

Hornsea Project Three
Offshore Wind Farm



Hornsea Project Three Offshore Wind Farm

Preliminary Environmental Information Report:
Chapter 11 – Infrastructure and Other Users

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Environmental Impact Assessment

Preliminary Environmental Information Report

Volume 2

Chapter 11 – Infrastructure and Other Users

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Glossary

Term	Definition
Block	A North Sea acreage sub-division measuring approximately 10 x 20 kms, forming part of a quadrant (e.g. Block 9/13 is the 13th block in Quadrant 9) used by the OGA for delineating licence agreements to the oil and gas industry.
Marine Aggregate	Marine dredged sand and/or gravel.
Option or Prospecting Aggregate Extraction Areas	Aggregate areas that have been identified by prospective dredging companies, agreed with The Crown Estate during the tender process and have been awarded the right to apply for a marine licence.
Seismic Survey	The technique involves releasing pulses of acoustic energy along designated lines, the energy penetrates the sub-surface rocks and is reflected back to the surface where it can be detected by acoustic transducers and relayed to a recording vessel.

Acronyms

Acronym	Description
AfL	Agreement for Lease
BEIS	Department for Business, Energy & Industrial Strategy
BMAPA	British Marine Aggregates Producers Association
CA	Cruising Association
CCS	Carbon Capture and Storage
CFAR	Constant False Alarm Rate
CPA	Closest Point of Approach
DECC	Department of Energy and Climate Change
DWR	Deep Water Route
ERRV	Emergency Response and Rescue Vessels
ESCA	European Subsea Cables UK Association
FDP	Field Development Plan
GBF	Gravity Base Foundation
HSE	Health and Safety Executive
ICPC	International Cable Protection Committee
IMO	International Maritime Organization

Acronym	Description
MCA	Maritime and Coastguard Agency
MHWS	Mean High Water Springs
OGA	Oil and Gas Authority
NRA	Navigational Risk Assessment
RCS	Radar Cross Section
REWS	Radar Early Warning System
RYA	Royal Yachting Association
SAS	Surfers Against Sewage
SCUBA	Self-Contained Underwater Breathing Apparatus
SSC	Suspended Sediment Concentration
TCE	The Crown Estate
TCPA	Time to Closest Point of Approach
UCG	Underground Coal Gasification
UKCS	UK Continental Shelf
UKHO	United Kingdom Hydrographic Office
UXO	Unexploded Ordnance

Units

Unit	Description
km	kilometre
GW	Gigawatt
m	metre
MW	Megawatt
NM	Nautical Mile

11. Infrastructure and Other Users

11.1 Introduction

- 11.1.1.1 This chapter of the Preliminary Environmental Information Report (PEIR) presents the findings to date of the Environmental Impact Assessment (EIA) for the potential impacts of the Hornsea Project Three offshore wind farm (hereafter referred to as Hornsea Three) on infrastructure and other users. Specifically, this chapter considers the potential impact of Hornsea Three seaward of Mean High Water Springs (MHWS) during its construction, operation and maintenance, and decommissioning phases.
- 11.1.1.2 This chapter includes information summarised from the technical report included at volume 5, annex 11.1: Radar Early Warning Systems Technical Annex.

11.2 Purpose of this chapter

- 11.2.1.1 The primary purpose of the Environmental Statement is to support the Development Consent Order (DCO) application for Hornsea Three under the Planning Act 2008 (the 2008 Act). This PEIR constitutes the Preliminary Environmental Information for Hornsea Three and sets out the findings of the EIA to date to support pre-application consultation activities required under the 2008 Act. The EIA will be finalised following completion of pre-application consultation and the Environmental Statement will accompany the application to the Secretary of State for Development Consent.
- 11.2.1.2 The PEIR will form the basis for Phase 2 Consultation which will last for 28 days and conclude on 4th September 2017. At this point, comments received on the PEIR will be reviewed and incorporated (where appropriate) into the Environmental Statement, which will be submitted in support of the application for Development Consent scheduled for the second quarter of 2018.
- 11.2.1.3 In particular, this PEIR chapter:

- Presents the existing environmental baseline established from desk studies, and consultation;
- Presents the potential environmental effects on infrastructure and other users arising from Hornsea Three, based on the information gathered and the analysis and assessments undertaken to date;
- Identifies any assumptions and limitations encountered in compiling the environmental information; and
- Highlights any necessary monitoring and/or mitigation measures which could prevent, minimise, reduce or offset the possible environmental effects identified in the EIA process.

11.2.1.4 This PEIR chapter considers the impact of Hornsea Three on existing infrastructure and other users within the vicinity of Hornsea Three. The receptors which are considered in this chapter include:

- Recreational sailing and motor cruising;
- Kite surfing, surfing and windsurfing;
- Sea/surf kayaking and canoeing;
- Scuba diving;
- Recreational fishing;
- Offshore telecommunications cables;
- Carbon capture and storage and natural gas storage;
- Disposal sites;
- Aggregate extraction; and
- Oil and gas operations (including pipelines).

11.3 Study area

- 11.3.1.1 The infrastructure and other users study area for Hornsea Three includes all infrastructure and other users receptors within an area which has the potential to be affected by Hornsea Three. This includes the Hornsea Three array area and the offshore cable corridor, which comprises the offshore development footprint, and extends from the Hornsea Three array area to the UK coastline from Robin Hood's Bay in the north to Walcott in the south.
- 11.3.1.2 The infrastructure and other users study area varies in scale depending on the particular receptor. For example, as the position of existing offshore cable s is well known, the infrastructure and other users study area can be reduced to these exact locations. However, activities such as recreational fishing require a more dynamic study area, as these activities can vary in location due to changing environmental conditions. The infrastructure and other users study area has been divided into different areas according to each receptor, listed below and shown on Figure 11.1:

- **Infrastructure and other users study area: broad (black) area:** This area includes the direct physical overlap of Hornsea Three and considers the potential for movement around Hornsea Three and to and from the coast, for the following receptors:
 - Recreational receptors (including receptors carrying out fishing, sailing and motor cruising; kite surfing; surfing; windsurfing; sea/surf kayaking and canoeing; and SCUBA diving activities);

- **Infrastructure and other users study area: Inner (purple) area (within 1 km of Hornsea Three):** This area includes the extent of potential direct physical overlap between the Hornsea Three project activities and the following receptors:
 - Cable and pipeline operators;
 - Carbon Capture and Storage (CCS), natural gas storage and underground coal gasification; and
 - Oil and gas operators (licence blocks coincident or within 1 km of Hornsea Three).
- **Infrastructure and other users study area: marine processes (yellow) area (within 16 km of the Hornsea Three array area and 21.5 km of the offshore cable corridor):** This area is based on modelled data and one tidal ellipse respectively (see chapter 1: Marine processes), for the following receptors:
 - Aggregate extraction and disposal sites.
- **Infrastructure and other users study area: REWS (green) area (within 35 km of Hornsea Three array):** This area is based on the maximum range of the Radar Early Warning Systems (REWS) located on oil and gas platforms, for the following receptors:
 - REWS and Closest Point of Approach (CPA) alarms.

11.3.1.3 The cumulative effects assessment considers other projects/plans within the broad infrastructure and other users study area (black area) shown in Figure 11.1, with the exception of other offshore wind farms projects, where the cumulative infrastructure and other users study area extends across the southern North Sea (see Figure 11.12).

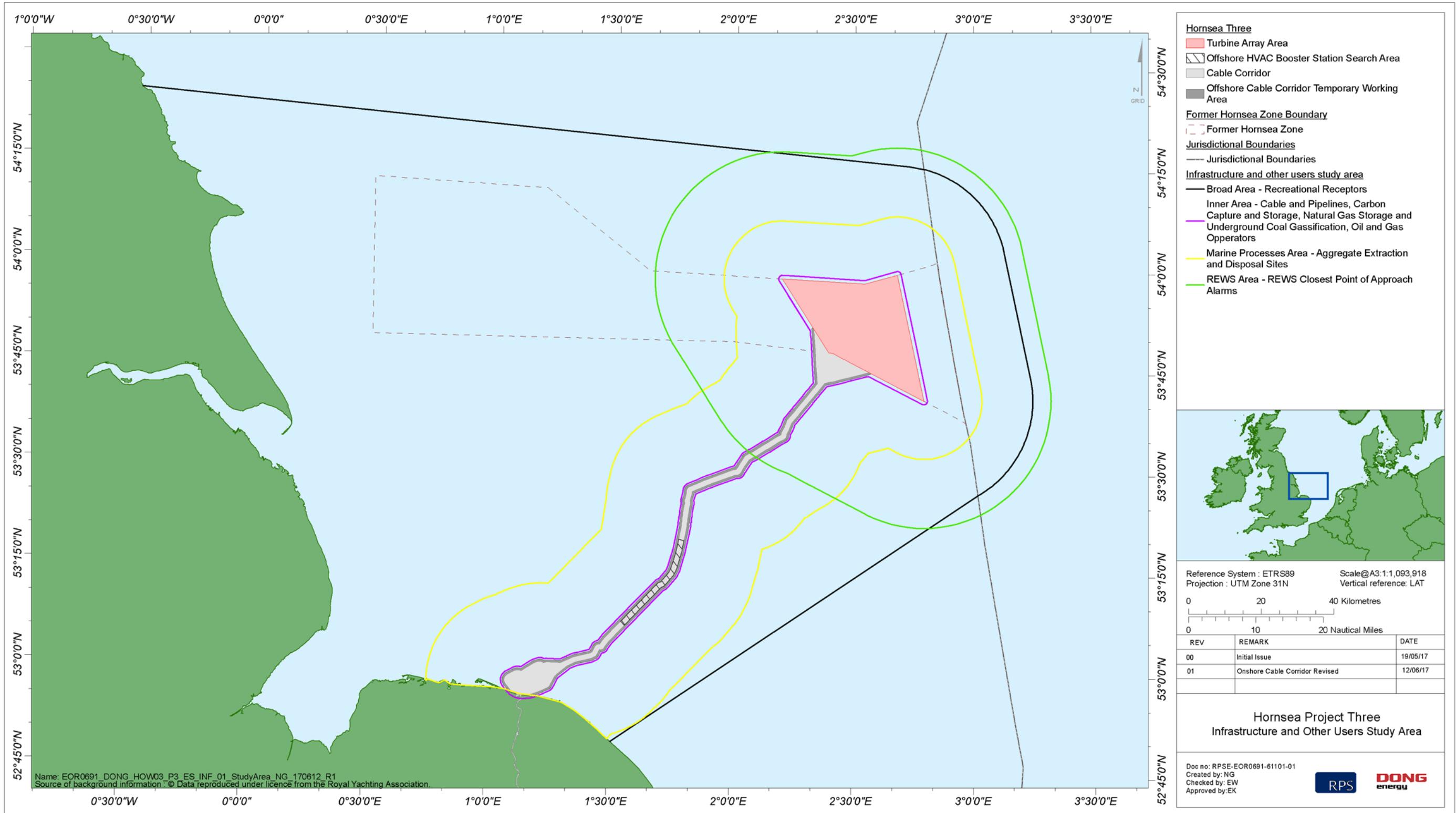


Figure 11.1: Hornsea Three infrastructure and other users study area.

11.4 Planning policy context

- 11.4.1.1 Planning policy on offshore renewable energy Nationally Significant Infrastructure Projects (NSIPs), specifically in relation to infrastructure and other users, is contained in the Overarching National Policy Statement (NPS) for Energy (NPS EN-1; DECC, 2011a) and the NPS for Renewable Energy Infrastructure (NPS EN-3, DECC, 2011b).
- 11.4.1.2 NPS EN-3 includes guidance on what matters are to be considered in the assessment. These are summarised in Table 11.1 below.
- 11.4.1.3 NPS EN-3 also highlights a number of factors relating to the determination of an application and in relation to mitigation. These are summarised in Table 11.2 below.

Table 11.1: Summary of NPS EN-3 provisions relevant to this chapter.

Summary of NPS EN-3 provision	How and where considered in the PEIR
<i>Oil, gas and other offshore Infrastructure and activities</i>	
Paragraph 2.6.179 notes that applicants should undertake an assessment of the potential effect of the proposed development on existing or permitted offshore infrastructure or activities.	The Hornsea Three assessment has considered each of these potential effects and provided an assessment of their likely significance, considering each phase of the development process (i.e. construction, operation and decommissioning).
Paragraphs 2.6.180 – 2.6.181 note that applicants should establish stakeholder engagement with interested parties in the offshore sector early in the development phase of the proposed offshore wind farm, with an aim to resolve as many issues as possible prior to the submission of an application. Such stakeholder engagement should continue throughout the life of the development.	Consultation with potentially affected stakeholders has been carried out from the early stages of the project and continues through the pre-application consultation process. Details of this are presented in Table 11.3.
Paragraph 2.6.184 notes that applicants should ensure site selection and site design of the proposed offshore wind farm has been made with a view to avoiding or minimising disruption or economic loss or any adverse effect on safety to other offshore industries.	Hornsea Three has been sited to minimise disruption with other users, where possible. In cases where potential disruption has been highlighted by early consultation, Hornsea Three has, where appropriate and feasible, provided mitigation measures to reduce or negate impacts. This is discussed further within section 11.11. See also volume 1, chapter 4: Site Selection and Consideration of Alternatives. See also the consultation undertaken to date and how Hornsea Three has considered it (Table 11.3).

Table 11.2: Summary of NPS EN-3 policy on decision making relevant to this chapter.

Summary of NPS EN-3 policy on decision making (and mitigation)	How and where considered in the PEIR
<i>Oil, gas and other offshore Infrastructure and activities</i>	
Paragraph 2.6.183 notes that where a wind farm potentially affects other offshore infrastructure or activity, a pragmatic approach should be employed by the Secretary of State. The Secretary of State should expect the applicant to minimise negative impacts and reduce risks to as low as reasonably practicable.	The Hornsea Three impact assessment describes the steps that Hornsea Three has taken to avoid or reduce the impact of the development (section 11.11).
Paragraph 2.6.184 notes that the Secretary of State should be satisfied that the site selection and site design of the wind farm has been made with a view to avoiding or minimising disruption or economic loss or any adverse effects on safety to other offshore industries. The Secretary of State should not consent applications which pose unacceptable risks to safety after mitigation measures have been considered.	
Paragraph 2.6.186 notes that where schemes have been carefully designed and the necessary consultation has been undertaken at an early stage, mitigation measures may be found that can negate or reduce effects on other offshore infrastructure or operations to a level sufficient to enable the Secretary of State to grant consent.	
Paragraph 2.6.187 notes in relation to mitigation: that detailed discussions between the applicant and the relevant consultees should have progressed as far as reasonably possible prior to the submission of an application. As such, appropriate mitigation should be included in any application and ideally agreed between relevant parties.	
Paragraph 2.6.188 notes that in some circumstances, the Secretary of State may wish to consider the potential to use requirements involving arbitration as a means of resolving how adverse impacts on other commercial activities will be addressed.	Hornsea Three has been sited to minimise conflicts with other users, where possible. In cases where conflict has been highlighted by early consultation, Hornsea Three has, where appropriate and feasible, proposed mitigation measures to reduce or negate impacts (section 11.11). Mitigation measures for infrastructure and other users receptors are presented in Table 11.24 of this chapter. See also volume 1, chapter 4: Site Selection and Consideration of Alternatives.

11.5 Consultation

11.5.1.1 A summary of the key issues raised during consultation specific to infrastructure and other users is outlined below, together with how these issues have been considered in the production of this PEIR.

11.5.2 Hornsea Project One and Hornsea Project Two consultation

11.5.2.1 Hornsea Three has similarities, both in terms of the nature of the development and its location, to Hornsea Project One and Hornsea Project Two. The matters relevant to Hornsea Three, which were raised by consultees during the pre-application and examination phases of Hornsea Project One and Hornsea Project Two on infrastructure and other users matters, are set out in volume 4, annex 1.1: Hornsea Project One and Hornsea Project Two Consultation of Relevance to Hornsea Three.

11.5.3 Hornsea Three consultation

11.5.3.1 Table 11.3 below summarises the issues raised relevant to infrastructure and other users, which have been identified during consultation activities undertaken to date. Table 11.3 also indicates either how these issues have been addressed within this PEIR or how Hornsea Three has had regard to them.

Table 11.3: Summary of key consultation issues raised during consultation activities undertaken for Hornsea Three relevant to infrastructure and other users.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
25 November 2016	PINS Scoping Opinion	Hornsea Three proposed to scope out all airborne noise impacts from activities taking place seaward of MHWS. The Secretary of State agrees that airborne noise seaward of MHWS can be scoped out of the assessment however advises that the ES should consider the potential for significant effects from airborne noise due to activities seaward of MHWS for receptors at the coastline.	The impact from airborne noise due to cable installation activities seaward of MHWS for receptors at the coastline (in the vicinity of the landfall) has been assessed in volume 3, chapter 8: Noise and Vibration. Further justification for scoping out airborne noise impacts is provided in Table 11.20.
25 November 2016	PINS Scoping Opinion	Hornsea Three proposed to scope out the displacement of recreational vessels, kite surfing, kayaking, surfing and diving from the Hornsea Three array area. With the exception of recreational vessels, the Secretary of State agrees that these effects can be scoped out. However the Secretary of State does not agree that the displacement of recreational vessels, kite surfing, kayaking, surfing and diving effects can be scoped out for activities associated with the export cable.	The impact on recreational vessels within the Hornsea Three array area has been assessed in paragraph 11.11.1.3 and paragraph 11.11.2.3. The impact on recreational vessels, kite surfing, kayaking, surfing and diving in the offshore cable corridor has been assessed in paragraph 11.11.1.3 and paragraph 11.11.2.3. Further justification for scoping out impacts is provided in Table 11.18.
25 November 2016	PINS Scoping Opinion	The ES should clearly explain the methodology used to assess effects on recreational craft, pipelines and oil and gas operators and the criteria used to evaluate the significance of those effects.	The EIA methodology for infrastructure and other users is detailed in section 11.9. The criteria used to evaluate the significance of effect are presented in Table 11.23.
25 November 2016	Coal Authority Scoping Response	The Coal Authority has no issues that it would wish to see considered as part of the Environmental Statement for this proposal.	N/A
25 November 2016	MMO Scoping Response	The MMO agrees with the approach and data sources outlined by Hornsea Three regarding other sea users. Iterative discussions with consultees regarding the requirement and feasibility of any mitigation measures are expected to provide a robust assessment of the proposed development.	Navigation, and associated consultation, is presented in chapter 7: Shipping and Navigation. Assessment of effects on other sea users (including recreational vessels and recreational fishing vessels) is presented in section 11.11.
23 February 2017	Navigational Risk Assessment (NRA) Hazard Workshop	Concerns were raised in regard to the distance between the Hornsea Three offshore cable corridor and the dredging site currently in production and the impacts of exclusion zones around export cable maintenance vessels on dredging activities. Centrica noted that future oil and gas developments in the area could be impacted by Hornsea Three, with helicopter operations and diving activities (in relation to foundation piling for Hornsea Three) cited as examples of operations that could be impacted. In relation to REWS and Closest Point of Approach, Vroon raised concerns that Emergency Response and Rescue Vessels (ERRVs) may have difficulty monitoring vessel traffic following the construction of Hornsea Three, particularly at the Schooner and Ketch fields. The Cruising Association (CA) stated that there was little concern with regards to the marking of structures within the Hornsea Three array area, although it is possible to become disorientated especially if there is larger spacing between structures, as identifying rows of turbines can become difficult. However the greater spacing between structures may result in a less strong stance on the need for alignment. The CA advised that the angle of the proposed navigation corridor between the Hornsea Three array area and Hornsea Project One and Hornsea Project Two is not of great significance to recreational vessels since they would be unlikely to use it for transit, and the presence of a Deep Water Route (DWR) would also not be an issue. The CA advised that the region containing the Hornsea Three array area is the worst in the UK in terms of visibility, however the fog signals typical of offshore wind farm developments would be sufficient and yachts would consider using the array area for transit as large vessels would not consider following. The prohibition of anchoring within the array area was discussed, with Anatec advising that rights of navigation are only extinguished at structures (except during maintenance operations) and that a lower scale Admiralty chart could be produced in order to mark the array cabling clearly. The CA raised concerns that the offshore HVAC booster stations could obstruct vessels transiting along the coast to e.g. Whitby. The CA commented that in order to qualify for a Royal Yachting Association (RYA) Yachtmaster Ocean certificate a continuous 600 mile passage must be undertaken, and a popular route for undertaking this passage may involve navigating through the Hornsea Three array area and/or offshore HVAC booster stations.	The impact on dredging activity is considered within Table 11.19. The impact on aggregate resource is assessed in paragraph 11.11.1.25. The impact of Hornsea Three on vessel rerouting is assessed in chapter 7: Shipping and Navigation. The impact on helicopter operations is assessed in chapter 8: Aviation, Military and Communication. Subsea noise resulting from Hornsea Three piling is discussed within volume 4, annex 3.1: Subsea Noise Technical Report. The Schooner A and Ketch platforms are not protected by REWS as detailed within section 11.7.16. The effect of Hornsea Three on recreational vessels is assessed in paragraph 11.11.1.3 and paragraph 11.11.2.3.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
01 February 2017	Royal Yachting Association (RYA)	<p>The RYA is not too concerned with respect to the Hornsea Three array area on the basis that there is very little recreational activity that far offshore and anyone who is transiting that far offshore would be very experienced and well equipped. The RYA's main concern relates to the cable landfall and any resulting reduction in water depth, and also noted that there could be issues where the cable crosses inland waterways.</p> <p>The RYA would not be too concerned with respect to the proposed layouts, and considered the proposed navigation corridor between the Hornsea Three array area, Hornsea Project One and Hornsea Project Two to be more than adequate with respect to use by recreational craft.</p> <p>The RYA does not see the need for operational safety zones for floating offshore wind turbines but respects the use of safety zones during construction as well as for manned structures during operation.</p>	<p>The impact on recreational vessels is assessed in paragraph 11.11.1.3 and paragraph 11.11.2.3.</p> <p>Safety zones are discussed in section 11.10.</p> <p>The impact on onshore recreational activities is assessed in volume 3, chapter 6: Land Use, Agriculture and Recreation.</p>
25 November 2016	Alpha Petroleum	<p>Alpha Petroleum assets within the vicinity of Hornsea Three are the Wenlock platform and the licenced acreage immediately around this platform (49/12b). It is highly likely that the Wenlock platform will be decommissioned before the start of Hornsea Three offshore construction (which at the time of consultation was scheduled for 2023). Wells and platform piles would be cut 3 m below sea bed, while the pipeline tieing back to Indefatigable platform is likely to be abandoned in situ. Due to the timing of the decommissioning of the Wenlock platform it was considered by all parties that there were no potential significant interactions between the two projects.</p>	<p>Note: Hornsea Three offshore construction is now scheduled to commence in 2022 (see volume 1, chapter 3: Project Description). Further consultation will be carried out with Alpha Petroleum prior to the Environmental Statement to clarify the timing of the decommissioning of the Wenlock platform.</p> <p>Licence 49/12b intercepted with the offshore cable corridor presented within the Hornsea Three Scoping Report (DONG Energy Power (UK) Ltd, 2016). The offshore cable corridor presented in the PEIR no longer intercepts this licence block. Following this consultation there has been no further assessment of Alpha Petroleum assets or infrastructure.</p>
19 September 2016	Centrica Resources UK pre-application consultation	<p>Centrica advised that production had stopped in the Audrey field and that the two platforms Audrey B (XW) Audrey XW 2 and Audrey 1 WD Audrey A (WD) would be decommissioned, which may be complete by Hornsea Three construction.</p> <p>Pipeline proximity and crossing agreements were discussed, which may also be required for decommissioned pipelines left in situ.</p> <p>Advised that the ST-1 platform is shut-in and close to being decommissioned (decommissioning plans have been submitted to BEIS). Advised that the Markham complex is managed from Centrica's Hoofddorp office in the Netherlands.</p> <p>Regarding REWS and CPA, Centrica are conducting studies with Ultra in the east Irish Sea and advised that mitigation included a REWS software update. Centrica confirmed that the REWS feed associated with the Greater Markham Area is managed by the asset as normally there is no ERRV..</p> <p>Discussed the proximity of the Hornsea Three array area and the Chiswick platform (2.69 km), and associated impracticalities regarding helicopter access/egress to/from the Chiswick platform and any future exploration vessels.</p> <p>Discussed the requirement to enter into a confidentiality agreement with regard to Centrica future activities.</p>	<p>The two Audrey platforms were located within the offshore cable corridor presented within the Hornsea Three Scoping Report (DONG Energy Power (UK) Ltd, 2016). The offshore cable corridor presented in the PEIR no longer intercepts the two platforms.</p> <p>Pipeline proximity and crossing agreements are discussed in paragraph 11.7.15.2.</p> <p>The impact on the Centrica operated REWS is discussed in paragraph 11.11.2.65.</p> <p>The impact on CPA to Centrica operated platforms will be assessed in the Environmental Statement which will be submitted in Quarter 2 of 2018. .</p> <p>Helicopter access to Centrica's Chiswick platform is discussed in chapter 8: Aviation, Military and Communication.</p>
05 December 2016	Centrica Resources UK pre-application consultation	<p>Centrica discussed the recently acquired licence P2286 covering blocks 49/3, 49/9d and 49/4d in the 28th licence round. Explained they were a drill or drop licence with a well required to be drilled prior to September 2019 prior to Hornsea Three construction. Both parties noted that it is currently very difficult to gauge the potential impacts to each party due to the uncertainty surrounding locations of exploration wells and wind farm layouts at the present time.</p> <p>Discussed the requirement for further consultation when the Hornsea 3 project would be more advanced and further information would be available to be provided from Centrica.</p>	<p>The potential impact on Centrica operated licences presented in section 11.11 are currently on hold pending further consultation between Hornsea Three and Centrica.</p> <p>The potential impact to Centrica operated licences will be presented in the Environmental Statement which will be submitted in Quarter 2 of 2018.</p>
12 December 2016	Centrica Resources UK pre-application consultation	Centrica confirmed they have a REWS on the J6A platform, which covers the surrounding platforms in the Greater Markham Complex (i.e. Chiswick, Markham ST-1, Windermere and Grove platforms (all NUI)).	The impact on REWS on the J6A platform is assessed in paragraph 11.11.2.65.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
19 September 2016	ConocoPhillips pre-application consultation	<p>Advised that the Viking field and Viking Transmission System (which is currently out of service and not gas-filled) are currently being decommissioned. The future of the area depends on late life plans still under discussion.</p> <p>Noted that the Hornsea Three offshore cable corridor scoping area presented a number of issues with regard to pipelines and infrastructure. There may be a temporal overlap between Hornsea Three construction activities and ConocoPhillips decommissioning activities. Discussed requirement for crossing/proximity agreements with pipelines (active or decommissioned and left in situ).</p> <p>Advised that LOGGS is still fully operational, and the infrastructure may well be in place in 2023.</p> <p>Discussed potential effect of Hornsea Three on the REWS protecting the Saturn and Murdoch platforms. Noted that vessel rerouting and alignment with ConocoPhillips platforms was a potential issue.</p>	<p>Note: Hornsea Three offshore construction is now scheduled to commence in 2022 (see volume 1, chapter 3: Project Description). Further consultation will be carried out with oil and gas operators.</p> <p>The impact of Hornsea Three offshore cable corridor construction activities on ConocoPhillips assets and infrastructure is assessed in section 11.11.</p> <p>Pipeline crossing and proximity agreements are discussed in paragraph 11.7.15.2.</p> <p>The impact on ConocoPhillips operated REWS is assessed in paragraph 11.11.2.65.</p> <p>The impact on CPA of ConocoPhillips operated platforms will be assessed in the Environmental Statement which will be submitted in Quarter 2 of 2018.</p>
21 November 2016	ConocoPhillips pre-application consultation	ConocoPhillips provided information about their REWS, which is split into two systems, quad 44 and quad 49. Each comprises of a number of radars and AIS which feed information into a field wide collision risk management system which protects the whole field. Interference on one radar would therefore have an effect on the whole field.	The impact on REWS for ConocoPhillips operated platforms is assessed in paragraph 11.11.2.65.
24 October 2016	Shell pre-application consultation	<p>Discussed helicopter access requirements to the Cutter and Carrack platforms, and pipeline crossing and proximity agreements.</p> <p>Shell raised a concern regarding access to the Galleon platform. If a jack-up vessel was needed, this would be jacked up within the 500 m safety zone of the platform.</p> <p>Shell identified that Carrack West is a subsea installation (well head) to the south of Carrack, which has been decommissioned.</p> <p>Shell confirmed that in the short term, no decommissioning activities are planned and there are no plans for any new platforms.</p> <p>Shell had no immediate concerns from an exploration perspective however a confidentiality agreement would be required to discuss future activity.</p>	<p>Helicopter access to the Cutter and Carrack platforms is assessed in chapter 8: Aviation, Military and Communication.</p> <p>The impact of the Hornsea Three offshore cable corridor on Shell assets and infrastructure is assessed in section 11.11. Note: the Galleon platform was located within the offshore cable corridor presented within the Hornsea Three Scoping Report (DONG Energy Power (UK) Ltd, 2016). This platform is not located within the offshore cable corridor presented in the PEIR.</p> <p>Pipeline crossing and proximity agreements are discussed in paragraph 11.7.15.2.</p>
20 December 2016	Shell pre-application consultation	Shell advised they do not have REWS on the Cutter and Carrack platforms and that these platforms are protected by radar protection from standby vessels/emergency relief vessels located at the Clipper facilities.	The impact of Hornsea Three on marine radar is considered in chapter 7: Shipping and Navigation.
05 April 2017	Shell pre-application consultation	Repeat of the consultation previously carried out on 24 October 2016 to new points of contact within Shell.	N/A
08 December 2016	Third Energy pre-application consultation	<p>Third Energy has two prospects within licence block 44/27 (P2284), with all wells to be drilled prior to the start of offshore construction. As there would be no requirement for platforms, no significant issues are anticipated in relation to Hornsea Three at this stage.</p> <p>Discussed the potential extension of life to the Schooner A platform. The Oil and Gas Authority (OGA) is working with oil and gas operators to look at ways of maximising production but it may involve considerable infrastructure change and rerouting of gas.</p>	The impact on helicopter access to Third Energy licenced acreage is assessed in chapter 8: Aviation, Military and Communication.
22 September 2016	Wintershall	Potential for interaction between Hornsea Three piling activities and Wintershall seismic survey activity within their licenced acreage to the north of Hornsea Three. Hornsea Three advised that subsea sound would be modelled for construction activities. Advised that well 49/08c-4 is currently suspended and is subject to final abandonment.	Subsea noise resulting from Hornsea Three piling is discussed within volume 4, annex 3.1: Subsea Noise Technical Report, and assessed in relation to seismic survey activities within paragraph 11.11.1.81.
10 November 2016	Faroe Petroleum	<p>Discussed future plans for the Schooner A and Ketch platforms, and the likely scenario of the platforms being decommissioned by 2021/2022. Noted that the 9 NM consultation zones surrounding the Schooner and Ketch platforms intercept with the Hornsea Three array area.</p> <p>Faroe advised that little activity occurred in the licensed areas and that any activity would occur within the 500 m safety zones of the Schooner and Ketch platforms. Advised that the suspended exploration well in the licence area would be Plugged and Abandoned (P&A). No seismic survey activity was planned for the licensed acreage.</p> <p>The Schooner and Ketch platforms are NUI's and do not have REWS. When the platforms are manned, a multi-use vessel patrols the platform and safety zone, acting as an ERRV. Noted that timing of decommissioning indicates that CPA is not anticipated to be an issue.</p>	<p>The impact on helicopter access to the Schooner A and Ketch platforms is assessed in chapter 8: Aviation, Military and Communication.</p> <p>Potential impacts on activities in the licensed acreage operated by Faroe is assessed in section 11.11 and in regard to helicopter access in chapter 8: Aviation, Military and Communication.</p>

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
26 January 2017	Faroe Petroleum – email	Faroe advised that Hornsea Three activities do not impinge on their gas fields, as Faroe operations will be completed and decommissioned prior to the start of Hornsea Three construction in 2023.	Note: Hornsea Three offshore construction is now scheduled to commence in 2022 (see volume 1, chapter 3, Project Description). Further consultation will be carried out with oil and gas operators. Potential impacts on activities in the licenced acreage operated by Faroe is assessed in section 11.11 and in regard to helicopter access in chapter 8: Aviation, Military and Communication.
24 November 2016	Petrofac pre-application consultation	Petrofac advised that the Schooner A and Ketch platforms do not have REWS and are not protected by REWS.	N/A
07 December 2016	Independent Oil and Gas pre-application consultation	Independent Oil and Gas operates 48/24b which overlaps with the Hornsea Three offshore cable corridor, and has recently acquired the Vulcan satellite fields in the northeast of 48/25 and mid and south 49/21. Current development plans are based around the utilisation of existing infrastructure, including tie-ins to existing export pipelines, with the infrastructure scheduled to be in place prior to 2023. Independent Oil and Gas advised that there will be new wells across all their licenced acreage and at least two gas hubs and subsea tiebacks. The first well will be in licence P1736 (block 48/23a) by mid-2018 with first gas by end 2018.	Note: Hornsea Three offshore construction is now scheduled to commence in 2022 (see volume 1, chapter 3, Project Description). Further consultation will be carried out with oil and gas operators. The impact on Independent Oil and Gas licenced acreage is assessed in section 11.11. Pipeline crossing and proximity agreements are discussed in paragraph 11.7.15.2.
08 February 2017	Independent Oil and Gas pre-application consultation	Independent Oil and Gas provided an email update of their development plans. The draft Field Development Plan (FDP) was issued to the OGA in December 2016. They will complete subsurface evaluations in April which will provide well location considerations.	The impact on Independent Oil and Gas licenced acreage is assessed in section 11.11.
04 October 2016	INEOS	INEOS advised that the Windermere platform is not producing and will be decommissioned (with wells) prior to 2023. The Topaz subsea well (which does not have a safety zone) is also not producing and will be decommissioned by 2023, with the pipeline likely to remain in situ. Post-decommissioning requirements include one or two surveys but no ongoing monitoring obligations. The Clipper South platform currently ties back to Loggs. A new pipeline is proposed that will either go north to the Clipper platform or west to a Perenco asset. Recently published production profile indicated a P10 profile that extends to 2024. INEOS advised they have no current exploration plans in the southern North Sea.	Note: Hornsea Three offshore construction is now scheduled to commence in 2022 (see volume 1, chapter 3, Project Description). Further consultation will be carried out with oil and gas operators. Helicopter access to the Windermere platform and Topaz subsea well is assessed in chapter 8: Aviation, Military and Communication. Pipeline crossing and proximity agreements are discussed in paragraph 11.7.15.2. The impact of the Hornsea Three offshore cable corridor on INEOS assets and infrastructure is discussed in section 11.11.
28 September 2016	OGA	The OGA advised that the Hornsea Three offshore cable corridor was unlikely to be a major issue however the Hornsea Three array area was of interest. There is no new or pending legislation regarding licencing or pipelines that Hornsea Three should be aware of, and the OGA are not progressing any primary legislation but environmental legislation was more active. The 29 th and 30 th licence rounds and out of round bids were discussed. The 29 th round only offered those blocks covered by the recent government seismic survey area, and a further mini round was being considered although this did not include blocks within the Hornsea Three array area. The content of the 30 th licence round had not yet been decided, but it would include the licences coincident with the Hornsea Three array area. The timing of this round was not confirmed but it could be Q1 2017. The OGA shared their corporate plan for 2016 to 2021 which advises a further seismic programme to be delivered that is not coincident with Hornsea Three. Future plans for end of life oil and gas collaboration (e.g. gas compression) were discussed. The OGA advised they were considering a compression concept but no area had been decided as yet. The OGA advised that there would be a lot of decommissioning activity in the offshore cable corridor, with the Viking field already undergoing decommissioning and ConocoPhillips potentially closing all fields feeding the Theddlethorpe terminal (i.e. LOGGS, Viking and CMS). Fields that feed into these platforms (e.g. Centrica's Audrey field) would then need to cease producing as well.	Offshore oil and gas licence rounds are discussed in paragraph 11.7.9.1. Decommissioning plans are discussed in section 11.7.11. Note: oil and gas platforms were located within the offshore cable corridor presented within the Hornsea Three Scoping Report (DONG Energy Power (UK) Ltd, 2016). There are no platforms located within the offshore cable corridor presented in the PEIR (see section 11.7.11). Seismic survey activity is discussed in section 11.11.
16 March 2017	Engie UK	Engie UK have no concerns with regard to the project at this stage.	N/A

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
06 April 2017	Ithaca	<p>The cessation of production at the Anglia A platform has recently been agreed, and the platform is in hydrocarbon safe mode pending the development and approval of decommissioning plans. The Anglia A to LOGGS PP pipelines may be decommissioned in situ or removed. The Ithaca decommissioning programme may overlap with the Hornsea Three construction schedule.</p> <p>Ithaca do not have any current development plans within licence P128 (licence blocks 48/18b and 48/19b).</p> <p>No significant concerns regarding future interactions were raised and the need for proximity and crossing agreements was discussed.</p>	<p>Ithaca assets were located within the offshore cable corridor presented within the Hornsea Three Scoping Report (DONG Energy Power (UK) Ltd, 2016). The offshore cable corridor presented in the PEIR no longer intercepts the Anglia A platform or licence blocks 48/18b and 48/19b.</p> <p>Pipeline crossing and proximity agreements are discussed in paragraph 11.7.15.2.</p>
03 April 2017	Total Netherlands – pre application consultation meeting	Total Netherlands advised that they had no immediate concerns with regard to the Netherlands licence blocks. Total Netherlands take the lead for the Total UK licence and will respond shortly in this regard.	N/A
03 April 2017	Total UK – email	Total Netherlands advised that the Total UK licence block 49/10b is part of the Markham complex and is now operated by Centrica.	The baseline for oil and gas operations is presented within section 11.7.9.

11.6 Methodology to inform the baseline

11.6.1 Desktop study

11.6.1.1 Information on infrastructure and other users within the infrastructure and other users study area was collected through a detailed desktop review of existing studies and datasets and through consultation. Data sources are summarised at Table 11.4 below.

Table 11.4: Summary of key data sources.

Topic	Data Source
Recreational activities	UK Atlas of Recreational Boating (RYA) SeaSearch Finstrokes Young 2003 and 2004
Recreational fishing	Defra (2013) Sea Angling 2012 – a survey of recreational sea angling activity and economic value in England, November 2013 Offshore Energy SEA (2009)
Offshore wind farms	The Crown Estate (TCE) Charts Offshore Wind Projects TCE Wind Farm Export Cable Routes Seabed Agreement
Offshore cables	SeaZone Solutions Ltd Kingfisher Information Service – Cable Awareness (KIS-ORCA) TCE Wind Farm Export Cable Routes Seabed Agreement Electrics, Telecommunications Cables in the North Sea (Emodnet)
Disposal sites	SeaZone Solution Ltd Cefas 2016 Licenced Disposal Sites for all of UK
Marine aggregate extraction	TCE Marine Aggregate Agreements BMAPA dredger reports Rijkswaterstaat (Ministry of Infrastructure and the Environment)
Carbon capture and storage	TCE
Natural gas storage	TCE
Oil and gas assets	UK Oil and Gas Data/CDA/nlog Consultation with oil and gas operators

11.6.1.2 The assessment of environmental impacts for infrastructure and other users was also designed and undertaken in accordance with the following guidance documents/references:

- The RYA's Position on Offshore Renewable Energy Developments: Paper 1 (of 4) – Wind Energy, September 2015 (RYA, 2015);
- Guidance on Environmental Impact Assessment of Offshore Renewable Energy Development on Surfing Resources and Recreation (SAS, 2009);
- European Subsea Cables UK Association (ESCA) Guideline No 6, The Proximity of Offshore Renewable Energy Installations and Submarine Cable Infrastructure in UK Waters (ESCA, March 2016);
- The International Cable Protection Committee (ICPC) recommendations:
 - Recommendation No.2. Recommended Routing and Reporting Criteria for Cables in Proximity to Others (ICPC, 2015);
 - Recommendation No.3. Criteria to be Applied to Proposed Crossings Submarine Cables and/or Pipelines (ICPC, 2014); and
 - Recommendation No.13. The Proximity of Offshore Renewable Wind Energy Installations and Submarine Cable Infrastructure in National Waters (ICPC, 2013).
- Oil and Gas Licencing Rounds (OGA, 2016a);
- Oil and Gas UK, Pipeline Crossing Agreement and Proximity Agreement Pack (Oil and Gas UK, 2015a); and
- TCE Guidance: Offshore wind farms and electricity export cables – crossing agreements (TCE, 2012).

11.7 Baseline environment

11.7.1 Recreational sailing and motor cruising

This section provides an overview of recreational sailing and motor cruising activity within the infrastructure and other users study area (see Figure 11.1, Broad Area, denoted in black). It should be noted that recreational sailing and motor cruising is considered in the Navigational Risk Assessment as a specific vessel size category (volume 5, annex 7.1: Hornsea Three Array Area, Offshore Cable Corridor and Hornsea Three Offshore HVAC Booster Station Search Area Navigational Risk Assessment), and the infrastructure and other users chapter considers receptors undertaking recreational sailing and motor cruising as an activity only.

Recreational sailing is generally divided into two categories: offshore and inshore. Offshore sailing is usually undertaken by yachts in the form of either cruising or organised offshore racing. Inshore sailing is typically undertaken by smaller vessels including dinghies and recreational vessels that are used for either cruising at leisure or racing. Cruising may include day trips between local ports and often includes a return journey to the home port on the same day. Inshore racing takes place around racing marks and navigational buoyage.

Recreational sailing usually takes place in the vicinity of established sailing clubs. However, boats can also be launched and sailed wherever access to launch is permitted and therefore the activity is not always associated with a specific club.

Hornsea Three array area

Due to the distance of the Hornsea Three array area from the UK coast (approximately 121 km/65 NM at its nearest point), any sailing would be likely to only consist of occasional offshore cruising and racing. The RYA atlas of recreational boating does not identify any activity in the vicinity of the Hornsea Three array area. This does not preclude the presence of cruising or racing within the Hornsea Three array area, but does indicate the overall usage must be low (and occasional). . The RYA also noted during consultation that there is very little recreational activity as far offshore as the Hornsea Three array area, with any activity likely to be limited to very experienced and well equipped sailors (Table 11.3).

The maritime traffic surveys carried out in June/July 2016 to inform the Navigational Risk Assessment (NRA) (see volume 5, annex 7.1: Hornsea Three Array Area, Offshore Cable Corridor and Hornsea Three Offshore HVAC Booster Station Search Area Navigational Risk Assessment) recorded recreational vessel tracks passing through the Hornsea Three array area. The majority of recreational traffic intersecting the site however was recorded on 28th and 29th June when the 500 NM North Sea Race was taking place, and this is not considered to be representative of baseline levels of recreational usage.

Offshore cable corridor

11.7.1.6

The East Anglia and Humber coasts are recognised as popular UK sailing areas with several RYA clubs and marinas (DECC, 2009). Figure 11.2 presents data from the RYA atlas of recreational boating. There are a number of sailing clubs along the North Norfolk coastline, with Blakeney sailing club being the nearest to the Hornsea Three offshore cable corridor. There is low to medium recreational vessel activity in the nearshore area of the Hornsea Three offshore cable corridor, with a number of offshore routes fanning out from the coastal area which are likely to intersect the offshore cable corridor. The offshore cable corridor also crosses a general boating area, which runs parallel to the coast.

11.7.1.7

The maritime traffic surveys carried out in September 2016 to inform the NRA (see volume 5, annex 7.1: Hornsea Three Array Area, Offshore Cable Corridor and Hornsea Three Offshore HVAC Booster Station Search Area Navigational Risk Assessment) recorded recreational vessel tracks crossing the Hornsea Three offshore cable corridor, including the offshore HVAC booster station search area, although activity was very limited.

11.7.2

Other recreational activities

Offshore cable corridor

11.7.2.1

This section provides an overview of other recreational activities within the infrastructure and other users study area (see Figure 11.1, Broad Area, denoted in black). Kite surfing, surfing and wind surfing all occur almost entirely in coastal waters, usually within 1 NM of the shore. Kite surfing, surfing and wind surfing all have the potential to occur within the nearshore and inshore sections of the Hornsea Three offshore cable corridor.

11.7.2.2

There is no physical restriction on the offshore range of kayaks and canoes however for logistical and safety reasons most will stay relatively close to the shore, undertaking coastal rather than seaward trips. Kayaking and canoeing have the potential to occur within the nearshore and inshore sections of the Hornsea Three offshore cable corridor.

11.7.2.3

There are several SCUBA diving sites within the nearshore and inshore sections of the Hornsea Three offshore cable corridor (Figure 11.2), including sites associated with ship wrecks (e.g. the SS Vera and SS Rosalie), the Sheringham chalk gullies (Finstrokes, 2017), and survey activity (Seasearch, 2017).

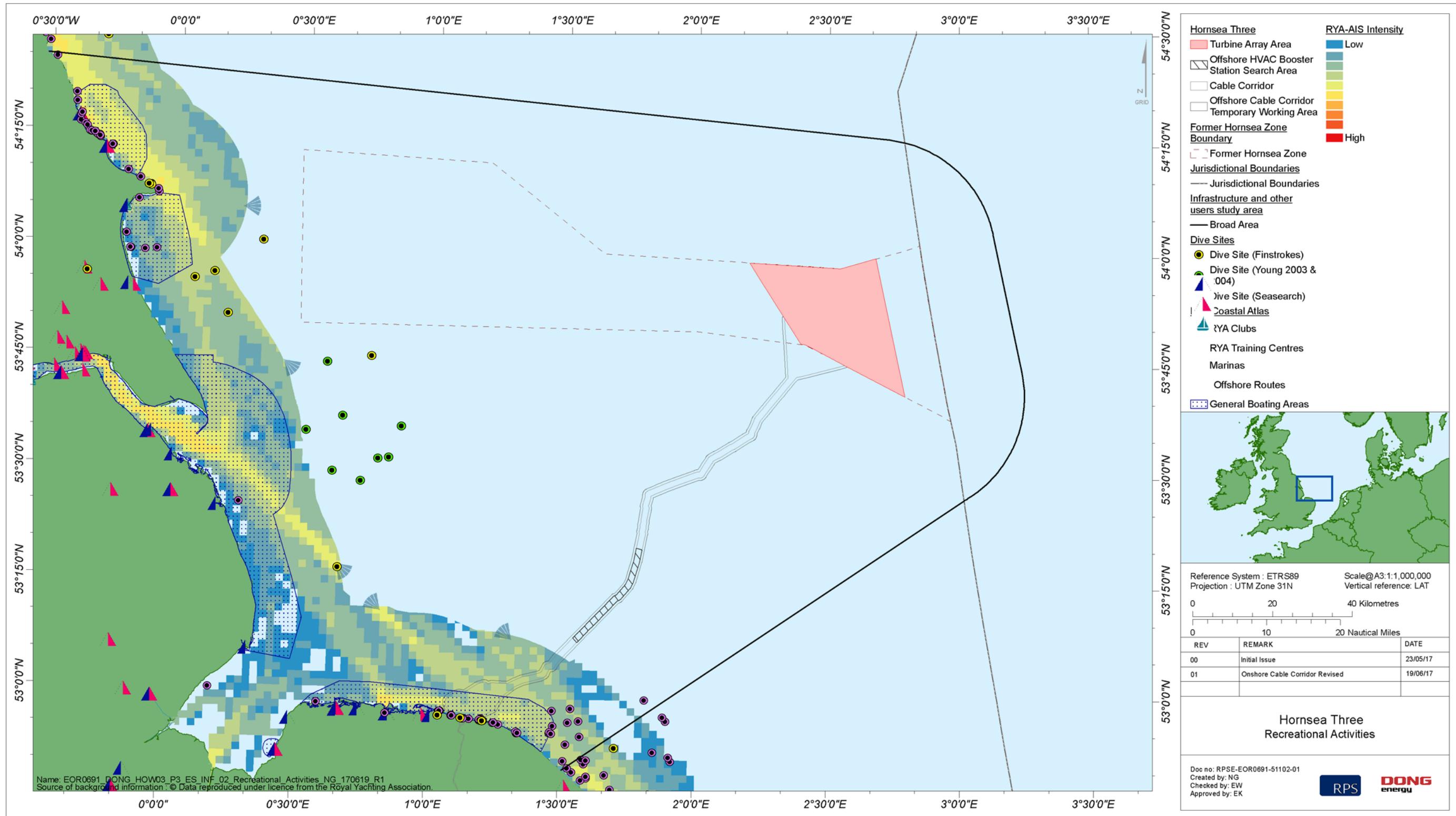


Figure 11.2: Recreational sailing activities and SCUBA diving sites in the vicinity of Hornsea Three.

11.7.3 Recreational fishing

11.7.3.1 This section provides an overview of recreational fishing activity within the infrastructure and other users study area (see Figure 11.1, Broad Area, denoted in black) (i.e. fishing for pleasure rather than commercial reasons). It should be noted that recreational fishing vessels are considered in the Navigational Risk Assessment as a specific vessel size category (volume 5, annex 7.1: Hornsea Three Array Area, Offshore Cable Corridor and Hornsea Three Offshore HVAC Booster Station Search Area Navigational Risk Assessment), and the infrastructure and other users chapter considers receptors undertaking recreational fishing as an activity only.

11.7.3.2 The 2012 Sea Angling survey estimated that there are 884,000 sea anglers in England, with almost four million days of sea angling recorded over the survey year (Defra, 2013). Shore fishing was the most common type of sea angling (almost 3 million angler-days) compared with private/rented boats (1 million) and charter boats (0.1 million). It is generally considered that the area within 1 NM of the shoreline is of prime importance to anglers (Offshore Energy SEA, 2009).

Hornsea Three array area

11.7.3.3 Due to the distance of the Hornsea Three array area from the UK coastline (approximately 121 km/65 NM at its nearest point), recreational fishing vessel activity is likely to be limited. No recreational fishing vessels were identified in the vicinity of the Hornsea Three array area during the maritime traffic surveys (see volume 5, annex 7.1: Hornsea Three Array Area, Offshore Cable Corridor and Hornsea Three Offshore HVAC Booster Station Search Area Navigational Risk Assessment).

Offshore cable corridor

11.7.3.4 The principal ports and angling locations in the eastern region are Southend, Burnham, Bradwell and Lowestoft for boat angling, with 26 charter boats, and Canvey, Clacton, Aldeburgh, Lowestoft and Cromer for shore angling (Offshore Energy SEA, 2009). A number of areas in proximity to the offshore cable corridor landfall are also listed by British Sea Fishing as venues for shore fishing, including Wells-Next-the-Sea, Blakeney, Sheringham and Cromer (British Sea Fishing, 2017).

11.7.3.5 No recreational fishing vessels were identified in the vicinity of the Hornsea Three offshore cable corridor during the maritime traffic surveys (see volume 5, annex 7.1: Hornsea Three Offshore Array Area, Offshore Cable Corridor and Hornsea Three Offshore HVAC Booster Station Search Area Navigational Risk Assessment).

11.7.4 Offshore wind farms

11.7.4.1 This section provides an overview of offshore wind farm activity within the infrastructure and other users study area (southern North Sea). Offshore wind farms are shown in Figure 11.3. The closest consented offshore wind farms are Hornsea Project One (7 km from the Hornsea Three array area; 7 km from the offshore cable corridor) and Hornsea Project Two (7 km from the Hornsea Three array area; 18 km from the offshore cable corridor).

11.7.4.2 The Dudgeon offshore wind farm (under construction) is located 87 km from the Hornsea Three array area and 11 km from the offshore cable corridor. Sheringham Shoal (operational) is located 109 km from the Hornsea Three array area and 7 km from the offshore cable corridor. There are a number of other proposed offshore wind farm sites across the southern North Sea.

11.7.5 Cables

11.7.5.1 This section provides an overview of cables within the infrastructure and other users study area (see Figure 11.1, Inner Area, denoted in purple) for cable and pipeline operators. Cables are shown in Figure 11.3 and also within the crossing schedule (volume 4, annex 3.4: Crossing Schedule (Offshore)). There is one active telecoms cable, Norsea com 1 segment 3/Tampnet operated by Viatel UK Ltd/Tampnet, which crosses north-south across the Hornsea Three array area. There are two out of service cables crossing the Hornsea Three array area, one route with two branches (Stratos 1 and Stratos 2) and one route Weybourne to Esbjerg. There are no other cables within 1 km of the Hornsea Three array area.

11.7.5.2 There are two active telecoms cables (Norsea com 1 segment 3/Tampnet and North Sea Offshore operated by British Telecom), and two out of service telecoms cables (Stratos and Weybourne to Esbjerg) crossing the Hornsea Three offshore cable corridor, with North Sea Offshore, Stratos and Weybourne to Esbjerg making landfall in the area of the Hornsea Three landfall. In the landfall location, the Hornsea Three offshore cable corridor also crosses the export cables for the Dudgeon and Sheringham Shoal offshore wind farms.

11.7.5.3 Where the Hornsea Three cables (either array, interconnector or export cables) will be required to cross an active cable, it is intended that commercial crossing agreements will be entered into with the cable operator. This is a formal arrangement that establishes the responsibilities and obligations of both parties and to allow operations to be managed safely. A crossing agreement based upon the Oil and Gas UK template will be used for any cable crossings. Where a cable is inactive, Hornsea Three will consult with the cable operator to ascertain if such a crossing agreement is required.

11.7.6 Carbon capture and storage, natural gas storage and underground coal gasification

11.7.6.1 This section provides an overview of CCS, natural gas storage and underground coal gasification activity within the infrastructure and other users study area (see Figure 11.1, Inner Area, denoted in purple) for CCS, natural gas storage and underground coal gasification. There are no proposed CCS developments or natural gas storage sites within the Hornsea Three array area or offshore cable corridor, or within the infrastructure and other users study area (see Figure 11.1, Inner Area, denoted in purple) for these developments. The nearest CCS development is a CCS storage area located 61.2 km from the Hornsea Three array area. The nearest natural gas storage site is the proposed Deborah Gas Storage Site operated by ENI, located 84 km from the Hornsea Three array area and 10 km from the offshore cable corridor (see Figure 11.4).

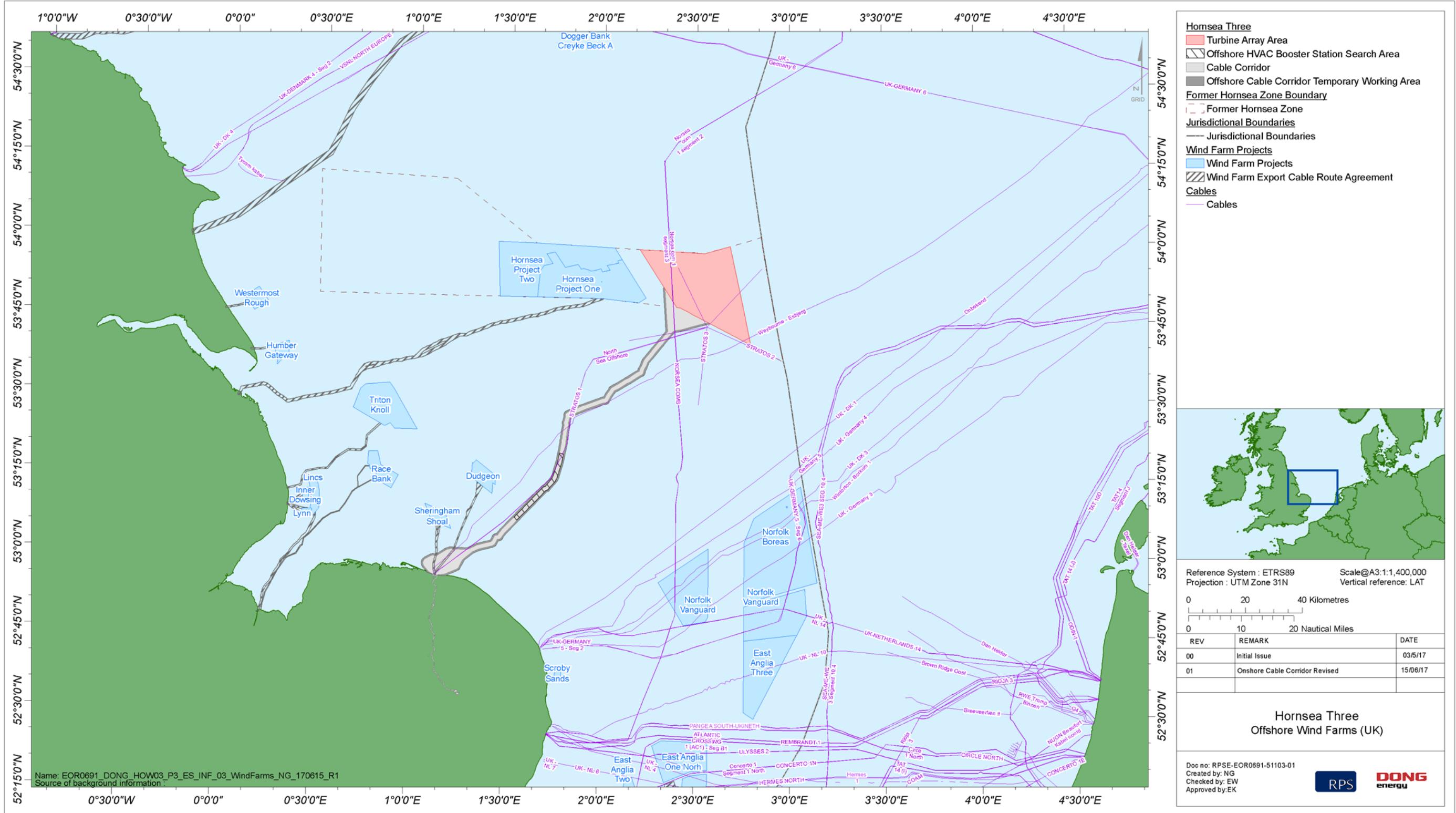


Figure 11.3: Offshore wind farm sites and offshore cable routes in the vicinity of Hornsea Three.

11.7.6.2 There is an underground coal gasification (UCG) site located 2.4 km to the southeast of the nearshore section of the Hornsea Three offshore cable corridor (Figure 11.4). The Coal Authority granted a conditional UCG licence for the East Anglia Offshore Area which ran from 2009 to 2013 and has now expired. There has been no indication provided by the Coal Authority whether this licence will be renewed.

11.7.6.3 As there are no CCS, natural gas storage or UCG sites within the relevant infrastructure and other users study area (see Figure 11.1, Inner Area, denoted in purple), assessment of effects on these receptors have been screened out.

11.7.7 Disposal sites

11.7.7.1 This section provides an overview of disposal sites within the infrastructure and other users study area (see Figure 11.1, Marine Processes Area, denoted in Yellow) for aggregate extraction and disposal sites. Only marine sediment dredged from dock sites and navigation channels and small amounts of fish waste are permitted to be disposed of at sea, with industrial waste banned since 1992 and sewage sludge since 1998 (Cefas, 2009). In 2007 the UK granted 101 permits for the disposal of dredged material and no permits for other types of waste (DECC, 2011c). Disposal sites are shown in Figure 11.4. There are no disposal sites within the Hornsea Three array area or offshore cable corridor. The nearest open disposal site to the Hornsea Three array area is the Hornsea disposal site Subzone 1 at a distance of 7.3 km to the west, with the nearest site to the offshore cable corridor also being the Hornsea disposal site Subzone 1, located 6.2 km from the offshore cable corridor.

11.7.7.2 The presence of munitions on the UK Continental Shelf (UKCS) is a historical legacy presenting a remaining risk to users of the marine environment (DECC, 2011c). The UK Offshore Energy SEA does not report any chemical munitions disposal sites in the vicinity of the former Hornsea Zone (DECC, 2011c). Between 2004 and 2008, the UK reported 703 munitions encounters, with the highest density of encounters reported in the southern North Sea between the UK and the Netherlands, and with no clear relationship between the locations of known munitions dumpsites and the encounters (DECC, 2011c). An Unexploded Ordnance (UXO) survey will be required as part of pre-construction works for the Hornsea Three array area and offshore cable corridor which will be used to determine any ad-hoc ordnance disposal (see volume 1, chapter 3, Project Description).

11.7.8 Marine aggregate extraction

11.7.8.1 This section provides an overview of aggregate extraction sites within the infrastructure and other users study area (see Figure 11.1, Marine Processes Area, denoted in Yellow) for aggregate extraction and disposal sites. There are currently no aggregate extraction sites within the Hornsea Three array area (Figure 11.4). Sites located within 16 km of the Hornsea Three array area (i.e. within the infrastructure and other users study area (see Figure 11.1, Marine Processes Area, denoted in Yellow) based on modelled data, see section 11.3) are listed in Table 11.5. There are four sites located within 21.5 km of the offshore cable corridor (i.e. within the infrastructure and other users study area (see Figure 11.1, Marine Processes Area, denoted in Yellow) based on one tidal ellipse (the path followed by a water particle in one complete tidal cycle) (see section 11.3) as listed in Table 11.5. Dredger routes are considered within chapter 7: Shipping and Navigation.

Table 11.5: Marine aggregate areas within 16 km of the Hornsea Three array area.

Area Name	Company	Area Number	Area (km ²)	Distance to array area (km)
Number 7	DEME Building Materials Ltd	491	141.4	4.1
Number 5	DEME Building Materials Ltd	483	28.2	14.0
Number 4 and 7	DEME Building Materials Ltd	506	51.1	13.3

Table 11.6: Marine aggregate areas within 21.5 km of the Hornsea Three offshore cable corridor.

Area Name	Company	Area Number	Area (km ²)	Distance to offshore cable corridor (km)
Number 7	DEME Building Materials Ltd	491	141.4	0 (overlaps)
Number 5	DEME Building Materials Ltd	483	28.2	1.9
Number 4 and 7	DEME Building Materials Ltd	506	51.1	7.5
Number 3	DEME Building Materials Ltd	484	17.2	13.2

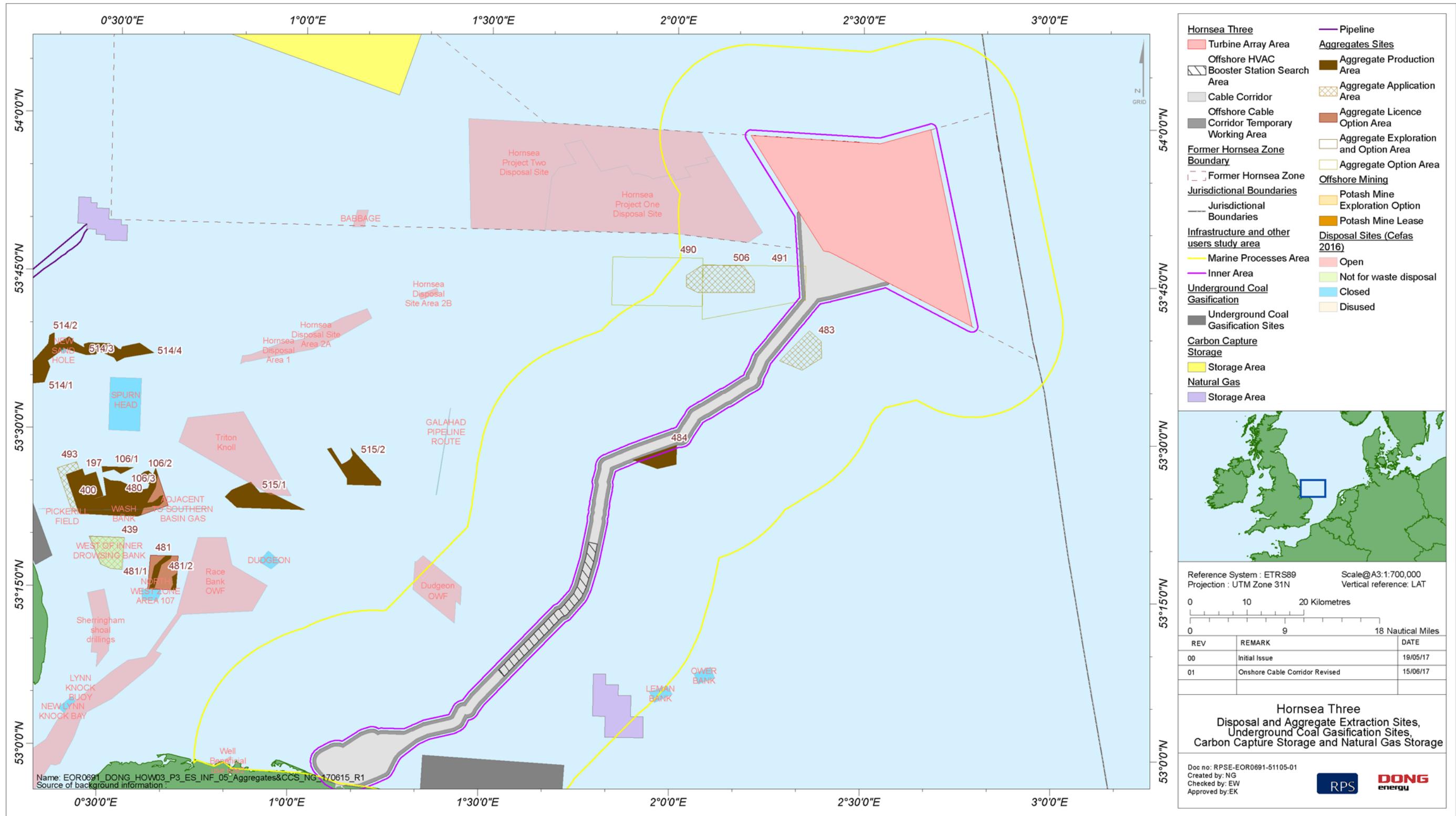


Figure 11.4: Disposal and Aggregate Extraction Sites, CCS, Natural Gas Storage and Underground Coal Gasification sites in the vicinity of Hornsea Three.

11.7.9 Oil and gas operations

- 11.7.9.1 This section provides an overview of oil and gas activity within the infrastructure and other users study area (see Figure 11.1, Inner Area, denoted in purple) for oil and gas operators.
- 11.7.9.2 Licences for the exploration and extraction of oil and gas on the UK Continental Shelf have been offered since 1964 and are granted by the Oil and Gas Authority (OGA). These licences are granted for identified geographical United Kingdom Hydrographic Office (UKHO) areas (blocks and sub-blocks) in consecutive rounds, with the most recent being the 29th licence round, with blocks offered on 27th July 2016 and awards announced on 23rd March 2017; and the 29th supplementary round, launched on 6th December 2016. The 30th licence round is likely to be announced towards the latter half of Q2 2017 (OGA, 2017b).
- 11.7.9.3 The main type of offshore licence is the Innovative Licence (OGA, 2017c). This is a new licence introduced by the OGA for the 29th licence round which replaces the traditional Seaward Production Licence. The Innovative Licence may cover the whole, or part of a specified block or a group of blocks, and grants exclusive rights to the holders 'to search and bore for, and extract, petroleum' (including gas) in the area covered by the licence. The initial term is variable and runs for a maximum of nine years. The initial term is subdivided into three phases. Phase A is a period for carrying out geotechnical studies and geophysical data reprocessing; Phase B is a period for undertaking seismic surveys and acquiring other geophysical data; and Phase C is for drilling. There is a mandatory requirement to relinquish 50% of the licence block after the initial term. The second term is for field development and lasts four years and the third term, for production, is for 18 years. Longer terms may apply in certain areas. The traditional licence terms still apply to licences gained prior to the 29th licence round for which the initial term is four years, which can then be renewed for a further four years with a third term of 18 years. Exclusive rights may also include retained rights within an existing licenced acreage.
- 11.7.9.4 Figure 11.5, Table 11.7 and Table 11.8 present the licenced blocks coincident with the Hornsea Three array area and offshore cable corridor. There are currently 11 licenced blocks coincident with the Hornsea Three array area operated by Centrica, INEOS and Shell. There are five open (unlicensed) blocks coincident with the Hornsea Three array area (49/2, 49/4, 49/7, 49/8 and 49/9). There are an additional three blocks (49/1 and 49/10 unlicensed; 49/10a operated by Centrica) within 1 km of the Hornsea Three array area. None of the unlicensed blocks have been offered in the 29th supplementary round.

Table 11.7: Licenced blocks coincident with the Hornsea Three array area.

Block	Type	Licence	Operator
49/1a	Production	P520	INEOS
49/2a	Production	P1013	
49/9b	Production	P524	
49/3	Production	P2286	
49/4a	Production	P468	Centrica
49/4b	Production	P1186	
49/4d	Production	P2286	
49/9c	Production	P901	
49/9d	Production	P901	Shell
49/8a	Production	P523	
49/9a	Production	P132	

Table 11.8: Licenced blocks coincident with the Hornsea Three offshore cable corridor.

Block	Type	Licence	Operator
48/19a	Production	P8	Shell
48/19c	Production	P465	
48/20a	Production	P8	
48/20b	Production	P1909	INEOS
48/23c	Production	P2085	Independent Oil And Gas Plc
48/24b	Production	P2085	
48/15a	Production	P130	ConocoPhillips
49/11a	Production	P28	

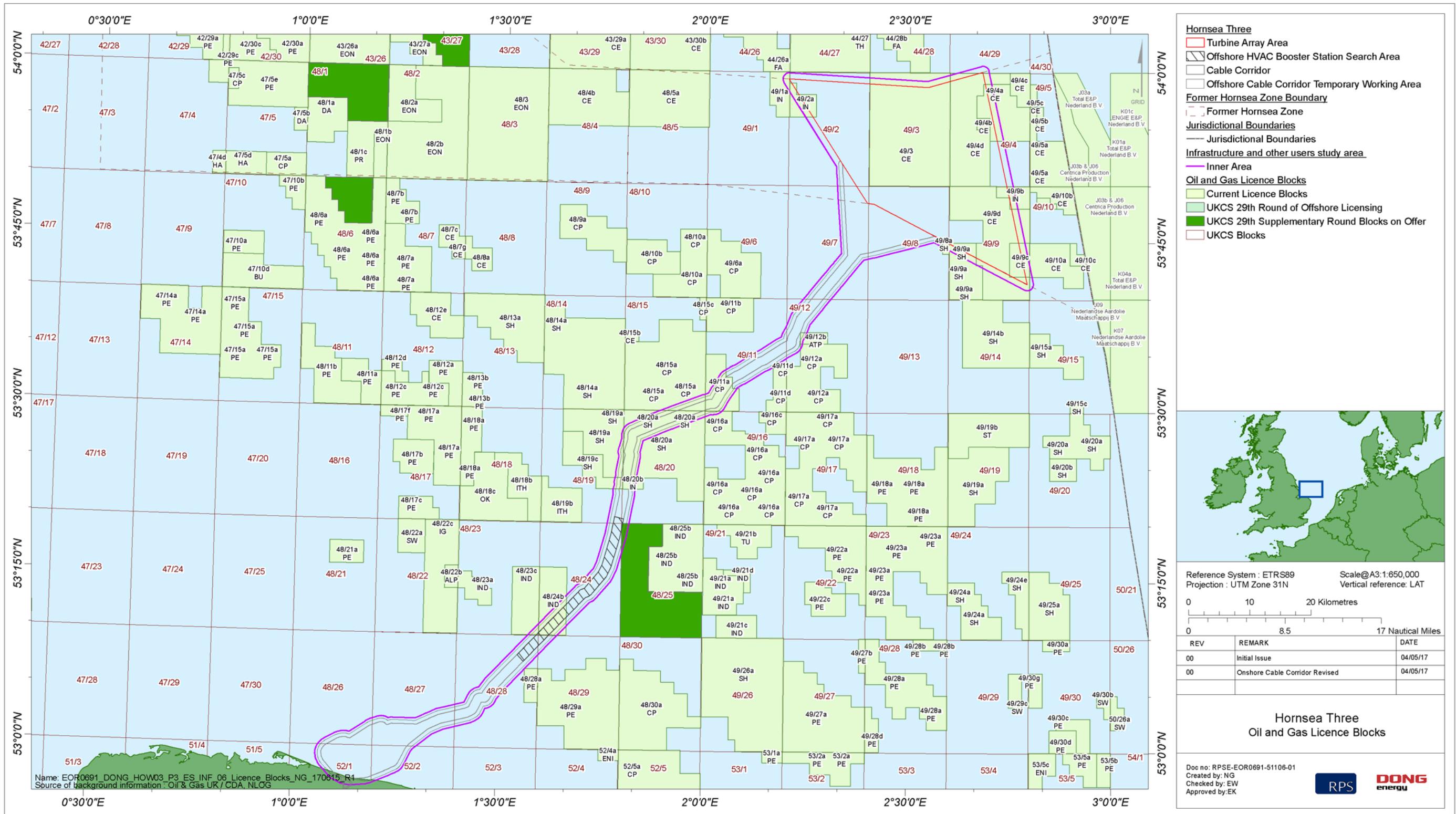


Figure 11.5: Oil and gas licence blocks in the vicinity of Hornsea Three.

- 11.7.9.5 There are currently eight licenced blocks coincident with the Hornsea Three offshore cable corridor, operated by Shell, INEOS, Independent Oil and Gas and ConocoPhillips, with two of these blocks (48/23c and 48/24b operated by Independent Oil and Gas) coinciding with the offshore HVAC booster station search area. There are 15 unlicensed blocks within the offshore cable corridor, with six of these (48/19, 48/20, 48/24, 48/25, 48/28 and 48/29) coinciding with the offshore HVAC booster station search area. There are an additional three blocks (49/12a and 49/16a licenced to ConocoPhillips and 49/12b licenced to Alpha Petroleum) within 1 km of the offshore cable corridor. None of the unlicensed blocks have been offered in the 29th supplementary round with the exception of block 48/25a which has been offered.
- 11.7.9.6 Unlicensed blocks 49/2, 49/7 and 49/8 overlap with both the Hornsea Three array area and the offshore cable corridor.
- 11.7.10 Hydrocarbon fields**
- 11.7.10.1 This section provides an overview of hydrocarbon fields within the infrastructure and other users study area (see Figure 11.1, Inner Area, denoted in purple) for oil and gas operators. Areas with hydrocarbon potential have been extensively explored, with many fields brought into production in the southern North Sea. There is a consensus view that the great majority of large fields in shelf depth waters (<200 m) have already been discovered (DECC, 2011c), however with technological advances in seismic processing and drilling techniques there is still potential for discoveries. There is a strong drive by the OGA to increase exploration and a competition was launched prior to the 29th round to stimulate exploration activity, with seismic data from the Government-funded seismic surveys of the Rockall Basin and Mid North Sea High areas being made available free of charge for the first time. These areas are outside the Hornsea Three development area.
- 11.7.10.2 Owing to the geology of the southern North Sea, the hydrocarbon fields in this region are gas or gas condensate fields rather than oil fields. Figure 11.6 presents the known gas fields that intersect with the infrastructure and other users study area (Inner Area, as denoted on Figure 11.6). There are four gas fields coincident with the Hornsea Three array area, operated by INEOS and Centrica, namely Windermere, Chiswick, Grove and Topaz (Table 11.9).
- 11.7.10.3 There are four known gas fields within the offshore cable corridor (Table 11.10), operated by Shell, INEOS and Centrica.

Table 11.9: Gas fields located within the Hornsea Three array area.

Field Name	Status	Discovery Date	Discovery Well	Production Date	Operator	Licence
Grove	Producing	01/09/1971	49/10-1	01/05/2007	Centrica	P83,P901
Chiswick	Producing	01/10/1984	49/04-1	01/09/2007	Centrica	P468,P1186
Topaz	Producing	01/08/1987	49/01-3	01/11/2009	INEOS	P520,P847,P1013
Windermere	Producing	01/12/1989	49/09b-2	01/04/1997	INEOS	P524,P1146

Table 11.10: Gas fields located within the Hornsea Three offshore cable corridor.

Field Name	Status	Discovery Date	Discovery Well	Production Date	Operator	Licence
Galleon	Producing	01/03/1985	48/20a-3A	01/10/1994	Shell	P8,P130
Audrey	Producing	01/03/1976	49/11a-1	01/10/1998	Centrica	P28,P130
Skiff	Producing	01/09/1995	48/20a-7	01/10/2000	Shell	P8
Clipper South	Producing	01/03/1983	48/19a-3	01/08/2012	INEOS	P8,P465

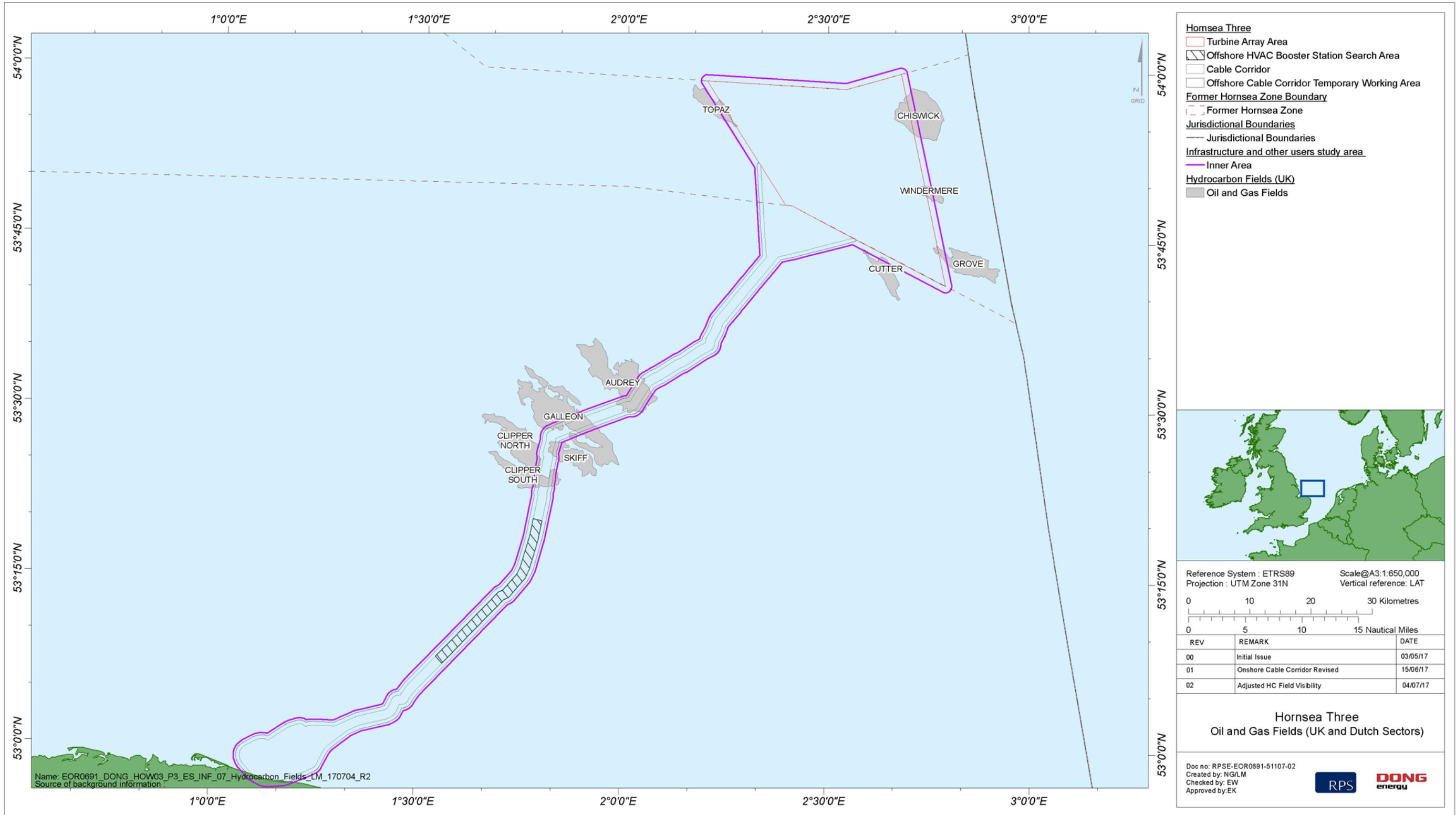


Figure 11.6: Hydrocarbon fields surrounding Hornsea Three.

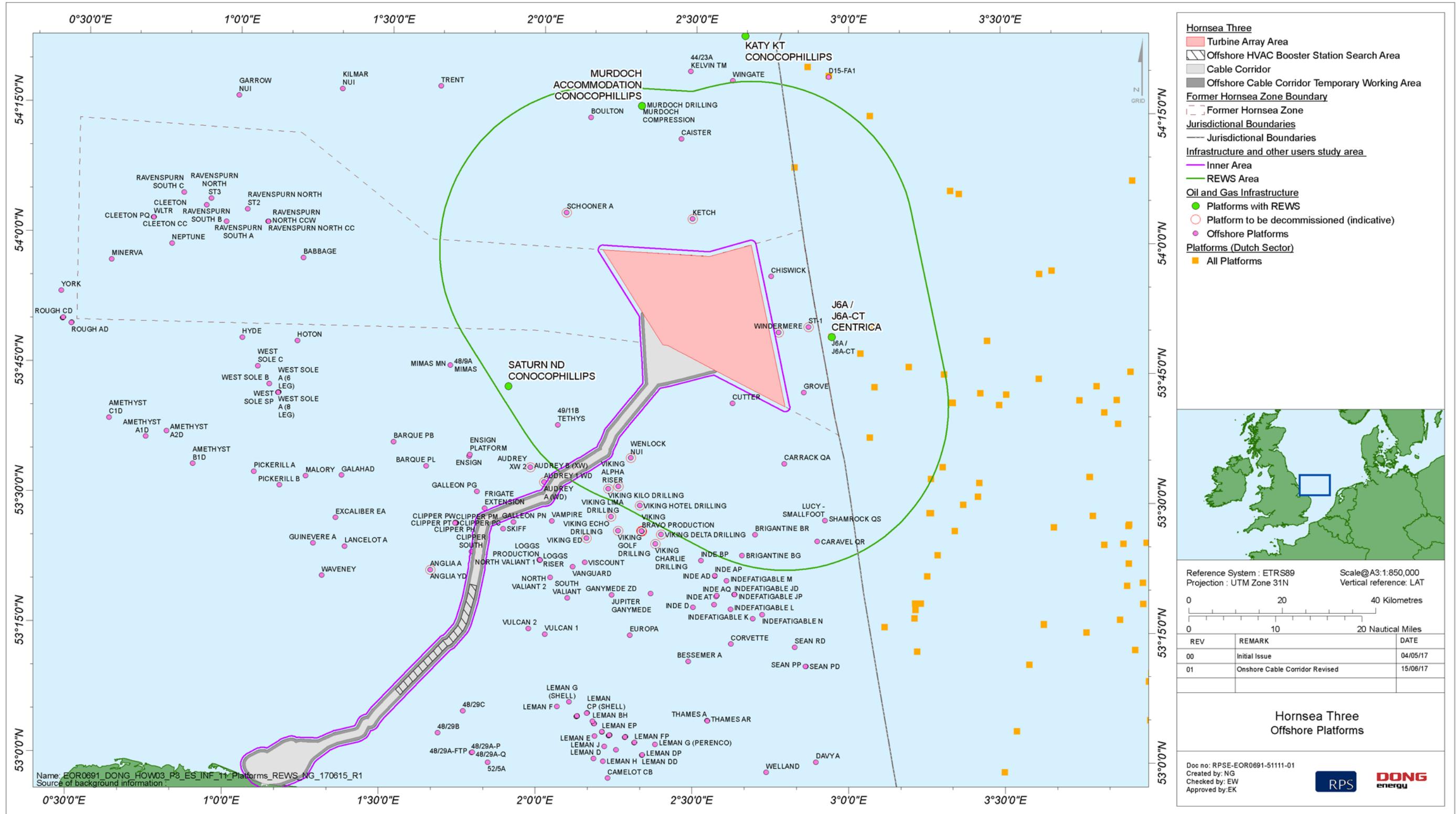
11.7.11 Surface structures

- 11.7.11.1 This section provides an overview of surface structures within the infrastructure and other users study area (see Figure 11.1, Inner Area, denoted in purple) for oil and gas operators. Oil and gas related surface structures include permanent and temporary structures. Permanent infrastructure includes gas platforms while temporary structures include drilling rigs and vessels. Gas platforms are protected by a 500 m safety zone.
- 11.7.11.2 Figure 11.7 presents the current gas platforms located in proximity to the Hornsea Three array area. There are no platforms located within the Hornsea Three array area or within 1 km of the Hornsea Three array area. Platforms with helidecks that are located within 9 NM of the Hornsea Three array area include the Schooner A, Ketch, Chiswick, ST-1, J6A/J6A-CT, Grove, Windermere and Carrack QA platforms. Effects on helicopter access to these platforms are assessed in chapter 8: Aviation, Military and Communication.
- 11.7.11.3 There are no platforms located within the Hornsea Three offshore cable corridor or offshore HVAC booster station search area. There is one active gas platform, Clipper South operated by INEOS, located within 1 km of the Hornsea Three offshore cable corridor.
- 11.7.11.4 Consultation has advised that a number of structures and associated infrastructure within the southern North Sea are scheduled to be decommissioned in the near future (Table 11.3). This information has been combined with data from the OGA in regard to submitted and/or approved decommissioning plans where available to provide an indicative decommissioning scenario in Table 11.11. Only platforms within the licence blocks located within the infrastructure and other users study area (see Figure 11.1, Inner Area, denoted in purple) for oil and gas operators are shown (i.e. platforms within licence blocks adjacent to or within 1 km of Hornsea Three). The indicative position outlined in Table 11.11 below represents the best understanding at the time of writing.
- 11.7.11.5 As these platforms are all located outside the infrastructure and other users study area (see Figure 11.1, Inner Area, denoted in purple) for oil and gas operators, decommissioning activities associated with these platforms are not considered further within this chapter. Effects on helicopter access to these platforms during decommissioning activities are considered in chapter 8: Aviation, Military and Communication and effects on navigation are considered in chapter 7: Shipping and Navigation.

Table 11.11: Platforms to be decommissioned (indicative).

Platform	Block	Operator	Consultation	OGA Data (OGA, 2017a)	Timescales
Wenlock	49/12a (within 1 km of offshore cable corridor)	Alpha Petroleum	Likely to be decommissioned before the start of Hornsea Three offshore construction in 2023*. Wells and platform piles to be cut below sea bed. Pipeline to Indefatigable to be abandoned in situ.	N/A	Prior to 2023 ^a .
Audrey B (XW) Audrey XW 2	48/15a (coincident with offshore cable corridor)	Centrica	Likely to be decommissioned prior to Hornsea Three construction phase.	N/A	Prior to 2023 ^a .
Audrey 1 WD Audrey A (WD)	49/11a (coincident with offshore cable corridor)				
Viking (various)	49/12a and 49/16a (within 1 km of offshore cable corridor).	ConocoPhillips	Currently being decommissioned. There may be a temporal overlap between Hornsea Three construction activities and ConocoPhillips decommissioning activities.	Decommissioning programmes for Viking CD, DD, ED, GD, HD approved in 2016. Removal to shore of topsides and jackets for recycling/disposal. Viking Satellites CD, DD, ED, GD, HD: Draft programme under consideration. Pipelines to remain buried in situ. All mattresses on pipelines to remain in situ to maintain pipeline stabilisation.	2014 to 2018 (ConocoPhillips, 2015). Potential for overlap with Hornsea Three construction phase (Table 11.3).
Windermere	49/9b (coincident with Hornsea Three array area)	INEOS	Very likely to be decommissioned (with wells) prior to 2023*.	N/A	Prior to 2023 ^a .

^a Note: Hornsea Three offshore construction is now scheduled to commence in 2022 (see volume 1, chapter 3: Project Description). Further consultation will be carried out with oil and gas operators.



11.7.12 Subsea structures

11.7.12.1 This section provides an overview of subsea structures within the infrastructure and other users study area (see Figure 11.1, Inner Area, denoted in purple) for oil and gas operators. Subsea structures (excluding wells) include protective structures, pipe junctions, manifolds, wellheads, trees and valves. Subsea structures are usually protected by a 500 m safety zone.

11.7.12.2 Subsea structures are shown in Figure 11.8. There are no subsea structures within the Hornsea Three array area or within 1 km of the Hornsea Three array area. There are no active subsea structures within the Hornsea Three offshore cable corridor or within 1 km of the offshore cable corridor, however there is one "lost pipe" with status shown as "removed" within 1 km of the offshore cable corridor.

11.7.12.3 Subsea structures may require long term access by a mobile rig or vessel which is discussed in chapter 8: Aviation, Military and Communication.

11.7.13 Wells

11.7.13.1 This section provides an overview of wells within the infrastructure and other users study area (see Figure 11.1, Inner Area, denoted in purple) for oil and gas operators. Wells are classified into four categories:

- Completed: when a well is completed it is ready for production (or injection);
- Drilling: wells in the process of being drilled (with drilling lasting several months);
- Plugged and abandoned (P&A): where a well has become non-productive or non-viable. The standard requirement is to remove the well head and cut and remove the casings 10 feet below the seabed (Oil and Gas UK, 2015b). The well is plugged with cement plugs and salvage of all recoverable equipment is undertaken; and
- Suspended: after initial drilling, a well may be temporarily suspended if an operator intends to carry out further operations at a later date. In this event the well head may be left protruding a metre or two above the seabed and a guide base is left on the seabed to facilitate re-entry.

11.7.13.2 Completed, drilling and suspended wells are relevant to the assessment of Hornsea Three as they typically have a 500 m safety zone (completed and drilling wells) and/or may require long term access via helicopter to a mobile rig or vessel (completed and suspended wells). Helicopter access is discussed in chapter 8: Aviation, Military and Communication. P&A wells do not have safety zones and will not be revisited and therefore are not considered further within this chapter.

11.7.13.3 There are no completed or drilling wells within the Hornsea Three array area however there is one suspended well within the Hornsea Three array area (49/08c-4 operated by Wintershall) (Figure 11.8) and an additional suspended well within 1 km of the Hornsea Three array area. There are no completed, drilling or suspended wells within the Hornsea Three offshore cable corridor (Figure 11.8) however there are four completed wells within 1 km of the offshore cable corridor.

11.7.14 Drilling and the placement of infrastructure

11.7.14.1 Agreements for Lease (AfL) have been granted by The Crown Estate for the Hornsea Three array area. Under the terms of the AfL, Hornsea Three has been granted certain rights which have taken effect from the date at which the AfL was granted. In the event an oil or gas operator wishes to drill within the AfL areas (or to drill outwith the AfL areas but in a location that requires some use of part of the AfL areas, such as a 500 m safety zone) they must obtain approval from the Secretary of State for those works.

11.7.14.2 Each AfL provides that following a request from the Secretary of State in order to allow oil or gas works to proceed, the Commissioners (of The Crown Estate) are entitled to terminate the relevant part of the AfL area that is required for the relevant works.

11.7.14.3 The 2011 ministerial statement entitled "Crown Estate Leases for Offshore Renewables Projects: Oil and Gas Clause", and DECC guidance to give effect to this policy (DECC, 2014), state that prior to the Secretary of State confirming that the oil or gas works may proceed and requesting that the Commissioners terminate the relevant part of the AfL area, the two parties must agree an appropriate level of compensation between them for the disruption. Failing that, there is a route available to obtain an independent third party valuation based on ensuring that the wind operator is in no worse position than they would have been had the overlap not arisen.

11.7.14.4 To this extent a 1 km restricted zone from either side of the AfL area has been considered as a maximum design scenario in the assessments to follow in section 11.11 and section 11.12. While neither the OGA nor the HSE stipulate a minimum separation distance that a well can be drilled from seabed infrastructure, this is based on the potential for 500 m safety zones to be applied for around oil and gas infrastructure and 500 m safety zones to be applied for around the Hornsea Three infrastructure (during the construction phase and/or operational and maintenance phase). It does not take into account the potential for 1,000 m advisory safety distances as these will be temporary and are not statutory.

11.7.14.5 In the event new platforms or subsea infrastructure are proposed, the operator would need to take into consideration any infrastructure within 9 NM of the proposed platform/subsea infrastructure in relation to helicopter access requirements (see chapter 8: Aviation, Military and Communication).

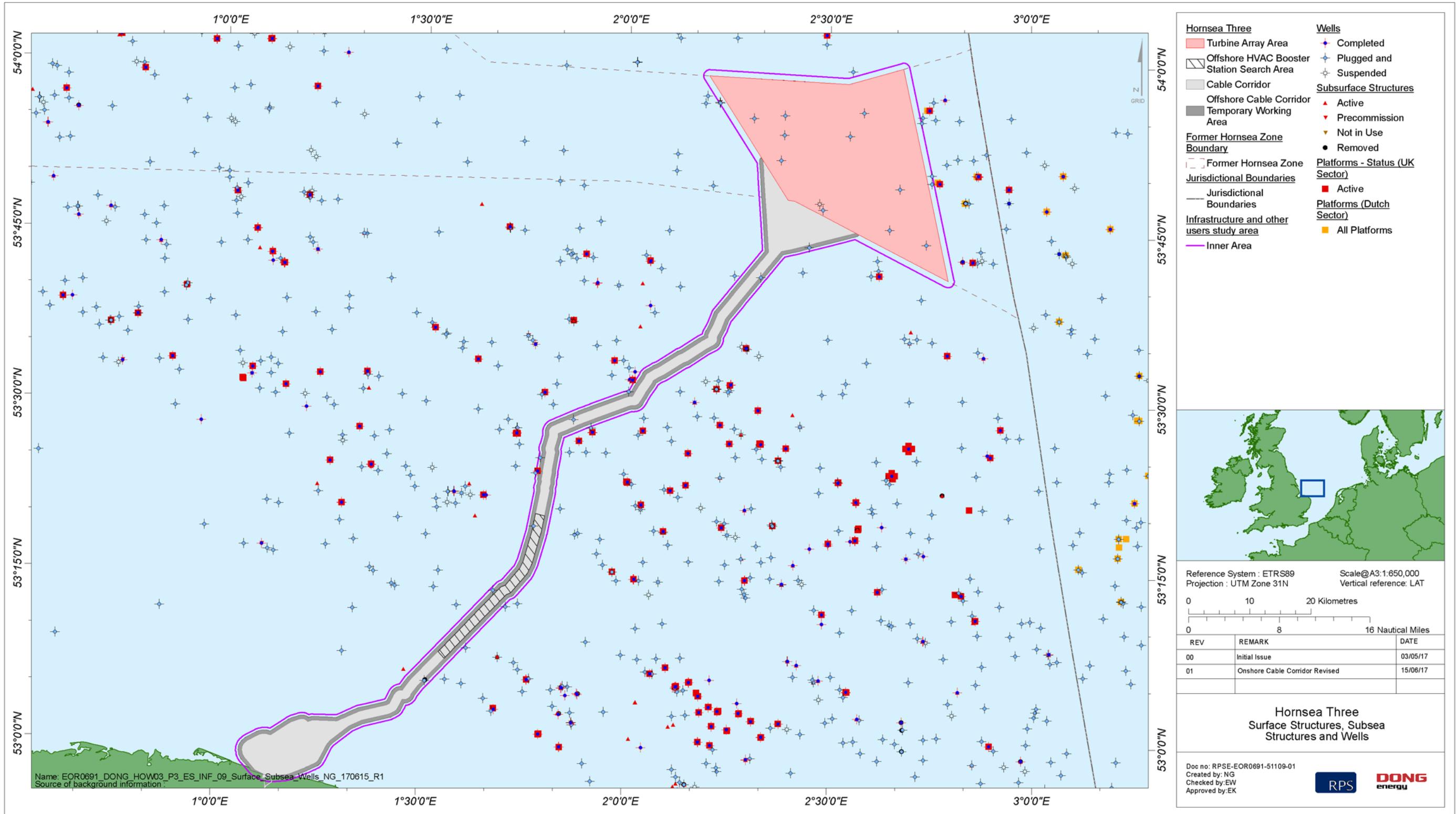


Figure 11.8: Surface, subsea structures and wells in the vicinity of Hornsea Three.

11.7.15 Pipelines

11.7.15.1 There are no pipelines located within the Hornsea Three array area or within 500 m of the Hornsea Three array area, however the Topaz to Schooner gas export and methanol umbilical pipelines are located within 1 km of the Hornsea Three array area. There are 27 active pipelines which intersect the Hornsea Three offshore cable corridor, and a further two active pipelines within 1 km of the offshore cable corridor. Pipeline crossings are listed in Table 11.12 and also within the crossing schedule (volume 4, annex 3.4: Crossing Schedule (Offshore)). The two additional pipelines located within 1 km of the offshore cable corridor are listed in Table 11.13.

Crossing ID	Platform Source/Destination	Fluid	Operator
OID_37	Audrey WD to Loggs PP Gas Line	Gas	Centrica
OID_38	Audrey XW to Alison KX	Unknown	ConocoPhillips
OID_39	Saturn ND to Loggs PR	Gas	ConocoPhillips
OID_40	Loggs PR to Saturn ND	Methanol	ConocoPhillips
OID_41	Ann XM to Loggs PR	Gas	Centrica
OID_42	Carrack QA to Clipper PR	Unknown	Shell
OID_43	Clipper PR to Carrack QA	Unknown	Shell

Table 11.12: Pipeline crossings within the Hornsea Three offshore cable corridor.

Crossing ID	Platform Source/Destination	Fluid	Operator
OID_8	SHEARWATER TO BACTON (SEAL)	Gas	Shell
OID_9	BACTON TO LANCELOT	Chemical	Perenco
OID_10	LANCELOT TO BACTON	Gas	Perenco
OID_13	ESMOND TO BACTON	Gas	Perenco
OID_14	CLIPPER PT TO BACTON	Gas	Shell
OID_15	BACTON TO CLIPPER PT	Chemical	Shell
OID_19	LOGGS PP TO ANGLIA YD GAS LINE	Gas	Ithaca
OID_20	LOGGS PP TO ANGLIA YD MEOH LINE	Methanol	Ithaca
OID_21	LOGGS PP TO THEDDLETHORPE MEOH LINE	Methanol	ConocoPhillips
OID_22	LOGGS PP TO THEDDLETHORPE GAS LINE	Gas	ConocoPhillips
OID_23	LOGGS TO CLIPPER SOUTH METHANOL PIPELINE	Methanol	INEOS
OID_24	CLIPPER SOUTH TO LOGGS GAS PIPELINE	Gas	INEOS
OID_26	Viking AR to Thedlethorpe Gas Line	Gas	ConocoPhillips
OID_27	Viking AR to Thedlethorpe Meoh Line	Methanol	ConocoPhillips
OID_28	Clipper PM to Skiff	Chemical	Shell
OID_29	Skiff to Clipper PM	Gas	Shell
OID_30	Galleon PN to Clipper PM	Gas	Shell
OID_31	Clipper PM to Galleon PN Meg	Chemical	Shell
OID_32	Clipper PM to Galleon PN Elec	Unknown	Shell
OID_36	Audrey WD to Loggs PP Meoh Line	Methanol	Centrica

Table 11.13: Pipelines within 1 km of the Hornsea Three offshore cable corridor.

Pipeline reference	Platform Source/Destination	Fluid	Operator
PL2838	ENSIGN NPAI TO AUDREY WD GAS EXPORT	Gas	Centrica
PL2839	AUDREY TO ENSIGN METHANOL LINE	Methanol	Centrica

11.7.15.2 Where the Hornsea Three export cables will be required to cross an active pipeline, it is intended that commercial crossing agreements will be entered into with the pipeline operator. This is a formal arrangement that establishes the responsibilities and obligations of both parties and to allow operations to be managed safely. A crossing agreement based upon the Oil and Gas UK template will be used for the pipeline crossings. Where the Hornsea Three export cables are located within 500 m of an active pipeline, it is intended that a commercial proximity agreement will be entered into with the pipeline operator. This, in the same way as the crossing agreement, establishes the responsibilities and obligations of both parties and to allow operations to be managed safely. The pipeline locations are shown in Figure 11.9.

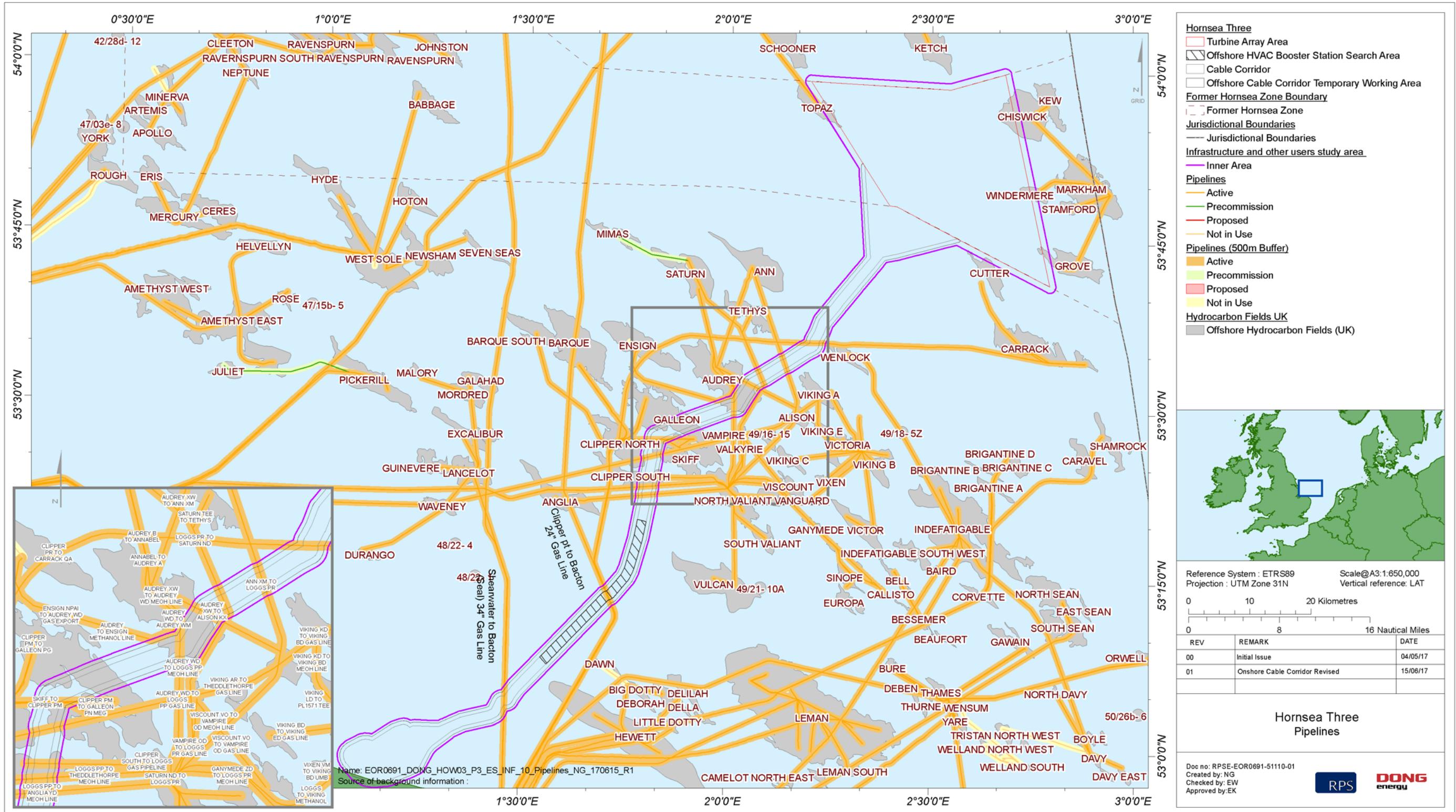


Figure 11.9: Pipelines located in the vicinity of Hornsea Three.

11.7.16 Services associated with the oil and gas industry

11.7.16.1 The following services are associated with the oil and gas industry:

- Helicopters: the oil and gas industry relies on helicopters for personnel transfer and emergency evacuation. Helicopter and associated aviation considerations are addressed separately in chapter 8, Aviation, Military and Communication;
- Vessels: the oil and gas industry requires supply or support vessels for its operations. Vessel access to oil and gas platforms and subsea infrastructure is considered within paragraph 11.11.2.78. Vessels and associated navigational considerations are addressed separately in chapter 7: Shipping and Navigation;
- REWS: A variety of early warning systems are used to prevent vessel collision with an offshore oil and gas platform, including REWS. This system utilises radar mounted on the platform to detect and track vessels and provide collision warning when vessels are in breach of defined Closest Point of Approach (CPA) and Time to Closest Point of Approach (TCPA) parameters. When they reach a certain threshold an alarm is triggered. This value is set in accordance with the platform operator's own performance standards and typically consists of an amber alert and a red alarm indicating when vessel intervention or emergency procedures are required. The REWS radar does not work in isolation, but together with other radar and AIS data provides a field wide collision risk management system which protects the whole field. The REWS on one platform (and sometimes combined with the REWS on another platform) therefore protects a range of platforms. The REWS located within 60 km of the Hornsea Three array area are shown in Table 11.14 and Figure 11.7 together with the platforms that the REWS protect. Typically the detection limit for a 100 m² radar cross section (RCS) target vessel is 30 km (16 NM) however this may vary depending on factors such as weather conditions. REWS systems which may be within line of sight of the Hornsea Three array area (considered to be a distance out to 35 km) include the J6A platform REWS operated by Centrica and the Saturn and Murdoch platform REWS operated by ConocoPhillips. An assessment was carried out on the potential impact of Hornsea Three on the J6A platform REWS (Centrica) and the Saturn platform REWS (ConocoPhillips) systems and is presented in paragraph 11.11.2.65. As the Murdoch platform REWS (ConocoPhillips) system has an overlapping coverage with the ConocoPhillips operated Katy platform REWS, considered to be outside the line of sight of the Hornsea Three array area, the Murdoch platform REWS was not considered within this assessment; and
- Seismic survey operations: carried out by the oil and gas industry in order to identify sub-surface geological structures that might trap oil and gas deposits. The potential for subsea noise generated from piling activities to interfere with the seismic acoustic signal is addressed in paragraph 11.11.1.81. Subsea noise, resulting from Hornsea Three, is further discussed within volume 4, annex 3.1: Subsea Noise Technical Report.

Table 11.14: Installations equipped with REWS within 60 km of the Hornsea Three array area.

Name of Platform	Other platforms protected by the REWS	Operator	Distance to HOW03 array boundary	
			NM	km
J6A	J6A	Centrica	6.9	12.8
	Chiswick		1.5	2.7
	Markham ST-1		4.5	8.3
	Grove		2.4	4.5
	Windermere	INEOS	1.0	1.8
Murdoch	Murdoch	ConocoPhillips	16.9	31.3
	Katy		24.1	44.7
	Munro		26.8	49.7
	Boulton		15.3	28.3
	Caister		13.3	24.6
	Kelvin		21.1	39.1
Katy	As for the Murdoch REWS	ConocoPhillips	24.1	44.7
Saturn	Saturn		17.7	32.7
	Tethys		15.3	28.4
	Mimas		22.1	40.9
	Viking KD		17.9	33.1
	Vulcan 2 UR		36.4	67.4
	Vampire OD		24.1	44.7
LOGGS	Input from Saturn REWS		28.8	53.3
Viking Bravo	Input from Saturn REWS		20.5	38
Europa EZ	Input from Saturn REWS		31.8	58.9

11.7.17 Future baseline scenario

- 11.7.17.1 The future baseline scenario for recreational activities is considered unlikely to change substantially from that presented in section 11.7 above, in the absence of Hornsea Three. The future baseline scenario for offshore cables, CCS, natural gas storage and underground coal gasification and marine aggregates is subject to gradual change as new projects/sites are identified. The future baseline scenario for oil and gas activities and associated development (including platforms, wells and pipelines) is considered to be subject to the greatest degree of change, which will depend upon currently unknown outcomes of, for example, acquisitions, exploration and development, and decommissioning.
- 11.7.17.2 In 2016 the OGA reported a continued decline in oil and gas production in the UKCS (continuing a gradual decline seen since the year 2000) (OGA, 2016b). While this decline is predicted to continue they report a range of possible outcomes because the future rate of production is dependent on such a large number of different and unknown factors, including the level of investment and the success of further exploration. Operators continue to find it difficult to predict production accurately as older fields mature and their reliability reduces. A significant share of future oil and gas production is expected to come from new fields and major projects in existing fields. With the recent dramatic fall in oil prices the projections are even less certain than normal. It is probably a reasonable assumption therefore that oil and gas activity will continue to decline. The potential for future activity within oil and gas licence blocks is however taken into account within this chapter.

11.7.18 Data limitations

- 11.7.18.1 The data sources used in this chapter are detailed in Table 11.4 above. The data used are the most up to date publicly available information which can be obtained from the applicable data sources as cited, and data that have been provided through consultation as detailed in section 11.6 above. The data are therefore limited by what is available and by what has been made available, at the time of writing the PEIR.
- 11.7.18.2 Given the scale of consultation undertaken on behalf of the former Hornsea Zone in general, for Hornsea Project One, Hornsea Project Two and for Hornsea Three, it is considered that the data employed in the assessment are of a robust nature and are sufficient for the purposes of the impact assessment presented.

11.8 Key parameters for assessment

11.8.1 Maximum design scenario

11.8.1.1 The maximum design scenarios identified in Table 11.15, Table 11.16 and Table 11.17 have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. These scenarios have been selected from the details provided in the project description (volume 1, chapter 3: Project Description). Effects of greater significance are not predicted to arise should any other development scenario, based on details within the project Design Envelope (e.g. different turbine layout), to that assessed here be taken forward in the final design scheme.

11.8.1.2 Receptor groups have been divided into the following categories for ease of reference:

- Recreational users and recreational fishing;
- Aggregate extraction, cables and pipelines; and
- Oil and gas operations.

11.8.1.3 Many of the potential impacts upon infrastructure and other users are related to navigational safety and collision risk. To avoid duplication, navigational safety and risk to all vessel types from Hornsea Three is considered in chapter 7: Shipping and Navigation. Therefore the following assessment only considers impacts that will potentially affect the undertaking of a certain marine activity or the operational effectiveness of marine infrastructure in the wider infrastructure and other users study area.

11.8.1.4 Indirect effects on nearshore recreational receptors through visual amenity are considered in volume 3, chapter 4: Landscape and Visual Resources and volume 3, chapter 10: Socio-economics.

11.8.1.5 Impacts upon oil and gas activities may also arise from modifications to helicopter routes or helicopter access to platforms, and interference with microwave communication links. These impacts are assessed in chapter 8: Aviation, Military and Communication.

11.8.1.6 The effects of airborne noise due to activities seaward of MHWS for receptors at the coastline is considered in volume 3, chapter 8: Noise and Vibration.

11.8.2 Impacts scoped out of the assessment

11.8.2.1 On the basis of the baseline environment and the project description outlined in volume 1, chapter 3: Project Description, a number of impacts are proposed to be scoped out of the assessment for infrastructure and other users. These impacts are outlined, together with a justification for scoping them out, in Table 11.18, Table 11.19 and Table 11.20.

Table 11.15: Maximum design scenario considered for the assessment of potential impacts on infrastructure and other users: recreational users and recreational fishing.

Potential impact	Maximum design scenario	Justification
<i>Construction phase</i>		
Hornsea Three infrastructure, safety zones and advisory safety distances associated with activities within the Hornsea Three array area and along the offshore cable corridor may displace recreational craft and recreational fishing vessels resulting in a loss of recreational resource.	<p>Total area of 1,223.6 km² (696 km² Hornsea Three array area + 354.6 km² offshore cable corridor area + 173 km² temporary working area) comprising:·</p> <p>Hornsea Three array area:</p> <ul style="list-style-type: none"> • Up to 342 wind turbines with floating foundations spread evenly across the array area (12 mooring lines; excursion area 25% of water depth; 1,000 m mooring cable radius); • Up to 12 offshore HVAC collector substations; • Up to four offshore HVDC substations; • Up to three offshore accommodation platforms; • Array cables of up to 850 km in length; • Up to 15 substation/accommodation platform interconnector cable trenches of up to 225 km in length. <p>500 m safety zones will be applied for around wind turbines and offshore platforms under construction.</p> <p>Advisory safety distances of 1,000 m will be recommended around vessels undertaking construction activities.</p> <p>Construction phase lasting up to 11 years over two phases, with a gap of up to 6 years between the same activity between phases.</p> <p>Offshore cable corridor:</p> <ul style="list-style-type: none"> • Up to six subsea HVAC booster stations on the seabed with piled foundations (50 m length x 50 m width x 15 m height above seabed); • Up to six export cable trenches of up to 145 km in length (from Hornsea Three array area to landfall). <p>500 m safety zones will be applied for around offshore platforms under construction.</p> <p>Advisory safety distances of 1,000 m will be recommended around vessels undertaking construction activities.</p> <p>Maximum installation duration for the six subsea HVAC booster stations: up to 12 months (based on two months per structure).</p> <p>Installation of export cables will occur over a maximum duration of three years. The export cables could be installed in up to two phases with a gap of six years between phases. Therefore the maximum duration over which export cables could be installed is nine years.</p> <p>Maximum installation duration for the export cables within the intertidal area: 24 months over up to two phases with a gap of up to six years between phases. Therefore the maximum duration over which export cables could be installed in the intertidal area is eight years.</p>	The maximum amount of infrastructure within the Hornsea Three array area and offshore cable corridor leading to the longest construction period and the greatest area of displacement due to infrastructure, safety zones and advisory safety distances.

Potential impact	Maximum design scenario	Justification
<i>Operation phase</i>		
<p>Hornsea Three infrastructure, safety zones and advisory safety distances associated with infrastructure and maintenance activities within the Hornsea Three array area and along the offshore cable corridor may displace recreational craft and recreational fishing vessels resulting in a loss of recreational resource.</p>	<p>Total area of 1,050.6 km² (696 km² Hornsea Three array area + 354.6 km² offshore cable corridor area) comprising:</p> <p>Hornsea Three array area:</p> <ul style="list-style-type: none"> Up to 342 wind turbines with floating foundations spread evenly across the array area (12 mooring lines; excursion area 25% of water depth; 1,000 m mooring cable radius); Up to 12 offshore HVAC collector substations; Up to four offshore HVDC substations; Up to three offshore accommodation platforms; Array cables of up to 850 km in length; Up to 15 substation/accommodation platform interconnector cable trenches of up to 225 km in length. <p>500 m safety zones will be applied for around manned offshore platforms.</p> <p>500 m safety zones will be applied for around wind turbines and offshore platforms undergoing major maintenance.</p> <p>Advisory safety distances of 1,000 m will be recommended around vessels undertaking major maintenance activities.</p> <p>Offshore cable corridor:</p> <ul style="list-style-type: none"> Up to four offshore HVAC booster stations (90 m length x 90 m width x 90 m total height); Up to six export cables of up to 145 km in length (from Hornsea Three array area to landfall). <p>500 m safety zones will be applied for around manned offshore platforms.</p> <p>Advisory safety distances of 1,000 m will be recommended around vessels during major maintenance activities.</p> <p>Anticipated design life of wind farm 25 years.</p>	<p>Parameters which lead to the greatest area of displacement due to infrastructure, safety zones and advisory safety distances. The above surface Offshore HVAC booster stations represent the maximum design scenario (rather than subsea HVAC booster stations) due to the potential for operational safety zones.</p>

Potential impact	Maximum design scenario	Justification
<i>Decommissioning phase</i>		
Hornsea Three infrastructure, safety zones and advisory safety distances associated with activities within the Hornsea Three array area and along the offshore cable corridor may displace recreational craft and recreational fishing vessels resulting in a loss of recreational resource.	<p>Total area of 1,050.6 km² (696 km² Hornsea Three array area + 354.6 km² offshore cable corridor area) comprising:</p> <p>Hornsea Three array area:</p> <ul style="list-style-type: none"> Up to 342 wind turbines with floating foundations spread evenly across the array area (12 mooring lines; excursion area 25% of water depth; 1,000 m mooring cable radius); Up to 12 offshore HVAC collector substations; Up to four offshore HVDC substations; Up to three offshore accommodation platforms; Array cables of up to 850 km in length; Up to 15 substation/accommodation platform interconnector cable trenches of up to 225 km in length. <p>500 m safety zones will be applied for around wind turbines and offshore platforms undergoing decommissioning. Advisory safety distances of 1,000 m will be recommended around vessels undertaking decommissioning activities. Maximum decommissioning duration for the Hornsea Three array area: up to 11 years based on construction timeframes.</p> <p>Offshore cable corridor:</p> <ul style="list-style-type: none"> Up to six subsea HVAC booster stations on the seabed with piled foundations (50 m length x 50 m width x 15 m height above seabed); Up to six export cables of up to 145 km in length (from Hornsea Three array area to landfall). <p>500 m safety zones will be applied for around offshore platforms undergoing decommissioning. Advisory safety distances of 1,000 m will be recommended around vessels undertaking decommissioning activities. Maximum decommissioning duration for the six subsea HVAC booster stations: up to 12 months (based on construction timeframes). Maximum decommissioning duration for the export cables: up to nine years based on construction timeframes. Maximum decommissioning duration for the export cables within the intertidal area: up to eight years based on construction timeframes.</p>	The greatest amount of infrastructure within the Hornsea Three array area and offshore cable corridor leading to the greatest area of displacement due to infrastructure, safety zones and advisory safety distances.

Table 11.16: Maximum design scenario considered for the assessment of potential impacts on infrastructure and other users: aggregate extraction, cables and pipelines

Potential impact	Maximum design scenario	Justification
Construction phase		
Installation of Hornsea Three infrastructure may affect existing cables and pipelines or restrict access to cables and pipelines.	<p>Total area of 1,223.6 km² (696 km² Hornsea Three array area + 354.6 km² offshore cable corridor area + 173 km² temporary working area) comprising: <u>Hornsea Three array area</u>:</p> <ul style="list-style-type: none"> • Up to 342 wind turbines with floating foundations spread evenly across the array area (12 mooring lines; excursion area 25% of water depth; 1,000 m mooring cable radius); • Up to 12 offshore HVAC collector substations; • Up to four offshore HVDC substations; • Up to three offshore accommodation platforms; • Array cables of up to 850 km in length, 10 m maximum width of seabed affected, target burial to be determined by cable burial risk assessment; • Up to 15 substation/accommodation platform interconnector cable trenches of up to 225 km in length, 10 m maximum width of seabed affected, target burial to be determined by cable burial risk assessment. <p>500 m safety zones will be applied for around wind turbines and offshore platforms under construction.</p> <p>Advisory safety distances of 1,000 m will be recommended around vessels undertaking construction activities.</p> <p>Construction phase lasting up to 11 years over two phases, with a gap of up to 6 years between the same activity between phases.</p> <p><u>Offshore cable corridor:</u></p> <ul style="list-style-type: none"> • Up to six subsea HVAC booster stations (50 m length x 50 m width x 15 m height above seabed); • Up to six export cable trenches of up to 145 km in length (from Hornsea Three array area to landfall), 10 m maximum width of seabed affected, target burial to be determined by cable burial risk assessment. <p>500 m safety zones will be applied for around offshore platforms under construction.</p> <p>Advisory safety distances of 1,000 m will be recommended around vessels undertaking construction activities.</p> <p>Maximum installation duration for the six subsea HVAC booster stations: up to 12 months (based on two months per structure).</p> <p>Installation of export cables will occur over a maximum duration of three years. The export cables could be installed in up to two phases with a gap of six years between phases. Therefore the maximum duration over which export cables could be installed is nine years).</p>	The maximum amount of infrastructure and associated safety zones and advisory safety distances leading to the crossing of the greatest number of existing pipelines and cables and the greatest sea area potentially affected.
Installation of infrastructure has the potential to lead to increased suspended sediment concentrations and deposition, which could cause a change in aggregate resource in aggregate extraction areas.	<p>Total area of 1,223.6 km² (696 km² Hornsea Three array area + 354.6 km² offshore cable corridor area + 173 km² temporary working area) comprising: <u>Hornsea Three array area</u>:</p> <p>Foundation Installation</p> <ul style="list-style-type: none"> • Total spoil volume 113,097 m³ consisting of: largest turbine monopile foundations (up to 160 monopiles), associated diameter 15 m, drilling to 40 m penetration depth, spoil volume per foundation 7,069 m³, up to 10% of foundations may be drilled, (160 x 10% x 7,069 m³); • Total spoil volume 253,338 m³ consisting of: largest offshore High Voltage Alternating Current (HVAC) collector substation piled jacket foundations (up to 12 foundations), 24 piles per foundation (six legs, four piles per leg), 4 m diameter, drilling to 70m penetration depth, spoil volume per foundation 21,112 m³, up to 100% of foundations may be drilled, (12 x 21,112 m³); • Total spoil volume 193,962 m³ consisting of: largest offshore High Voltage Direct Current (HVDC) converter substation piled jacket foundations (up to four foundations), 72 piles per foundation (18 legs, four piles per leg), 3.5 m diameter, drilling to 70m penetration depth, spoil volume per foundation 48,490 m³, up to 100% of foundations may be drilled, (4 x 48,490 m³); 	<p>Whilst a maximum design scenario is provided for this potential impact involving installation activities across the whole Hornsea Three array area and offshore cable corridor, it is noted that not all installation activities have the potential to interact with aggregate extraction sites in the vicinity of Hornsea Three as some of these activities are located at too great a distance for interaction to occur. Only Hornsea Three activities in close proximity to aggregate extraction sites have any potential for interaction.</p> <p>The marine processes assessment (chapter 1) considers a number of maximum design scenarios related to increases in suspended sediment concentrations and deposition of these sediments to the seabed due to construction phase activities. Specifically drilling for piled foundation installation and dredging for seabed preparation prior to installing gravity base foundations is considered. Two scenarios are considered due to the fact that the two techniques will release different sediment grain sizes (with finer material being released via</p>

Potential impact	Maximum design scenario	Justification
	<ul style="list-style-type: none"> Total spoil volume 21,207 m³ consisting of: largest offshore accommodation platform monopile foundations (up to 3 monopiles), associated diameter 15 m, drilling to 40 m penetration depth, spoil volume per foundation 7,069 m³, up to 100% of foundations may be drilled, (3 x 7,069 m³); Drilling rate of 0.2 to 0.5 m/hour per hour; Up to two foundations may be simultaneously drilled, minimum spacing 1,000 m; Disposal of drill arisings at water surface; and <p><i>Inter-array cable Installation</i></p> <ul style="list-style-type: none"> Installation method: mass flow excavator; Total length 850 km; V-shape trench; width = 6 m; depth = 2 m; volume = (850 km x 6 m x 2 m x 0.5 (i.e. to account for V-shape of trench)) = 5,100,000 m³; and Installation rate of 1.5 to 5 km/day. <p><i>Substation interconnector cables</i></p> <ul style="list-style-type: none"> Installation method: mass flow excavator; 15 in-project cables, total length 225 km; V-shape trench; width = 6 m; depth = 2 m; volume = (225 km x 6 m x 2 m x 0.5 (i.e. to account for V-shape of trench)) = 1,350,000 m³; and Installation rate of 1.5 to 5 km/day. <p><i>Sandwave clearance</i></p> <ul style="list-style-type: none"> Sand wave clearance by mass flow excavation, resulting in removal of up to 168,325 m³ within the Hornsea Three array area, (based on the Hornsea Three array area geophysical survey data combined with cable installation design specifications), Construction phase lasting up to 11 years over two phases, with a gap of up to 6 years between the same activity between phases. <p><u>Offshore cable corridor:</u></p> <p><i>Foundation Installation</i></p> <ul style="list-style-type: none"> Total spoil volume 84,448 m³ consisting of: largest offshore HVAC booster station piled jacket foundations (up to four foundations, up to 6 legs, up to 4 piles per leg, 4 m pile diameter, penetration depth up to 70 m, (4 x 21,112 m³); Disposal of drill arisings at water surface <p><i>Export Cable Installation</i></p> <ul style="list-style-type: none"> Up to six cable trenches; each 173 km in length (1,038 km in total); Installation method: mass flow excavator; V-shape trench; width = 6 m; depth = 2 m; volume = (6 x 173 km x 6 m x 2 m x 0.5 (i.e. to account for V-shape of trench)) = 6,226,000 m³; Installation rate of 1.5 to 5 km/day <p><i>Sandwave Clearance</i></p> <ul style="list-style-type: none"> Sandwave clearance: up to 182,056 m³ (via mass flow excavator) within the Hornsea Three offshore cable corridor, (based on the Hornsea Three offshore cable corridor geophysical survey data combined with cable installation design specifications); Construction phase lasting up to 11 years over two phases, with a gap of up to 6 years between the same activity between phases. 	drilling) and at a different rate. In the context of sediment deposition leading to potential impacts on aggregate resource in aggregate extraction areas, drilling for foundation installation has been selected as the maximum design scenario as this releases finer grained sediment which has the potential to deposit over a wider area, leading to the greatest potential to impact on aggregate resource. In the case of cables (both within the Hornsea Three array area and along the Hornsea Three offshore cable corridor), the greatest number and length of cables and greatest target burial depth have been assessed. A mass flow excavator will disturb the greatest volume of sediment and as such is considered to be the maximum design scenario for sediment dispersion. The volume of material to be cleared from individual sandwaves will vary according to the local dimensions of the sandwave (height, length and shape) and the level to which the sandwave must be reduced (also accounting for stable sediment slope angles and the capabilities and requirements of the cable burial tool being used). These details are not fully known at this stage, however, based on the available geophysical data, it is anticipated that the bedforms requiring clearance in the array area are likely to be in the range 1 to 2 m in height. Sandwave clearance may involve dredging or mass flow excavation tools. Of these, mass flow excavation will most energetically disturb sediment in the clearance profile and as such is considered to be the maximum design scenario for sediment dispersion causing elevated SSC over more than a very short period of time. Dredging will result in a potentially greater instantaneous local effect in terms of SSC and potentially a greater local thickness of sediment deposition, but likely of a shorter duration and smaller extent, respectively. As such, clearance via mass flow excavator is considered the maximum design scenario in the context of this impact. Further details of the maximum design scenario (in terms of, for example, volumes of material disturbed and released, release rates etc.) for each foundation type and the cable route are provided in chapter 1, Marine Processes

Potential impact	Maximum design scenario	Justification
<i>Operation phase</i>		
Hornsea Three infrastructure, safety zones and advisory safety distances may lead to a temporary loss of access to existing cables and pipelines for repair or maintenance.	<p>Total area of 1,050.6 km² (696 km² Hornsea Three array area + 354.6 km² offshore cable corridor area) comprising:</p> <p>Hornsea Three array area:</p> <ul style="list-style-type: none"> Up to 342 wind turbines with floating foundations spread evenly across the array area (12 mooring lines; excursion area 25% of water depth; 1,000 m mooring cable radius); Up to 12 offshore HVAC collector substations; Up to four offshore HVDC substations; Up to three offshore accommodation platforms; Array cables of up to 850 km in length; Up to 15 substation/accommodation platform interconnector cables of up to 225 km in length. <p>500 m safety zones will be applied for around manned offshore platforms.</p> <p>500 m safety zones will be applied for around wind turbines and offshore platforms undergoing major maintenance.</p> <p>Advisory safety distances of 1,000 m will be recommended around vessels undertaking major maintenance activities.</p> <p>Offshore cable corridor:</p> <ul style="list-style-type: none"> Up to four offshore HVAC booster stations (90 m length x 90 m width x 90 m total height); Up to six export cables of up to 145 km in length (from Hornsea Three array area to landfall). <p>500 m safety zones will be applied for around manned offshore platforms.</p> <p>Advisory safety distances of 1,000 m will be recommended around vessels during major maintenance activities.</p> <p>Anticipated design life of wind farm 25 years.</p>	Parameters which lead to the greatest area affected by infrastructure, safety zones and advisory safety distances. Above surface offshore HVAC booster stations represent the maximum design scenario (rather than subsea HVAC booster stations) due to the potential for operational safety zones.

Potential impact	Maximum design scenario	Justification
<i>Decommissioning phase</i>		
Removal of Hornsea Three infrastructure may affect existing cables and pipelines or restrict access to cables and pipelines.	<p>Total area of 1,223.6 km² (696 km² Hornsea Three array area + 354.6 km² offshore cable corridor area + temporary working area) comprising: <u>Hornsea Three array</u>:</p> <ul style="list-style-type: none"> • Up to 342 wind turbines with floating foundations spread evenly across the array area (12 mooring lines; excursion area 25% of water depth; 1,000 m mooring cable radius); • Up to 12 offshore HVAC collector substations; • Up to four offshore HVDC substations; • Up to three offshore accommodation platforms; • Array cables of up to 850 km in length, 10 m maximum width of seabed affected; • Up to 15 substation/accommodation platform interconnector cables of up to 225 km in length, 10 m maximum width of seabed affected. <p>Total removal of all cables. Cable protection to be left in situ. 500 m safety zones will be applied for around wind turbines and offshore platforms undergoing decommissioning. Advisory safety distances of 1,000 m will be recommended around vessels undertaking decommissioning activities. Maximum decommissioning duration for the Hornsea Three array area: up to 11 years based on construction timeframes.</p> <p><u>Offshore cable corridor</u>:</p> <ul style="list-style-type: none"> • Up to six subsea HVAC booster stations (50 m length x 50 m width x 15 m height above seabed); • Up to six export cables of up to 145 km in length (from Hornsea Three array area to landfall), 10 m maximum width of seabed affected. <p>500 m safety zones will be applied for around offshore platforms undergoing decommissioning. Advisory safety distances of 1,000 m will be recommended around vessels undertaking decommissioning activities. Maximum decommissioning duration for the six subsea HVAC booster stations: up to 12 months (based on construction timeframes). Maximum decommissioning (removal) duration for export cables: up to nine years based on construction timeframes. Total removal of all cables. Cable protection to be left in situ.</p>	The maximum amount of infrastructure and associated safety zones and advisory safety distances leading to the crossing of the greatest number of existing cables and pipelines and the greatest sea area potentially affected.

Potential impact	Maximum design scenario	Justification
<p>Removal of infrastructure has the potential to lead to increased suspended sediment concentrations and deposition, which could cause a change in aggregate resource in aggregate extraction areas.</p>	<p>Total area of 1,223.6 km² (696 km² Hornsea Three array area + 354.6 km² offshore cable corridor area + 173 km² temporary working area) comprising: Hornsea Three array:</p> <p>Cutting off jacket foundations below the seabed surface</p> <ul style="list-style-type: none"> • Largest number of piled jacket foundations for turbines (up to 342), four piles per foundation (four legs, one pile per leg), 4 m diameter; • Largest number of piled jacket foundations for offshore HVAC collector substations (up to 12), 24 piles per foundation (six legs, four piles per leg), 4 m diameter; • Largest number of piled jacket foundations for large offshore HVDC converter substations (up to four), 72 piles per foundation (18 legs, four piles per leg), 3.5 m diameter); and • Largest number of piled jacket foundations for offshore accommodation platforms (up to three), four piles per foundation (four legs, one pile per leg), 4 m diameter. <p>Removal of gravity base foundations</p> <ul style="list-style-type: none"> • Largest number of gravity base foundations for turbines (up to 342 41 m diameter) and offshore accommodation platforms (up to three 41 m diameter) and the largest dimensions of gravity base foundation for offshore HVAC collector substations (up to 12 75 m length scale) and offshore HVDC converter substations (up to four 75 m length scale) in the array area. <p>Removal of array, platform interconnector or offshore accommodation platform cables</p> <ul style="list-style-type: none"> • Removal (total or partial) of limited sections of the array cables and offshore platform interconnector cables. (To be determined in consultation with key stakeholders as part of the decommissioning plan.) <p>Offshore cable corridor:</p> <p>Cutting off jacket foundations below the seabed surface</p> <ul style="list-style-type: none"> • Largest number of piled jacket foundations for offshore HVAC booster station (up to four), 24 piles per foundation (six legs, four piles per leg), 4 m diameter. <p>Removal of gravity base foundations</p> <ul style="list-style-type: none"> • Largest number of offshore HVAC booster station gravity base foundations (up to four), associated base dimensions 75 m. <p>Removal of export cables</p> <ul style="list-style-type: none"> • Removal (total or partial) of limited sections of the export cables. (To be determined in consultation with key stakeholders as part of the decommissioning plan.) • Maximum decommissioning duration for the Hornsea Three array area: up to 11 years based on construction timeframes. 	<p>When cutting off jacket foundations below the seabed surface, the greatest disturbance results from the greatest number of foundations.</p> <p>When removing gravity base foundations, the greatest disturbance results from the greatest number of foundations.</p> <p>When removing export, array, platform interconnector or offshore accommodation platform cables, only limited lengths are likely to be removed, from locations to be agreed at a later date.</p>

Table 11.17: Maximum design scenario considered for the assessment of potential impacts on infrastructure and other users: oil and gas operations.

Potential impact	Maximum design scenario	Justification
<i>Construction phase</i>		
Hornsea Three infrastructure, safety zones and advisory safety distances associated with the Hornsea Three array area may restrict potential seismic survey activity.	<p>Total area of 696 km² for Hornsea Three array area comprising:</p> <ul style="list-style-type: none"> Up to 342 wind turbines with floating foundations spread evenly across the array area (12 mooring lines; excursion area 25% of water depth; 1,000 m mooring cable radius); Up to 12 offshore HVAC collector substations; Up to four offshore HVDC substations; Up to three offshore accommodation platforms; Array cables of up to 850 km in length; Up to 15 substation/accommodation platform interconnector cables of up to 225 km in length. <p>500 m safety zones will be applied for around wind turbines and offshore platforms under construction. Advisory safety distances of 1,000 m will be recommended around vessels undertaking construction activities. Construction phase lasting up to 11 years over two phases, with a gap of up to 6 years between the same activity between phases.</p>	<p>Parameters that represent the largest area over which seismic survey activities may be restricted, and over the longest construction period.</p> <p>It should be noted construction will progress across the site over time to the full build out scenario presented. As the spatial programme is not known however the assessment considers the construction to start in any area that is applicable to the assessment as the maximum design scenario.</p>
Drilling and the placement of infrastructure has the potential to be restricted within the Hornsea Three array area and within 1 km from the boundary of the array area by the presence of infrastructure, safety zones and advisory safety distances.	<ul style="list-style-type: none"> Total area of 696 km² for Hornsea Three array area comprising: Up to 342 wind turbines with floating foundations spread evenly across the array area: 12 mooring lines; excursion area 25% of water depth; 1,000 m mooring cable radius; Up to 12 offshore HVAC collector substations; Up to four offshore HVDC substations; Up to three offshore accommodation platforms; Array cables of up to 850 km in length; Up to 15 substation/accommodation platform interconnector cables of up to 225 km in length. <p>500 m safety zones will be applied for around wind turbines and offshore platforms under construction. Advisory safety distances of 1,000 m will be recommended around vessels undertaking construction activities. Construction phase lasting up to 11 years over two phases, with a gap of up to 6 years between the same activity between phases.</p>	<p>Parameters that represent the largest area over which drilling activity or the siting of infrastructure would potentially be restricted, and over the longest construction period.</p> <p>It should be noted construction will progress across the site over time to the full build out scenario presented. As the spatial programme is not known however the assessment considers the construction to start in any area that is applicable to the assessment as the maximum design scenario.</p>
Safety zones around the offshore HVAC booster stations and advisory safety distances associated with activities underway along the offshore cable corridor may restrict potential seismic survey activity.	<p>Total area of 527.6 km² of offshore cable corridor (354.6 km² offshore cable corridor + 173 km² temporary working area) comprising:</p> <ul style="list-style-type: none"> Up to six subsea HVAC booster stations (50 m length x 50 m width x 15 m height above seabed); Up to six export cables of up to 145 km in length (from the Hornsea Three array area to landfall). <p>500 m safety zones will be applied for around offshore platforms under construction. Advisory safety distances of 1,000 m will be recommended around vessels undertaking construction activities. Maximum installation duration for the six subsea HVAC booster stations: up to 12 months (based on two months per structure). Installation of export cables will occur over a maximum duration of three years. The export cables could be installed in up to two phases with a gap of six years between phases. Therefore the maximum duration over which export cables could be installed is nine years).</p>	<p>Parameters that create the greatest disruption to seismic survey activities in terms of area affected and duration.</p>

Potential impact	Maximum design scenario	Justification
Drilling and the placement of infrastructure has the potential to be restricted within the offshore cable corridor and within 1 km from the boundary of the offshore cable corridor.	<p><u>Total area of 527.6 km² of offshore cable corridor (354.6 km² offshore cable corridor + 173 km² temporary working area) comprising:</u></p> <ul style="list-style-type: none"> Up to six subsea HVAC booster stations (50 m length x 50 m width x 15 m height above seabed); Up to six export cables of up to 145 km in length (from the Hornsea Three array area to landfall). <p>500 m safety zones will be applied for around offshore platforms under construction.</p> <p>Advisory safety distances of 1,000 m will be recommended around vessels undertaking construction activities.</p> <p>Maximum installation duration for the six subsea HVAC booster stations: up to 12 months (based on two months per structure).</p> <p>Installation of export cables will occur over a maximum duration of three years. The export cables could be installed in up to two phases with a gap of six years between phases. Therefore the maximum duration over which export cables could be installed is nine years).</p>	Parameters that create the greatest disruption to drilling and the siting of infrastructure in terms of area affected and duration.
The piling of wind turbine and substation foundations will generate underwater noise that may acoustically interfere with seismic survey operations.	<p><u>Maximum design spatial: monopile foundations with concurrent piling</u></p> <p>Up to 361 monopiles (342 turbine foundations and 19 foundations for other infrastructure and platform foundations)</p> <ul style="list-style-type: none"> Piling of up to 342 monopile foundations of 7 m diameter; Piling of up to 19 monopile foundations, 15 m diameter, for substations and platforms including: <ul style="list-style-type: none"> Three offshore accommodation platforms; Twelve offshore HVAC collector substations; and Four offshore HVAC booster stations (on the Hornsea Three offshore cable route corridor). Absolute maximum hammer energy of up to 5,000 kJ, although typically the maximum hammer energy will be considerably less than this and the absolute maximum hammer energy (i.e. up to 5,000 kJ) would not be required at all locations; Maximum four hours piling duration per monopile (including 30 minute soft start) within a 24 hour period; Maximum total duration of actual piling is 1,444 hours (four x 361); Piling within Hornsea Three array area could occur as single vessel scenario or two concurrent vessels (at opposite ends of the site) although maximum design spatial scenario is for <u>concurrent piling</u>. Concurrent piling will occur only within the Hornsea Three array area and not within the Hornsea Three offshore cable corridor; Assumed that one monopile could be installed in each 24 hours period for single piling or up to two monopiles installed for concurrent piling, plus a 20% contingency allowance. Therefore, <u>maximum</u> number of days (single vessel scenario) on which piling could occur is 433.2 days, which consists of: <ul style="list-style-type: none"> Hornsea Three array area = 428.4 days (357 days piling for 342 turbines + three accommodation platforms + 12 offshore HVAC collector substations * 20% contingency); and Hornsea Three offshore cable corridor = 4.8 days (four days piling for four offshore HVAC booster stations * 20% contingency). Or <u>minimum</u> number of days (concurrent vessel scenario) on which piling could occur is 216.6 days, which consists of: <ul style="list-style-type: none"> Hornsea Three array area = 214.2 days (178.5 days piling for 342 turbines + three accommodation platforms + 12 offshore HVAC collector substations * 20% contingency); and Hornsea Three offshore cable corridor = 2.4 days (two days piling for four offshore HVAC booster stations * 20% contingency). Foundation installation could occur over 2.5 years in up to two phases (i.e. of ~1.25 years each phase) with a gap of six years between phases. This includes foundation installation for the offshore HVAC booster substations within the Hornsea Three offshore cable corridor which is expected to occur within an eight month piling phase. 	<p>The maximum design spatial design scenario equates to the greatest area of effect from subsea noise at any one time during piling. The subsea noise Inspire 'lite' modelling showed that the greatest area of effect was for 5,000 kJ hammer and a 7 m diameter pile. The area of ensonification for a 15 m diameter pile was, in fact, smaller than for a 7 m diameter pile (due to the higher frequency components of the smaller pile leading to greater propagation; see section 5.1.1.2 in volume 4, annex 3.1: Subsea Noise Technical Report) and therefore the maximum design scenario presented here captures all pile diameters within the project description up to and including the largest 15 m diameter pile.</p> <p>The HVAC transmission option results in the maximum design scenario spatially due to the potential of monopile foundations for the offshore HVAC booster stations.</p> <p>Two vessels piling concurrently at maximum spacing would result in the largest area of impact at any one time.</p>

Potential impact	Maximum design scenario	Justification
	<p>Maximum design temporal: jacket foundations with single piling <u>Up to 2,016 pin piles (1,368 for turbine foundations and 648 for other infrastructure and platform foundations)</u></p> <ul style="list-style-type: none"> • Piling of up to 342 jacket foundations (four piles per foundation, each pin pile 4 m diameter), with up to 1,368 piles (342 x 4) in total; • Piling of up to 19 jacket foundations, up to 4 m diameter, for substations and platforms including: <ul style="list-style-type: none"> ◦ Three offshore accommodation platforms (six legs with four piles per leg), with up to 72 piles (three x 24) in total; ◦ Twelve offshore HVAC collector substations (six legs with four piles per leg), with up to 288 piles (12 x 24) in total; and ◦ Four offshore HVDC converter substations (72 piles per foundation) with up to 288 piles (four x 72) in total. • Maximum hammer energy of up to 2,500 kJ, although typically the maximum hammer energy will be considerably less than this, with only a proportion of the piles requiring the maximum hammer energy (i.e. up to 2,500 kJ); • Maximum four hours piling duration per pile (including 30 minute soft start); • Maximum total piling duration 8,064 hours of piling (four x 2,016); • Piling could occur as single vessel scenario or two concurrent vessels (at opposite ends of the site) although maximum design temporal scenario is for <u>single piling</u>; • Assumed that four pin piles could be installed in each 24 hour period for single piling, or up to eight pin piles installed for concurrent piling, plus a 20% contingency; • Therefore <u>maximum number of days</u> (single piling scenario) on which piling could occur is 604.8 days (2,016 pin piles ((1,368 pin piles for turbines + 72 pin piles for accommodation platforms + 288 pin piles for offshore HVAC collector substations + 288 pin piles for offshore HVDC converter substations) / four a day) x 20% contingency) within the Hornsea Three array area. • Or <u>minimum number of days</u> (concurrent piling scenario) on which piling could occur is 302.4 days (2,016 pin piles ((1,368 pin piles for turbines + 72 pin piles for accommodation platforms + 288 pin piles for offshore HVAC collector substations + 288 pin piles for offshore HVDC converter substations) / eight a day) x 20% contingency) within the Hornsea Three array area. <p>Foundation installation could occur over 2.5 years in up to two phases (i.e. of ~1.25 years each phase) with a gap of six years between phases.</p>	<p>The maximum design temporal scenario represents the longest duration of effects from subsea noise. This scenario assumes piled foundations again but this time for jackets as this could result in a longer duration of piling per foundation compared with monopiles.</p> <p>The HVDC transmission option results in the maximum design scenario temporally as the offshore HVDC converter substations (HVDC transmission option) requires a greater number of pin piles compared to the offshore HVAC booster stations (HVAC transmission option).</p> <p>Scenario assumes longest duration of piling per pile (4 hours) and number of days piling is estimated assuming four pile jacket foundation installed per day, although realistically there is potential to install up to eight piles in one day.</p> <p>Single vessel piling is assumed as this would prolong the total number of days on which piling could occur within the 2.5 year piling phase (although noting that the piling phase itself has not actually increased under this scenario).</p>
<i>Operation phase</i>		
The presence of infrastructure within the Hornsea Three array area may restrict potential seismic survey activity.	<p>Total area of 696 km² of Hornsea Three array area comprising:</p> <ul style="list-style-type: none"> • Up to 342 wind turbines with floating foundations spread evenly across the array area (12 mooring lines; excursion area 25% of water depth; 1,000 m mooring cable radius); • Up to 12 offshore HVAC collector substations; • Up to four offshore HVDC substations; • Up to three offshore accommodation platforms; • Array cables of up to 850 km in length; • Up to 15 substation/accommodation platform interconnector cables of up to 225 km in length. <p>500 m safety zones will be applied for around manned offshore platforms.</p> <p>500 m safety zones will be applied for around wind turbines and offshore platforms undergoing major maintenance.</p> <p>Advisory safety distances of 1,000 m will be recommended around vessels undertaking major maintenance activities.</p> <p>Anticipated design life of wind farm 25 years.</p>	Parameters that create the greatest disruption to seismic survey activities in terms of area affected and duration.

Potential impact	Maximum design scenario	Justification
Drilling and the placement of infrastructure has the potential to be restricted within the Hornsea Three array area and within 1 km from the boundary of the array area by the presence of infrastructure, safety zones and advisory safety distances.	<p>Total area of 696 km² of Hornsea Three array area comprising:</p> <ul style="list-style-type: none"> Up to 342 wind turbines with floating foundations spread evenly across the array area: 12 mooring lines; excursion area 25% of water depth; 1,000 m mooring cable radius; Up to 12 offshore HVAC collector substations; Up to four offshore HVDC substations; Up to three offshore accommodation platforms; Array cables of up to 850 km in length; Up to 15 substation/accommodation platform interconnector cables of up to 225 km in length. <p>500 m safety zones will be applied for around manned offshore platforms. 500 m safety zones will be applied for around wind turbines and offshore platforms undergoing major maintenance. Advisory safety distances of 1,000 m will be recommended around vessels undertaking major maintenance activities. Anticipated design life of wind farm 25 years.</p>	Largest area over which drilling activity or the siting of infrastructure would potentially be restricted.
Safety zones around the offshore HVAC booster stations and advisory safety distances associated with maintenance activities underway along the offshore cable corridor may restrict potential seismic survey activity.	<p>Total area of 354.6 km² of offshore cable corridor comprising:</p> <ul style="list-style-type: none"> Up to four offshore HVAC booster stations (90 m length x 90 m width x 90 m total height); Up to six export cables of up to 145 km in length (from the Hornsea Three array area to landfall). <p>500 m safety zones will be applied for around manned offshore platforms. Advisory safety distances of 1,000 m will be recommended around vessels during major maintenance activities. Anticipated design life of wind farm 25 years.</p>	Parameters that create the greatest disruption to seismic survey activities in terms of area affected and duration. Offshore HVAC booster stations represent the maximum design scenario (rather than subsea HVAC booster stations) due to the potential for operational safety zones.
Drilling and the placement of infrastructure has the potential to be restricted within the offshore cable corridor and within 1 km from the boundary of the offshore cable corridor.	<p>Total area of 354.6 km² of offshore cable corridor comprising:</p> <ul style="list-style-type: none"> Up to four offshore HVAC booster stations (90 m length x 90 m width x 90 m total height); Up to six export cables of up to 145 km in length (from the Hornsea Three array area to landfall). <p>500 m safety zones will be applied for around manned offshore platforms. Advisory safety distances of 1,000 m will be recommended around vessels during major maintenance activities. Anticipated design life of wind farm 25 years.</p>	Parameters that create the greatest disruption to drilling and the siting of infrastructure in terms of area affected and duration.

Potential impact	Maximum design scenario	Justification
The presence of new wind turbines in previously open sea areas may cause interference with the performance of the REWS located on oil and gas platforms.	<p>Total area of 696 km² of Hornsea Three array area comprising:</p> <ul style="list-style-type: none"> • Up to 342 wind turbines (monopile foundation) within an area of up to 696 km²; • Up to 19 offshore platforms. <p>Modelled dimensions:</p> <ul style="list-style-type: none"> • Layout A (an indicative layout with maximum number of turbines) (see Annex 11.1: Radar Early Warning Systems Technical Annex); • Turbine parameters (generic turbine geometry scaled to achieve the approximate dimensions of the proposed Hornsea Three turbines, with the maximum design scenario being the maximum number of turbines in the Hornsea Three array area (see Annex 11.1: Radar Early Warning Systems Technical Annex); • Rotor diameter: 184 m; • Hub diameter: 7 m; • Blade length: 88.5 m; • Lower blade tip height: 38.5 m LAT; • Hub height: 127 m LAT; • Upper blade tip height: 222 m LAT; • Diameter of monopile: 8 m tapering to 6 m at top; • Offshore platforms 80 m x 80 m x 80 m. <p>Anticipated design life of wind farm 25 years.</p>	Parameters that create the greatest number of turbines with the greatest radar cross section.
Wind turbines and associated infrastructure will form a physical obstruction and may disrupt vessel access to oil and gas platforms and subsea infrastructure.	<p>Total area of 696 km² of Hornsea Three array area comprising:</p> <ul style="list-style-type: none"> • Up to 342 wind turbines with floating foundations spread evenly across the array area (12 mooring lines; excursion area 25% of water depth; 1,000 m mooring cable radius); • Total development area of up to 696 km²; • Up to 12 offshore HVAC collector substations; • Up to four offshore HVDC substations; • Up to three offshore accommodation platforms. <p>500 m safety zones will be applied for around manned offshore platforms.</p> <p>500 m safety zones will be applied for around wind turbines and offshore platforms undergoing major maintenance. Advisory safety distances of 1,000 m will be recommended around vessels undertaking major maintenance activities.</p> <p>Offshore cable corridor:</p> <ul style="list-style-type: none"> • Up to four offshore HVAC booster stations (90 m length x 90 m width x 90 m total height); • Up to six export cables of up to 145 km in length (from the Hornsea Three array area to landfall). <p>500 m safety zones will be applied for around manned offshore platforms.</p> <p>Advisory safety distances of 1,000 m will be recommended around vessels during major maintenance activities.</p> <p>Anticipated design life of wind farm 25 years.</p>	Parameters that create the greatest disruption to vessel access in terms of area affected and duration.

Potential impact	Maximum design scenario	Justification
<i>Decommissioning phase</i>		
Hornsea Three infrastructure, safety zones and advisory safety distances associated with decommissioning of the Hornsea Three array area may restrict potential seismic survey activity.	<p>Total area of 696 km² Hornsea Three array area comprising:</p> <ul style="list-style-type: none"> Up to 342 wind turbines with floating foundations spread evenly across the array area (12 mooring lines; excursion area 25% of water depth; 1,000 m mooring cable radius); Up to 12 offshore HVAC collector substations; Up to four offshore HVDC substations; Up to three offshore accommodation platforms. Array cables of up to 850 km in length; Up to 15 substation/accommodation platform interconnector cables of up to 225 km in length. <p>500 m safety zones will be applied for around wind turbines and offshore platforms undergoing decommissioning. Advisory safety distances of 1,000 m will be recommended around vessels undertaking decommissioning activities. Maximum decommissioning duration for the Hornsea Three array area: up to 11 years based on construction timeframes.</p>	Parameters that represent the largest area over which seismic survey activities may be restricted, and over the longest duration.
Drilling and the placement of infrastructure has the potential to be restricted within the Hornsea Three array area and within 1 km from the boundary of the array area by the presence of infrastructure, safety zones and advisory safety distances.	<p>Total area of 696 km² of Hornsea Three array area comprising:</p> <ul style="list-style-type: none"> Up to 342 wind turbines floating foundations spread evenly across the array area (12 mooring lines; excursion area 25% of water depth; 1,000 m mooring cable radius); Up to 12 offshore HVAC collector substations; Up to four offshore HVDC substations; Up to three offshore accommodation platforms; Array cables of up to 850 km in length; Up to 15 substation/accommodation platform interconnector cables of up to 225 km in length. <p>500 m safety zones will be applied for around wind turbines and offshore platforms undergoing decommissioning. Advisory safety distances of 1,000 m will be recommended around vessels undertaking decommissioning activities. Maximum decommissioning duration for the Hornsea Three array area: up to 11 years based on construction timeframes.</p>	Parameters that represent the largest area over which drilling activity or the siting of infrastructure would be restricted, and over the longest duration.
Safety zones around the offshore HVAC booster stations and advisory safety distances associated with activities underway along the offshore cable corridor may restrict potential seismic survey activity.	<p>Total area of 696 km² of offshore cable corridor comprising:</p> <ul style="list-style-type: none"> Up to six offshore HVAC booster stations (50 m length x 50 m width x 15 m height above seabed); Up to six export cables of up to 145 km in length (from the Hornsea Three array area to landfall). <p>500 m safety zones will be applied for around offshore platforms undergoing decommissioning. Advisory safety distances of 1,000 m will be recommended around vessels undertaking decommissioning activities. Maximum decommissioning (removal) duration for the six subsea HVAC booster stations: up to 12 months (based on construction timeframes). Maximum decommissioning (removal) duration for export cables: up to nine years based on construction timeframes.</p>	Parameters that create the greatest disruption to seismic survey activities in terms of area affected and duration.

Potential impact	Maximum design scenario	Justification
Drilling and the placement of infrastructure has the potential to be restricted within the offshore cable corridor and within 1 km from the boundary of the offshore cable corridor.	<p><u>Total area of 527.6 km² of offshore cable corridor (354.6 km² offshore cable corridor + 173 km² temporary working area) comprising:</u></p> <ul style="list-style-type: none"> • Up to six offshore HVAC booster stations (50 m length x 50 m width x 15 m height above seabed); • Up to six export cables of up to 145 km in length (from the Hornsea Three array area to landfall). <p>500 m safety zones will be applied for around offshore platforms undergoing decommissioning. Advisory safety distances of 1,000 m will be recommended around vessels undertaking decommissioning activities. Maximum decommissioning (removal) duration for the six subsea HVAC booster stations: up to 12 months (based on construction timeframes). Maximum decommissioning (removal) duration for export cables: up to nine years based on construction timeframes. Cable protection shall be left in situ.</p>	Parameters that create the greatest disruption to drilling and the siting of infrastructure in terms of area affected and duration.

Table 11.18: Impacts scoped out of the assessment for infrastructure and other users: recreational users and recreational fishing.

Potential impact	Justification
Construction phase	
Safety zones and advisory safety distances associated with activities within the Hornsea Three array area may displace kite surfing, kayaking, surfing and diving activities resulting in a loss of recreational resource.	Due to the distance offshore of the Hornsea Three array area (approximately 65 NM at closest point), kite surfing, surfing, windsurfing, sea/surf kayaking, canoeing and SCUBA activities are considered extremely unlikely to take place in this area. This was agreed by PINS in their scoping opinion (PINS, 2016).
Hornsea Three construction activities may result in sediment plumes which may overlap with diving sites.	There are no SCUBA diving sites highlighted within the Hornsea Three array area or along the majority of the offshore cable corridor, with the exception of at the cable landfall location (Figure 11.2). Chapter 1, Marine Processes provides an assessment of the potential for Hornsea Three construction activities to cause elevations in suspended sediment concentrations. The predicted spatial extent of sediment plumes from construction within the Hornsea Three array area do not overlap with any SCUBA diving sites. Whilst the predicted elevations in suspended sediments associated with the construction activities along the offshore cable corridor may overlap with some inshore SCUBA diving sites, this will occur over a very short duration, and any deposition arising from the activities in the vicinity of these sites will be of a very low magnitude (see chapter 1: Marine Processes). Due to the very low impact magnitude, impacts upon recreational diving have been screened out of this assessment.
Operation phase	
The physical presence of the Hornsea Three array area and safety zones and advisory safety distances associated with infrastructure and maintenance activities may displace kite surfing, kayaking, surfing and diving activities resulting in a loss of recreational resource.	Due to the distance offshore of the Hornsea Three array area (approximately 65 NM at closest point), kite surfing, surfing, windsurfing, sea/surf kayaking, canoeing and SCUBA activities are considered extremely unlikely to take place in this area. This was agreed by PINS in their scoping opinion (PINS, 2016).
Decommissioning phase	
Safety zones and advisory safety distances associated with activities within the Hornsea Three array area may displace kite surfing, kayaking, surfing and diving activities resulting in a loss of recreational resource.	Due to the distance offshore of the Hornsea Three array area (approximately 65 NM at closest point), kite surfing, surfing, windsurfing, sea/surf kayaking, canoeing and SCUBA activities are considered extremely unlikely to take place in this area. This was agreed by PINS in their scoping opinion (PINS, 2016).

Table 11.19: Impacts scoped out of the assessment for infrastructure and other users: marine disposal sites, cables and pipelines.

Potential impact	Justification
Construction, Operation and Decommissioning phases	
Impact on access to marine aggregate extraction areas	Restriction of access to marine aggregate extraction sites has been scoped out of the assessment on the basis that, with the exception of a small area of overlap with area 491, there are no marine aggregate extraction sites within the Hornsea Three array area or offshore cable corridor. Any restriction of access would therefore be associated with advisory safety distances around vessels carrying out export cable installation or maintenance activities, which would be temporary, transient and of limited spatial extent compared with the size of the aggregate areas.
Impact on marine disposal sites	There are no marine disposal sites within the Hornsea Three array area or the offshore cable corridor. The nearest sites are those associated with Hornsea Project One and Hornsea Project Two. The assessment completed in chapter 1: Marine Processes concludes that the deposition of sediment to the seabed, at measureable thicknesses, due to Hornsea Three construction activities will be localised and would not extend to these disposal sites. In addition, chapter 1: Marine Processes concludes that the operational presence of Hornsea Three will not alter regional sediment transport pathways. As such, there is not anticipated to be any physical impact on these sites and so disposal sites have been scoped out of the assessment.
Impact on cables and pipelines from scour and sediment mobilisation resulting from Hornsea Three	Impacts upon cables and pipelines may arise as a result of physical impacts upon marine processes arising from Hornsea Three resulting in scour and sediment mobilisation. An assessment has been completed in chapter 1: Marine Processes of the changes to physical process regimes predicted to occur as a result of the construction, operation and decommissioning of Hornsea Three. This included an assessment of changes to the tidal regime (e.g. tidal flows) and concluded that changes to current speeds resulting from the operational presence of Hornsea Three will be limited to within the Hornsea Three array area and a narrow region just outside the boundary. As such, indirect impacts on surrounding infrastructure (e.g. cables and pipelines) due to predicted changes to physical process are not anticipated to occur. In addition, a first-order estimate has been performed of the scour potential due to the presence of the turbine foundation structures in the Hornsea Three array area. The results of this scour assessment are presented in chapter 1: Marine Processes. From this assessment, it is not anticipated that scour associated with individual turbine foundation structures will impact upon surrounding infrastructure, such as cables and pipelines, therefore this impact has been screened out of the assessment.

Table 11.20: Impacts scoped out of the assessment for infrastructure and other users: airborne noise.

Potential impact	Justification
Construction phase	
Piling activities will generate construction noise that may exceed guideline levels for commercial fishing vessels and commercial shipping traffic	The assessment for Hornsea Project Two concluded that potential airborne noise effects from piling were negligible for receptors on board commercial fishing vessels and commercial shipping traffic. The worst case distance of the receptor from the nearest wind turbine/project boundary is the same for Hornsea Three (500 m for commercial fishing vessel, 1 NM for commercial shipping traffic). The effect of airborne noise from piling on receptors on board commercial fishing vessels and commercial ships has therefore been scoped out of this assessment. This was agreed by the Secretary of State in their scoping opinion (PINS, 2016).
Piling activities will generate construction noise that may exceed guideline levels for manned gas platforms	The assessment for Hornsea Project Two concluded that potential airborne noise effects from piling were negligible for receptors on board gas platforms. The nearest manned gas platform to Hornsea Three (Schooner A platform) is located at a greater distance from the Hornsea Three project boundary compared with Hornsea Project Two. The effect of airborne noise from piling on receptors on board gas platforms has therefore been scoped out of this assessment. This was agreed by the Secretary of State in their scoping opinion (PINS, 2016).
Piling activities will generate construction noise that may exceed guideline levels for residential onshore receptors and leisure and recreational receptors	The assessment for Hornsea Project Two concluded that the predicted airborne noise levels generated from piling were well below the threshold of significant impact adopted for receptors at and around the East Riding of Yorkshire coastline. The Hornsea Three array area is located further from the nearest UK coastline. The effect of airborne noise during construction from piling for residential onshore receptors and leisure and recreational receptors has therefore been scoped out of this assessment. This was agreed by the Secretary of State in their scoping opinion (PINS, 2016).
Operation phase	
Airborne noise may exceed guideline levels for commercial fishing vessels and commercial shipping traffic	The assessment for Hornsea Project Two concluded that potential operational noise effects were negligible for receptors on board commercial fishing vessels and commercial shipping traffic. The worst case distance of the receptor from the nearest wind turbine/project boundary is the same for Hornsea Three (50 m for commercial fishing vessel, 1 NM for commercial shipping traffic). The effect of operational noise for receptors on board commercial fishing vessels and commercial shipping traffic has therefore been scoped out of this assessment. This was agreed by the Secretary of State in their scoping opinion (PINS, 2016).
Airborne noise may exceed guideline values for offshore accommodation platforms	The assessment for Hornsea Project Two concluded that potential operational noise effects were negligible for receptors on board gas accommodation platforms. The nearest gas platform with accommodation to Hornsea Three (Schooner A platform) is located at a greater distance from the Hornsea Three project boundary compared with Hornsea Project Two. The effect of operational noise for receptors on board gas accommodation platforms has therefore been scoped out of this assessment. This was agreed by the Secretary of State in their scoping opinion (PINS, 2016).
Airborne noise may exceed guideline levels for residential onshore receptors and leisure and recreational receptors	The assessment for Hornsea Project Two concluded that the predicted operational noise levels were well below the threshold of significant impact adopted for receptors at and around the East Riding of Yorkshire coastline. The Hornsea Three array area is located further from the nearest UK coastline. The effect of airborne noise during operations for residential onshore receptors, and leisure and recreational receptors has therefore been scoped out of this assessment. This was agreed by the Secretary of State in their scoping opinion (PINS, 2016).
Decommissioning phase	
Airborne noise may exceed guideline levels for commercial fishing vessels and commercial shipping traffic	Decommissioning activities will be similar to construction activities but with the exception that piling operations will not be required. Given that the level of noise generated from the decommissioning of Hornsea Three will be less than the construction phase, the effect of airborne noise from piling for receptors on board commercial fishing vessels and commercial ships has therefore been scoped out of this assessment. This was agreed by the Secretary of State in their scoping opinion (PINS, 2016).
Airborne noise may exceed guideline values for offshore accommodation platforms	Decommissioning activities will be similar to construction activities but with the exception that piling operations will not be required. Given that the level of noise generated from the decommissioning of Hornsea Three will be less than the construction phase, the effect of airborne noise from piling for receptors on board gas accommodation platforms has therefore been scoped out of this assessment. This was agreed by the Secretary of State in their scoping opinion (PINS, 2016).
Airborne noise may exceed guideline levels for residential onshore receptors and leisure and recreational receptors	Decommissioning activities will be similar to construction activities but with the exception that piling operations will not be required. Given that the level of noise generated from the decommissioning of Hornsea Three will be less than the construction phase, the effect of airborne noise from piling for residential onshore receptors, and leisure and recreational receptors has therefore been scoped out of this assessment. This was agreed by the Secretary of State in their scoping opinion (PINS, 2016).

11.9 Impact assessment criteria

- 11.9.1.1 The criteria for determining the significance of effects is a two stage process that involves defining the sensitivity of the receptors and the magnitude of the impacts. This section describes the criteria applied in this chapter to assign values to the sensitivity of receptors and the magnitude of potential impacts. The terms used to define sensitivity and magnitude are based on those used in the DMRB methodology, which is described in further detail in volume 1, chapter 5: Environmental Impact Assessment Methodology.
- 11.9.1.2 The criteria for defining sensitivity in this chapter are outlined in Table 11.21 below.

Table 11.21: Definition of terms relating to the sensitivity of the receptor.

Sensitivity	Definition used in this chapter
Very High	Receptor is of critical importance to the local, regional or national economy and/or the receptor is highly vulnerable to impacts that may arise from the project and/or recoverability is long term or not possible.
High	Receptor is of high value to the local, regional or national economy and/or the receptor is generally vulnerable to impacts that may arise from the project and/or recoverability is slow and/or costly.
Medium	Receptor is of moderate value to the local, regional or national economy and/or the receptor is somewhat vulnerable to impacts that may arise from the project and/or has moderate to high levels of recoverability.
Low (or lower)	Receptor is of low value to the local, regional or national economy and/or the receptor is not generally vulnerable to impacts that may arise from the project and/or has high recoverability.
Negligible	Receptor is of negligible value to the local, regional or national economy and/or the receptor is not vulnerable to impacts that may arise from the project and/or has high recoverability.

- 11.9.1.3 The criteria for defining magnitude in this chapter are outlined in Table 11.22 below.
- 11.9.1.4 The significance of the effect upon infrastructure and other users is determined by correlating the magnitude of the impact and the sensitivity of the receptor. The particular method employed for this assessment is presented in Table 11.23. Where a range of significance of effect is presented in Table 11.23, the final assessment for each effect is based upon expert judgement.
- 11.9.1.5 For the purposes of this assessment, any effects with a significance level of minor or less have been concluded to be not significant in terms of the EIA Regulations.

Table 11.22: Definition of terms relating to the magnitude of an impact.

Magnitude of impact	Definition used in this chapter
Major	Total loss of ability to carry on activities and/or impact is of extended physical extent and/or long term duration (i.e. total life of project) and/or frequency of repetition is continuous and/or effect is not reversible for project (Adverse).
Moderate	Loss or alteration to significant portions of key components of current activity and/or physical extent of impact is moderate and/or medium term duration (i.e. operational period) and/or frequency of repetition is medium to continuous and/or effect is not reversible for project phase (Adverse).
Minor	Minor shift away from baseline, leading to a reduction in level of activity that may be undertaken and/or physical extent of impact is low and/or short to medium term duration (i.e. construction period) and/or frequency of repetition is low to continuous and/or effect is not reversible for project phase (Adverse).
Negligible	Very slight change from baseline condition and/or physical extent of impact is negligible and/or short term duration (i.e. less than two years) and/or frequency of repetition is negligible to continuous and/or effect is reversible (Adverse).
No change	No change from baseline conditions.

Table 11.23: Matrix used for the assessment of the significance of the effect.

Sensitivity of receptor	Magnitude of impact					
		No change	Negligible	Minor	Moderate	Major
	Negligible	Negligible	Negligible	Negligible or minor	Negligible or minor	Minor
	Low	Negligible	Negligible or minor	Negligible or minor	Minor	Minor or moderate
	Medium	Negligible	Negligible or minor	Minor	Moderate	Moderate or major
	High	Negligible	Minor	Minor or moderate	Moderate or major	Major or substantial
	Very high	Negligible	Minor	Moderate or major	Major or substantial	Substantial

11.10 Measures adopted as part of Hornsea Three

11.10.1.1 As part of the project design process, a number of designed-in measures have been proposed to reduce the potential for impacts on infrastructure and other users (see Table 11.24). This approach has been employed in order to demonstrate commitment to measures by including them in the design of Hornsea Three and have therefore been considered in the assessment presented in section 11.11 below. These measures are considered standard industry practice for this type of development. Assessment of sensitivity, magnitude and therefore significance includes implementation of these measures.

Table 11.24: Designed-in measures adopted as part of Hornsea Three.

Measures adopted as part of Hornsea Three	Justification
A cable crossing agreement will be established with relevant cable operators. This agreement will include the ability of a cable operator to access their cable during construction if required. If such works are required to occur simultaneously, consultation with the cable operator will be undertaken.	To reduce potential conflict at cable crossing locations. Such agreements would be based on the templates (OP115) provided by Oil and Gas UK (Oil and Gas UK, 2015a).
The crossing or laying of marine export cables from Hornsea Three over or adjacent to existing or future pipelines will be subject to pipeline crossing/proximity agreements between Hornsea Three and the pipeline operators, prior to the start of the construction phase.	To reduce potential conflict at pipeline crossing locations. Such agreements would be based on the templates (OP115) provided by Oil and Gas UK (Oil and Gas UK, 2015a).
Continued consultation with oil and gas operators and licensees will promote and maximise cooperation between parties and minimise both spatial and temporal interactions between conflicting activities.	Licence blocks will be relinquished and acquired by different operators over the duration of the project life and oil and gas operations will change according to the project phase. By continued consultation with the oil and gas operators both parties will keep informed of planned activities in order to minimise disruption to either parties operations and to maximise coexistence.
Hornsea Three intends to apply for a standard 500 m safety zone (as per the 2007 Safety Zone regulations cited in the justification column), around each of the wind turbines, offshore HVAC collector substations, offshore HVDC converter stations, accommodation platforms and the offshore HVAC booster stations whilst construction/decommissioning works are ongoing. Safety zones of 50 m may be sought for incomplete structures where construction/decommissioning activity may be temporarily paused (and therefore the 500 m safety zone has lapsed). During the operational phase a 500 m safety zone shall also be applied for around manned offshore platforms, and around wind turbines and offshore platforms undergoing major maintenance.	Safety zones are established in the interests of safety to infrastructure and other users receptors, in accordance with The Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations 2007.
1,000 m advisory safety distances will be recommended around vessels undertaking construction, major maintenance and decommissioning activities.	Advisory safety distances are recommended in the interests of safety to other marine users, particularly navigational safety.
Promulgation of information including regular Notices to Mariners, navigational aids and marine charting updates will be utilised. Information and notices will also be posted at the landfall location.	To ensure other marine users are aware of wind farm operations.
At the time of decommissioning, Hornsea Three shall consult with BEIS and any other relevant bodies to determine whether safety zones will be required for the decommissioning of Hornsea Three.	Safety zones are established in the interests of safety to infrastructure and other users receptors, in accordance with The Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations 2007.

11.11 Assessment of significance

11.11.1 Construction phase

- 11.11.1.1 The impacts of the offshore construction of Hornsea Three have been assessed on infrastructure and other users. The environmental impacts arising from the construction of Hornsea Three are listed in Table 11.15, Table 11.16 and Table 11.17 above along with the maximum design scenario against which each construction phase impact has been assessed.
- 11.11.1.2 A description of the potential effect on infrastructure and other users receptors caused by each identified impact is given below. The receptors have been divided into categories, as per Table 11.15, Table 11.16 and Table 11.17, for ease of reference.

Recreational users and recreational fishing

Hornsea Three infrastructure, safety zones and advisory safety distances associated with activities within the Hornsea Three array area and along the offshore cable corridor may displace recreational craft and recreational fishing vessels resulting in a loss of recreational resource.

Magnitude of impact

- 11.11.1.3 The installation of infrastructure, including floating foundations and associated mooring lines, and the presence of safety zones and advisory safety distances during the construction phase may result in the displacement of recreational craft and recreational fishing vessels from the Hornsea Three array area and along the offshore cable corridor.
- 11.11.1.4 The spatial extent of the Hornsea Three array area is small in the context of the available sailing area in the southern North Sea, covering approximately 696 km², with the potential for safety zones and advisory safety distances to extend up to 500 m and 1,000 m respectively beyond this area. The impact of safety zones and advisory safety distances is mostly reversible as once each structure has been installed and commissioned these will be removed. The exception is for manned offshore platforms, where 500 m safety zones will be applied for throughout the operational phase. The presence of mooring lines associated with floating foundations may also result in an ongoing displacement impact within the array area. Construction of the Hornsea Three array area could take up to 11 years over up to two phases (albeit with a six year gap between phases). The level of recreational activity within the Hornsea Three array area is low, and recreational fishing activity is likely to be limited, giving a very low frequency of impact.

11.11.1.5 The offshore cable corridor extends 145 km from the Hornsea Three array area to the landfall. Up to six export cables will be installed by up to nine vessels and up to 15 support vessels at different stages over a period of up to nine years (installation of the export cables themselves will occur over a duration of three years, however the cables could be installed in up to two phases with a gap of six years between phases). In addition, up to six subsea HVAC booster stations may be installed within the offshore HVAC booster station search area. The spatial extent of the impact will be relatively small, with the potential for localised displacement of recreational craft from the individual 1,000 m advisory safety distances around each cable installation vessel and 500 m safety zones around the subsea HVAC booster stations. There is low to medium recreational vessel activity in the nearshore area of the Hornsea Three offshore cable corridor and a number of offshore routes which may intersect the offshore cable corridor.

11.11.1.6 Works to install the export cables within the intertidal area may take place over a period of up to eight years (installation of the export cables themselves within the intertidal area will occur over a duration of 24 months, however the cable could be installed in up to two phases with a gap of six years between phases). There is a general boating area crossing the inshore section of the offshore cable corridor. Boat angling and shore angling also takes place, particularly within 1 NM of the shoreline. There is the potential for temporary loss of recreational resource during nearshore/inshore and intertidal cable installation activities.

11.11.1.7 For the Hornsea Three array area the impact is predicted to be of local spatial extent, short to medium term duration, continuous (but of low occurrence) and low reversibility .

11.11.1.8 For the offshore HVAC booster search area the impact is predicted to be of very local spatial extent, short to medium term duration, continuous and low reversibility.

11.11.1.9 For the offshore cable corridor the impact is predicted to be of local spatial extent, short to medium term duration, intermittent and high reversibility.

11.11.1.10 It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **minor**.

Sensitivity of the receptor

11.11.1.11 Recreational vessels are able to alter their route, dependent on the target destination. There are also a variety of boat angling and shore angling locations along the eastern region such that alternatives are available during installation works at the cable landfall. Notices to Mariners will be promulgated regularly during the construction phase, advising of the location and nature of construction works, and information and notices will be posted at the landfall location, ensuring that recreational activities can be planned accordingly.

11.11.1.12 The receptor is deemed to be of low vulnerability, high recoverability and moderate value. The sensitivity of the receptor is therefore, considered to be **low**.

Significance of the effect

- 11.11.1.13 Overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **minor**. The effect will, therefore, be of **negligible** adverse significance, which is not significant in EIA terms.
- 11.11.1.14 It is important to note that the assessment presented above considers a maximum design scenario involving the full build out of Hornsea Three using floating foundations, with associated mooring lines. There are a range of floating foundations as well as other technologies (such as monopiles and jacket foundations) which will be considered for Hornsea Three. If such alternative technologies were to be used (those foundations that are more 'tried and tested' by the offshore wind industry or alternative floating foundation concepts that had a reduced seabed/water column footprint) or if the spatial extent of deployment of the floating foundation design considered in this assessment was reduced, the magnitude of this impact (and hence the significance of effect), may change. Any updates to the project description and impact assessment will be presented in the Environmental Statement.

Aggregate extraction, cables and pipelines

Installation of Hornsea Three infrastructure may affect existing cables and pipelines or restrict access to cables and pipelines.

Magnitude of impact

- 11.11.1.15 There are no pipelines located within the Hornsea Three array area or within 500 m of the Hornsea Three array area, however the Topaz well to Schooner platform pipelines operated by INEOS are located within 1 km of the Hornsea Three array area. There are 27 active pipelines which intersect the Hornsea Three offshore cable corridor, operated by Shell, Perenco, Ithaca, ConocoPhillips, INEOS and Centrica, and a further two pipelines within 1 km of the offshore cable corridor, operated by Centrica.
- 11.11.1.16 There is one active telecoms cable (Norsea com 1 segment 3/Tampnet) and two out of service cables (Stratos and Weybourne to Esbjerg) crossing the Hornsea Three array area. There are two active telecoms cables (Norsea com 1 segment 3/Tampnet and North Sea Offshore) and two out of service telecoms cables (Stratos and Weybourne to Esbjerg) crossing the Hornsea Three offshore cable corridor, with North Sea Offshore, Stratos and Weybourne to Esbjerg making landfall in the area of the Hornsea Three landfall. In the landfall location, the Hornsea Three offshore cable corridor also crosses the export cables for the Dudgeon and Sheringham Shoal offshore wind farms.
- 11.11.1.17 Hornsea Three infrastructure, including floating foundations and associated mooring lines, and the presence of safety zones and advisory safety distances may restrict access to existing cables and pipelines within the Hornsea Three array area (cables) and along the offshore cable corridor (cables and pipelines).

11.11.1.18 Pipeline crossing and proximity agreements will be established with relevant pipeline operators, to minimise the potential for any impact on existing lines in accordance with recognized industry best practice, with discussions between the relevant operators and Hornsea Three already underway. The crossing agreement, based on the templates (OP115) provided by Oil and Gas UK (Oil and Gas UK, 2015a), will ensure that all parties have agreed on the methods to be employed and that the risks have been managed to acceptable standards. Where the cable is located within 500 m of a pipeline, it is intended that a proximity agreement will be entered into between the pipeline operator and Hornsea Three, to establish the responsibilities and obligations of both parties. Cable crossing and proximity agreements will similarly be established with the relevant cable operator. It is also intended that similar pipeline or cable crossing and proximity agreements will be put in place for all future pipelines and cables where required, prior to their installation.

11.11.1.19 Crossing agreements will include the ability of a cable/pipeline operator to access their infrastructure during Hornsea Three construction as far as practical, though exclusion will be required as identified in paragraph 11.11.1.17 above. The crossing agreements would ensure close communication and planning between both parties to ensure disruption of activities is minimised.

11.11.1.20 The impact is predicted to be of local spatial extent, short to medium term duration, continuous (Hornsea Three array area)/intermittent (offshore cable corridor) and low reversibility (Hornsea Three array area)/high reversibility (offshore cable corridor). It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **minor**.

Sensitivity of the receptor

11.11.1.21 Restriction of access to an active pipeline or cable for inspection and maintenance activities could be critical to the operator of that cable/pipeline. Pipeline and cable crossings are common across the UKCS (see Figure 11.9 and Kingfisher Information Service – Offshore Renewable & Cable Awareness, 2017), and there are established mechanisms for controlling the level of impact to both parties, in the form of the commercial agreements referred to in paragraph 11.11.1.18 above.

11.11.1.22 The operators of active pipelines and cables are deemed to be of medium vulnerability, medium recoverability and high value. The sensitivity of the receptor is therefore, considered to be **high**.

Significance of the effect

11.11.1.23 Overall, it is predicted that the sensitivity of the receptor is considered to be **high** and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

11.11.1.24 It is important to note that the assessment presented above considers a maximum design scenario involving the full build out of Hornsea Three using floating foundations, with associated mooring lines. There are a range of floating foundations as well as other technologies (such as monopiles and jacket foundations) which will be considered for Hornsea Three. If such alternative technologies were to be used (those foundations that are more 'tried and tested' by the offshore wind industry or alternative floating foundation concepts that had a reduced seabed/water column footprint) or if the spatial extent of deployment of the floating foundation design considered in this assessment was reduced, the magnitude of this impact (and hence the significance of effect), may change. Any updates to the project description and impact assessment will be presented in the Environmental Statement.

Installation of infrastructure has the potential to lead to increased suspended sediment concentrations and deposition, which could cause a change in aggregate resource in aggregate extraction areas.

11.11.1.25 The installation of the Hornsea Three wind turbine and offshore platform foundations and cables has the potential to increase suspended sediment concentration (SSC) within the water column and also to deposit disturbed sediments on the surrounding seabed. This in turn has the potential to impact on adjacent aggregate extraction areas, through the potential deposition of sediment within the licenced areas. The potential change to the physical environment from the Hornsea Three related construction activities referred to above are presented in chapter 1: Marine Processes, and are assessed below in terms of aggregate extraction areas as a receptor.

11.11.1.26 Aggregate extraction licences are shown in Figure 11.4, with their distances from the Hornsea Three array area and offshore cable corridor presented in Table 11.5 and Table 11.6 respectively. The closest licence to the Hornsea Three array area is 4 km away, with two further licence areas located 13.3 km and 14 km away. One aggregate extraction site lies directly adjacent to the offshore cable corridor and another site is 1.9 km away. Two further licenced sites are located 7.5 km and 13.2 km away.

Magnitude of impact

11.11.1.27 Chapter 1: Marine Processes considers potential elevations in SSC and deposition to the sea bed as a result of a number of activities proposed to occur both with the Hornsea Three array area and offshore cable corridor. More specifically these activities are: drilling for foundation installation, sea bed preparation for gravity base installation, sandwave clearance prior to cable installation and cable installation itself.

11.11.1.28 In terms of drilling for foundation installation, deposition of sandy deposits arising from this activity are predicted to be concentrated in an area of the order of 200 to 700 m downstream and upstream from individual foundation locations and tens to hundreds of metres wide. Such deposits are predicted to be tens of centimetres to 1 m in depth (coarser sediments will be deposited to greater depths, but more localised to the turbines than that described above for sandy sediments). Fine grained material will be dispersed widely in the surrounding region and is not expected to settle to a measureable thickness.

11.11.1.29 In terms of cable installation within the array area, the volumes of material being displaced and deposited locally are relatively limited (up to 6 m³ per metre of cable burial). This also limits the thickness of any resulting deposition. Any such deposition would also be expected to be localised and as such would not be expected to interact with the aggregate extraction areas in proximity to the offshore cable corridor. For sandwave clearance prior to cable installation, the majority of sediment would be deposited locally. Finer grained material may enter into suspension and be advected away from the point of release up to distances of several tens of kilometres. However at this distance concentrations would be very low and within natural variability. Deposition of sediments to a thickness that is measureable is likely to remain limited.

11.11.1.30 Along the offshore cable corridor, foundation installation may also be required for the offshore HVAC booster stations. An assessment is made of the potential deposition of sediments due to this activity within chapter 1: Marine Processes. However, it is noted here that there are no aggregate extraction sites in close proximity to the offshore HVAC booster station search area. For cable installation along the offshore cable corridor, deposition is predicted to be the same as that described above for the same activity in the array area (i.e. localised to the point of cable burial and limited in thickness due to the limited amount of material displaced).

11.11.1.31 In terms of sandwave clearance along the offshore cable corridor, such operations may result in up to 182,056 m³ of sediment being displaced. However, it is noted that this equates to the total volume of material displaced along the entire corridor and not just those sections of the corridor in proximity to aggregate extraction sites. The precise locations of sandwave clearance along the corridor are not currently known, although it is likely that only a small proportion of the above total volume would occur in areas near to aggregate extraction licences, given the linear nature of the offshore cable corridor and the fact that the licences are discrete locations along this route. The Hornsea Three offshore cable corridor is characterised by the presence of sands and gravels. These coarse grained sediments are predicted to settle out of suspension in close proximity to the release location. It is anticipated that any deposited sediments would be subject to redistribution under the prevailing coastal processes. Whilst resulting thicknesses of sediment accumulation may be relatively large, these would be confined to within tens to a few hundreds of metres.

11.11.1.32 The above referenced assessments provide predictions regarding the potential for increased sediment deposition due to construction activities, both within the Hornsea Three array area and along the offshore cable corridor.

11.11.1.33 The impact of deposition on aggregate resources is predicted to be, short term. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be **negligible**.

Sensitivity of the receptor

11.11.1.34 Dredging operators are adaptable as they are able, to some extent, to screen out unwanted fine sediment load. The aggregate resource is of value to the economy.

11.11.1.35 The receptor is deemed to be of medium vulnerability and have moderate recoverability. The sensitivity of the receptor is therefore, considered to be **medium**.

Significance of the effect

11.11.1.36 Overall, it is predicted that the sensitivity of the receptor is considered to be **medium** and the magnitude is deemed to be **negligible**. The effect will, therefore, be of **negligible** adverse significance, which is not significant in EIA terms.

Oil and gas operations

Hornsea Three infrastructure, safety zones and advisory safety distances associated with the Hornsea Three array area may restrict potential seismic survey activity.

11.11.1.37 The installation and presence of Hornsea Three infrastructure, including floating foundations and associated mooring lines, and the presence of safety zones and advisory safety distances will exclude conventional towed streamer seismic survey vessels from the Hornsea Three array area throughout the construction period. The Hornsea Three array area overlaps with 11 licenced blocks and five unlicenced blocks (Table 11.7 and paragraph 11.7.9.4). Seismic surveys within these blocks are anticipated to be restricted to varying extents. Other more recent methods of seismic survey include the use of ocean bottom cables and the use of fixed vertical cables. Both methods provide an opportunity to work in a much more congested field. The ocean bottom cables can be used when there is sea surface congestion (i.e. wind turbines, platforms) and the vertical cables can be used when the sea floor is congested (i.e. with cables or pipelines). The laying and retrieval of both methods would be restricted by the mooring lines associated with floating foundations.

11.11.1.38 The assessment of this potential impact is complicated by the fact that future oil and gas plans have a degree of uncertainty associated with them. This complication feeds into assigning sensitivity to each receptor (in this case, licence blocks). Where consultation with the operators of the licence blocks in proximity to the Hornsea Three array area has demonstrated uncertainty regarding future plans, it is problematic to assign sensitivity without introducing high levels of precaution into the assessment. Where this is the case, sensitivity is not assigned within this PEIR and consultation is ongoing to understand future oil and gas plans (as discussed below) to enable sensitivity to be assigned, and a significance of effect to be concluded, for the Environmental Statement. At the point the Environmental Statement is submitted, it is likely that a level of residual uncertainty will remain regarding the future plans of operators of the licence blocks and as such a level of precaution will be built into the assessment. The level of uncertainty, and hence the level of precaution that is built into the assessment, will change over time as operators' plans become clearer.

Magnitude of impact

11.11.1.39 The area of overlap between the relevant licence block and the Hornsea Three array area is presented in Table 11.25. For assessment purposes, and based on professional judgement, the area of overlap has been deemed to be major where it is 100% of the total block area, moderate where the overlap is 50% or more, minor where the overlap is 10% or more, and negligible where the overlap is less than 10%. Considering the current operators of the licence blocks, Centrica has the greatest number, and generally the greatest area, of blocks affected by Hornsea Three (see Table 11.25). INEOS has three licenced blocks overlapping with the Hornsea Three array area with a smaller area affected and Shell has two licenced blocks affected with a relatively small area of overlap (see Table 11.25). The five unlicensed blocks overlap the Hornsea Three array area by varying degrees (see Table 11.25), with the greatest area of overlap coinciding with the remaining unlicensed part of block 49/9. The safety zones and advisory safety distances implemented during the Hornsea Three construction phase will increase the area of overlap, e.g. for infrastructure under construction on the edge of the array area boundary.

11.11.1.40 The maximum offshore construction duration for the Hornsea Three array area will be a period of up to 11 years over up to two phases (with a six year gap between phases). This is a relatively long period in comparison to a licence agreement, which is four years for the first term of the traditional Seaward Production Licence and up to nine years for the initial phase of an Innovative Licence. A typical survey period is six months and therefore there is the potential for surveys to take place within parts of the licenced blocks where construction activity has not yet commenced. However, as infrastructure is installed, the area available for seismic surveys will be restricted, and the presence of floating foundations and associated mooring lines may also further restrict the ability to use certain alternative survey methods. There are a relatively small number of blocks affected overall and there will be continued consultation and promulgation of information.

- 11.11.1.41 The impact is predicted to be of local spatial extent, relatively long term duration relative to a licence period, continuous and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **major** for the licence block 49/4b (currently operated by Centrica) and 49/9 (currently unlicensed); **moderate** for 49/3, 49/4d, 49/9c and 49/9d (currently operated by Centrica) and 49/2 (currently unlicensed); **minor** for 49/4a (currently operated by Centrica) 49/2a and 49/9b (currently operated by INEOS), 49/9a (currently operated by Shell), 49/4 and 49/8 (currently unlicensed); and **negligible** for 49/1a (currently operated by INEOS), 49/8a (currently operated by Shell) and 49/7 (currently unlicensed).
- Sensitivity of the receptor
- 11.11.1.42 The sensitivity of the receptor depends on their future exploration plans. Information on each block and the assessed sensitivity is summarised in Table 11.25 below.
- 11.11.1.43 The sensitivity of the licence operator has not been assessed for Centrica. Discussions are ongoing between Hornsea Three and Centrica (Table 11.3). There is not enough certainty in relation to Centrica's future plans to assign sensitivity to these licence blocks at this stage and this will be updated for the Environmental Statement.
- 11.11.1.44 The sensitivity of the licence operator has been assessed as low for INEOS and Shell on the basis of consultation with these operators which has advised that they currently have no exploration plans/concerns in these licence blocks. As there is currently no receptor for the unlicensed blocks, the sensitivity is negligible, however in the event that these blocks are licenced, the sensitivity will increase as seismic activity may be required. Any future operator of the unlicensed blocks should be aware of Hornsea Three and will have taken potential coexistence into consideration.
- 11.11.1.45 A small proportion of known hydrocarbon fields intersect with the Hornsea Three array area (Figure 11.6) however it is understood that with improved seismic technology new fields are still being discovered within the North Sea.
- 11.11.1.46 In all instances, consultation with the operators of the blocks in proximity to the Hornsea Three array area has aimed to address any future operational issues and establish a line of communication to ensure coexistence between both activities can be achieved with minimal disruption.
- 11.11.1.47 The licensed operator is deemed to be of low (INEOS and Shell) vulnerability, medium recoverability and high value. The sensitivity of the licence operator is therefore, considered to be **low** (INEOS and Shell). The sensitivity of the unlicensed blocks is considered to be **negligible**.

Table 11.25: Area of overlap of each licence block with the Hornsea Three array area and sensitivity of each licence operator in relation to reduction in seismic survey area and drilling restrictions.

Block	Operator	Area of overlap (%)	Consultation	Sensitivity	
				Seismic survey	Drilling
49/3	Centrica	88.7 (moderate)	Confidential consultation has advised the potential for ongoing activity in Centrica operated licences.	On hold, to be updated for Environmental Statement	On hold, to be updated for Environmental Statement
49/4d		90 (moderate)			
49/9c		61 (moderate)			
49/9d		66 (moderate)			
49/4a		19.5 (minor)			
49/4b		100 (major)			
49/1a	INEOS	0.1 (negligible)	INEOS advised that they have no current exploration plans in the southern North Sea.	Low	Low
49/2a		37.9 (minor)			
49/9b		22.1 (minor)			
49/8a	Shell	0.98 (negligible)	Shell confirmed that they had no immediate concerns from an exploration perspective however a confidentiality agreement is being progressed in order to discuss any future activity.	Low	Low
49/9a		11.9 (minor)			
49/2	Unlicenced	54.2 (moderate)	N/A	Negligible	Negligible
49/4		30.6 (minor)			
49/7		1.6 (negligible)			
49/8		32.5 (minor)			
49/9		100 (major)			

Significance of the effect

- 11.11.1.48 Overall, it is predicted that the sensitivity of the receptor is considered to be **low** (INEOS and Shell)/**negligible** (unlicensed blocks) and the magnitude is deemed to be **major** (licence blocks 49/4b and 49/9); **moderate** (49/3, 49/4d, 49/9c, 49/9d and 49/2); **minor** (49/2a, 49/9b, 49/4, 49/4a, 49/8 and 49/9a); **negligible** (49/1a, 49/8a and 49/7). The effect will, therefore, be **minor** adverse significance (licence block 49/2a and 49/9b currently operated by INEOS, 49/9a currently operated by Shell, and currently unlicensed blocks 49/2, 49/4, 49/8 and 49/9), which is not significant in EIA terms; and **negligible** adverse significance (licence blocks 49/1a currently operated by INEOS, 49/8a currently operated by Shell, and currently unlicensed block 49/7), which is not significant in EIA terms. Note that the significance of effect has not been assessed for licence blocks currently operated by Centrica as it is not possible to assign sensitivity to this receptor. This will be updated for the Environmental Statement.
- 11.11.1.49 It is important to note that the assessment presented above considers a maximum design scenario involving the full build out of Hornsea Three using floating foundations, with associated mooring lines. There are a range of floating foundations as well as other technologies (such as monopiles and jacket foundations) which will be considered for Hornsea Three. If such alternative technologies were to be used (those foundations that are more 'tried and tested' by the offshore wind industry or alternative floating foundation concepts that had a reduced seabed/water column footprint) or if the spatial extent of deployment of the floating foundation design considered in this assessment was reduced, the magnitude of this impact (and hence the significance of effect), may change. Any updates to the project description and impact assessment will be presented in the Environmental Statement.
- Drilling and the placement of infrastructure has the potential to be restricted within the Hornsea Three array area and within 1 km from the boundary of the array area by the presence of infrastructure, safety zones and advisory safety distances.**
- 11.11.1.50 Drilling and the placement of infrastructure associated with gas field development or natural gas storage and CCS projects may be restricted (but not prohibited) within the Hornsea Three array area and may be restricted from within 1 km of the Hornsea Three array area during the Hornsea Three construction phase (based on the potential for 500 m safety zones to be applied for around any oil and gas infrastructure and the potential for 500 m safety zones to extend beyond the Hornsea Three array area). There may be further, temporary restrictions from any 1,000 m advisory safety distances associated with construction vessels which may extend beyond the array area.
- 11.11.1.51 In the event that new oil and gas platforms or subsea structures are proposed, the restricted area may need to be extended further considering helicopter access requirements (see chapter 8: Aviation, Military and Communication and chapter 11: Inter-relationships).

11.11.1.52 For the purposes of this assessment (and all relevant assessments within this chapter), well abandonment has been considered to be equivalent to drilling activities and oil and gas infrastructure decommissioning activities have been assumed to be the reverse of oil and gas infrastructure installation activities, in terms of impact magnitude and sensitivity (e.g. the requirement for a rig or vessel and associated safety zones).

11.11.1.53 The assessment of this potential impact is complicated by the fact that future oil and gas plans have a degree of uncertainty associated with them. This complication feeds into assigning sensitivity to each receptor (in this case, licence blocks). Where consultation with the operators of the licence blocks in proximity to the Hornsea Three array area has demonstrated uncertainty regarding future plans, it is problematic to assign sensitivity without introducing high levels of precaution into the assessment. Where this is the case, sensitivity is not assigned within this PEIR and consultation is ongoing to understand future oil and gas plans (as discussed below) to enable sensitivity to be assigned, and a significance of effect to be concluded, for the Environmental Statement. At the point the Environmental Statement is submitted, it is likely that a level of residual uncertainty will remain regarding the future plans of operators of the licence blocks (for example whether or not an exploitable resource will be found and if so, where any infrastructure associated with this will be located) and as such a level of precaution will be built into the assessment. The level of uncertainty, and hence the level of precaution that is built into the assessment, will change over time as operators' plans become clearer.

Magnitude of impact

11.11.1.54 The area of overlap between the relevant licence block and the Hornsea Three array area is presented in Table 11.25 and described in paragraph 11.11.1.39. Considering the current operators of the licence blocks, Centrica has the greatest number, and generally the greatest area, of blocks affected by Hornsea Three (see Table 11.25). INEOS has three licenced blocks overlapping with the Hornsea Three array area with a smaller area affected and Shell has two licenced blocks affected with a relatively small area of overlap (see Table 11.25). The five unlicensed blocks overlap the Hornsea Three array area by varying degrees (see Table 11.25), with the greatest area of overlap coinciding with the remaining unlicensed part of block 49/9. The potential for a restriction on activities within 1 km or more of the Hornsea Three array area for the reasons described in paragraph 11.11.1.50 above will increase the area of overlap however any additional restrictions from advisory safety distances will be temporary.

11.11.1.55 Construction of the Hornsea Three array area will take place over a period of up to 11 years over up to two phases (albeit with a six year gap between phases). This is a relatively long period in comparison to a licence agreement as detailed in paragraph 11.11.1.40. Drilling activity may take place during an approximate three month period. Drilling may be able to proceed prior to construction or during the construction period depending on the required location. Due to the relatively small area that is required by a drill rig and the ability of an operator to directionally drill if required (providing this commences at a location outside the restricted zone), drilling activity may be able to take place in the remaining areas of the licence blocks not affected by the Hornsea Three array area throughout the construction phase. Drilling may also take place between 500 m and 1 km from the Hornsea Three array area in the event that no safety zones are required in this location.

11.11.1.56 The impact is predicted to be of local spatial extent, relatively long term duration relative to a licence period, continuous and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **major** for licence block 49/4b (currently operated by Centrica) and 49/9 (currently unlicensed); **moderate** for 49/3, 49/4d, 49/9c, 49/9d (currently operated by Centrica) and 49/2 (currently unlicensed); **minor** for 49/4a (currently operated by Centrica) 49/2a and 49/9b (currently operated by INEOS), 49/9a (currently operated by Shell) 49/4 and 49/8 (currently unlicensed); and **negligible** for 49/1a (currently operated by INEOS), 49/8a (currently operated by Shell) and 49/7 (currently unlicensed).

Sensitivity of the receptor

11.11.1.57 The sensitivity of the receptor depends on the area of their licenced acreage affected and the future plans of the licence operator in relation to potential exploitation of hydrocarbons. Information on each block and the assessed sensitivity is summarised in Table 11.25.

11.11.1.58 In all instances, consultation with the operators of the blocks in proximity to the Hornsea Three array area has aimed to address any future operational issues and establish a line of communication to ensure coexistence between both activities can be achieved with minimal disruption.

11.11.1.59 The sensitivity of the licence operator has not been assessed for Centrica. Discussions are ongoing between Hornsea Three and Centrica (Table 11.4). There is not enough certainty in relation to Centrica's future plans to assign sensitivity to these licence blocks at this stage and this will be updated for the Environmental Statement.

11.11.1.60 The licensed operator is deemed to be of low (INEOS and Shell vulnerability, medium recoverability and high value. The sensitivity of the licence operator is therefore, considered to be **below** (INEOS and Shell). The sensitivity of the unlicensed blocks is considered to be **negligible**.

Significance of the effect

11.11.1.61 Overall, it is predicted that the sensitivity of the receptor is considered to be **low** (INEOS and Shell)/**negligible** (unlicensed blocks) and the magnitude is deemed to be **major** (licence blocks 49/4b and 49/9); **moderate** (49/3, 49/4d, 49/9c, 49/9d and 49/2); **minor** (49/2a, 49/4, 49/4a, 49/8, 49/9a and 49/9b); **negligible** (49/1a, 49/8a and 49/7). The effect will, therefore, be of **minor** adverse significance (licence block 49/2a and 49/9b currently operated by INEOS, 49/9a currently operated by Shell, and currently unlicensed blocks 49/2, 49/4, 49/8 and 49/9), which is not significant in EIA terms; and **negligible** adverse significance (licence blocks 49/1a and 49/9b currently operated by INEOS, 49/8a currently operated by Shell, and currently unlicensed block 49/7), which is not significant in EIA terms. Note that the significance of effect has not been assessed for licence blocks currently operated by Centrica as it is not possible to assign sensitivity to this receptor. This will be updated for the Environmental Statement.

11.11.1.62 It is important to note that the assessment presented above considers a maximum design scenario involving the full build out of Hornsea Three using floating foundations, with associated mooring lines. There are a range of floating foundations as well as other technologies (such as monopiles and jacket foundations) which will be considered for Hornsea Three. If such alternative technologies were to be used (those foundations that are more 'tried and tested' by the offshore wind industry or alternative floating foundation concepts that had a reduced seabed/water column footprint) or if the spatial extent of deployment of the floating foundation design considered in this assessment was reduced, the magnitude of this impact (and hence the significance of effect), may change. Any updates to the project description and impact assessment will be presented in the Environmental Statement.

Safety zones around the offshore HVAC booster stations and advisory safety distances associated with activities underway along the offshore cable corridor may restrict potential seismic survey activity.

11.11.1.63 Safety zones around the subsea HVAC booster stations and advisory safety distances around cable installation vessels carrying out activities along the offshore cable corridor will exclude conventional towed streamer seismic survey vessels throughout the construction period.

Magnitude of impact

11.11.1.64 The area of overlap between the relevant licence block and the Hornsea Three offshore cable corridor and offshore HVAC booster station search area is presented in Table 11.26. For assessment purposes, and based on professional judgement, the area of overlap has been deemed to be major where it is 100% of the total block area, moderate where the overlap is 50% or more, minor where the overlap is 10% or more, and negligible where the overlap is less than 10%.

Table 11.26: Area of overlap of each licence block with offshore cable corridor/offshore HVAC booster station search area and sensitivity of each licence operator in relation to reduction in seismic survey area and drilling restrictions.

Block	Operator	Area of overlap with offshore cable corridor (%)	Area of overlap with offshore HVAC booster station search area (%)	Sensitivity	
				Seismic survey	Drilling
48/19a	Shell	0.2 (negligible)	N/A	Low	Low
48/19c		1.5 (negligible)	N/A		
48/20a		15.8 (minor)	N/A		
48/20b	INEOS	36.6 (minor)	N/A	Low	Low
48/23c	Independent Oil and Gas	0.2 (negligible)	0.2 (negligible)	Low	Low
48/24b		16.7 (minor)	16.7 (minor)		
48/15a	ConocoPhillips	2.3 (negligible)	N/A	Low	Low
49/11a		23.5 (minor)	N/A		
49/2	Unlicensed	1.6 (negligible)	N/A	Negligible	Negligible
49/7		21.5 (minor)	N/A		
49/8		18.8 (minor)	N/A		
49/12		5.8 (negligible)	N/A		
49/11		7.8 (negligible)	N/A		
48/20		4.9 (negligible)	0.2 (negligible)		
48/19		3.5 (negligible)	0.9 (negligible)		
48/25		0.03 (negligible)	0.03 (negligible)		
48/24		13.1 (minor)	13.1 (minor)		
48/29		0.6 (negligible)	0.6 (negligible)		
48/28		12.1 (minor)	2.6 (negligible)		
48/27		14.4 (minor)	N/A		
48/26		4.7 (negligible)	N/A		
52/2		7.7 (negligible)	N/A		
52/1		15.9 (minor)	N/A		

- 11.11.1.65 The magnitude of impact for operators with licenced blocks along the offshore cable corridor (and not within the offshore HVAC booster station search area) will reduce potential seismic survey activity in an area of relatively small spatial extent and for a relatively short duration from the presence of individual 1,000 m advisory safety distances around cable installation vessels (which may be working together in close proximity) as they move along the offshore cable corridor. The impact will be intermittent, with up to six cable installation events along the offshore cable corridor. The installation of export cables will occur over a maximum duration of three years (installation could occur over two phases with a gap of six years between phases, giving a total installation duration of nine years). Cable installation activity will be transient, with installation progress typically 1.5 km to 5 km per day.
- 11.11.1.66 Up to six subsea HVAC booster stations may be installed within the offshore HVAC booster station search area with associated 500 m safety zones implemented during the construction phase. Assuming, as a maximum design scenario, that the six subsea HVAC booster stations are located in close proximity and spaced up to 1 km apart so that their 500 m safety zones are contiguous, the combined area of the safety zones could be up to 4.74 km². These safety zones will be in place for the duration of the construction of the subsea HVAC booster stations (up to 12 months based on two months per structure), with the potential for operational zones thereafter. There are two licenced blocks within the offshore HVAC booster search area, currently operated by Independent Oil and Gas, and six unlicensed blocks. These blocks have a negligible level of overlap with the offshore HVAC booster station search area (see Table 11.26). Assuming, as a maximum design scenario, that the six subsea HVAC booster stations are located fully within a single licence block, the magnitude of impact will restrict potential seismic survey activity in an area of relatively small spatial extent compared with the total area of the licence block from the presence of the combined safety zones. The offshore HVAC booster station search area itself overlaps with a relatively small proportion of each licence block.
- 11.11.1.67 The impact is predicted to be of local spatial extent, short term duration (offshore cable corridor)/long term duration (offshore HVAC booster station search area), intermittent (offshore cable corridor)/continuous (offshore HVAC booster station search area) and high (offshore cable corridor)/low (offshore HVAC booster station search area) reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **minor** (licence blocks 48/20a, 48/20b, 48/24, 48/24b, 48/27, 48/28, 49/8, 49/11a, 49/7 and 52/1); and **negligible** (all other licence blocks).
- Sensitivity of the receptor**
- 11.11.1.68 The sensitivity of the receptor depends on the information provided through consultation with the operator of the licence block. Information on each block and the assessed sensitivity is summarised in Table 11.26. As noted above, the impact will affect a relatively small proportion of the licence blocks. Consultation with the operators of the affected licence blocks (Shell, INEOS, Independent Oil and Gas, and ConocoPhillips) did not identify any planned seismic survey activity within the offshore cable corridor during the Hornsea Three construction period (see Table 11.3).

11.11.1.69 The promulgation of information through Notices to Mariners combined with ongoing consultation will enable the operators to plan surveys taking into account the timing of Hornsea Three construction activities. Sufficient information exchange between parties and continued consultation will be in place to avoid conflicting interactions. Any future operator of the unlicensed blocks will be aware of the Hornsea Three project and will have taken potential coexistence into consideration.

11.11.1.70 The operators of the affected licenced blocks are deemed to be of low vulnerability, medium recoverability and high value. The sensitivity of the receptor is therefore, considered to be **low**. The sensitivity of the unlicensed block is considered to be **negligible**.

Significance of the effect

11.11.1.71 Overall, it is predicted that the sensitivity of the receptor is considered to be **low** (licensed blocks)/**negligible** (unlicensed blocks) and the magnitude is deemed to be **minor** (licence blocks 48/20a, 48/20b, 48/24, 48/24b, 48/27, 48/28, 49/8, 49/11a, 49/7 and 52/1); and **negligible** (all other licence blocks). The effect will, therefore, be of **minor** adverse significance (licence blocks 48/20a currently operated by Shell, 48/20b currently operated by INEOS, 48/24b currently operated by Independent Oil and Gas and 49/11a currently operated by ConocoPhillips), which is not significant in EIA terms and **negligible** adverse significance (all other licence blocks), which is not significant in EIA terms.

Drilling and the placement of infrastructure has the potential to be restricted within the offshore cable corridor and within 1 km from the boundary of the offshore cable corridor.

11.11.1.72 Drilling activities has the potential to be restricted within the offshore cable corridor during the Hornsea Three construction phase from the presence of installation activities and newly installed cables. Drilling may also be restricted from within 1 km from either side of the offshore cable corridor (based on the potential for 500 m safety zones to be applied for around any oil and gas infrastructure and the potential for 500 m safety zones to extend beyond the offshore cable corridor from Hornsea Three construction activities within the offshore HVAC booster station search area). There may be further, temporary restrictions from any 1,000 m advisory safety distances associated with construction vessels working along the offshore cable route. The subsea HVAC booster stations if required will be located within the restricted area along the offshore cable corridor, therefore they are not assessed separately in this assessment. It should be noted that pipelines would be able to be installed across this area subject to crossing agreements being put in place.

Magnitude of impact

11.11.1.73 The area of overlap between the relevant licence block and the Hornsea Three offshore cable corridor is presented in Table 11.26 and described in paragraph 11.11.1.64. There is the potential for further restrictions from any safety zones or temporary advisory safety distances that may extend beyond the offshore cable corridor boundary.

11.11.1.74 The magnitude of impact for operators with licenced blocks along the offshore cable corridor will be limited to a restriction on drilling and the placement of infrastructure within an area of relatively small spatial extent in relation to the total licence block area. There may be up to six cable installation events along the offshore cable corridor over a total export cable installation period of up to nine years (installation of the export cables themselves will occur over a duration of three years, however the cable could be installed in up to two phases with a gap of six years between phases). Any additional restrictions from advisory safety distances will be temporary.

11.11.1.75 The impact is predicted to be of local spatial extent, long term duration relative to a licence period, continuous and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **minor** (licence blocks 48/20a, 48/20b, 48/24, 48/24b, 48/27, 48/28, 49/8, 49/11a, 49/7 and 52/1); and **negligible** (all other licence blocks).

Sensitivity of the receptor

11.11.1.76 The sensitivity of the receptor depends on the information provided through consultation with the operator of the licence block. Information on each block and the assessed sensitivity is summarised in Table 11.26. As noted above, the impact will affect a relatively small proportion of the licence blocks. Consultation with the operators of the affected licence blocks (Shell, INEOS, Independent Oil and Gas and ConocoPhillips) did not identify any plans for the development of new infrastructure within the offshore cable corridor during the Hornsea Three construction period (see Table 11.3).

11.11.1.77 Drilling may still take place between 500 m and 1 km from the offshore cable corridor provided that no permanent safety zones will be applied for by the oil and gas operator. Drilling may also still take place by means of directional drilling, providing this commences at a location outside the restricted area.

11.11.1.78 There is the potential to coexist through ongoing consultation and promulgation of information. Sufficient information exchange between parties and continued consultation will be in place to avoid conflicting interactions. Any future operator of the unlicensed blocks will be aware of the Hornsea Three project and will have taken potential coexistence into consideration.

11.11.1.79 The operators of the affected licenced blocks are deemed to be of low vulnerability, medium recoverability and high value. The sensitivity of the receptor is therefore, considered to be **low**. The sensitivity of the unlicensed blocks is considered to be **negligible**.

Significance of the effect

- 11.11.1.80 Overall, it is predicted that the sensitivity of the receptor is considered to be **low** (licensed blocks)/**negligible** (unlicensed blocks) and the magnitude is deemed to be **minor** (licence blocks 48/20b, 49/11a and 49/7); and **negligible** (all other licence blocks). The effect will, therefore, be of **minor** adverse significance (licence blocks 48/20a currently operated by Shell, 48/20b currently operated by INEOS, 48/24b currently operated by Independent Oil and Gas, and 49/11a currently operated by ConocoPhillips), which is not significant in EIA terms and **negligible** adverse significance (all other licence blocks), which is not significant in EIA terms.
- The piling of wind turbine and substation foundations will generate underwater noise that may acoustically interfere with seismic survey operations.**
- 11.11.1.81 The underwater noise emissions, resulting from the construction phase, reported in volume 4, annex 3.1: Subsea Noise Technical Report.
- Magnitude of impact
- 11.11.1.82 During conventional towed streamer seismic surveys, air guns produce a source noise which is reflected back off the seabed and picked up by acoustic recorders at the sea surface. The peak source level is around 230 dB over a range of frequencies but the <100 Hz range is of interest to the survey. The sound repetition is every 1 to 60 seconds. The duration of a survey may last up to six months depending on the extent required moving over a tracked area. Firing duration will be continual subject to operational requirements. Underwater noise from piling activities will produce similar sound pressure and frequencies. Piling noise will occur at a much greater repetition, for a short period at each fixed location, and for a much longer overall duration.
- 11.11.1.83 Due to these different temporal and spatial requirements the two activities have the potential to be able to occur concurrently. In addition, the potential for any interference will dissipate with distance from the piling activity. Blocks immediately adjacent to the Hornsea Three array area (and the offshore HVAC booster station search area) have the potential to be affected. Piling could occur on 302.4 days phased over a 2.5 year piling phase based on the maximum design temporal scenario for the Hornsea Three array area infrastructure (see Table 11.17). The maximum piling duration for the offshore HVAC booster stations will be 16 days over a 2.5 year piling phase for all Hornsea Three infrastructure assuming an HVAC transmission option for the maximum design spatial scenario (see Table 11.17).
- 11.11.1.84 The impact is predicted to be of regional spatial extent, short to medium term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **moderate**.

Sensitivity of the receptor

- 11.11.1.85 The sensitivity of the licence operator carrying out seismic survey activity will be dependent on the survey activity coinciding temporally and spatially with the noise source and having similar acoustic frequency. The actual techniques that will be used, in particular the ability for live or post-processing of seismic data to filter out acoustic interference, will reduce the sensitivity. The operator will also be provided with sufficient information on Hornsea Three construction activities through promulgation of Notices to Mariners and continued consultation in order that seismic survey activity can be planned to avoid the construction noise temporally and spatially.

- 11.11.1.86 The licence operator is deemed to be of low vulnerability, high recoverability and high value. The sensitivity of the receptor is therefore, considered to be **low**.

Significance of the effect

- 11.11.1.87 Overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **moderate**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Future monitoring

- 11.11.1.88 No specific monitoring requirements have been identified for the construction phase in relation to recreational users and recreational fishing; aggregate extraction, cables and pipelines; and oil and gas operations.

11.11.2 Operational and maintenance phase

- 11.11.2.1 The impacts of the offshore operation and maintenance of Hornsea Three have been assessed on infrastructure and other users. The environmental impacts arising from the operation and maintenance of Hornsea Three are listed in Table 11.15, Table 11.16 and Table 11.17 along with the maximum design scenario against which each operation and maintenance phase impact has been assessed.

- 11.11.2.2 A description of the potential effect on infrastructure and other users receptors caused by each identified impact is given below. The receptors have been divided into categories, as per Table 11.15, Table 11.16 and Table 11.17, for ease of reference.

Recreational users and recreational fishing

Hornsea Three infrastructure, safety zones and advisory safety distances associated with infrastructure and maintenance activities within the Hornsea Three array area and along the offshore cable corridor may displace recreational craft and recreational fishing vessels resulting in a loss of recreational resource.

- 11.11.2.3 During the operational and maintenance phase of Hornsea Three, recreational craft and recreational fishing vessels may be displaced, either because of the physical presence of the wind turbines and associated infrastructure or due to the presence of safety zones and advisory safety distances. This is a continuation of the construction phase impact (section 11.11.1).

Magnitude of impact

- 11.11.2.4 The presence of infrastructure, including floating foundations and associated mooring lines, may result in the displacement of recreational craft and recreational fishing vessels from the Hornsea Three array area. In addition, there is the potential for up to 19 operational safety zones associated with the Hornsea Three accommodation platforms and offshore substations. Further safety zones and/or advisory safety distances will be required periodically within the Hornsea Three array area around structures undergoing maintenance or around vessels carrying out maintenance activities. Along the offshore cable corridor, there is the potential for up to four operational safety zones associated with the offshore HVAC booster stations, and advisory safety distances will be recommended around vessels during any export cable maintenance activities, which may result in the displacement of recreational craft and recreational fishing vessels.

- 11.11.2.5 The spatial extent of the impact is small in the context of the available sailing area in the southern North Sea as described in paragraph 11.11.1.4. The impact of safety zones around manned platforms will also be small and safety zones/advisory safety distances associated with maintenance activities will be temporary. The presence of mooring lines associated with floating foundations may result in an ongoing displacement impact within the array area. The level of recreational activity within the Hornsea Three array area is low as described in paragraph 11.11.1.4, and there is low to medium recreational vessel activity in nearshore areas of the Hornsea Three offshore cable corridor, with boating and angling also taking place closer to shore as described in paragraph 11.11.1.5.

- 11.11.2.6 The impact is predicted to be of local spatial extent, short term (offshore cable corridor)/long term duration (Hornsea Three array area and offshore HVAC booster stations), continuous (Hornsea Three array area and offshore HVAC booster stations)/intermittent (offshore cable corridor) and low reversibility (Hornsea Three array area and offshore HVAC booster stations)/high reversibility (offshore cable corridor). It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **negligible**.

Sensitivity of the receptor

- 11.11.2.7 Recreational vessels are able to alter their route, dependent on the target destination. There are also a variety of boat angling and shore angling locations along the eastern region such that alternatives are available during any maintenance works at the cable landfall. Notices to Mariners will be promulgated as required during the operational and maintenance phase, advising of the location and nature of maintenance works, ensuring that recreational activities can be planned accordingly.

- 11.11.2.8 The receptor is deemed to be of low vulnerability, high recoverability and moderate value. The sensitivity of the receptor is therefore, considered to be **low**.

Significance of the effect

- 11.11.2.9 Overall, it is predicted that the sensitivity of the receptor the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **negligible**. The effect will, therefore, be of **negligible** adverse significance, which is not significant in EIA terms.

- 11.11.2.10 It is important to note that the assessment presented above considers a maximum design scenario involving the full build out of Hornsea Three using floating foundations, with associated mooring lines. There are a range of floating foundations as well as other technologies (such as monopiles and jacket foundations) which will be considered for Hornsea Three. If such alternative technologies were to be used (those foundations that are more 'tried and tested' by the offshore wind industry or alternative floating foundation concepts that had a reduced seabed/water column footprint) or if the spatial extent of deployment of the floating foundation design considered in this assessment was reduced, the magnitude of this impact (and hence the significance of effect), may change. Any updates to the project description and impact assessment will be presented in the Environmental Statement.

Aggregate extraction, cables and pipelines

Hornsea Three infrastructure, safety zones and advisory safety distances may lead to a temporary loss of access to existing cables and pipelines for repair or maintenance.

Magnitude of impact

- 11.11.2.11 As described in paragraph 11.11.1.15, the Topaz well to Schooner platform pipelines are located within 1 km of the Hornsea Three array area and there are 27 active pipelines which intersect the Hornsea Three offshore cable corridor, with a further two pipelines within 1 km of the offshore cable corridor. There is one active cable and two out of service cables crossing the Hornsea Three array area and offshore cable corridor, and the offshore cable corridor also crosses the export cables for the Dudgeon and Sheringham Shoal offshore wind farms.

- 11.11.2.12 Hornsea Three infrastructure, including floating foundations and associated mooring lines, and the presence of operational safety zones, temporary safety zones and advisory safety distances associated with maintenance activities, may restrict access to existing cables and pipelines within the Hornsea Three array area (cables) and along the offshore cable corridor (cables and pipelines). Loss of access to cables and pipelines associated with any temporary safety zones/advisory safety distances is considered to be limited in extent and infrequent. Loss of access to cables and pipelines associated with the presence of structures would be considered in the crossing/proximity agreements to the extent that such a scenario would not be an impediment to operations.
- 11.11.2.13 Crossing and proximity agreements will be established with relevant pipeline and cable operators, to minimise the potential for any impact in accordance with recognized industry best practice, with discussions between the relevant operators and Hornsea Three already underway. These agreements, based on the templates (OP115) provided by Oil and Gas UK (Oil and Gas UK, 2015a), will ensure close communication and planning between both parties to ensure disruption of activities is minimised. It is also intended that similar pipeline or cable crossing and proximity agreements will be put in place for all future pipelines and cables where required, prior to their installation.
- 11.11.2.14 The impact is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **minor**.
- Sensitivity of the receptor
- 11.11.2.15 Maintenance activities associated with Hornsea Three will be publicised well in advance via Notices to Mariners. The terms of the crossing and proximity agreements will ensure communication between both parties and that loss of access is minimised.
- 11.11.2.16 The operators of existing pipelines and cables are deemed to be of medium vulnerability, medium recoverability and high value. The sensitivity of the receptor is therefore, considered to be **high**. In the unlikely event that the temporary restriction of access occurs concurrently with an emergency event (pipeline or cable) the effect will be more critical, however owing to the nature of the emergency, emergency response will be prioritised to ensure no significant adverse impact occurs on safety and the environment.
- Significance of the effect
- 11.11.2.17 Overall, it is predicted that the sensitivity of the receptor is considered to be **high** and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.
- 11.11.2.18 It is important to note that the assessment presented above considers a maximum design scenario involving the full build out of Hornsea Three using floating foundations, with associated mooring lines. There are a range of floating foundations as well as other technologies (such as monopiles and jacket foundations) which will be considered for Hornsea Three. If such alternative technologies were to be used (those foundations that are more 'tried and tested' by the offshore wind industry or alternative floating foundation concepts that had a reduced seabed/water column footprint) or if the spatial extent of deployment of the floating foundation design considered in this assessment was reduced, the magnitude of this impact (and hence the significance of effect), may change. Any updates to the project description and impact assessment will be presented in the Environmental Statement.
- Oil and gas operations***
- The presence of infrastructure within the Hornsea Three array area may restrict potential seismic survey activity.**
- 11.11.2.19 Hornsea Three infrastructure, including floating foundations and associated mooring lines, and the presence of operational safety zones and safety zones/advisory safety distances associated with maintenance activities, will exclude conventional towed streamer seismic survey vessels from the Hornsea Three array area. The Hornsea Three array area overlaps with 11 licenced blocks and five unlicensed blocks (Table 11.7 and paragraph 11.7.9.4). Seismic surveys within these blocks are anticipated to be restricted to varying extents. Other more recent methods of seismic survey include the use of ocean bottom cables and the use of fixed vertical cables.
- 11.11.2.20 The assessment of this potential impact is complicated by the fact that future oil and gas plans have a degree of uncertainty associated with them. This complication feeds into assigning sensitivity to each receptor (in this case, licence blocks). Where consultation with the operators of the licence blocks in proximity to the Hornsea Three array area has demonstrated uncertainty regarding future plans, it is problematic to assign sensitivity without introducing high levels of precaution into the assessment. Where this is the case, sensitivity is not assigned within this PEIR and consultation is ongoing to understand future oil and gas plans (as discussed below) to enable sensitivity to be assigned, and a significance of effect to be concluded, for the Environmental Statement. At the point the Environmental Statement is submitted, it is likely that a level of residual uncertainty will remain regarding the future plans of operators of the licence blocks and as such a level of precaution will be built into the assessment. The level of uncertainty, and hence the level of precaution that is built into the assessment, will change over time as operators' plans become clearer.

Magnitude of impact

- 11.11.2.21 With the potential for 342 wind turbines with floating foundations and associated mooring lines 1,000 m in radius to be present within the Hornsea Three array area, in addition to the potential for up to 19 operational safety zones around offshore platforms, and further safety zones/advisory safety distances around maintenance activities, the area available for seismic surveys will be restricted. Owing to the size of the seismic arrays used for conventional towed streamer seismic surveys, conventional towed streamer seismic exploration within the Hornsea Three array area is not anticipated to be possible. Modern seismic survey techniques employing ocean bottom cables or vertical cables may also be restricted.
- 11.11.2.22 The area of overlap between the relevant licence block and the Hornsea Three array area is presented in Table 11.25 and described in paragraph 11.11.1.39. Considering the current operators of the licence blocks, Centrica has the greatest number, and generally the greatest area, of blocks affected by Hornsea Three (see Table 11.25). INEOS has three licenced blocks overlapping with the Hornsea Three array area with a smaller area affected and Shell has two licenced blocks affected with a relatively small area of overlap (see Table 11.25). The five unlicensed blocks overlap the Hornsea Three array area by varying degrees (see Table 11.25), with the greatest area of overlap coinciding with the remaining unlicensed part of block 49/9. Any safety zones or advisory safety distances extending beyond the Hornsea Three array area will increase the area of overlap.
- 11.11.2.23 The impact is predicted to be of local spatial extent, long term duration, continuous and low reversibility. It is predicted that the impact will affect the receptor directly.
- 11.11.2.24 The magnitude is therefore, considered to be major for the licence block 49/4b (currently operated by Centrica) and 49/9 (currently unlicensed); moderate for 49/3, 49/4d, 49/9c and 49/9d (currently operated by Centrica) and 49/2 (currently unlicensed); minor for 49/4a (currently operated by Centrica) 49/2a and 49/9b (currently operated by INEOS), 49/9a (currently operated by Shell), 49/4 and 49/8 (currently unlicensed); and negligible for 49/1a (currently operated by INEOS), 49/8a (currently operated by Shell) and 49/7 (currently unlicensed).

Sensitivity of the receptor

- 11.11.2.25 The sensitivity of the receptor depends on their future exploration plans. Information on each block and the assessed sensitivity is summarised in Table 11.25.
- 11.11.2.26 The sensitivity of the licence operator has not been assessed for Centrica. Discussions are ongoing between Hornsea Three and Centrica (Table 11.4). There is not enough certainty in relation to Centrica's future plans to assign sensitivity to these licence blocks at this stage and this will be updated for the Environmental Statement.

11.11.2.27 The sensitivity of the licence operator, as the receptor, is assumed to be low for INEOS and Shell on the basis of consultation which has advised that they currently have no exploration plans/concerns. As there is currently no receptor for the unlicensed blocks, the sensitivity is negligible, however in the event that these blocks are licenced, the sensitivity will increase as seismic activity may be required. Any future operator of the unlicensed blocks will be aware of Hornsea Three and will have taken potential coexistence into consideration.

11.11.2.28 In all instances, consultation with the operators of the blocks in proximity to the Hornsea Three array area has aimed to address any future operational issues and establish a line of communication to ensure coexistence between both activities can be achieved with minimal disruption.

11.11.2.29 The licensed operator is deemed to be of low (INEOS and Shell) vulnerability, medium recoverability and high value. The sensitivity of the licence operator is therefore, considered to be **below** (INEOS and Shell). The sensitivity of the unlicensed blocks is considered to be **negligible**.

Significance of the effect

11.11.2.30 Overall, it is predicted that the sensitivity of the receptor is considered to be **low** (INEOS and Shell)/**negligible** (unlicensed blocks) and the magnitude is deemed to be **major** (licence blocks 49/4b and 49/9); **moderate** (49/3, 49/4d, 49/9c, 49/9d and 49/2); **minor** (49/2a, 49/9b, 49/4, 49/4a, 49/8 and 49/9a); **negligible** (49/1a, 49/8a and 49/7). The effect will, therefore, be **minor** adverse significance (licence block 49/2a and 49/9b currently operated by INEOS, 49/9a currently operated by Shell, and currently unlicensed blocks 49/2, 49/4, 49/8 and 49/9), which is not significant in EIA terms; and **negligible** adverse significance (licence blocks 49/1a currently operated by INEOS, 49/8a currently operated by Shell, and currently unlicensed block 49/7), which is not significant in EIA terms. Note that the significance of effect has not been assessed for licence blocks currently operated by Centrica as it is not possible to assign sensitivity to this receptor. This will be updated for the Environmental Statement.

11.11.2.31 It is important to note that the assessment presented above considers a maximum design scenario involving the full build out of Hornsea Three using floating foundations, with associated mooring lines. There are a range of floating foundations as well as other technologies (such as monopiles and jacket foundations) which will be considered for Hornsea Three. If such alternative technologies were to be used (those foundations that are more 'tried and tested' by the offshore wind industry or alternative floating foundation concepts that had a reduced seabed/water column footprint) or if the spatial extent of deployment of the floating foundation design considered in this assessment was reduced, the magnitude of this impact (and hence the significance of effect), may change. Any updates to the project description and impact assessment will be presented in the Environmental Statement.

Drilling and the placement of infrastructure has the potential to be restricted within the Hornsea Three array area and within 1 km from the boundary of the array area by the presence of infrastructure, safety zones and advisory safety distances.

- 11.11.2.32 Drilling and the placement of infrastructure associated with gas field development or natural gas storage and CCS projects may be restricted (but not prohibited) within the Hornsea Three array area due to the presence of infrastructure and mooring lines and may be restricted from within 1 km of the Hornsea Three array area (based on the potential for 500 m safety zones to be applied for around any oil and gas infrastructure and the potential for 500 m safety zones to extend beyond the Hornsea Three array area) during the operational and maintenance phase. There may be further, temporary restrictions from any 1,000 m advisory safety distances associated with maintenance vessels which may extend beyond the array area.
- 11.11.2.33 In the event that new oil and gas platforms or subsea structures are proposed, the restricted area would need to be extended further considering helicopter access requirements (see chapter 8: Aviation, Military and Communication and chapter 11: Inter-relationships).
- 11.11.2.34 As described in paragraph 11.11.1.52, for the purposes of this assessment, well abandonment has been considered to be equivalent to drilling activities and oil and gas infrastructure decommissioning activities have been assumed to be the reverse of oil and gas infrastructure installation activities, in terms of impact magnitude and sensitivity.
- 11.11.2.35 The assessment of this potential impact is complicated by the fact that future oil and gas plans have a degree of uncertainty associated with them. This complication feeds into assigning sensitivity to each receptor (in this case, licence blocks). Where consultation with the operators of the licence blocks in proximity to the Hornsea Three array area has demonstrated uncertainty regarding future plans, it is problematic to assign sensitivity without introducing high levels of precaution into the assessment. Where this is the case, sensitivity is not assigned within this PEIR and consultation is ongoing to understand future oil and gas plans (as discussed below) to enable sensitivity to be assigned, and a significance of effect to be concluded, for the Environmental Statement. At the point the Environmental Statement is submitted, it is likely that a level of residual uncertainty will remain regarding the future plans of operators of the licence blocks (for example whether or not an exploitable resource will be found and if so, where any infrastructure associated with this will be located) and as such a level of precaution will be built into the assessment. The level of uncertainty, and hence the level of precaution that is built into the assessment, will change over time as operators' plans become clearer.

Magnitude of impact

- 11.11.2.36 With the potential for 342 wind turbines with floating foundations and associated mooring lines 1,000 m in radius to be present within the Hornsea Three array area, and array cables, in addition to the potential for up to 19 operational safety zones around offshore platforms, and further safety zones/advisory safety distances around maintenance activities, drilling and the placement of infrastructure will be greatly restricted within the Hornsea Three array area. There may be further, temporary restrictions from any 1,000 m advisory safety distances associated with maintenance vessels which may extend beyond the array area.
- 11.11.2.37 As the minimum spacing between turbines is 1,000 m (and the average spacing is greater), which is equal to the area required for a single well safety zone, there is the potential that a well could be drilled. Drilling is further restricted however by the drill rig or vessel being able to access the location within the array area which will be very much dependent on the ultimate configuration of mooring lines, considering the maximum design scenario of floating turbines, and array cables. It is possible to directionally drill if required (providing this commences at a location outside the restricted zone) and it may be possible to drill at a distance of between 500 m and 1 km from the Hornsea Three array area in the event that no permanent safety zones are required. Such activities would be subject to consultation and agreement between both interested parties.
- 11.11.2.38 The area of overlap between the relevant licence block and the Hornsea Three array area is presented in Table 11.25 and described in paragraph 11.11.1.39. Considering the current operators of the licence blocks, Centrica has the greatest number, and generally the greatest area, of blocks affected by Hornsea Three (see Table 11.25). INEOS has three licenced blocks overlapping with the Hornsea Three array area, with a smaller area affected (see Table 11.25). Shell has two licenced blocks affected with a relatively small area of overlap (see Table 11.25). The five unlicensed blocks overlap the Hornsea Three array area by varying degrees (see Table 11.25), with the greatest area of overlap coinciding with the remaining unlicensed part of block 49/9. The potential for a restriction on activities within 1 km or more of the Hornsea Three array area for the reasons described above will increase the area of overlap however any additional restrictions from advisory safety distances will be temporary.
- 11.11.2.39 The impact is predicted to be of local spatial extent, long term duration, continuous and low reversibility. It is predicted that the impact will affect the receptor directly.
- 11.11.2.40 The magnitude is therefore, considered to be **major** for licence block 49/4b (currently operated by Centrica) and 49/9 (currently unlicensed); **moderate** for 49/3, 49/4d, 49/9c, 49/9d (currently operated by Centrica) and 49/2 (currently unlicensed); **minor** for 49/4a (currently operated by Centrica) 49/2a and 49/9b (currently operated by INEOS), 49/9a (currently operated by Shell) 49/4 and 49/8 (currently unlicensed); and **negligible** for 49/1a (currently operated by INEOS), 49/8a (currently operated by Shell) and 49/7 (currently unlicensed).

Sensitivity of the receptor

- 11.11.2.41 The sensitivity of the receptor depends on the area of their licenced acreage affected and the future plans of the licence operator in relation to potential exploitation of hydrocarbons. Information on each block and the assessed sensitivity is summarised in Table 11.25.
- 11.11.2.42 In all instances, consultation with the operators of the blocks in proximity to the Hornsea Three array area has aimed to address any future operational issues and establish a line of communication to ensure coexistence between both activities can be achieved with minimal disruption. Any future operator of the unlicensed blocks will be aware of Hornsea Three and will have taken potential coexistence into consideration.
- 11.11.2.43 The sensitivity of the licence operator has not been assessed for Centrica. Discussions are ongoing between Hornsea Three and Centrica (Table 11.4). There is not enough certainty in relation to Centrica's future plans to assign sensitivity to these licence blocks at this stage and this will be updated for the Environmental Statement.
- 11.11.2.44 The licensed operator is deemed to be of low (INEOS and Shell) vulnerability, medium recoverability and high value. The sensitivity of the licence operator is therefore, considered to be **low** (INEOS and Shell). The sensitivity of the unlicensed blocks is considered to be **negligible**.

Significance of the effect

- 11.11.2.45 Overall, it is predicted that the sensitivity of the receptor is considered to be **low** (INEOS and Shell)/**negligible** (unlicensed blocks) and the magnitude is deemed to be **major** (licence blocks 49/4b and 49/9); **moderate** (49/3, 49/4d, 49/9c, 49/9d and 49/2); **minor** (49/2a, 49/9b, 49/4, 49/4a, 49/8 and 49/9a); **negligible** (49/1a, 49/8a and 49/7). The effect will, therefore, be **minor** adverse significance (licence block 49/2a and 49/9b currently operated by INEOS, 49/9a currently operated by Shell, and currently unlicensed blocks 49/2, 49/4, 49/8 and 49/9), which is not significant in EIA terms; and **negligible** adverse significance (licence blocks 49/1a currently operated by INEOS, 49/8a currently operated by Shell, and currently unlicensed block 49/7), which is not significant in EIA terms. Note that the significance of effect has not been assessed for licence blocks currently operated by Centrica as it is not possible to assign sensitivity to this receptor. This will be updated for the Environmental Statement.

11.11.2.46 It is important to note that the assessment presented above considers a maximum design scenario involving the full build out of Hornsea Three using floating foundations, with associated mooring lines. There are a range of floating foundations as well as other technologies (such as monopiles and jacket foundations) which will be considered for Hornsea Three. If such alternative technologies were to be used (those foundations that are more 'tried and tested' by the offshore wind industry or alternative floating foundation concepts that had a reduced seabed/water column footprint) or if the spatial extent of deployment of the floating foundation design considered in this assessment was reduced, the magnitude of this impact (and hence the significance of effect), may change. Any updates to the project description and impact assessment will be presented in the Environmental Statement.

Safety zones around the offshore HVAC booster stations and advisory safety distances associated with maintenance activities underway along the offshore cable corridor may restrict potential seismic survey activity.

11.11.2.47 Safety zones around the offshore HVAC booster stations and advisory safety distances around cable maintenance vessels carrying out activities along the offshore cable corridor will exclude conventional towed streamer seismic survey vessels from the area.

Magnitude of impact

11.11.2.48 The area of overlap between the relevant licence block and the Hornsea Three offshore cable corridor is presented in Table 11.26 and described in paragraph 11.11.1.64. The magnitude of impact for operators with licenced blocks along the offshore cable corridor (and not within the offshore HVAC booster station search area) will restrict potential seismic survey area in an area of relatively small spatial extent and for a relatively short duration from the presence of individual 1,000 m advisory safety distances around cable maintenance vessels (which may be working together in close proximity) as they move along the offshore cable corridor. The impact will be infrequent and temporary. Due to the transient and infrequent nature of any cable maintenance activity, the magnitude of impact is considered to be negligible.

11.11.2.49 There is the potential for up to four offshore HVAC booster stations within the offshore HVAC booster station search area, with the potential for operational safety zones around each structure. Assuming, as a maximum design scenario, that the four offshore HVAC booster stations are located in close proximity and spaced up to 1 km apart so that their 500 m safety zones are contiguous, the combined area of the safety zones could be up to 3.16 km². There are two licenced blocks within the offshore HVAC booster search area, currently operated by Independent Oil and Gas and six unlicensed blocks. Two of these blocks (48/24b currently operated by Independent Oil and Gas, and 48/24 currently unlicensed) have a minor level of overlap with the offshore HVAC booster station search area and the rest of these blocks have a negligible level of overlap with the offshore HVAC booster station search area (see Table 11.26). Assuming, as a maximum design scenario, that the four offshore HVAC booster stations are located fully within a single licence block, the magnitude of impact will restrict potential seismic survey area in an area of relatively small spatial extent compared with the total area of the licence block, and over a long term duration.

11.11.2.50 The impact is predicted to be of local spatial extent, short term (offshore cable corridor)/long term (offshore HVAC booster station search area) duration, intermittent (offshore cable corridor)/continuous (offshore HVAC booster station search area) and high (offshore cable corridor)/low (offshore HVAC booster station search area) reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **minor** for licence blocks 48/24b currently operated by Independent Oil and Gas and 48/24 currently unlicensed and **negligible** for all other licence blocks.

Sensitivity of the receptor

11.11.2.51 Seismic activities will be able to continue along the length of the offshore cable corridor when maintenance activities are not taking place, with the exception of at the locations of the offshore HVAC booster stations.

11.11.2.52 The sensitivity of the receptor depends on the information provided through consultation with the operator of the licence block. Information on each block and the assessed sensitivity is summarised in Table 11.26. As noted above, the impact will affect a relatively small proportion of the licenced blocks and/or will occur over a limited duration. Consultation with the operators of the affected licence blocks (Shell, INEOS, Independent Oil and Gas and ConocoPhillips) did not identify any long term future plans for seismic survey activity within the offshore cable corridor during the Hornsea Three operational and maintenance phase (see Table 11.3).

11.11.2.53 The promulgation of information through Notices to Mariners combined with ongoing consultation will enable the operators to plan surveys taking into account the presence of Hornsea Three. Sufficient information exchange between parties and continued consultation will be in place to avoid conflicting interactions. Any future operator of the unlicensed blocks will be aware of the Hornsea Three project and will have taken potential coexistence into consideration.

11.11.2.54 The operators of the affected licenced blocks are deemed to be of low vulnerability, medium recoverability and high value. The sensitivity of the receptor is therefore, considered to be **low**. The sensitivity of the unlicensed blocks is considered to be **negligible**.

Significance of the effect

11.11.2.55 Overall, it is predicted that the sensitivity of the receptor is considered to be **low** (licenced blocks)/**negligible** (unlicensed blocks) and the magnitude is deemed to be **minor** for licence blocks 48/24b currently operated by Independent Oil and Gas and 48/24 currently unlicensed and **negligible** for all other licence blocks. The effect will, therefore, be of **minor** adverse significance for 48/24b (Independent Oil and Gas) which is not significant in EIA terms and **negligible** adverse significance, which is not significant in EIA terms.

Drilling and the placement of infrastructure has the potential to be restricted within the offshore cable corridor and within 1 km from the boundary of the offshore cable corridor.

11.11.2.56 Drilling activities may be restricted within the offshore cable corridor during the Hornsea Three operational and maintenance phase from the presence of up to six export cables installed across the corridor. Drilling may also be restricted within 1 km from either side of the offshore cable corridor (based on the potential for 500 m safety zones to be applied for around any oil and gas infrastructure and the potential for 500 m safety zones to extend beyond the offshore cable corridor from Hornsea Three infrastructure within the offshore HVAC booster station search area). There may be further, temporary restrictions from any 1,000 m advisory safety distances associated with maintenance vessels working along the offshore cable route. The four offshore HVAC booster stations if required will be located within the restricted area along the offshore cable corridor, therefore they are not assessed separately in this assessment. It should be noted that pipelines would be able to be installed across this area subject to crossing and proximity agreements being put in place.

Magnitude of impact

11.11.2.57 The area of overlap between the relevant licence block and the Hornsea Three offshore cable corridor is presented in Table 11.26 and described in paragraph 11.11.1.64. There is the potential for further restrictions from any 500 m safety zones or 1,000 m advisory safety distances that may extend beyond the offshore cable corridor boundary. However such further restrictions will be either highly localised or temporary and infrequent.

11.11.2.58 The magnitude of impact for operators with licenced blocks along the offshore cable corridor will be limited to a restriction on drilling and the placement of infrastructure within an area of relatively small spatial extent in relation to the total licence block area, and over a long term duration.

- 11.11.2.59 The impact is predicted to be of local spatial extent, long term duration, continuous and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **minor** (licence blocks 48/20a, 48/20b, 48/24, 48/24b, 48/27, 48/28, 49/2, 49/7, 49/8, 49/11a and 52/1); and **negligible** (all other licence blocks).

Sensitivity of the receptor

- 11.11.2.60 The sensitivity of the receptor depends on the information provided through consultation with the operator of the licence block. Information on each block and the assessed sensitivity is summarised in Table 11.26. Consultation with the operators of the affected licence blocks (Shell, INEOS, Independent Oil and Gas and ConocoPhillips) did not identify any plans for the development of new infrastructure within the offshore cable corridor during the Hornsea Three operational and maintenance phase (see Table 11.3).

- 11.11.2.61 Drilling may still take place between 500 m to 1 km from the offshore cable corridor provided that no permanent safety zones will be applied for by the oil and gas operator. Drilling may also still take place by means of directional drilling, providing this commences at a location outside the restricted area.

- 11.11.2.62 There is the potential to coexist through ongoing consultation and promulgation of information. Sufficient information exchange between parties and continued consultation will be in place to avoid conflicting interactions. Any future operator of the unlicensed blocks will be aware of the Hornsea Three project and will have taken potential coexistence into consideration.

- 11.11.2.63 The operators of the affected licence blocks are deemed to be of low vulnerability, medium recoverability and high value. The sensitivity of the receptor is therefore, considered to be **low**. The sensitivity of the unlicensed blocks is considered to be **negligible**.

Significance of the effect

- 11.11.2.64 Overall, it is predicted that the sensitivity of the receptor is considered to be **low** (licenced blocks)/**negligible** (unlicensed blocks) and the magnitude is deemed to be **minor** (licence blocks 48/20a, 48/20b, 48/24, 48/24b, 48/27, 48/28, 49/2, 49/7, 49/8, 49/11a and 52/1); and **negligible** (all other licence blocks). The effect will, therefore, be of **minor** adverse significance (licence blocks 48/20a currently operated by Shell, 48/20b currently operated by INEOS, 48/24b currently operated by Independent Oil and Gas and 49/11a currently operated by ConocoPhillips), which is not significant in EIA terms and **negligible** adverse significance (all other licence blocks), which is not significant in EIA terms.

The presence of new wind turbines in previously open sea areas may cause interference with the performance of the REWS located on oil and gas platforms.

- 11.11.2.65 The physical presence of wind turbines and associated offshore structures has the potential to interfere with the performance of REWS, through effects such as high radar returns, shadowing (effectively a shadow is cast by the wind turbines which creates a region where the radar beam is unable to fully illuminate an object), increased number of detections and false alarm/track generation. This system is sometimes used by oil and gas operators as an integral part of their anti-collision safety systems for their offshore platforms (see section 11.7.16).

- 11.11.2.66 Platforms with REWS potentially within operational range of the Hornsea Three array area have been identified (see Table 11.14). The REWS on the J6A platform (operated by Centrica) is located 6.9 NM from the Hornsea Three array area and is therefore within the approximate detection range for a 100 m² target (16 NM). The J6A platform REWS also provides coverage and protection to the Chiswick, Markham ST-1, Windermere and Grove platforms (see Table 11.14). It should be noted that consultation with Centrica and INEOS (see Table 11.3) has advised that the Markham ST-1 and Windermere platforms are expected to be decommissioned prior to the construction of Hornsea Three. These platforms have however been included in the assessment as the decommissioning plans have not yet been approved by BEIS.

- 11.11.2.67 The REWS on the Murdoch and Saturn platforms (operated by ConocoPhillips), located 16.9 NM and 17.6 NM from the Hornsea Three array area respectively, are potentially within the approximate detection range for a 100 m² RCS target. Since the Murdoch platform REWS has an overlapping coverage with the Katy platform REWS (also operated by ConocoPhillips), the Murdoch platform REWS was not considered within this assessment. The Saturn platform REWS also provides coverage and protection to the Tethys, Mimas, Viking KD, Vulcan 2 UR and Vampire OD platforms operated by ConocoPhillips.

- 11.11.2.68 Radar modelling was carried out on the effect of Hornsea Three on the J6A and Saturn platform REWS. This is presented in volume 5, annex 10.1: Radar Early Warning Systems Technical Annex and the results are discussed for each platform in turn below.

Magnitude of impact

- 11.11.2.69 The layout and returns modelling results for the J6A platform REWS indicate that the close proximity of this platform, in addition to the Windermere, Chiswick, Grove, Markham ST-1 and J6A platforms (which are also protected by the J6A platform REWS), to the Hornsea Three array area may raise potential concerns when considering the detection and tracking of vessels travelling through the Hornsea Three array area. If the REWS is unable to detect and track a vessel within the wind farm it may cause the REWS to issue delayed TCPA alarms when a vessel is approaching any of these platforms, resulting in insufficient response times to deal with potential collision threats.

- 11.11.2.70 To further assess the ability of the J6A platform REWS to detect a vessel within the Hornsea Three array area, a constant false alarm rate (CFAR) threshold over the detection region was modelled. The radar returns from a small test vessel (100 m^2 RCS) was then modelled. The vessel has high returns at close ranges, which then reduces with range up to approximately 16 NM (30 km). The returns from the test vessel were then compared against the CFAR detection threshold to establish the detection regions. If the vessel returns are above the CFAR threshold, then the vessel is detected and if the returns are below the threshold the target is assumed to be undetected within that region. Figure 11.10 shows the detection plot from the J6A platform REWS for the test vessel over the Hornsea Three array area. Dark areas within the plot denote regions where the vessels will not be detected. The results show that the raised threshold levels caused by the presence of turbines will inherently cause detection loss of vessels travelling through the Hornsea Three array area. This effect, in combination with potential shadowing effects, may cause the REWS to lose tracks of the vessels and fail in raising TCPA alarms in a timely manner.
- 11.11.2.71 The results also show that at close ranges the REWS easily detects the test vessel as the returns are above the detection threshold. Once the vessel is travelling within the Hornsea Three array area, the raised threshold over the cells around each turbine can cause loss of detection. A larger size test vessel ($1,000 \text{ m}^2$ RCS) was not modelled as the results would be similar for the 100 m^2 RCS test vessel.
- 11.11.2.72 The layout and returns modelling and CFAR modelling was also undertaken for the Saturn platform REWS. A small test vessel of 100 m^2 RCS was modelled. The results indicate that the range of detection is 16 NM, therefore the Hornsea Three array area will not have an impact on the REWS for a 100 m^2 RCS test vessel due to the distance of the REWS from the nearest turbine 17.6 NM (32.7 NM).
- 11.11.2.73 As the smaller test vessel could not be detected, a larger test vessel of $1,000 \text{ m}^2$ RCS was also modelled. This represents a 1,000 GT vessel. The modelling indicates that the typical radar detection range for a $1,000 \text{ m}^2$ RCS target is approximately 26.6 NM (48 km). When considering the CFAR threshold over the Hornsea Three array area, the detection of the $1,000 \text{ m}^2$ RCS target test vessel is shown in Figure 11.11. The results show that for a larger vessel the Hornsea Three array area is unlikely to affect the performance of the REWS on the Saturn platform. There will be some detection loss at the edges of the Hornsea Three array area; however, this is sufficiently far to uphold the integrity of the TCPA alarms.
- 11.11.2.74 The impact is predicted to be of local spatial extent, medium term duration, continuous and not reversible for the project phase. It is predicted that the impact will affect the receptor directly. The physical extent of the impact is moderate for the J6A platform REWS, operated by Centrica, and minor for the Saturn platform REWS, operated by ConocoPhillips. The magnitude is therefore, considered to be **moderate** for Centrica and **minor** for ConocoPhillips.

Sensitivity of the receptor

11.11.2.75 REWS, where installed, play a fundamental part of an operator's anti-collision safety systems on their platform. The platform operator is deemed to be of medium vulnerability, medium recoverability and high value. The sensitivity of the receptor is therefore, considered to be **high**.

Significance of the effect

11.11.2.76 Overall, it is predicted that the sensitivity of the receptor is considered to be **high** and the magnitude is deemed to be **moderate** for the J6A platform REWS (Centrica) and **minor** for the Saturn platform REWS (ConocoPhillips). The effect will, therefore, be of **moderate** adverse significance, which is significant in EIA terms for the J6A platform REWS (Centrica) and **minor** adverse significance, which is not significant in EIA terms for the Saturn platform REWS (ConocoPhillips).

Further mitigation

11.11.2.77 There are potential mitigation measures available to reduce the significance of effect on the REWS on the J6A platform, such as updating the tracking and thresholding software to reduce losses within the wind farms. The implementation of any mitigation measures through software modifications is highly dependent on the REWS setup. Hornsea Three proposes that further consultation with Centrica shall be undertaken to ascertain suitable options. This will enable the impact to be reduced to an acceptable level to the receptor. The residual effect will therefore be **minor** which is not significant in EIA terms.

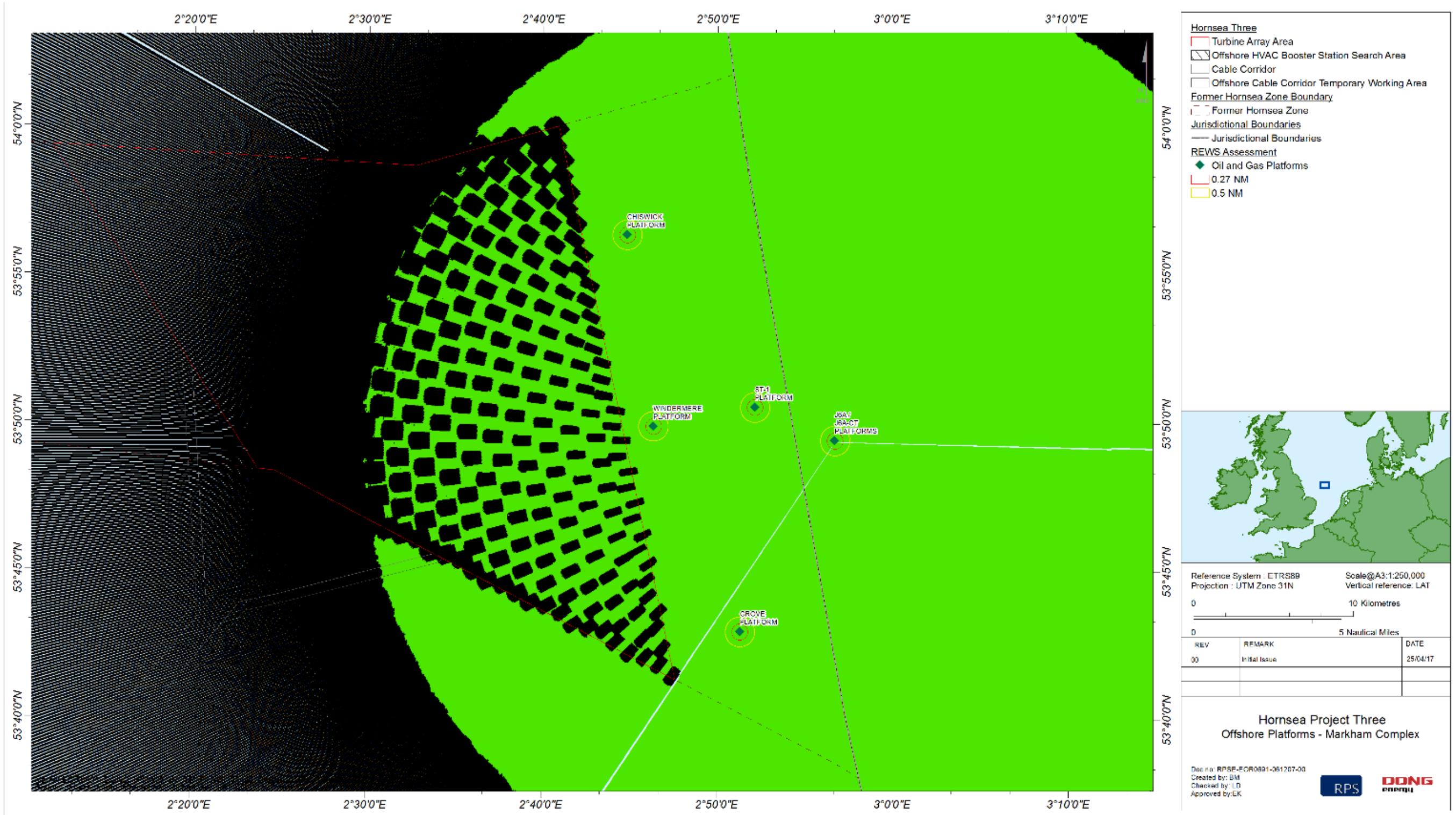


Figure 11.10: J6A platform REWS detection plot showing loss regions for a 100 m² RCS target test vessel.

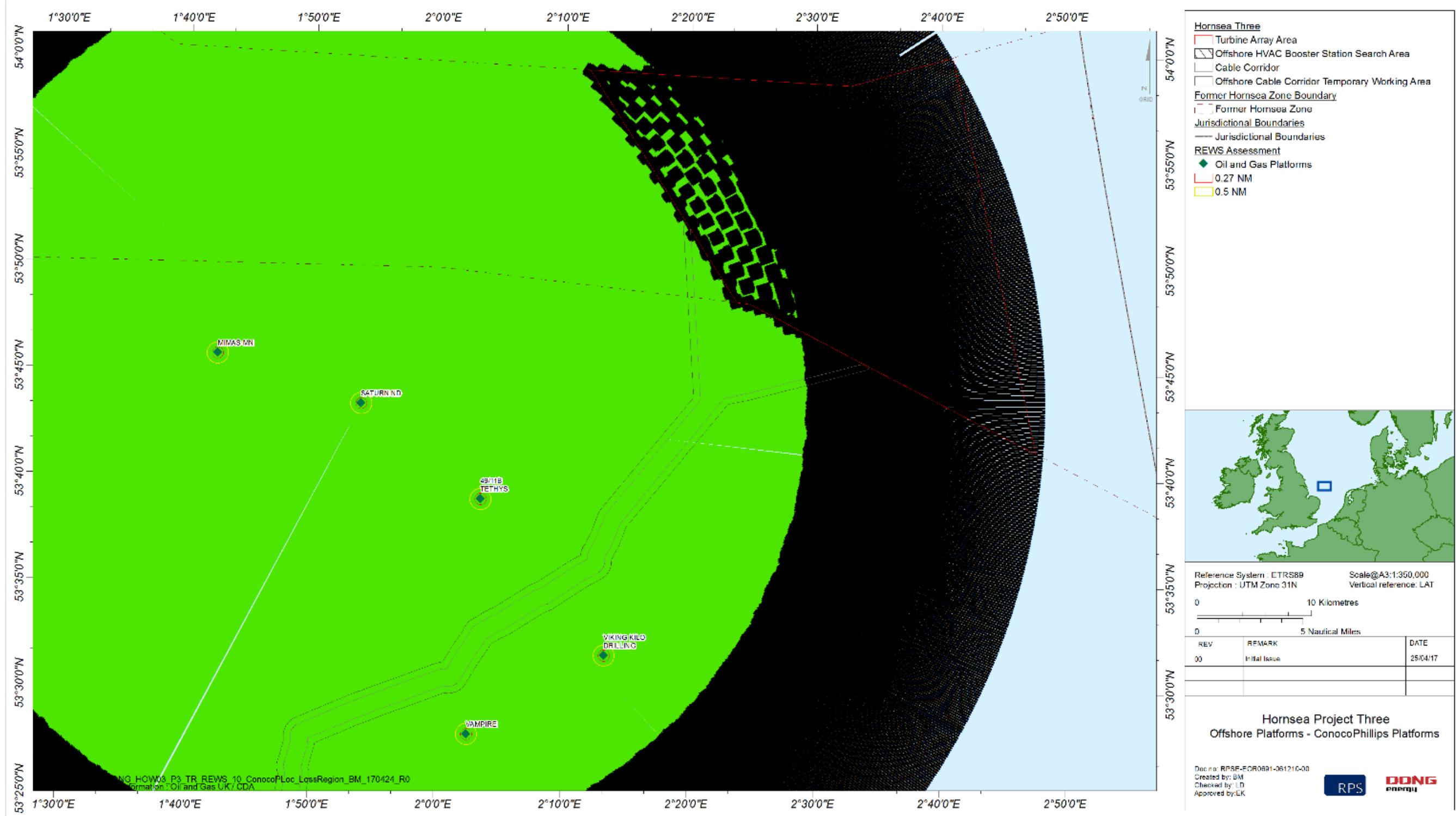


Figure 11.11: Saturn platform REWS detection plot showing loss regions for a large 1,000 m² RCS target over the Hornsea Project Three array area.

Wind turbines and associated infrastructure will form a physical obstruction and may disrupt vessel access to oil and gas platforms and subsea infrastructure.

11.11.2.78 This impact considers vessel access to oil and gas platforms and subsea infrastructure only. An assessment of restrictions to helicopter access to existing or new oil and gas platforms or subsea structures is provided in chapter 8: Aviation, Military and Communication. An assessment on route deviations to vessels is provided in chapter 7: Shipping and Navigation.

Magnitude of impact

11.11.2.79 With the potential for 342 wind turbines with floating foundations and associated mooring lines 1,000 m in radius to be present within the Hornsea Three array area, in addition to the potential for up to 19 operational safety zones around offshore platforms within the Hornsea Three array area and an additional four within the offshore HVAC booster station search area, and further safety zones/advisory safety distances around maintenance activities within the Hornsea Three array area and along the offshore cable corridor, there is the potential for disruption of vessel access to oil and gas platforms and subsea infrastructure.

11.11.2.80 There are no existing platforms or subsea structures (that are not wells) within the Hornsea Three array area or within 1 km of the Hornsea Three array area. There are no platforms or active subsea structures (that are not wells) located within the Hornsea Three offshore cable corridor or offshore HVAC booster station search area, however there is one active gas platform, Clipper South operated by INEOS, located within 1 km of the offshore cable corridor. In relation to wells, there is one suspended well within the Hornsea Three array area (operated by Wintershall) and one suspended well within 1 km of the Hornsea Three array area (operated by INEOS). There are no wells within the Hornsea Three offshore cable corridor, however there are four completed wells within 1 km of the offshore cable corridor (operated by INEOS).

11.11.2.81 The Clipper South platform is located 800 m from the offshore cable corridor, and outside the offshore HVAC booster search area. The 500 m safety zone around this platform is therefore 300 m from the offshore cable corridor and may overlap with any advisory safety distances around maintenance vessels working infrequently along the offshore cable corridor. This overlap is not considered to disrupt vessel access to the Clipper South platform due to the advisory nature of the safety distance and the close communication which will be established between both parties to ensure that activities can be coordinated.

11.11.2.82 There is potential for vessel access to the suspended well within the Hornsea Three array area to be restricted by the presence of wind turbines and associated infrastructure. There is also potential for vessel access to the suspended well within 1 km of the Hornsea Three array area to be very slightly disrupted by the presence of any safety zones/advisory safety distances associated with maintenance activities.

11.11.2.83 The four completed wells within 1 km of the Hornsea Three offshore cable corridor are located in a single position within the Clipper South field operated by INEOS, 6.9 km to the north of the offshore HVAC booster search area. Completed wells are typically subject to a 500 m safety zone. Any overlap between these safety zones and any advisory safety distances around maintenance vessels working infrequently along the offshore cable corridor is not considered to disrupt vessel access to these wells due to the advisory nature of the safety distance and the close communication which will be established between both parties to ensure that activities can be coordinated.

11.11.2.84 Any plans for new infrastructure will be developed by operators with an awareness of the presence of Hornsea Three. In the event that new infrastructure is planned in close proximity, consultation will take place between Hornsea Three and the relevant oil and gas operator to establish close communication. Whilst this is not a legislative requirement the OGA interactive maps show the locations of wind farm developments.

11.11.2.85 The impact is predicted to be of local spatial extent, short term (offshore cable corridor)/long term (Hornsea Three array area and offshore HVAC booster station search area) duration, intermittent (offshore cable corridor)/continuous (Hornsea Three array area and offshore HVAC booster station search area) and high (offshore cable corridor)/low (Hornsea Three array area and offshore HVAC booster station search area) reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **minor**.

Sensitivity of the receptor

11.11.2.86 The sensitivity of the receptor depends on the information provided through consultation with the operator. Vessel access to the suspended well within the Hornsea Three array area will not be restricted as consultation with Wintershall has advised that it is due for decommissioning prior to Hornsea Three construction (see Table 11.3). Consultation with INEOS similarly advised that the Topaz suspended well head within 1 km of the Hornsea Three array area is likely to be decommissioned prior to Hornsea Three construction, and that they do not have any current exploration plans within the southern North Sea (see Table 11.3). End of field life for the Clipper South field is expected in 2024 (DEA UK SNS Ltd, 2015), prior to Hornsea Three operation, as also indicated by INEOS during consultation (see Table 11.3).

11.11.2.87 Therefore, there is unlikely to be potential for disruption to vessel access to existing infrastructure. Close communication will be established between Hornsea Three and the relevant operators in the vicinity of the Hornsea Three array area and offshore cable corridor to ensure that future activities can be coordinated. Any future operator of the unlicensed blocks will be aware of the Hornsea Three project and will have taken potential coexistence into consideration.

11.11.2.88 The oil and gas operator is deemed to be of low vulnerability, high recoverability and high value. The sensitivity of the receptor is therefore, considered to be **low**.

Significance of the effect

11.11.2.89 Overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

11.11.2.90 It is important to note that the assessment presented above considers a maximum design scenario involving the full build out of Hornsea Three using floating foundations, with associated mooring lines. There are a range of floating foundations as well as other technologies (such as monopiles and jacket foundations) which will be considered for Hornsea Three. If such alternative technologies were to be used (those foundations that are more 'tried and tested' by the offshore wind industry or alternative floating foundation concepts that had a reduced seabed/water column footprint) or if the spatial extent of deployment of the floating foundation design considered in this assessment was reduced, the magnitude of this impact (and hence the significance of effect), may change. Any updates to the project description and impact assessment will be presented in the Environmental Statement.

Future monitoring

11.11.2.91 No specific monitoring requirements have been identified for the operational and maintenance phase in relation to recreational users and recreational fishing; aggregate extraction, cables and pipelines; and oil and gas operations.

11.11.3 Decommissioning phase

11.11.3.1 The impacts of the offshore decommissioning of Hornsea Three have been assessed on infrastructure and other users. The environmental effects arising from the decommissioning of Hornsea Three are listed in Table 11.15, Table 11.16 and Table 11.17 along with the maximum design scenario against which each decommissioning phase impact has been assessed.

11.11.3.2 A description of the potential effect on infrastructure and other users receptors caused by each identified impact is given below. The receptors have been divided into categories, as per Table 11.15, Table 11.16 and Table 11.17, for ease of reference.

Recreational users and recreational fishing

Hornsea Three infrastructure, safety zones and advisory safety distances associated with activities within the Hornsea Three array area and along the offshore cable corridor may displace recreational craft and recreational fishing vessels resulting in a loss of recreational resource.

11.11.3.3 The effects of decommissioning activities are expected to be the same or similar to the effects from construction. The significance of effect is therefore **negligible**, which is not significant in EIA terms (see paragraph 11.11.1.13).

Aggregate extraction, cables and pipelines

Removal of Hornsea Three infrastructure may affect existing cables and pipelines or restrict access to cables and pipelines.

11.11.3.4 The effects of decommissioning activities are expected to be the same or similar to the effects from construction. The significance of effect is therefore **minor**, which is not significant in EIA terms (see paragraph 11.11.1.23).

Removal of infrastructure has the potential to lead to increased suspended sediment concentrations and deposition, which could cause a change in aggregate resource in aggregate extraction areas.

11.11.3.1 The potential changes to the physical environment due to decommissioning activities are expected to be the same or similar to the effects from construction. The significance of effect is therefore **negligible**, which is not significant in EIA terms (see paragraph 11.11.1.36).

Oil and gas operations

Hornsea Three infrastructure, safety zones and advisory safety distances associated with decommissioning of the Hornsea Three array area may restrict potential seismic survey activity.

11.11.3.2 The effects of decommissioning activities are expected to be the same or similar to the effects from construction. The significance of effect is therefore **minor** adverse significance (licence block 49/2a and 49/9b currently operated by INEOS, 49/9a currently operated by Shell, and currently unlicensed blocks 49/2, 49/4, 49/8 and 49/9), which is not significant in EIA terms; and **negligible** adverse significance (licence blocks 49/1a currently operated by INEOS, 49/8a currently operated by Shell, and currently unlicensed block 49/7), which is not significant in EIA terms. (see paragraph 11.11.1.48). Note that the significance of effect has not been assessed for licence blocks currently operated by Centrica as it is not possible to assign sensitivity to this receptor. This will be updated for the Environmental Statement.

Drilling and the placement of infrastructure has the potential to be restricted within the Hornsea Three array area and within 1 km from the boundary of the array area by the presence of infrastructure, safety zones and advisory safety distances.

11.11.3.3 The effects of decommissioning activities are expected to be the same or similar to the effects from construction. The significance of effect is therefore **minor** adverse significance (licence block 49/2a and 49/9b currently operated by INEOS, 49/9a currently operated by Shell, and currently unlicensed blocks 49/2, 49/4, 49/8 and 49/9), which is not significant in EIA terms; and negligible adverse significance (licence blocks 49/1a and 49/9b currently operated by INEOS, 49/8a currently operated by Shell, and currently unlicensed block 49/7), which is not significant in EIA terms. (see paragraph 11.11.1.61). Note that the significance of effect has not been assessed for licence blocks currently operated by Centrica as it is not possible to assign sensitivity to this receptor. This will be updated for the Environmental Statement.

Safety zones around the offshore HVAC booster stations and advisory safety distances associated with activities underway along the offshore cable corridor may restrict potential seismic survey activity.

11.11.3.4 The effects of decommissioning activities are expected to be the same or similar to the effects from construction. The significance of effect is therefore **minor** adverse significance (licence blocks 48/20a currently operated by Shell, 48/20b currently operated by INEOS, 48/24b currently operated by Independent Oil and Gas and 49/11a currently operated by ConocoPhillips), which is not significant in EIA terms and **negligible** adverse significance (all other licence blocks), which is not significant in EIA terms. (see paragraph 11.11.1.71).

Drilling and the placement of infrastructure has the potential to be restricted within the offshore cable corridor and within 1 km from the boundary of the offshore cable corridor.

11.11.3.5 The effects of decommissioning activities are expected to be the same or similar to the effects from construction. The significance of effect is **minor** adverse significance (licence blocks 48/20a currently operated by Shell, 48/20b currently operated by INEOS, 48/24b currently operated by Independent Oil and Gas, and 49/11a currently operated by ConocoPhillips), which is not significant in EIA terms and **negligible** adverse significance (all other licence blocks), which is not significant in EIA terms. (see paragraph 11.11.1.80).

Future monitoring

11.11.3.6 No specific monitoring requirements have been identified for the decommissioning phase in relation to recreational users and recreational fishing; aggregate extraction, cables and pipelines; and oil and gas operations.

11.12 Cumulative Effect Assessment methodology

11.12.1 Screening of other projects and plans into the Cumulative Effect Assessment

The Cumulative Effect Assessment (CEA) takes into account the impact associated with Hornsea Three together with other projects and plans. The projects and plans selected as relevant to the CEA presented within this chapter are based upon the results of a screening exercise undertaken as part of the 'CEA long list' of projects (see annex 4.5: Cumulative Effects Screening Matrix and Location of Schemes). Each project on the CEA long list has been considered on a case by case basis for scoping in or out of this chapter's assessment based upon data confidence, effect-receptor pathways and the spatial/temporal scales involved.

In undertaking the CEA for Hornsea Three, it is important to bear in mind that other projects and plans under consideration will have differing potential for proceeding to an operational stage and hence a differing potential to ultimately contribute to a cumulative impact alongside Hornsea Three. For example, relevant projects and plans that are already under construction are likely to contribute to cumulative impact with Hornsea Three (providing effect or spatial pathways exist), whereas projects and plans not yet approved or not yet submitted are less certain to contribute to such an impact, as some may not achieve approval or may not ultimately be built due to other factors. For this reason, all relevant projects and plans considered cumulatively alongside Hornsea Three have been allocated into 'Tiers', reflecting their current stage within the planning and development process. This allows the CEA to present several future development scenarios, each with a differing potential for being ultimately built out. Appropriate weight may therefore be given to each Tier in the decision making process when considering the potential cumulative impact associated with Hornsea Three (e.g. it may be considered that greater weight can be placed on the Tier 1 assessment relative to Tier 2). An explanation of each tier is included below:

- Tier 1: Hornsea Three considered alongside other project/plans currently under construction and/or those consented but not yet implemented, and/or those submitted but not yet determined and/or those currently operational that were not operational when baseline data was collected, and/or those that are operational but have an on-going impact;
- Tier 2: All projects/plans considered in Tier 1, as well as those on relevant plans and programmes likely to come forward but have not yet submitted an application for consent (the PINS programme of projects is the most relevant source of information). Specifically, this Tier includes all projects where the developer has submitted a Scoping Report; and
- Tier 3: All projects/plans considered in Tier 2, as well as those on relevant plans and programmes likely to come forward but have not yet submitted an application for consent (the PINS programme of projects is the most relevant source of information). Specifically, this Tier includes all projects where the developer has advised PINS in writing that they intend to submit an application in the future but have not submitted a Scoping Report.

- 11.12.1.3 The specific projects scoped into this CEA and the Tiers into which they have been allocated, are outlined in Table 11.27.
- 11.12.1.4 It is noted that Tier 1 includes projects, plans and activities that are operational, under construction, consented but not yet implemented and submitted but not yet determined. The certainty associated with other projects, plans and activities, in terms of the scale of the development and the likely impacts, increase as they progress from submitted applications to operational projects. In particular, offshore wind farms seek consent for a maximum design scenario and the as built offshore wind farm will be selected from the range of consented scenarios. In addition, the maximum design scenario quoted in the application (and the associated Environmental Statement) are often refined during the determination period of the application. For example, it is noted that the Applicant for Hornsea Project One has gained consent for an overall maximum number of turbines of 240, as opposed to 332 considered in the Environmental Statement. Similarly, Hornsea Project Two has gained consent for an overall maximum number of turbines of 300, as opposed to 360 considered in the Environmental Statement.
- 11.12.1.5 It should be noted that the CEA presented in this infrastructure and other users chapter has been undertaken on the basis of information presented in the Environmental Statements for the other projects, plans and activities. The level of impact on infrastructure and other users would likely be reduced from those presented here. In addition, Hornsea Three is currently considering how the different levels of certainty associated with projects in Tier 1 can be reflected in the CEA and an update, in terms to the approach to tiering, will be presented in the Environmental Statement.

11.12.2 Maximum design scenario

- 11.12.2.1 The maximum design scenarios identified in Table 11.28, Table 11.29 and Table 11.30 have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. The cumulative impact presented and assessed in this section have been selected from the details provided in the Hornsea Three project description (volume 1, chapter 3: Project Description), as well as the information available on other projects and plans, in order to inform a 'maximum design scenario'. Effects of greater adverse significance are not predicted to arise should any other development scenario, based on details within the project Design Envelope (e.g. different turbine layout), to that assessed here be taken forward in the final design scheme.

Table 11.27: List of other projects and plans considered within the CEA.

Tier	Phase	Project/Plan	Distance from Hornsea Three array area	Distance from Hornsea Three offshore cable corridor	Details	Date of Construction (if applicable)	Overlap of construction phase with Hornsea Three construction phase	Overlap of operation phase with Hornsea Three operation phase
<i>Aggregates</i>								
1	Option	106 East - 480	120 km	51 km	Aggregate Licence Option Area operated by Hanson Aggregates Marine Ltd	N/A	N/A	Yes
	Option	Humber 4 - 490	19 km	13 km	Aggregate Option Area operated by DEME Building Materials Ltd	N/A	N/A	Yes
	Option	Humber 7 - 491	4 km	0 km	Aggregate Option Area operated by DEME Building Materials Ltd	N/A	N/A	Yes
	Option	Inner Dowsing - 481	125 km	38 km	Aggregate Licence Option Area operated by Tarmac Marine Ltd/Van Oord Ltd	N/A	N/A	Yes
	Application	Humber 4 and 7 - 506	13 km	8 km	Aggregate Application Area operated by DEME Building Materials Ltd	N/A	N/A	Yes
	Application	Humber 5 - 483	14 km	2 km	Aggregate Application Area operated by DEME Building Materials Ltd	N/A	N/A	Yes
	Application	Humber Overfalls - 493	132 km	60 km	Aggregate Application Area operated by Tarmac Marine Ltd	N/A	N/A	Yes
	Application	Inner Dowsing - 439	131 km	48 km	Aggregate Application Area operated by Hanson Aggregates Marine Ltd	N/A	N/A	Yes
	Production	Humber 3 - 484	43 km	0 km	Aggregate Production Area operated by DEME Building Materials Ltd	N/A	N/A	Yes
<i>Offshore wind farms</i>								
	Awaiting consent	East Anglia Three	103 km	87 km	Up to 1200 MW (up to 172 turbines of up to 7 – 12 MW capacity)	2020-2022	Yes	Yes
	Consented	Dogger Bank Creyke Beck A	76 km	91 km	Up to 1.2 GW (Up to 200 turbines of up to 10 MW capacity)	2021-2024	Yes	Yes
	Consented	Dogger Bank Creyke Beck B	99 km	115 km	Up to 1.2 GW (Up to 200 turbines of up to 10 MW turbines)	2021-2024	Yes	Yes
	Consented	Dogger Bank Teesside A	107 km	123 km	Up to 1.2 GW	2023-2026	Yes	Yes
	Consented	Dogger Bank Teesside B	95 km	108 km	Up to 1.2 GW	2023-2026	Yes	Yes
	Consented	Hornsea Project Two	7 km	18 km	Up to 300 6-15 MW turbines (DCO)	2017-2019	No	Yes
	Consented	East Anglia One	152 km	106 km	714 MW (102 x 7 MW)	2017-2019	No	Yes

Tier	Phase	Project/Plan	Distance from Hornsea Three array area	Distance from Hornsea Three offshore cable corridor	Details	Date of Construction (if applicable)	Overlap of construction phase with Hornsea Three construction phase	Overlap of operation phase with Hornsea Three operation phase
	Consented	Triton Knoll	100 km	44 km	750-900 MW (113-288 x 8 MW turbines) Greater Wash. 20 miles off the coast of Lincolnshire and 28 miles from the coast of N Norfolk Restriction on installation of 7 m monopiles between 1st Sept - 16th Oct during herring spawning season	2017-2021	No	Yes
	Under construction	Dudgeon	87 km	11 km	20 miles off the coast of Cromer, North Norfolk. Up to 400 MW and 77 WTGs.	2017 (completion)	No	Yes
	Under construction	Galloper	195 km	79 km	Up to 336 MW (56 x 6 MW turbines)	2017	No	Yes
	Under construction	Hornsea Project One	7 km	7 km	Project One, the first development in the Zone, will comprise of up to three wind farm arrays. Project One will have a combined capacity of up to 1.2 gigawatts (GW). The offshore wind turbines for Project One will be located in the centre of the Hornsea Zone, covering an area of approximately 407 km ² . Hornsea wind farm zone lies approximately 103 km east of the coast of Yorkshire and covers an area of approximately 4,735 km ² . The site has a generating capacity of 4 GW to be achieved by 2020. Up to 240 5-8 MW turbines (DCO)	2017-2018	No	Yes
	Under construction	Race Bank	114 km	28 km	Up to 580 MW	2017	No	Yes
	<i>Cables and pipelines</i>							
Pre-commission	PL2236 - MIMAS TO SATURN	33 km	22 km	10 inch Pre-commission GAS pipeline operated by CONOCOPHILLIPS	2017-2018	No	Yes	
Pre-commission	PL2237 - SATURN TO MIMAS	33 km	22 km	3 inch Pre-commission CHEMICAL pipeline operated by CONOCOPHILLIPS	2017-2018	No	Yes	
Pre-commission	PLU3122 - JULIET TO PICKERILL A UMBILICAL	89 km	50 km	138 mm Pre-commission MIXED HYDROCARBONS pipeline operated by ENGIE	2017-2018	No	Yes	
Pre-commission	PL3088 - CYGNUS TO ETS GAS PIPELINE	48 km	64 km	24 inch Pre-commission GAS pipeline operated by ENGIE	2017-2018	No	Yes	
Pre-commission	PL3121 - JULIET TO PICKERILL A GAS PIPELINE	89 km	50 km	12 inch Pre-commission MIXED HYDROCARBONS pipeline operated by ENGIE	2019-2021	No	Yes	
Under construction	PL0219_PR K4-Z to K5-A	20 km	35 km	6-inch Under construction Gas pipeline operated by Total E&P Nederland B.V.	2017-2018	No	Yes	
Under construction	PL0219_UM K4-Z to K5-A	20 km	35 km	5-inch Under construction Control pipeline operated by Total E&P Nederland B.V.	2017-2018	No	Yes	

Tier	Phase	Project/Plan	Distance from Hornsea Three array area	Distance from Hornsea Three offshore cable corridor	Details	Date of Construction (if applicable)	Overlap of construction phase with Hornsea Three construction phase	Overlap of operation phase with Hornsea Three operation phase
2	Proposed	PL0221_HS D18-A to D15-FA-1	19 km	45 km	2-inch Proposed Methanol pipeline operated by GDF SUEZ E&P Nederland B.V.	2019-2021	No	Yes
	Proposed	PL0221_PR D18-A to D15-FA-1	19 km	45 km	8-inch Proposed Gas pipeline operated by GDF SUEZ E&P Nederland B.V.	2019-2021	No	Yes
<i>Offshore wind farms</i>								
2	Pre-planning application	Norfolk Vanguard	73 km	51 km	Up to 1800 MW (120 - 257 turbines of up to 7 – 15 MW capacity)	2020-2022	Yes	Yes
<i>Cables and pipelines</i>								
2	Proposed	Viking Link Interconnector	13 km	18 km	High voltage (up to 500 kV) Direct Current (DC) electricity interconnector.	2019-2022	No	Yes
<i>Offshore wind farms</i>								
3	Pre-consent application	East Anglia Two	158 km	94 km	Up to 800 MW	2022-2024	Yes	Yes
	Pre-consent application	Norfolk Boreas	53 km	64 km	Up to 1,800 MW	Unknown	Unknown	Unknown
	Pre-consent application	East Anglia One North	141 km	90 km	600 MW to 800 MW	Unknown	Unknown	Unknown
	Pre-consent application	Hornsea Project Four	36 km	47 km	1,000 MW	Unknown	Unknown	Unknown

Table 11.28: Maximum design scenario considered for the assessment of potential cumulative impacts on infrastructure and other users: recreational users and recreational fishing.

Potential impact	Maximum design scenario	Justification
<i>Construction phase</i>		
Hornsea Three infrastructure, safety zones and advisory safety distances associated with activities within the Hornsea Three array area and along the offshore cable corridor, alongside other plans/projects, may displace recreational craft and recreational fishing vessels resulting in a loss of recreational resource.	<p>Tier 1</p> <ul style="list-style-type: none"> • Aggregate option/application areas (480, 490, 491, 481, 506, 483, 493, 439); • Hornsea Project One and Hornsea Project Two; • Dudgeon, East Anglia One, East Anglia Three, Galloper, Race Bank and Triton Knoll; • Dogger Bank Creyke Beck A, Dogger Bank Creyke Beck B, Dogger Bank Teesside A and Dogger Bank Teesside B; • Proposed pipelines listed in Table 11.27. <p>Tier 2</p> <ul style="list-style-type: none"> • Norfolk Vanguard; • Viking Link Interconnector. <p>Tier 3</p> <ul style="list-style-type: none"> • East Anglia Two; • Norfolk Boreas; • East Anglia One North; • Hornsea Project Four. 	<p>Outcome of the CEA will be greatest when the activities of other projects/plans occur within the same recreational area creating the greatest area that will be restricted at any one time for any single receptor.</p> <p>Activities associated with existing operational offshore wind farms are considered to be part of the baseline and are therefore not assessed. Oil and gas activities within existing licenced areas are considered to be part of the baseline and are therefore not assessed.</p>
<i>Operation phase</i>		
Hornsea Three infrastructure, safety zones and advisory safety distances associated with infrastructure and maintenance activities within the Hornsea Three array area and along the offshore cable corridor, alongside other plans/projects, may displace recreational craft and recreational fishing vessels resulting in a loss of recreational resource.	As above for construction phase.	As above for construction phase.
<i>Decommissioning phase</i>		
Hornsea Three infrastructure, safety zones and advisory safety distances associated with activities within the Hornsea Three array area and along the offshore cable corridor, alongside other plans/projects, may displace recreational craft and recreational fishing vessels resulting in a loss of recreational resource.	As above for construction phase.	As above for construction phase.

Table 11.29: Maximum design scenario considered for the assessment of potential cumulative impacts on infrastructure and other users: aggregate extraction, cables and pipelines.

Potential impact	Maximum design scenario	Justification
Construction phase		
Installation of Hornsea Three infrastructure, alongside other plans/projects, may affect existing cables and pipelines or restrict access to cables and pipelines.	<p>Tier 1</p> <ul style="list-style-type: none"> • Hornsea Project One; • Hornsea Project Two; • Dudgeon offshore wind farm. <p>Tier 2</p> <ul style="list-style-type: none"> • No Tier 2 projects/plans identified. <p>Tier 3</p> <ul style="list-style-type: none"> • No Tier 3 projects/plans identified. 	Outcome of the CEA will be greatest when the activities of adjacent projects/plans occur concurrently with those at Hornsea Three. Scenarios leading to the greatest restricted areas.
Installation of Hornsea Three infrastructure, alongside other plans/projects, has the potential to lead to increased suspended sediment concentrations and deposition, which could cause a change in aggregate resource in aggregate extraction areas.	<p>Tier 1</p> <ul style="list-style-type: none"> • Aggregate option/ application/ production areas Humber 3 (484), Humber 4 and 7 (506) and Humber 5 (483). <p>Tier 2</p> <ul style="list-style-type: none"> • No Tier 2 projects/plans identified. <p>Tier 3</p> <ul style="list-style-type: none"> • No Tier 3 projects/plans identified. 	Outcome of the CEA will be greatest with the maximum potential for interaction of increase in suspended sediment concentrations within 16 km of the array area (based on modelled data) and 21.5 km of the offshore cable corridor (based on one tidal excursion) as this includes the maximum area of potential overlap for suspended sediments.
Operation phase		
Hornsea Three infrastructure, safety zones and advisory safety distances, alongside other plans/projects, may lead to a temporary loss of access to existing cables and pipelines for repair or maintenance.	As above for construction phase.	As above for construction phase.
Decommissioning phase		
Removal of Hornsea Three infrastructure, alongside other plans/projects, may affect existing cables and pipelines or restrict access to cables and pipelines.	As above for construction phase.	As above for construction phase.
Removal of Hornsea Three infrastructure, alongside other plans/projects, has the potential to lead to increased suspended sediment concentrations and deposition, which could cause a change in aggregate resource in aggregate extraction areas.	<p>Tier 1</p> <ul style="list-style-type: none"> • Aggregate option/ application/ production areas Humber 3 (484), Humber 4 and 7 (506) and Humber 5 (483). <p>Tier 2</p> <ul style="list-style-type: none"> • No Tier 2 projects/plans identified. <p>Tier 3</p> <ul style="list-style-type: none"> • No Tier 3 projects/plans identified. 	Outcome of the CEA will be greatest with the maximum potential for interaction of increase in suspended sediment concentrations within one tidal excursion as this includes the maximum area of potential overlap for suspended sediments.

Table 11.30: Maximum design scenario considered for the assessment of potential cumulative impacts on infrastructure and other users: oil and gas operations.

Potential impact	Maximum design scenario	Justification
Construction phase		
Hornsea Three infrastructure, safety zones and advisory safety distances associated with the Hornsea Three array area, alongside other plans/projects, may restrict potential seismic survey activity.	Tier 1 <ul style="list-style-type: none"> • Aggregate option/application areas (491, 506, 483); • Hornsea Project One; • Hornsea Project Two. Tier 2 <ul style="list-style-type: none"> • Viking Link Interconnector. Tier 3 <ul style="list-style-type: none"> • No Tier 3 projects/plans identified. 	Outcome of the CEA will be greatest when considered with scenarios that reduce the space available in those licence blocks identified as being affected by Hornsea Three.
Drilling and the placement of infrastructure has the potential to be restricted within the Hornsea Three array area and within 1 km from the boundary of the array area by the presence of infrastructure, safety zones and advisory safety distances, alongside other plans/projects.	Tier 1 <ul style="list-style-type: none"> • Aggregate option/application areas (491, 506, 483); • Hornsea Project One; • Hornsea Project Two. Tier 2 <ul style="list-style-type: none"> • Viking Link Interconnector. Tier 3 <ul style="list-style-type: none"> • No Tier 3 projects/plans identified. 	Outcome of the CEA will be greatest when considered with scenarios that represent the largest area from which drilling would be restricted in those licence blocks identified as being affected by Hornsea Three.
Safety zones around the offshore HVAC booster stations and advisory safety distances associated with activities underway along the offshore cable corridor, alongside other plans/projects, may restrict potential seismic survey activity.	Tier 1 <ul style="list-style-type: none"> • Aggregate option/application areas (491, 506, 483); • Hornsea Project One; • Dudgeon. Tier 2 <ul style="list-style-type: none"> • No Tier 2 projects/plans identified. Tier 3 <ul style="list-style-type: none"> • No Tier 3 projects/plans identified. 	Outcome of the CEA will be greatest when considered with scenarios that reduce the space available in those licence blocks identified as being affected by Hornsea Three.
Drilling and the placement of infrastructure has the potential to be restricted within the offshore cable corridor and within 1 km from the boundary of the offshore cable corridor, alongside other plans/projects.	Tier 1 <ul style="list-style-type: none"> • Aggregate option/application areas (491, 506, 483); • Hornsea Project One; • Dudgeon. Tier 2 <ul style="list-style-type: none"> • No Tier 2 projects/plans identified. Tier 3 <ul style="list-style-type: none"> • No Tier 3 projects/plans identified. 	Outcome of the CEA will be greatest when considered with scenarios that represent the largest area from which drilling would be restricted in those licence blocks identified as being affected by Hornsea Three.

Potential impact	Maximum design scenario	Justification
The piling of wind turbine and substation foundations, alongside other plans/projects, will generate underwater noise that may acoustically interfere with seismic survey operations.	<p>Tier 1</p> <ul style="list-style-type: none"> • Dogger Bank Creyke Beck A, Dogger Bank Creyke Beck B, Dogger Bank Teesside A and Dogger Bank Teesside B. <p>Tier 2</p> <ul style="list-style-type: none"> • Norfolk Vanguard. <p>Tier 3</p> <ul style="list-style-type: none"> • East Anglia Two; • Norfolk Boreas; • East Anglia One North; • Hornsea Project Four. 	Outcome of the CEA will be greatest when considered with other projects/plans which would generate sufficient underwater noise levels of the same frequency that could overlap with the area already affected by Hornsea Three. Scenarios that would increase interference on same seismic surveys.
<i>Operation phase</i>		
The presence of infrastructure within the Hornsea Three array area, alongside other plans/projects, may restrict potential seismic survey activity.	<p>Tier 1</p> <ul style="list-style-type: none"> • Aggregate option/application areas (491, 506, 483); • Hornsea Project One; • Hornsea Project Two. <p>Tier 2</p> <ul style="list-style-type: none"> • Viking Link Interconnector. <p>Tier 3</p> <ul style="list-style-type: none"> • No Tier 3 projects/plans identified. 	Outcome of the CEA will be greatest when considered with scenarios that reduce the space available in those licence blocks identified as being affected by Hornsea Three.
Drilling and the placement of infrastructure has the potential to be restricted within the Hornsea Three array area and within 1 km from the boundary of the array area by the presence of infrastructure, safety zones and advisory safety distances, alongside other plans/projects.	<p>Tier 1</p> <ul style="list-style-type: none"> • Aggregate option/application areas (491, 506, 483); • Hornsea Project One; • Hornsea Project Two. <p>Tier 2</p> <ul style="list-style-type: none"> • Viking Link Interconnector. <p>Tier 3</p> <ul style="list-style-type: none"> • No Tier 3 projects/plans identified. 	Outcome of the CEA will be greatest when considered with scenarios that represent the largest area from which drilling would be restricted in those licence blocks identified as being affected by Hornsea Three.
Safety zones around the offshore HVAC booster stations and advisory safety distances associated with maintenance activities underway along the offshore cable corridor, alongside other plans/projects, may restrict potential seismic survey activity.	<p>Tier 1</p> <ul style="list-style-type: none"> • Aggregate option/application areas (491, 506, 483); • Hornsea Project One; • Dudgeon. <p>Tier 2</p> <ul style="list-style-type: none"> • No Tier 2 projects/plans identified. <p>Tier 3</p> <ul style="list-style-type: none"> • No Tier 3 projects/plans identified. 	Outcome of the CEA will be greatest when considered with scenarios that reduce the space available in those licence blocks identified as being affected by Hornsea Three.

Potential impact	Maximum design scenario	Justification
Drilling and the placement of infrastructure has the potential to be restricted within the offshore cable corridor and within 1 km from the boundary of the offshore cable corridor, alongside other plans/projects.	<p>Tier 1</p> <ul style="list-style-type: none"> • Aggregate option/application areas (491, 506, 483); • Hornsea Project One; • Dudgeon. <p>Tier 2</p> <ul style="list-style-type: none"> • No Tier 2 projects/plans identified. <p>Tier 3</p> <ul style="list-style-type: none"> • No Tier 3 projects/plans identified. 	Outcome of the CEA will be greatest when considered with scenarios that represent the largest area from which drilling would be restricted in those licence blocks identified as being affected by Hornsea Three.
The presence of new wind turbines in previously open sea areas, alongside other plans/projects, may cause interference with the performance of the REWS located on oil and gas platforms.	<p>Tier 1</p> <ul style="list-style-type: none"> • Hornsea Project One; • Hornsea Project Two. <p>Tier 2</p> <ul style="list-style-type: none"> • No Tier 2 projects/plans identified. <p>Tier 3</p> <ul style="list-style-type: none"> • No Tier 3 projects/plans identified. 	Outcome of the CEA will be greatest when considered with scenarios that create the greatest potential disturbance to radar already affected by Hornsea Three.
Wind turbines and associated infrastructure, alongside other plans/projects, may disrupt vessel access to oil and gas platforms and subsea infrastructure.	<p>Tier 1</p> <ul style="list-style-type: none"> • Hornsea Project One; • Hornsea Project Two. <p>Tier 2</p> <ul style="list-style-type: none"> • No Tier 2 projects/plans identified. <p>Tier 3</p> <ul style="list-style-type: none"> • No Tier 3 projects/plans identified. 	Outcome of the CEA will be greatest when considered with other projects/plans that create the greatest disruption in terms of area affected and duration.
<i>Decommissioning phase</i>		
Hornsea Three infrastructure, safety zones and advisory safety distances associated with decommissioning of the Hornsea Three array area, alongside other plans/projects, may restrict potential seismic survey activity.	<p>Tier 1</p> <ul style="list-style-type: none"> • Aggregate option/application areas (491, 506, 483); • Hornsea Project One; • Hornsea Project Two. <p>Tier 2</p> <ul style="list-style-type: none"> • Viking Link Interconnector. <p>Tier 3</p> <ul style="list-style-type: none"> • No Tier 3 projects/plans identified. 	Outcome of the CEA will be greatest when considered with scenarios that reduce the space available in those licence blocks identified as being affected by Hornsea Three.

Potential impact	Maximum design scenario	Justification
Drilling and the placement of infrastructure has the potential to be restricted within the Hornsea Three array area and within 1 km from the boundary of the array area by the presence of infrastructure, safety zones and advisory safety distances, alongside other plans/projects.	<p>Tier 1</p> <ul style="list-style-type: none"> • Aggregate option/application areas (491, 506, 483); • Hornsea Project One; • Hornsea Project Two. <p>Tier 2</p> <ul style="list-style-type: none"> • Viking Link Interconnector. <p>Tier 3</p> <ul style="list-style-type: none"> • No Tier 3 projects/plans identified. 	Outcome of the CEA will be greatest when considered with scenarios that represent the largest area from which drilling would be restricted in those licence blocks identified as being affected by Hornsea Three.
Safety zones around the offshore HVAC booster stations and advisory safety distances associated with activities underway along the offshore cable corridor, alongside other plans/projects, may restrict potential seismic survey activity.	<p>Tier 1</p> <ul style="list-style-type: none"> • Aggregate option/application areas (491, 506, 483); • Hornsea Project One; • Dudgeon. <p>Tier 2</p> <ul style="list-style-type: none"> • No Tier 2 projects/plans identified. <p>Tier 3</p> <ul style="list-style-type: none"> • No Tier 3 projects/plans identified. 	Outcome of the CEA will be greatest when considered with scenarios that reduce the space available in those licence blocks identified as being affected by Hornsea Three.
Drilling and the placement of infrastructure has the potential to be restricted within the offshore cable corridor and within 1 km from the boundary of the offshore cable corridor, alongside other plans/projects.	<p>Tier 1</p> <ul style="list-style-type: none"> • Aggregate option/application areas (491, 506, 483); • Hornsea Project One; • Dudgeon. <p>Tier 2</p> <ul style="list-style-type: none"> • No Tier 2 projects/plans identified. <p>Tier 3</p> <ul style="list-style-type: none"> • No Tier 3 projects/plans identified. 	Outcome of the CEA will be greatest when considered with scenarios that represent the largest area from which drilling would be restricted in those licence blocks identified as being affected by Hornsea Three.

11.13 Cumulative Effect Assessment

11.13.1.1 A description of the significance of cumulative effects upon infrastructure and other users receptors arising from each identified impact is given below.

11.13.2 Construction phase

Recreational users and recreational fishing

Hornsea Three infrastructure, safety zones and advisory safety distances associated with activities within the Hornsea Three array area and along the offshore cable corridor, alongside other plans/projects, may displace recreational craft and recreational fishing vessels resulting in a loss of recreational resource.

11.13.2.1 The construction of Hornsea Three has the potential to affect recreational activities. Additional projects/plans in the vicinity of Hornsea Three will further restrict the area available for recreational activities (see Figure 11.12).

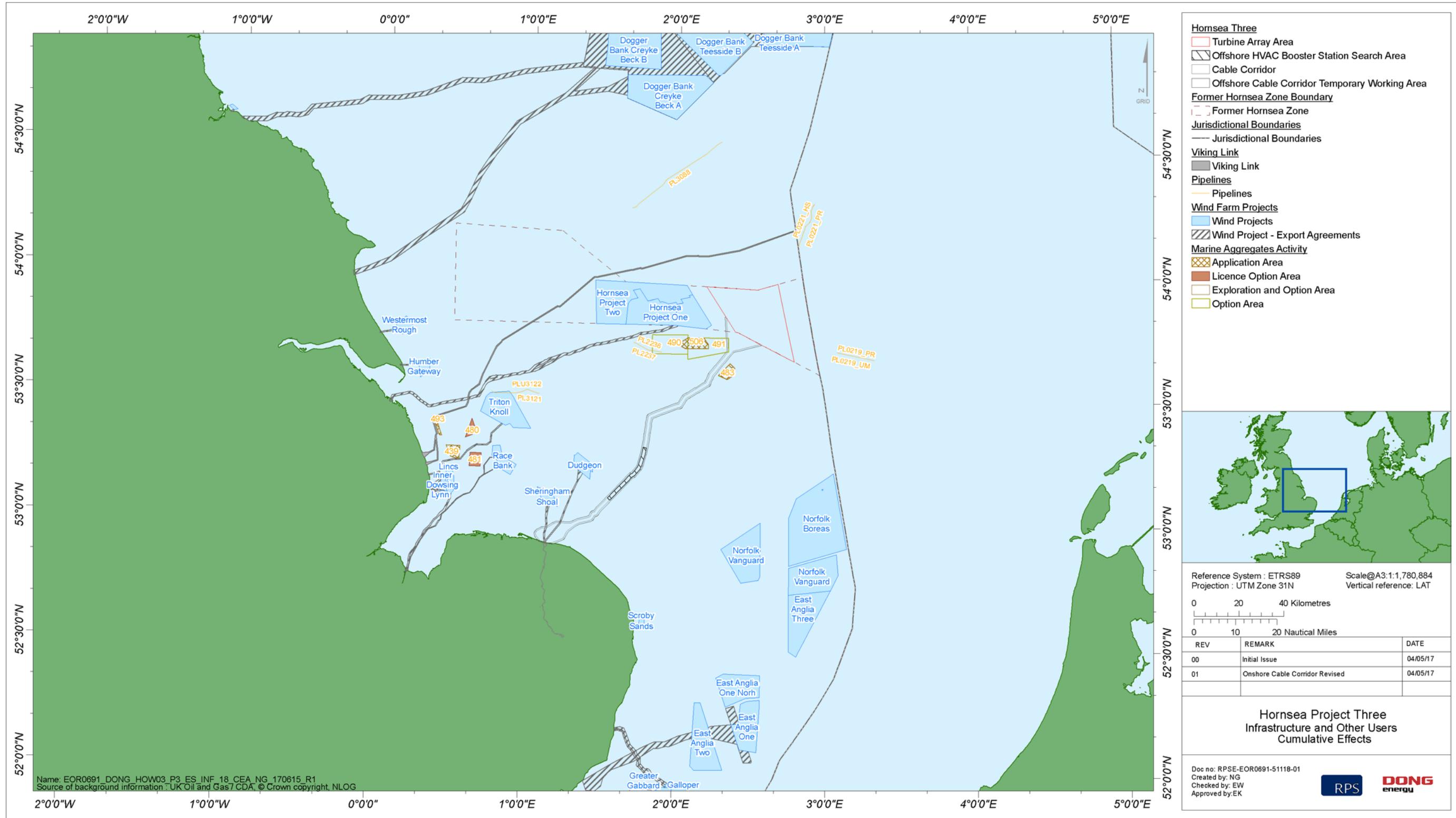
Tier 1

Magnitude of impact

11.13.2.2 The installation and presence of Hornsea Three infrastructure and associated safety zones and advisory safety distances, together with the presence of Hornsea Project One, Hornsea Project Two, Dudgeon, East Anglia One, East Anglia Three, Galloper, Race Bank and Triton Knoll; the construction activities associated with the export cable routes of the Dogger Bank Creyke Beck A, Dogger Bank Creyke Beck B, Dogger Bank Teesside A and Dogger Bank Teesside B projects; the operational and maintenance activities associated with the proposed pipelines in the vicinity; and activities associated with the aggregate option/application areas (Figure 11.12), may further result in the displacement of recreational craft and recreational fishing vessels.

11.13.2.3 The Hornsea Project One and Hornsea Project Two offshore wind farms will be operational prior to the Hornsea Three construction phase (Table 11.27). Recreational vessels displaced by construction activities within the Hornsea Three array area may also be displaced by the presence of these operational projects, which are located 7 km from the Hornsea Three array area at the closest point. Recreational vessels traversing along the eastern coast of the UK displaced by installation activities along the Hornsea Three offshore cable corridor and offshore HVAC booster station search area may also be displaced along the respective export cable corridors for Hornsea Project One and Hornsea Project Two during any operational and maintenance activities and due to the potential presence of operational safety zones associated with any offshore substations positioned along the cable routes.

- 11.13.2.4 The Dudgeon, East Anglia One, Galloper, Race Bank and Triton Knoll offshore wind farms are also scheduled to be operational prior to the Hornsea Three construction phase, while the East Anglia Three offshore wind farm construction phase overlaps with the Hornsea Three construction phase by one year (Table 11.27). Recreational vessels traversing along the eastern coast of the UK displaced by installation activities along the Hornsea Three offshore cable corridor and offshore HVAC booster station search area may also be displaced along the respective export cable corridors for these projects during any construction and/or operational and maintenance activities and due to the potential presence of safety zones associated with any offshore substations positioned along the cable routes (where applicable). The Dudgeon export cable corridor crosses the Hornsea Three offshore cable corridor.
- 11.13.2.5 Construction of the Dogger Bank Creyke Beck A, Dogger Bank Creyke Beck B, Dogger Bank Teesside A and Dogger Bank Teesside B projects has the potential to overlap with the construction phase of Hornsea Three. Recreational vessels traversing along the eastern coast of the UK may intersect with cable installation activities along the export cable corridors of each of these projects, in addition to installation activities along the Hornsea Three offshore cable corridor, and therefore there is the potential for these vessels to be displaced a number of times, depending on the final construction schedules.
- 11.13.2.6 Other activities in the area, including new aggregate extraction areas (480, 490, 491, 481, 506, 483, 493, 439) and operational and maintenance activities associated with the proposed pipelines, will add to the cumulative impact through increased vessel movements in the area.
- 11.13.2.7 The spatial extent of any impact will be small in the context of the available sailing area in the southern North Sea. The likelihood of there being a cumulative effect on recreational vessels in offshore areas is low, given the low level of recreational activity anticipated within offshore areas and likely limited recreational fishing activity. The likelihood of there being a cumulative effect on recreational vessels in nearshore and inshore areas is also low, as although recreational activity is greater, activity is likely to be more localised to those areas. The exception is at the cable landfall location, where the Dudgeon export cable crosses the Hornsea Three offshore cable corridor, however the likelihood of activities taking place simultaneously along both cable routes is considered to be low.
- 11.13.2.8 The impact is predicted to be of regional spatial extent, short to medium term duration, intermittent (offshore cable corridor)/continuous (Hornsea Three array area and offshore HVAC booster station search area) and low reversibility (Hornsea Three array area and offshore HVAC booster station search area)/high reversibility (offshore cable corridor). It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be minor.



Sensitivity of receptor

- 11.13.2.9 Recreational vessels are able to alter their route, dependent on the target destination. Notices to Mariners will be promulgated regularly during the construction phase, advising of the location and nature of construction works, ensuring that recreational activities can be planned accordingly.
- 11.13.2.10 The receptor is deemed to be of low vulnerability, high recoverability and moderate value. The sensitivity of the receptor is therefore, considered to be **low**.

Significance of Effect

- 11.13.2.11 Overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Tier 2

Magnitude of impact

- 11.13.2.12 In addition to the Tier 1 projects/plans considered above, the installation and presence of Hornsea Three infrastructure and associated safety zones and advisory safety distances, together with the presence of Norfolk Vanguard and the operational and maintenance activities along the proposed Viking Link Interconnector cable (Figure 11.12), may further result in the displacement of recreational craft and recreational fishing vessels.
- 11.13.2.13 The construction phase for the Norfolk Vanguard offshore wind farm may overlap with the construction phase for Hornsea Three by one year (Table 11.27). Recreational vessels displaced by construction activities within the Hornsea Three array area may also be displaced by activities associated with the construction and subsequent operation of Norfolk Vanguard, which is located 73 km from the Hornsea Three array area. Recreational vessels traversing along the eastern coast of the UK displaced by installation activities along the Hornsea Three offshore cable corridor and offshore HVAC booster station search area may also be displaced along the export cable corridor for the Norfolk Vanguard project during any construction and subsequent maintenance activities and due to the potential presence of safety zones associated with any offshore substations positioned along the cable route.
- 11.13.2.14 Operational and maintenance activities associated with the Viking Link Interconnector cable (Figure 11.12), which will be operational prior to the Hornsea Three construction phase (Table 11.27), will add to the cumulative impact through increased vessel movements in the area.

11.13.2.15 The spatial extent of any impact will be small in the context of the available sailing area in the southern North Sea. The likelihood of there being a cumulative effect on recreational vessels in offshore areas is low, given the low level of recreational activity anticipated within offshore areas and likely limited recreational fishing activity. The likelihood of there being a cumulative effect on recreational vessels in nearshore and inshore areas is also low, as although recreational activity is greater, activity is likely to be more localised to those areas.

11.13.2.16 The impact is predicted to be of regional spatial extent, short to medium term duration, intermittent (offshore cable corridor)/continuous (Hornsea Three array area and offshore HVAC booster station search area) and low reversibility (Hornsea Three array area and offshore HVAC booster station search area)/high reversibility (offshore cable corridor). It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **minor**.

Sensitivity of receptor

11.13.2.17 Recreational vessels are able to alter their route, dependent on the target destination. Notices to Mariners will be promulgated regularly during the construction phase, advising of the location and nature of construction works, ensuring that recreational activities can be planned accordingly.

11.13.2.18 The receptor is deemed to be of low vulnerability, high recoverability and moderate value. The sensitivity of the receptor is therefore, considered to be **low**.

Significance of Effect

11.13.2.19 Overall, it is predicted that the sensitivity of the receptor the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Tier 3

11.13.2.20 In addition to the Tier 1 and Tier 2 projects/plans considered above, the East Anglia Two, Norfolk Boreas, East Anglia One North and Hornsea Project Four offshore wind farms may further result in the displacement of recreational craft and recreational fishing vessels.

11.13.2.21 Construction of the East Anglia Two project has the potential to overlap with the construction phase of Hornsea Three. Construction timeframes for the Norfolk Boreas, East Anglia One North and Hornsea Project Four projects are currently unknown, however for the purposes of this assessment it is assumed that the construction phases may overlap with the Hornsea Three construction phase. Recreational vessels traversing along the eastern coast of the UK may intersect with cable installation activities along the export cable corridors of these projects, in addition to installation activities along the Hornsea Three offshore cable corridor, and therefore there is the potential for recreational vessels to be displaced a number of times, depending on the final construction schedules.

11.13.2.22 The spatial extent of any impact will be small in the context of the available sailing area in the southern North Sea. The likelihood of there being a cumulative effect on recreational vessels in offshore areas is low, given the low level of recreational activity anticipated within offshore areas and likely limited recreational fishing activity. The likelihood of there being a cumulative effect on recreational vessels in nearshore and inshore areas is also low, as although recreational activity is greater, activity is likely to be more localised to those areas.

11.13.2.23 The impact is predicted to be of regional spatial extent, short to medium term duration, intermittent (offshore cable corridor)/continuous (Hornsea Three array area) and low reversibility (Hornsea Three array area)/high reversibility (offshore cable corridor). It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **minor**.

Sensitivity of receptor

11.13.2.24 Recreational vessels are able to alter their route, dependent on the target destination. Notices to Mariners will be promulgated regularly during the construction phase, advising of the location and nature of construction works, ensuring that recreational activities can be planned accordingly.

11.13.2.25 The receptor is deemed to be of low vulnerability, high recoverability and moderate value. The sensitivity of the receptor is therefore, considered to be **low**.

Significance of Effect

11.13.2.26 Overall, it is predicted that the sensitivity of the receptor the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Aggregate extraction, cables and pipelines

Installation of Hornsea Three infrastructure, alongside other plans/projects, may affect existing cables and pipelines or restrict access to cables and pipelines.

Tier 1

Magnitude of impact

11.13.2.27 Cables and pipelines crossed by Hornsea Three are discussed in section 11.7.5 and section 11.7.15. Cumulative impacts are only likely to arise if other crossings are within the same section of those cables and pipelines. This situation may arise when considering Hornsea Three alongside the Dudgeon project, where depending on the final selected route, the out of service Weybourne to Esbjerg cable may be crossed by the Hornsea Three export cable and the Dudgeon export cable in relatively close proximity. There is also the potential for the Sheringham Shoal, North Sea offshore and Stratos cables to be affected by both Hornsea Three and Dudgeon, as these cables also make landfall in a similar location.

11.13.2.28 The Dudgeon export cable is scheduled to be installed prior to the Hornsea Three construction phase (Table 11.27). There is potential for a cumulative impact on access to the Weybourne to Esbjerg, Sheringham Shoal, North Sea offshore and Stratos cables for repair or maintenance where Hornsea Three installation activities overlap with any operational and maintenance activities being carried out along the Dudgeon export cable. Any impact would be temporary and it is unlikely that such activities would occur concurrently.

11.13.2.29 Crossing and proximity agreements will be established for Hornsea Three with the relevant cable operators, and similar agreements will be in place for the Dudgeon project. These agreements will include provision for the cable operator(s) to access their cable during Hornsea Three construction as far as practical. Crossing and proximity agreements will ensure close communication and planning between the relevant parties to ensure disruption of activities is minimised.

11.13.2.30 The Topaz well to Schooner platform pipelines are located within a proposed navigation corridor between the Hornsea Three array area and Hornsea Project One/Hornsea Project Two. The presence of Hornsea Three, together with Hornsea Project One and Project Two, may therefore result in an indirect impact on access to this pipeline due to the presence of shipping traffic (see chapter 7: Shipping and Navigation). The pipeline is located toward the northern entrance of the corridor.

11.13.2.31 The impact is predicted to be of local spatial extent, short term duration (cables)/short to medium term duration (Topaz to Schooner pipeline), intermittent (cables)/continuous (Topaz to Schooner pipeline) and high (cables)/low (Topaz to Schooner pipeline) reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **minor**.

Sensitivity of receptor

11.13.2.32 For active cables, a restriction on access in the event of an emergency could be critical to the operator of that cable. The operators of the out of service cables are deemed to be less sensitive to any impact.

11.13.2.33 Consultation with INEOS has advised that the Topaz suspended well head is not producing and is likely to be decommissioned prior to Hornsea Three construction, with the pipeline likely to remain in situ (see Table 11.3). Therefore, it is unlikely that access to this pipeline will be required during the Hornsea Three construction phase, although there may be a requirement for post-decommissioning surveys within this area.

11.13.2.34 The receptor is deemed to be of low vulnerability, high recoverability and high value (active cables)/low value (out of service cables/pipelines). The sensitivity of the receptor is therefore, considered to be **high** (active cables)/**negligible** (out of service cables/pipelines).

Significance of Effect

- 11.13.2.35 Overall, it is predicted that the sensitivity of the receptor is considered to be **high** (active cables)/**negligible** (out of service cables/pipelines) and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Tier 2

- 11.13.2.36 No Tier 2 projects have been identified.

Tier 3

- 11.13.2.37 No Tier 3 projects have been identified.

Installation of Hornsea Three infrastructure, alongside other plans/projects, has the potential to lead to increased suspended sediment concentrations and deposition, which could cause a change in aggregate resource in aggregate extraction areas.

Tier 1

Magnitude of impact

- 11.13.2.38 A number of aggregate extraction sites (either already licenced or under application) have been screened into the assessment (Tier 1) on the basis that they are within the area over which there is potential for an overlap in SSC arising from Hornsea Three during the construction phase. This area has been defined as 16 km from the array area (based on modelled data) and 21.5 km from the offshore cable corridor (based on the spatial extent of one tidal excursion). More specifically these sites are: Humber 3 (484), Humber 4 and 7 (506) and Humber 5 (483).

- 11.13.2.39 Chapter 1: Marine Processes provides an assessment of potential for cumulative effects between Hornsea Three construction activities and these aggregate extraction operations. This assessment concludes that should construction activities (such as cable and foundation installation) associated with Hornsea Three occur at the same time as dredgers were operating along the western margin of the Humber 5 aggregate area or eastern margin of Humber 7 aggregate area, it is possible that any fine sediment plumes from the respective activities would be additive. However, the assessment found that higher concentration plumes would not be expected to persist for much longer than a few hours. In addition, the potential for material dispersed during cable laying activities within the Hornsea Three offshore cable corridor to deposit within aggregate dredging areas is considered to be low.

- 11.13.2.40 Based on the assessment referred to above, the interaction of plumes from the construction of Hornsea Three and the aggregate extraction sites screened into the assessment is considered to be short term and highly localised, with limited potential for this interaction to impact upon the aggregate resource within one of the extraction sites. The magnitude of this impact is **no change**.

Sensitivity of receptor

- 11.13.2.41 Dredging operators are adaptable as they are able, to some extent, to screen out unwanted fine sediment load. The aggregate resource is of value to the economy.

- 11.13.2.42 The receptor is deemed to be of medium vulnerability and have moderate recoverability. The sensitivity of the receptor is therefore, considered to be **medium**.

Significance of Effect

- 11.13.2.43 Overall, it is predicted that the sensitivity of the receptor is considered to be **medium** and the magnitude is deemed to be **no change**. The effect will, therefore, be of **negligible** adverse significance, which is not significant in EIA terms.

Tier 2

- 11.13.2.44 No Tier 2 projects have been identified.

Tier 3

- 11.13.2.45 No Tier 3 projects have been identified.

Oil and gas operations

Hornsea Three infrastructure, safety zones and advisory safety distances associated with the Hornsea Three array area, alongside other plans/projects, may restrict potential seismic survey activity.

- 11.13.2.46 Hornsea Three infrastructure, safety zones and advisory safety distances will restrict conventional towed streamer seismic exploration activities, and potentially other more recent methods for seismic survey, in the licence blocks which overlap with the Hornsea Three array area. Cumulative impacts will arise when a particular licence block that is already affected by Hornsea Three is also affected by another project/plan.

Tier 1

Magnitude of impact

- 11.13.2.47 The Hornsea Three array area is located 7 km to the east of the Hornsea Project One and Hornsea Project Two offshore wind farm sites at the closest point. These offshore wind farms will be operational prior to the Hornsea Three construction phase (Table 11.27). There are only two licence blocks that coincide with the Hornsea Three array area, Hornsea Project One and/or Hornsea Project Two (Figure 11.13). Unlicensed block 49/2, which overlaps the Hornsea Three array area by approximately 54% of the block area, also overlaps with the southeastern corner of Hornsea Project One. Unlicensed block 49/7, which overlaps with a small proportion of the Hornsea Three array area (approximately 2%), also overlaps with the lower southeastern corner of Hornsea Project One.

- 11.13.2.48 In the event that these blocks are licenced, there remains potential for surveys to take place within the parts of the blocks which do not overlap with the offshore wind farm project areas. However, the remaining area of block 49/2, and part of the remaining area of block 49/7, are located within a proposed navigation corridor between the Hornsea Three array area and Hornsea Project One/Hornsea Project Two, which may further restrict the ability to carry out seismic surveys due to the presence of shipping traffic (see chapter 7: Shipping and Navigation).
- 11.13.2.49 The presence of the Hornsea Three array area therefore also has the potential to result in indirect impacts on operators through the creation of the proposed navigation corridor, which may result in restrictions on seismic survey activity. INEOS has two licenced blocks which overlap with the Hornsea Three array area and the proposed navigation corridor (Figure 11.13). Block 49/2a overlaps with the Hornsea Three array area by approximately 38% of the total block area, with the remaining area within the proposed navigation corridor. Block 49/1a marginally overlaps with the Hornsea Three array area (0.1%) however the remaining area is located entirely within, or at the northern entrance of, the proposed navigation corridor. Unlicensed block 49/1, which overlaps with Hornsea Project One and Hornsea Project Two, also overlaps with the proposed navigation corridor. Seismic surveys within the southern part of licenced block 44/26a (Faroe) and unlicensed block 44/26, located at the northern entrance of the navigation corridor, may also be restricted to the extent that the proposed navigation corridor extends into these blocks.
- 11.13.2.50 It is anticipated that the proposed navigation corridor will be available for use by transiting vessels during the Hornsea Three construction phase (see volume 5, annex 7.1: Hornsea Three Array Area, Offshore Cable Corridor and Hornsea Three Offshore HVAC Booster Station Search Area Navigational Risk Assessment). The Maritime and Coastguard Agency (MCA) are currently considering the inclusion of a routeing measure (likely an International Maritime Organization (IMO) Deep Water Route) or Fairway buoys to clearly identify navigational priorities within the proposed navigation corridor (see volume 5, annex 7.1: Hornsea Three Array Area, Offshore Cable Corridor and Hornsea Three Offshore HVAC Booster Station Search Area Navigational Risk Assessment). In the event that an IMO routing measure is established, there may be restrictions on seismic survey activities within the navigation corridor.
- 11.13.2.51 Other activities in the area, including new aggregate extraction areas within block 49/7 (491, 506, 483), will add to the cumulative impact.
- 11.13.2.52 The impact is predicted to be of local spatial extent, relatively long term duration relative to a licence period, continuous and low reversibility. It is predicted that the impact will affect the receptor directly/indirectly. The magnitude is therefore, considered to be **moderate** (licensed blocks 49/1a and 49/2a currently operated by INEOS and unlicensed blocks 49/1 and 49/2)/**minor** (licensed block 44/26a currently operated by Faroe and unlicensed blocks 44/26 and 49/7).

Sensitivity of the receptor

- 11.13.2.53 The sensitivity of the receptor depends on the area of their licenced acreage affected and the future exploration plans of the licence operator. Information on each block and the assessed sensitivity is summarised in Table 11.31 below.
- 11.13.2.54 The sensitivity of the licence operator, as the receptor, is low for INEOS and Faroe on the basis of consultation which has advised that they currently have no exploration plans in this area. As there is currently no receptor for the unlicensed blocks, the sensitivity is negligible, however in the event that these blocks are licenced, the sensitivity will increase as seismic activity may be required. Any future operator of the unlicensed blocks will be aware of Hornsea Three and will have taken potential coexistence into consideration.
- 11.13.2.55 The licensed operator is deemed to be of low (INEOS and Faroe) vulnerability, medium recoverability and high value. The sensitivity of the licence operator is therefore, considered to be **low** (INEOS and Faroe). The sensitivity of the unlicensed blocks is considered to be **negligible**.

Table 11.31: Sensitivity of each licence operator potentially cumulatively affected in relation to reduction in seismic survey area.

Block	Operator	Area of overlap with Hornsea Three array area (%)	Area of overlap with Tier 1 projects (%)	Overlap with proposed navigation corridor	Consultation	Sensitivity
44/26a	Faroe	0	N/A	Northern entrance	Faroe advised that no seismic activity was planned for the licenced acreage.	Low
49/1a	INEOS	0.1	N/A	Yes	INEOS advised that they have no current exploration plans in the southern North Sea.	Low
49/2a		37.9	N/A	Yes		
44/26	Unlicensed	0	N/A	Northern entrance	N/A	Negligible
49/2		54.2	Hornsea Project Two (1.9%)	Yes		
49/7		1.6	Hornsea Project Two (0.4%), Aggregate Areas 491, 506, 483 (29%)	Yes		

Significance of the effect

- 11.13.2.56 Overall, it is predicted that the sensitivity of the receptor is considered to be **low** (INEOS and Faroe)/**negligible** (unlicensed blocks) and the magnitude is deemed to be **moderate** (licensed blocks 49/1a and 49/2a currently operated by INEOS and unlicensed blocks 49/1 and 49/2)/**minor** (licensed block 44/26a currently operated by Faroe and unlicensed blocks 44/26 and 49/7). The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Tier 2

Magnitude of impact

- 11.13.2.57 In addition to the Tier 1 projects/plans considered above, the Viking Link Interconnector cable, which will be operational prior to the Hornsea Three construction phase (Table 11.27), has the potential to add to the cumulative impact through increased activities in the area during any operational and maintenance work (Figure 11.13). This cable route is located approximately 13 km to the north of the Hornsea Three array area and crosses licensed block 44/26a (Faroe) and the remaining unlicensed areas of block 44/26. These licence blocks are also located at the northern entrance of the proposed navigation corridor (Figure 11.12), and therefore seismic surveys within licensed block 44/26a (Faroe) and unlicensed block 44/26 may be restricted.
- 11.13.2.58 As noted in paragraph 11.13.2.50, the proposed navigation corridor may be in use during the Hornsea Three construction phase and any IMO routing measures may lead to restrictions on seismic survey activities within the navigation corridor.

- 11.13.2.59 The impact is predicted to be of local spatial extent, relatively long term duration relative to a licence period, continuous and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be **minor**.

Sensitivity of receptor

- 11.13.2.60 The sensitivity of the licence operator, as the receptor, is low for Faroe on the basis of consultation which has advised that they have no exploration plans at the present time (Table 11.31). As there is currently no receptor for the unlicensed block, the sensitivity is negligible, however in the event that this block is licenced, the sensitivity will increase as seismic activity may be required. Any future operator of unlicensed blocks will be aware of Hornsea Three and will have taken potential coexistence into consideration.
- 11.13.2.61 The licensed operator is deemed to be of low vulnerability, medium recoverability and high value. The sensitivity of the licence operator is therefore, considered to be **low** (Faroe). The sensitivity of the unlicensed block is considered to be **negligible**.

Significance of Effect

- 11.13.2.62 Overall, it is predicted that the sensitivity of the receptor is considered to be **low** (Faroe)/**negligible** (unlicensed block) and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Tier 3

- 11.13.2.63 No Tier 3 projects have been identified.

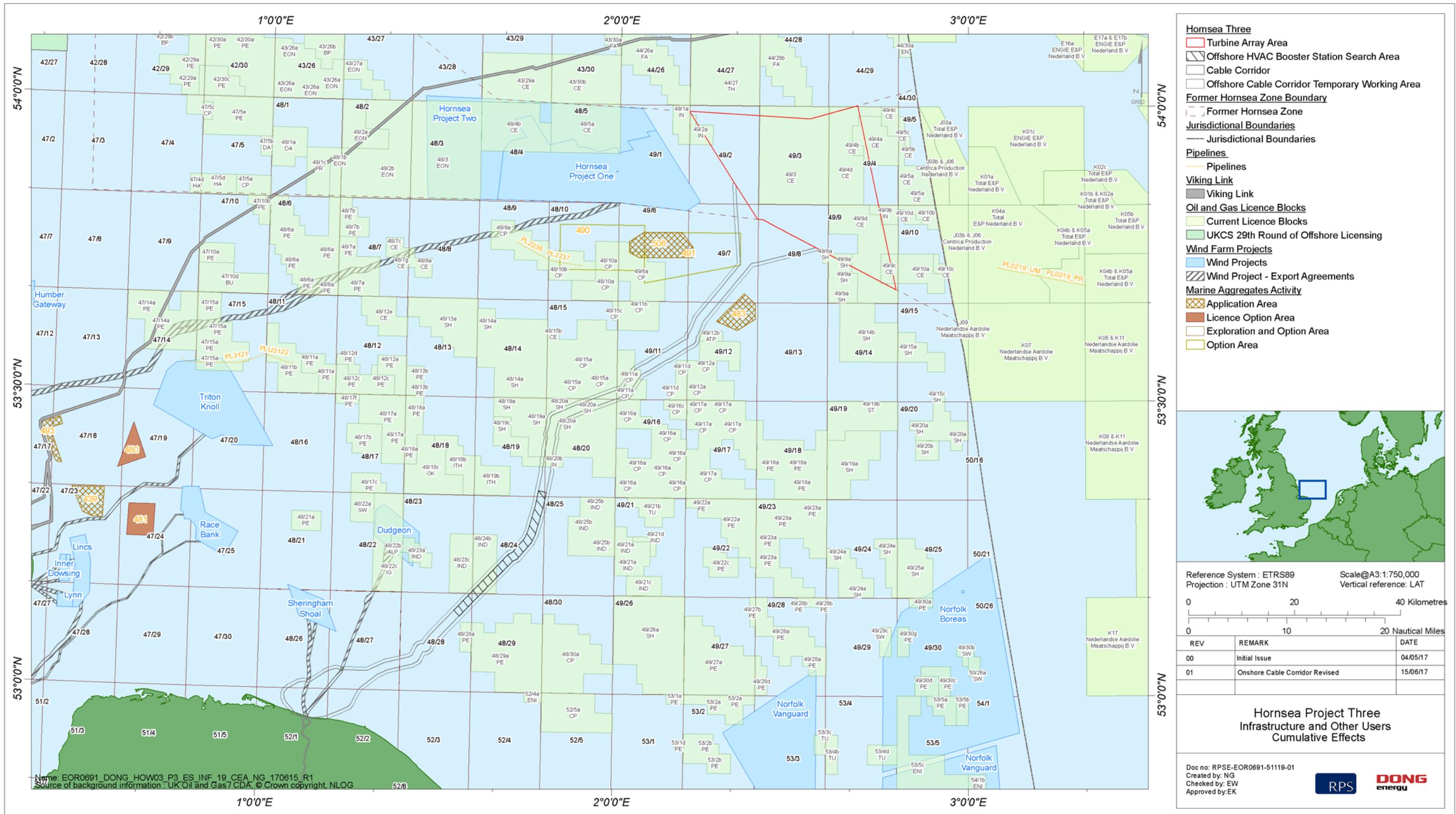


Figure 11.13: Other projects/plans screened into the cumulative assessment and oil and gas licence blocks.

Drilling and the placement of infrastructure has the potential to be restricted within the Hornsea Three array area and within 1 km from the boundary of the array area by the presence of infrastructure, safety zones and advisory safety distances, alongside other plans/projects.

- 11.13.2.64 Drilling and the placement of infrastructure may be restricted (but not prohibited) within the Hornsea Three array area and from within 1 km of the Hornsea Three array area during the Hornsea Three construction phase. Cumulative impacts will arise when a particular licence block that is already affected by Hornsea Three is also affected by another project/plan.
- 11.13.2.65 In the event that new oil and gas platforms or subsea structures are proposed, the cumulative restricted area may need to be extended further considering helicopter access requirements (see chapter 8: Aviation, Military and Communication and chapter 11: Inter-relationships).

Tier 1

Magnitude of impact

- 11.13.2.66 The Hornsea Three array area is located 7 km to the east of the Hornsea Project One and Hornsea Project Two offshore wind farm sites at the closest point. These offshore wind farms will be operational prior to the Hornsea Three construction phase (Table 11.27). There are only two licence blocks that coincide with the Hornsea Three array area, Hornsea Project One and/or Hornsea Project Two (Figure 11.13), unlicensed blocks 49/2 and 49/7 (see paragraph 11.13.2.47).
- 11.13.2.67 In the event that these blocks are licenced, there remains potential for drilling activity to take place in the remaining areas of the licence blocks not affected by the Hornsea Three array area and via directional drilling (providing this commences at a location outside the restricted zone). However, the remaining area of block 49/2, and part of the remaining area of block 49/7, are located within a proposed navigation corridor between the Hornsea Three array area and Hornsea Project One/Hornsea Project Two, which may further restrict the ability to carry out drilling and the placement of infrastructure via a drilling rig and associated safety zone due to the presence of shipping traffic and the potential to create a hazard to navigation (see chapter 7: Shipping and Navigation).
- 11.13.2.68 The presence of the Hornsea Three array area therefore also has the potential to result in indirect impacts on operators through the creation of the navigation corridor. INEOS has two licenced blocks which overlap with the Hornsea Three array area and/or the navigation corridor (Figure 11.13), block 49/2a and block 49/1a (see paragraph 11.13.2.49). Unlicensed block 49/1, which overlaps with Hornsea Project One and Hornsea Project Two, also overlaps with the proposed navigation corridor. Drilling activities within the southern part of licenced block 44/26a (Faroe) and unlicensed block 44/26, located at the northern entrance of the proposed navigation corridor, may also be restricted. In the event that an IMO routing measure is established by MCA (see paragraph 11.13.2.50), drilling will be restricted. Any proposed drilling activity and associated placement of infrastructure would be subject to a navigational risk assessment for prior approval by the MCA, which would take account of Hornsea Three and other Tier 1 projects.

11.13.2.69 Other activities in the area, including new aggregate extraction areas within block 49/7 (491, 506, 483), will add to the cumulative impact.

11.13.2.70 The impact is predicted to be of local spatial extent, relatively long term duration relative to a licence period, continuous and low reversibility. It is predicted that the impact will affect the receptor directly/indirectly. The magnitude is therefore, considered to be **major** (licensed blocks 49/1a and 49/2a currently operated by INEOS and unlicensed blocks 49/1 and 49/2)/**minor** (licensed block 44/26a currently operated by Faroe and unlicensed blocks 44/26 and 49/7).

Sensitivity of the receptor

11.13.2.71 The sensitivity of the receptor depends on the area of their licenced acreage affected and the future plans of the licence operator in relation to potential exploitation of hydrocarbons. Information on each block and the assessed sensitivity is summarised in Table 11.32.

Table 11.32: Sensitivity of each licence operator potentially cumulatively affected in relation to drilling restrictions.

Block	Operator	Area of overlap with Hornsea Three array area (%)	Area of overlap with Tier 1 projects (%)	Overlap with proposed navigation corridor	Consultation	Sensitivity
44/26a	Faroe	0	N/A	Northern entrance	Faroe advised that little activity occurred in the licenced areas and that any activity would occur within the 500 m safety zone of the Schooner platforms.	Low
49/1a	INEOS	0.1	N/A	Yes	INEOS advised that they have no current exploration plans in the southern North Sea.	Low
49/2a		37.9	N/A	Yes		
44/26	Unlicensed	0	N/A	Northern entrance	N/A	Negligible
49/2		54.2	Hornsea Project Two (1.9%)	Yes		
49/7		1.6	Hornsea Project Two (0.4%), Aggregate Areas 491, 506, 483 (29%)	Yes		

11.13.2.72 In all instances, consultation with the operators of the blocks in proximity to the Hornsea Three array area has aimed to address any future operational issues and establish a line of communication to ensure coexistence between both activities can be achieved with minimal disruption.

11.13.2.73 The licensed operator (INEOS and Faroe) is deemed to be of low vulnerability, medium recoverability and high value. The sensitivity of the licence operator is therefore, considered to be **low** (INEOS and Faroe). The sensitivity of the unlicensed blocks is considered to be **negligible**.

Significance of the effect

11.13.2.74 Overall, it is predicted that the sensitivity of the receptor is considered to be **low** (INEOS and Faroe)/**negligible** (unlicensed blocks) and the magnitude is deemed to be **moderate** (INEOS and unlicensed blocks 49/1 and 49/2)/**minor** (Faroe and unlicensed blocks 44/26 and 49/7). The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Tier 2

Magnitude of impact

11.13.2.75 In addition to the Tier 1 projects/plans considered above, the Viking Link Interconnector cable, which will be operational prior to the Hornsea Three construction phase (Table 11.27), has the potential to add to the cumulative impact through increased activities in the area during any operational and maintenance work (Figure 11.13). This cable route crosses licenced block 44/26a (Faroe) and the remaining unlicensed areas of block 44/26. These licence blocks are located at the northern entrance of the navigation corridor (Figure 11.13), and therefore drilling and the placement of infrastructure within licenced block 44/26a (Faroe) and unlicensed block 44/26 may be restricted. In the event that an IMO routing measure is established by MCA for the corridor (see paragraph 11.13.2.50), drilling will be restricted in this area. Any proposed drilling activity and associated placement of infrastructure would be subject to a navigational risk assessment for prior approval by the MCA, which would take account of Hornsea Three and Tier 2 projects.

11.13.2.76 The impact is predicted to be of local spatial extent, long term duration, continuous and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be **minor**.

Sensitivity of receptor

11.13.2.77 The sensitivity of the licence operator, as the receptor, is low for Faroe on the basis of consultation which has advised that there is little activity within their licenced area (Table 11.32). As there is currently no receptor for the unlicensed block, the sensitivity is negligible, however in the event that this block is licenced, the sensitivity will increase as drilling activity may be required. Any future operator of unlicensed blocks will be aware of Hornsea Three and will have taken potential coexistence into consideration.

11.13.2.78 In all instances, consultation with the operators of the blocks in proximity to the Hornsea Three array area has aimed to address any future operational issues and establish a line of communication to ensure coexistence between both activities can be achieved with minimal disruption.

11.13.2.79 The licensed operator (Faroe) is deemed to be of low vulnerability, medium recoverability and high value. The sensitivity of the licence operator is therefore, considered to be **low** (Faroe). The sensitivity of the unlicensed block is considered to be **negligible**.

Significance of Effect

11.13.2.80 Overall, it is predicted that the sensitivity of the receptor is considered to be **low** (Faroe)/**negligible** (unlicensed block) and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Tier 3

11.13.2.81 No Tier 3 projects have been identified.

Safety zones around the offshore HVAC booster stations and advisory safety distances associated with activities underway along the offshore cable corridor, alongside other plans/projects, may restrict potential seismic survey activity.

11.13.2.82 Safety zones around the subsea HVAC booster stations and advisory safety distances around cable installation vessels carrying out activities along the offshore cable corridor will exclude seismic exploration activities in the licence blocks which overlap with the Hornsea Three offshore cable corridor. Cumulative impacts will arise when a particular licence block that is already affected by Hornsea Three is also affected by another project/plan.

Tier 1

Magnitude of impact

11.13.2.83 The Hornsea Three offshore cable corridor is located 7 km from Hornsea Project One at the closest point. Hornsea Project One will be operational prior to the Hornsea Three construction phase (Table 11.27). There are only two licence blocks that coincide with the Hornsea Three offshore cable corridor and Hornsea Project One (Figure 11.13), unlicensed blocks 49/2 and 49/7, which overlap with the southeastern corner of Hornsea Project One.

11.13.2.84 The Hornsea Three offshore cable corridor is also located in proximity to aggregate option/application areas 506, 491 and 483 and the export cable route for the Dudgeon offshore wind farm, which crosses the offshore cable corridor at the landfall end (Figure 11.13). There are five licence blocks located within the Hornsea Three offshore cable corridor that overlap with these other projects/plans, unlicensed blocks 52/1, 52/2, 48/27, 49/7 and 49/12.

11.13.2.85 There is potential for a cumulative impact where activities associated with Hornsea Project One, the aggregate areas or the Dudgeon export cable take place concurrently with Hornsea Three installation activities within the relevant licence blocks. The magnitude of impact will restrict potential seismic survey activity in an area within those licence blocks of relatively small spatial extent and for a relatively short duration as the Hornsea Three cable installation vessels move along the offshore cable corridor. Due to the transient nature of cable installation activity, the magnitude of impact is considered to be negligible.

11.13.2.86 There are no Tier 1 projects coinciding with the offshore HVAC booster station search area, such that no cumulative effects are predicted on operators of licence blocks at this location.

11.13.2.87 The impact is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **negligible**.

Sensitivity of receptor

11.13.2.88 As noted in paragraph 11.13.2.84 above, the affected licence blocks are unlicensed, and therefore there is currently no receptor. Any future operator of the unlicensed blocks will be aware of the Hornsea Three project and will have taken potential coexistence into consideration. The promulgation of information through Notices to Mariners combined with consultation will enable future operators to plan surveys taking into account the timing of Hornsea Three construction activities. As there is currently no receptor, sensitivity is considered to be **negligible**.

Significance of Effect

11.13.2.89 Overall, it is predicted that the sensitivity of the receptor is considered to be **negligible** and the magnitude is deemed to be **negligible**. The effect will, therefore, be of **negligible** adverse significance, which is not significant in EIA terms.

Tier 2

11.13.2.90 No Tier 2 projects have been identified.

Tier 3

11.13.2.91 No Tier 3 projects have been identified.

Drilling and the placement of infrastructure has the potential to be restricted within the offshore cable corridor and within 1 km from the boundary of the offshore cable corridor, alongside other plans/projects.

Tier 1

Magnitude of impact

11.13.2.92 The Hornsea Three offshore cable corridor is located 7 km from Hornsea Project One, which will be operational prior to the Hornsea Three construction phase (Table 11.27). There are only two licence blocks that coincide with the Hornsea Three offshore cable corridor and Hornsea Project One (Figure 11.13), unlicensed blocks 49/2 and 49/7, which overlap with the southeastern corner of Hornsea Project One.

11.13.2.93 The Hornsea Three offshore cable corridor is also located in proximity to aggregate option/application areas 506, 491 and 483 and the export cable route for the Dudgeon offshore wind farm, which crosses the offshore cable corridor at the landfall end (Figure 11.13). There are five licence blocks located within the Hornsea Three offshore cable corridor that overlap with these other projects/plans, unlicensed blocks 52/1, 52/2, 48/27, 49/7 and 49/12.

11.13.2.94 There is potential for a cumulative impact where activities associated with Hornsea Project One, the aggregate areas or the Dudgeon export cable take place concurrently with Hornsea Three installation activities within the

relevant licence blocks. The magnitude of impact will be limited to a restriction on drilling and the placement of infrastructure within an area of relatively small spatial extent and for a relatively short duration as the Hornsea Three cable installation vessels move along the offshore cable corridor. Due to the transient nature of cable installation activity, the magnitude of impact is considered to be negligible.

11.13.2.96 There are no Tier 1 projects coinciding with the offshore HVAC booster station search area, such that no cumulative effects are predicted on operators of licence blocks at this location.

11.13.2.97 The impact is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **negligible**.

Sensitivity of receptor

11.13.2.98 As noted above, the affected licence blocks are unlicensed, and therefore there is currently no receptor. Any future operator of the unlicensed blocks will be aware of the Hornsea Three project and will have taken potential coexistence into consideration. The promulgation of information through Notices to Mariners combined with consultation will enable future operators to plan activities taking into account the timing of Hornsea Three construction activities. As there is currently no receptor, sensitivity is considered to be **negligible**.

Significance of Effect

11.13.2.99 Overall, it is predicted that the sensitivity of the receptor is considered to be **negligible** and the magnitude is deemed to be **negligible**. The effect will, therefore, be of **negligible** adverse significance, which is not significant in EIA terms.

Tier 2

11.13.2.100 No Tier 2 projects have been identified.

Tier 3

11.13.2.101 No Tier 2 projects have been identified.

The piling of wind turbine and substation foundations, alongside other plans/projects, will generate underwater noise that may acoustically interfere with seismic survey operations.

11.13.2.102 The underwater noise emissions, resulting from the construction phase of Hornsea Three are further reported in volume 4, annex 3.1: Subsea Noise Technical Report.

Tier 1

Magnitude of impact

11.13.2.103 Hornsea Project One and Hornsea Project Two will be operational prior to the Hornsea Three construction phase (Table 11.27) and therefore there is no potential for a cumulative impact from piling activities associated with these projects on seismic survey operations taking place within licence blocks in the vicinity of Hornsea Three.

11.13.2.104 There is potential for the Hornsea Three construction phase to overlap with the construction phases for the Dogger Bank Cleyke Beck A, Dogger Bank Cleyke Beck B, Dogger Bank Teesside A and Dogger Bank Teesside B projects, and therefore potential for concurrent piling activity. As the nearest of these projects is located 76 km from the Hornsea Three array area and as the sound level from piling dissipates with distance from the source (see volume 4, annex 3.1: Subsea Noise Technical Report), it is considered unlikely that there will be potential for significant cumulative impacts on seismic survey operations taking place within licence blocks in the vicinity of Hornsea Three. As described in paragraph 11.11.1.82, underwater noise from piling and seismic survey activities will produce similar sound pressure and frequencies, however due to different temporal and spatial requirements the two activities have the potential to be able to occur concurrently.

11.13.2.105 The impact is predicted to be of regional spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **moderate**.

Sensitivity of receptor

11.13.2.106 The sensitivity of the oil and gas operator to the potential impact will be dependent on their survey activity coinciding temporally and spatially with the noise source and having similar acoustic frequency. The actual techniques that will be used, in particular the ability for live or post-processing of seismic data to filter out acoustic interference, will reduce the sensitivity of the operator. The operator will also be provided with sufficient information in order that seismic survey activity can be planned to avoid the construction noise temporally and spatially if necessary.

11.13.2.107 The oil and gas operator is deemed to be of low vulnerability, high recoverability and high value. The sensitivity of the receptor is therefore, considered to be **low**.

Significance of Effect

11.13.2.108 Overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **moderate**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Tier 2

Magnitude of impact

- 11.13.2.109 There is potential for the Hornsea Three construction phase to overlap with the construction phase for Norfolk Vanguard by one year, and therefore potential for concurrent piling activity. As this project is located 73 km from the Hornsea Three array area and as the sound level from piling dissipates with distance from the source (see volume 4, annex 3.1: Subsea Noise Technical Report), it is considered unlikely that there will be potential for significant cumulative impacts on seismic survey operations taking place within licence blocks in the vicinity of Hornsea Three. As described in paragraph 11.11.1.82, underwater noise from piling and seismic survey activities will produce similar sound pressure and frequencies, however due to different temporal and spatial requirements the two activities have the potential to be able to occur concurrently.
- 11.13.2.110 The impact is predicted to be of regional spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **moderate**.

Sensitivity of receptor

- 11.13.2.111 The sensitivity of the oil and gas operator to the potential impact will be dependent on their survey activity coinciding temporally and spatially with the noise source and having similar acoustic frequency. The actual techniques that will be used, in particular the ability for live or post-processing of seismic data to filter out acoustic interference, will reduce the sensitivity of the operator. The operator will also be provided with sufficient information in order that seismic survey activity can be planned to avoid the construction noise temporally and spatially if necessary.

- 11.13.2.112 The oil and gas operator is deemed to be of low vulnerability, high recoverability and high value. The sensitivity of the receptor is therefore, considered to be **low**.

Significance of Effect

- 11.13.2.113 Overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **moderate**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Tier 3

Magnitude of impact

- 11.13.2.114 Construction of the East Anglia Two project has the potential to overlap with the construction phase of Hornsea Three (Table 11.27). Construction timeframes for the Norfolk Boreas, East Anglia One North and Hornsea Project Four offshore wind farms are currently unknown, however for the purposes of this assessment it is assumed that the construction phases for these projects may also overlap with the Hornsea Three construction phase, resulting in the potential for concurrent piling activity. The East Anglia Two and East Anglia One North projects are located 158 km and 141 km respectively from the Hornsea Three array area, with Norfolk Boreas and Hornsea Project Four located in closer proximity at 53 km and 36 km respectively. The sound level from piling dissipates with distance from the source (see volume 4, annex 3.1: Subsea Noise Technical Report), therefore whilst it is considered unlikely that there will be potential for significant cumulative impacts on seismic survey operations taking place within licence blocks in the vicinity of Hornsea Three from piling activities associated with East Anglia Two and East Anglia One North, there is potential for a cumulative effect on seismic survey operations within licence blocks in the vicinity of Hornsea Three from piling activities associated with Norfolk Boreas and Hornsea Project Four. As described in paragraph 11.11.1.82, underwater noise from piling and seismic survey activities will produce similar sound pressure and frequencies, however due to different temporal and spatial requirements the two activities have the potential to be able to occur concurrently.

- 11.13.2.115 The impact is predicted to be of regional spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **moderate**.

Sensitivity of receptor

- 11.13.2.116 The sensitivity of the oil and gas operator to the potential impact will be dependent on their survey activity coinciding temporally and spatially with the noise source and having similar acoustic frequency. The actual techniques that will be used, in particular the ability for live or post-processing of seismic data to filter out acoustic interference, will reduce the sensitivity of the operator. The operator will also be provided with sufficient information in order that seismic survey activity can be planned to avoid the construction noise temporally and spatially if necessary.

- 11.13.2.117 The oil and gas operator is deemed to be of low vulnerability, high recoverability and high value. The sensitivity of the receptor is therefore, considered to be **low**.

Significance of Effect

- 11.13.2.118 Overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **moderate**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Future monitoring

11.13.2.119 No specific monitoring requirements have been identified for the construction phase in relation to recreational users and recreational fishing; aggregate extraction, cables and pipelines; and oil and gas operations.

11.13.3 Operation and maintenance phase

Recreational users and recreational fishing

Hornsea Three infrastructure, safety zones and advisory safety distances associated with infrastructure and maintenance activities within the Hornsea Three array area and along the offshore cable corridor, alongside other plans/projects, may displace recreational craft and recreational fishing vessels resulting in a loss of recreational resource.

11.13.3.1 During the operational and maintenance phase of Hornsea Three, recreational craft and recreational fishing vessels may be displaced from the Hornsea Three array area and along the offshore cable corridor by the physical presence of infrastructure, safety zones and advisory safety distances. Other projects/plans in the region may further reduce the available recreational resource.

Tier 1

Magnitude of impact

11.13.3.2 The presence of Hornsea Three infrastructure and associated safety zones and advisory safety distances, together with the presence of Hornsea Project One, Hornsea Project Two, Dudgeon, East Anglia One, East Anglia Three, Galloper, Race Bank and Triton Knoll; the operational and maintenance activities associated with the export cable routes of the Dogger Bank Creyke Beck A, Dogger Bank Creyke Beck B, Dogger Bank Teesside A and Dogger Bank Teesside B projects; the operational and maintenance activities associated with the proposed pipelines in the vicinity; and activities associated with the aggregate option/application areas (Figure 11.12), may further result in the displacement of recreational craft and recreational fishing vessels.

11.13.3.3 Recreational vessels displaced by the Hornsea Three array area may also be displaced by the presence of Hornsea Project One and Hornsea Project Two. Recreational vessels traversing along the eastern coast of the UK displaced by maintenance activities along the Hornsea Three offshore cable corridor and by operational safety zones associated with the offshore HVAC booster stations may also be displaced by any maintenance activities along the respective export cable corridors for Hornsea Project One and Hornsea Project Two, and from the potential presence of operational safety zones associated with any offshore substations positioned along the cable routes.

11.13.3.4 Recreational vessels traversing along the eastern coast of the UK displaced by maintenance activities along the Hornsea Three offshore cable corridor and by operational safety zones associated with the offshore HVAC booster stations may also be displaced by any maintenance activities along the respective export cable corridors for the Dudgeon, East Anglia One, East Anglia Three, Galloper, Race Bank, Triton Knoll, Dogger Bank Creyke Beck A, Dogger Bank Creyke Beck B, Dogger Bank Teesside A and Dogger Bank Teesside B offshore wind farms, and from the potential presence of operational safety zones associated with any offshore substations positioned along the cable routes (where applicable). The Dudgeon export cable corridor crosses the Hornsea Three offshore cable corridor.

11.13.3.5 Other activities in the area, including new aggregate extraction areas (480, 490, 491, 481, 506, 483, 493, 439) and operational and maintenance activities associated with the proposed pipelines, will add to the cumulative impact through increased vessel movements in the area.

11.13.3.6 The spatial extent of any impact will be small in the context of the available sailing area in the southern North Sea. The likelihood of there being a cumulative effect on recreational vessels in offshore areas is low, given the low level of recreational activity anticipated within offshore areas and likely limited recreational fishing activity. The likelihood of there being a cumulative effect on recreational vessels in nearshore and inshore areas is also low, as although recreational activity is greater, activity is likely to be more localised to those areas and therefore recreational receptors are unlikely to pass multiple project locations. The exception is at the cable landfall location, where the Dudgeon export cable crosses the Hornsea Three offshore cable corridor. Any displacement from operational and maintenance activities along the respective export cable routes will be infrequent as it is unlikely that such activities would occur concurrently across multiple projects.

11.13.3.7 The impact is predicted to be of regional spatial extent, long term duration, intermittent (offshore cable corridor)/continuous (Hornsea Three array area and offshore HVAC booster station search area) and low reversibility (Hornsea Three array area and offshore HVAC booster station search area)/high reversibility (offshore cable corridor). It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **minor**.

Sensitivity of receptor

11.13.3.8 Recreational vessels are able to alter their route, dependent on the target destination. Notices to Mariners will be promulgated during the operational and maintenance phase, advising of the location and nature of maintenance works, ensuring that recreational activities can be planned accordingly.

11.13.3.9 The receptor is deemed to be of low vulnerability, high recoverability and moderate value. The sensitivity of the receptor is therefore, considered to be **low**.

Significance of Effect

- 11.13.3.10 Overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Tier 2

Magnitude of impact

- 11.13.3.11 In addition to the Tier 1 projects/plans considered above, the presence of Hornsea Three infrastructure and associated safety zones and advisory safety distances, together with the presence of Norfolk Vanguard and the operational and maintenance activities along the proposed Viking Link Interconnector cable (Figure 11.12), may further result in the displacement of recreational craft and recreational fishing vessels.
- 11.13.3.12 Recreational vessels displaced by the presence of the Hornsea Three array area may also be displaced by the presence of Norfolk Vanguard, which is located 73 km from the Hornsea Three array area. Recreational vessels traversing along the eastern coast of the UK displaced by maintenance activities along the Hornsea Three offshore cable corridor and by operational safety zones associated with the offshore HVAC booster stations may also be displaced by any maintenance activities along the export cable corridor for the Norfolk Vanguard project and from the potential presence of operational safety zones associated with any offshore substations positioned along the cable route.
- 11.13.3.13 Operational and maintenance activities associated with the Viking Link Interconnector cable will add to the cumulative impact through increased vessel movements in the area.
- 11.13.3.14 The spatial extent of any impact will be small in the context of the available sailing area in the southern North Sea and the baseline level and nature of recreational activity, as described in paragraph 11.13.3.6.
- 11.13.3.15 The impact is predicted to be of regional spatial extent, long term duration, intermittent (offshore cable corridor)/continuous (Hornsea Three array area and offshore HVAC booster station search area) and low reversibility (Hornsea Three array area and offshore HVAC booster station search area)/high reversibility (offshore cable corridor). It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **minor**.
- Sensitivity of receptor
- 11.13.3.16 Recreational vessels are able to alter their route, dependent on the target destination. Notices to Mariners will be promulgated during the operational and maintenance phase, advising of the location and nature of maintenance works, ensuring that recreational activities can be planned accordingly.

- 11.13.3.17 The receptor is deemed to be of low vulnerability, high recoverability and moderate value. The sensitivity of the receptor is therefore, considered to be **low**.

Significance of Effect

- 11.13.3.18 Overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Tier 3

- 11.13.3.19 In addition to the Tier 1 and Tier 2 projects/plans considered above, the East Anglia Two, Norfolk Boreas and East Anglia One North projects may further result in the displacement of recreational craft and recreational fishing vessels. Recreational vessels traversing along the eastern coast of the UK may be displaced by any operational safety zones and/or operational and maintenance activities along the export cable corridors of these projects, in addition to similar activities along the Hornsea Three offshore cable corridor.
- 11.13.3.20 The spatial extent of any impact will be small in the context of the available sailing area in the southern North Sea and the baseline level and nature of recreational activity, as described in paragraph 11.13.3.6.
- 11.13.3.21 The impact is predicted to be of regional spatial extent, long term duration, intermittent (offshore cable corridor)/continuous (Hornsea Three array area) and low reversibility (Hornsea Three array area)/high reversibility (offshore cable corridor). It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **minor**.
- Sensitivity of receptor
- 11.13.3.22 Recreational vessels are able to alter their route, dependent on the target destination. Notices to Mariners will be promulgated during the operational and maintenance phase, advising of the location and nature of maintenance works, ensuring that recreational activities can be planned accordingly.
- 11.13.3.23 The receptor is deemed to be of low vulnerability, high recoverability and moderate value. The sensitivity of the receptor is therefore, considered to be **low**.
- Significance of Effect
- 11.13.3.24 Overall, it is predicted that the sensitivity of the receptor the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Aggregate extraction, cables and pipelines

Hornsea Three infrastructure, safety zones and advisory safety distances, alongside other plans/projects, may lead to a temporary loss of access to existing cables and pipelines for repair or maintenance.

Tier 1

Magnitude of impact

- 11.13.3.25 Cables and pipelines crossed by Hornsea Three are discussed in section 11.7.5 and section 11.7.15. As described in paragraph 11.13.2.27, cumulative impacts are only likely to arise if other crossings are within the same section of those cables and pipelines, and this situation may arise when considering Hornsea Three alongside the Dudgeon project.
- 11.13.3.26 There is potential for a cumulative impact on access to the Weybourne to Esbjerg, Sheringham Shoal, North Sea offshore and Stratos cables for repair or maintenance where Hornsea Three operational and maintenance activities overlap with similar activities being carried out along the Dudgeon export cable. Any impact would be temporary and it is unlikely that such activities would occur concurrently.
- 11.13.3.27 Crossing and proximity agreements will be established for Hornsea Three with the relevant cable operators, and similar agreements will be in place for the Dudgeon project. Crossing and proximity agreements will ensure close communication and planning between the relevant parties to ensure disruption of activities is minimised.
- 11.13.3.28 The Topaz to Schooner pipelines are located within a proposed navigation corridor between the Hornsea Three array area and Hornsea Project One/Hornsea Project Two. The presence of Hornsea Three, together with Hornsea Project One and Project Two, may therefore result in an indirect impact on access to this pipeline due to the presence of shipping traffic (see chapter 7: Shipping and Navigation). The pipeline is located toward the northern entrance of the corridor. As noted in paragraph 11.13.2.50, any IMO routing measures may lead to restrictions on other activities within the navigation corridor.
- 11.13.3.29 The impact is predicted to be of local spatial extent, short term duration (cables)/long term duration (Topaz to Schooner pipeline), intermittent (cables)/continuous (Topaz to Schooner pipeline) and high (cables)/low (Topaz to Schooner pipeline) reversibility. It is predicted that the impact will affect the receptor directly/indirectly. The magnitude is therefore, considered to be **negligible** (cables) and **minor** (Topaz to Schooner pipeline).

Sensitivity of receptor

- 11.13.3.30 For active cables, a restriction on access in the event of an emergency could be critical to the operator of that cable. The operators of the out of service cables are deemed to be less sensitive to any impact.

11.13.3.31 Consultation with INEOS has advised that the Topaz suspended well head is likely to be decommissioned prior to Hornsea Three construction, with the pipeline likely to remain in situ (see Table 11.3). Therefore, it is unlikely that access to this pipeline will be required during the Hornsea Three operational and maintenance phase, although there may be a requirement for post-decommissioning surveys within this area.

11.13.3.32 The receptor is deemed to be of low vulnerability, high recoverability and high value (active cables)/low value (out of service cables/pipelines). The sensitivity of the receptor is therefore, considered to be **high** (active cables)/**negligible** (out of service cables/pipelines).

Significance of Effect

11.13.3.33 Overall, it is predicted that the sensitivity of the receptor is considered to be **high** (active cables)/**negligible** (out of service cables/pipelines) and the magnitude is deemed to be **negligible** (cables)/**minor** (Topaz to Schooner pipeline). The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Tier 2

11.13.3.34 No Tier 2 projects have been identified.

Tier 3

11.13.3.35 No Tier 3 projects have been identified.

Oil and gas operations

The presence of infrastructure within the Hornsea Three array area, alongside other plans/projects, may restrict potential seismic survey activity.

11.13.3.36 The presence of infrastructure within the Hornsea Three array area will restrict conventional towed streamer seismic exploration activities, and potentially other more recent methods for seismic survey, in the licence blocks which overlap with the Hornsea Three array area. Cumulative impacts will arise when a particular licence block that is already affected by Hornsea Three is also affected by another project/plan.

Tier 1

Magnitude of impact

- 11.13.3.37 There are only two licence blocks that coincide with the Hornsea Three array area, Hornsea Project One and/or Hornsea Project Two (Figure 11.13), unlicensed blocks 49/2 and 49/7 (see paragraph 11.13.2.47). In the event that these blocks are licenced, there remains potential for surveys to take place within the parts of the blocks which do not overlap with the offshore wind farm project areas. However, the remaining area of block 49/2, and part of the remaining area of block 49/7, are located within a proposed navigation corridor between the Hornsea Three array area and Hornsea Project One/Hornsea Project Two, which may further restrict the ability to carry out seismic surveys due to the presence of shipping traffic (see chapter 7: Shipping and Navigation).
- 11.13.3.38 The presence of the Hornsea Three array area therefore also has the potential to result in indirect impacts on operators through the creation of the navigation corridor, which may result in restrictions on seismic survey activity. INEOS has two licenced blocks which overlap with the Hornsea Three array area and the navigation corridor (Figure 11.13), block 49/2a and block 49/1a (see paragraph 11.13.2.49). Unlicensed block 49/1, which overlaps with Hornsea Project One and Hornsea Project Two, also overlaps with the proposed navigation corridor. Seismic surveys within the southern part of licenced block 44/26a (Faroe) and unlicensed block 44/26, located at the northern entrance of the proposed navigation corridor, may also be restricted. As noted in paragraph 11.13.2.50, any IMO routing measures may lead to restrictions on other activities within the navigation corridor.
- 11.13.3.39 Other activities in the area, including new aggregate extraction areas within block 49/7 (491, 506, 483), will add to the cumulative impact.

- 11.13.3.40 The impact is predicted to be of local spatial extent, long term duration, continuous and low reversibility. It is predicted that the impact will affect the receptor directly/indirectly. The magnitude is therefore, considered to be **moderate** (INEOS and unlicensed blocks 49/1 and 49/2)/**minor** (Faroe and unlicensed blocks 44/26 and 49/7).

Sensitivity of receptor

- 11.13.3.41 The sensitivity of the licence operator, as the receptor, is low for INEOS and Faroe on the basis of consultation which has advised that they currently have no exploration plans (Table 11.31). As there is currently no receptor for the unlicensed blocks, the sensitivity is negligible, however in the event that these blocks are licenced, the sensitivity will increase as seismic activity may be required. Any future operator of the unlicensed blocks will be aware of Hornsea Three and will have taken potential coexistence into consideration.
- 11.13.3.42 The licensed operator is deemed to be of low (INEOS and Faroe) vulnerability, medium recoverability and high value. The sensitivity of the licence operator is therefore, considered to be **low** (INEOS and Faroe). The sensitivity of the unlicensed blocks is considered to be **negligible**.

Significance of Effect

- 11.13.3.43 Overall, it is predicted that the sensitivity of the receptor is considered to be **low** (INEOS and Faroe)/**negligible** (unlicensed blocks) and the magnitude is deemed to be **moderate** (INEOS and unlicensed blocks 49/1 and 49/2)/**minor** (Faroe and unlicensed blocks 44/26 and 49/7). The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Tier 2

Magnitude of impact

- 11.13.3.44 In addition to the Tier 1 projects/plans considered above, the Viking Link Interconnector cable has the potential to add to the cumulative impact through increased activities in the area during any operational and maintenance work (Figure 11.13). This cable route crosses licenced block 44/26a (Faroe) and the remaining unlicensed areas of block 44/26. These licence blocks are also located at the northern entrance of the proposed navigation corridor (Figure 11.13), and therefore seismic surveys within these areas may be restricted. As noted in paragraph 11.13.2.50, any IMO routing measures may lead to restrictions on other activities within the navigation corridor.
- 11.13.3.45 Any operational and maintenance works associated with the Viking Link Interconnector cable would be infrequent and temporary.
- 11.13.3.46 The impact is predicted to be of local spatial extent, relatively long term duration relative to a licence period, continuous and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be **minor**.

Sensitivity of receptor

- 11.13.3.47 The sensitivity of the licence operator, as the receptor, is low for Faroe on the basis of consultation which has advised that they currently have no exploration plans (Table 11.31). As there is currently no receptor for the unlicensed block, the sensitivity is negligible, however in the event that this block is licenced, the sensitivity will increase as seismic activity may be required. Any future operator of unlicensed blocks will be aware of Hornsea Three and will have taken potential coexistence into consideration.
- 11.13.3.48 The licensed operator is deemed to be of low (Faroe) vulnerability, medium recoverability and high value. The sensitivity of the licence operator is therefore, considered to be **low** (Faroe). The sensitivity of the unlicensed block is considered to be **negligible**.

Significance of Effect

- 11.13.3.49 Overall, it is predicted that the sensitivity of the receptor is considered to be **low** (Faroe)/**negligible** (unlicensed blocks) and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Tier 3

- 11.13.3.50 No Tier 3 projects have been identified.

Drilling and the placement of infrastructure has the potential to be restricted within the Hornsea Three array area and within 1 km from the boundary of the array area by the presence of infrastructure, safety zones and advisory safety distances, alongside other plans/projects.

- 11.13.3.51 Drilling and the placement of infrastructure may be restricted (but not prohibited) within the Hornsea Three array area and from within 1 km of the Hornsea Three array area during the Hornsea Three operational and maintenance phase. Cumulative impacts will arise when a particular licence block that is already affected by Hornsea Three is also affected by another project/plan.
- 11.13.3.52 In the event that new oil and gas platforms or subsea structures are proposed, the cumulative restricted area may need to be extended further considering helicopter access requirements (see chapter 8: Aviation, Military and Communication and chapter 11: Inter-relationships).

Tier 1

Magnitude of impact

- 11.13.3.53 There are only two licence blocks that coincide with the Hornsea Three array area, Hornsea Project One and/or Hornsea Project Two (Figure 11.13), unlicensed blocks 49/2 and 49/7 (see paragraph 11.13.2.47). In the event that these blocks are licenced, there remains potential for drilling activity to take place in the remaining areas not affected by Hornsea Three and via directional drilling (providing this commences at a location outside the restricted zone). However, the remaining area of block 49/2, and part of the remaining area of block 49/7, are located within a proposed navigation corridor between the Hornsea Three array area and Hornsea Project One/Hornsea Project Two, which may further restrict the ability to carry out drilling and the placement of infrastructure via a drilling rig and associated safety zone due to the presence of shipping traffic and the potential to create a hazard to navigation (see chapter 7: Shipping and Navigation).

- 11.13.3.54 The presence of the Hornsea Three array area therefore also has the potential to result in indirect impacts on operators through the creation of the proposed navigation corridor. INEOS has two licenced blocks which overlap with the Hornsea Three array area and/or the navigation corridor (Figure 11.13), block 49/2a and block 49/1a (see paragraph 11.13.2.49). Unlicensed block 49/1, which overlaps with Hornsea Project One and Hornsea Project Two, also overlaps with the proposed navigation corridor. Drilling activities within the southern part of licenced block 44/26a (Faroe) and unlicensed block 44/26, located at the northern entrance of the navigation corridor, may also be restricted. In the event that an IMO routing measure is established by MCA for the corridor (see paragraph 11.13.2.50), drilling will be restricted in this area. Any proposed drilling activity and associated placement of infrastructure would be subject to a navigational risk assessment for prior approval by the MCA, which would take account of Hornsea Three and other Tier 1 projects.

- 11.13.3.55 Other activities in the area, including new aggregate extraction areas within block 49/7 (491, 506, 483), will add to the cumulative impact.

- 11.13.3.56 The impact is predicted to be of local spatial extent, long term duration, continuous and low reversibility. It is predicted that the impact will affect the receptor directly/indirectly. The magnitude is therefore, considered to be **major** (licensed blocks 49/1a and 49/2a currently operated by INEOS and unlicensed blocks 49/1 and 49/2)/**minor** (licensed block 44/26a currently operated by Faroe and unlicensed blocks 44/26 and 49/7).

Sensitivity of the receptor

- 11.13.3.57 The sensitivity of the licence operator, as the receptor, is low for INEOS and Faroe on the basis of consultation which has advised that they have no exploration plans or limited levels of activity within this area (Table 11.32). As there is currently no receptor for the unlicensed blocks, the sensitivity is negligible, however in the event that these blocks are licenced, the sensitivity will increase as drilling and the placement of infrastructure may be required. Any future operator of the unlicensed blocks will be aware of Hornsea Three and will have taken potential coexistence into consideration.

- 11.13.3.58 In all instances, consultation with the operators of the blocks in proximity to the Hornsea Three array area has aimed to address any future operational issues and establish a line of communication to ensure coexistence between both activities can be achieved with minimal disruption.

- 11.13.3.59 The licensed operator (INEOS and Faroe) is deemed to be of low vulnerability, medium recoverability and high value. The sensitivity of the licence operator is therefore, considered to be **low** (INEOS and Faroe). The sensitivity of the unlicensed blocks is considered to be **negligible**.

Significance of the effect

- 11.13.3.60 Overall, it is predicted that the sensitivity of the receptor is considered to be **low** (INEOS and Faroe)/**negligible** (unlicensed blocks) and the magnitude is deemed to be **major** (licensed blocks 49/1a and 49/2a currently operated by INEOS and unlicensed blocks 49/1 and 49/2)/**minor** (licensed block 44/26a currently operated by Faroe and unlicensed blocks 44/26 and 49/7). The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Tier 2

Magnitude of impact

- 11.13.3.61 In addition to the Tier 1 projects/plans considered above, the Viking Link Interconnector cable has the potential to add to the cumulative impact through increased activities in the area during any operational and maintenance work (Figure 11.13). This cable route crosses licenced block 44/26a (Faroe) and the remaining unlicensed areas of block 44/26. These licence blocks are also located at the northern entrance of the navigation corridor (Figure 11.13), and therefore drilling and the placement of infrastructure within these blocks may be restricted.

11.13.3.62 Any operational and maintenance works associated with the Viking Link Interconnector cable would be infrequent and temporary. There are a relatively small number of blocks affected overall and there will be continued consultation and promulgation of information.

11.13.3.63 The impact is predicted to be of local spatial extent, long term duration, continuous and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be **minor**.

Sensitivity of receptor

11.13.3.64 The sensitivity of the licence operator, as the receptor, is low for Faroe on the basis of consultation which has advised that there is little activity within their licenced area (Table 11.32). As there is currently no receptor for the unlicensed block, the sensitivity is negligible, however in the event that this block is licenced, the sensitivity will increase as drilling activity may be required. Any future operator of unlicensed blocks will be aware of Hornsea Three and will have taken potential coexistence into consideration.

11.13.3.65 In all instances, consultation with the operators of the blocks in proximity to the Hornsea Three array area has aimed to address any future operational issues and establish a line of communication to ensure coexistence between both activities can be achieved with minimal disruption.

11.13.3.66 The licensed operator (Faroe) is deemed to be of low vulnerability, medium recoverability and high value. The sensitivity of the licence operator is therefore, considered to be **low** (Faroe). The sensitivity of the unlicensed block is considered to be **negligible**.

Significance of Effect

11.13.3.67 Overall, it is predicted that the sensitivity of the receptor is considered to be **low** (Faroe)/**negligible** (unlicensed block) and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Tier 3

11.13.3.68 No Tier 3 projects have been identified.

Safety zones around the offshore HVAC booster stations and advisory safety distances associated with maintenance activities underway along the offshore cable corridor, alongside other plans/projects, may restrict potential seismic survey activity.

11.13.3.69 Safety zones around the offshore HVAC booster stations and advisory safety distances around operational and maintenance activities along the offshore cable corridor will exclude seismic exploration activities in the licence blocks which overlap with the Hornsea Three offshore cable corridor. Cumulative impacts will arise when a particular licence block that is already affected by Hornsea Three is also affected by another project/plan.

Tier 1

Magnitude of impact

11.13.3.70 The Hornsea Three offshore cable corridor is located 7 km from Hornsea Project One at the closest point. There are only two licence blocks that coincide with the Hornsea Three offshore cable corridor and Hornsea Project One (Figure 11.13), unlicensed blocks 49/2 and 49/7, which overlap with the southeastern corner of Hornsea Project One.

11.13.3.71 The Hornsea Three offshore cable corridor is also located in proximity to aggregate option/application areas 506, 491 and 483, and the export cable route for the Dudgeon offshore wind farm (Figure 11.13). There are five licence blocks located within the Hornsea Three offshore cable corridor that overlap with these other projects/plans, unlicensed blocks 52/1, 52/2, 48/27, 49/7 and 49/12.

11.13.3.72 There is potential for a cumulative impact where activities associated with Hornsea Project One, the aggregate areas or the Dudgeon export cable take place concurrently with Hornsea Three operational and maintenance activities within the affected licence blocks. The magnitude of impact will restrict potential seismic survey activity in an area within these licence blocks of relatively small spatial extent and for a relatively short duration as the Hornsea Three cable maintenance vessels move along the offshore cable corridor. Due to the transient and infrequent nature of any cable maintenance activity, the magnitude of impact is considered to be negligible.

11.13.3.73 There are no Tier 1 projects coinciding with the offshore HVAC booster station search area, such that no cumulative effects are predicted on operators of licence blocks at this location.

11.13.3.74 The impact is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **negligible**.

Sensitivity of receptor

11.13.3.75 As noted above, the affected licence blocks are unlicensed, and therefore there is currently no receptor. Any future operator of the unlicensed blocks will be aware of the Hornsea Three project and will have taken potential coexistence into consideration. The promulgation of information through Notices to Mariners combined with consultation will enable future operators to plan surveys taking into account the timing of any Hornsea Three operational and maintenance activities. As there is currently no receptor, sensitivity is considered to be **negligible**.

Significance of Effect

11.13.3.76 Overall, it is predicted that the sensitivity of the receptor is considered to be **negligible** and the magnitude is deemed to be **negligible**. The effect will, therefore, be of **negligible** adverse significance, which is not significant in EIA terms.

Tier 2

- 11.13.3.77 No Tier 2 projects have been identified.

Tier 3

- 11.13.3.78 No Tier 3 projects have been identified.

Drilling and the placement of infrastructure has the potential to be restricted within the offshore cable corridor and within 1 km from the boundary of the offshore cable corridor, alongside other plans/projects.

Tier 1

Magnitude of impact

- 11.13.3.79 As described in paragraph 11.13.3.70, two licence blocks coincide with the Hornsea Three offshore cable corridor and Hornsea Project One (Figure 11.13), unlicensed blocks 49/2 and 49/7, which overlap with the southeastern corner of Hornsea Project One.
- 11.13.3.80 The Hornsea Three offshore cable corridor is also located in proximity to aggregate option/application areas 506, 491 and 483, and the export cable route for the Dudgeon offshore wind farm (Figure 11.13). There are five licence blocks located within the Hornsea Three offshore cable corridor that overlap with these other projects/plans, unlicensed blocks 52/1, 52/2, 48/27, 49/7 and 49/12.
- 11.13.3.81 There is potential for a cumulative impact where activities associated with Hornsea Project One, the aggregate areas or the Dudgeon export cable take place concurrently with Hornsea Three operational and maintenance activities within the affected licence blocks. The magnitude of impact will be limited to a restriction on drilling and the placement of infrastructure within an area of relatively small spatial extent and for a relatively short duration as the Hornsea Three cable maintenance vessels move along the offshore cable corridor. Due to the transient and infrequent nature of any cable maintenance activity, the magnitude of impact is considered to be negligible.
- 11.13.3.82 There are no Tier 1 projects coinciding with the offshore HVAC booster station search area, such that no cumulative effects are predicted on operators of licence blocks at this location.
- 11.13.3.83 The impact is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **negligible**.

Sensitivity of receptor

- 11.13.3.84 As noted above, the affected licence blocks are unlicensed, and therefore there is currently no receptor. Any future operator of the unlicensed blocks will be aware of the Hornsea Three project and will have taken potential coexistence into consideration. The promulgation of information through Notices to Mariners combined with consultation will enable future operators to plan activities taking into account the timing of Hornsea Three operational and maintenance activities. As there is currently no receptor, sensitivity is considered to be **negligible**.

Significance of Effect

- 11.13.3.85 Overall, it is predicted that the sensitivity of the receptor is considered to be **negligible** and the magnitude is deemed to be **negligible**. The effect will, therefore, be of **negligible** adverse significance, which is not significant in EIA terms.

Tier 2

- 11.13.3.86 No Tier 2 projects have been identified.

Tier 3

- 11.13.3.87 No Tier 2 projects have been identified.

The presence of new wind turbines in previously open sea areas, alongside other plans/projects, may cause interference with the performance of the REWS located on oil and gas platforms.

- 11.13.3.88 The physical presence of wind turbines and associated offshore structures has the potential to interfere with the performance of the REWS (see paragraph 11.11.2.65). This system is sometimes used by oil and gas operators as an integral part of their anti-collision safety systems for their offshore platforms (see section 11.7.16).

- 11.13.3.89 Platforms with REWS potentially within operational range of the Hornsea Three array area have been identified (see Table 11.14). This includes the REWS systems on the J6A platform operated by Centrica (see paragraph 11.11.2.66) and on the Murdoch and Saturn platforms operated by ConocoPhillips (see paragraph 11.11.2.67). As discussed in paragraph 11.11.2.67, the Murdoch platform REWS was not considered within this assessment.

- 11.13.3.90 Radar modelling was carried out on the cumulative effect of Hornsea Three together with other relevant projects/plans. For REWS, relevant projects/plans include other offshore wind farms within operational range of the same REWS affected by Hornsea Three. The cumulative radar modelling is presented in volume 5, annex 10.1: Radar Early Warning Systems Technical Annex.

Tier 1

Magnitude of impact

- 11.13.3.91 There are no Tier 1 projects that have the potential to affect the REWS on the J6A platform and so there is no cumulative impact on this system. Hornsea Project One and Hornsea Project Two have the potential to affect the REWS on the Saturn platform. Combined impact modelling of Hornsea Three along with Hornsea Project One and Hornsea Project Two on the Saturn platform REWS was therefore carried out (see volume 5, annex 11.1: Radar Early Warning Systems Technical Annex).
- 11.13.3.92 For a small vessel (100 m² RCS) the radar coverage extends only up to the near edge of the Hornsea Three array area. However the radar coverage also extends over Hornsea Project One and Hornsea Project Two as well as part of the proposed navigation corridor which is formed between Hornsea Three, and Hornsea Project One and Hornsea Project Two. This may affect the detection of traffic passing between the wind farms. The detection performance based on the comparison between the target returns and the detection threshold is shown in Figure 11.14.
- 11.13.3.93 The results of the detection analysis demonstrate that the REWS may not always be able to detect smaller targets travelling within the wind farm region (mainly within Hornsea Project One and Hornsea Project Two). The threshold levels, however, depend highly on the CFAR algorithms deployed within the REWS which is proprietary to the system in use and so could vary if a different algorithm was modelled.
- 11.13.3.94 The performance of the REWS in detecting larger vessels of 1,000 GT or above using a 1,000 m² RCS target vessel was also tested. Although the larger vessel will generate stronger radar returns, the results show that the REWS will have large areas where it would not be able to detect the vessel if it travels through the Hornsea Project One and Hornsea Project Two offshore wind farms. This is mainly due to the strong turbine returns which will inherently increase the detection threshold around the turbines. Larger vessels are likely to be detected as they travel through the proposed navigation corridor between Hornsea Three, and Hornsea Project One and Hornsea Project Two.
- 11.13.3.95 At the time of writing, consultation is ongoing regarding the Saturn REWS. Whilst the above section provides consideration of the potential impact on the Saturn REWS cumulatively from the presence of Hornsea Project One, Hornsea Project Two and Hornsea Three, it is not possible to conclude a magnitude of effect until this consultation has progressed further. As such, no evaluation of magnitude is presented at this stage and this will be updated for the Environmental Statement.

Sensitivity of receptor

- 11.13.3.96 REWS, where installed, play a fundamental part of an operator's anti-collision safety systems on their platform. The platform operator is deemed to be of medium vulnerability, medium recoverability and high value. The sensitivity of the receptor is therefore, considered to be **high**.

Significance of Effect

- 11.13.3.97 A significance of effect has not been assessed for the Saturn platform REWS, operated by ConocoPhillips, as it is not possible to assign magnitude to this potential impact at this stage. This will be updated for the Environmental Statement.

Tier 2

- 11.13.3.98 No Tier 2 projects have been identified.

Tier 3

- 11.13.3.99 No Tier 3 projects have been identified.

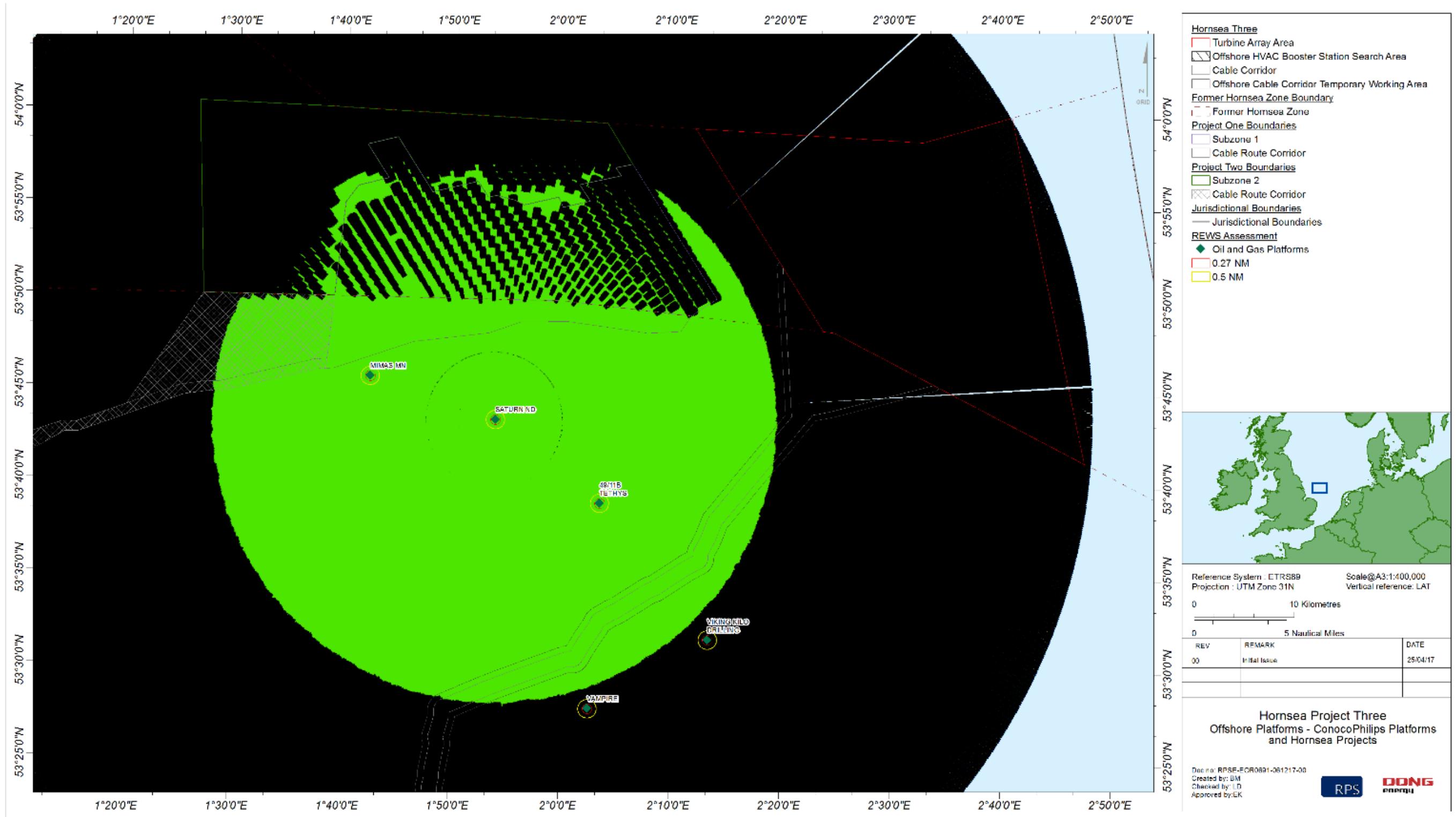


Figure 11.14: Saturn platform REWS detection plot showing loss regions for a 100 m² RCS target test vessel over the combined Hornsea Project One, Hornsea Project Two and Hornsea Three array area.

Wind turbines and associated infrastructure, alongside other plans/projects, may disrupt vessel access to oil and gas platforms and subsea infrastructure.

11.13.3.100 This impact considers vessel access to oil and gas platforms and subsea infrastructure. Cumulative impacts will arise when existing infrastructure already affected by Hornsea Three is also affected by another project/plan. A cumulative effect assessment of disruption to helicopter access to existing or new oil and gas platforms or subsea structures is provided in chapter 8: Aviation, Military and Communication. A cumulative assessment on route deviations to vessels is provided in chapter 7: Shipping and Navigation.

Tier 1

Magnitude of impact

11.13.3.101 The Clipper South platform operated by INEOS is located within 1 km of the Hornsea Three offshore cable corridor. There are no Tier 1 projects located in close proximity to this platform such that cumulative impacts on access are not anticipated. There is one suspended well within the Hornsea Three array area (operated by Wintershall), and one additional suspended well (Topaz, INEOS) located both within 1 km of the Hornsea Three array area and within the proposed navigation corridor. There is no potential for a cumulative impact on vessel access to the suspended well within the Hornsea Three array area, however there is potential for an indirect cumulative effect on vessel access to the Topaz well due to the presence of the proposed navigation corridor between the Hornsea Three array area and Hornsea Project One/Hornsea Project Two, and the presence of shipping traffic. As noted in paragraph 11.13.2.50, any IMO routing measures may lead to restrictions on other activities within the navigation corridor.

11.13.3.102 There are four completed wells within 1 km of the Hornsea Three offshore cable corridor, located in the Clipper South field operated by INEOS. There are no Tier 1 projects located in close proximity to these wells such that cumulative impacts are not anticipated.

11.13.3.103 The impact is predicted to be of local spatial extent, long term duration, continuous and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be **minor**.

Sensitivity of receptor

11.13.3.104 The sensitivity of the receptor varies depending on the information provided through consultation with the operator of the block. Consultation with INEOS has advised that the Topaz suspended well head is likely to be decommissioned prior to Hornsea Three construction, and that they do not have any current exploration plans within the southern North Sea (see Table 11.3). Therefore, there is unlikely to be potential for cumulative disruption to vessel access to existing infrastructure.

11.13.3.105 Close communication will be established between Hornsea Three and the relevant operators in the vicinity of the Hornsea Three array area and offshore cable corridor to ensure that future activities can be coordinated. Any future operator of the unlicensed blocks will be aware of the Hornsea Three project and will have taken potential coexistence into consideration.

11.13.3.106 The oil and gas operator is deemed to be of low vulnerability, high recoverability and high value. The sensitivity of the receptor is therefore, considered to be **low**.

Significance of Effect

11.13.3.107 Overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Tier 2

11.13.3.108 No Tier 2 projects have been identified.

Tier 3

11.13.3.109 No Tier 3 projects have been identified.

Future monitoring

11.13.3.110 No specific monitoring requirements have been identified for the operational and maintenance phase in relation to recreational users and recreational fishing; aggregate extraction, cables and pipelines; and oil and gas operations.

11.13.4 Decommissioning phase

Recreational users and recreational fishing

Hornsea Three infrastructure, safety zones and advisory safety distances associated with activities within the Hornsea Three array area and along the offshore cable corridor, alongside other plans/projects, may displace recreational craft and recreational fishing vessels resulting in a loss of recreational resource.

11.13.4.1 The effects of decommissioning activities are expected to be the same or similar to the effects from construction. The significance of effect is therefore **minor**, which is not significant in EIA terms (see paragraphs 11.13.2.11, 11.13.2.19 and 11.13.2.26).

Aggregate extraction, cables and pipelines

Removal of Hornsea Three infrastructure, alongside other plans/projects, may affect existing cables and pipelines or restrict access to cables and pipelines.

- 11.13.4.2 The effects of decommissioning activities are expected to be the same or similar to the effects from construction. The significance of effect is therefore **minor**, which is not significant in EIA terms (see paragraph 11.13.2.35).

Removal of Hornsea Three infrastructure, alongside other plans/projects, has the potential to lead to increased suspended sediment concentrations and deposition, which could cause a change in aggregate resource in aggregate extraction areas.

- 11.13.4.3 The potential changes to the physical environment due to decommissioning activities are expected to be the same or similar to the effects from construction. The significance of effect is therefore negligible, which is not significant in EIA terms (see paragraph 11.13.2.38).

Oil and gas operations

Hornsea Three infrastructure, safety zones and advisory safety distances associated with decommissioning of the Hornsea Three array area, alongside other plans/projects, may restrict potential seismic survey activity.

- 11.13.4.4 The effects of decommissioning activities are expected to be the same or similar to the effects from construction. The significance of effect is therefore **minor**, which is not significant in EIA terms (see paragraphs 11.13.2.56 and 11.13.2.62).

Drilling and the placement of infrastructure has the potential to be restricted within the Hornsea Three array area and within 1 km from the boundary of the array area by the presence of infrastructure, safety zones and advisory safety distances, alongside other plans/projects.

- 11.13.4.5 The effects of decommissioning activities are expected to be the same or similar to the effects from construction. The significance of effect is therefore **minor**, which is not significant in EIA terms (see paragraphs 11.13.2.74 and 11.13.2.80).

Safety zones around the offshore HVAC booster stations and advisory safety distances associated with activities underway along the offshore cable corridor, alongside other plans/projects, may restrict potential seismic survey activity.

- 11.13.4.6 The effects of decommissioning activities are expected to be the same or similar to the effects from construction. The significance of effect is therefore **negligible**, which is not significant in EIA terms (see paragraph 11.13.2.89).

Drilling and the placement of infrastructure has the potential to be restricted within the offshore cable corridor and within 1 km from the boundary of the offshore cable corridor, alongside other plans/projects.

- 11.13.4.7 The effects of decommissioning activities are expected to be the same or similar to the effects from construction. The significance of effect is therefore **negligible**, which is not significant in EIA terms (see paragraph 11.13.2.99).

Future monitoring

- 11.13.4.8 No specific monitoring requirements have been identified for the decommissioning phase in relation to recreational users and recreational fishing; aggregate extraction, cables and pipelines; and oil and gas operations.

11.14 Transboundary effects

- 11.14.1.1 A screening of transboundary impacts has been carried out and is presented in volume 1, annex 5.3: Transboundary Impacts Screening. This screening exercise identified that there was potential for significant transboundary effects with regard to infrastructure and other users from Hornsea Three upon the interests of other EEA States.

- 11.14.1.2 Potential transboundary impacts that have been identified relate to the following impact:

- The presence of new wind turbines in previously open sea areas may cause interference with the performance of the REWS located on oil and gas platforms.

- 11.14.1.3 This impact is assessed within paragraph 11.11.2.65. The significance of effect will be **moderate** for the J6A platform REWS operated by Centrica, which is significant in EIA terms. The J6A platform is located within Dutch territorial waters (Figure 11.7). Hornsea Three is in consultation with Centrica. There are potential mitigation measures available which will enable the impact to be reduced to an acceptable level to the receptor. The residual effect will therefore be **minor** which is not significant in EIA terms.

11.15 Inter-related effects

- 11.15.1.1 Inter-relationships are considered to be the impacts and associated effects of different aspects of the proposal on the same receptor. These are considered to be:
- Project lifetime effects: Assessment of the scope for effects that occur throughout more than one phase of the project (construction, operational and maintenance, and decommissioning), to interact to potentially create a more significant effect on a receptor than if just assessed in isolation in these three key project stages (e.g. subsea noise effects from piling, operational turbines, vessels and decommissioning); and
 - Receptor led effects: Assessment of the scope for all effects to interact, spatially and temporally, to create inter-related effects on a receptor. As an example, all effects on infrastructure and other users, such as a restriction in potential seismic survey activity, restrictions on drilling and the placement of infrastructure, disruption of vessel access to infrastructure, may interact to produce a different, or greater effect on this receptor than when the effects are considered in isolation. Receptor-led effects might be short term, temporary or transient effects, or incorporate longer term effects.
- 11.15.1.2 A description of the likely inter-related effects arising from Hornsea Three on infrastructure and other users is provided in chapter 12: Inter-Related Effects (Offshore).

11.16 Conclusion and summary

- 11.16.1.1 Consultation has taken place with infrastructure and other users receptors, as presented in section 11.5. A summary of the findings of the assessment completed to date for infrastructure and other users is presented in Table 11.33, Table 11.34 and Table 11.35.
- 11.16.1.2 It is concluded that there will be no significant effects arising from the development of Hornsea Three in isolation during the construction, operational and maintenance, or decommissioning phases on recreational users and recreational fishing receptors; aggregate extraction, cables and pipelines receptors; and oil and gas operators. It should be noted that the significance of effect has not been assessed for Centrica licence blocks as Hornsea Three are in discussions with Centrica and there is not enough certainty in relation to future plans to assign sensitivity to their licence blocks at this stage. These assessments will be updated for the Environmental Statement.
- 11.16.1.3 It is concluded that there will be no significant cumulative effects arising from the development of Hornsea Three when considered alongside other projects/plans on recreational users and recreational fishing receptors; aggregate extraction, cables and pipelines receptors; and for the majority of oil and gas operators.

11.16.1.4 The potential cumulative effect arising from Hornsea Three during the operational and maintenance phase, alongside other projects/plans, on the Saturn platform REWS, operated by ConocoPhillips, has been considered within the assessment. Consultation regarding the Saturn REWS is ongoing and it has not been possible to conclude this assessment until this consultation has progressed further. This assessment will be updated for the Environmental Statement.

11.16.1.5 Transboundary effects relate to effects of Hornsea Three in isolation on the J6A platform REWS operated by Centrica, which is significant in EIA terms. There are mitigation measures available to reduce the significance of effect on the REWS on the J6A platform (see paragraph 11.16.1.4). Hornsea Three proposes that further consultation with Centrica shall be undertaken to ascertain suitable options. Following the implementation of mitigation measures it is anticipated that the residual effect will be not significant in EIA terms.

11.16.1.6 Inter-related effects arising from Hornsea Three on infrastructure and other users is provided in chapter 11: Inter-Related Effects (Offshore).

11.17 Next Steps

- 11.17.1.1 Further consultation is required to refine the impacts on oil and gas operators. This consultation shall continue during the preparation of the Environmental Statement such that the most up to date information can be used within the assessments.

Table 11.33: Summary of potential environment effects, mitigation and monitoring: recreational users and recreational fishing.

Description of impact	Measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Construction Phase							
Hornsea Three infrastructure, safety zones and advisory safety distances associated with activities within the Hornsea Three array area and along the offshore cable corridor may displace recreational craft and recreational fishing vessels resulting in a loss of recreational resource	Promulgation of Information through Notices to Mariners	Minor	Low	Negligible (not significant in EIA terms)	None	N/A	None
Operation Phase							
Hornsea Three infrastructure, safety zones and advisory safety distances associated with infrastructure and maintenance activities within the Hornsea Three array area and along the offshore cable corridor may displace recreational craft and recreational fishing vessels resulting in a loss of recreational resource	Promulgation of Information through Notices to Mariners	Negligible	Low	Negligible (not significant in EIA terms)	None	N/A	None
Decommissioning Phase							
Hornsea Three infrastructure, safety zones and advisory safety distances associated with activities within the Hornsea Three array area and along the offshore cable corridor may displace recreational craft and recreational fishing vessels resulting in a loss of recreational resource	Promulgation of Information through Notices to Mariners	Minor	Low	Negligible (not significant in EIA terms)	None	N/A	None

Table 11.34: Summary of potential environment effects, mitigation and monitoring: aggregate extraction, cables and pipelines.

Description of impact	Measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Construction Phase							
Installation of Hornsea Three infrastructure may affect existing cables and pipelines or restrict access to cables and pipelines	Cable/pipeline crossing and proximity agreements will be established with relevant operators	Minor	High	Minor (not significant in EIA terms)	None	N/A	None
Installation of infrastructure has the potential to lead to increased suspended sediment concentrations and deposition, which could cause a change in aggregate resource in aggregate extraction areas	N/A	Negligible	Medium	Negligible	None	N/A	None
Operation Phase							
Hornsea Three infrastructure, safety zones and advisory safety distances may lead to a temporary loss of access to existing cables and pipelines for repair or maintenance	Cable/pipeline crossing and proximity agreements will be established with relevant operators	Minor	High	Minor (not significant in EIA terms)	None	N/A	None
Decommissioning Phase							
Removal of Hornsea Three infrastructure may affect existing cables and pipelines or restrict access to cables and pipelines	Cable/pipeline crossing and proximity agreements will be established with relevant operators	Minor	High	Minor (not significant in EIA terms)	None	N/A	None
Removal of infrastructure has the potential to lead to increased suspended sediment concentrations and deposition, which could cause a change in aggregate resource in aggregate extraction areas	N/A	Negligible	Medium	Negligible	None	N/A	None

Table 11.35: Summary of potential environment effects, mitigation and monitoring: oil and gas operations.

Description of impact	Measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Construction Phase							
Hornsea Three infrastructure, safety zones and advisory safety distances associated with the Hornsea Three array area may restrict potential seismic survey activity	Promulgation of information through Notices to Mariners. Ongoing consultation with oil and gas operators will promote and maximise cooperation between parties and minimise both spatial and temporal interactions to facilitate coexistence	Major (49/4b currently operated by Centrica and 49/9 currently unlicensed); Moderate (49/3, 49/4d, 49/9c and 49/9d currently operated by Centrica and 49/2 currently unlicensed); Minor (49/4a currently operated by Centrica, 49/2a and 49/9b currently operated by INEOS and 49/9a currently operated by Shell, 49/4 and 49/8 currently unlicensed); and Negligible (49/1a currently operated by INEOS, 49/8a and 49/7 currently unlicensed).	Low (INEOS and Shell) Negligible (unlicensed blocks) Hold (Centrica), to be updated for Environmental Statement.	Minor (49/2a and 49/9b currently operated by INEOS, 49/9a currently operated by Shell, and currently unlicensed blocks 49/2, 49/4, 49/8 and 49/9) (not significant in EIA terms); and Negligible (49/1a currently operated by INEOS, 49/8a currently operated by Shell, and currently unlicensed block 49/7) (not significant in EIA terms). Hold (Centrica), to be updated for Environmental Statement.	None	N/A	None
Drilling and the placement of infrastructure has the potential to be restricted within the Hornsea Three array area and within 1 km from the boundary of the array area by the presence of infrastructure, safety zones and advisory safety distances	Ongoing consultation with oil and gas operators will promote and maximise cooperation between parties and minimise both spatial and temporal interactions to facilitate coexistence						
Safety zones around the offshore HVAC booster stations and advisory safety distances associated with activities underway along the offshore cable corridor may restrict potential seismic survey activity	Promulgation of information through Notices to Mariners. Ongoing consultation with oil and gas operators will promote and maximise cooperation between parties and minimise both spatial and temporal interactions to facilitate coexistence	Minor (licence blocks 48/20a, 48/20b, 48/24, 48/24b, 48/27, 48/28, 49/8, 49/11a, 49/7 and 52/1); and Negligible (all other licence blocks).	Low (licenced blocks) Negligible (unlicensed blocks)	Minor (448/20a currently operated by Shell, 48/20b currently operated by INEOS, 48/24b currently operated by Independent Oil and Gas and 49/11a currently operated by ConocoPhillips) (not significant in EIA terms); Negligible (all other licence blocks) (not significant in EIA terms).	None	N/A	None
Drilling and the placement of infrastructure has the potential to be restricted within the offshore cable corridor and within 1 km from the boundary of the offshore cable corridor	Ongoing consultation with oil and gas operators will promote and maximise cooperation between parties and minimise both spatial and temporal interactions to facilitate coexistence						
The piling of wind turbine and substation foundations will generate underwater noise that may acoustically interfere with seismic survey operations	Ongoing consultation with oil and gas operators will promote and maximise cooperation between parties and minimise both spatial and temporal interactions to facilitate coexistence	Moderate	Low	Minor (not significant in EIA terms)	None	N/A	None

Description of impact	Measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Operation Phase							
The presence of infrastructure within the Hornsea Three array area may restrict potential seismic survey activity	Ongoing consultation with oil and gas operators will promote and maximise cooperation between parties and minimise both spatial and temporal interactions to facilitate coexistence	Major (49/4b currently operated by Centrica and 49/9 currently unlicensed); Moderate (49/3, 49/4d, 49/9c and 49/9d currently operated by Centrica and 49/2 currently unlicensed);	Low (INEOS and Shell) Negligible (unlicensed blocks)	Minor (49/2a and 49/9b currently operated by INEOS, 49/9a currently operated by Shell, and currently unlicensed blocks 49/2, 49/4, 49/8 and 49/9) (not significant in EIA terms); and	None	N/A	None
Drilling and the placement of infrastructure has the potential to be restricted within the Hornsea Three array area and within 1 km from the boundary of the array area by the presence of infrastructure, safety zones and advisory safety distances	Ongoing consultation with oil and gas operators will promote and maximise cooperation between parties and minimise both spatial and temporal interactions to facilitate coexistence	Minor (49/4a currently operated by Centrica, 49/2a and 49/9b currently operated by INEOS and 49/9a currently operated by Shell, 49/4 and 49/8 currently unlicensed); and Negligible (49/1a currently operated by INEOS, 49/8a and 49/7 currently unlicensed).	Hold (Centrica), to be updated for Environmental Statement.	Negligible (49/1a currently operated by INEOS, 49/8a currently operated by Shell, and currently unlicensed block 49/7) (not significant in EIA terms). Hold (Centrica), to be updated for Environmental Statement.			
Safety zones around the offshore HVAC booster stations and advisory safety distances associated with maintenance activities underway along the offshore cable corridor may restrict potential seismic survey activity	Promulgation of information through Notices to Mariners. Ongoing consultation with oil and gas operators will promote and maximise cooperation between parties and minimise both spatial and temporal interactions to facilitate coexistence	Minor (48/24b currently operated by Independent Oil and Gas and 48/24 currently unlicensed); and Negligible for all other licence blocks.	Low (licenced blocks) Negligible (unlicensed blocks)	Minor (48/24b currently operated by Independent Oil and Gas) (not significant in EIA terms); Negligible (all other licence blocks) (not significant in EIA terms).	None	N/A	None
Drilling and the placement of infrastructure has the potential to be restricted within the offshore cable corridor and within 1 km from the boundary of the offshore cable corridor	Ongoing consultation with oil and gas operators will promote and maximise cooperation between parties and minimise both spatial and temporal interactions to facilitate coexistence	Minor (licence blocks 48/20a, 48/20b, 48/24, 48/24b, 48/27, 48/28, 49/2, 49/7, 49/8, 49/11a and 52/1); and Negligible (all other licence blocks).	Low (licenced blocks) Negligible (unlicensed blocks)	Minor (48/20a currently operated by Shell, 48/20b currently operated by INEOS, 48/24b currently operated by Independent Oil and Gas and 49/11a currently operated by ConocoPhillips), (not significant in EIA terms); Negligible (all other licence blocks), (not significant in EIA terms).	None	N/A	None

Description of impact	Measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
The presence of new wind turbines in previously open sea areas may cause interference with the performance of the REWS located on oil and gas platforms		Moderate (J6A platform REWS, operated by Centrica); Minor (Saturn REWS, operated by ConocoPhillips).	High	Moderate (J6A platform REWS operated by Centrica) (significant in EIA terms); Minor (Saturn platform REWS operated by ConocoPhillips) (not significant in EIA terms).	There are potential mitigation measures available to reduce the significance of effect on the REWS on the J6A platform, such as updating the tracking and thresholding software to reduce losses within the wind farms. The implementation of any mitigation measures through software modifications is highly dependent on the REWS setup. Hornsea Three proposes that further consultation with Centrica shall be undertaken to ascertain suitable options.	Minor (not significant in EIA terms).	None
Wind turbines and associated infrastructure will form a physical obstruction and may disrupt vessel access to oil and gas platforms and subsea infrastructure	Ongoing consultation with oil and gas operators will promote and maximise cooperation between parties and minimise both spatial and temporal interactions to facilitate coexistence	Minor	Low	Minor (not significant in EIA terms)	None	N/A	None
Decommissioning Phase							
Hornsea Three infrastructure, safety zones and advisory safety distances associated with decommissioning of the Hornsea Three array area may restrict potential seismic survey activity	Promulgation of information through Notices to Mariners. Ongoing consultation with oil and gas operators will promote and maximise cooperation between parties and minimise both spatial and temporal interactions to facilitate coexistence	Major (49/4b currently operated by Centrica and 49/9 currently unlicensed); Moderate (49/3, 49/4d, 49/9c and 49/9d currently operated by Centrica and 49/2 currently unlicensed); Minor (49/4a currently operated by Centrica, 49/2a and 49/9b currently operated by INEOS and 49/9a currently operated by Shell, 49/4 and 49/8 currently unlicensed); and Negligible (49/1a currently operated by INEOS, 49/8a and 49/7 currently unlicensed).	Low (INEOS and Shell) Negligible (unlicensed blocks) Hold (Centrica), to be updated for Environmental Statement.	Minor (49/2a and 49/9b currently operated by INEOS, 49/9a currently operated by Shell, and currently unlicensed blocks 49/2, 49/4, 49/8 and 49/9) (not significant in EIA terms); and Negligible (49/1a currently operated by INEOS, 49/8a currently operated by Shell, and currently unlicensed block 49/7) (not significant in EIA terms). Hold (Centrica), to be updated for Environmental Statement.	None	N/A	None
Drilling and the placement of infrastructure has the potential to be restricted within the Hornsea Three array area and within 1 km from the boundary of the array area by the presence of infrastructure, safety zones and advisory safety distances	Ongoing consultation with oil and gas operators will promote and maximise cooperation between parties and minimise both spatial and temporal interactions to facilitate coexistence						

Description of impact	Measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Safety zones around the offshore HVAC booster stations and advisory safety distances associated with activities underway along the offshore cable corridor may restrict potential seismic survey activity	Promulgation of information through Notices to Mariners. Ongoing consultation with oil and gas operators will promote and maximise cooperation between parties and minimise both spatial and temporal interactions to facilitate coexistence	Minor (licence blocks 48/20a, 48/20b, 48/24, 48/24b, 48/27, 48/28, 49/8, 49/11a, 49/7 and 52/1); and Negligible (all other licence blocks).	Low (licenced blocks) Negligible (unlicensed blocks)	Minor (448/20a currently operated by Shell, 48/20b currently operated by INEOS, 48/24b currently operated by Independent Oil and Gas and 49/11a currently operated by ConocoPhillips) (not significant in EIA terms); Negligible (all other licence blocks) (not significant in EIA terms).	None	N/A	None
Drilling and the placement of infrastructure has the potential to be restricted within the offshore cable corridor and within 1 km from the boundary of the offshore cable corridor	Ongoing consultation with oil and gas operators will promote and maximise cooperation between parties and minimise both spatial and temporal interactions to facilitate coexistence						

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