.5 m, Width at base: 1.5m, Width at surface: 5m - Haul Road: Number: 1, Width: 6m (with 7 m passing places), Length: 40km, Depth: 1m - Temporary access roads: Number: 24, Width: 6 m (with 7 m passing places), Total combined length (excluding existing paved sections): 10km, Depth: average of 0.5m - Joint Bays: Number: 240, Depth: 2.5m, Area: 225m² per Joint Bay, Joint Bay compounds: 240 40x40m compounds - Link Boxes: Number: 240, Depth: 2m, Area: 9m² per Link Box - HDDs: Number: 112, HDD compounds (entry and exit): 56 70x70m compounds <p>Onshore Substation and Energy Balancing Infrastructure:</p> <ul style="list-style-type: none"> - Construction duration: 36 months - Temporary access road: Number: 1, Length: 1,600 m, Width: 15m (8m road, 7m soil storage) - Permanent infrastructure area: 155,000 m² - Temporary works area: 130,000 m² <p>400 kV ECC:</p> <ul style="list-style-type: none"> - Number of cable circuits: 4 - Cable trench depth: 1.5m - Length: 2,100m, Width: 60 m <p>HGV and employee numbers developed and informed by realistic worst case assumptions for material demand per month and required resource, based on the above Hornsea Four</p>	<p>The MDS would result in the highest numbers of vehicle movements across the highway network. The earliest construction year (2023) represent the worst case.</p> <p>Agreement with ERYC at the Technical Panel on the 1 May 2019 that for the PEIR, the driver delay assessment would present details of peak hour traffic flows through critical junctions. ERYC advised at the same Technical Panel meeting that the assessment should look at the following junctions:</p> <ul style="list-style-type: none"> * A164/Jocks Lodge; * All roundabout junctions along the A164 to the south towards the Humber Bridge; * B1230 junction with Coppleflat Lane to the east of Walkington; * A1079/ A1174 junction; and * Fraisthorpe junction with the A165
TT-C-3	All- Onshore	Construction	Impact on Driver Delay on locally significant roads: Construction Phase Additional construction traffic may influence driver delay.	Primary: Co1 Co150 Tertiary: Co124 Co144 Secondary: Co62	Likely significant effects without secondary mitigation Construction traffic movements on the A164 and other key roads in the County	Detailed Assessment	N/A as impact scoped in		<p>The MDS would result in the highest numbers of vehicle movements across the highway network. The earliest construction year (2023) represent the worst case.</p>

TT-C-4	All- Onshore	Construction	Impact on Driver Delay on local roads and past locally sensitive receptors: Construction Phase Additional construction traffic may influence driver delay and affect sensitive receptors	Primary: Co1 Co150 Tertiary: Co124 Co144 Secondary: Co62	Likely significant effects without secondary mitigation Construction traffic movements on the A164 and other key roads in the County	Detailed Assessment	N/A as impact scoped in	<p>MDSS. An indicative construction programme has been developed based on previous project experience. This is presented in Annex 7.1: Traffic and Transport Technical Report.</p> <p>The peak month for HGV deliveries would be month two when there could be a combined peak of 640 two-way HGV movements per day. These worst case daily HGV movements have been increased further by 10% to account for incidental deliveries, resulting in a peak of 704 two-way HGV movements per day.</p> <p>To take account of any potential acceleration or slippage of construction activities a theoretical worst case month has been derived by examining the potential for individual construction activities to move relative to each other. The use of a theoretical worst case month results in a peak of 1,097 two-way HGV movements per day (compared to the peak 704 two-way HGV movements per day in month two).</p> <p>All HGV traffic has been assumed to have an origin on the A164 towards Hull.</p>	Agreement with ERYC at the 7 January 2019 Technical Panel that in addition to considering driver delay impacts associated with an increase in traffic that consideration of driver delay resulting from the use of narrow road where two vehicles (especially HGVs) can not pass will be undertaken. Agreement with ERYC at the Technical Panel meeting on the 1 May 2019 that for PEIR this would include details of likely traffic flows along each link and a description of potential mitigation measures.
TT-C-5	All- Onshore	Construction	Impact on Driver Delay on very minor local roads, parts of roads or uni-directional impact: Construction Phase Additional construction traffic may influence driver delay	Primary: Co1 Co150 Tertiary: Co124 Co144 Secondary: Co62	No likely significant effects	Detailed Assessment	N/A as impact scoped in	<p>During construction there could be a peak of up to 184 employees per day working on Hornsea Four (368 two-way LCV movements per day). However, as employees would work on a discrete section of the project and then move on, it is not possible to forecast at this stage which sections would overlap. Therefore, the worst monthly case traffic demand of 49 employees per day has been assigned to each access. This results in a worst case of 49 employees driving to each access at the same time (98 two-way LCV movements per day). However, in order to ensure that the impacts are realistic on the main A roads, all LCV movements have been capped at 368 two-way LCV movements per day, i.e. the peak number of employee movements for the whole of Hornsea Four.</p> <p>In addition to considering the worst case for total employee numbers, it has also been assumed that all employees would drive themselves to work, i.e. no car-sharing, bus, walking, cycling has been applied.</p>	
TT-C-6	All- Onshore	Construction	Severance: Construction Phase The temporary impact of the construction work may affect severance of routes/cause severance.	Primary: Co1 Co150 Tertiary: Co124 Co144 Secondary: Co62	No likely significant effects	Detailed Assessment	N/A as impact scoped in	<p>The maximum design scenario for considering driver delay impacts assumes that all employees would depart and leave within a single hour and that this hour could also overlap with the network am or pm peak hours.</p>	The MDS would result in the highest numbers of vehicle movements across the highway network.
TT-C-7	All- Onshore	Construction	Pedestrian delay and amenity: Construction Phase The temporary impact of the construction work may affect pedestrian delay and amenity	Primary: Co1 Co150 Tertiary: Co124 Co144 Secondary: Co62	Likely significant effects without secondary mitigation. Impact will reduce amenity of users and may increase delay slightly. PRoWs typically not used by large numbers but are well protected by legislation/acts of parliament	Detailed Assessment (pedestrian delay scoped out, and considered as part of wider amenity assessment).	N/A as impact scoped in		The MDS would result in the highest numbers of vehicle movements across the highway network.
TT-C-8	All- Onshore	Construction	Accidents and Road Safety: Construction Phase The temporary impact of the construction work may affect accidents and road safety.	Primary: Co1 Co150 Tertiary: Co124 Co144 Secondary: Co62	Likely significant effects without secondary mitigation Serious injury or death could result. Particularly at access points where vehicle conflicts occur and risk levels are high. The sensitivity increases if vulnerable road users are present	Detailed Assessment	N/A as impact scoped in		The MDS would result in the highest numbers of vehicle movements across the highway network.

TT-C-9	All- Onshore	Construction	Abnormal Loads: Construction Phase The temporary impact of hazardous, dangerous and abnormal loads during construction works.	Primary Co150 Tertiary Co144	Likely significant effect without secondary mitigation Transformers likely to be massively abnormal in every dimension. Potential damage to highway structures. Risk to other road users during the move. Specialist vehicles required. Route also uses SRN adjacent to the Port and Humber Bridge – nationally important piece of the network	Detailed Assessment	N/A as impact scoped in	Onshore Export Cable Corridor, Cable Drums: - Weight: 32,700kg - To be transported on an articulated HGV with a low loader/ load bed trailer. The vehicle and trailer combination would have an overall length of approximately 24m. Onshore Substation and Energy Balancing Infrastructure: Transformers: - Number: 6, Weight: 387,000kg, Height: 5.0m, Length: 11.65m, Width: 4.2m. - To be transported by a specialist abnormal load vehicle of approximately 93m in length.	The largest load required to be transported to site would require the largest vehicle, therefore having the greatest potential impact upon structures, highway condition, and manoeuvrability
TT-O-10	All- Onshore	Operation	Impacts from traffic generation: Operation Potential traffic impacts arising from the operation and maintenance of the onshore elements	None N/A	No likely significant effect	Scoped out	Agreement from PINS during EIA Scoping (23 November 2018 Scoping Opinion Section 4.19) and with ERYC at the first Human Environment Technical Panel meeting on 7 January 2019 that operational impacts can be scoped out. The rationale for this agreement being the low levels of operational traffic demand. Onshore operation and maintenance will be largely preventative and corrective, with remote monitoring of the onshore cables and onshore substation. Further details of the operation of Hornsea Four are in Volume 1, Chapter 4: Project Description.	N/A as impact scoped out	N/A as impact scoped out
TT-D-11	All- Onshore	Decommissioning	Impacts from traffic generation: Decommissioning The temporary impact of the decommissioning work may affect driver delay, safety and other elements of the network	Tertiary: Co127	No likely significant effect	Scoped out	Agreement from PINS during EIA Scoping (23 November 2018 Scoping Opinion Section 4.19) that decommissioning impacts can be scoped out.	N/A as impact scoped out	N/A as impact scoped out
TT-C-12	All- Onshore	Construction	Impact of Hornsea Four on Planned Changes in the Network: Construction Phase Large construction project nearby on A164 and surrounds with similar timeframe. Impact on construction traffic; routing; TM etc. Could be construction benefits/savings from joined up working.	None	Likely significant effect without secondary mitigation Large construction project nearby on A164 and surrounds with similar timeframe. Impact on construction traffic; routing; TM etc. Could be construction benefits/savings from joined up working.	Detailed Assessment	N/A as impact scoped in	The MDS would assume that the construction phase would overlap with other projects resulting in potentially significant cumulative impacts. Two schemes have been agreed with ERYC for cumulative assessment. The Jocks Lodge scheme is currently at the planning stage and an application is due to be submitted in spring 2019 with permission by summer 2019. Assuming permission is granted works are expected to start in 2020 and take 24 months, as such works are scheduled to be complete by 2022/2023. The Castle Street scheme is currently at the planning stage and a DCO submission is expected in later summer 2019 with works proposed to commence March 2020, with a completion date of 2024/2025. The MDS would therefore assume that the Jocks Lodge and Castle Street schemes could overlap with the peak construction period for Hornsea Four.	Agreed with ERYC at the Technical Panel on the 1 May 2019 that for the PEIR the cumulative impact assessment should consider the potential for cumulative impacts with the Jocks Lodge and Castle Road highway improvement schemes. No other projects were identified.

ID	Project Element	Original Project Phase	Project Activity and Impact	Embedded Mitigation Measures	Likely Significance of Effect at Scoping Stage and Justification	Hornsea Four Position	Further Evidence to Support "Scoping Out"	Maximum Design Scenario (MDS)	Justification
NV-C-1	Onshore ECC	Construction	Noise and vibration: Construction Phase Indicative temporary works area - temporary noise and vibration from onshore cable installation (excluding HDD works).	Primary: Co36 Co41 Co133 Co134	No likely significant effect	Scoped Out	Not required as agreement achieved during EIA Scoping.	N/A as impact scoped out	N/A as impact scoped out
NV-C-2	Onshore ECC	Construction	Noise and vibration: Construction Phase Indicative temporary works area - temporary noise and vibration from HDD works and other trenchless technologies.	Primary Co36 Co41 Co133 Tertiary Co123 Co124	Likely significant effect without secondary mitigation Depending on the size of equipment required for each crossing, NSRs may experience significant effects, however these will normally be relatively brief. Should HDD be required at night, impacts may be greater.	Detailed Assessment	N/A as impact scoped in	<p>Onshore Export Cable Corridor:</p> <ul style="list-style-type: none"> - Construction duration: 30 months - Logistics compounds: Number: 8, Size: 140x140 m, Duration: 36 months - ECC: Length: 40 km (approximate), Width: 80m, Area: 3,200,000 m² - HDDs: Number: 112, HDD compounds (entry and exit): 56 70x70m compounds, Duration of HDD Compound: 1 month each - HDD required at night, using largest equipment, required at all crossings, compound required at all crossings; <p>Construction Equipment (Per HDD):</p> <ul style="list-style-type: none"> - Maximum HDD noise: 120dB - Tracked Excavator: Number: 1, Noise Level: 107dB(A), 50% ontime - Backhoe Loader: Number: 1, Noise Level: 96dB(A), 50% ontime - Bulldozer: Number: 1, Noise Level: 108dB(A), 50% ontime - Dumper: Number: 1, Noise Level: 101dB(A), 50% ontime - Mobile Crane: Number: 1, Noise Level: 106dB(A), 25% ontime - Cement Mixer Truck (Discharging): Number: 1, Noise Level: 103dB(A), 25% ontime - Truck Mounted Concrete Pump and Boom Arm: Number: 1, Noise Level: 108dB(A), 25%ontime - Drilling Rig: Number: 1, Noise Level 105dB(A), 75% ontime - Water Pump: Number: 1, Noise Level: 93dB(A), 75% ontime - Generator: Number: 1, Noise Level: 105dB(A), 100% ontime 	HDD involves the most equipment/complexity and has the limited potential for night-time working which creates the biggest impacts on residential receptors.
NV-C-3	Landfall	Construction	Noise and vibration: Construction Phase Landfall, nearshore and intertidal area - temporary noise and vibration from cable installation works.	Primary Co134 Tertiary Co123 Co124	Likely significant effect without secondary mitigation Subject to the proximity of receptors to the works.	Detailed Assessment	N/A as impact scoped in	<p>Landfall:</p> <ul style="list-style-type: none"> - Construction duration: 32 months - Landfall compound: Number: 1, Total Area: 40,000 m², Duration: 32 months - Beach closure: 32 months - HDD Number: 8 - HDD required at night, using largest equipment, pit open two months, 8 vessels near (5km² area) shore <p>Construction Equipment (Per HDD):</p> <ul style="list-style-type: none"> - Maximum HDD noise: 120dB - Tracked Excavator: Number: 1, Noise Level: 107dB(A), 50% ontime - Backhoe Loader: Number: 1, Noise Level: 96dB(A), 50% ontime - Bulldozer: Number: 1, Noise Level: 108dB(A), 50% ontime - Dumper: Number: 1, Noise Level: 101dB(A), 50% ontime - Mobile Crane: Number: 1, Noise Level: 106dB(A), 25% ontime - Cement Mixer Truck (Discharging): Number: 1, Noise Level: 103dB(A), 25% ontime - Truck Mounted Concrete Pump and Boom Arm: Number: 1, Noise Level: 108dB(A), 25%ontime - Drilling Rig: Number: 1, Noise Level 105dB(A), 75% ontime - Water Pump: Number: 1, Noise Level: 93dB(A), 75% ontime - Generator: Number: 1, Noise Level: 105dB(A), 100% ontime 	HDD involves the most equipment/complexity and has the potential for night-time working which creates the biggest impacts on residential receptors
NV-C-4	Onshore ECC	Construction	Noise and vibration: Construction Phase Temporary noise and vibration from constructing the jointing bays.	Primary: Co36 Co41 Co133 Co134 Tertiary: Co124	Likely significant effect without secondary mitigation Noise effects dependent on proximity to NSRs.	Detailed Assessment	N/A as impact scoped in	<p>Onshore Export Cable Corridor:</p> <ul style="list-style-type: none"> - Joint Bays area 384,000 m² (240 x 40m x 40m): - Joint Bays Volume 960,000m³ (384,000 m² x 2.5m) <p>Construction Equipment (Joint Bays):</p> <ul style="list-style-type: none"> - Bulldozer: Number: 1, Noise Level:108dB(A) - Tracked Excavator: Number: 1, Noise Level: 107dB(A), - Generator: Number: 1, Noise Level: 105dB(A), 100% ontime - Water Pump: Number: 1, Noise Level: 93dB(A), 75% ontime - Dump Truck: Number: 1, Noise Level: 115dB(A) - Cement Mixer Truck (Discharging): Number: 1, Noise Level: 103dB(A), 25% ontime - Truck Mounted Concrete Pump and Boom Arm: Number: 1, Noise Level: 108dB(A), 25% ontime 	The MDS uses the highest potential number of JBs which accounts for a worst case assessment.

NV-C-5	Onshore ECC	Construction	Noise and vibration: Construction Phase Temporary noise and vibration from constructing the haul road access points	Primary: Co36 Co41 Co135	No likely significant effect	Scoped out	Construction access points from the highway network will be located at least 150 m from noise sensitive properties (Co 135). Plant required for construction of the access points/roads will be no greater in number and nature to that assessed for HDD and Joint bay construction. At this distance and based on the calculations undertaken for the HDD/Jointing Bays, noise levels are predicted to be below the construction threshold and, therefore, no significant impacts are expected.	N/A as impact scoped out	N/A as impact scoped out
NV-C-6	Onshore Substation	Construction	Noise and vibration: Construction Phase Temporary noise and vibration from construction of the onshore substation. (Includes the temporary impacts of tubular steel piling (percussive piling)	Primary Co36 Tertiary Co124 Secondary Co169	Likely significant effect without secondary mitigation Subject to the proximity of receptors to the selected substation site and/or without secondary mitigation in place	Detailed Assessment	N/A as impact scoped in	Onshore Substation and Energy Balancing Infrastructure: - Maximum construction period: 36 months Construction Equipment (OnSS and EBI): - Tracked Excavator: Number: 2, Noise Level: 107dB(A), 75% ontine - Backhoe Loader: Number: 2, Noise Level: 96dB(A), 75% ontine - Bulldozer: Number: 2, Noise Level: 108dB(A), 75% ontine - Dumper: Number: 2, Noise Level: 101dB(A), 75% ontine - Mobile Crane: Number: 2, Noise Level: 106dB(A), 75% ontine - Cement Mixer Truck (Discharging): Number: 1no, Noise Level: 103dB(A), 50% ontine - Truck Mounted Concrete Pump and Boom Arm: Number: 1, Noise Level: 108dB(A), 50% ontine - Piling – pre-cast concrete piles	The MDS relates to the maximum activity at the OnSS and EBI, inclusive of piling activity.
NV-C-7	All onshore	Construction	Noise and vibration: Construction Phase Traffic noise	Primary Co135 Tertiary Co144	Likely significant effect without secondary mitigation Subject to the anticipated volumes of traffic and/or without secondary mitigation in place	Detailed Assessment	N/A as impact scoped in	The derivation of the peak construction flows has been carried out by T&T in accordance with their MDS. Refer to Impact ID TT-C-2 to TT-C-8. Traffic flows are provided as both peak traffic AAWT and more detailed Average flow AAWT to present two cases (MDS and then average provided for context).	The MDS relates to the maximum number of movements on any one link to create the AAWT.
NV-O-8	Onshore Substation	Operation	Noise and vibration: Operation Phase Noise from the onshore substation	Secondary Co159	Likely significant effect without secondary mitigation Noise effects dependent on design, layout and proximity to NSRs.	Detailed Assessment	N/A as impact scoped in	Operational Noise Onshore Substation (HVAC): - Variable Shunt Reactor: Number: 12, Noise Level: 97dB(A) - Fixed Shunt Reactor: Number: 4, Noise Level: 93dB(A) - DRC: Number: 6, Noise Level: 93dB(A) - DRC Transformer: Number: 6, Noise Level: 91dB(A) - DRC Reactor: Number: 6, Noise Level: 84dB - Super Grid Transformer: Number: 6, Noise Level: 95dB(A) - Harmonic Filter: Number: 4, Noise Level: 91dB(A) Energy Balancing Infrastructure: - MV/LV Transformers: Number: 100, Noise Level: 65dB(A) - Power Converters: Number: 100, Noise Level: 85dB(A) - Battery Area: Noise Level: 84dB(A) - Central AC Units: Number: 2, Noise Level: 80dB(A)	The HVAC is considered to be the MDS due to the amount of external equipment compared to HVDC.
NV-O-9	ECC	Operation	Noise and vibration: Operation Phase Noise from buried cables	N/A	No likely significant effect	Scoped Out	Not required as agreement achieved during EIA Scoping.	N/A as impact scoped out	N/A as impact scoped out
NV-O-10	Onshore Substation	Operation	Noise and vibration: Operation Phase Operational Traffic Noise	N/A	No likely significant effect	Scoped Out	Not required as agreement achieved during EIA Scoping.	N/A as impact scoped out	N/A as impact scoped out
NV-O-11	Onshore Substation	Operation	Noise and vibration: Operation Phase Noise and vibration from routine maintenance activities	N/A	No likely significant effect	Scoped Out	Not required as agreement achieved during EIA Scoping.	N/A as impact scoped out	N/A as impact scoped out
NV-O-12	All onshore	Operation	Noise and vibration: Operation Phase Vibration	N/A	No likely significant effect	Scoped Out	Not required as agreement achieved during EIA Scoping.	N/A as impact scoped out	N/A as impact scoped out

NV-O-13	Offshore HVAC Booster	Operation	Noise and vibration: Operation Phase Noise from operation of the offshore HVAC booster	N/A	No likely significant effect	Scoped out	No likely significant effects due to the distance (>20km) offshore are predicted. Simple calculations based on the plant and equipment located at the OnSS shows that predicted noise levels from the booster are expected to be below 15 dB at onshore receptors.	N/A as impact scoped out	N/A as impact scoped out
NV-D-14	Onshore ECC	Decommissioning	Noise and vibration: Decommissioning Phase Temporary noise and vibration from plant along the cable route	Tertiary Co127	No likely significant effect	Scoped Out	Not required as agreement achieved during EIA Scoping.	N/A as impact scoped out	N/A as impact scoped out
NV-D-15	Onshore Substation	Decommissioning	Noise and vibration: Decommissioning Phase Temporary noise and vibration from plant at the onshore substation	Tertiary Co127	No likely significant effect Impacts are likely to be no higher than for construction.	Scoped out	Decommissioning of the onshore infrastructure for Hornsea Four will comprise the following activities: - Buried export cables left in situ, with cable ends cut, sealed and securely buried. Partial removal of cables at landfall occur for aluminium/steel recycling; - Joint Bays and Link boxes will typically be left in situ, or removed if feasible; and - The OnSS above ground electrical equipment and infrastructure will be removed, along with building foundations and security fencing. The site will be returned to its previous condition. Further details will be provided and secured within a Decommissioning Plan, agreed with stakeholders prior to decommissioning commencing. The construction of Hornsea Four presents the highest potential for significant environmental effects. Impacts during decommissioning would result in an effect of equal significance, at worst. Primary, tertiary and secondary mitigation measures that are necessary to reduce significant effects during construction to acceptable levels would be secured for decommissioning activities, if relevant, and noted within technical chapters. In line with the proportionate approach to EIA, effects during decommissioning are therefore scoped out of the EIA for Hornsea Four.	N/A as impact scoped out	N/A as impact scoped out

ID	Project Element	Original Project Phase	Project Activity and Impact	Embedded Mitigation Measures	Likely Significance of Effect at Scoping Stage and Justification	Hornsea Four Position	Further Evidence to Support "Scoping Out"	Maximum Design Scenario (MDS)	Justification
AQ-C-1	All-onshore	Construction	Dust generation Dust raising activities (earthworks, traffic on unpaved areas, construction works) from onshore construction works. This may have an effect on human and ecological receptors sensitive to dust and PM10.	Primary Co133 Co134 Co135 Tertiary Co64 Co114 Co124	No likely significant effects	Simple Assessment		<p>Landfall: - Construction duration: 32 months - Landfall compound: Number: 1, Total Area: 40,000 m², Duration: 32 months - HDD: Number: 8</p> <p>Onshore Export Cable Corridor: - Construction duration: 30 months - Logistics compounds: Number: 8, Size: 140x140 m, Duration: 36 months - ECC: Length: 40 km (approximate), Width: 80m, Area: 3,200,000 m² - Number of cable circuits: 6 - Cable trench: Depth: 1.5 m, Width at base: 1.5m, Width at surface: 5m - HDDs: Number: 112, HDD compounds (entry and exit): 56 70x70m compounds, Duration of HDD Compound: 1 month each - Haul Road: Number: 1, Width: 6m (with 7 m passing places), Length: 40km, Depth: 1m - Temporary access roads: Number: 24, Width: 6 m (with 7 m passing places), Total combined length (excluding existing paved sections): 10km, Depth: 1m</p> <p>Onshore Substation and Energy Balancing Infrastructure: - Construction duration: 36 months - Permanent infrastructure area: 155,000 m² - Temporary works area: 130,000 m²</p> <p>400 kV ECC: - Number of cable circuits: 4 - Cable trench depth: 1.5m - Length: 2,100m, Width: 60 m</p>	The MDS represents the maximum impacts from dust.
AQ-A-2	All-onshore	All	Dust generation and exhaust emissions from traffic Construction, related traffic will be associated with emissions of dust and exhaust gases, which may affect human and ecological receptors.	N/A	Likely significant effect without secondary mitigation	Detailed Assessment -	N/A as impact scoped in	<p>The derivation of the peak construction flows has been carried out by T&T in accordance with their MDS. Refer to Impact ID TT-C-2 to TT-C-8.</p> <p>The Hornsea Four construction-generated traffic flows show that the assessment screening criteria (of 500 vehicles or 100 HDVs per day) is exceeded on 45 roads. The impact of this increase in traffic will therefore be assessed using dispersion modelling.</p> <p>Traffic flows during operation and decommissioning are scoped out of the assessment.</p>	The MDS represents the maximum impacts from traffic generated pollutants.
AQ-O-3	All-onshore	Operation and Decommissioning	Dust generation and exhaust emissions from traffic Operation (and maintenance) and decommissioning related traffic will be associated with emissions of dust and exhaust gases, which may affect human and ecological receptors.	N/A	No likely significant effects	Scoped Out	<p>Traffic associated with operational activities fall below the IAQM thresholds for the assessment of air quality. Operation and maintenance activities are largely preventative and corrective, with remote monitoring of the onshore cables and onshore substation. Further details of the operational impacts are included within Volume 1 Chapter 4 Project Description.</p> <p>The construction of Hornsea Four presents the highest potential for significant environmental effects. Impacts during decommissioning would result in an effect of equal significance, at worst. Primary, tertiary and secondary mitigation measures that are necessary to reduce significant effects during construction to acceptable levels would be secured for decommissioning activities, if relevant, and noted within technical chapters. In line with the proportionate approach to EIA, effects during decommissioning are therefore scoped out of the EIA for Hornsea Four.</p>	N/A as impact scoped out	N/A as impact scoped out
AQ-O-4	All-onshore	Operation	Emissions from facilities Operation and maintenance of the onshore export cable and onshore substation may affect human and ecological receptors.	N/A	No likely significant effects	Scoped Out	Not required as agreement achieved during EIA Scoping.	N/A as impact scoped out	N/A as impact scoped out

AQ-D-5	Cable Route Corridor	Decommissioning	Dust generation Temporary impacts of decommissioning of the OnSS may affect receptors sensitive to dust (human and ecological).	Primary Co41 Tertiary Co64 Co114 Co124 Co127	No likely significant effects	Scoped Out	<p>Decommissioning of the onshore infrastructure for Hornsea Four will comprise the following activities:</p> <ul style="list-style-type: none"> - Buried export cables left in situ, with cable ends cut, sealed and securely buried. Partial removal of cables at landfall occur for aluminium/steel recycling; - Joint Bays and Link boxes will typically be left in situ, or removed if feasible; and - The OnSS above ground electrical equipment and infrastructure will be removed, along with building foundations and security fencing. The site will be returned to its previous condition. <p>Further details will be provided and secured within a Decommissioning Plan, agreed with stakeholders prior to decommissioning commencing.</p> <p>The construction of Hornsea Four presents the highest potential for significant environmental effects. Impacts during decommissioning would result in an effect of equal significance, at worst. Primary, tertiary and secondary mitigation measures that are necessary to reduce significant effects during construction to acceptable levels would be secured for decommissioning activities, if relevant, and noted within technical chapters. In line with the proportionate approach to EIA, effects during decommissioning are therefore scoped out of the EIA for Hornsea Four.</p>	N/A as impact scoped out	N/A as impact scoped out
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ID	Project Element	Original Project Phase	Project Activity and Impact	Embedded Mitigation Measures	Likely Significance of Effect at Scoping Stage and Justification	Hornsea Four position	Further Evidence to Support "Scoping Out"	Maximum Design Scenario (MDS)	Justification
SE-C-1	All - onshore and offshore	Construction	Contributions to economic activity through construction activities	N/A	Potential significant effects (beneficial)	Simple Assessment	N/A as impact scoped in	Maximum Design Scenario not appropriate for employment and GVA related impacts in this case	Effects in relation to employment and GVA generated as a result of construction activity are all beneficial, so a maximum design scenario is not appropriate here. Aside from the size of the workforce, detailed aspects of scheme design do not have a substantial bearing on the economic impact assessment.
SE-C-2	All - onshore and offshore	Construction	Contributions to Employment through construction activities	N/A	Potential significant effects (beneficial)	Simple Assessment	N/A as impact scoped in		Due to the early stages of Hornsea Four, the assessment draws mainly on assumptions from industry evidence rather than specific design factors. Non-design factors (such as the selection of ports, procurement approach and the geography of the development's supply chain) are more important factors in determining the overall level of potential economic impact.
SE-C-3	All - onshore and offshore	Construction	Enabling local residents to access employment opportunities through construction activities	N/A	Potential significant effects (beneficial)	Simple Assessment	N/A as impact scoped in		Three construction scenarios have been assessed which test the sensitivity of impacts with regard to the assumptions around local and UK based benefits.
SE-O-4	All - onshore and offshore	Operation	Contributions to economic activity through operation and maintenance activities	N/A	Potential significant effects (beneficial)	Simple Assessment	N/A as impact scoped in		Effects in relation to employment and GVA generated as a result of operation and maintenance activity are all beneficial, so a maximum design scenario is not appropriate here.
SE-O-5	All - onshore and offshore	Operation	Contributions to Employment through operation and maintenance activities	N/A	Potential significant effects (beneficial)	Simple Assessment	N/A as impact scoped in		Aside from the size of the workforce, detailed aspects of scheme design do not have a substantial bearing on the economic impact assessment. Due to the early stages of Hornsea Four, the assessment draws mainly on assumptions from industry evidence rather than specific design factors. Non-design factors (such as the selection of ports, procurement approach and the geography of the development's supply chain) are more important factors in determining the overall level of potential economic impact.
SE-O-6	All - onshore and offshore	Operation	Enabling local residents to access employment opportunities through operation and maintenance activities	N/A	Potential significant effects (beneficial)	Simple Assessment	N/A as impact scoped in		Two O&M scenarios have been assessed which test the sensitivity of impacts with regard to the assumptions around local and UK based benefits.
SE-D-7	All - onshore and offshore	Decommissioning	Decommissioning Phase Impacts on employment and GVA	N/A	No likely significant effects	Scoped out	Not required as agreement achieved during EIA Scoping.	N/A as impact scoped out	N/A as impact scoped out

SE-A-8	All - onshore and offshore	All	Cumulative Impacts relevant to Socio-economics	N/A	No likely significant effects	Scoped out	Absence of specific response from PINS during EIA scoping, it is assumed agreement to scope out has been achieved. Hornsea Four will be set against a background of a variety of economic development activity and in a regional context will likely provide some economic and employment benefits. The socio-economic assessment will consider the contribution of Hornsea Four to the local, regional and national economy to the extent practicable. However, it is not proposed that positive cumulative effects with other plans and proposals are specifically assessed. This is because such benefits are a desired outcome of local, regional and national policies for economic development and Hornsea Four will simply be adding to the benefits provided from other planned development.	N/A as impact scoped out	N/A as impact scoped out
SE-A-9	All - onshore	All	Tourism Impacts	N/A	No likely significant effects	Scoped out	Absence of specific response from PINS during EIA scoping, it is assumed agreement to scope out has been achieved. The proposed offshore infrastructure is not close to concentrations of onshore or offshore tourism and leisure activity. Likewise, the onshore ECC and associated works are not located close to major tourism centres or tourism and leisure assets. In the absence of significant effects to the tourism economy identified in other chapters (e.g. Volume 3, Chapter 6: Land Use and Agriculture), it is not necessary to assess under Socio-economics.	N/A as impact scoped out	N/A as impact scoped out
SE-A-10	All - onshore	All	Adequate Services and Infrastructure – Pressures on social services such as health care, education and justice	N/A	No likely significant effects	Scoped out	Absence of specific response from PINS during EIA scoping, it is assumed agreement to scope out has been achieved. While there will be a large construction workforce, much of it will be drawn from local and regional resources and no single community social service will be exposed to large-scale demand from workers.	N/A as impact scoped out	N/A as impact scoped out
SE-A-11	All - onshore	All	Adequate Services and Infrastructure – Housing Pressures – eg. affordability, availability and appropriateness	N/A	No likely significant effects	Scoped out	Absence of specific response from PINS during EIA scoping, it is assumed agreement to scope out has been achieved. While there will be a large construction workforce, much of it will be drawn from local and regional resources and demand for temporary accommodation by those hired from outside the region will be distributed over a relatively wide area and unlikely to compete with others (e.g. domestic or tourism) for availability.	N/A as impact scoped out	N/A as impact scoped out