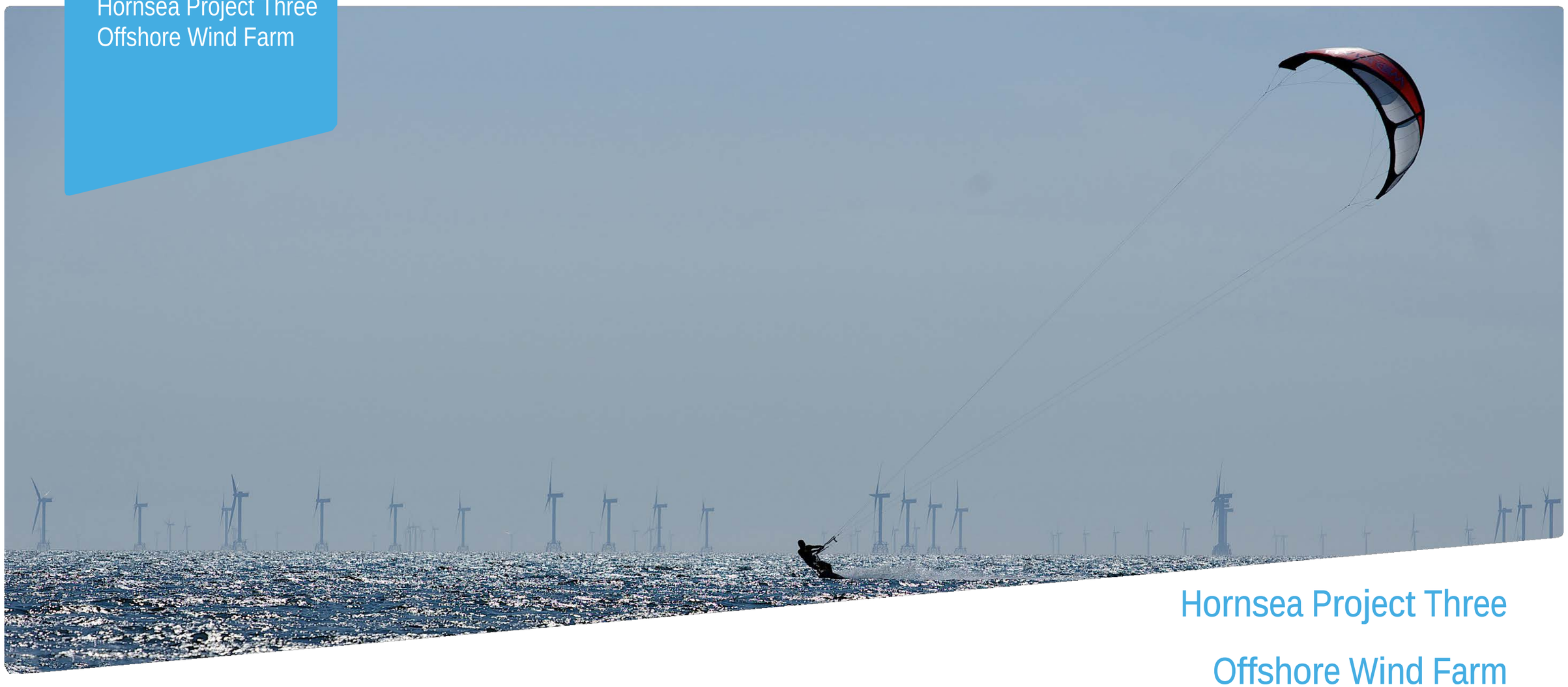
Hornsea Project Three
Offshore Wind Farm



Hornsea Project Three

Offshore Wind Farm

Environmental Statement:
Volume 2, Chapter 8 – Aviation, Military and Communication

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Hornsea 3
Offshore Wind Farm

Ørsted

Environmental Impact Assessment

Environmental Statement

Volume 2

Chapter 8 – Aviation, Military and Communication

Report Number: A6.2.8

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Date: May 2018

This report is also downloadable from the Hornsea Project Three offshore wind farm website at:

www.hornseaproject3.co.uk

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Front cover picture: Kite surfer near a UK offshore wind farm © Orsted Hornsea Project Three (UK) Ltd., 2018.

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Glossary

Term	Definition
0° Isotherm	The altitude in which the temperature is at 0°C (the freezing point of water) in a free atmosphere.
Flight Level	A standard nominal altitude of an aircraft, in hundreds of feet, based upon a standardised air pressure at sea-level.
Helicopter Main Route (HMR)	Routes which are established to facilitate safe helicopter flights in Instrument Flight Rules (IFR) conditions (i.e. when flight cannot be completed in visual conditions).
The icing level	The icing level is the height at which the air temperature reaches freezing (the 0° isotherm).
Instrument Approach	A procedure used by helicopters for low-visibility offshore approaches to offshore platforms which relies upon an aircraft's on-board weather radar for guidance and as a means of detecting obstacles in the approach path.
Instrument Flight Rules (IFR)	The rules governing procedures for flights conducted on instruments.
Instrument Meteorological Conditions(IMC)	Weather conditions which would preclude flight by the Visual Flight Rules (VFR) (i.e. conditions where the aircraft is in or close to cloud or flying in visibility less than a specified minimum).
Minimum Safe Altitude (MSA)	Under aviation flight rules, the altitude below which it is unsafe to fly in IMC owing to presence of terrain or obstacles within a specified area.
Missed Approach Procedure (MAP)	The actions for the crew of an aircraft to take when an instrument approach procedure is not successful (e.g. the crew are unable to see the runway, approach lights or helideck).
Precision Approach Radar (PAR)	A military instrument approach system which provides both horizontal and vertical guidance for landing from 10 or 20 nautical miles (nm) from the airfield.
Uncontrolled airspace	Airspace in which Air Traffic Control (ATC) does not exercise any executive authority, but may provide basic information services to aircraft in radio contact. In the UK, Class G airspace is uncontrolled.
Visual Flight Rules (VFR)	The rules governing flight conducted visually (i.e. with the crew maintaining separation from obstacles and other aircraft visually).

Acronyms

Acronym	Description
ADR	Air Defence Radar
agl	Above ground level
Amsl	Above mean sea level
AIP	Aeronautical information package
AIS	Aeronautical Information Service
ANSP	Air Navigation Service Provider
ARA	Airborne Radar Approach
ASAC	Airspace surveillance and control systems
ATA	Aerial tactics area
ATC	Air Traffic Control
ATS	Air Traffic Services
ATSU	Air Traffic Service Unit
CAA	Civil Aviation Authority
CAP	Civil Aviation Publication
Centrica, UK	Centrica North Sea Ltd
Centrica Netherlands	Centrica Production Nederland B.V.
Centrica Resources UK	Centrica Resources Ltd,
CHC	CHC Scotia Helicopters Ltd
CNS	Communication, navigation and surveillance
DfT	Department for Transport
DGC	Defence Geographic Centre
DIO	Defence Infrastructure Organisation
DSC	Digital Selective Calling
Engie E&P	Engie E&P UKCS Ltd
Engie E&P Netherlands	ENGIE E&P Nederland B.V
ERCoP	Emergency Response and Cooperation Plan
Faroe Petroleum	Faroe Petroleum (U.K.) Ltd

Acronym	Description
FIR	Flight Information Region
FL	Flight Level
GPS	Global Positioning System
HMR	Helicopter Main Route
IFR	Instrument Flight Rules
ILS	Instrument Landing Systems
IMC	Instrument Meteorological Conditions
INEOS	INEOS UK SNS Ltd
JRC	The AW4Joint Radio Company Ltd
LOS	Line of Sight
MAP	Missed Approach Procedure
MAPt	Missed Approach Procedure point
MCA	Maritime and Coastguard Agency
MDA	Managed Danger Area
MET	Meteorological
MGN	Maritime Guidance Notice
MHWS	Mean High Water Springs
MOD	Ministry of Defence
MESA	Minimum Enroute Safe Altitude
MSA	Minimum Safe Altitude
NAM	Nederlandse Aardolie Maatschappij B.V.
NATO	North Atlantic Treaty Organisation
NATS	NATS Ltd. (formerly National Air Traffic Services Ltd.)
NHV	Noordzee Helikopters Vlaaderen
NOTAM	Notice to Airmen
OGA	Oil and Gas Authority
OLS	Obstacle limitation surfaces
ORAG	Offshore Renewables Aviation Guidance
OSA	Offshore Safety Area

Acronym	Description
PAR	Precision Approach Radar
PSR	Primary Surveillance Radar
SARG	Safety and Airspace Regulation Group
Shell	Shell UK Ltd.
Spirit Energy	Spirit Energy Ltd, a new company arising from a Centrica E&P and Bayerngas Norge AS joint venture; part of the Centrica Group.
Spirit Energy North Sea	Spirit Energy North Sea Ltd, formerly Centrica North Sea Ltd; part of the Centrica Group.
Spirit Energy Resources	Spirit Energy Resources Ltd formerly Spirit Norway Ltd, and prior to that Centrica resources Ltd; part of the Centrica Group.
SSR	Secondary Surveillance Radar
Third Energy	Third Energy Offshore Ltd
Total, UK	Total E&P UK Ltd
Total, Netherlands	Total E&P Nederland B.V.
TRA	Temporary Reserved Airspace
TTA	Technical Training Area
TV	Television
UHF	Ultra High Frequency
UKCS	United Kingdom Continental Shelf
UKHO	United Kingdom Hydrographic Office
UKLFS	UK low flying system
UXO	Unexploded Ordinance
VFR	Visual Flight Rules
VHF	Very High Frequency
Wintershall	Wintershall Holding GmbH

Units

Unit	Description
ft	Feet
km	kilometre
GW	Gigawatt
m	metre
m/s	metre per second
MW	Megawatt
nm	nautical mile

8. Aviation, Military and Communication

8.1 Introduction

8.1.1.1 This chapter of the Environmental Statement presents the results 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 aviation, military and communication receptors. 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.

8.1.1.2 The impacts of Hornsea Three on Search and Rescue helicopter operations, and radar interference associated with shipping and vessel navigation are considered in volume 2, chapter 7: Shipping and Navigation. Subsea telecommunication cables are discussed in volume 2, chapter 10: Infrastructure and Other Users.

8.1.1.3 The more detailed technical information which underpins the baseline and impact assessment presented in this chapter is contained within volume 5, annex 8.1: Aviation, Military and Communication Technical Report.

8.2 Purpose of this chapter

8.2.1.1 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) and accompanies the application to the Secretary of State for Development Consent.

8.2.1.2 It is intended that the Environmental Statement will provide statutory and non-statutory consultees with sufficient information to complete the examination of Hornsea Three and will form the basis of agreement on the content of the DCO and/or Marine Licence conditions (as required).

8.2.1.3 In particular, this Environmental Statement chapter:

- Presents the existing environmental baseline established from desk studies, and consultation;
- Presents the potential environmental effects on aviation, military and communication arising from Hornsea Three, based on the information gathered and the analysis and assessments undertaken;
- 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.

8.3 Study area

8.3.1.1 The aviation, military and communication study area is shown in Figure 8.1 below. This includes the Hornsea Three array area and the offshore cable corridor, which comprises the offshore development footprint, as well as the airspace between the Hornsea Three array area and the UK mainland from Norwich airport to the south and RAF Staxton Wold to the north. The Hornsea Three aviation, military and communication study area also covers:

- The airspace most likely to be used by helicopters servicing Hornsea Three. It is not yet known which helicopter provider would be used for Hornsea Three or from which airport the helicopter operator would be based, however flights are likely to originate from the east coast of the UK or to come from an offshore base or vessel with helicopter personnel transfer;
- Radars on the east coast of England that could potentially detect 325 m high (blade tip) wind turbines within the Hornsea Three array area;
- Helicopter Main Routes (HMRs) operating within the proximity of the Hornsea Three array area;
- Offshore platforms that have 9 nm consultation zones that overlap with the Hornsea Three array area;
- Low flying areas and military practice areas that intersect or are adjacent to the Hornsea Three array area and offshore cable corridor;
- Microwave links within 30 km from the centre of the Hornsea Three array area; and
- Very high frequency (VHF)/ultra-high frequency (UHF) communications.

8.3.1.2 The aviation, military and communication study area includes Hornsea Project One which was granted development consent in December 2014 and Hornsea Project Two which was granted development consent in August 2016.

8.3.1.3 The southern North Sea aviation, military and communication study area is the area considered within the cumulative effect assessment (CEA) for the assessment of radar impacts. The southern North Sea aviation, military and communication study area encapsulates the southern North Sea and adjacent Dutch territorial waters (see Figure 8.1) which also includes other offshore wind farms in the southern North Sea and in Dutch territorial waters that could have potential effects on identified radar receptors.

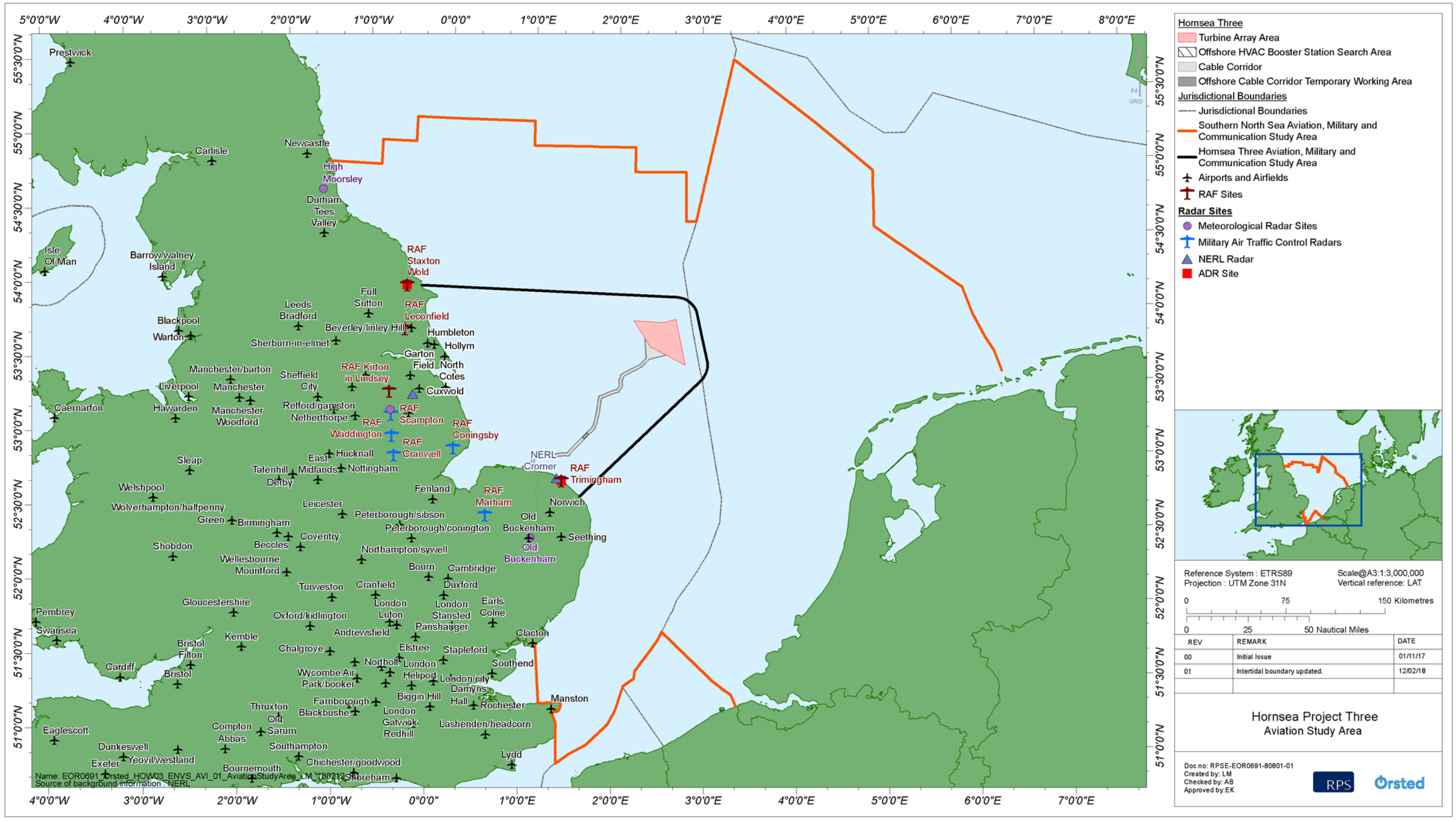

Figure 8.1: Location of the Hornsea Three aviation, military and communication study area and the southern North Sea aviation, military and communication study area.

8.4 Planning policy context

8.4.1 National Policy Statements

8.4.1.1 Planning policy on offshore renewable energy Nationally Significant Infrastructure Projects (NSIPs), specifically in relation to aviation, military and communication, is contained in the Overarching National Policy Statement (NPS) for Energy (NPS EN-1; DECC, 2011a) and the NPS for Renewable Energy Infrastructure (EN-3, DECC, 2011b).

8.4.1.2 NPS EN-1 includes guidance on what matters are to be considered in the assessment. These are summarised in Table 8.1 below.

Table 8.1: Summary of NPS EN-1 provisions relevant to aviation, military and communication.

Summary of NPS EN-1 provision	How and where considered in the Environmental Statement
Where the proposed development may have an effect on civil or military aviation and/or other defence assets an assessment of potential effects should be set out in the Environmental Statement (paragraph 5.4.10 of NPS EN-1).	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 maintenance, and decommissioning). See section 8.11 of this chapter.
The applicant should consult the Ministry of Defence (MOD), Civil Aviation Authority (CAA), NATS Ltd (NATS) and any aerodrome – licensed or otherwise – likely to be affected by the proposed development (paragraph 5.4.11 of NPS EN-1).	Consultation with potentially affected stakeholders has been carried out from the early stages of the project (see Table 8.4 of this chapter).
Any assessment of aviation or other defence interests should include potential impacts of the project upon the operation of Communication, Navigation and Surveillance (CNS) infrastructure, flight patterns (both civil and military), other defence assets and aerodrome operational procedures. It should also assess the cumulative effects of the project with other relevant projects in relation to aviation and defence (paragraph 5.4.12 of NPS EN-1).	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 maintenance, and decommissioning). See section 8.11 of this chapter. Cumulative effects have been assessed in section 8.13 of this chapter.

8.4.1.3 NPS EN-1 also highlights a number of factors relating to the determination of an application and in relation to mitigation. These are summarised in Table 8.2 below.

Table 8.2: Summary of NPS EN-1 policy on decision making relevant to aviation, military and communication.

Summary of NPS EN-1 policy on decision making (and mitigation)	How and where considered in the Environmental Statement
Secretary of State should be satisfied that the effects on civil and military aerodromes, aviation technical sites and other defence assets have been addressed by the applicant and that any necessary assessment of the proposal on aviation or defence interests has been carried out. In particular, it should be satisfied that the proposal has been designed to minimise adverse impacts upon the operation and safety of aerodromes and that reasonable mitigation is carried out (paragraph 5.4.14 of NPS EN-1).	Consultation has involved all relevant aviation, military and communication stakeholders which include but are not limited to: • NATS; • CAA; • Regional Aerodromes; • Norwich and Humberside Airports; • Helicopter Operators: Bristow, Noordzee Helikopters Vlaaderen (NHV), Bond, CHC Scotia Helicopters Ltd (CHC) Uni-Fly A/S (Uni-Fly), Babcock NCS, British International Helicopters (BIH); • Oil and Gas operators: Alpha Petroleum, ConocoPhillips, Wintershall Holding GmbH (Wintershall), Perenco, Faroe Petroleum (U.K.) Ltd (Faroe Petroleum), Spirit Energy Ltd (formerly Centrica E&P) ; Spirit Energy North Sea Ltd (formerly Centrica North Sea Ltd) and Spirit Energy Resources Ltd (formerly Centrica Resources Ltd; and Third Energy Offshore Ltd (Third Energy), Engie E&P UKCS Ltd (Engie E&P), Ineos UK SNS Ltd (Ineos), Shell UK Ltd (Shell), Total E&P UK Ltd (Total, UK), Nederlandse Aardolie Maatschappij B.V. (NAM), Total E&P Nederland B.V. (Total Netherlands), ENGIE E&P Nederland B.V (Engie E&P Netherlands); • MOD; • Defence Geographic Centre; and • Meteorological office (Met office). Comments from these stakeholders have been considered in the Hornsea Three EIA. It is by this pre-application consultation that Hornsea Three, along with adhering to relevant legislation/guidance, ensures that the requirements of NPS EN-1 are met in relation to assessing the impact on civil and military aerodromes, aviation technical sites and other defence assets. The impact assessment on aviation, military and communication is presented in section 8.11 of this chapter.
If there are conflicts between the Government's energy and transport policies and military interests in relation to the application, the Secretary of State should expect the relevant parties to have made appropriate efforts to work together to identify realistic and pragmatic solutions to the conflicts. In so doing, the parties should seek to protect the aims and interests of the other parties as far as possible (paragraph 5.4.15 of NPS EN-1).	The following impact assessment shows that Hornsea Three has taken steps to avoid or reduce the impact of the development through mitigation and mutually agreed solutions. Mitigation measures for aviation, military and communication receptors are presented in Table 8.13 of this chapter. The impact assessment on aviation military and communication receptors is presented in section 8.11 of this chapter.

Summary of NPS EN-1 policy on decision making (and mitigation)	How and where considered in the Environmental Statement
Where aviation and navigation lighting is requested on structures that goes beyond statutory requirements by any of the relevant aviation and defence consultees, the Secretary of State should satisfy itself of the necessity of such lighting taking into account the case put forward by the consultees. The effect of such lighting on the landscape and ecology may be a relevant consideration (paragraph 5.4.16 of NPS EN-1).	Aviation lighting requirements are outlined in section 8.10 of this chapter and will satisfy the requirements of CAP 393 (Article 223) (CAA, 2016a). An indicative lighting plan is included in volume 2, chapter 10: Seascape and Visual Resources.
Where, after reasonable mitigation, operational changes, obligations and requirements have been proposed, the Secretary of State considers that: • a development would prevent a licensed aerodrome from maintaining its licence; • the benefits of the proposed development are outweighed by the harm to aerodromes serving business, training or emergency service needs; or • the development would significantly impede or compromise the safe and effective use of defence assets or significantly limit military training; • the development would have an impact on the safe and efficient provision of *en route* air traffic control services for civil aviation; consent should not be granted (paragraph 5.4.17 of NPS EN-1).	Hornsea Three has been sited to minimise conflicts with aviation, military and communication receptors. In cases where conflict has been highlighted by early consultation, Hornsea Three has, where appropriate, proposed mitigation measures to reduce or negate impacts. Mitigation measures for aviation, military and communication receptors are presented in Table 8.13 of this chapter. The impact assessment on aviation military and communication receptors are presented in section 8.11 of this chapter.
Where a proposed energy infrastructure development would significantly impede or compromise the safe and effective use of civil or military aviation or defence assets and or significantly limit military training, the Secretary of State may consider the use of 'Grampian', or other forms of condition which relate to the use of future technological solutions, to mitigate impacts. Mitigation for infringement of Obstacle Limitation Surfaces (OLS) may include: • amendments to layout or scale of infrastructure; • changes to operational procedures of the aerodromes in accordance with relevant guidance; and • installation of obstacle lighting and/or by notification in Aeronautical Information Service publications. For CNS infrastructure, the UK military Low Flying system (including Tactical Training Areas (TTAs)) and designated air traffic routes, mitigation may also include: • lighting; • operational airspace changes; and • upgrading of existing CNS infrastructure. Mitigation for effects on radar, communications and navigational systems may include reducing the scale of a project (paragraphs 5.4.18 – 5.4.21 of NPS EN-1).	Hornsea Three has been sited to minimise conflicts with aviation, military and communication receptors. In cases where conflict has been highlighted by early consultation, Hornsea Three has, where appropriate, proposed mitigation measures to reduce or negate impacts. Mitigation measures for aviation, military and communication receptors are presented in Table 8.13 of this chapter. The impact assessment on aviation military and communication receptors is presented in section 8.11 of this chapter.

8.4.2 Other relevant policies

8.4.2.1 The aviation military and communication assessment has also taken consideration the specific policies set out in the East Offshore Coast Marine Plans (MMO, 2014). Key provisions are set out in Table 8.3 along with details as to how these have been considered within the assessment.

Table 8.3: East Marine Plans polices of relevance to this chapter.

Policy	Key Provisions	How and where considered in the Environmental Statement
Defence DEF1	Proposals in or affecting Ministry of Defence Danger and Exercise Areas should not be authorised without agreement from the Ministry of Defence.	MOD Danger and exercise areas are discussed in section 8.7.3 and in Table 8.9. Consultation with the MOD is included in Table 8.4.

8.5 Consultation

8.5.1.1 A summary of the key issues raised during consultation specific to aviation, military and communication is outlined below, together with how these issues have been considered in the production of this Environmental Statement chapter.

8.5.2 Hornsea Project One and Hornsea Project Two consultation

8.5.2.1 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 aviation, military and communication, are set out in volume 4, annex 1.1: Hornsea Project One and Hornsea Project Two Consultation of Relevance to Hornsea Three.

8.5.3 Hornsea Three consultation

8.5.3.1 Table 8.4 below summarises the issues raised relevant to aviation, military and communication, which have been identified during consultation activities undertaken to date. Table 8.4 also indicates either how these issues have been addressed within this Environmental Statement or how Hornsea Three has had regard to them. Further information on the consultation activities undertaken for Hornsea Three can be found in the Consultation Report (document reference number A5.1) that accompanies the application for Development Consent.

Table 8.4: Summary of key consultation issues raised during consultation activities undertaken for Hornsea Three relevant to aviation, military and communication.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
27 January 2016	JRC – pre-application consultation email	Hornsea Three requested a radio systems assessment for utility companies from JRC. JRC does not foresee any potential problems based on known interference scenarios and the data provided to them at the time of their assessment.	Radio interference is detailed in section 8.7.4.
18 August 2016	Ofcom – pre-application consultation email	Hornsea Three requested an Ofcom search for microwave fixed links within a 30 km radius of a central point within the Hornsea Three array area. Ofcom provided a list of microwave fixed links.	All known microwave fixed links are assessed in paragraph 8.11.2.81.
25 August 2016	Atkins – pre-application consultation email	Hornsea Three requested an assessment of UHF Radio Scanning Telemetry communications used in the region and were advised there were no objections to Hornsea Three.	Radio interference is detailed in section 8.7.4.
4 October 2016	INEOS – pre-application consultation meeting	Advised that the Windermere platform and Topaz well, is not producing and that decommissioning is planned and anticipated to be complete prior to Hornsea Three construction (2022). No decommissioning plans have as yet been submitted to BEIS. Programme can take five years. Advised that at present INEOS do not have any exploration plans in southern North Sea.	Helicopter access to the Windermere platform is assessed in paragraph 8.11.2.29 et seq. Helicopter access to subsea infrastructure and licenced acreage within 9 nm of the Hornsea Three array area is assessed in paragraph 8.11.2.75.
24 October 2016	Shell – pre-application consultation meeting	Provided information in regard to helicopter access requirements to the Cutter and Carrack platforms. Shell confirmed that in the short term, no decommissioning activities are planned and that there are no plans for new platforms. Shell confirmed that they had no immediate concerns from an exploration perspective. Advised that Carrack west wellhead has been decommissioned.	As the Cutter platform does not have a helideck, helicopter access to this platform is not assessed. Helicopter access to the Carrack platform is assessed in paragraph 8.11.2.29 et seq.
10 November 2016	Faroe Petroleum – pre-application consultation meeting	Provided information in regard to helicopter operations to the Schooner and Ketch platforms and the potential decommissioning dates of these platforms being prior to Hornsea Three construction. Advised that further information would be known end of 2017. Advised that Faroe Petroleum were moving towards use of boats for maintenance programmes as this was more cost effective. Advised that little activity occurred in the licenced areas that are within 9 nm of the Hornsea three array area, and that any activity associated with existing operations would occur within the 500 m safety zones of the Schooner and Ketch platforms.	Helicopter access to the Schooner A and Ketch platforms is assessed in paragraph 8.11.2.29. Helicopter access to subsea infrastructure and licenced acreage within 9 nm of the Hornsea Three array area is assessed in paragraph 8.11.2.75.
25 November 2016	PINS – Scoping Opinion	Agreement that effects on cellular phone coverage can be scoped out as there is no coverage in the vicinity of the Hornsea Three array area. Insufficient information to support a decision to scope out the effects on military ATC radar and meteorological radar at this stage. Advised Hornsea Three to seek agreement from relevant consultees on scoping out these matters.	Consultation on military ATC radar was held with the MOD which is discussed in Table 8.5 and in paragraph 8.7.5.6 Consultation with regard to meteorological radar was held with the Met Office which is discussed in Table 8.5 and in paragraph 8.7.5.7.
25 November 2016	MOD – Scoping Response	The potential for the offshore development area to contain unexploded ordnance (UXO) has been identified and need to address this hazard. The extent of maritime military practice and exercise areas and use of airspace for defence purposes in the vicinity of Hornsea Three have been recognised. Hornsea Three has also specifically identified the potential effect that the wind farm may have upon the effective operation of defence radars and aviation. The need for the proposed development to be fitted with relevant aviation and maritime warning lighting to maintain navigational safety is identified.	UXO within the Hornsea Three array area and offshore cable corridor has been considered in a historical context in volume 2, chapter 9: Marine Archaeology. The potential hazard related to UXO during construction will be considered in the Construction Method Statement which is developed post consent. Military practice and exercise areas are considered in Table 8.9. Defence radar are considered in paragraph 8.7.5.3. The aviation and maritime warning lighting requirements are identified in Table 8.13.
8 December 2016	Third Energy – pre-application consultation meeting	Advised that all wells in their P2284 licence would be drilled prior to the start of offshore construction and, as there would be no requirement for platforms, no significant issues are anticipated in relation to Hornsea Three at this stage. Discussion was had on the potential extension of the life of the Schooner platform (presently operated by Faroe Petroleum).	Helicopter access to subsea infrastructure and licenced acreage within 9 nm of the Hornsea Three array area is assessed in paragraph 8.11.2.75

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
21 December 2016	CAA – Scoping Response	The CAA confirmed that appropriate statutory aviation consultees (Defence Infrastructure Organisation (DIO)/(MOD) and NATS) have been identified. The impact of wind turbines on aviation may include the potential impact on the communications, navigation and surveillance infrastructure and also that turbines can cause a physical obstruction to aviation. The official position of all aviation stakeholders Hornsea Three should therefore be established through direct consultation. It is recommended that Emergency Service Helicopter Support Units (police and air ambulance) are consulted as they may operate in the area of concern and be affected by the introduction of tall obstacles. The CAA requested that any feature/structure 70 feet in height, or greater, above ground level is notified to the Defence Geographic (dvof@mod.uk) including the location(s), height(s) and lighting status of the feature/structure, the estimated and actual dates of construction and the maximum height of any construction equipment to be used, at least 10 weeks prior to the start of construction, to allow for the appropriate notification to the relevant aviation communities. Any structure of 150 m or more must be lit in accordance with the Air Navigation Order and should be appropriately marked.	All relevant aviation stakeholders have been consulted including the DIO/MOD and NATS (Table 8.4). Emergency service helicopter support units are not of relevance to offshore wind farms and are therefore not applicable. The lighting, marking and notification requirements in relation to the Hornsea Three wind farm are detailed in Table 8.13.
19 September 2016	Centrica Resources UK – pre-application consultation meeting	Advised ST1 is shut-in and close to being decommissioned. Advised that the Markham complex is managed from Centrica's Hoofddorp office in the Netherlands. Advised that the Markham complex is accessed from Den Helder. Discussed proximity of Chiswick platform to the Hornsea Three array area and difficulties this would create in regard to access/egress and exploration activities.	Helicopter access to the Centrica operated platforms is assessed in paragraph 8.11.2.29 et seq.
5 December 2016	Centrica Resources UK – pre-application consultation meeting	Discussed the recently acquired licence P2286 in the 28th licence round. Explained it is a drill or drop licence with a well required to be drilled prior to September 2019 prior to Hornsea Three construction. Discussed the requirement for further consultation at a later stage when further information would be available from both parties,	Helicopter access to subsea infrastructure and licenced acreage within 9 nm of the Hornsea Three array area is assessed in paragraph 8.11.2.75.
14 March 2017	Centrica Resources UK – pre-application consultation meeting	Discussed helicopter operational requirements. Noted the proximity of the Hornsea Three array area to the Markham complex platforms as a concern.	Helicopter access to the Centrica operated platforms is assessed in paragraph 8.11.2.29 et seq.
24 March 2017	Centrica Resources UK – pre-application consultation meeting email	Hornsea Three requested further information on Centrica aviation operational requirements to their platforms and licenced acreage within 9 nm of the Hornsea Three array area which was provided.	Helicopter access to the Centrica operated platforms is assessed in paragraph 8.11.2.29 et seq.
14 February 2017	MOD – pre-application consultation email	Hornsea Three requested further clarification in regard to the potential effect of Hornsea Three on the MOD ADR and ATC radar. The MOD confirmed that it is unlikely that there will be any detectability from any MOD ADR or ATC radars to the proposed development, due to the distance offshore, beyond radar line of sight.	The effect on defence radar is discussed in paragraph 8.7.5.
1 August 2016	NATS Safeguarding – pre-application consultation email	NATS Safeguarding has no objection to this development.	Potential effects on the interests of NATS radar are assessed in paragraph 8.11.2.81.
9 March 2017	NATS Safeguarding – pre-application consultation email	Hornsea Three requested and received clarification of NATS position in respect of Hornsea Three that it anticipates no impact on its own infrastructure and operations. Hornsea Three requested and received clarification on NATS position with regard to HMRs. NATS reissued their 2012 position statement advising the Oil and Gas Industry and air operators that they should comment on any foreseen impact. NATS advised to engage with the air operators and industry on the impact on helicopter routes. NATS provided information on how air traffic is controlled and request for Hornsea Three to contact NATS once a helicopter service provider has been selected for the project.	Oil and gas operators have been consulted in relation to potential effects on helicopter routes (Table 8.4). The impact on HMRs is assessed in paragraphs 8.11.2.3 et seq. and 8.13.3.1 et seq. Increase in air traffic arising from Hornsea Three is assessed in paragraph 8.11.1.3.
3 February 2017	Met Office – pre-application consultation email	Hornsea Three requested information on meteorological radar safeguarding requirements and was advised that the meteorological radar are safeguarded to 20 km.	Meteorological radar is discussed in paragraph 8.7.5.7 of this chapter.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
9 March 2017	ConocoPhillips – pre-application consultation email	Hornsea Three requested information in regard to ConocoPhillips' aviation operations in relation to the Murdoch group of platforms. ConocoPhillips provided information in regard to cross transit flight and use of HMRs. They provided information in regard to flying above wind farms at or above the Minimum Enroute Safe Altitude (MESA), and when aircraft would need to route below cloud in VMC (Visual Meteorological Conditions). They provided information in regard to undertaking airborne radar approaches (ARA) to the Murdoch field and the operational requirements to the field.	The Murdoch platforms are greater than 9 nm away from the Hornsea Three array area and therefore no assessment has been undertaken on the approach to these platforms. Information on the operational requirements in relation to these platforms has been used in the assessments for cross-zone transit and HMRs in paragraph 8.11.2.3 et seq.
3 April 2017	Total Netherlands – pre-application consultation meeting	Total Netherlands advised they had no immediate concerns with regard to the Netherland licence blocks, but that as they take the lead for the Total UK licence they will respond shortly in this regard. Informed Hornsea Three that the Netherlands work to a 5 nm free zone for helicopter access rather than the UK requirement for a 9 nm consultation zone.	Helicopter access to subsea infrastructure and licenced acreage within 9 nm of the Hornsea Three array area is assessed in paragraph 8.11.2.75.
3 April 2017	Total UK – pre-application consultation email	Total Netherlands advised that the Total UK acreage 49/10b now forms part of the Centrica Markham complex and so consultation should be had with Centrica in this regard.	Helicopter access to subsea infrastructure and licenced acreage within 9 nm of the Hornsea Three array area (including licence block 49/10b) is assessed in paragraph 8.11.2.75.
16 March 2017	Engie, UK – pre-application consultation email	Engie UK advised that they have no immediate concerns with regard to Hornsea Three at this stage.	Noted.
20 April 2017	Centrica /CHC – pre-application consultation telecom	Discussed the operational requirements to Centrica platforms. CHC advised they will fly direct to an unmanned installation if that is required and do not need to go via manned hub platform. CHC advised final approach path is set at 7 nm for their procedures.	Helicopter access to the Spirit Energy operated platforms is assessed in paragraph 8.11.2.3 et seq.
2 August 2017	NATS Safeguarding – pre-application PEIR response	NATS safeguarding anticipates no impact from the Hornsea Three. Accordingly, it has no objections to the DCO/Hornsea Three.	Noted.
16 August 2017	Belgian Civil Aviation Authority – pre-application PEIR response.	Since Hornsea Three is situated outside the Belgium airspace, there is, from an aeronautical perspective, no objection against this project.	Noted.
29 August 2017	MCA – pre-application PEIR response	The boundary turbines, where they are more than 900 m apart, must be lit with a single 2,000 candela, red aviation light, flashing Morse 'W' in unison with all other boundary turbines. All other turbines must be fitted with a fixed single red 200 candela aviation light for SAR purposes.	Hornsea Three will meet all the regulatory aviation lighting requirements as presented in Table 8.13.
20 September 2017	MOD (DIO Safeguarding) - pre-application PEIR response	The PEIR recognises the principal defence issues that will be of relevance to the progression of the Hornsea Three. The extent of maritime military practise and exercise areas and use of airspace for defence purposes in the vicinity of Hornsea Three have been recognised and the potential effect that Hornsea Three may have upon the effective operation of defence radars and aviation interests has been considered.	Noted.
20 September 2017	MOD (DIO Safeguarding) – pre-application PEIR response	The need for Hornsea Three to be fitted with relevant aviation and maritime warning lighting to maintain navigational safety is recognised. It should be noted that, subject to verifying the precise location and height of structures above sea level, the MOD may request that structures are fitted with aviation warning lighting in order to maintain safety in relation to defence aviation activities when there is no mandatory requirement for installation.	Hornsea Three notes this response and in accordance with the recommendation in CAP 764 will continue to consult with the MOD to better understand their requirements. Hornsea Three will meet all the regulatory aviation lighting requirements as presented in Table 8.13.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
20 September 2017	Centrica – pre-application PEIR response	Helicopter operations to operational platforms within 5 km of the edge of Hornsea Three are identified in the PEIR as impacted, though the extent to which this would be a significant restriction needs to be thoroughly evaluated by helicopter operators. Evacuation protocols may be compromised without suitable mitigation due to helicopters being the primary method of transporting personnel in the event of an emergency. Chiswick and Grove platforms: not normally manned, helicopter transported maintenance interventions take place on each for over 40 days per year. Risk assessment methodology: Discussion is needed on the approach and conclusions reached. Concerns that Centrica may consider intolerable from a safety perspective are incorrectly evaluated as not posing a significant impact.	Helicopter access to the Spirit Energy operated platforms is assessed in paragraph 8.11.2.29 et seq. Consultation was held on the methodology used to assess access requirements to Spirit Energy operated platforms with Centrica and CHC (the helicopter service provider to these platforms for Centrica) as detailed in this table below.
20 September 2017	Peel Ports – pre-application PEIR response	The construction and operation of Hornsea Three will not interfere with the operation of the Port's radar, navigation or communications systems.	Noted.
31 October 2017	Centrica/CHC – pre-application consultation meeting	Discussed the methodology used in the assessment on the potential effect of Hornsea Three on airborne radar approach to Centrica operated platforms presently serviced by CHC helicopters. CHC advised through post consultation email correspondence (21 November 2017) that they agree with the information used by Hornsea Three to inform the assessment. They noted that a standard rate of descent of 350 feet per nm has been used to calculate the distance based on the altitude required, but that the CHC ARA is a bit closer than that, so it provides a maximum scenario. CHC noted that MAP may be an issue with Chiswick and Grove platforms. CHC agreed that HMRs are not an issue and direct routing (or routing via a corner of Hornsea Three) over Hornsea Three would not be a problem.	Helicopter access to the Spirit Energy operated platforms is assessed in paragraph 8.11.2.29 et seq. MAPs are discussed in the assessment to Spirit Energy operated platforms in paragraph 8.11.2.29 et seq. HMRs are assessed in paragraph 8.11.2.3 et seq.
31 October 2017	Aviation workshop (Centrica, Aviatec, Bristows, NHV, CHC, Babcock NCS, Uni-fly nwp, NATS, BIH) – pre-application consultation workshop	To ensure aviation stakeholders are up to date on the former Hornsea Zone development and the Hornsea Three project description and construction timeline. To agree the assessment principles of impacts on aviation stakeholders in regard to HMRs and cross zone traffic. During the meeting it was agreed that the use of HMRs are not significant and that HMR and cross zone assessments should be combined. Agreed that the corridor between Hornsea Project One, Hornsea Project Two and Hornsea Three could be used in VFR. Advised that in Instrument Meteorological Conditions (IMC) that require flight below 2,500 ft and in low visibility (<1,500 m), flight may require deviation around Hornsea Three. Discussed accessing data on cloud height and visibility to support the assessment from the Met office and accessing data on number of flights across the former Hornsea Zone from NATS.	The HMR assessment and cross zone assessments have been combined in paragraph 8.11.2.3 et seq. The cumulative effect on HMRs and cross zone transit is assessed in paragraph 8.13.3.1. Met data has been obtained to support the aviation assessments and is presented in the volume 5, annex 8.1: Aviation, Military and Communication Technical Report. Radar data has been obtained from NATS to support the aviation assessments and is presented in the volume 5, annex 8.1: Aviation, Military and Communication Technical Report.
29 January 2018	MOD (DIO Safeguarding) – pre-application consultation email	The MOD have confirmed that the Outer Silver Pit Submarine Exercise Area is no longer in use and therefore there is no requirement to consider within the Hornsea Three Environmental Impact Assessment.	Noted – effects on the Outer Silver Pit Submarine Exercise Area have therefore been scoped out of the assessment (see Table 8.9).

8.6 Methodology to inform the baseline

8.6.1 Desktop study

8.6.1.1 Information on aviation, military and communication within the Hornsea Three aviation, military and communication study area was collected through a detailed desktop review of existing datasets and through consultation. These are summarised at Table 8.5 below. Point-to-point Line of Sight (LOS) analysis was undertaken using the ATDI ICS LT (Version 3.9.92) tool (see volume 5, annex 8.1: Aviation, Military and Communication Technical Report).

Table 8.5: Summary of key data sources.

Data	Source
HMRs	NATS Aeronautical Information Service, ENR 6-1-16
Radar	NATS wind farm self-assessment maps
Military Practice Areas	NATS Aeronautical Information Service, ENG_ENR-1-6 Seazone Hydrospatial L072016.0003
Radio and communications	Ofcom, Atkins, JRC, stakeholders
Oil and gas platforms	UKOilandGas: Common Data Access (UK platforms) TNO: Netherlands Oil and Gas Portal (Dutch platforms)
Oil and gas licence blocks	UK Oil and Gas Data/CDA/nlog (11 November 2017) and OGA licence data: TNO: Netherlands Oil and Gas Portal (14 July 2017).
Oil and gas operations	Consultation with applicable platform operators and operators of UK and Dutch licence blocks
Wind speed and direction data	Data recorded at Schooner A platform (*supplied during Hornsea Project One consultation with Tullow the operator of the Schooner A platform).*
Cloud height and visibility data	Met Office frequency tables prepared for Hornsea Three (Met Office, 2017).
Number of helicopter flights	NATS radar data prepared for Hornsea Three (NATS, 2017c)

8.6.1.2 The desk study identified the following stakeholders which are considered further in section 8.7 below:

- Civil en-route operations;
- MOD Air Defence operations and training;
- Helicopter support to offshore oil and gas operations; and
- Aircraft using various communication systems.

8.6.2 Site specific surveys

8.6.2.1 Hornsea Three commissioned NATS to provide an analysis of radar data to provide an understanding of the aviation baseline. NATS provided an analysis of a typical month of stored radar data within a 9 nm buffer of the Hornsea Three array (NATS, 2017c). Data was extracted from the NATS data warehouse for the entire month of October 2017 from surface up to a pressure altitude of 6,000 ft (FL60). This data has been used to inform the aviation assessments in section 8.11.

8.7 Baseline environment

8.7.1 Airspace designations

8.7.1.1 The Hornsea Three array area and offshore cable corridor are situated in an area of Class G uncontrolled airspace, which is established from the surface up to Flight Level (FL) 195 (approximately 19,500 ft.) and Class C controlled airspace, which is established above FL 195. Under these classifications of airspace the following applies:

- Class G uncontrolled airspace: any aircraft can operate in this area of uncontrolled airspace without any mandatory requirement to be in communication with an ATC unit. Pilots of aircraft operating Visual Flight Rules (VFR) in Class G airspace are ultimately responsible for seeing and avoiding other aircraft and obstructions; and
- Class C controlled airspace: all aircraft operating in this airspace must be in receipt of an air traffic service (ATS).

8.7.1.2 In the Hornsea Three array area the Class G uncontrolled airspace below FL 195 (approximately 19,500 ft.) is subdivided into areas with the following aviation stakeholder responsibility (NATS, 2017b):

- Anglia Radar: To enhance flight safety and expedite Search and Rescue in the Southern North Sea Airspace, a Deconfliction Service, Traffic Service, Basic Service and Alerting Service is available from the Air Traffic Service Unit (ATSU) at Aberdeen Airport and employing NATS Primary Surveillance Radar (PSR). These services are available to helicopters operating in support to the offshore oil and gas industry and to civil and military aircraft transiting the area from the surface up to FL 65. The ATSU will provide, within its specified area of responsibility, Deconfliction Service or Traffic Service within the limits of surveillance cover. Outside surveillance cover or in the event of surveillance failure, a Basic Service and Alerting Service will be provided within the limits of VHF; and
- MOD Air Surveillance and Control Systems (ASACS): uses its Air Defence Radar (ADR) resources in support of operational flights within UK airspace and for training exercises. Two Managed Danger Areas (MDAs) are established over the North Sea (Central and Southern MDA). Within the lateral and vertical confines of the MDAs, air combat training, high energy manoeuvres and supersonic flight can be expected. The Southern MDA (EG D323) is located above the Hornsea Three array area and

is divided into six distinct areas (A, B, C, D, E and F). EG D323D is located directly above the Hornsea Three array area and, when active, operates from FL 50 up to FL 660. (Note when the Southern MDA is activated, Anglia Radar will restrict offshore helicopter operations to FL 40 and below).

8.7.1.3 The Hornsea Three offshore cable corridor passes through the Wash Aerial Tactics Area (ATA) North, the Wash ATA South, and an Offshore Safety Area (OSA). The ATAs are airspace of defined dimensions designated for air combat training within which high energy manoeuvres are regularly practiced by aircraft formations. Autonomous operations are only permitted within ATAs above FL 195 when the overlying Temporary Reserved Airspace (TRA) is active (NATS, 2017a). The Anglia OSA consists of the airspace from surface to 3,500 ft. above lowest astronomical tide (ALT) within the area shown in Figure 8.2. This is an area where pilots of helicopters are required to contact Anglia Radar and will normally plan to fly at specified en-route altitudes (NATS 2017b).

8.7.1.4 The CAA's Safety and Airspace Regulation Group (SARG) is responsible for the regulation of ATS in the UK; the planning and regulation of all UK airspace, including the CNS infrastructure; and also has the lead responsibility within the CAA for all wind turbine related issues. At all times, responsibility for the provision of safe services lies with the ATS provider or Air Navigation Service Provider (ANSP).

8.7.1.5 The London/Amsterdam Flight Information Regions (FIRs) and delegated areas of responsibility were considered against the mapping data. As shown in Figure 8.2, Hornsea Three is entirely within the UK FIR.

8.7.2 Military Low Flying Operations

8.7.2.1 The UK Low Flying System (UKLFS) used for Military Low Flying activity covers the open airspace over the entire UK land mass and surrounding sea areas generally out to 2 nm from the coastline, from the surface to 2,000 ft. agl (above ground level) or amsl (above mean sea level). The Hornsea Three array area, at a distance of 121 km northeast off the Norfolk coast and 160 km east of the Yorkshire coast, will not therefore affect routine Military Low Flying activity.

8.7.3 Military Exercise and Training Areas

8.7.3.1 There are two submarine practice areas in the vicinity of the Hornsea Three array area (see Figure 8.2). One area lies to the north of the Hornsea Three array area in the Outer Silver Pit location and overlaps the northernmost corner of the Hornsea Three array area by a distance of 123 m. The MOD have confirmed that the Outer Silver Pit Submarine Exercise Area is no longer in use. The other submarine practice area lies 12.4 km to the east in Dutch territorial waters.

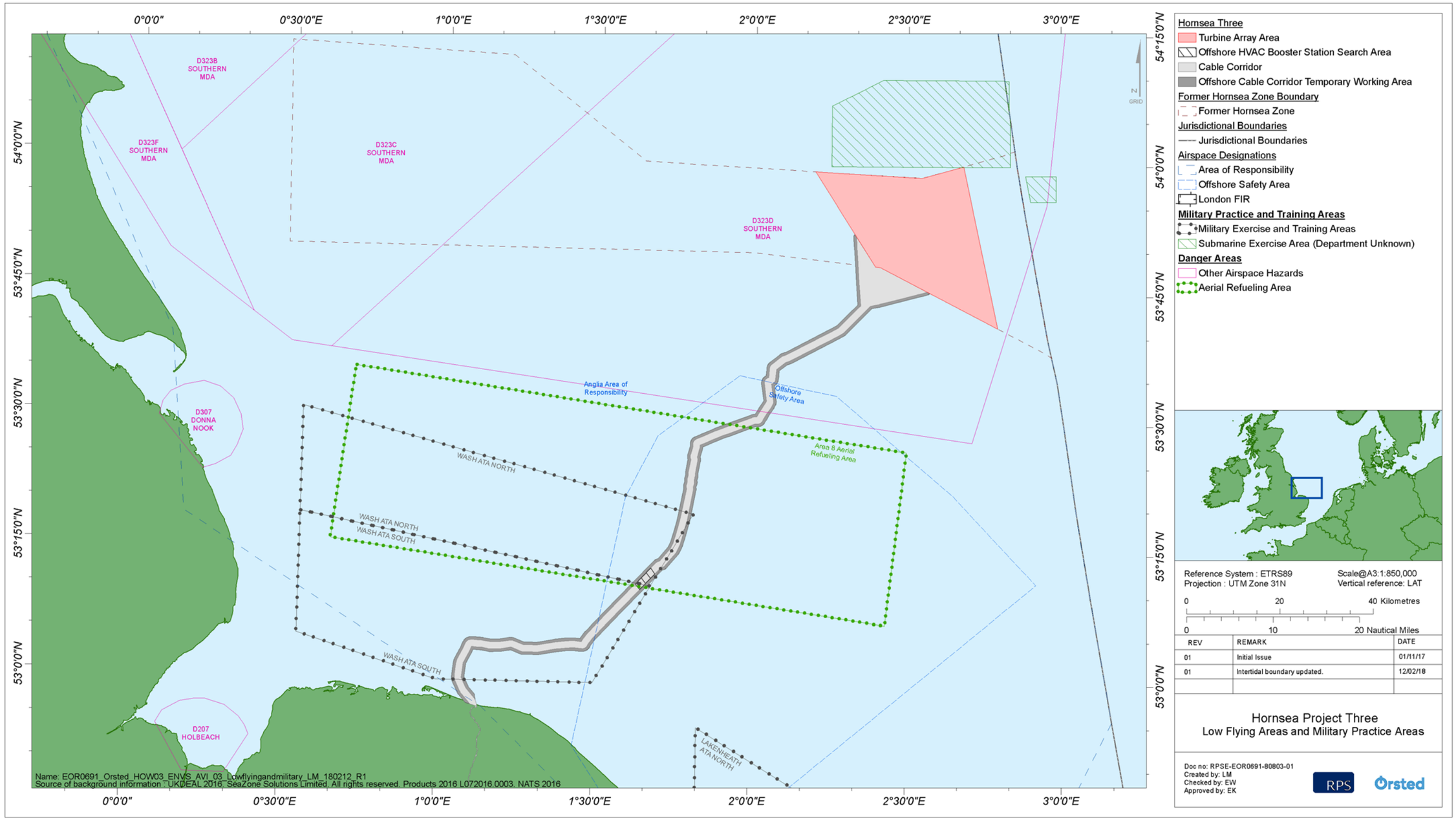

Figure 8.2: Airspace designations and military practice areas.

8.7.4 Civil aviation

8.7.4.1 Three UK helicopter companies, Bristow Helicopters Ltd; Bond Offshore Helicopters Ltd; and CHC Scotia Ltd, operate approximately 95 aircraft in support of the oil and gas industry around the UK. The main operating bases are: Aberdeen; Sumburgh; Scatsta; Norwich; Humberside; and Blackpool. Three other UK helicopter companies regularly operate to offshore locations on a much smaller scale in support of renewable energy projects and marine navigation facilities. Four Norwegian helicopter companies, Bristow Norway; CHC Helikopter Service; Blueway; and Norsk Helikopterservice, operate approximately 55 aircraft in support of the oil and gas industry. The main operating bases are: Stavanger, Bergen, Brønnøysund, Hammerfest, and Kristiansund. In 2014 there were 228 helideck-equipped fixed installations and approximately 50 to 100 mobile helidecks on the UK continental shelf (UKCS). The CAA reported a total of 86,000 helicopter flight hours for 2012. There were about 100 helideck-equipped fixed installations and approximately 20 to 40 mobile helidecks on the Norwegian Continental Shelf (NCS) and in 2012, approximately 57,000 flight hours were flown (CAA, 2014b).

8.7.4.2 A network of HMRs is established to support the transport of personnel and equipment to offshore oil and gas installations. The HMR system is shown in Figure 8.3. The purpose of an HMR as detailed in CAP 764 is to provide a network of offshore routes as used by civilian helicopters and to effectively provide an obstacle free zone for safe flight when VFR cannot be used. The HMR structure therefore provides both an identification of common flight paths and a safe means of flying to and from offshore locations outside the coverage of air traffic control. Such routes have no separate airspace classification (i.e. they remain Class G, uncontrolled airspace), but they are used by the air navigation service provider (NATS/Anglia Radar) and helicopter operators for flight planning and management purposes (NATS 2017b).

8.7.4.3 HMRs have no lateral dimensions, with only the route centre-lines charted (CAA, 2016c). CAP 764 states that there should be no obstacles within 2 nm either side of HMRs but where planned should be consulted upon with the helicopter operators and ANSP. This distance is based upon operational experience, the accuracy of navigation systems and practicality. The 2 nm distance provides time and space for helicopter pilots to descend safely to an operating height below the icing level should such conditions arise.

8.7.4.4 HMR 2 crosses through the Hornsea Three array area and routed for transit from Norwich International Airport to oil and gas platforms to the east of the Hornsea Three array area, although it is understood that the majority of these platforms, including the Markham complex operated by Spirit Energy, are predominantly approached from Den Helder, further to the east. The offshore HVAC booster station search area is crossed by HMR 5.

8.7.4.5 Vertically the HMRs over the southern North Sea extend from 1,500 ft. amsl to FL 60 (inclusive) (NATS 2017b) except that:

- (a) Anglia Radar will not normally allocate cruising levels above FL 40 on HMRs in the southern North Sea beneath EG D323B and EG D323C, this area is to the west of the Hornsea Three array area and so is not applicable (see Figure 8.2); and
- (b) Where helicopter icing conditions or other flight safety considerations dictate, helicopters may be forced to operate below 1,500 ft. amsl. In these circumstances, where possible, pilots should endeavour to follow HMRs and advise the ATSU of the new altitude giving the reason for operating below 1,500 ft. amsl.

8.7.4.6 Compliance with the HMR structure is not compulsory. In the general interests of flight safety, however, civil helicopter pilots are strongly encouraged to plan their flights using HMRs wherever possible (NATS 2017b). It should be noted however that the Offshore Renewables Aviation Guidance (ORAG) (RenewableUK, 2016) advises that the HMR routes in the southern North Sea are rarely followed and Hornsea Three pre-application consultation has advised that they are not routinely used but are used more as a point of reference. Other traffic operating in proximity of these routes are advised to maintain an alert look out, especially in the Anglia OSA (NATS 2017b).

8.7.4.7 Helicopters must avoid persons, vessels, vehicles and structures by a minimum distance of 500 ft. In visual conditions, pilots may use HMRs or they may opt to fly direct to their destination in open air space. When operating within Instrument Flight Rules (IFR), helicopters require a Minimum Safe Altitude (MSA) of 1,000 ft. height clearance from obstacles within 5 nm of the aircraft. Whilst following an HMR the helicopters operate IFR under Anglia Radar service provision.

8.7.4.8 Helicopters are height-banded, so that those outbound to North Sea installations fly at 2,000 ft. and 3,000 ft., whilst those inbound fly at 1,500 ft. and 2,500 ft. This allows for 500 ft. vertical separation between helicopters travelling in opposite directions. A large number of turbines beneath an HMR would result in helicopters flying higher in order to maintain a safe vertical separation from turbines and each other.

8.7.4.9 It should be noted that fog and cloud (particularly cumulonimbus cloud) poses meteorological risks and therefore helicopter flights may be restricted in certain weather conditions. In addition, although the sea conditions have no primary impact upon helicopter flight, helicopter offshore operations are generally limited to the lower of Sea State 6 (this is a scale from 0 to 9 of wave height due to wind and swell, used by the World Meteorological Organisation, with 6 donating a wave height of 4 to 6 m, very rough conditions with high swell) or the capability of the helicopter emergency floatation system due to the ability of recovering personnel from the sea in the event of a forced water landing (RenewableUK, 2016).

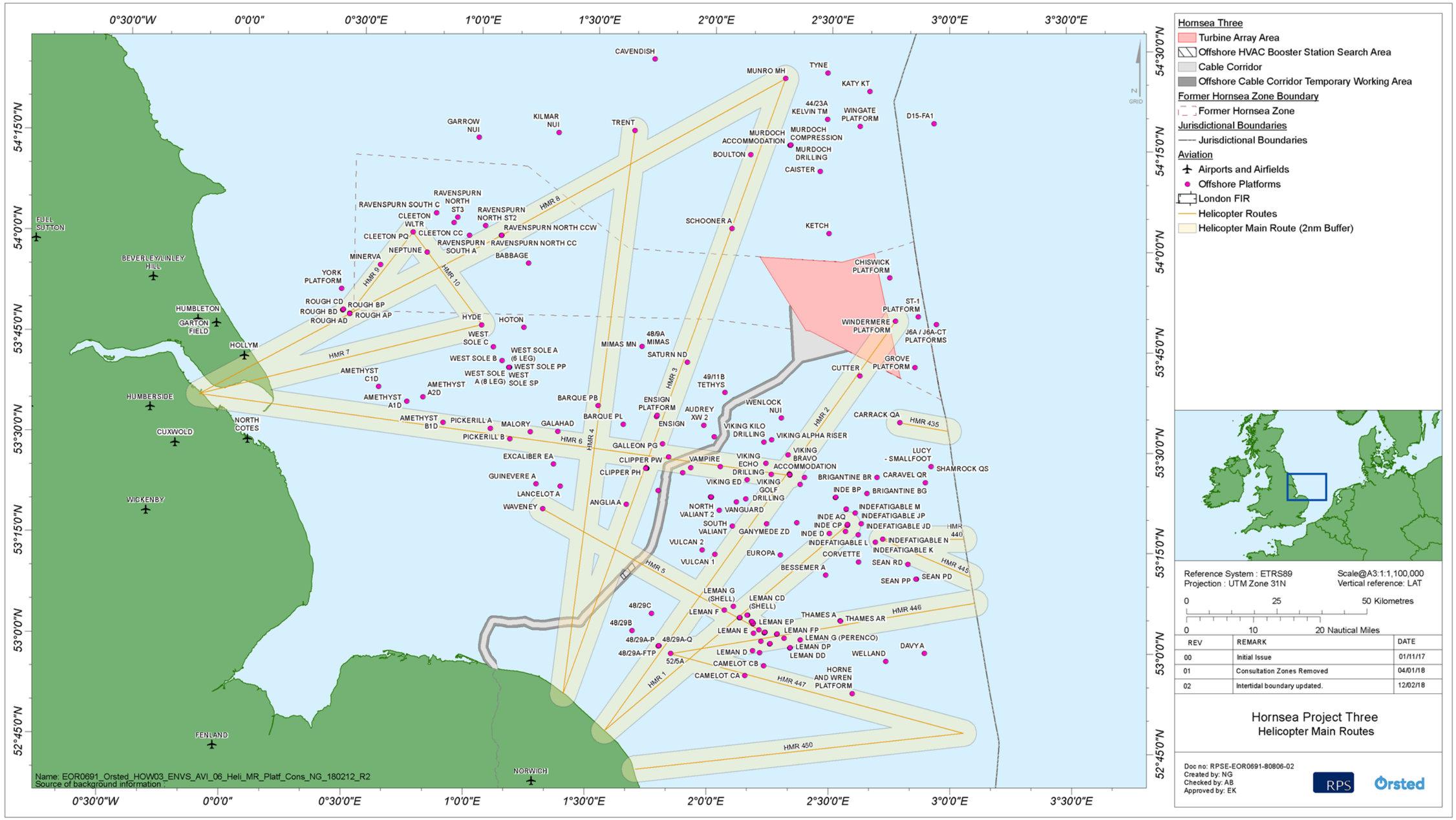

Figure 8.3: Helicopter Main Routes.

8.7.4.10 To help achieve a safe operating environment, a consultation zone of 9 nm radius exists around offshore helicopter destinations (CAA, 2016c). This consultation zone is not considered a prohibition on development within a 9 nm radius of offshore operations but a trigger for consultation with offshore helicopter operators, the operators of existing installations and the holders of oil and gas exploration and development licences to help to ensure safe offshore helicopter operations.

8.7.4.11 The basic requirement of the 9 nm consultation zone is to promote consultation that will help to ensure safe instrument approaches in poor weather conditions where a low visibility approach profile is needed. In addition, the consultation helps to ensure that helicopter pilots are able to safely carry out a Missed Approach Procedure (MAP). Such profiles must allow for an acceptable pilot workload, a controlled rate of descent, one engine inoperative performance and obstacle clearance (CAA, 2016c). The Hornsea Three array area extends into the 9 nm consultation zones of nine platforms, as listed in Table 8.6 (see also Figure 8.3).

Table 8.6: Offshore platforms with 9 nm consultation zone overlapping with the Hornsea Three array area.

Platform	Operator	Helideck	Type of Platform	Status	Distance to Hornsea Three array area boundary	
					nm	km
Schooner A	Faroe Petroleum	Yes	NUI	Active. Potential to be decommissioned by 2021/2022.	5.98	11.07
Ketch	Faroe Petroleum	Yes	NUI	Active. Potential to be decommissioned by 2021/2022.	4.14	7.67
Chiswick	Spirit Energy	Yes	NUI	Active.	1.45	2.69
ST-1	Spirit Energy	Yes	NUI	Production ceased. Decommissioning plans submitted to BEIS, scheduled for 2018-2020 (Centrica, 2016). Not yet approved.	4.48	8.29
J6A/J6A-CT	Spirit Energy	Yes	Manned	Active.	6.90	12.77
Grove	Spirit Energy	Yes	NUI	Active.	2.43	4.50
Windermere	INEOS	Yes	NUI	Production ceased. Due to be decommissioned by 2023.	0.98	1.82
Cutter	Shell	No	NUI	Active.	2.52	4.67
Carrack QA	Shell	Yes	NUI	Active.	6.65	12.31

8.7.4.12 Those platforms without a helideck or which will be decommissioned prior to the start of Hornsea Three construction have not been carried forward into the assessments presented in section 8.11 below.

8.7.4.13 Wind turbines are considered to be physical obstructions and helicopter operators must observe the minimum obstacle clearance criteria of 1,000 ft. during IFR (when all helicopters must maintain a vertical separation of 1,000 ft. from any obstacle). Furthermore, during the approach to an installation, all radar contacts (including radar contacts that are turbines) have to be avoided laterally by at least 1 nm. The combined effects of maintaining the required distances from any obstacles within the 9 nm consultation zone of an offshore installation may impair the safety of instrument approaches and MAP to and from an offshore installation. This may result in a restriction on helicopter operations to an installation in certain weather conditions, which may have safety implications. Safety implications include a potential impact upon the integrity of offshore platform Safety Cases that are based on the use of helicopters to facilitate evacuation procedures.

8.7.4.14 Helicopter access associated with platform decommissioning activities may also be restricted for the reasons in the paragraph above if the 9 nm consultation zone overlaps with the Hornsea Three array area. Known platform decommissioning activities (from consultation with the platform operators see Table 8.4 and OGA, 2017a) within 9 nm of the Hornsea Three array area are listed in Table 8.6.

8.7.4.15 Subsurface infrastructure and wells that have not been permanently decommissioned or plugged and abandoned may at some time require the presence of a rig or vessel that is equipped with a helideck. A 9 nm consultation zone should again be a trigger for consultation with the operators of subsea infrastructure and wells requiring helicopter access (CAA, 2016c). The subsea infrastructure and wells within 9 nm of the Hornsea Three array area are shown in Table 8.7 and Figure 8.4. The licenced areas (see paragraph 8.7.4.16 below) and associated operators within 9 nm of the Hornsea Three array area where future operations may be required are also shown in Table 8.7 and Figure 8.4.

8.7.4.16 The licenced areas refer to offshore oil and gas licences. The main type of offshore licence is the Innovative Licence (OGA, 2017b). 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 licence runs through a series of consecutive terms with set dates to move from one term into the next providing certain conditions of the licence have been met by the licence holder. The licence terms dates are shown in Table 8.7. 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. It should be noted that whilst a licence is granted for a set period of time, there remains an inherent level of uncertainty in regard to whether a licence will progress from one term to the next, and to the activity associated with each progressive term.

8.7.5 Civil and military radar

8.7.5.1 NATS use PSRs based in North Lincolnshire (Claxby) and Norfolk (Cromer) to support their provision of ATC services to aircraft operating between the UK and mainland Europe, and to those overflying the UK FIR in the region of Hornsea Three. Anglia Radar also employs NATS radar to support their provision of services to aircraft of the oil and gas industries within the lateral confines of their area of responsibility over the southern North Sea.

8.7.5.2 The Hornsea Three array area, is located within the operational range of the NATS Claxby PSR (operational range of 200 nm) at a distance of 95 nm. The Hornsea Three array is not located within the operational range of the NATS Cromer PSR (operational range of 60 nm) at a distance of 65.7 nm. The Hornsea Three array area is also within the operational range of the MOD's ASACS Air Defence PSRs located at Staxton Wold (at a distance of 93.7 nm) and Trimingham (at a distance of 65.6 nm) which both have an operational range of over 216 nm. The location of these radar installations is provided in Figure 8.5. The figure shows the operational range of the radar and, for the NATS PSR radar, shows the turbine tip height in meters that can be detected by the radar. It should be noted that the dataset provides the detection distance for a 200 m high turbine but in the instance of the Claxby PSR, the operational range extends beyond this.

8.7.5.3 Civil airspace and air traffic surveillance and management infrastructure is comprised of the following systems:

- Primary Surveillance Radar (PSR);
- Secondary Surveillance Radar (SSR); and
- Aeronautical Navigation Aids (Navaids).

8.7.5.4 A wide range of systems, including Navaids such as Instrument Landing Systems (ILS) and VHF Omni-Directional Radio-Range/Distance-Measuring Equipment, together with air-ground communications facilities, which could potentially be affected by wind turbine developments may also be present.

8.7.5.5 Military Air Defence systems are typically more complex than civil communication, navigation and surveillance (CNS) systems. The MOD has a role to provide unimpeded airspace surveillance and early warning of air attack and intrusion into UK airspace. Air Defence Radars have an operational range of over 400 km. Whilst an operational range for radar is provided, it should be noted that in certain circumstances wind turbines will not have the potential to affect radar when, for example there is sufficient geographical terrain, or the curvature of the earth, prevents the turbines from being detected.

8.7.5.6 Military air traffic management is supported by military ATC radars, the nearest being located at Trimingham at a distance of 65.6 nm from Hornsea Three. These are typically standard terminal area ATC radars with an instrumented range of 60 nm. Military air traffic management is also supported by military landing aid precision approach radar (PAR) at certain airfields. These have a much shorter instrumented range and are only safeguarded out to 20 nm in certain directions.

8.7.5.7 The Met Office radar network currently consists of 16 sites. Consultation with the Met Office advised that they work to wind turbine safeguarding guidelines that stipulate a 20 km (10.1 nm) separation between any development and a weather radar system. The nearest Met Office radar to Hornsea Three is at Old Buckenham at a distance of 92.1 nm.

Table 8.7: Licence Blocks and subsea infrastructure within 9 nm of the Hornsea Three array area.

Licence Block	Name	Subsea structure	Field/Licence	Status	Licence Terms			Operator
					1st Term end date	2nd Term end date	Licence expiry date	
43/30b	N/A	N/A	P2112	Active	19/12/2017	19/12/2021	19/12/2039	No operator (Atlantic Petroleum and Holywell resources)
44/26a	North West Schooner Subsea	Well head (well: 44/26a-7)	P516 Schooner	Active	13/06/1991	N/A	13/06/2021	Faroe Petroleum
44/27	N/A	N/A	P2284	Active	01/09/2015	31/08/2023	31/08/2041	Third Energy
44/28b	N/A	N/A	P453	Active	10/05/1989	10/05/2019	10/05/2019	Faroe Petroleum
44/29b	N/A	N/A	P454	Active	10/05/1989	10/05/2019	10/05/2019	Engie E&P UK
44/30a	N/A	N/A	P611	Active	03/06/1993	N/A	03/06/2023	Engie E&P UK
48/5a	N/A	N/A	P2112	Extant	19/12/2017	19/12/2021	19/12/2039	No operator (Atlantic Petroleum and Holywell resources)
49/1a	N/A	N/A	P520	Extant	13/06/1991	N/A	13/06/2021	INEOS
49/2a	Well head Topaz	Well head (well: 49/02a-6z)	Topaz / P1013	Not producing – to be decommissioned	22/12/2004	22/12/2016	22/12/2034	INEOS
49/3	N/A	N/A	P2286	Extant	31/08/2019	31/08/2023	31/08/2041	Spirit Energy Resources
49/4a	N/A	N/A	P468	Extant	10/05/1989	10/05/2019	10/05/2019	Spirit Energy North Sea Ltd
49/4b	N/A	N/A	P1186	Extant	30/11/2008	30/11/2012	30/11/2030	Spirit Energy North Sea Ltd
49/4c	Kew subsea wellhead	Well head (wells: 49/04c/7z and 49/04c-7Z)	Kew / P1186	Active/Extant	30/11/2008	30/11/2012	30/11/2030	Spirit Energy North Sea Ltd
49/4d	N/A	N/A	P2286	Extant	31/08/2019	31/08/2023	31/08/2041	Spirit Energy Resources
49/5a	N/A	N/A	P455	Extant	10/05/1989	10/05/2019	10/05/2019	Spirit Energy North Sea Ltd
49/5b	N/A	N/A	P1186	Extant	30/11/2008	30/11/2012	30/11/2030	Spirit Energy North Sea Ltd
49/5c	N/A	N/A	P1186	Extant	30/11/2008	30/11/2012	30/11/2030	Spirit Energy North Sea Ltd
49/8a	N/A	N/A	P523	Extant	13/06/1991	N/A	13/06/2021	Shell
49/9a	N/A	N/A	P132	Extant	13/06/1991	N/A	13/06/2021	Shell
49/9c	N/A	N/A	P901	Extant	20/09/2000	20/09/2012	20/09/2030	Spirit Energy Resources
49/9d	N/A	N/A	P2286	Extant	31/08/2019	31/08/2023	31/08/2041	Spirit Energy Resources
49/10a	Grove west	Wellhead (well: 49/10a-6Y) and Choke Valve	Grove / P83	Active/Extant	24/11/1971	N/A	N/A	Spirit Energy Resources
49/10b	N/A	N/A	P701	Extant	19/07/1995	19/07/2007	19/07/2025	Total UK

Licence Block	Name	Subsea structure	Field/Licence	Status	Licence Terms			Operator
					1st Term end date	2nd Term end date	Licence expiry date	
49/14b	Carrack West wellhead	Wellhead (well: 49/14b-7)	Carrack / P132	Consultation has advised this wellhead has been decommissioned	31/12/1977	31/12/2017	31/12/2017	Shell
49/15/a	Carrack east wellhead	Wellhead (well: 49/15a-3)	Carrack / P54	Active / Extant	24/11/1971	N/A	N/A	Shell
J03b and J06	N/A	N/A	Unknown	Extant	Unknown	Unknown	Unknown	Spirit Energy
J03a	N/A	N/A	Unknown	Extant	Unknown	Unknown	Unknown	NAM
K07	N/A	N/A	Unknown	Extant	Unknown	Unknown	Unknown	NAM
K04a	N/A	N/A	Unknown	Extant	Unknown	Unknown	Unknown	Total Nederland
K01a	N/A	N/A	Unknown	Extant	Unknown	Unknown	Unknown	NAM
D18a	N/A	N/A	Unknown	Extant	Unknown	Unknown	Unknown	ENGIE E&P Nederland
J09	N/A	N/A	Unknown	Extant	Unknown	Unknown	Unknown	NAM
44/26	N/A	N/A	Unknown	N/A	N/A	N/A	N/A	Unlicensed
44/28	N/A	Well 44/28a-6 (suspended)						
44/29	N/A	Well 44/29-1A						
44/30	N/A	N/A						
49/1	N/A	N/A						
49/2	N/A	N/A						
49/4	N/A	N/A						
49/5	N/A	N/A						
49/6	N/A	N/A						
49/7	N/A	N/A						
49/8	N/A	Wells 49/08c-4 (suspended)						
49/9	N/A	49/08b-3 (suspended)						
49/10	N/A	N/A						
49/12	N/A	N/A						
49/13	N/A	N/A						
49/14	N/A	N/A						
49/15	N/A	N/A						

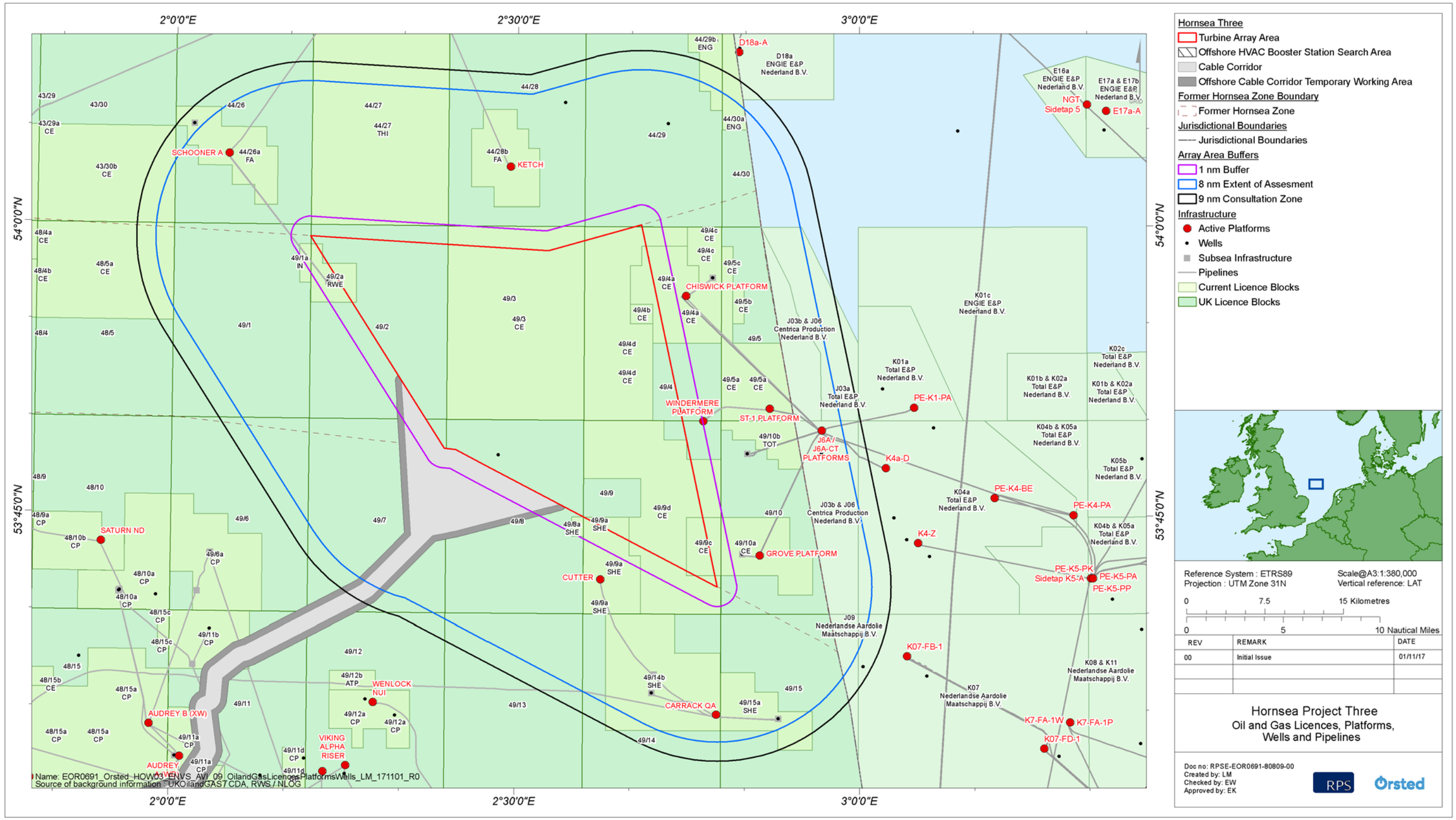

Figure 8.4: Oil and gas licences, platforms and subsea infrastructure within 9 nm of the Hornsea Three array area.

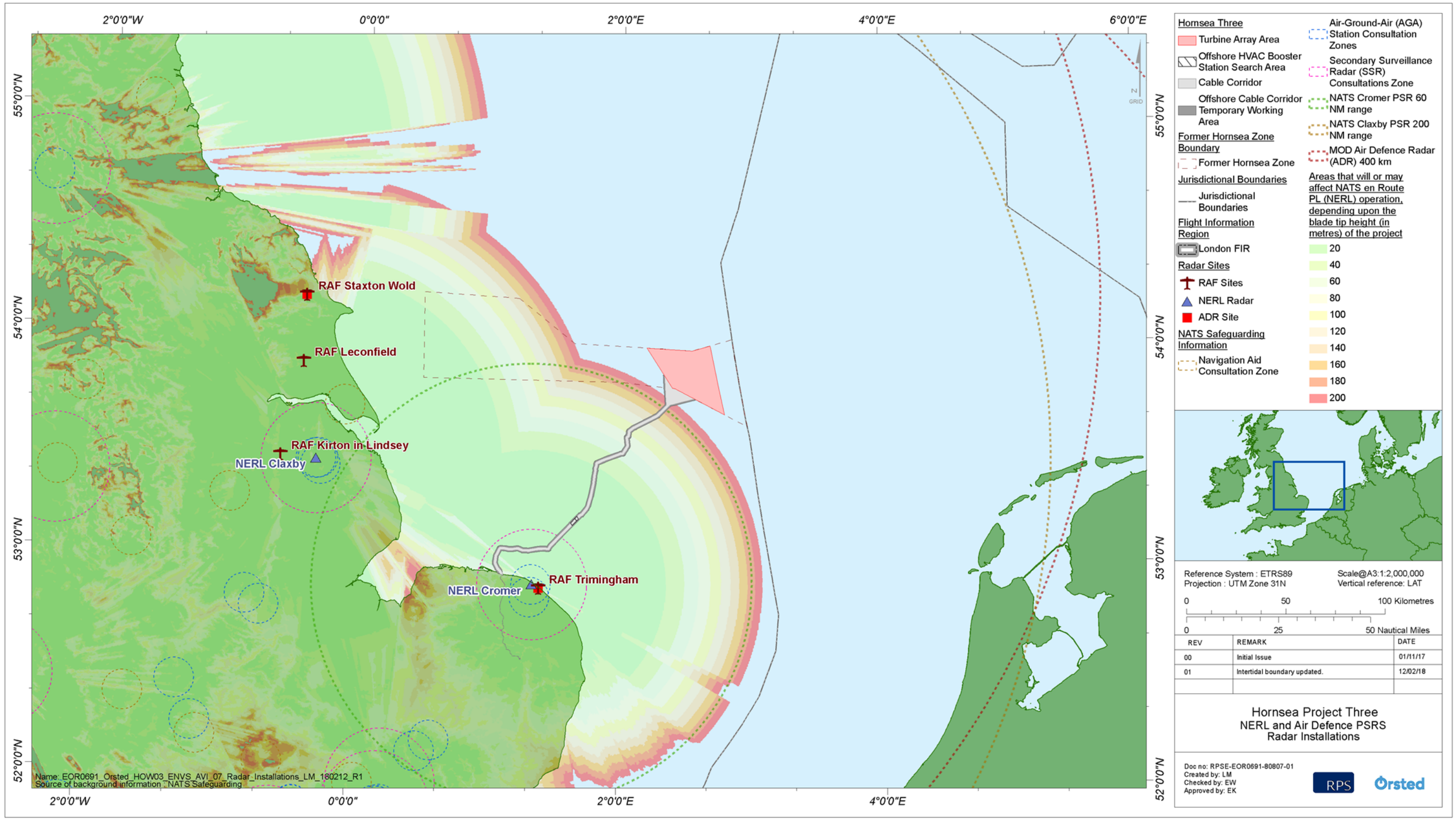

Figure 8.5: NATS PSR and MOD ADR.

8.7.6 Communication

8.7.6.1 Military and civil aviation rely on CNS infrastructure to support airspace and air traffic management. Military CNS has a crucial role in providing air defence surveillance and control for UK and the North Atlantic Treaty Organization (NATO).

8.7.6.2 Maritime communication devices considered within the Hornsea Three EIA include UHF communication, satellite communication, VHF radio, television and offshore microwave fixed links.

8.7.6.3 Satellite communication users include surface vessels or rigs/platforms.

8.7.6.4 VHF radio is used by large commercial container ships, offshore service vessels, fishing vessels and pleasure craft in the marine band (approx. 156 to 174 MHz) for ship to ship, ship to platform and ship to shore voice communication.

8.7.6.5 Offshore microwave links in the vicinity of the Hornsea Three array area have been identified through consultation with oil and gas companies and using Ofcom data. A request was made to Ofcom for known microwave links within a 26.5 km radius of a central point within the Hornsea Three array area boundary. Ofcom provided microwave fixed links in Band range 1.4 GHz to 55 GHz and frequency range 1,350 to 57,000 MHz. One identified link is operated by Spirit Energy Resources and two links are operated by ConocoPhillips (UK) Limited, as shown in Figure 8.6. No links cross the Hornsea Three array area. Microwave links operate on a 'line of sight' basis.

8.7.6.6 A request was made to JRC in regard to interference with radio systems operated by utility companies in support of their regulatory operational requirements. A 26 km radius was assessed and JRC confirmed that there are no links within the vicinity of the Hornsea Three array area.

8.7.7 Future baseline scenario

8.7.7.1 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 requires that "*an outline of the likely evolution thereof without implementation of the development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge*" is included within the Environmental Statement.

8.7.7.2 In the event that Hornsea Three does not come forward, an assessment of the future baseline conditions has been carried out and is described within this section.

8.7.7.3 It is difficult to define what the likely evolution of the aviation interests in the southern North Sea in the absence of Hornsea Three. The OGA (2016) reported a continued decline in oil and gas production in the UKCS (continuing a gradual decline seen since the year 2000). 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. As old fields are decommissioned helicopter use will decline. Consultation has advised that new marine technology using marine service and accommodation vessels equipped with walk-to-work systems is also offering an alternative to helicopters for the oil and gas industry. Helicopter operations are however being used and being planned in the offshore wind industry particularly for routine operation and maintenance purposes. It should be noted that walk-to-work systems are also offering an alternative to helicopters for the offshore wind industry. It is considered a reasonable assumption therefore that helicopter numbers will remain fairly constant but that the providers may gradually shift from servicing one offshore industry (oil and gas) to another (wind) and may in time be reduced due to a shift to walk-to-work systems.

8.7.8 Data limitations

8.7.8.1 The data used in this chapter are detailed in section 8.6.1 above. The data used are the most up to date publicly available information which can be obtained from the applicable data sources as cited. Data have also been provided through consultation as detailed in section 8.5 above.

8.7.8.2 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.

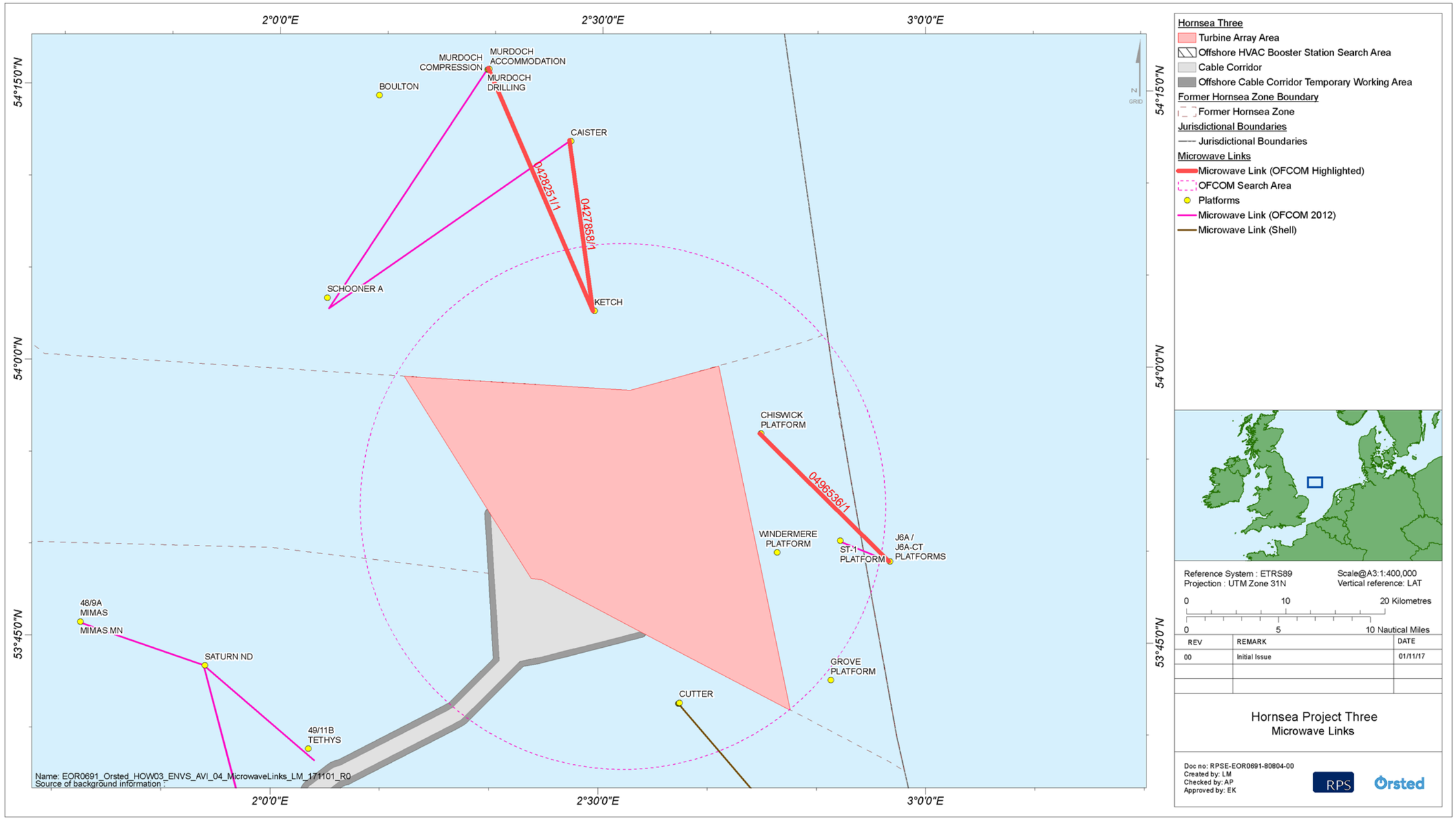

Figure 8.6: Microwave links in the vicinity of the Hornsea Three array area.

8.8 Key parameters for assessment

8.8.1 Maximum design scenario

8.8.1.1 The maximum design scenarios identified in Table 8.8 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 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.

8.8.2 Impacts scoped out of the assessment

8.8.2.1 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 aviation, military and communication. These impacts are outlined, together with a justification for scoping them out, in Table 8.9.

Table 8.8: Maximum design scenario considered for the assessment of potential impacts on aviation, military and communication.

Potential impact	Maximum design scenario	Justification
Construction phase		
Hornsea Three helicopter operations may affect the available airspace for other users.	*Hornsea Three array area:* 1,957 return trips for the construction phase based on: • Up to 225 return trips for wind turbine installation; • Up to 600 return trips for monopile installation; • Up to 600 return trips for array cable installation; and • Up to 532 return trips for all offshore substations and accommodation platforms construction. Hornsea Three array area construction duration: up to eight years over two phases. A gap of up to three years will occur between an activity finishing in the first phase and starting in the second phase of construction. Pre-construction activities will occur one to two years prior to the start of the eight year construction. The construction activities will occur over the following durations within the eight year construction period: • Foundation installation: up to 2.5 years; • Cable installation: up to 2.5 years; and • Substations and platforms: up to 38 months (two months per structure). *Hornsea Three offshore cable corridor:* 1,828 return trips for the construction phase based on: • Up to 1,828 return trips for cable installation; and • Helicopter return trips for offshore HVAC booster station foundations included in Hornsea Three array area above. Hornsea Three offshore cable corridor construction duration: up to eight years over two phases. A gap of up to three years will occur between an activity finishing in the first phase and starting in the second phase of construction. Pre-construction activities will occur one to two years prior to the start of the eight year construction. The construction activities will occur over the following durations within the eight year construction period: • Cable installation: up to three years; and • Substations: up to eight months (two months per substation).	The maximum number of helicopter round trips during the construction phase which may affect the available airspace for other users.
Operation phase		
Wind turbines and hoist operations will form an aerial obstruction resulting in disruption to cross – zone transit helicopter traffic, and Hornsea Three infrastructure will form an aerial obstruction resulting in disruption to helicopters using HMRs.	Anticipated design life of wind farm 35 years. It may be desirable to 'repower' Hornsea Three at or near the end of the design life of Hornsea Three to the end of the 50 year Crown Lease period. If the specifications and designs of the new turbines and/or foundations fell outside of the Maximum design scenario or the impacts of constructing, operation and maintenance, and decommissioning them were to fall outside those considered by this EIA, repowering would require further consent (and EIA) and is therefore outside of the scope of this document. *Hornsea Three array area:* • Up to 160 wind turbines with a maximum tip height of 325 m LAT within an area of up to 696 km^2; • Up to 2,293 return helicopter trips/year to wind turbines; and • Helicopter hoisting platforms may be installed on each of the wind turbine nacelles to enable crews to access the nacelle wind turbine for maintenance. *Hornsea Three offshore cable corridor:* • Up to four offshore HVAC booster stations (tallest element 90 m LAT).	These parameters represent the greatest potential for interference with operations, communication and/or radar systems to cross-zone (Hornsea Three array area) helicopter transit below 2,500 ft and the ability to use the HMRs. Greatest height of infrastructure within the array, the greatest height for hoist operations to take place and the maximum number of helicopter return trips.

Potential impact	Maximum design scenario	Justification
Hornsea Three helicopter operations may affect the available airspace for other users.	*Hornsea Three array area:* Up to 5,451 return trips/year (comprising up to 4,300 to wind turbines, up to 371 to platforms and up to 780 for crew changes) to and from an onshore helicopter base or from an offshore base or vessel with helicopter personnel transfer. Anticipated design life of wind farm 35 years. It may be desirable to 'repower' Hornsea Three at or near the end of the design life of Hornsea Three to the end of the 50 year Crown Lease period. If the specifications and designs of the new turbines and/or foundations fell outside of the Maximum design scenario or the impacts of constructing, operation and maintenance, and decommissioning them were to fall outside those considered by this EIA, repowering would require further consent (and EIA) and is therefore outside of the scope of this document.	The maximum number of return helicopter flights associated with the greatest number of wind turbines (up to 300 wind turbines).
Wind turbines will form a physical obstruction and may disrupt helicopter access, including requirements for decommissioning, to oil and gas platforms.	*Hornsea Three array area:* • Up to 160 wind turbines with a maximum tip height of 325 m LAT; • The maximum area of the Hornsea Three array area within 9 nm of these platforms. Anticipated design life of wind farm 35 years. It may be desirable to 'repower' Hornsea Three at or near the end of the design life of Hornsea Three to the end of the 50 year Crown Lease period. If the specifications and designs of the new turbines and/or foundations fell outside of the Maximum design scenario or the impacts of constructing, operation and maintenance, and decommissioning them were to fall outside those considered by this EIA, repowering would require further consent (and EIA) and is therefore outside of the scope of this document.	These parameters represent the maximum design scenario for height of infrastructure within the array which has the greatest potential for interference with operations, communication and/or radar systems.
Wind turbines will form an aerial obstruction and may disrupt helicopter access to helideck equipped drilling rigs and vessels conducting operations at subsea infrastructure and well locations.	*Hornsea Three array area:* • Up to 160 wind turbines with a maximum tip height of 325 m LAT; • The maximum area of the Hornsea Three array area within 9 nm of active subsea infrastructure and wells. Anticipated design life of wind farm 35 years. It may be desirable to 'repower' Hornsea Three at or near the end of the design life of Hornsea Three to the end of the 50 year Crown Lease period. If the specifications and designs of the new turbines and/or foundations fell outside of the Maximum design scenario or the impacts of constructing, operation and maintenance, and decommissioning them were to fall outside those considered by this EIA, repowering would require further consent (and EIA) and is therefore outside of the scope of this document.	These parameters represent the maximum design scenario for height of infrastructure within the array which has the greatest potential for interference with operations, communication and/or radar systems.
Wind turbines may disrupt radar coverage of NATS Claxby PSR and the Military ADR located at Staxton Wold and Trimingham.	*Hornsea Three array area:* • Wind turbines with a maximum tip height of 325 m within an area of up to 696 km^2; Anticipated design life of wind farm 35 years. It may be desirable to 'repower' Hornsea Three at or near the end of the design life of Hornsea Three to the end of the 50 year Crown Lease period. If the specifications and designs of the new turbines and/or foundations fell outside of the Maximum design scenario or the impacts of constructing, operation and maintenance, and decommissioning them were to fall outside those considered by this EIA, repowering would require further consent (and EIA) and is therefore outside of the scope of this document.	These parameters represent the maximum design scenario for height of infrastructure within the array which has the greatest potential for interference with radar systems.

Potential impact	Maximum design scenario	Justification
Decommissioning phase		
Hornsea Three helicopter operations may affect the available airspace for other users.	*Hornsea Three array area:* 1,957 return trips based on construction helicopter numbers: • Up to 225 return trips for wind turbine decommissioning; • Up to 600 return trips for monopile decommissioning; • Up to 600 return trips for array cable decommissioning; and • Up to 532 return trips for all offshore substations and accommodation platforms decommissioning. Decommissioning of Hornsea Three array area could take up to eight years over two phases. A gap of up to three years will occur between an activity finishing in the first phase and starting in the second phase of decommissioning. *Hornsea Three offshore cable corridor:* 1,828 return trips based on construction helicopter numbers: • Up to 1,828 return trips for cable decommissioning; and • Helicopter return trips for offshore HVAC booster station foundations included Hornsea Three array area above. Decommissioning of Hornsea Three offshore cable corridor could take up to eight years over two phases. A gap of up to three years will occur between an activity finishing in the first phase and starting in the second phase of decommissioning.	The maximum number of helicopter round trips during the decommissioning phase (based on construction helicopter numbers) which may affect the available airspace for other users.

Table 8.9: Impacts scoped out of the assessment for aviation, military and communication.

Potential impact	Justification
Construction phase	
Construction activity and associated vessel movements may interfere with operations within the Military Practice Area located in the Outer Silver Pit area.	Consultation has been undertaken with the MOD who have confirmed that the Outer Silver Pit Submarine Exercise Area is no longer in use and therefore there is no requirement to consider in the Hornsea Three Environmental Impact Assessment. Effects on the Outer Silver Pit Submarine Exercise Area have therefore been scoped out of the assessment.
Construction activity and associated vessel movements may interfere with operations within the Military Practice Area located in the Dutch territorial water.	The Dutch Submarine Exercise Area is located 12.4 km from Hornsea Three and is therefore considered to be too far away to have any spatial overlap with Hornsea Three construction activities. Effects on the Dutch Submarine Exercise Area have therefore been scoped out of the assessment.
Operation and maintenance phase	
Maintenance activity and associated vessel movements may interfere with operations within the Military Practice Area located in the Outer Silver Pit area.	Consultation has been undertaken with the MOD who have confirmed that the Outer Silver Pit Submarine Exercise Area is no longer in use and therefore there is no requirement to consider in the Hornsea Three Environmental Impact Assessment. Effects on the Outer Silver Pit Submarine Exercise Area have therefore been scoped out of the assessment.
Maintenance activity and associated vessel movements may interfere with operations within the Military Practice Area located in the Dutch territorial water.	The Dutch Submarine Exercise Area is located 12.4 km from Hornsea Three and is therefore considered to be too far away to have any spatial overlap with Hornsea Three operation and maintenance activities. Effects on the Dutch Submarine Exercise Area have therefore been scoped out of the assessment.
Impact of physical presence of wind turbines in Hornsea Three array area on fixed wing aircraft.	Commercial air traffic will be at a height that is not affected by the Hornsea Three turbines. Due to the distance offshore recreational fixed wing aircraft are not anticipated in the location of the Hornsea Three array area. Military and surveillance aircraft could be found in the vicinity however any aircraft will be made aware of the location of the project as all structures will appear in UK AIP and will be marked and lit in accordance with the designed in designed in mitigation (Table 8.13). Effects to fixed wing aircraft have therefore been scoped out of the assessment.
Impact of physical presence of wind turbines in Hornsea Three array area on military ATC radar and landing aids.	Military ATC radars have an instrumented range of 60 nm. Military landing aid precision approach radar are only safeguarded out to 20 nm in certain directions. Wind turbines within the Hornsea Three array area (at a distance of 65 nm at the closest point to land) would not be detectable by Military ATC Radars or military landing aids. The MOD confirmed that it is unlikely that there will be any detectability from any MOD ATC radars to the Hornsea Three Array area. This is due to the distance of the Hornsea Three array area offshore, which ensures that it is beyond radar line of sight. This provides the confirmation requested by PINS in their Scoping Opinion in order to justify scoping out effects on military ATC radar (PINS, 2016).
Impact of physical presence of wind turbines in Hornsea Three array area on meteorological radar.	Meteorological radars are land based and have a safeguarding range of 20 km. The Hornsea Three array area, a distance of 65 nm at the closest point to land, would not affect these meteorological radar. The Met Office confirmed that the meteorological radar are safeguarded to 20 km (see Table 8.4). This provides the confirmation requested by PINS in their Scoping Opinion in order to justify scoping out effects on meteorological radar (PINS, 2016).
Impact of physical presence of wind turbines in Hornsea Three array area on cellular telephones.	Cellular telephone providers do not provide coverage for users located in the vicinity of the Hornsea Three array area. In the Scoping Opinion, the Secretary of State agreed that effects on cellular phone coverage can be scoped out as there is no coverage in the vicinity of the Hornsea Three array area (PINS, 2016).
Impact of physical presence of wind turbines in Hornsea Three array area on satellite systems.	The Ofcom Tall Structures guidance document indicates that the principal impact of new structures, such as wind turbines, upon satellite television is the potential blocking between the receiver and the satellite (Ofcom, 2009). Satellite signals are generally received from a high elevation; this means that disruption to satellite reception is usually limited only to cases where a receiver is very close to a tall structure (for example a ship passing a turbine). Trials undertaken for North Hoyle Wind Farm tested Global Positioning System (GPS) performance in the vicinity of the North Hoyle wind turbines, found there to be no significant impact (DfT, 2004). Satellite communication has therefore been scoped out of the assessment.
Impact of physical presence of wind turbines in Hornsea Three array area on microwave links.	Microwave links operate on a 'line of sight' basis and so can be scoped out as there are no microwave links crossing the Hornsea Three array area.
Impact of physical presence of wind turbines in Hornsea Three array area on offshore communication systems.	The North Hoyle trials (DfT 2004) indicated that wind turbines had no noticeable effects upon any voice communication system, vessel to vessel or vessel to shore station. These included ship borne, shore based and hand held VHF transceivers and mobile telephones. Digital selective calling (DSC) was also satisfactorily tested. There are no radio systems operated by utility companies within the vicinity of Hornsea Three. Offshore communication systems have therefore been scoped out of the assessment.
Impact of physical presence of wind turbines in Hornsea Three array area on UHF radio systems.	There are no radio systems operated by utility companies within the vicinity of Hornsea Three. A request was made to Atkins Windfarm support (who have responsibility for providing wind farm/turbine support services to the Telecommunications Association of the UK Water Industry) in relation to UHF Radio Scanning Telemetry communications, who responded that they had no objection to Hornsea Three. UHF radio systems have therefore been scoped out of the assessment.
Impact of physical presence of wind turbines in Hornsea Three creating turbulence which may affect aviation.	Turbulence may affect aircraft during critical stages of flight, or those involved in very light sport aviation such as gliding, parachuting, hang-gliding, paragliding or microlight operations. The Hornsea Three array area is not in the vicinity of an aerodrome and at a distance offshore not to anticipate light sport aviation. Effects from turbulence have therefore been scoped out of the assessment.

Potential impact	Justification
Decommissioning phase	
Decommissioning activity and associated vessel movements may interfere with operations within the Military Practice Area located in the Outer Silver Pit area.	Consultation has been undertaken with the MOD who have confirmed that the Outer Silver Pit Submarine Exercise Area is no longer in use and therefore there is no requirement to consider in the Hornsea Three Environmental Impact Assessment. Effects on the Outer Silver Pit Submarine Exercise Area have therefore been scoped out of the assessment.
Decommissioning activity and associated vessel movements may interfere with operations within the Military Practice Area located in the Dutch territorial water.	The Dutch Submarine Exercise Area is located 12.4 km from Hornsea Three and is therefore considered to be too far away to have any spatial overlap with Hornsea Three decommmissioning activities. Effects on the Dutch Submarine Exercise Area have therefore been scoped out of the assessment.

8.9 Impact assessment methodology

8.9.1 Overview

8.9.1.1 The aviation, military and communication EIA has followed the methodology set out in volume 1, chapter 5: Environmental Impact Assessment Methodology. Specific to the aviation, military and communication EIA, the assessment was designed and undertaken in accordance with the following guidance documents/references:

- Civil Aviation Publication (CAP) 393 The Air Navigation Order 2016 and the Regulations (CAA, 2016);
- CAP 437 Standards for Offshore Helicopter Landing Areas, Eighth Edition (CAA, 2016);
- CAP 764 CAA Policy and Guidelines on Wind Turbines, Sixth Edition (CAA, 2016);
- CAP 670 Air Traffic Services Safety Requirements, Third Edition, second amendment (CAA, 2014a);
- Marine Guidance Note (MGN) 543 (M+F) Safety of Navigation: Offshore Renewable Energy Installations (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response (MCA, 2016);
- MGN 372 (M+F) Offshore Renewable Energy Installations (OREIs): Guidance to Mariners Operating in the Vicinity of UK OREIs (MCA, 2008b);
- Wind farms: MOD Safeguarding (MOD, 2014);
- NATS Aeronautical Information Service (NATS, 2017) (http://www.nats-uk.ead-it.com/public/index.php.html);
- Ofcom, Wind Farm Coordination Policy (Ofcom, 2017); and
- Offshore Renewables Aviation Guidance (ORAG) Good Practice Guidelines for Offshore Renewable Energy Developments (RenewableUK, 2016)).

8.9.2 Impact assessment criteria

8.9.2.1 At the present time, there is no recognised industry best practice with regard to the assessment of impact of offshore wind farms upon aviation operations. As such the assessment methodology is one that was developed specifically for Hornsea Project One and Hornsea Project Two and has been employed, with some refinement through consultation (see Table 8.4), for Hornsea Three.

8.9.2.2 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.

8.9.2.3 The criteria for defining sensitivity in this chapter are outlined in Table 8.10 below.

Table 8.10: Definition of terms relating to the sensitivity of the receptor.

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

8.9.2.4 The criteria for defining magnitude in this chapter are outlined in Table 8.11 below.

Table 8.11: 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).
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.
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.
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.
No change	No change from baseline conditions.

8.9.2.5 The significance of the effect upon aviation, military and communication 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 8.12. Where a range of significance of effect is presented in Table 8.12, the final assessment for each effect is based upon expert judgement.

8.9.2.6 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 8.12: Matrix used for the assessment of the significance of the effect.

		Magnitude of impact				
Sensitivity of receptor		*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

Oil and gas assessments with uncertainty associated with future activities

8.9.2.7 Assessments have been undertaken to consider the potential impacts of Hornsea Three on aviation associated with oil and gas activity. For certain impacts, these assessments can be complicated by the fact that future oil and gas plans have varying degrees of certainty associated with them. This is the case for the potential to disrupt helicopter access to helideck equipped drilling rigs and vessels associated with subsea infrastructure and wells which are not yet planned or do not currently exist. The approach outlined below has been taken for this impact (both in isolation and within the cumulative assessment) to reflect the uncertainty.

8.9.2.8 Initially, consideration has been given to the oil and gas licence blocks that overlap with, or lie within 8 nm of Hornsea Three (the distance at which instrument approach procedures to an offshore helideck have the potential to be restricted due to the presence of the Hornsea Three turbines, as discussed in paragraph 8.11.2.32). An assessment has then been undertaken for those licenced oil and gas blocks in which the licence terms temporally overlap with the operation and maintenance phase of Hornsea Three (see Table 8.7), and:

- The licence operator has the appropriate licences and consents needed to undertake the specific activity which is being assessed; and/or
- There is sufficient information in the public domain (available either through consultation or publicly available documents) regarding the future activity for an assessment to be undertaken.

8.9.2.9 Licenced blocks where the licence terms extend beyond the start of the offshore construction date of Hornsea Three (i.e. 2022 and beyond, meaning a temporal overlap exists) but for which the criteria listed above are not met (i.e. a licence operator does not hold the appropriate licences and consents needed to undertake a specific activity, and/or there is insufficient information available either through consultation (see Table 8.4 for a summary of consultation undertaken) or in the public domain (see Table 8.5 for a list of data sources) to undertake an assessment), have been considered within the assessment, although no conclusion has been reached on the magnitude of the impact or the sensitivity of receptor. This is because there is no temporal and/or spatial information currently available on any future activities and no conceptual overlap can therefore be identified between Hornsea Three and the activity being assessed.

8.9.2.10 Oil and gas blocks which are currently unlicensed have not been considered in the EIA on the basis of no information being available (and therefore low data confidence) on future potential activities. Blocks which are currently licenced, although the terms of the licence expire prior to the offshore construction phase (i.e. prior to 2022) and/or operation and maintenance phase, and/or decommissioning phase of Hornsea Three (see Table 8.7), have not been considered, in the relevant impact assessment, on the basis of no temporal overlap.

8.10 Measures adopted as part of Hornsea Three

8.10.1.1 As part of the project design process, a number of designed-in measures have been proposed to reduce the potential for impacts on aviation, military and communication (see Table 8.13). As there is a commitment to implement these measures they are considered inherently part of the design of Hornsea Three and have therefore been considered in the assessment presented in section 8.11 below (i.e. the determination of magnitude and therefore significance assumes implementation of these measures). These measures are considered standard industry practice for this type of development.

Table 8.13: Designed-in measures adopted as part of Hornsea Three.

Measures adopted as part of Hornsea Three	Justification
The UK Hydrographic Office (UKHO) will be informed of the locations, heights and lighting status of the wind turbines, including estimated and actual dates of construction and the maximum height of any construction equipment to be used, prior to the start of construction, to allow inclusion on Aviation Charts.	To comply with CAP 764 (CAA, 2016c). Structures with a maximum height of 300 ft. (91.4 m) above ground level or higher shall be promulgated in the UK AIP and charted on civil aviation charts. Accordingly, any such structure is required to be notified to the Defence Geographic Centre (DGC) who provides the source of obstacle data, published in the UK AIP at ENR 5.4. In addition, the developer shall provide the maximum height of any construction equipment required to build the turbines. Removal of turbines is also required to be notified and expected date of removal. While aviation charts are in the process of being updated, developments shall also be notified through the means of a Notice to Airmen (NOTAM). The CAA also requests that any feature/structure 70 ft. (21.3 m) in height, or greater, above ground level is also reported to the DGC. It should be noted that NOTAMs would not routinely be required for structures under 300 ft. (91.4 m) unless specifically requested by an aviation stakeholder.
During the operational phase, the Hornsea Three operator will issue, as necessary, requests to the UK Aeronautical Information Service to submit NOTAMs in the event of any failure of aviation lighting.	To comply with CAP 764 (CAA, 2016c) which contains the CAA policy on actions in the event of the failure of aviation warning lights on offshore wind turbines listed in the UK AIP.
Hornsea Three will continue to consult with current oil and gas operators and licensees and will consider representations if approached by future oil and gas operators and licensees.	To promote and maximise cooperation between parties and minimise both spatial and temporal interactions between conflicting activities.
An Emergency Response and Cooperation Plan (ERCoP) will be in place for the operation and maintenance of Hornsea Three. The ERCoP will detail specific marking and lighting of the wind turbines. The requirements for lighting on offshore obstructions, including to support helicopter hoist operations, is contained in CAP 393 (Article 223) (CAA, 2016a), CAP 764 (CAA, 2016c) and CAP 437 (CAA, 2016b). The lighting shall meet the current CAA requirements and will include: the lighting of boundary turbines, where they are more than 900 m apart, with a single 2,000 candela, red aviation light, flashing Morse 'W' in unison with all other boundary turbines. All other turbines will be fitted with a fixed single red 200 candela aviation light for SAR purposes.	This will ensure appropriate lighting is in place to facilitate aeronautical safety.
Hornsea Three shall continue to consult with the MOD to better understand their aviation lighting requirements.	This will maintain safety in relation to defence aviation activities undertaken in the area.

8.11 Assessment of significance

8.11.1 Construction phase

8.11.1.1 The impacts of the offshore construction of Hornsea Three have been assessed on aviation, military and communication. The potential impacts arising from the construction of Hornsea Three are listed in Table 8.8 along with the maximum design scenario against which each construction phase impact has been assessed.

8.11.1.2 A description of the potential effect on aviation, military and communication receptors caused by each identified impact is given below.

Hornsea Three helicopter operations may affect the available airspace for other users

Magnitude of impact

8.11.1.3 The Hornsea Three project may require up to 1,957 helicopter return trips (Hornsea Three array area) and 1,828 helicopter return trips (Hornsea Three offshore cable corridor) over the construction phase (Table 8.8). It is not yet known which helicopter provider would be used for the construction of Hornsea Three or from which airport the helicopter operator would be based, however flights are likely to originate from the east coast of the UK or to come from an offshore base or vessel with helicopter personnel transfer. These flights would be in addition to existing helicopter traffic levels in the southern North Sea at the time of construction.

8.11.1.4 The North Sea offshore oil and gas industry is served by approximately 100 flights a day (Parliament, Helicopter Safety Briefing Document, 2014) which is equivalent to 36,500 flights a year. It is very difficult to predict how the baseline air traffic will change over the course of the Hornsea Three construction phase. While UKCS oil and gas operations are declining and alternative vessel-based services are becoming available to the oil and gas industry, helicopter operations for the offshore wind industry are increasing. This could see the net effect resulting in similar overall helicopter movements to what is seen today. The increase in helicopter requirements from Hornsea Three will however be focused within one area of the southern North Sea, which could see a localised increase in helicopter flights.

8.11.1.5 The impact is predicted to be of local spatial extent, short to medium term duration, continuous and not reversible for the construction phase of Hornsea Three. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be minor.

Sensitivity of receptor

8.11.1.6 Helicopter flights in the UK are highly regulated. The CAA SARG is responsible for the regulation of ATS in the UK; the planning and regulation of all UK airspace, including the CNS infrastructure, and also has the lead responsibility within the CAA for all wind turbine related issues.

8.11.1.7 At all times, responsibility for the provision of safe services lies with the ATS provider or ANSP. Consultation with NATS has advised that there is a mature ATC system provided by NATS in the southern North Sea area that was originally set up to support the offshore oil and gas industry but is available to all users of this airspace. All helicopters flying in these areas are provided with ATC services as they transit to and from offshore installations. Flights to and from Hornsea Three would have the same services available to them. Such services ensure a safe separation distance between aircraft. In addition, a CAA review (CAA, 2014b) of air traffic safety advises that over recent years, significant improvements in surveillance radar and radio coverage within the UK North Sea environment have been developed and implemented which has enhanced the service ATC providers are able to deliver during the en-route phase of flight, to and from the oil and gas platforms.

8.11.1.8 The same rules of the air and ATC services will continue to apply to helicopter operators within the southern North Sea. The provision of a service to Hornsea Three is not considered to affect the provision of a service to another user of the airspace. Best practice offshore aviation guidance has been developed for the offshore wind energy sector (Renewables UK, 2016) which will be taken into consideration by Hornsea Three.

8.11.1.9 The ability of the helicopter operator to continue using the southern North Sea airspace 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

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

Future monitoring

8.11.1.11 No aviation, military and communication monitoring to test the predictions made within the construction phase impact assessment is considered necessary.

8.11.2 Operational and maintenance phase

8.11.2.1 The impacts of the offshore operation and maintenance of Hornsea Three have been assessed on aviation, military and communication. The potential impacts arising from the operation and maintenance of Hornsea Three are listed in Table 8.8 along with the maximum design scenario against which each operation and maintenance phase impact has been assessed.

8.11.2.2 A description of the potential effect on aviation, military and communication receptors caused by each identified impact is given below.

Wind turbines and hoist operations will form an aerial obstruction resulting in disruption to cross – zone transit helicopter traffic, and Hornsea Three infrastructure will form an aerial obstruction resulting in disruption to helicopters using HMRs

Magnitude of impact

8.11.2.3 When flying in IFR, helicopters are required to maintain a 1,000 ft vertical separation from obstacles. Consultation meetings have advised that most helicopter operators choose to fly in IFR conditions regardless of weather conditions. A typical MSA of 1,500 ft. is therefore flown to allow for 1,000 ft. clearance of transiting vessels. The Hornsea Three turbines will be 325 m (1,066 ft.) at their maximum height. The present MSA of 1,500 ft. will therefore be required to be raised to 2,066 ft. by the presence of the turbines (1,066 ft. plus 1,000 ft. clearance). As helicopters are height banded in the southern North Sea at 500 ft. intervals this would mean the MSA would be raised to 3,000 ft. (inbound) and 2,500 ft. (outbound). This is an additional 500 ft. climb and descent required per journey.

8.11.2.4 The maximum flight path distances across the Hornsea Three array area are shown in Figure 8.7. The maximum flight path across the Hornsea Three array area on a north-south axis is 35 km and on a northwest-southeast diagonal, 51 km. These flight paths are not considered likely based on the location of the airfields and destination oil and gas platforms in relation to these flight paths. For instance, a direct flight path from Norwich airport to the north of the Hornsea Three array area, which is a more probable requirement to serve the platforms and licenced acreage to the north of the Hornsea Three array area, is, at its maximum, a distance of 27.5 km across the Hornsea Three array area.

8.11.2.5 A direct flight path from Humberside airport to the east of the Hornsea Three array area, which would serve the licenced acreage and platforms to the east of the Hornsea Three array area, is, at its maximum, a distance of 27.1 km across the Hornsea Three array area. A direct flight path from Humberside airport to the Chiswick platform (operated by Spirit Energy) as shown in Figure 8.7, is at its maximum, a distance of 26.9 km across the Hornsea Three array area and would require 13% of the total flight distance to be flown at a raised MSA based on the Hornsea Three project alone.

8.11.2.6 A typical months radar data was assessed by NATS for October 2017 (NATS 2017c) to show the flights transiting within 9 nm of Hornsea Three from sea level to FL60 (see Figure 8.8). The majority of flights recorded are return helicopter flights from Norwich airfield (an average of six return flights a day). Two return flights over the entire month are from Humberside (an average of 0.06 flights a day). One of these flights was a Hornsea Three surveillance flight. The data also includes a single flight from outside the UK FIR which routed southeast to northwest through the Hornsea Three array area at 3,000 ft on 30 October 2017. This is considered by NATS to most probably be a light aircraft transiting between Edinburgh and Holland.

8.11.2.7 North-south cross-zone traffic can be seen to occur from Norwich airport up to some of the platforms and licenced acreage to the north of the Hornsea Three array area. Consultation has advised that the Ketch platform (Faroe Petroleum) is serviced from Norwich, this platform is however likely to be decommissioned prior to Hornsea Three construction and will therefore not be present during the operational phase. Consultation has advised that the Murdoch group of platforms (ConocoPhillips) are serviced from Norwich. The flight path from Norwich airport to the Caister platform (part of the Murdoch group of platforms) (as shown in Figure 8.7) is at its maximum, a distance of 5.2 km across the array area. This flight path would require 2.8% of the total flight distance to be flown at a raised MSA based on the Hornsea Three project alone.

8.11.2.8 Consultation has advised the platforms and acreage to the east of the Hornsea Three array area are predominantly served from the Netherlands which is supported by the lack of east- west routes shown in Figure 8.8. However, consultation has also advised that whilst it is usual for the industry to use an airfield that flies the shortest route, in some instances this may vary as for example when using a contractor (e.g. when contracting a drilling rig). An east-west route, for helicopters flying from Humberside to east of the Hornsea Three array area should therefore be considered as a possible scenario.

8.11.2.9 Hoist operations are maintenance activities which take place using helicopters lowering personnel and/or equipment to the wind turbines by hoist. Hoist operations may occur on a daily basis but will be restricted to VFR conditions only. Assuming VFR can be flown for 90% (see volume 4, annex 1.1: Hornsea Project One and Hornsea Project Two Consultation of Relevance to Hornsea Three) of the year and a maximum of up to 2,293 helicopter flights are required a year for both corrective and preventative maintenance within the Hornsea Three array area, there will be approximately 12 helicopters performing hoist operations across the Hornsea Three array area of 696 km^2 on any one day of the year.

8.11.2.10 When hoist operations are within 434 ft. of the turbines, which will be the majority of the time (considering hoist operations occur within 10 m of the nacelle, and then movement between turbines) no additional height gain will be required as this is within the height band of between 1,066 ft. to 1,500 ft. (plus 1,000 ft. separation raises the MSA to 2,500 ft.).

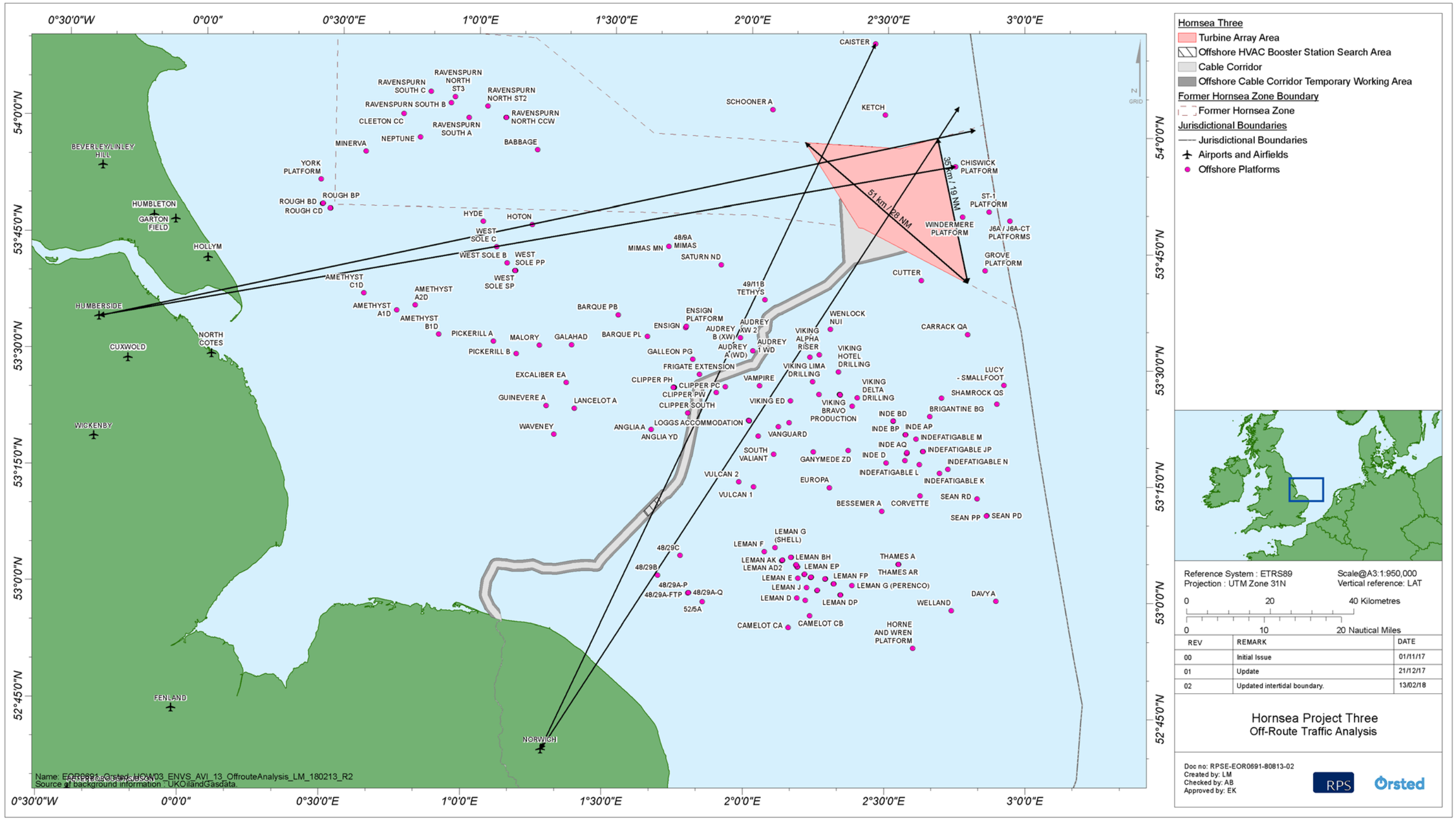

Figure 8.7: Hornsea Three off route traffic analysis.

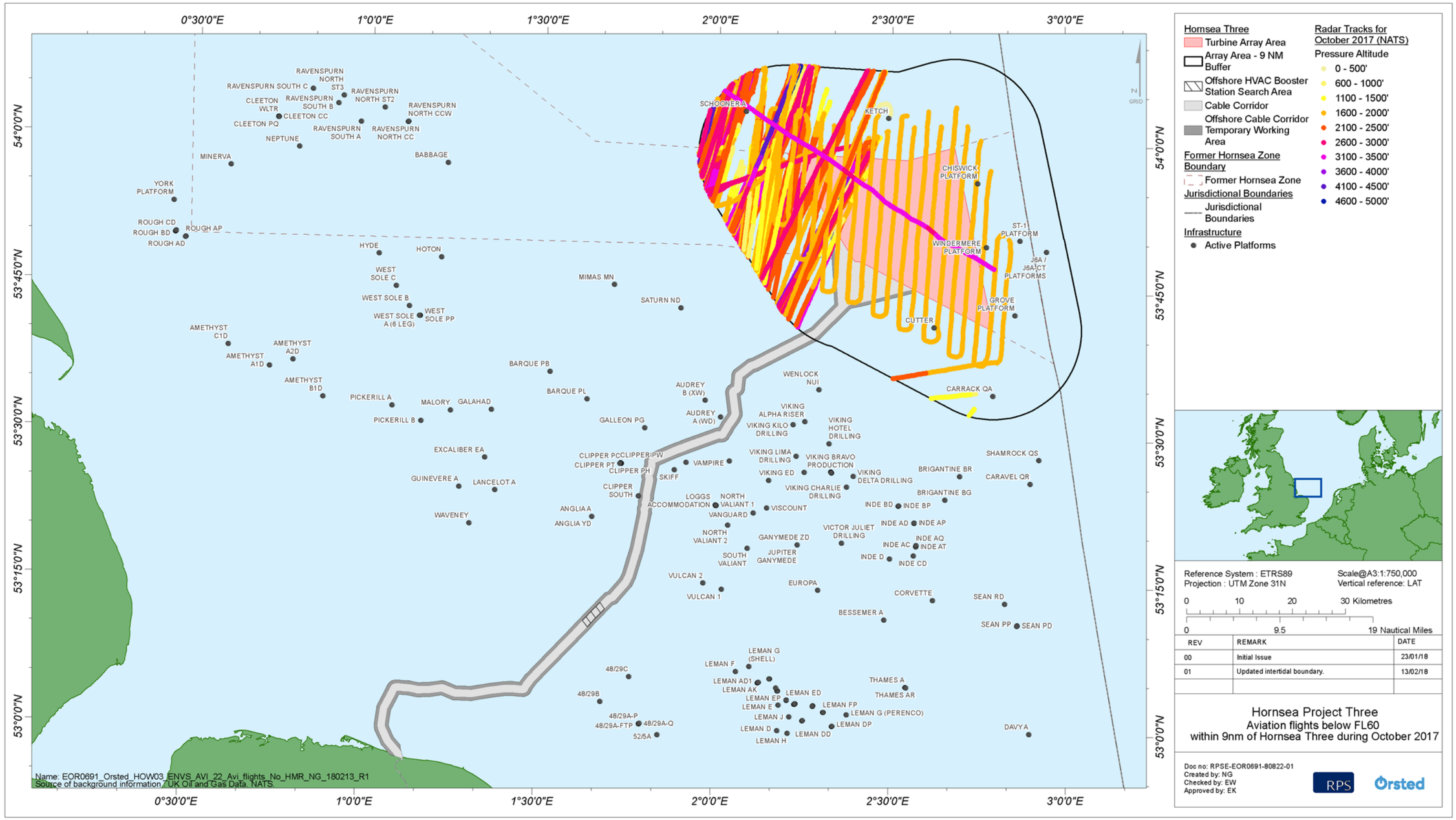

Figure 8.8: Aviation flights within 9 nm of Hornsea Three during October 2017.

8.11.2.11 When IMC require flight at an MSA below 2,500 ft the helicopter operators will be required to reroute around Hornsea Three or to use the HMR Network. HMRs are established to both provide an identification of common flight paths and to facilitate safe helicopter flights when flying in IMC (i.e. when flight cannot be completed in visual conditions). CAP 764 recommends HMRs should ideally be free of obstacles 2 nm either side of the centre line due to the requirement for helicopters to transit below the 0° isotherm level during conditions which pose an icing risk. Helicopters may choose to fly as low as 500 ft. in such conditions when they are within the HMR. Hornsea Three pre-application consultation has advised that the HMR network is not widely used in the southern North Sea and that helicopter operators choose to route directly to their destination. HMR 2 crosses the Hornsea Three array (Figure 8.3) but the presence of the turbines in HMR 2 would preclude the use of this route when the weather would require flight at a lower altitude than 2,500 ft.

8.11.2.12 The altitude that the helicopter can fly is based on obstacle clearance criteria and may also be dictated by the icing level or 0° isotherm (the level at which the air temperature reaches freezing). Flight into known icing conditions can be prohibiting, and is generally time-limited, depending upon the aircraft type. Thus a low freezing level can pose problems for helicopter operations. Consultation has advised that this varies for different aircraft and that certain aircraft can be fitted with icing protection should this become a client requirement. Aircraft unable to fly in icing conditions would need to route below the icing level. Aircraft already operate under these limitations occasionally, but the higher the MSA, the more frequent will be the days where the freezing level is at or below MSA.

8.11.2.13 The presence of obstructions in HMR 2 means that aircraft would not be able to use this route in IMC when the weather conditions require flight at a lower altitude than 2,500 ft. which could be up to 10% of the time (see details of consultation undertaken with BOND in volume 4, annex 1.1: Hornsea Project One and Hornsea Project Two Consultation of Relevance to Hornsea Three) and therefore would reroute around Hornsea Three.

8.11.2.14 Up to four offshore HVAC booster stations of a maximum height of 90 m LAT may be positioned within the offshore HVAC booster station search area within the Hornsea Three offshore cable corridor (see Figure 8.3). The offshore HVAC booster station search area is crossed by HMR 3 and HMR 5. The maximum height of the tallest element of the offshore HVAC booster station is 90 m (295 ft). When operating under IFR, a helicopter flying above the offshore HVAC booster stations would need to be flown at a minimum altitude of 1,295 ft amsl (height banded to 1,500 ft).

8.11.2.15 There are a considerable number of offshore oil and gas platforms located in HMRs which are of a similar height to the offshore HVAC booster stations (for example the Carrack platform within HMR 435 is 84.7 m high). During consultation for Hornsea Project One (see volume 4, annex 1.1: Hornsea Project One and Hornsea Project Two Consultation of Relevance to Hornsea Three) NATS advised that obstacles (such as an offshore HVAC booster station) can be present within HMRs just as other oil and gas platforms are and that this is not seen as a safety issue as it is a stationary and identifiable object that can be navigated around. The offshore HVAC booster stations are not considered a prohibition on the use of the HMR however, dependent on their ultimate location and configuration, may require a very minor deviation, in instances where aircraft are required to fly below MSA 1,500 ft. There is available airspace to all sides of the proposed location of the offshore HVAC booster stations for this minor deviation.

8.11.2.16 The impact on cross-zone traffic, both raising the MSA and using the HMR network, is predicted to be of regional spatial extent, medium term duration, continuous and not reversible for the operation and maintenance phase of Hornsea Three. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be moderate.

Sensitivity of the receptor

8.11.2.17 Cross-zone transit flights can be flown in visual conditions (i.e. in weather conditions in which pilots will be able to see and avoid obstructions) or in IMC when the icing level is high enough. In these weather conditions, due to the presence of Hornsea Three turbines, helicopters would be required to transit at a higher MSA over the Hornsea Three array area. Should weather conditions exist whereby either VFR or IFR transits cannot be continued above the Hornsea Three array area, helicopters may choose to reroute to the HMR network, however it would not be possible to use the HMR 2 across the Hornsea Three array for the same reasons as the cross-zone flight and they would therefore be required to deviate around the Hornsea Three array area. An obstacle free route is available as a deviation around the Hornsea Three array area. A suggested deviation is shown in Figure 8.9. It should be noted that an amendment to the HMR is not being proposed but is noted as an alternative route option for the helicopter operator. The ability of the helicopter operator to safely undertake the intended journey is therefore not affected.

8.11.2.18 In regard to cross zone traffic and the use of HMR 2 the helicopter operator has low vulnerability as it is able to adapt to an increased MSA. The helicopter may also have a certain level of icing protection and there are alternative routes that can be flown. There may however be, as a consequence of the raised MSA, an increased journey time due to the requirement to fly at a greater height or to deviate around the Hornsea Three array area, which will affect the helicopter operator directly.

8.11.2.19 In regard to the use of HMR 3 and HMR 5, the helicopter operator has low vulnerability as it able to continue to fly these routes with very minor deviations. The location of the offshore HVAC booster stations would be reported to the DGC (as per CAP 764 para 4.9(2)).

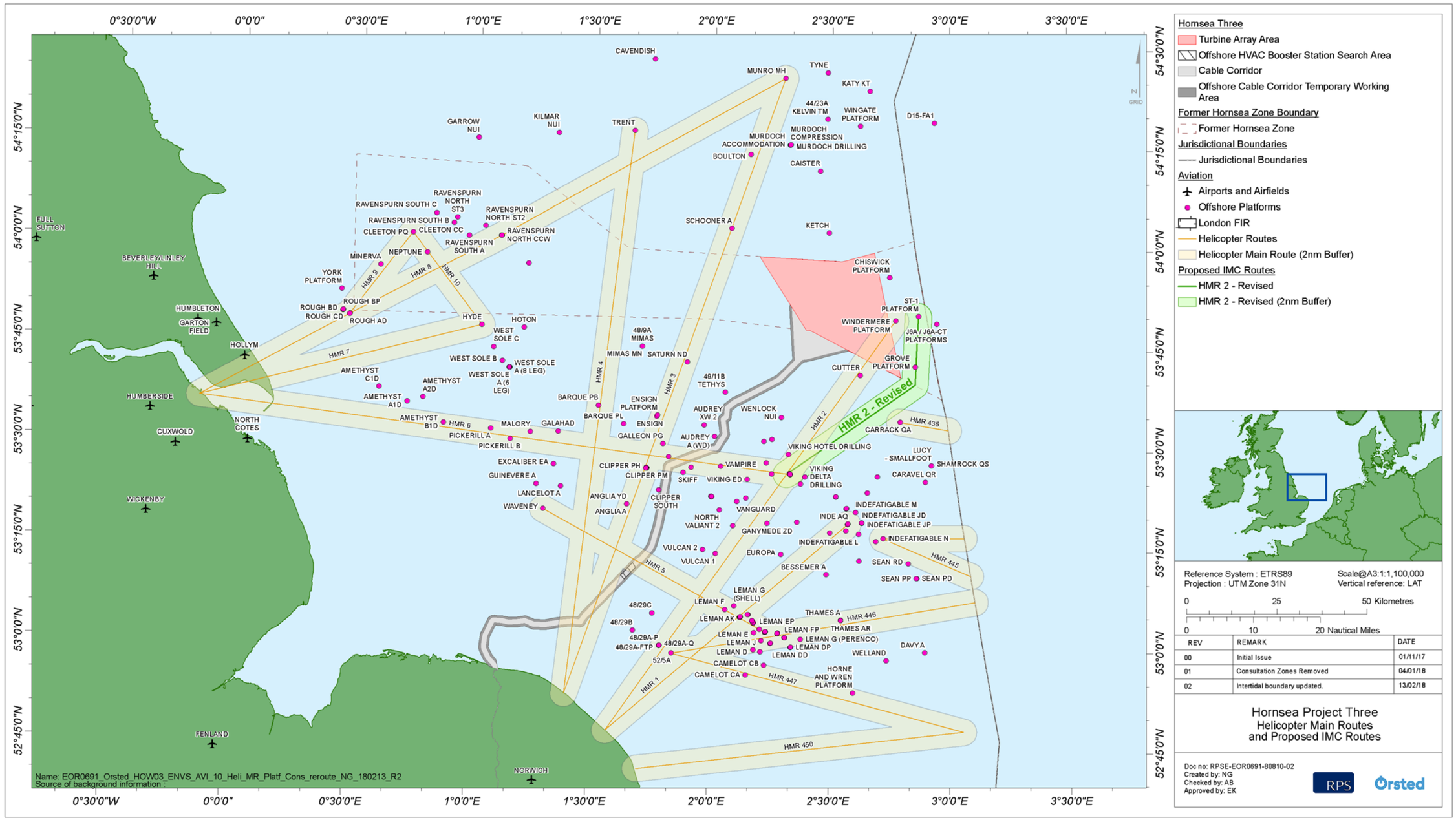

Figure 8.9: Helicopter Main Routes and proposed IMC routes.

8.11.2.20 The sensitivity of the helicopter operator to be able to transit Hornsea Three has therefore been assessed as low vulnerability, high recoverability and high value. The sensitivity of the receptor is therefore considered to be low.

Significance of effect

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

Hornsea Three helicopter operations may affect the available airspace for other users

8.11.2.22 This impact is a continuation of the potential impact upon available airspace for other users during the construction phase.

Magnitude of impact

8.11.2.23 The Hornsea Three project may require up to 4,671 return helicopter flights per year or approximately 14 flights per day during the operation and maintenance phase. It is not yet known which helicopter provider would be used or from which airport the helicopter operator would be based, however flights are likely to originate from the east coast of the UK or from an onshore helicopter base or from an offshore base or vessel with helicopter personnel transfer. These flights would be in addition to the prevailing helicopter traffic levels in the southern North Sea at the time of Hornsea Three operation.

8.11.2.24 The North Sea offshore oil and gas industry is presently served by some 100 flights a day (Parliament, 2014). It is very difficult to predict how the baseline air traffic will change over the operational phase of Hornsea Three. While UKCS oil and gas operations are declining and alternative vessel-based services are becoming available to the oil and gas industry, helicopter operations for the offshore wind industry are increasing. This could see the net effect resulting in similar overall helicopter movements to what is seen today. The increase in helicopter requirements from Hornsea Three during the operation and maintenance phase will however be focused within one area of the southern North Sea, which could see a localised increase in helicopter flights. The impact is predicted to be of regional spatial extent, medium term duration, continuous and not reversible for the lifetime of Hornsea Three. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be moderate.

Sensitivity of receptor

8.11.2.25 Helicopter flights in the UK are highly regulated (see paragraph 8.11.1.7) and their sensitivity within this regulated environment is discussed in paragraph 8.11.1.6.

8.11.2.26 The same rules of the air and ATC services will continue to apply to helicopter operators within the southern North Sea. The provision of a service to Hornsea Three is not considered to affect the provision of a service to another user of the airspace

8.11.2.27 The helicopter operator using the southern North Sea airspace 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

8.11.2.28 Overall, 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.

Wind turbines will form a physical obstruction and may disrupt helicopter access including requirements for decommissioning to oil and gas platforms

Magnitude of impact

8.11.2.29 Wind turbines are considered as physical obstructions and helicopter operators must maintain the minimum obstacle clearance criteria of 1,000 ft in IMC. Furthermore during the approach to an installation, all radar contacts (including radar contacts that are turbines) have to be avoided laterally by at least 1 nm. These combined effects within a 9 nm consultation zone of an offshore installation may impair the safety of air operations to that installation and affect the installation operators' regulatory requirements with regard to safety of operation. The 9 nm consultation zones of the Schooner A and Ketch platforms (currently operated by Faroe Petroleum); the Chiswick, ST-1, J6A/J6A-CT and Grove platforms (currently operated by Spirit Energy), the Windermere platform (currently operated by INEOS) and the Carrack QA platform (currently operated by Shell) (detail provided in Table 8.6) overlap with the Hornsea Three array area.

8.11.2.30 If high altitude flights are required during normal weather conditions, flights can be flown under VFR. Instrument approach procedures are used as a low-visibility approach procedure to the platforms, and rely upon an on-board weather radar for obstacle detection and navigation. Helicopters which operate to and from offshore platforms are fitted with airborne weather radar which can be used to conduct an instrument approach in poor visibility. The radar is designed to display weather phenomena, such as rain, as well as obstacles such as oil or gas platforms, or wind turbines. In IMC and in certain wind conditions, which dictate the area of approach to the platform, instrument approach procedures might be restricted due to the proximity of wind turbine structures to the flight approach path.

8.11.2.31 Current operational procedures indicate that the optimum descent angle for helicopters on approach to offshore platforms is a descent rate of 300 ft. per minute to 400 ft. per minute (3° to 4° glide path) (CAA, 2016c). When conducting an instrument approach procedure a helicopter must maintain a 1,000 ft. vertical clearance from all obstacles as it lines up its final descent and a 1 nm lateral separation from all radar contacts. It is also required to maintain a suitable distance from its point of destination, such that a MAP can be enacted, if required (see paragraph 8.7.4.11).

8.11.2.32 If it is assumed that an acceptable rate of descent is a 3.5° glide path, the minimum distance that a 325 m high turbine can be constructed from a platform is 8 nm before instrument approach procedures have the potential to be restricted. The helicopter descends from the MSA at 8.4 nm avoiding all radar contacts by 1 nm but flying in any wind direction, to the Fixed Approach Point at 7nm (the procedural value set by the helicopter operator and ranging typically from 5 to 7 nm). The helicopter then flies a straight line approach (up to 30º out of wind in either direction) to a minimum descent height of 200 to 300 ft typically at 2 nm (CAA, 2016c). The helicopter then flies to the Missed Approach Point at 0.75 nm where a decision is made either to land or to fly past and conduct a Missed Approach Procedure.

8.11.2.33 As the final approach path from the Fixed Approach Point of an instrument approach procedure is required into wind (with up to 30º out of wind variation) for reasons of helicopter stability, instrument approach procedures will be restricted in certain weather conditions by the presence of the Hornsea Three array area. Figure 8.10 and Figure 8.11 shows the constrained approach sectors that would be restricted for instrument approach procedures.

8.11.2.34 Due to the presence of wind turbines in the Hornsea Three array area, a volume of airspace would be considered unavailable for instrument approach procedures to these platforms. This would apply in certain weather conditions during high altitude access under instrument approaches. The potential number of instrument approach procedures to the platforms within 9 nm that are likely to be affected by the Hornsea Three array area have been assessed assuming the worst case restricted areas (see volume 5, annex 8.1: Aviation, Military and Communication Technical Report). From consultation with helicopter operators and drawing on the operational experience of Orsted's helicopter specialist, it is known that due to the frequency of certain weather conditions which dictate IMC, direct instrument approach procedures are conducted to platforms approximately 5% of the time. This assessment assumes an even spread of IMC across the year and uses month averaged wind direction and wind speed data from the Schooner A platform to highlight times of the year when instrument approaches could be restricted.

8.11.2.35 It should be noted that under certain weather conditions and sea states, flights may be restricted irrespective of Hornsea Three. These restrictions have not been taken into account in this assessment.

Magnitude of impact for Schooner A and Ketch platforms

8.11.2.36 Based on a Fixed Approach Point at 7 nm and allowing a 1 nm separation distance from the wind turbines, it is estimated that 333.3° of airspace surrounding the Schooner A platform, and 212.5° of airspace around the Ketch platform would remain available for instrument approach procedures and MAP requirements.

8.11.2.37 The results indicate that the Hornsea Three array area would not prevent instrument approaches to the Schooner A platform. This is because, even though a small portion of airspace is restricted, direct instrument approaches can be flown up to 30º out of wind.

8.11.2.38 The results indicate that the impact of the Hornsea Three array area would be to prevent instrument approaches to the Ketch Platform on approximately 0.27 to 0.36 days per month (up to 3.66 days per year). The greatest impact is seen in the month of May when 1.17% of flights may be precluded. The least impact is seen in October when 0.82% of flights may be precluded. Over the year, less than 2% of days are restricted which is considered to be a low occurrence.

8.11.2.39 There is no impact to the Schooner A platform as instrument approaches to the platform can be made in all wind directions (see paragraph 8.11.2.37) The impact to the Ketch platform is predicted to be of local spatial extent, medium term duration, intermittent in occurrence and not reversible for the operation and maintenance phase of Hornsea Three. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be minor.

Magnitude of the Chiswick, ST-1, J6A/J6A-CT and Grove platforms

8.11.2.40 Based on a Fixed Approach Point at 7 nm and allowing a 1 nm lateral separation distance from the wind turbines, it is estimated that 190° of airspace surrounding the Chiswick platform, 239.6° around the ST-1 platform, 294.1° around the J6A/J6A-CT platform and 234.9° around the Grove platform would remain available for instrument approach procedures and MAP. When the surface wind is such that an ARA might be flown directly towards the Hornsea Three array area, utilising an approach path offset by up to 30º should ensure that helicopters would have sufficient airspace to complete a MAP.

8.11.2.41 The results indicate that the impact of the Hornsea Three array area would be to prevent instrument approaches to the Chiswick platform on approximately 0.17 to 0.40 days per month (up to 3.49 days per year). The greatest impact is seen in the month of April when 1.35% of flights may be precluded. The lowest impact is seen in August when 0.56% of flights may be precluded. Over the year less than 2% of days are restricted which is considered to be a low occurrence.

8.11.2.42 The results indicate that the impact of the Hornsea Three array area would be to prevent instrument approaches to the ST-1 platform on approximately 0.07 to 0.22 days per month (up to 1.84 days per year). The greatest impact is seen in the month of April when 0.74% of flights may be precluded. The lowest impact is seen in August when 0.23% of flights may be precluded. Over the year less than 2% of days are restricted which is considered to be a low occurrence.

8.11.2.43 The results indicate that the impact of the Hornsea Three array area would be to prevent instrument approaches to the J6/J6a-CT platform on approximately 0.01 to 0.06 days per month (up to 0.45 days per year). The greatest impact is seen in the month of April when 0.216% of flights may be precluded. The lowest impact is seen in August when 0.05% of flights may be precluded. Over the year less than 2% of days are restricted which is considered to be a low occurrence.

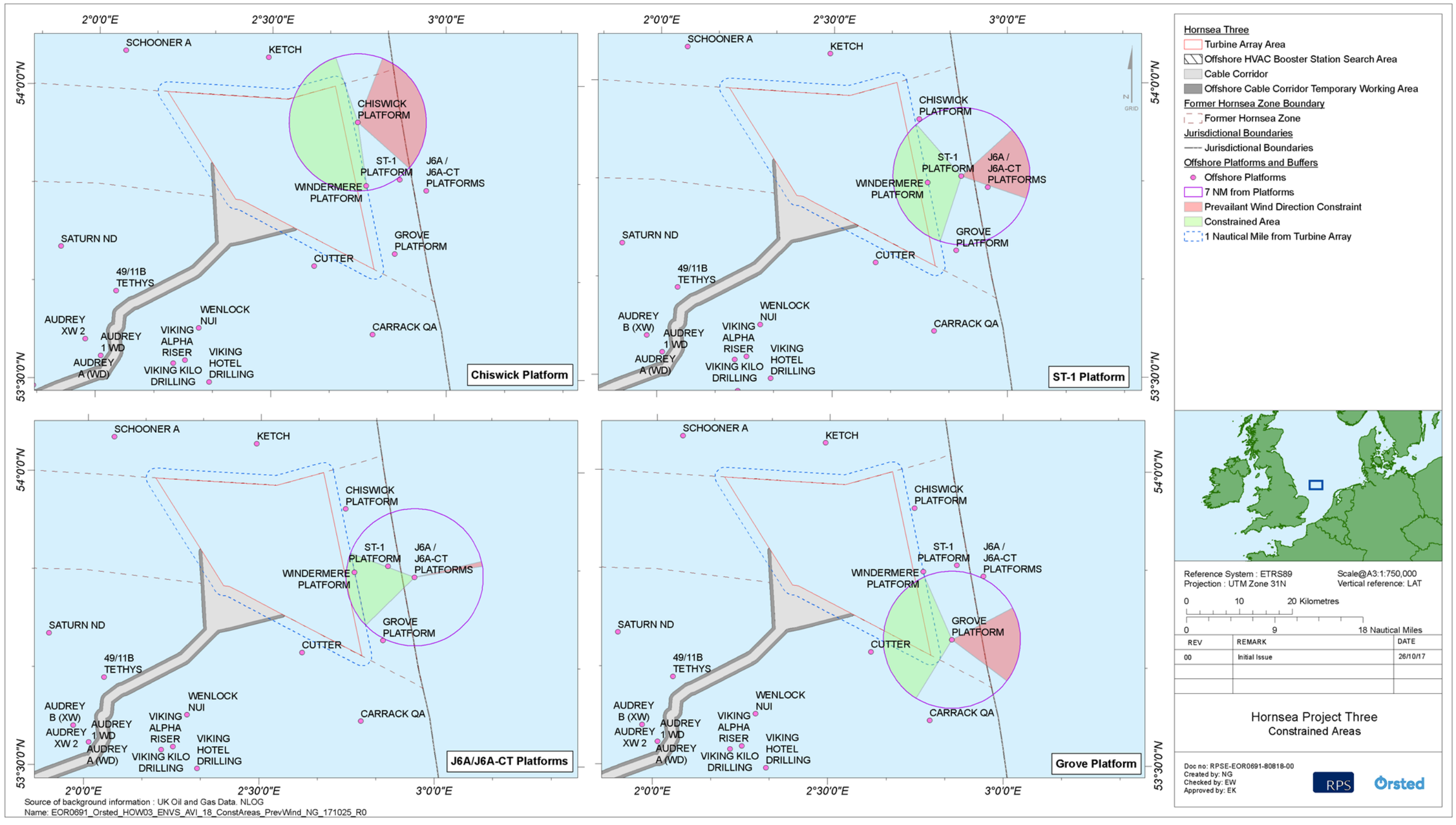

Figure 8.10: Illustration of constrained approach areas under certain conditions for Chiswick, ST-1, J6A/J6A-CT and Grove platforms in relation to the Hornsea Three array area.

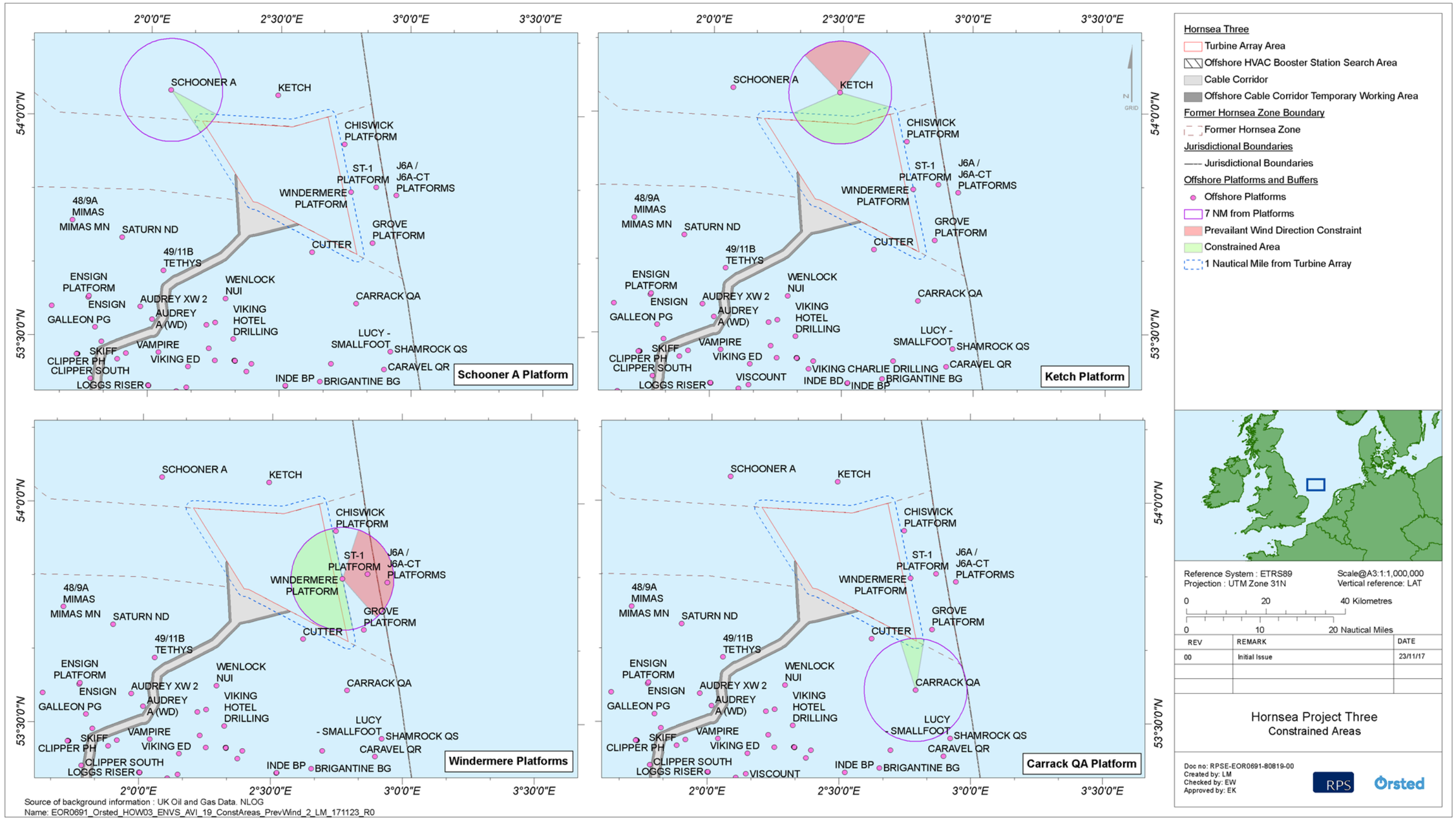

Figure 8.11: Illustration of constrained approach areas under certain conditions to Schooner A, Ketch, Windermere and Carrack QA platforms in relation to the Hornsea Three array area.

8.11.2.44 The results indicate that the impact of the Hornsea Three array area would be to prevent instrument approaches to the Grove platform on approximately 0.12 to 0.25 days per month (up to 2.18 days per year). The greatest impact is seen in the month of April when 0.83% of flights may be precluded. The lowest impact is seen in August when 0.39% of flights may be precluded. Over the year less than 2% of days are restricted which is considered to be a low occurrence.

8.11.2.45 The impact is predicted to be of local spatial extent, medium term duration, intermittent in occurrence, and not reversible for the operation and maintenance phase of Hornsea Three. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be minor.

Magnitude of the Windermere platform (INEOS)

8.11.2.46 Based on a Fixed Approach Point at 7 nm and allowing a 1 nm separation distance from the wind turbines, it is estimated that 180° of airspace surrounding the Windermere platform would remain available for instrument approach procedures and MAP.

8.11.2.47 The results indicate that the impact of the Hornsea Three array area would be to prevent instrument approaches to the Windermere Platform on approximately 0.19 to 0.43 days per month (up to 3.73 days per year). The greatest impact is seen in the month of April when 1.43% of flights may be precluded. The lowest impact is seen in August when 0.62% of flights may be precluded. Over the year less than 2% of days are restricted which is considered to be a low occurrence.

8.11.2.48 The impact is predicted to be of local spatial extent, medium term duration, intermittent in occurrence and not reversible for the operation and maintenance phase of Hornsea Three. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be minor.

Magnitude of Carrack QA platform (Shell)

8.11.2.49 Based on a Fixed Approach Point of 7 nm, it is estimated that 333.6° of airspace surrounding the Carrack platform would remain available for instrument approach procedures and MAP.

8.11.2.50 The results indicate that the Hornsea Three array area would not prevent instrument approaches to the Carrack QA platform. This is because, even though a small portion of airspace is restricted, direct instrument approaches can be flown up to 30º out of wind. There is therefore no impact to the Carrack QA platform.

Sensitivity of receptor

8.11.2.51 The sensitivity of the receptor (the platform operator) will depend on the operational requirements of the platform and whether access is required for planned decommissioning.

Sensitivity of the Schooner and Ketch platforms (currently operated by Faroe Petroleum)

8.11.2.52 Consultation took place with the operator of the Ketch platform (Faroe Petroleum) and has confirmed that flights to this platform are from Norwich. The platform is a NUI but daily shuttling to the platform is required in the manned phase, which occurs two weeks out of five during the summer and short ad-hoc visits during the winter. Access will be required for these routine maintenance periods and operational emergencies. If high altitude flights are required during normal weather conditions, flights can be flown visually under VFR. The only time access will be restricted is either during maintenance periods when weather conditions require instrument approaches, or during operational emergencies when helicopter flights are required direct to the platform at high altitude and under IMC.

8.11.2.53 Consultation has advised that the Ketch platform is likely to be decommissioned in 2021 to 2022 prior to the start of construction of Hornsea Three (2022) however this is not as yet confirmed by an approved decommissioning plan. Furthermore, consultation has advised that Faroe Petroleum are moving towards the use of vessels for maintenance programmes as this can be more cost effective, which may reduce the use of helicopters. Together these factors indicate that there is unlikely to be operational restrictions on access to the Ketch platform or access requirements during platform decommissioning.

8.11.2.54 The sensitivity of the platform operator to access the Ketch platform is deemed to be of low vulnerability, high recoverability and moderate value. The sensitivity of the receptor is therefore, considered to be low.

Sensitivity of the Chiswick, ST-1, J6A/J6A-CT and Grove platforms (currently operated by Spirit Energy).

8.11.2.55 Consultation took place with the operator of the Chiswick, ST-1, J6A/J6A-CT and Grove platforms (Spirit Energy). From this consultation, it is understood that the Chiswick, and Grove platforms are NUI's and access will be required for monthly maintenance flights (up to 40 days per year) and operational emergencies.

8.11.2.56 From this consultation, it is understood that the J6A platform is manned and requires daily flights and operational emergencies.

8.11.2.57 Consultation has also advised that the ST-1 platform is due for decommissioning between 2018 and 2020 and the decommissioning plans have been submitted to BEIS but are not yet approved. It is most probable that this platform will be decommissioned prior to the start of Hornsea Three offshore construction (indicatively 2022) and therefore in advance of the operation and maintenance phase. Operational access requirements to the ST-1 platform, or during platform decommissioning, are therefore not likely to be affected by Hornsea Three.

8.11.2.58 If high altitude flights are required during normal weather conditions, flights can be flown visually under VFR. The only time access will be restricted is when weather conditions require instrument approaches.

8.11.2.59 The sensitivity of the platform operator to access these platforms is deemed to be of moderate vulnerability, high recoverability and high value. The sensitivity of the receptor is therefore, considered to be high for the Chiswick, J6A and Grove platforms and low for the ST-1 platform.

Sensitivity of the Windermere platform (INEOS)

8.11.2.60 Consultation took place with the operator of the Windermere platform (INEOS). From this consultation, it is understood that this platform is a NUI and therefore access will be required for routine maintenance and operational emergencies. If high altitude flights are required during normal weather conditions, flights can be flown visually under VFR. The only time access will be restricted is either during maintenance periods when weather conditions require instrument approaches, or during operational emergencies when helicopter flights are required direct to the platform at high altitude and under IMC.

8.11.2.61 Consultation has also advised that the Windermere platform is very likely to be decommissioned prior to the start of construction of Hornsea Three (2022) and therefore in advance of the operation and maintenance phase of Hornsea Three, however this is not as yet confirmed by an approved decommissioning plan. This means that there is unlikely to be operational restrictions on access to the Windermere platform or access requirements during platform decommissioning. The sensitivity of the platform operator is deemed to be of low vulnerability, high recoverability and low value. The sensitivity of the receptor is therefore, considered to be low.

Sensitivity of Carrack QA platform (currently operated by Shell)

8.11.2.62 There is no impact to the Carrack QA platform and so the sensitivity has not been assessed.

Significance of the effect

Significance of effect for Schooner A and Ketch platforms (currently operated by Faroe Petroleum)

8.11.2.63 Overall, the sensitivity of the receptor to access the Ketch platform is considered to be low and the magnitude of impact is deemed to be minor. The effect will, therefore, be of minor adverse significance, which is not significant in EIA terms.

Significance of effect for the ST-1, J6A/J6A-CT and Grove platforms (currently operated by Spirit Energy).

8.11.2.64 Overall, the sensitivity of the receptor is considered to be high for the Chiswick, J6A and Grove platforms and low for the ST-1 platform and the magnitude of impact is deemed to be minor for all platforms. The effect will, therefore, be of minor adverse significance, which is not significant in EIA terms.

Significance of effect of the Windermere platform (INEOS)

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

Significance of the Carrack QA platform (currently operated by Shell)

8.11.2.66 There is no impact to the Carrack QA platform and so the significance of effect has not been assessed.

Wind turbines will form an aerial obstruction and may disrupt helicopter access to helideck equipped drilling rigs and vessels conducting operations at subsea infrastructure and well locations

8.11.2.67 The assessment of this potential impact is complicated by the fact that future oil and gas plans have varying degrees of certainty associated with them (for example whether or not an exploitable resource will be found and if so, where any infrastructure associated with this will be located). For this reason, as noted in paragraphs 8.9.2.7 to 8.9.2.10 above, the assessment has only been able to consider those licenced blocks with potential for spatial and temporal interactions, which are licenced beyond the start of the Hornsea Three operation and maintenance phase (i.e. assumed to be 2030 and beyond) and:

- The licence operator has the appropriate licences and consents needed to undertake the specific activity which is being assessed; and/or
- There is sufficient information in the public domain (available either through consultation or publicly available documents) regarding the future activity for an assessment to be undertaken.

8.11.2.68 Licenced blocks where the licence terms extend beyond the start of the operation and maintenance phase of Hornsea Three but do not meet the criteria listed above (i.e. a licence operator does not hold the appropriate licences and consents needed to undertake a specific activity, and/or there is insufficient information available either through consultation or in the public domain to undertake an assessment), have been considered within the assessment, although no conclusion has been reached on the magnitude of the impact or the sensitivity of receptor. This applies to licence blocks 43/30b, 48/5a, 49/3, 49/4d, 49/9c, 49/9d, 49/4b, 49/5b and 49/5c.

Magnitude of impact

8.11.2.69 Subsurface infrastructure and wells, that have not been permanently decommissioned or plugged and abandoned, may at some time require access from a rig or vessel with a helideck. A 9 nm consultation zone exists around offshore helicopter operations (see paragraph 8.7.4.12). A 9 nm consultation zone should again be a trigger for consultation with the operators of subsea infrastructure and wells requiring helicopter access (CAA, 2016c). As discussed in paragraph 8.11.2.29 wind turbines are considered as physical obstructions and helicopter operators must observe the minimum obstacle clearance criteria of 1,000 ft in IMC. Furthermore during the approach to an installation, all radar contacts (including radar contacts that are turbines) have to be avoided laterally by at least 1 nm. If high altitude flights are required during normal weather conditions, flights can be flown under VFR. In IMC and in certain wind conditions, which dictate the area of approach to an installation, instrument approach procedures might be restricted due to the proximity of wind turbine structures to the flight approach path.

8.11.2.70 When conducting an instrument approach procedure, a helicopter must maintain a 1,000 ft. vertical clearance from all obstacles as it lines up its final descent and a 1 nm lateral separation from all radar contacts. The helicopter lines up predominantly into wind at the Fixed Approach Point at 7 nm (the procedural value set by the helicopter operator and ranging typically from 5 to 7 nm). The maximum distance that a helicopter can be from the Hornsea Three array area before an instrument approach may be affected to an installation is therefore 8 nm (7 nm Fixed Approach Point + 1 nm lateral separation). When flying in VFR a helicopter must maintain a 150 m (500 ft) separation distance from all obstacles. On this basis access requirements in IMC are considered to be potentially affected at a distance of between 1 nm and 8 nm from the Hornsea Three turbines and restricted at a distance of less than 1 nm. Access requirements in VFR are not considered to be affected at a distance of greater than 1 nm from the Hornsea three turbines. At a distance of less than 1 nm access requirements in VFR are considered possible but may be affected when considering other factors such as wind conditions, sea state and turbulence.

8.11.2.71 The subsea infrastructure (excluding subsea tiebacks, shown in Figure 8.4) within 8 nm of the Hornsea Three array area are presented in Table 8.6 and Figure 8.4 together with licence blocks (where future operations may be required) and known infrastructure.

8.11.2.72 The presence of the Hornsea Three array area may in certain weather conditions restrict access to certain locations within the licence blocks listed within Table 8.6. The magnitude of this impact has been assessed on the basis of the level of restricted access in IMC and VFR (paragraph 8.11.2.70), the total area of a licence block that is potentially affected and the duration that the effect will occur (i.e. the overlap between the current extent of the licence and the Hornsea Three operational phase). The magnitude has been defined (taking into consideration the results of the assessments on airborne radar approaches to platforms in this chapter) on the following basis:

- Total loss of access in VFR or IMC = major;
- 50 to 100% (array area + 1 nm), remaining % (1 to 8 nm) = moderate;
- 1 to 50% (array area + 1 nm) remaining % (1 to 8 nm) = minor; and
- 0% (array area + 1 nm) >0 - 100% (1 to 8 nm) = negligible.

8.11.2.73 The area that is affected as a percentage of the total licence block is presented in Table 8.14 below.

8.11.2.74 The impact is predicted to be of short to medium term duration, intermittent and not reversible for the lifetime of Hornsea Three for each licence block. It is predicted that the impact will affect the receptor directly for each licence block. The magnitude is dependent on the spatial extent and is:

- Negligible: 49/4c, J03b and J06, 49/15a, K04a, J03a, K07 and J09;
- Minor: 49/10a and 44/27; and
- Moderate: 49/2a.

Sensitivity of the receptor

8.11.2.75 The sensitivity of the operator is dependent on the extent to which their existing subsea infrastructure requiring access is affected (listed in Table 8.14 and subsea tie backs shown in Figure 8.4) and the known future activity in their licence blocks as ascertained through consultation (see Table 8.4) with the present operators of these licences. The sensitivity for each block is listed in Table 8.14. It is noted that this information is based on current knowledge only and that the operator and extent of licences is subject to change.

8.11.2.76 The licence operator access requirements is deemed to be of low vulnerability, high recoverability and low value, and is therefore considered to be low for Third Energy, INEOS, Total Netherlands and NAM (see Table 8.14).

8.11.2.77 The licence operator access requirements are deemed to be of moderate vulnerability with known access requirements, high recoverability and high value and is therefore considered to be moderate for Shell, Spirit Energy Resources, Spirit Energy North Sea Ltd and Spirit Energy (see Table 8.14).

Significance of effect

8.11.2.78 Overall, the sensitivity of the receptor is low for the operators Third Energy, INEOS, Total Netherlands and NAM; and moderate for Shell and Spirit Energy Resources, Spirit Energy North Sea Ltd and Spirit Energy. Overall the magnitude is negligible for licence blocks 49/4c, J03b and J06, 49/15a, K04a, J03a, K07 and J09; minor for licence blocks 49/10a, 44/27; and moderate for licence blocks 49/2a.

8.11.2.79 The effect will, therefore, be of **negligible** significance for the operators Total Netherlands (K04a) and NAM (J03a, K07 and J09) which is not significant in EIA terms.

8.11.2.80 The effect will, therefore, be of **minor** adverse significance for the operators Third Energy for licence block 44/27, INEOS for licence block 49/2a, Shell for licence block 49/15a, Spirit Energy Resources for licence block 49/10a, Spirit Energy North Sea ltd for licence block 49/4c and Spirit Energy for licence block J03b and J06, which is not significant in EIA terms.

Table 8.14: Percentage of licenced acreage within the Hornsea Three array area + 1 nm and within 8 nm of the Hornsea Three array area.

Licence Block	Licence number	Licence expiry date	Infrastructure [a]	Area of block (km^2)	Area inside array + 1 nm		Area inside 8 nm		Operator	Magnitude	Sensitivity
					Total area	%	Total area	%			
43/30b	P2112	19/12/2039	N/A [a]	121.5	0	0	6.5	5.3	No operator	There is insufficient information in the public domain (available either through consultation and/or publicly available documents) regarding future activities in these licence blocks for an assessment to be undertaken.	
48/5a	P2112	19/12/2039	N/A [a]	121.7	0	0	10.3	8.5			
49/3	P2286	31/08/2041	N/A [a]	243.6	241.5	99.1	243.6	100	Spirit Energy Resources		
49/4d	P2286	31/08/2041	N/A [a]	113.7	109.5	96.3	113.7	100			
49/9c	P901	20/09/2030	N/A [a]	18.4	18.4	100	18.4	100			
49/9d	P2286	31/08/2041	N/A [a]	142.6	121.8	85.4	142.6	100			
49/10a	P83	N/A	Grove platform and Grove west Wellhead (well: 49/10a-6Y) and Choke Valve	46.9	4.1	8.7	46.9	100	Spirit Energy Resources	Minor	Moderate
49/4b	P1186	30/11/2030	N/A [a]	4.1	4.1	100	4.1	100	Spirit Energy North Sea Ltd	There is insufficient information in the public domain (available either through consultation and/or publicly available documents) regarding future activities in these licence blocks for an assessment to be undertaken	
49/4c	P1186	30/11/2030	Kew subsea wellhead wells: 49/04c/7z and 49/04c-7Z)	16.2	0	0	16.2	100	Spirit Energy North Sea ltd	Negligible	Moderate
49/5b	P1186	30/11/2030	N/A [a]	4.1	0	0	4.1	100	Spirit Energy North Sea Ltd	There is insufficient information in the public domain (available either through consultation and/or publicly available documents) regarding future activities in these licence blocks for an assessment to be undertaken.	
49/5c	P1186	30/11/2030	N/A	4.	0	0	4.1	100			
J03b & J06	Unknown	Unknown	J6A platform	125.6	0	0	118.4	94.3	Spirit Energy	Negligible	Moderate
44/27	P2284	31/08/2041	N/A [a]	242.7	5.6	2.3	175.5	72.3	Third Energy	Minor	Low
49/2a	P1013	22/12/2034	N/A [a]	18.3	15.8	86.3	18.3	100	INEOS	Moderate	Low
49/15/a	P54	N/A	Carrack east wellhead (well: 49/15a-3)	38.9	0	0	29.3	75.3	Shell	Negligible	Moderate
K04a	Unknown	Unknown	N/A [a]	306.7	0	0	8.7	2.8	Total Netherlands	Negligible	Low
J03a	Unknown	Unknown	N/A [a]	72.2	0	0	34.6	47.9	NAM	Negligible	Low
K07	Unknown	Unknown	N/A [a]	407.9	0	0	1.9	0.5		Negligible	
J09	Unknown	Unknown	N/A [a]	18.4	0	0	11	59.8		Negligible	

a No infrastructure (excluding subsea tiebacks shown in Figure 8.4) are presently known to be within the licence block.

Wind turbines may disrupt radar coverage of NATS Claxby PSR and the Military ADR located at Staxton Wold and Trimingham

8.11.2.81 The Hornsea Three array area is within the operational range of ASACS ADRs located at Staxton Wold and Trimingham, which have a range of 400 km.

8.11.2.82 The presence of wind turbines has the potential to interfere with NATS PSRs if their operational range overlaps the Hornsea Three array area. Wind turbine clutter appearing on a radar display can affect the safe provision of air traffic services as it can mask unidentified aircraft from the air traffic controller and/or prevent them from accurately identifying aircraft under their control.

8.11.2.83 The other offshore infrastructure associated with Hornsea Three including the offshore HVAC booster stations, offshore transformer substations, offshore HVDC substations and offshore accommodation platforms do not pose any issue to radar systems as radar processing removes stationary objects from the radar display.

Magnitude of impact

Claxby PSR

8.11.2.84 The Hornsea Three array area is within the operational range of the NATS Claxby PSR (the range being 200 nm). Radar Line of Sight analysis (presented in volume 5, annex 8.1: Aviation, Military and Communication Technical Report) for wind turbines with a tip height of 325 m within the Hornsea Three array area concluded that the turbines are theoretically not detectable by the Claxby PSR system. Consultation with NATS has also advised that they anticipate no impact from Hornsea Three. As such, this radar has not been considered further in this assessment.

Staxton Wold ADR

8.11.2.85 Radar Line of Sight analysis for the Staxton Wold radar (see volume 5, annex 8.1: Aviation, Military and Communication Technical Report) concluded that wind turbines within the Hornsea Three array area with a tip height of 325 m are theoretically not detectable by the Staxton Wold ADR. As such, this radar has not been considered further in this assessment.

Trimingham ADR

8.11.2.86 Radar Line of Sight analysis for the Trimingham ADR (see volume 5, annex 8.1: Aviation, Military and Communication Technical Report) concluded that wind turbines with a tip height of 325 m within a small area along the southwestern boundary of the Hornsea Three array area would be considered theoretically intermittently detectable by the Trimingham ADR. Wind turbines in the southwestern section of the Hornsea Three array area are unlikely to be routinely detectable, and turbines in the northeastern section are not predicted to be detectable by the Trimingham ADR. The impact for the Trimingham ADR is predicted to be of very local spatial extent, medium term duration, intermittent and not reversible for the lifetime of Hornsea Three. It is predicted that the impact will affect the receptor directly. The magnitude is considered to be minor.

Sensitivity of receptor

Trimingham ADR

8.11.2.87 Military ADRs are used to protect the security interests of the UK. Their programming will have a certain level of ability to accommodate wind turbine infrastructure. As part of the pre-application consultation process, Hornsea Three has requested the DIO to undertake an assessment of the potential for the Hornsea Three array area to affect any of the radar or communication systems operated or controlled by the MOD. In response to this consultation, they confirmed that it is unlikely that there will be any detectability from any MOD ADR to the Hornsea Three array area due to the distance of the Hornsea Three array area offshore. As such, the MOD, as operator of the Trimingham ADR, is deemed to be of very low vulnerability, high recoverability and moderate value. The sensitivity of the receptor is therefore, considered to be negligible.

Significance of effect

8.11.2.88 Overall, the sensitivity of the MOD Trimingham ADR is considered to be negligible and the magnitude of impact is deemed to be minor. The effect will, therefore, be of **negligible** significance, which is not significant in EIA terms.

Future monitoring

8.11.2.89 No aviation, military and communication monitoring to test the predictions made within the operation and maintenance phase impact assessment is considered necessary.

8.11.3 Decommissioning phase

8.11.3.1 The impacts of the offshore decommissioning of Hornsea Three have been assessed on aviation, military and communication. The potential effects arising from the decommissioning of Hornsea Three are listed in Table 8.8 along with the maximum design scenario against which each decommissioning phase impact has been assessed.

8.11.3.2 A description of the potential effect on aviation, military and communication receptors caused by each identified impact is given below.

Hornsea Three helicopter operations may affect the available airspace for other users

8.11.3.3 By the time of Hornsea Three decommissioning it is highly probable that the aviation industry will be fully adapted to servicing the offshore wind industry in the southern North Sea. The decline in provision of a service to the oil and gas sector may have been replaced by an increased requirement from offshore wind. As it is not possible however to make accurate predictions of the future environment at this time, a continued base case has been assumed.

8.11.3.4 The effects of decommissioning activities are therefore expected to be the same or similar to the effects from construction. The significance of effect is **minor** adverse (see paragraph 8.11.1.10), which is not significant in EIA terms.

Future monitoring

8.11.3.5 No aviation, military and communication monitoring to test the predictions made within the decommissioning phase impact assessment is considered necessary.

8.12 Cumulative Effect Assessment methodology

8.12.1.1 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 volume 4, annex 5.3: Cumulative Effects Screening Matrix). 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.

8.12.1.2 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 with consent, and, where applicable (i.e. for low carbon electricity generation projects), that have been awarded a Contract for Difference (CFD) but have not yet been implemented; 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 project/plans that have consent but, where relevant (i.e. for low carbon electricity generation projects) have no CFD; and/or
    - Submitted but not yet determined.

- 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 and the adopted development plan including supplementary planning documents are the most relevant sources of information, along with information from the relevant planning authorities regarding planned major works being consulted upon, but not yet the subject of a consent application). Specifically, this Tier includes all projects where the developer has advised PINS in writing that they intend to submit an application in the future, those projects where a Scoping Report is available and/or those projects which have published a Preliminary Environmental Information Report (PEIR).

8.12.1.3 It is noted that 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 considered a maximum of turbines 332 turbines within the Environmental Statement, but has gained consent for 240 turbines. In addition, it is now known that Hornsea Project One 'as built' will consist of 174 turbines. 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 and the as built number of turbines is likely to be less than this. A similar pattern of reduction in the project envelope from that assessed in the Environmental Statement, to the consented envelope and the 'as built' project is also seen across other offshore wind farms of relevance to this CEA. This process of refinement can result in a reduction to associated project parameters, for example the number and length of cable to be installed and the number of offshore substations. The CEA presented in this aviation, military and communication chapter has been undertaken on the basis of information presented in the Environmental Statements, for the other projects, plans and activities. Given that this broadly represents a maximum design scenario, the level of cumulative impact on aviation, military and communication would highly likely be reduced from those presented here.

8.12.1.4 The specific projects scoped into this CEA and the tiers into which they have been allocated, are outlined in Table 8.15.

8.12.2 Maximum design scenario

8.12.2.1 The maximum design scenarios identified in Table 8.16 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 8.15: 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
1	*Offshore wind farms*							
	Operational	Dudgeon	87 km	11 km	168 turbines consented, of which 67 turbines were constructed.	N/A	No	Yes
		Humber Gateway	128 km	86 km	83 turbines consented, of which 73 turbines were constructed.	N/A	No	Yes
		Lincs, Lynn and Inner Dowsing	139 km	41 km	143 turbines consented, of which 129 turbines were constructed.	N/A	No	Yes
		Race Bank	114 km	28 km	206 turbines consented, of which only 91 turbines were constructed.	N/A	No	Yes
		Sheringham Shoal	109 km	7 km	108 turbines consented, of which 88 turbines were constructed.	N/A	No	Yes
		Westermost Rough	132 km	106 km	80 turbines consented, of which 35 turbines were constructed.	N/A	No	Yes
	Under construction	Hornsea Project One	7 km	14 km	332 turbines assessed in the Environmental Statement (although 240 turbines actually consented), of which 174 turbines to be constructed.	Construction 2017 to 2019	No	Yes
		Hornsea Project Two	7 km	20 km	360 turbines assessed in the Environmental Statement (although 300 turbines actually consented).	Construction 2020 to 2022	Yes	Yes
	Consented	East Anglia One	152	106	240 turbines consented, of which 102 turbines to be constructed.	Construction 2017 to 2019	No	Yes
		Triton Knoll	100 km	44 km	288 turbines consented, of which 90 to be constructed.	Construction 2017 to 2021	No	Yes
2	*Offshore wind farms*							
	Consented	East Anglia Three	103 km	87 km	172 turbines consented.	Construction 2019 to 2022	No	Yes
3	*Offshore wind farms*							
	Pre-consent application	East Anglia One North	141 km	90 km	Seeking consent for up to 67 turbines.	Construction 2021 to 2022	Yes	Yes
		East Anglia Two	158 km	94 km	Seeking consent for up to 75 turbines.	Construction 2023 to 2025	Yes	Yes
		Norfolk Boreas	53 km	64 km	Seeking consent for up to 257 turbines.	Construction 2024 to 2029	Yes	Yes
		Norfolk Vanguard	73 km	51 km	Seeking consent for up to 257 turbines.	Construction 2020 to 2026	No	Yes

Table 8.16: Maximum design scenario considered for the assessment of potential cumulative impacts on aviation, military and communication.

Potential impact	Maximum design scenario	Justification
Construction phase		
Hornsea Three helicopter operations may affect the available airspace for other users.	Maximum adverse scenario as described for Hornsea Three (see Table 8.8) assessed cumulatively with the full development of the following other proposed or existing marine projects in the region: Tier 1: • Hornsea Project One; and • Hornsea Project Two. Tier 2: • No Tier 2 projects/plans identified. Tier 3: • No Tier 3 projects/plans identified.	This includes the presence of other developments which will have the potential to affect the available airspace for other users in the same region. These projects, when considered alongside Hornsea Three, will lead to the maximum use of the regional airspace.
Operation phase		
Wind turbines and hoist operations will form an aerial obstruction resulting in disruption to cross – zone transit helicopter traffic, and Hornsea Three infrastructure will form an aerial obstruction resulting in disruption to helicopters using HMRs.	Maximum adverse scenario as described for Hornsea Three (see Table 8.8) assessed cumulatively with the full development of the following other proposed or existing marine projects in the region: Tier 1: • Hornsea Project One; • Hornsea Project Two; and • Dudgeon. Tier 2: • No Tier 2 projects/plans identified. Tier 3: • No Tier 3 projects/plans identified.	This includes the presence of other developments which have the potential to affect the operational airspace of helicopters operators identified as being affected by Hornsea Three and using HMR 2, HMR 3 and HMR 5 during the Hornsea Three operational phase. These projects, when considered alongside Hornsea Three, will lead to the maximum potential interference with aircraft operations and disruption to the use of HMR 2, HMR 3 and HMR 5.
Hornsea Three helicopter operations may affect the available airspace for other users.	Maximum adverse scenario as described for Hornsea Three (see Table 8.8) assessed cumulatively with the full development of the following other proposed or existing marine projects in the region: Tier 1: • Hornsea Project One; and • Hornsea Project Two. Tier 2: • No Tier 2 projects/plans identified. Tier 3: • No Tier 3 projects/plans identified.	This includes the presence of other developments which will have the potential to affect the available airspace for other users in the same region. These projects, when considered alongside Hornsea Three, will lead to the maximum use of the regional airspace.
Wind turbines will form a physical obstruction and may disrupt helicopter access including requirements for decommissioning to the Schooner A platform (Faroe Petroleum).	Maximum adverse scenario as described for Hornsea Three (see Table 8.8) assessed cumulatively with the full development of the following other proposed or existing marine projects in the region: Tier 1: • Hornsea Project One; and • Hornsea Project Two. Tier 2: • No Tier 2 projects/plans identified Tier 3: • No Tier 3 projects/plans identified	This includes other developments which have the potential to affect access to platforms affected by Hornsea Three. The developments must overlap with the 9 nm consultation zones of the respective platform. These projects, when considered alongside Hornsea Three, will lead to the maximum potential impact upon access to an individual platform.
Wind turbines will form an aerial obstruction and may disrupt helicopter access to helideck equipped drilling rigs and vessels conducting operations at subsea infrastructure and well locations.	Maximum adverse scenario as described for Hornsea Three (see Table 8.8) assessed cumulatively with the full development of the following other proposed or existing marine projects in the region: Tier 1: • Hornsea Project One; and • Hornsea Project Two. Tier 2: • No Tier 2 projects/plans identified Tier 3: • No Tier 3 project/plans identified	This includes other developments which have the potential to affect helicopter access to licenced acreage and subsea infrastructure already affected by Hornsea Three. These projects, when considered alongside Hornsea Three, will lead to the maximum potential impact upon helicopter access to licenced acreage and subsea infrastructure.

Potential impact	Maximum design scenario	Justification
Wind turbines may disrupt radar coverage of Military ADR located at Trimingham.	Maximum adverse scenario as described for Hornsea Three (see Table 8.8) assessed cumulatively with the full development of the following other proposed or existing marine projects in the region (see Table 8.15): Tier 1: • Dudgeon; • East Anglia One; • Hornsea Project One; • Hornsea Project Two; • Humber Gateway; • Lincs, Lynn and Inner Dowsing; • Race Bank; • Sheringham Shoal; • Triton Knoll; and • Westermost Rough. Tier 2: • East Anglia Three. Tier 3: • East Anglia One North; • East Anglia Two; • Norfolk Boreas; and • Norfolk Vanguard.	This includes other offshore wind farm projects which are within the operational range of the Military ADR. These projects, when considered alongside Hornsea Three, will lead to the maximum potential impact upon a single radar.
Decommissioning phase		
Hornsea Three helicopter operations may affect the available airspace for other users.	Maximum adverse scenario as described for Hornsea Three (see Table 8.8) assessed cumulatively with the full development of the following other proposed or existing marine projects in the region: Tier 1: • Hornsea Project One; and • Hornsea Project Two. Tier 2: • No Tier 2 projects/plans identified. Tier 3: • No Tier 3 projects/plans identified.	This includes the presence of other developments which will have the potential to affect the available airspace for other users in the same region. These projects, when considered alongside Hornsea Three, will lead to the maximum use of the regional airspace.

8.13 Cumulative Effect Assessment

8.13.1.1 A description of the significance of cumulative effects upon aviation, military and communication receptors arising from each identified impact is given below.

8.13.2 Construction phase

Hornsea Three helicopter operations may affect the available airspace for other users

Tier 1

Magnitude of impact

8.13.2.1 Hornsea Three may require up to 3,785 helicopter round trips over the duration of the construction phase. It is not yet known which helicopter provider would be used or from which airport the helicopter operator would be based, however flights are likely to originate from the east coast of the UK.

8.13.2.2 The offshore oil and gas industry is presently served by some 100 flights a day (Parliament, 2014) which equates to some 36,500 flights a year. Other projects that will contribute to helicopter flights within the vicinity of Hornsea Three include Hornsea Project One and Hornsea Project Two.

8.13.2.3 Considering a steady state in the aviation baseline (see paragraph 8.11.1.3) the cumulative increase in helicopter operations from Hornsea Three and the Tier 1 wind farms is noticeable, particularly as flights will be concentrated in a regional area.

8.13.2.4 The impact is predicted to be of regional spatial extent, short to medium term duration, continuous and not reversible for the lifetime of Hornsea Three. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be moderate.

Sensitivity of receptor

8.13.2.5 Helicopter operations in the UK are highly regulated (see paragraph 8.11.1.6) and their sensitivity within this regulated environment is discussed in paragraph 8.11.1.7.

8.13.2.6 The same rules of the air and ATC services will continue to apply to helicopter operators within the southern North Sea. The provision of a service to Hornsea Three is not considered to affect the provision of a service to another user of the airspace.

8.13.2.7 The helicopter operator using the southern North Sea airspace 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

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

Tier 2

8.13.2.9 There are no additional Tier 2 developments identified that would result in increased helicopter numbers in shared airspace with Hornsea Three. The assessment for Tier 2 therefore remains the same as for Tier 1 above.

Tier 3

8.13.2.10 There are no additional Tier 3 developments identified that would result in increased helicopter numbers in shared airspace with Hornsea Three. The assessment for Tier 3 therefore remains the same as for Tier 1 above.

Future monitoring

8.13.2.11 No aviation, military and communication monitoring to test the predictions made within the construction phase impact assessment is considered necessary.

8.13.3 Operation and maintenance phase

Wind turbines and hoist operations will form an aerial obstruction resulting in disruption to cross – zone transit helicopter traffic, and Hornsea Three infrastructure will form an aerial obstruction resulting in disruption to helicopters using HMRs

Tier 1

Magnitude of impact

8.13.3.1 Helicopters transiting the Hornsea Three array area will be required to fly 1,000 ft. higher than the wind turbines. Consultation meetings have advised that most helicopter operators choose to fly in IFR conditions regardless of weather conditions. A typical MSA of 1,500 ft. is therefore flown to allow for 1,000 ft. clearance of transiting vessels. The Hornsea Three wind turbines will be 325 m (1,066 ft.) at their maximum height. The present MSA of 1,500 ft. will therefore be required to be raised to 2,066 ft. by the presence of the turbines (1,066 ft. plus 1,000 ft. clearance). As helicopters are height banded in the southern North Sea at 500 ft. intervals this would mean the MSA would be raised to 3,000 ft. (inbound) and 2,500 ft. (outbound). This is an additional 500 ft. climb and descent required per journey.

8.13.3.2 The maximum flight path distances across the Hornsea Three array area are shown in Figure 8.12. There are no other Tier 1 projects which would result in a cumulative effect on north-south or diagonal cross-zone traffic. Hornsea Project One and Hornsea Project Two would contribute to a cumulative effect on east-west cross-zone traffic. The flight path from Humberside airport to Chiswick platform (as shown in Figure 8.12) would require a flight path distance at a raised MSA from these projects together with Hornsea Three of 62.3 km. This is 30% of the total route distance. There would be no cumulative effect on access to oil and gas licenced acreage to the east to southeast of the Hornsea Three array area.

8.13.3.3 Hoist operations are maintenance activities which take place using helicopters lowering personnel and/or equipment to the wind turbines by hoist (see paragraph 8.11.2.9). When hoist operations are within 434 ft. of the Hornsea Three wind turbines, which will be the majority of the time, no additional height gain will be required as this is within the height band of between 1,066 ft. to 1,500 ft. (plus 1,000 ft. separation raises the MSA to 2,500 ft.). The frequency of this impact occurring is based upon the level of cross-zone transit traffic. A typical months radar data was assessed by NATS for October 2017 (NATS 2017c) to show the flights transiting within 9 nm of Hornsea Three from sea level to FL60 (see Figure 8.8). As discussed in paragraph 8.11.2.29 above, the majority of flights recorded are return helicopter flights from Norwich airfield (an average of six return flights a day). One return flight (excluding the Hornsea Three surveillance flight) is from Humberside (an average of 0.03 flights a day).

8.13.3.4 Consultation has advised that the Ketch platform is serviced from Norwich, this platform is however likely to be decommissioned prior to Hornsea Three construction. Consultation has advised the platforms and acreage to the east of the Hornsea Three array area are predominantly served from the Netherlands. Consultation has also advised that whilst it is usual for the industry to use an airfield that flies the shortest route, in some instances this may vary as for example when using a contractor (e.g. when contracting a drilling rig). The east-west route, although not shown in the typical months data, should therefore be considered as a possible scenario.

8.13.3.5 When IMC require flight at an MSA below 2,500 ft, the helicopter operators will be required to reroute around Hornsea Three or to use the HMR Network. HMRs are described in paragraph 8.11.2.3. The presence of obstructions from Hornsea Three in HMR 2 means that certain aircraft would not be able to use this route in IMC when the weather conditions require flight at a lower altitude than 2,500 ft. Helicopters would need to deviate around the Hornsea Three array area which could increase the track time from departure to destination. There are no other offshore wind farms located below HMR 2.

8.13.3.6 Considering Hornsea Project One and Hornsea Project Two at a distance of 3.9 nm from the western edge of the Hornsea Three array area, there is potential for a cumulative effect on HMR 3. The physical presence of Hornsea Project One and Hornsea Project Two would restrict the use of HMR 3 in certain weather conditions. An obstacle free route for HMR 3 would need to take into account Hornsea Project One, Hornsea Project Two, and Hornsea Three (see Figure 8.13). A potential alternative route for HMR 3 is therefore affected by the presence of Hornsea Three. The radar data presented by NATS (see paragraph 8.11.2.29) predicts that considering the current operational scenario approximately six flights a day could be traversing this area and in certain weather conditions may be required to use an alternative route to HMR 3 (see Figure 8.14). However, consultation has advised the Schooner and Ketch platforms are likely to be decommissioned prior to construction of Hornsea Three, therefore this number could be much less as the flight paths presently routing to Schooner and Ketch platforms (see Figure 8.14) would no longer be required.

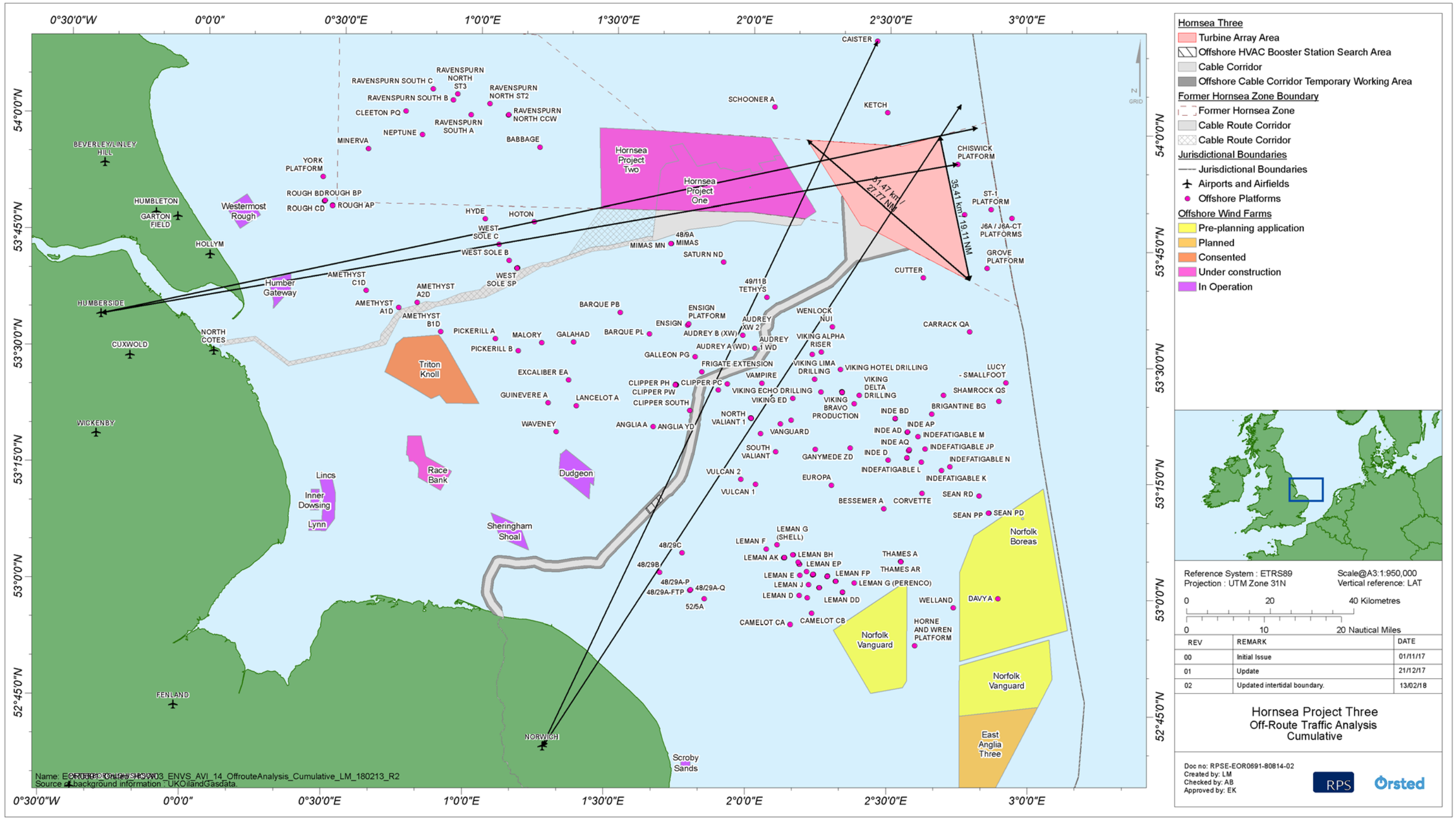

Figure 8.12: Cumulative off route traffic analysis.

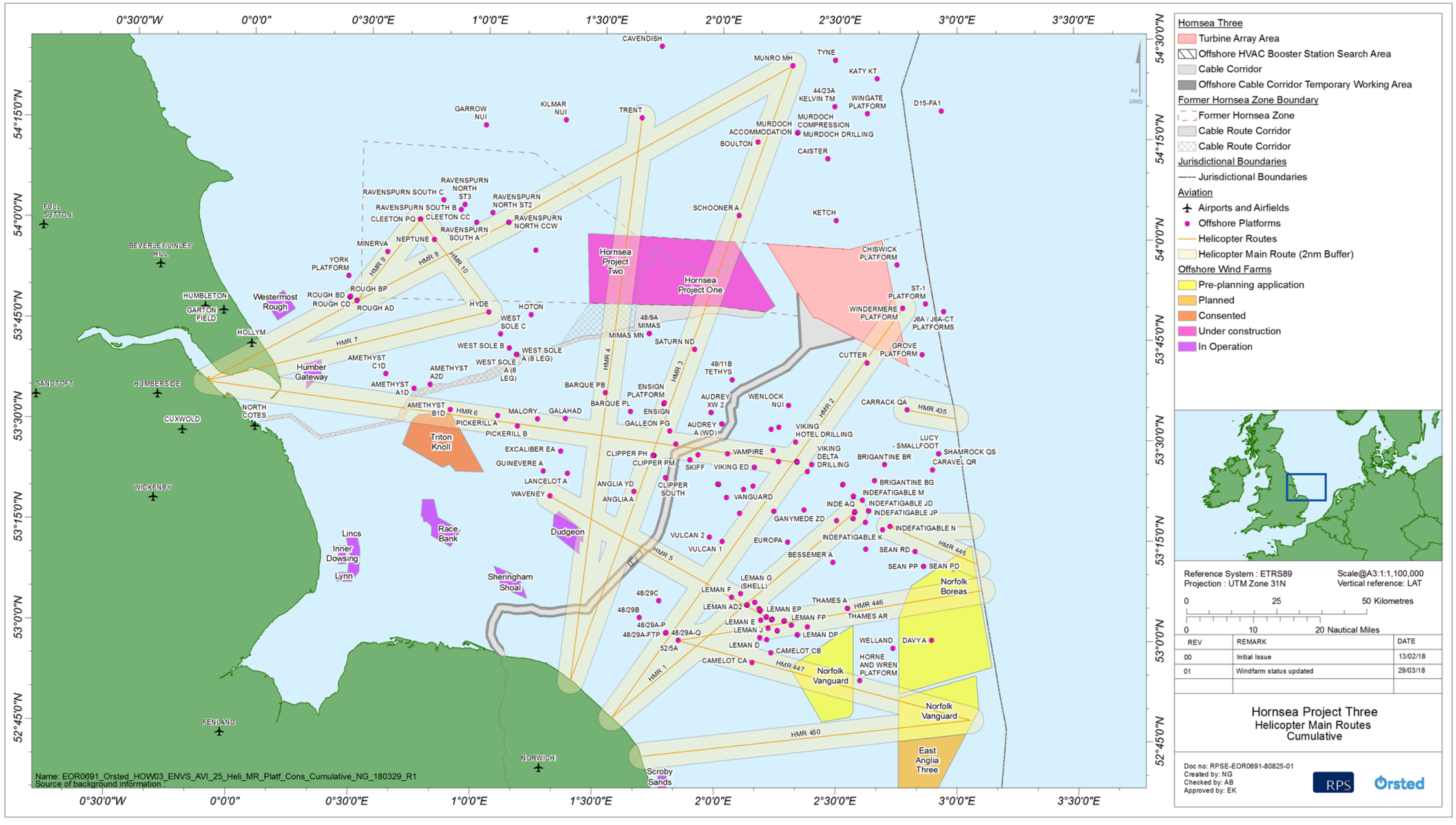

Figure 8.13: The HMRs and offshore wind farms in southern North Sea.

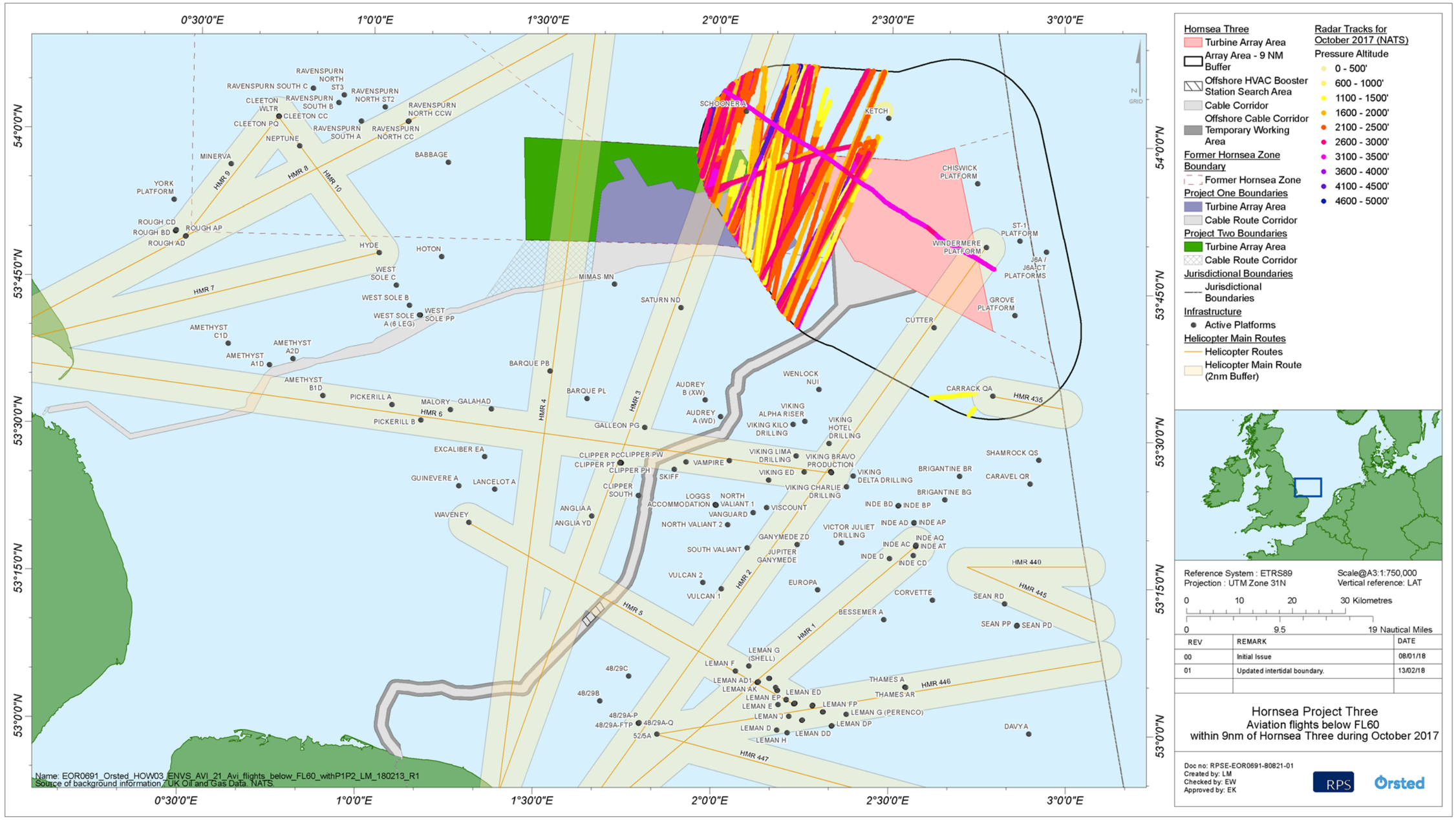

Figure 8.14: Aviation flights within 9 nm of Hornsea Three during October 2017, showing Hornsea Project One and Hornsea Project Two and the HMR network (note the Hornsea Three surveillance flight has been removed as not representative of typical flight path).

8.13.3.7 Pre-application consultation for Hornsea Three has advised that when weather conditions require flight below 2,500 ft an alternative route could be flown along the corridor between Hornsea Project One, Hornsea Project Two and Hornsea Three (see Figure 8.13). This corridor would be able to be used in VFR however in low visibility, a deviation around the eastern edge of Hornsea Three may be required. An analysis of the percentage frequency of low cloud (less than 2,500 ft) and low visibility (less than 1,500 m) when the deviation around the outside of Hornsea Project One, Hornsea Project Two and Hornsea Three (and not through the corridor) may be required has been undertaken (see volume 5, annex 8.1: Aviation, Military and Communication Technical Report). The results of this analysis indicate that that this would occur from between 0.1% of the time (September and November) to 3.2 % of the time (April).

8.13.3.8 Hornsea Three may require up to four offshore HVAC booster stations of a maximum height of 90 m LAT, which will positioned within the offshore HVAC booster station search area of the Hornsea Three offshore cable corridor as shown in Figure 8.3. The offshore HVAC booster station search area is crossed by HMR 3 and HMR 5. Hornsea Project One and Hornsea Project Two would also have an effect on HMR 3, and the Dudgeon wind farm would have an effect on HMR 5.

8.13.3.9 There are a considerable number of offshore oil and gas platforms located in HMRs which are of a similar height to the Hornsea Three offshore HVAC booster stations. The offshore HVAC booster stations are not considered a prohibition on the use of the HMR (see paragraph 8.11.2.15) but dependent on their ultimate location and configuration may require a very minor deviation, in instances where aircraft are required to fly below MSA 1,500 ft.

8.13.3.10 The additional infringement of Dudgeon on HMR 5 is minor and there is available space to deviate the HMR slightly without any significant implications on route distance or height requirements. The cumulative effect on HMR 3 seaward of the Hornsea Three offshore HVAC booster stations has been assessed above (see paragraph 8.13.3.5). There are no additional cumulative effects on HMR 3 landward of the Hornsea Three offshore HVAC booster stations.

8.13.3.11 The impact on cross-zone traffic, both raising the MSA and using the HMR network, is predicted to be of regional spatial extent, medium term duration, continuous and not reversible for the lifetime of Hornsea Three. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be moderate.

Sensitivity of receptor

8.13.3.12 Cross-zone transit flights can be flown in visual conditions (i.e. in weather conditions in which pilots will be able to see and avoid obstructions) or in IMC when the icing level is high enough. In these weather conditions, helicopters would be required to transit at a higher MSA over the Hornsea Project One, Hornsea Project Two and Hornsea Three array areas. Should weather conditions exist whereby either VFR or IFR transits cannot be continued above the Hornsea Project One, Hornsea Project Two and Hornsea Three array areas, helicopters would reroute to use the HMR network or as this will be restricted by the presence of these projects, to deviate around the project areas. The helicopter operator has low vulnerability as it is able to adapt to an increased MSA, and has alternative routes to use. There may however be an increased journey time due to the requirement to fly at a greater height or to deviate around the Hornsea Project One, Hornsea Project Two and Hornsea Three array areas. The helicopter operators that may be affected include the operators that fly to the oil and gas platforms and licenced acreage to the northeast of and within 9 nm of the Hornsea Three array area including Spirit Energy Resources and Total UK (see Table 8.14 for a listing of licence blocks) and north to the Murdoch group of platforms operated by ConocoPhillips.

8.13.3.13 There is considered to be operational need for HMR 5 in certain weather conditions, however the routes can still be flown with very minor deviations. The location of the Hornsea Three offshore HVAC booster stations would be reported to the DGC (as per CAP 764 para 4.9(2)).

8.13.3.14 The sensitivity of the helicopter operator required to fly cross-zone or use the HMR network is deemed to be of low vulnerability, high recoverability and moderate value and the sensitivity of the receptor is therefore, considered to be low.

Significance of effect

8.13.3.15 Overall, the sensitivity of the receptor flying cross zone or using the HMR network is considered to be low and the magnitude of impact is deemed to be moderate. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Tier 2

8.13.3.16 There are no additional Tier 2 developments identified that impact on the cross-zone traffic. There are no additional Tier 2 developments identified that impact on HMR 2, HMR 3 and HMR 5. The assessment for Tier 2 therefore remains the same as for Tier 1 above.

Tier 3

8.13.3.17 There are no additional Tier 3 developments identified that impact on the cross-zone traffic. There are no additional Tier 3 developments identified that impact on HMR 2, HMR 3 and HMR 5. The assessment for Tier 2 therefore remains the same as for Tier 1 above.

Hornsea Three helicopter operations may affect the available airspace for other users

8.13.3.18 This impact is a continuation of the potential impact upon available airspace for other users during the construction phase.

Tier 1

Magnitude of impact

8.13.3.19 The Hornsea Three project may require up to 4,671 return helicopter flights per year or approximately 14 flights per day during the operation and maintenance phase. It is not yet known which helicopter provider would be used or from which airport the helicopter operator would be based, however flights are likely to originate from the east coast of the UK or from an onshore helicopter base or from an offshore base or vessel with helicopter personnel transfer. These flights would be in addition to the prevailing helicopter traffic levels in the southern North Sea at the time of Hornsea Three operation, discussed in paragraph 8.13.2.2.

8.13.3.20 Other projects that will contribute to helicopter flights within the southern North Sea include Hornsea Project One and Hornsea Project Two:

- Hornsea Project One: Estimate of 41 flights a day (SMart Wind Ltd., 2013). It is noted that this number is probably an overestimate based on Hornsea Project Two estimates; and
- Hornsea Project Two: Estimate of 18 flights a day (SMart Wind Ltd., 2015).

8.13.3.21 The oil and gas industry is changing with more fields now being decommissioned. There has been a gradual decline in oil and gas activity (OGA, 2016) and therefore helicopter requirements are likely to have decreased by the time of the Hornsea Three operation and maintenance phase. However considering a steady state in the oil and gas sector requirements as a worst case, the cumulative increase in helicopter operations from Hornsea Three and the Tier 1 wind farms is considerable.

8.13.3.22 The impact is predicted to be of regional spatial extent, medium term duration, continuous and not reversible for the lifetime of Hornsea Three. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be moderate.

Sensitivity of receptor

8.13.3.23 Helicopter flights in the UK are highly regulated (see paragraph 8.11.1.6) and their sensitivity within this regulated environment is discussed in paragraph 8.11.1.7.

8.13.3.24 The same rules of the air and ATC services will continue to apply to helicopter operators within the southern North Sea. The provision of a service to Hornsea Three is not considered to affect the provision of a service to another user of the airspace.

8.13.3.25 The helicopter operator using the southern North Sea airspace 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

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

Tier 2

8.13.3.27 There are no additional Tier 2 developments identified that would result in increased helicopter numbers in shared airspace with Hornsea Three. The assessment for Tier 2 therefore remains the same as for Tier 1 above.

Tier 3

8.13.3.28 There are no additional Tier 3 developments identified that would result in increased helicopter numbers in shared airspace with Hornsea Three. The assessment for Tier 3 therefore remains the same as for Tier 1 above.

Wind turbines will form a physical obstruction and may disrupt helicopter access to the Schooner A platform (Faroe Petroleum)

8.13.3.29 This assessment considers the cumulative impact on the Schooner A platform only. As can be seen in Figure 8.15 there are no Tier 1, Tier 2 or Tier 3 offshore wind farm projects which overlap the 9 nm consultation zone of the Chiswick, ST-1, J6A/J6A-CT, Grove Windermere and Carrack platforms. There are therefore no cumulative effects on these platforms.

Tier 1

Magnitude of impact

8.13.3.30 Wind turbines are considered as physical obstructions and helicopter operators must observe the minimum obstacle clearance criteria of 1,000 ft in IMC. Furthermore, during the approach to an installation, all radar contacts (including radar contacts that are turbines) have to be avoided laterally by at least 1 nm. These combined effects within a 9 nm consultation zone of an offshore installation may impair the safety of air operations to that installation and affect the installation operators' regulatory requirements with regard to safety of operation.

8.13.3.31 Due to the presence of wind turbines in the Hornsea Three array area, a volume of airspace would be considered unavailable for instrument approach procedures to the Schooner A platform. Hornsea Project One and Hornsea Project Two would further reduce the available airspace for instrument approach procedures to this platform (see Figure 8.15), the only platform for which a cumulative effect applies.

8.13.3.32 It is estimated that there would be 241.4° of available airspace surrounding the Schooner A platform for instrument approach procedures and MAP. When the surface wind is such that an ARA might be flown directly towards the Hornsea Three array area, utilising an approach path offset by up to 30º should ensure that helicopters would have sufficient airspace to complete a MAP.

8.13.3.33 The potential number of instrument approach procedures to the Schooner A platform that are likely to be affected by the Hornsea Three array area in addition to Hornsea Project One and Hornsea Project Two have been assessed assuming the worst case restricted areas (see volume 5, annex 8.1: Aviation, Military and Communication Technical Report).

8.13.3.34 The results indicate that the impact of Hornsea Three, together with Hornsea Project One and Hornsea Project Two, would be to prevent instrument approaches to the Schooner A platform on approximately 1.12 days per year. Over the year less than 2% of days are restricted which is considered to be a low occurrence.

8.13.3.35 It should be noted that under certain adverse weather conditions and sea states flights may be restricted irrespective of Hornsea Project One, Hornsea Project Two and Hornsea Three. The occurrence of such adverse weather events has not been taken into account in this assessment.

8.13.3.36 The impact on the Schooner A platform is predicted to be of local spatial extent, medium term duration, intermittent in occurrence and not reversible for the lifetime of Hornsea Three. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be minor.

Sensitivity of receptor

8.13.3.37 The sensitivity of the receptor (the platform operator) will depend on the operational requirements of the platform. Consultation took place with the operator of the Schooner A platform (Faroe Petroleum) and has advised that flights to this platform are from Norwich. The platform is a NUI, however daily shuttling is required in the manned phase, which occurs two weeks out of five during the summer and short ad-hoc visits during the winter. Access will be required for these routine maintenance periods and operational emergencies. If high altitude flights are required during normal weather conditions, flights can be flown visually under VFR. The only time access will be restricted is either during maintenance periods when weather conditions require instrument approaches, or during operational emergencies when helicopter flights are required direct to the platform at high altitude and under IMC.

8.13.3.38 Consultation has advised that the Schooner A platform is likely to be decommissioned in 2022 and therefore prior to the start of construction of Hornsea Three. It is noted however that the decommissioning of the Schooner A platform has not yet been confirmed by an approved decommissioning plan. Consultation has also advised that Faroe Petroleum are moving towards the use of vessels for maintenance programmes as this can be more cost effective, and may reduce the use of helicopters. Together these factors indicate that there is unlikely to be significant operational restrictions on access to the Schooner A platform or access requirements during platform decommissioning.

8.13.3.39 The sensitivity of the platform operator 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

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

Tier 2

8.13.3.41 There are no additional Tier 2 developments identified that impact on the Schooner A platform. The assessment for Tier 2 therefore remains the same as for Tier 1 above.

Tier 3

8.13.3.42 There are no additional Tier 3 developments identified that impact on Schooner A platform. The assessment for Tier 3 therefore remains the same as for Tier 1 above.

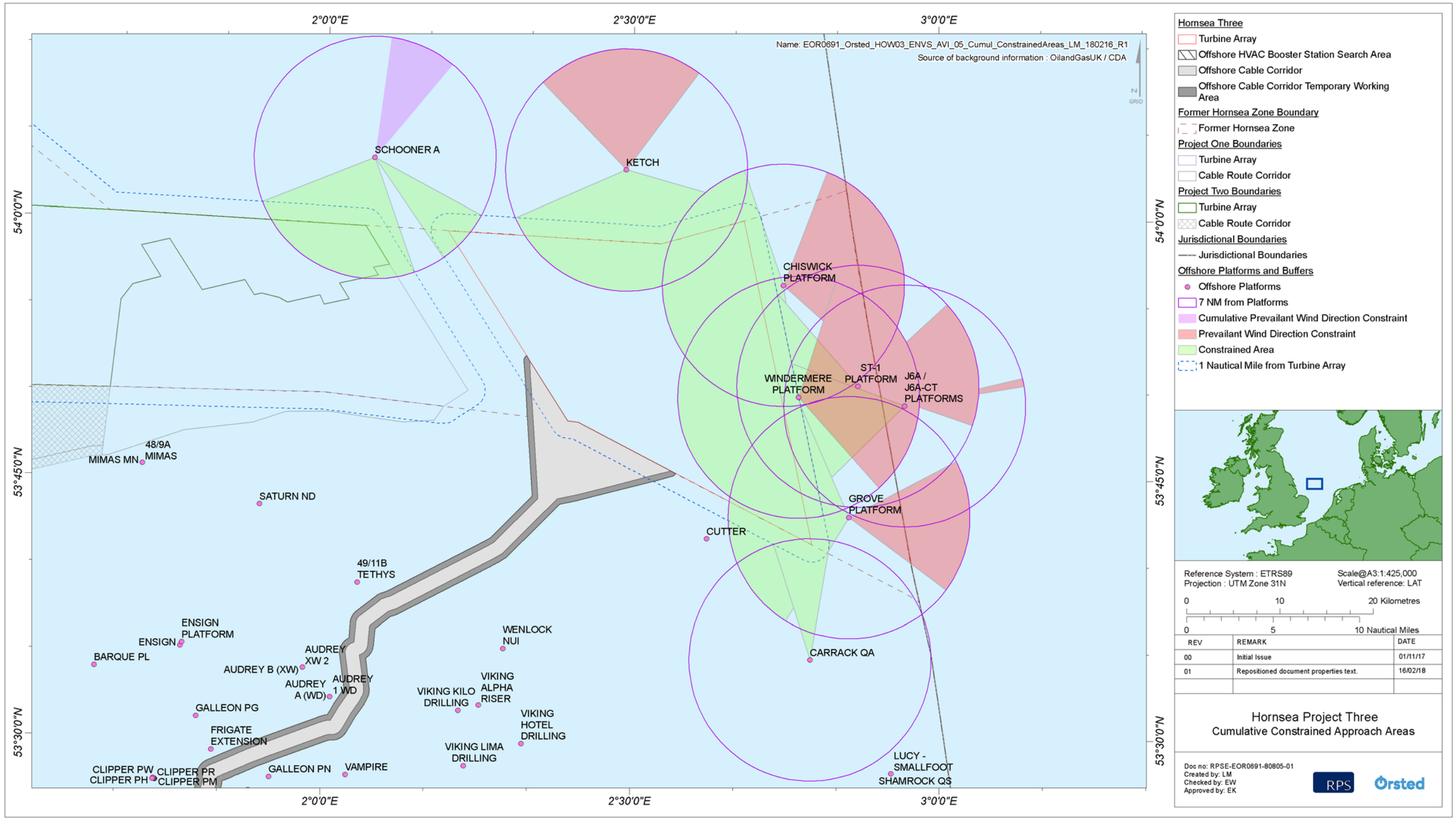

Figure 8.15: Cumulative constrained approach sectors.

Wind turbines will form an aerial obstruction and may disrupt helicopter access to helideck equipped drilling rigs and vessels conducting operations at subsea infrastructure and well locations

8.13.3.43 The assessment of this potential impact is complicated by the fact that future oil and gas plans have varying degrees of certainty associated with them (for example whether or not an exploitable resource will be found and if so, where any infrastructure associated with this will be located). For this reason, as noted in paragraphs 8.9.2.7 to 8.9.2.10 above) the assessment has only been able to consider those licenced blocks, with potential for spatial and temporal interactions, which are licenced beyond the start of Hornsea Three operation and maintenance phase (i.e. assumed to be beyond 2030) and:

- The licence operator has the appropriate licences and consents needed to undertake the specific activity which is being assessed; and/or
- There is sufficient information in the public domain (available either through consultation or publicly available documents) regarding the future activity for an assessment to be undertaken.

8.13.3.44 Licenced blocks where the licence terms extend beyond the start of the operation and maintenance phase of Hornsea Three but do not meet the criteria listed above (i.e. a licence operator does not hold the appropriate licences and consents needed to undertake a specific activity, and/or there is insufficient information in the public domain or through consultation to undertake an assessment), have been considered within the assessment, although no conclusion has been reached on the magnitude of the impact or the sensitivity of receptor. This applies to licence blocks 49/3, 43/30b and 48/5a.

Tier 1

Magnitude of impact

8.13.3.45 Subsurface infrastructure and wells that have not been permanently decommissioned or plugged and abandoned may at some time require access from a rig or vessel with a helideck. A 9 nm consultation zone exists around offshore helicopter destinations (see paragraphs 8.7.4.12) and is a trigger for consultation with the operators of subsea infrastructure and wells requiring helicopter access (CAA, 2016c).

8.13.3.46 As discussed in paragraph 8.11.2.70, when conducting an instrument approach procedure, a helicopter must maintain a 1,000 ft. vertical clearance from all obstacles as it lines up its final descent and a 1 nm lateral separation from all radar contacts. The helicopter lines up predominantly into wind at the Fixed Approach Point at 7 nm. The maximum distance that a helicopter can be from the Hornsea Three array area before an instrument approach may be affected to an installation is therefore 8 nm (7 nm Fixed Approach Point + 1 nm lateral separation). In VFR a helicopter requires a separation distance of 150 m (500 ft). The licence blocks within 8 nm of the Hornsea Three array area that are also within 8 nm of Hornsea Project One and/or Hornsea Project Two are listed in Table 8.17 below and are shown in Figure 8.16.

8.13.3.47 The physical presence of Hornsea Three together with Hornsea Project One and Hornsea Project Two may in certain weather conditions restrict access to certain locations within the licence blocks listed within Table 8.17. The magnitude of the impact has been assessed on the basis of the level of restricted access in IMC and VFR (paragraph 8.11.2.70), the total area of a licence block that is potentially affected and the duration that the effect will occur (i.e. the overlap between the current extent of the licence and the Hornsea Three, Hornsea Project One and Hornsea Project Two operational phases). The magnitude for each licence block is shown for each licence block in Table 8.17.

8.13.3.48 The impact is predicted to be of local spatial extent, medium term duration, intermittent and not reversible for the lifetime of Hornsea Three for each licence block. It is predicted that the impact will affect the receptor directly for each licence block. The magnitude is moderate for licence block 49/2a (INEOS), and minor for licence block 44/27 (Third Energy).

Sensitivity of the receptor

8.13.3.49 The sensitivity of the operator is dependent on the extent to which their existing infrastructure requiring access is affected (listed in Table 8.17 and subsea tie backs shown in Figure 8.16) and the anticipated future activity in their licence blocks as ascertained through consultation (see Table 8.4) with the present operators of these licences. The sensitivity for each block is listed in Table 8.17. It is noted that this information is based on current knowledge only and that the operator and extent of licences is subject to change.

8.13.3.50 The licence operator access requirements is deemed to be of low vulnerability, high recoverability and low value, and is therefore considered to be low for Third Energy and INEOS.

Significance of effect

8.13.3.51 Overall, the sensitivity of the receptor is low, and the magnitude of impact is moderate for licence block 49/2a (INEOS); and minor for licence block 44/27 (Third Energy).

8.13.3.52 The effect will, therefore, be of **minor** adverse significance for the INEOS (49/2a) and **negligible** significance for Third Energy (44/27), which is not significant in EIA terms.

Tier 2

8.13.3.53 There are no additional Tier 2 developments identified that will overlap a 9 nm zone around the Hornsea Three array area. The assessment for Tier 2 therefore remains the same as for Tier 1 above.

Tier 3

8.13.3.54 There are no additional Tier 3 developments identified that will overlap a 9 nm zone around the Hornsea Three array area. The assessment for Tier 2 therefore remains the same as for Tier 1 above.

Table 8.17: Percentage of licenced acreage within the Hornsea Three array area +1 nm and within 8 nm of the Hornsea Project One and Hornsea Project Two.

Licence Block	Licence expiry date	Infrastructure*	Area of block (km²)	Hornsea Three					Area within 8 nm of Hornsea Project One, Hornsea Project Two		Operator	Cumulative Magnitude (Hornsea Three, Hornsea Project One and Hornsea project Two)	Sensitivity
				Area within array + 1 nm		Area within 8 nm of Hornsea Three		Magnitude (Hornsea Three alone)	Total area	%			
				Total area	%	Total area	%						
49/3	31/08/2041	N/A [a]	243.6	241.5	99.1	243.6	100	There is insufficient information in the public domain (available either through consultation and/or publicly available documents) regarding future activities in these licence blocks for an assessment to be undertaken.	27.2	11.2	Spirit Energy Resources	There is insufficient information in the public domain (available either through consultation and/or publicly available documents) regarding future activities in these licence blocks for an assessment to be undertaken.	
43/30b	19/12/2039	N/A [a]	121.5	0	0	6.5	5.3		121.5	100	No operator		
48/5a	19/12/2039	N/A [a]	121.7	0	0	10.3	8.5		121.7	100	No operator		
44/27	31/08/2041	N/A [a]	242.7	5.6	2.3	175.5	72.3	Minor	49.3	20.3	Third Energy	Minor (negligible increase)	Low
49/2a	22/12/2034	N/A [a]	18.3	15.8	86.3	18.3	100	Moderate	18.3	100	INEOS	Moderate (moderate increase)	Low
a	No infrastructure (excluding subsea tie backs shown in Figure 8.4) is presently known to be within the licence block.												

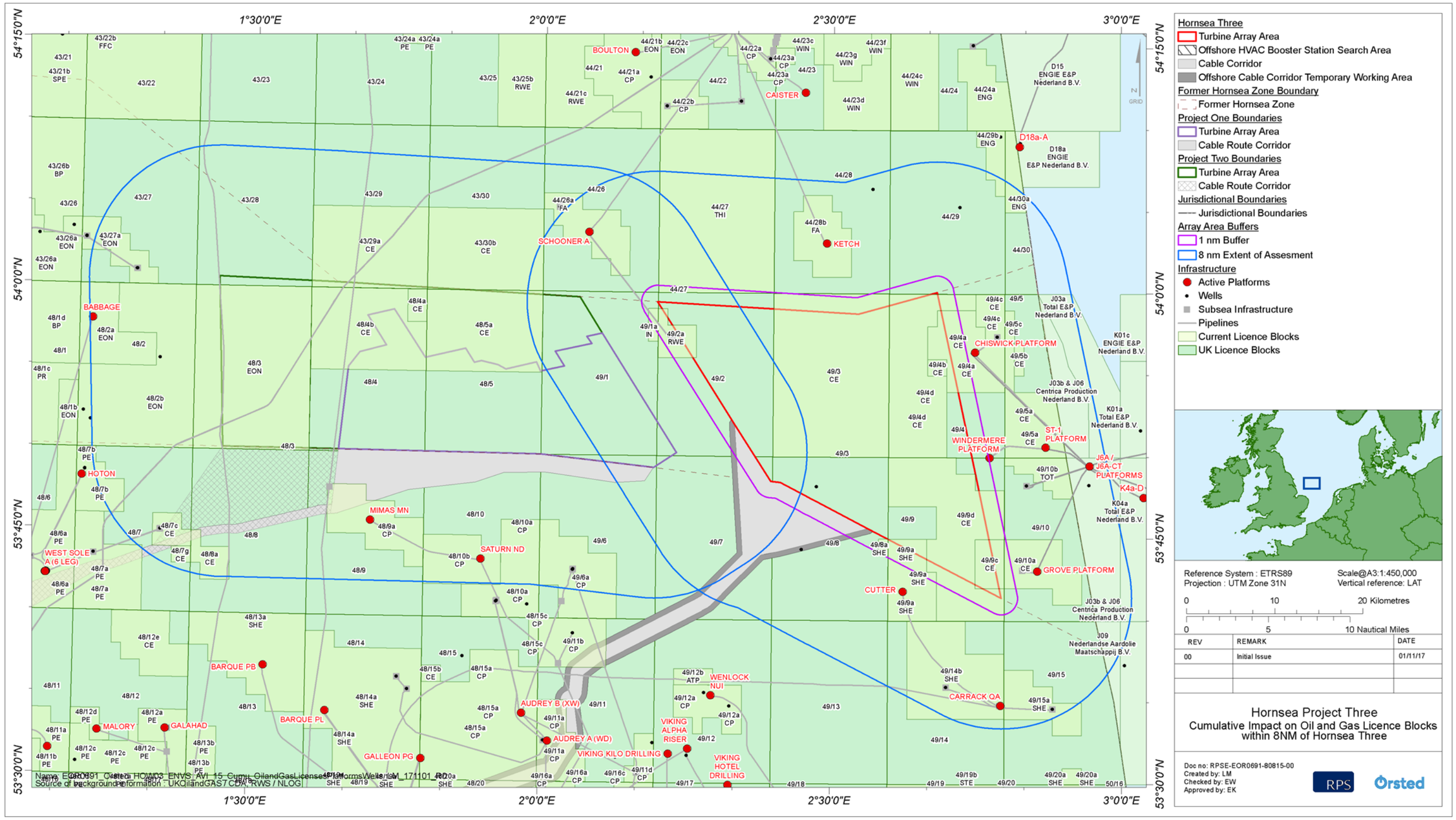

Figure 8.16: Licence blocks within 8 nm of Hornsea Three, Hornsea Project One and Hornsea Project Two.

Wind turbines may disrupt radar coverage of Military ADR located at Trimingham

Tier 1

Magnitude of impact

8.13.3.55 Radar Line of Sight analysis for the Trimingham ADR (see volume 5, annex 8.1: Aviation, Military and Communication Technical Report) indicates that Hornsea Three wind turbines with a tip height of 325 m would be considered theoretically intermittently detectable by the Trimingham ADR within a small area along the southwestern boundary of the Hornsea Three array area. Wind turbines in the southwestern section of the Hornsea Three array area are unlikely to be routinely detectable, and turbines in the northeastern section are not predicted to be detectable by the Trimingham ADR.

8.13.3.56 Other offshore wind farms that are considered likely to be detected by the Trimingham ADR include Dudgeon, East Anglia One, Hornsea Project One, Hornsea Project Two, Humber Gateway, Lincs, Lynn and Inner Dowsing, Race Bank, Sheringham Shoal, Triton Knoll and Westermost Rough. The potential cumulative effect will be to add to the radar clutter and possibly an increase in the signal processing demands of the Trimingham ADR.

8.13.3.57 The impact is predicted to be of regional spatial extent, medium term duration, intermittent and not reversible for the lifetime of Hornsea Three. It is predicted that the impact will affect the receptor directly. The magnitude is considered to be moderate.

Sensitivity of receptor

8.13.3.58 Military ADRs are used to protect the security interests of the UK. Their programming will have a certain level of ability to accommodate wind turbine infrastructure. The MOD, as operator of the Trimingham ADR, is deemed to be of very low vulnerability, high recoverability and moderate value. The sensitivity of the receptor is therefore, considered to be negligible.

Significance of effect

8.13.3.59 Overall, it is predicted that the sensitivity of the receptor is considered to be negligible and the magnitude of impact 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

8.13.3.60 In addition to the Tier 1 projects noted in 8.13.3.55 and 8.13.3.56 above, East Anglia Three may also be detectable by the Trimingham ADR. The cumulative effect will be to add a small degree of radar clutter and possibly an increase in the signal processing demands of the Trimingham ADR.

8.13.3.61 The impact is predicted to be of regional spatial extent, medium term duration, intermittent and not reversible for the lifetime of Hornsea Three. It is predicted that the impact will affect the receptor directly. The magnitude is considered to be moderate.

Sensitivity of receptor

8.13.3.62 The MOD, as operator of the Trimingham ADR, is deemed to be of very low vulnerability, high recoverability and moderate value. The sensitivity of the receptor is therefore, considered to be negligible.

Significance of effect

8.13.3.63 Overall, it is predicted that the sensitivity of the receptor is considered to be negligible and the magnitude of impact 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

8.13.3.64 In addition Tier 1 and Tier 2 offshore wind farms (paragraphs 8.13.3.55, 8.13.3.56 and 8.13.3.60), the following Tier 3 projects are considered likely to be detected by the Trimingham ADR: East Anglia One North, East Anglia Two, Norfolk Boreas and Norfolk Vanguard. The cumulative effect will be to add to the radar clutter and possibly an increase in the signal processing demands of the Trimingham ADR.

8.13.3.65 The impact is predicted to be of regional spatial extent, medium term duration, intermittent and not reversible for the lifetime of Hornsea Three. It is predicted that the impact will affect the receptor directly. The magnitude is considered to be moderate.

Sensitivity of receptor

8.13.3.66 The MOD, as operator of the Trimingham ADR, is deemed to be of very low vulnerability, high recoverability and moderate value. The sensitivity of the receptor is therefore, considered to be negligible.

Significance of effect

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

Future Monitoring

8.13.3.68 No aviation, military and communication monitoring to test the predictions made within the operation and maintenance phase impact assessment is considered necessary.

8.13.4 Decommissioning phase

Hornsea Three helicopter decommissioning activities may affect the available airspace for other users

Tier 1

8.13.4.1 By the time of Hornsea Three decommissioning it is highly probable that the aviation industry will be fully adapted to servicing the offshore wind industry in the southern North Sea. The decline in provision of a service to the oil and gas sector may have been replaced by an increased requirement from the offshore wind industry. It is not possible to make predictions of the future environment at this time, and so a continued base case has been assumed.

8.13.4.2 The effects of decommissioning activities are expected to be the same or similar to the effects from construction. The effect will therefore be of **minor** adverse significance (see paragraph 8.13.2.8), which is not significant in EIA terms.

Tier 2

8.13.4.3 There are no additional Tier 2 developments identified that would result in increased helicopter numbers in shared airspace with Hornsea Three. The assessment for Tier 2 therefore remains the same as for Tier 1 above.

Tier 3

8.13.4.4 There are no additional Tier 3 developments identified that would result in increased helicopter numbers in shared airspace with Hornsea Three. The assessment for Tier 3 therefore remains the same as for Tier 1 above.

Future monitoring

8.13.4.5 No aviation, military and communication monitoring to test the predictions made within the decommissioning phase impact assessment is considered necessary.

8.14 Transboundary effects

8.14.1.1 A screening of transboundary impacts has been carried out and is presented in volume 4, annex 5.5: Transboundary Impacts Screening Note. This screening exercise identified that there was the potential for significant transboundary effects with regard to aviation, military and communication from Hornsea Three upon the interests of other EEA States.

8.14.1.2 Potential transboundary impacts that have been identified relate to the following impacts:

- Wind turbines and hoist operations will form an aerial obstruction resulting in disruption to cross-zone transit helicopter traffic. The affected licenced acreage is operated by Spirit Energy. The impact is assessed in paragraph 8.11.2.3. The significance of effect will be of **minor** adverse significance, which is not significant in EIA terms;
- Wind turbines will form a physical obstruction and disrupt helicopter access to the Chiswick, ST-1, J6A/J6A-CT and Grove platforms. These platforms form part of the Markham complex operated by Spirit Energy. The impact is assessed in paragraph 8.11.2.29 et seq. The significance of effect will be of **minor** adverse significance, which is not significant in EIA terms; and
- Wind turbines will form an aerial obstruction and may disrupt helicopter access to helideck equipped drilling rigs and vessels conducting operations at subsea infrastructure and well locations. This impact may affect Dutch licenced acreage operated by Spirit Energy Resources. The impact is assessed in paragraph 8.11.2.67. The significance of effect will be **minor** adverse significance, which is not significant in EIA terms.

8.15 Inter-related effects

8.15.1.1 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 the operator of an offshore oil and gas platform such as restriction on helicopter access during IMC, restriction on ability to conduct MAPs, alteration to helicopter journey time, etc.), 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.

8.15.1.2 A description of the likely inter-related effects arising from Hornsea Three on aviation, military and communication is provided in volume 2, chapter 12: Inter-Related Effects (Offshore).

8.16 Conclusion and summary

8.16.1.1 Information on aviation, military and communication within the Hornsea Three aviation, military and communication study area was collected through a detailed desktop review of existing datasets and through consultation as detailed in Table 8.5. Hornsea Three commissioned NATS to provide an analysis of radar data to provide an understanding of the aviation baseline (see volume 5, annex 8.1: Aviation, Military and Communication Technical Report). Point-to-point Line of Sight (LOS) analysis was undertaken using the ATDI ICS LT (Version 3.9.92) tool (see volume 5, annex 8.1: Aviation, Military and Communication Technical Report). Consultation has taken place with aviation stakeholders, including helicopter operators, oil and gas operators, and regulators, as presented in section 8.5. The assessment methodology applied in this chapter has been discussed through the consultation process (Table 8.4).

8.16.1.2 Table 8.18 provides a summary of the potential impact, mitigation measures and residual effects in respect to aviation, military and communication.

8.16.1.3 Impacts assessed during the construction phase include Hornsea Three helicopter operations potentially affecting the available airspace for other users. Overall it is concluded that there will be no significant effects arising from Hornsea Three during the construction phase.

8.16.1.4 Impacts assessed during the operation and maintenance phase include wind turbines and hoist operations forming an aerial obstruction resulting in disruption to cross-zone transit helicopter traffic and the use of the HMR network; Hornsea Three helicopter operations potentially affecting the available airspace for other users; wind turbines forming a physical obstruction and potentially disrupting helicopter access including requirements for decommissioning to the Schooner A and Ketch, Chiswick, ST-1, J6A/J6A-CT, Grove, Windermere and Carrack QA platforms; wind turbines forming an aerial obstruction and potentially disrupting helicopter access to helideck equipped drilling rigs and vessels conducting operations at subsea infrastructure and well locations; and wind turbines potentially disrupting radar coverage of NATS Claxby PSR and Military ADR located at Staxton Wold and Trimingham and potentially interfering with existing offshore microwave and other communication links. Overall it is concluded that there will be no significant effects arising from Hornsea Three during the operation and maintenance phase.

8.16.1.5 Impacts assessed during the decommissioning phase include Hornsea Three helicopter operations potentially affecting the available airspace for other users. Overall it is concluded that there will be no significant effects arising from Hornsea Three during the decommissioning phase.

8.16.1.6 Impacts assessed during the construction, operation and maintenance and decommissioning phase for Hornsea Three, alongside other projects and plans included project activity and associated vessel movements potentially interfering with operations within the Military Practice Area located in the Outer Silver Pit area; helicopter operations potentially affecting the available airspace for other users; wind turbines and hoist operations potentially forming an aerial obstruction resulting in disruption to cross-zone transit helicopter traffic and the use of the HMR network; wind turbines potentially forming a physical obstruction and potentially disrupting helicopter access including requirements for decommissioning to the Schooner A platform; wind turbines forming an aerial obstruction and potentially disrupting helicopter access to helideck equipped drilling rigs and vessels conducting operations at subsea infrastructure and well locations; and wind turbines potentially disrupting radar coverage of Military ADR located at Trimingham. Overall it is concluded that there will be no significant cumulative effects from Hornsea Three alongside other projects/plans.

8.16.1.7 Potential transboundary impacts have been identified in regard to wind turbines and hoist operations forming an aerial obstruction resulting in disruption to cross-zone transit helicopter traffic; wind turbines forming a physical obstruction and disrupting helicopter access to the Chiswick, ST-1, J6A/J6A-CT and Grove platforms and wind turbines forming an aerial obstruction and potentially disrupting helicopter access to helideck equipped drilling rigs and vessels conducting operations at subsea infrastructure and well locations. Overall it is concluded that there will be no significant transboundary effects arising from Hornsea Three.

Table 8.18: Summary of potential environment effects, mitigation and monitoring.

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 helicopter operations may affect the available airspace for other users.	None	Minor	Low	**Minor** adverse (not significant in EIA terms)	None	N/A	None
Operation Phase							
Wind turbines and hoist operations will form an aerial obstruction resulting in disruption to cross – zone transit helicopter traffic, and Hornsea Three infrastructure will form an aerial obstruction resulting in disruption to helicopters using HMRs.	The UK Hydrographic Office (UKHO) will be informed of the locations, heights and lighting status of the wind turbines, including estimated and actual dates of construction and the maximum height of any construction equipment to be used, prior to the start of construction, to allow inclusion on Aviation Charts. An ERCoP will be in place for the operation and maintenance of Hornsea Three. The ERCoP will detail specific marking and lighting of the wind turbines. The requirements for lighting on offshore obstructions, including to support helicopter hoist operations, is contained in CAP 393 (Article 223) (CAA, 2016a), CAP 764 (CAA, 2016c) and CAP 437 (CAA, 2016b). The lighting shall meet the current CAA requirements. Hornsea Three shall continue to consult with the MOD to better understand their aviation lighting requirements. During the operational phase, the Hornsea Three operator will issue, as necessary, requests to the UK Aeronautical Information Service to submit NOTAMs in the event of any failure of aviation lighting.	Moderate	Low	**Minor** adverse (not significant in EIA terms)	None	N/A	None
Hornsea Three helicopter operations may affect the available airspace for other users.	None	Moderate	Low	**Minor** adverse (not significant in EIA terms)	None	N/A	None
Wind turbines will form a physical obstruction and may disrupt helicopter access including requirements for decommissioning to oil and gas platforms.	None	Schooner A and Ketch platform No impact (Schooner A platform) Minor (Ketch platform) Chiswick, ST-1, J6A/J6A-CT and Grove platforms Minor (Chiswick, ST-1, J6A/J6A-CT and Grove platforms) Windermere platform Minor (Windermere platform) Carrack QA platform No impact	Schooner A and Ketch platform Low (Ketch platform) Chiswick, ST-1, J6A/J6A-CT and Grove platforms High (Chiswick, J6A/J6A-CT and Grove platforms) Low (ST-1 platform) Windermere platform Low (Windermere platform) Carrack QA platform No impact	Schooner A and Ketch platform **Minor** adverse (Ketch platform) (not significant in EIA terms) Chiswick, ST-1, J6A/J6A-CT and Grove platforms **Minor** adverse (Chiswick, ST-1, J6A/J6A-CT and Grove platforms) (not significant in EIA terms) Windermere platform **Minor** adverse (Windermere platform) (not significant in EIA terms) Carrack QA platform No impact	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
Wind turbines will form an aerial obstruction and may disrupt helicopter access to helideck equipped drilling rigs and vessels conducting operations at subsea infrastructure and well locations.	Hornsea Three will continue to consult with current oil and gas operators and licensees and will consider representations if approached by future oil and gas operators and licensees, in order to promote and maximise cooperation between parties and minimise both spatial and temporal interactions between conflicting activities.	Negligible for licence blocks 49/4c, J03b and J06, 49/15a, K04a, J03a, K07 and J09; minor for licence blocks 49/10a, 44/27; and moderate for licence blocks 49/2a.	Low for the operators Third Energy, INEOS, Total Netherlands and NAM; and moderate for Shell and Spirit Energy Resources (49/10a), Spirit Energy North Sea Ltd (49/4c) and Spirit Energy (J03b and J06).	**Negligible** for the operators Total Netherlands (K04a) and NAM (J03a, K07 and J09) (not significant in EIA terms). **Minor** adverse for the operators Third Energy (44/27), INEOS (49/2a), Shell (49/15a), Spirit Energy Resources (49/10a), Spirit Energy North Sea ltd (49/4c) and Spirit Energy (J03b and J06), (not significant in EIA terms).	None	N/A	None
Wind turbines may disrupt radar coverage of NATS Claxby PSR and Military ADR located at Staxton Wold and Trimingham.	None	No impact for NATS Claxby PSR and Staxton Wold ADR. Minor for Trimingham ADR.	No impact for NATS Claxby PSR and Staxton Wold ADR. Negligible for Trimingham ADR.	No impact for NATS Claxby PSR and Staxton Wold ADR. **Negligible** for Trimingham ADR (not significant in EIA terms).	None	N/A	None
Decommissioning Phase							
Hornsea Three helicopter operations may affect the available airspace for other users.	None	Minor	Low	**Minor** adverse (not significant in EIA terms)	None	N/A	None

8.17 References

CAA (2016a) CAP 393 The Air Navigation Order 2016 and the Regulations

CAA (2016b) CAP 437 Standards for Offshore Helicopter Landing Areas, Eighth Edition

CAA (2016c) CAP 764 CAA Policy and Guidelines on Wind Turbines, Sixth Edition

CAA (2014a) CAP 670 Air Traffic Services Safety Requirements, Third Edition, second amendment

CAA (2014b) CAP 1145 Safety review of offshore public transport helicopter operations in support of the exploitation of oil and gas.

Centrica (2016) Markham ST-1 Decommissioning Programmes, Revision No A4, Available online: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/537038/Markham_ST-1_DP.pdf [Accessed 16 March 2017]

Department for Transport (DfT) (2004) Results of the electromagnetic investigations and assessments of marine radar, communications and positioning systems undertaken at the North Hoyle wind farm by QinetiQ and the Maritime and Coastguard Agency. QINETIQ.

MCA (2008) Offshore Renewable Energy Installations (OREIs): Guidance to Mariners Operating in the Vicinity of UK OREIs, MGN 372 (M+F)

MCA (2016) Safety of Navigation: Offshore Renewable Energy Installations (OREIs) - Guidance on UK Navigational Practice, Safety and Emergency Response Marine Guidance Note (MGN) 543 (M+F)

Met Office (2012) Met Office guidelines for wind farm developers: meteorological radar and other technical sites used for meteorology, April 2012.

MOD (2014) Guidance, Wind farms: MOD Safeguarding, Available online https://www.gov.uk/government/publications/wind-farms-ministry-of-defence-safeguarding/wind-farms-mod-safeguarding [Accessed 22 March 2017]

NATS (2017a) Aeronautical Information Package. ENR 1.1 - 1 General Rules and Procedures. Available online: http://www.nats-uk.ead-it.com/public/index.php.html [Accessed 16 March 2017]

NATS (2017b) Aeronautical Information Package. ENR 1.6 ATS Surveillance Services and Procedures. Available online: http://www.nats-uk.ead-it.com/public/index.php.html [Accessed 16 March 2017]

NATS (2017c) Hornsea Three radar data. NATS Analytics report A17218, Dec 2017

Office of Communications (Ofcom) (2009) Tall structures and their impact on broadcast and other wireless services. Ofcom.

Ofcom (2017) Ofcom Wind Farm Coordination Policy, Available online: https://www.ofcom.org.uk/manage-your-licence/radiocommunication-licences/fixed-terrestrial-links [Accessed 22 March 2017]

OGA (2016) OGA production projections, February 2016. Accessed at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/503852/OGA_production_projections_-_February_2016.pdf [16 March 2017].

Oil and Gas Authority (OGA) (2017a) Guidance, Oil and gas: decommissioning of offshore installations and pipelines, Available online: https://www.gov.uk/guidance/oil-and-gas-decommissioning-of-offshore-installations-and-pipelines#table-of-approved-decommissioning-programmes [Accessed 16 March 2017]

Oil and Gas Authority (OGA) (2017b) Offshore licences, Available at: https://www.ogauthority.co.uk/licensing-consents/offshore-licences/ [12 June 2017].

Parliament (2014) Helicopter safety briefing document. Available online: https://www.publications.parliament.uk/pa/cm201415/cmselect/cmtran/289/28905.htm [Accessed 16 March 2017]

Planning Inspectorate (PINS) (2012) Advice note six: Preparation and submission of application documents. Bristol, PINS.

PINS (2016) Hornsea Project Three Scoping Opinion. December 2016. Available online: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010080/EN010080-000069-Scoping%20Opinion.pdf [Accessed 18 January 2017]

RenewableUK (2016) Offshore Renewables Aviation Guidance (ORAG), Good Practice Guidelines for Offshore Renewable Energy Developments, June 2016.

SMart Wind Ltd. (2013) Hornsea Project One Offshore Wind Farm Environmental Statement. SMart Wind Ltd., London.

SMart Wind Ltd. (2015) Hornsea Project Two Offshore Wind Farm. Environmental Statement. SMart Wind Ltd., London.