Outer Dowsing Offshore Wind

Preliminary Environmental Information Report

Volume 1, Chapter 15: Shipping and Navigation

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OUTER DOWSING OFFSHORE WIND

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Abbreviations

Acronym	Expanded name
AIS	Automatic Identification System
ALARP	As Low As Reasonably Practicable
AoS	Area of Search
AtoN	Aids to Navigation
COLREGs	Convention on the International Regulations for Preventing Collisions at Sea
CoS	Chamber of Shipping
DCO	Development Consent Order
DECC	Department of Energy & Climate Change, now Department of Energy, Security and Net Zero
DESNZ	Department for Energy Security and Net Zero, formerly Department of Business, Energy and Industrial Strategy (BEIS), which was previously Department of Energy & Climate Change (DECC).
DfT	Department of Transport
ECC	Export Cable Corridor
EIA	Environmental Impact Assessment
ES	Environmental Statement
FLO	Fisheries Liaison Officer
FSA	Formal Safety Assessment
GT R4 Ltd	The Applicant. The special project vehicle created in partnership between Corio Generation (a wholly owned Green Investment Group portfolio company), Gulf Energy Development and TotalEnergies
GLA	General Lighthouse Authority
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
IMO	International Maritime Organisation
ITF	International Transport Forum
km	Kilometres
LOA	Length Overall
m	Metre
MAIB	Marine Accident Investigation Branch
MCA	Maritime and Coastguard Agency
MDS	Maximum Design Scenario
MGN	Marine Guidance Note
MHWS	Mean High Water Springs
MMO	Marine Management Organisation
MW	Megawatts
nm	Nautical Mile
NPS	National Policy Statement
NRA	Navigational Risk Assessment
NSIP	Nationally Significant Infrastructure Project
OECD	Organisation for Economic Cooperation and Development
ORCP	Offshore Reactive Compensation Platform

Acronym	Expanded name
OWF	Offshore Wind Farm
PEIR	Preliminary Environmental Information Report
PEXAs	Practice and Exercise Areas
PLL	Potential Loss of Life
Radar	Radio Detection and Ranging
RAM	Restricted in Ability to Manoeuvre
ORCP	Offshore Reactive Compensation Platform
RNLI	Royal National Lifeboat Institution
RYA	Royal Yachting Association
SAR	Search and Rescue
SOLAS	Safety of Life at Sea
TCE	The Crown Estate
TSS	Traffic Separation Scheme
UK	United Kingdom
UKHO	United Kingdom Hydrographic Office
UN	United Nations
UNCLOS	United Nations Convention of the Law of the Sea
WTG	Wind Turbine Generators

Terminology

Term	Definition
Adverse Weather Route	Preferred routes by certain vessels during periods of adverse weather conditions.
Array area	The area offshore within the PEIR Boundary within which the generating stations (including wind turbine generators (WTG) and inter array cables), offshore accommodation platforms, offshore transformer substations and associated cabling are positioned.
Automatic Identification System (AIS)	A system by which vessels automatically broadcast their identity, key statistics including location, destination, length, speed and current status. Most commercial vessels and European Union (EU)/UK fishing vessels over 15m in length are required to carry AIS.
Allision	Contact between a vessel and a stationary object.
Baseline	The status of the environment at the time of assessment without the development in place.
Collision	Contact between two or more moving vessels.
Cumulative effects	The combined effect of the Project acting cumulatively with the effects of a number of different projects, on the same single receptor/resource.
Cumulative impacts	Impacts that result from changes caused by other past, present or reasonably foreseeable actions together with the Project.
Development Consent Order (DCO)	An order made under the Planning Act 2008 granting development consent for a Nationally Significant Infrastructure Project (NSIP) from the Secretary of State (SoS) for Department for Energy Security and Net Zero (DESNZ).

Term	Definition
Effect	Term used to express the consequence of an impact. The significance of an effect is determined by correlating the magnitude of an impact with the sensitivity of a receptor, in accordance with defined significance criteria.
Environmental Impact Assessment (EIA)	A statutory process by which certain planned projects must be assessed before a formal decision to proceed can be made. It involves the collection and consideration of environmental information, which fulfils the assessment requirements of the Environmental Impact Assessment (EIA) Regulations, including the publication of an Environmental Statement (ES).
EIA Regulations	Infrastructure Planning (Environmental Impact Assessment) Regulations 2017
Environmental Statement (ES)	The suite of documents that detail the processes and results of the Environmental Impact Assessment (EIA).
Formal Safety Assessment (FSA)	A structured and systematic process for assessing the risks and costs (if applicable) associated with shipping activity as defined by the International Maritime Organization (IMO).
Impact	An impact to the receiving environment is defined as any change to its baseline condition, either adverse or beneficial.
Landfall	The location at the land-sea interface where the offshore export cable will come ashore.
Main Route	A route used on a regular basis by one or more vessels.
Marine Guidance Note (MGN)	Guidance released by the Maritime and Coastguard Agency (MCA) for the purposes of providing advice relating to the improvement of the safety of shipping and of life at sea.
Maximum Design Scenario	The maximum design parameters of the combined project assets that result in the greatest potential for change in relation to each impact assessed.
Mitigation	Mitigation measures, or commitments, are commitments made by the Project to reduce and/or eliminate the potential for significant effects to arise as a result of the Project. Mitigation measures can be embedded (part of the project design) or secondarily added to reduce impacts in the case of potentially significant effects.
Outer Dowsing Offshore Wind (ODOW)	The Project.
Offshore Export Cable Corridor (ECC)	The Offshore Export Cable Corridor (Offshore ECC) is the area within the Preliminary Environmental Information Report (PEIR) Boundary within which the export cable running from the array to landfall will be situated.
Offshore Reactive Compensation Station (ORCP)	Platforms located outside the array area which house electrical equipment and control and instrumentation systems. They also provide access facilities for work boats.
Onshore Infrastructure	The combined name for all onshore infrastructure associated with the Project from landfall to grid connection.
Preliminary Environmental	The PEIR is written in the style of a draft Environmental Statement (ES) and provides information to support and inform the statutory consultation process in the pre-application phase. Following that consultation, the PEIR

Term	Definition
Information Report (PEIR)	documentation will be updated to produce the Project's ES that will accompany the application for the Development Consent Order (DCO).
Project Design Envelope	A description of the range of possible elements that make up the Project's design options under consideration, as set out in detail in the project description. This envelope is used to define the Project for Environmental Impact Assessment (EIA) purposes when the exact engineering parameters are not yet known. This is also often referred to as the "Rochdale Envelope" approach.
Receptor	A distinct part of the environment on which effects could occur and can be the subject of specific assessments. Examples of receptors include species (or groups) of animals or plants, people (often categorised further such as 'residential' or those using areas for amenity or recreation), watercourses etc.
Regular Operator	A commercial operator associated with one or more vessels that transit an area on a regular basis.
Safety Zone	An area around a structure associated with an Offshore Renewable Energy Installation where entry is prohibited under the Energy Act 2004.
study area	Area(s) within which environmental impact may occur – to be defined on a receptor by receptor basis by the relevant technical specialist.
The Project	Outer Dowsing Offshore Wind including proposed onshore and offshore infrastructure.
Transboundary impacts	Transboundary effects arise when impacts from the development within one European Economic Area (EEA) state affects the environment of another EEA state(s).
Subsea	Subsea comprises everything existing or occurring below the surface of the sea
Wind Turbine Generator (WTG)	All the components of a wind turbine, including the tower, nacelle, and rotor.

15 Shipping and Navigation

15.1 Introduction

15.1.1 This chapter of the Preliminary Environmental Information Report (PEIR) presents the results to date of the Environmental Impact Assessment (EIA) for the potential impacts of Outer Dowsing Offshore Wind ("the Project") on shipping and navigation. Specifically, this chapter considers the potential impact of the Project seaward of Mean High Water Springs (MHWS) during the construction, operation and maintenance, and decommissioning phases.

15.1.2 GT R4 Limited (trading as Outer Dowsing Offshore Wind) hereafter referred to as the 'Applicant', is proposing to develop the Project. The Project will be located approximately 54 kilometres (km) from the Lincolnshire coastline in the southern North Sea. The Project will include both offshore and onshore infrastructure including an offshore generating station (wind farm), export cables to landfall, and connection to the electricity transmission network (see Volume 1, Chapter 3: Project Description for full details).

15.1.3 As required under the relevant Maritime and Coastguard Agency (MCA) guidance, namely Marine Guidance Note (MGN) 654 (MCA, 2021) (see Section 15.6), the shipping and navigation chapter has been informed by a Navigational Risk Assessment (NRA) process. The NRA is contained within Volume 2, Appendix 15.1: Navigational Risk Assessment. Compliance with MGN 654 has been demonstrated via completion of an MGN 654 checklist which is included as an Annex to the NRA (noting that certain checklist elements at PEIR stage reference updates that will be made at Environmental Statement (ES) stage).

15.1.4 This chapter should be read alongside the following chapters, noting the focus of the shipping and navigation assessment is navigational safety impacts to vessels in transit:

- Volume 1, Chapter 14: Commercial Fisheries; and
- Volume 1, Chapter 18: Infrastructure and Other Marine Users.

15.2 Statutory and Policy Context

15.2.1 The relevant legislation and planning policy for offshore renewable energy Nationally Significant Infrastructure Projects (NSIPs), specifically in relation to shipping and navigation, is outlined in Table 15.1.

15.2.2 It is noted that draft updates to National Policy Statement (NPS) EN-3 were consulted on between September and November 2021, with the outcome of the consultation currently pending. The draft provisions of relevance to shipping and navigation have been included in Table 15.1.

Table 15.1: Legislation and policy context

Legislation/policy	Key provisions	Section where comment addressed
United Nations Convention on the Law of the Sea (UNCLOS) (United Nations (UN), 1982)	UNCLOS defines the rights and responsibilities of all nations with respect to their use of the sea, throughout the world. Article 60(7) states "*Artificial islands, installations and structures and the safety zones around them may not be established where interference may be caused to the use of recognised sea lanes essential to international navigation*".	Internationally recognised sea lanes and other identified routes are considered a key element of the shipping and navigation baseline and have been considered wherever "*interference may be caused*" including through vessel displacement, port access, collision risk and allision risk in the impact assessment.
Convention on the International Regulations for Preventing Collisions at Sea (COLREGs) (International Maritime Organisation (IMO), 1972/77)	The COLREGs define the rules which must be adhered to by all vessels navigating internationally. Rule 8 Part (a) states "*Any action to avoid collision shall be taken in accordance with the Rules of this Part and shall, if the circumstances of the case admit, be positive, made in ample time and with due regard to the observance of good seamanship*." Rule 19 Part (b) states "*Every vessel shall proceed at a safe speed adapted to the prevailing circumstances and conditions of restricted visibility A power-driven vessel shall have her engines ready for immediate manoeuvre."*	The COLREGs in full are considered throughout this chapter and Volume 2, Appendix 15.1: NRA with particular regard in the context of the Project to collision avoidance (Rule 8) and conduct of vessels in restricted visibility (Rule 19) when considering collision risk in the impact assessment. The impact assessment (which includes consideration of COLREGs) is provided in Section 15.7.
The International Convention for the Safety of Life at Sea (SOLAS) Chapter V (IMO, 1974)	SOLAS Chapter V is an international agreement that sets basic minimum criteria for all seafarers, dependent on the size and type of vessel. Regulation 33 states "*The master of a ship at sea which is in a position to be able to provide assistance on receiving a signal from any source that persons are in distress at sea, is bound to proceed with all speed to their assistance, …*"	SOLAS Chapter V in full is considered throughout this chapter and Volume 2, Appendix 15.1: NRA with particular regard in the context of the Project to rendering assistance to persons in distress (Regulation 33) and passage planning (Regulation 34) when considering allision risk, anchor interaction with sub-sea cables and emergency response capability. The impact assessment (which

Legislation/policy	Key provisions	Section where comment addressed
	Regulation 34 states *"Prior to proceeding to sea, the master shall ensure that the intended voyage has been planned using the appropriate nautical charts and nautical publications for the area concerned, …"*.	includes consideration of SOLAS Chapter V) is provided in Section 15.7.
EN-3 NPS for Renewable Energy Infrastructure (Department of Energy & Climate Change (DECC), 2011)	EN-3 NPS for Renewable Energy sets out guidance and requirements for NSIPs.	As the Project is an offshore wind project of more than 100 Megawatts (MW) the Proposed Development falls under this NPS.
	Paragraph 2.6.153 states "*Applicants should establish stakeholder engagement with interested parties in the navigation sector early in the development phase of the proposed offshore wind farm and this should continue throughout the life of the development including during the construction, operation and decommissioning phases. Such engagement should be taken to ensure that solutions are sought that allow offshore wind farms and navigation uses of the sea to successfully co-exist*."	Stakeholder engagement is considered a key input to the shipping and navigation baseline and impact assessment. Consultation undertaken is outlined in Section 15.3.
	Paragraph 2.6.154 states "*Assessment should be underpinned by consultation with the Marine Management Organisation (MMO), Maritime and Coastguard Agency (MCA), the relevant General Lighthouse Authority (GLA), the relevant industry bodies (both national and local) and any representatives of recreational users of the sea, such as the Royal Yachting Association (RYA), who may be affected*."	The stated organisations are considered key stakeholders for shipping and navigation. Consultation undertaken is outlined in Section 15.3.
	Paragraph 2.6.155 states "*Information on internationally recognised sea lanes is publicly available and this should be considered by applicants prior to undertaking assessments. The*	Internationally recognised sea lanes, other identified routes and navigational features such as IMO routeing measures are considered a key element of the shipping and

Legislation/policy	Key provisions	Section where comment addressed
	assessment should include reference to any relevant, publicly available data available on the Maritime Database."	navigation baseline. The methodology for baseline data gathering and baseline conditions are outlined in Section 15.4.
	Paragraph 2.6.156 states "*Applicants should undertake a Navigational Risk Assessment (NRA) in accordance with relevant Government guidance prepared in consultation with the MCA and the other navigation stakeholders listed above."*	The NRA is considered a key input to the shipping and navigation impact assessment including compliance with MCA guidance documents. The NRA is provided in Volume 2, Appendix 15.1 and its methodology was agreed during consultation with the MCA and Trinity House (Section 15.3).
	Paragraph 2.6.160 states "*The potential effect on recreational craft, such as yachts, should be considered in any assessment*."	Small craft including recreational vessels are considered a relevant receptor to shipping and navigation. The impact assessment (which includes consideration of recreational vessels in transit) is provided in Section 15.7.
Draft National Policy Statement for Renewable Energy Infrastructure (EN-3) (Department for Energy, Security & Net Zero (DESNZ), 2023)	Paragraphs 3.8.193 to 3.8.194 "*Offshore wind farms will occupy an area of the sea and therefore it is inevitable that there will be an impact on navigation in and around the area of the site. This is relevant to both commercial and recreational users of the sea who may be affected by disruption or economic loss because of the proposed offshore wind farm. To ensure safety of shipping applicants should reduce risks to navigational safety to as low as reasonably practicable (ALARP)".*	The IMO Formal Safety Assessment (FSA) methodology (IMO, 2018) has been applied for assessing effects on shipping and navigation receptors including application of the As Low As Reasonably Practicable (ALARP) principle to ensure risks are within tolerable levels. The methodology for assessment is provided in Section 15.6.
	Paragraph 3.8.199 to 3.8.200 "*Applicants should engage with interested parties in the navigation sector early in the pre-application phase of the proposed offshore wind farm to help identify mitigation measures, including alterations to navigation routes, to facilitate proposed offshore wind development. This includes the MMO or NRW in*	Stakeholder engagement is considered a key input to the shipping and navigation baseline and impact assessment. Consultation undertaken is outlined in Section 15.3.

Legislation/policy	Key provisions	Section where comment addressed
	Wales, MCA, the relevant General Lighthouse Authority, such as Trinity House, the relevant industry bodies (both national and local) and any representatives of recreational users of the sea, such as the Royal Yachting Association (RYA), who may be affected. This should continue throughout the life of the development including during the construction, operation and decommissioning phases. Engagement should seek solutions that allow offshore wind farms to successfully co-exist with navigation and shipping uses of the sea."	
	Paragraph 3.8.201 "*The presence of the wind turbines can also have impacts on communication and shipborne and shore-based radar systems. See section 5.5 in EN-1 for further guidance.*"	Impacts on navigation, communications and position fixing equipment has been assessed in Volume 2, Appendix 15.1: Navigational Risk Assessment.
	Paragraph 3.8.202 to 3.8.203 "*Prior to undertaking assessments applicants should consider information on internationally recognised sea lanes, which is publicly available. Applicants should refer in assessments to any relevant, publicly available data available on the Maritime Database.*"	Internationally recognised sea lanes, other identified routes and navigational features such as IMO routeing measures are considered a key element of the shipping and navigation baseline. It is noted that no IMO routeing measures are in proximity to the array area. The methodology for baseline data gathering and baseline conditions are outlined in Section 15.4.
	Paragraph 3.8.204 to 3.8.205 "*Applicants should undertake a Navigational Risk Assessment (NRA) in accordance with relevant government guidance prepared in consultation with the MCA and the other navigation stakeholders listed above. The navigation risk assessment will for example necessitate*:	The NRA is considered a key input to the shipping and navigation impact assessment including compliance with MCA guidance documents. The NRA is provided in Volume 2, Appendix 15.1 and its methodology was agreed during consultation with the MCA and Trinity House (see Section 15.3).

Legislation/policy	Key provisions	Section where comment addressed
	▪ *A survey of vessel traffic in the vicinity of the proposed wind farm;* ▪ *a full NRA of the likely impact of the wind farm on navigation in the immediate area of the wind farm in accordance with the relevant marine guidance; and* ▪ *Cumulative and in-combination risks associated with the development and other developments (including other wind farms) in the same area of sea.*"	
National Policy Statement for Ports (Department of Transport (DfT), 2012)	The NPS for Ports sets out the framework for decisions on proposals for new port development.	Although not directly applicable to the Project, ports and port users are identified as potential receptors and therefore elements of the NPS are considered relevant.
	Paragraph 5.14.2 states "*Where the project is likely to have socio-economic impacts at local or regional levels, the applicant should undertake and include in their application an assessment of these impacts as part of the ES, ...*" Paragraph 5.14.4 states "*Applicants should describe the existing socio-economic conditions in the areas surrounding the proposed development and should also refer to how the development's socio-economic impacts correlate with local planning policies.*" Paragraph 5.14.5 states "*Socio-economic impacts may be linked to other impacts.*"	The socio-economic effect of the Project on local ports has been considered in Volume 1, Chapter 29: Socio-economic Characteristics. Displacements impacts have been considered in Section 15.7.
United Kingdom (UK) Marine Policy Statement (HM Government, 2011)	The UK Marine Policy Statement provides a framework for preparing Marine Plans and taking decisions affecting the marine environment.	Displacement of existing routes and activity and subsequent increases in collision risk has been considered. The impact assessment (which includes consideration of

Legislation/policy	Key provisions	Section where comment addressed
	Paragraph 3.4.7 states "*Increased competition for marine resources may affect the sea space available for the safe navigation of ships. Marine plan authorities and decision makers should take into account and seek to minimise any negative impacts on shipping activity, freedom of navigation and navigational safety and ensure that their decisions are in compliance with international maritime law*".	vessel displacement) is provided in Section 15.7.

15.3 Consultation

15.3.1 Consultation is a key part of the Development Consent Order (DCO) application process. Consultation regarding shipping and navigation has been conducted in line with MGN 654 (MCA, 2021) requirements, and therefore includes the EIA scoping process (Outer Dowsing Offshore Wind, 2022), meetings with key stakeholders, a regular operators outreach, and a hazard workshop. An overview of the Project consultation process is presented within Volume 1, Chapter 6: Consultation Process.

15.3.2 A summary of the key issues raised during consultation to date, specific to shipping and navigation, is outlined in Table 15.2 below, together with how these issues have been considered in the production of this PEIR.

Table 15.2: Summary of consultation relating to shipping and navigation

Date and consultation phase/type	Consultation and key issues raised	Section where comment addressed
02 June 2021 Initial consultation DFDS and Chamber of Shipping (CoS)	CoS raised cumulative concerns with the Dudgeon and Sheringham Extensions to the south.	Cumulative impact assessment is given in Section 15.8.
02 June 2021	DFDS noted concern over traffic passing inshore of the Outer Dowsing bank, in particular whether the Project may increase traffic levels in this area or reduce navigable width.	Associated impacts have been considered in Section 15.7. Full details of potential route deviations including on a cumulative basis are provided in Volume 2, Appendix 15.1: NRA.
02 June 2021	DFDS stated limited concern with their Newcastle to Ijmuiden Route. However, the Immingham-Cuxhaven	Associated impacts have been considered in Section 15.7. Full details of potential route

Date and consultation phase/type	Consultation and key issues raised	Section where comment addressed
	routeing will be affected. Adverse weather routeing between Immingham and Esbjerg may also be impacted	deviations including on a cumulative basis and in terms of adverse weather are provided in Volume 2, Appendix 15.1: NRA.
10 January 2022 Pre-Scoping Consultation Meeting Trinity House	**Re-Routeing** Trinity house has a key interest in where traffic passing north of the Project will route. North/south traffic passing west of the Hornsea sites is also of interest. Tanker traffic from Humber should be considered given the size of the vessels.	Vessel displacement has been considered in Section 15.7. Full details of potential route deviations including on a cumulative basis are provided in Volume 2, Appendix 15.1: NRA.
10 January 2022 Pre-Scoping Consultation Meeting Trinity House	**Layout** Trinity House prefers straight line edges for the Project with no isolated structures.	As per Section 15.5, the layout will be agreed with the MCA and Trinity House.
10 January 2022 Pre-Scoping Consultation Meeting Trinity House	**Construction Buoyage** Construction buoyage will need to be thoroughly considered regarding the presence of Triton Knoll and the shallow banks.	As per Section 15.5, lighting and marking including the buoyed construction area will be agreed with Trinity House.
14 January 2022 Pre-Scoping Consultation Meeting MCA	**Cumulative Effects** Proposed seaweed farms and Dutch wind farms to the north of the East Anglia projects are unlikely to cause any impact but interested in knowing if there is any effect.	Cumulative impact assessment is provided in Section 15.8. Screening of cumulative developments has been undertaken in Volume 2, Appendix 15.1: NRA.
14 January 2022 Pre-Scoping Consultation Meeting MCA	**Rescue Operations** The larger structures and rotor diameters can create challenges for Search and Rescue (SAR) helicopters.	As per Section 15.5, the layout will be agreed with the MCA and Trinity House. These discussions will include SAR considerations, noting the Project will be MGN 654 compliant.
16 August 2022 Consultation Meeting Chamber of Shipping (CoS)	**Study Area** Consideration should be taken in regard to the study area and the location of the existing Dudgeon/Sheringham sites and the planned extension projects.	Details of the study area are provided in Section 15.4.

Date and consultation phase/type	Consultation and key issues raised	Section where comment addressed
	CoS requested that PEIR included an idea of scale, possibly through the use of a grid to understand what the size of a certain development in the area will resemble.	
16 August 2022 Consultation Meeting CoS	**Vessel Traffic** CoS stated that general trends in vessel traffic will remain similar but cautious over the passenger cruising growth that was present pre-Covid-19 and how that growth may continue but routeing is currently vague.	The final NRA will consider potential future case traffic increases as detailed in Volume 2, Appendix 15.1: NRA.
8 September 2022 Consultation Meeting DFDS	Although King Seaways & Princess Seaways intersected or passed in proximity to the site on adverse weather routes, there is limited concern with the associated routeing. Key DFDS concern is the Immingham to Cuxhaven routes.	DFDS routeing has been identified and assessed within Volume 2, Appendix 15.1: NRA. Associated impact assessment is provided in Section 15.7.
26 August 2022 Scoping Opinion MCA	The Environmental Impact Assessment Report should supply detail on the possible impact on navigational issues for both commercial and recreational craft, specifically: ▪ Collision Risk ▪ Navigational Safety ▪ Visual intrusion and noise ▪ Risk Management and Emergency response ▪ Marking and lighting of site and information to mariners ▪ Effect on small craft navigational and communication equipment ▪ The risk to drifting recreational craft in adverse weather or tidal conditions ▪ The likely squeeze of small craft into the routes of larger commercial vessels.	The listed items are assessed within Volume 2, Appendix 15.1: NRA. Associated impacts are assessed where appropriate in Section 15.7.
26 August 2022 Scoping Opinion	The development area carries a moderate amount of traffic with several important commercial	Vessel routeing included during adverse weather is assessed in Section 15.7.

Date and consultation phase/type	Consultation and key issues raised	Section where comment addressed
MCA	shipping routes to/from UK ports, particularly passenger vessels, oil and gas support vessels and cargo ships including tankers. Attention needs to be paid to routing, particularly in heavy weather routeing so that vessels can continue to make safe passage without large-scale deviations. The likely cumulative and in combination effects on shipping routes should be considered which will be an important issue going forward. It should consider the proximity to other wind farm developments, particularly with the construction of Hornsea 2 and 3 and proposed extension to Dudgeon offshore wind farm, other infrastructure, and the impact on safe navigable sea room.	Cumulative impact assessment is provided in Section 15.8.
26 August 2022 Scoping Opinion MCA	It is noted that a Navigational Risk Assessment will be submitted in accordance with MGN 654. This should be accompanied by a detailed MGN 654 Checklist.	The NRA is provided in Volume 2, Appendix 15.1: NRA which includes a completed MGN 654 checklist.
26 August 2022 Scoping Opinion MCA	A vessel traffic survey must be undertaken to the standard of MGN 654 which will consist of a minimum of 28-days of seasonal data (two x 14-day surveys) collected from a vessel-based survey using AIS, radar and visual observations to capture all vessels navigating in the study area. We would expect the details of these consultations to be included within the NRA. Kindly note for all OREI developments, subject to the planning process, the traffic survey must be undertaken within 24-months prior to submission of the DCO application. If the EIA Report is not submitted within 24-months an additional 14-day continuation survey data may be required for	Vessel traffic survey approach has been agreed with the MCA and Trinity House. At PEIR primary assessment is based on a 14-day summer 2022 traffic survey. For the final NRA, an additional 14-days collected during winter 2022 will be added bringing the total up to 28-days.

Date and consultation phase/type	Consultation and key issues raised	Section where comment addressed
	each subsequent 12-month period. Should there be a break in the continuation surveys, a new full traffic survey may be required, and the time period starts from the completion of the initial 28-day survey period.	
26 August 2022 Scoping Opinion MCA	The proximity to other offshore wind farms will need to be fully considered, with an appropriate assessment of the distances between OREI boundaries and shipping routes as per MGN 654. The cumulative impacts of other wind farms in close proximity, in particular the Hornsea 3 and Dudgeon Extension developments will change routing, particularly those that transect the western and northern sections of the site. Attention must be paid for ensuring the established shipping routes within the area can continue safely without unacceptable deviations. Particular attention should also be given to the oil and gas activity within the area.	Cumulative impact assessment is provided in Section 15.8. Hornsea Three and the Dudgeon Extension have been screened in as Tier 1 projects. Full consideration has been given to oil and gas activity including in Volume 2, Appendix 15.1: NRA.
26 August 2022 Scoping Opinion MCA	The turbine layout design will require MCA approval prior to construction to minimise the risks to surface vessels, including rescue boats, and Search and Rescue (SAR) aircraft operating within the site. Any additional navigation safety and/or Search and Rescue requirements, as per MGN 654 Annex 5, will be agreed at the approval stage.	Embedded mitigations include compliance with MGN 654 and layout approval by the MCA and Trinity House (see Section 15.5).
26 August 2022 Scoping Opinion MCA	Attention should be paid to cabling routes and where appropriate burial depth for which a Burial Protection Index study should be completed and subject to the traffic volumes, an anchor penetration study may be	As per Section 15.5, a cable burial risk assessment process will be undertaken to determine cable protection requirements, and there will be full MGN 654 compliance including in relation

Date and consultation phase/type	Consultation and key issues raised	Section where comment addressed
	necessary. If cable protection measures are required e.g. rock bags or concrete mattresses, the MCA would be willing to accept a 5% reduction in surrounding depths referenced to Chart Datum. This will be particularly relevant where depths are decreasing towards shore and potential impacts on navigable water increase, such as at the HDD location.	to provisions associated with changes to water depths.
26 August 2022 Scoping Opinion MCA	Particular consideration will need to be given to the implications of the site size and location on SAR resources and Emergency Response Co-operation Plans (ERCoP). The report must recognise the level of radar surveillance, AIS and shore-based VHF radio coverage and give due consideration for appropriate mitigation such as radar, AIS receivers and in-field, Marine Band VHF radio communications aerial(s) (VHF voice with Digital Selective Calling (DSC)) that can cover the entire wind farm sites and their surrounding areas. A SAR checklist will also need to be completed in consultation with MCA, as per MGN 654 Annex 5 SAR requirements.	As per Section 15.5, there will be full MGN 654 compliance including in relation to provisions associated with the ERCoP, layout, and the SAR Checklist.
26 August 2022 Scoping Opinion MCA	MGN 654 Annex 4 requires that hydrographic surveys should fulfil the requirements of the International Hydrographic Organisation (IHO) Order 1a standard, with the final data supplied as a digital full density data set, and survey report to the MCA Hydrography Manager. Failure to report the survey or conduct it to Order 1a might invalidate the Navigational Risk Assessment if it was deemed not fit for purpose.	As per Section 15.5, there will be full MGN 654 compliance including in relation to hydrographic survey requirements.

Date and consultation phase/type	Consultation and key issues raised	Section where comment addressed
26 August 2022 Scoping Opinion Trinity House	NRA should include: ▪ Comprehensive vessel traffic analysis in accordance with MGN 654. ▪ The possible cumulative and in-combination effects on shipping routes and patterns should be adequately assessed. ▪ The potential "corridor" between the project and Triton Knoll OWF, including future traffic patterns should be considered and assessed.	▪ Vessel traffic survey approach has been agreed with MCA and Trinity House and is MGN 654 compliant. ▪ Cumulative impact assessment is provided in Section 15.8, noting further assessment is provided in Volume 2, Appendix 15.1: NRA. ▪ Post wind farm routeing in Volume 2, Appendix 15.1: NRA includes appropriate account of and assumptions around Triton Knoll.
26 August 2022 Scoping Opinion Trinity House	We consider that this development will need to be marked with marine aids to navigation by the developer/operator in accordance with the general principles outlined in IALA (International Association of Marine Aids to Navigation and Lighthouse Authorities) Guideline G1162 - The Marking of Offshore Man-Made Structures as a risk mitigation measure. In addition to the marking of the structures themselves, it should be borne in mind that additional aids to navigation such as buoys may be necessary to mitigate the risk posed to the mariner, particularly during the construction phase. All marine navigational marking, which will be required to be provided and thereafter maintained by the developer, will need to be addressed and agreed with Trinity House. This will include the necessity for the aids to navigation to meet the internationally recognised standards of availability and the reporting thereof.	As per Section 15.5, lighting and marking will be agreed with Trinity House and will be IALA G1162 compliant.

Date and consultation phase/type	Consultation and key issues raised	Section where comment addressed
26 August 2022 Scoping Opinion Trinity House	Assessment of impact on existing aids to navigation, to include both offshore and shore based (where any cabling reaches landfall) aids to navigation.	AtoN are considered in Volume 2, Appendix 15.1: NRA.
	A decommissioning plan, which includes a scenario where on decommissioning and on completion of removal operations an obstruction is left on site (attributable to the wind farm) which is considered to be a danger to navigation and which it has not proved possible to remove, should be considered. Such an obstruction may require to be marked until such time as it is either removed or no longer considered a danger to navigation, the continuing cost of which would need to be met by the developer/operator.	The Applicant will produce a decommissioning plan as detailed in Volume 2, Appendix 15.1: NRA.
26 August 2022 Scoping Opinion Trinity House	The possible requirement for navigational marking of the export cables and the vessels laying them. If it is necessary for the cables to be protected by rock armour, concrete mattresses or similar protection which lies clear of the surrounding seabed, the impact on navigation and the requirement for appropriate risk mitigation measures needs to be assessed.	As per Section 15.5, a cable burial risk assessment process will be undertaken to determine cable protection requirements, and there will be full MGN 654 compliance including provisions associated with changes to water depths. Lighting and marking will be agreed with Trinity House.
9 September 2022 Scoping Opinion Secretary of State	**Study Area** A study area of 10 nautical miles (nm) has been proposed for the shipping and navigation assessment, with a likely final study area within the NRA of 10nm proposed for the array and any Offshore Reactive Compensation Platforms (ORCPs), and 2nm for the Offshore Export Cable Corridor (ECC). The ES should explain the rationale behind the choice of study areas and, where	Details of the study areas are provided in Section 15.4. These were presented and agreed with the MCA, Trinity House and CoS during consultation.

Date and consultation phase/type	Consultation and key issues raised	Section where comment addressed
	possible, the approach should be agreed with the relevant consultation bodies.	
9 September 2022 Scoping Opinion Secretary of State	**ECC - Baseline Information** The Scoping Report states that a preliminary assessment of navigational features within the Area of Search (AoS) for the ECC has been undertaken; however, no baseline information for the ECC AoS has been included within the Scoping Report. The ES should describe the shipping and navigational baseline conditions for the entire AoS, accompanied by clear figures.	Volume 2, Appendix 15.1 provides full baseline details of the offshore ECC including in terms of vessel traffic, navigational features and marine incidents. Associated impact assessment is provided in Section 15.7.
9 September 2022 Scoping Opinion Secretary of State	**Assessment Methodology** The Scoping Report proposes to determine significance as either broadly acceptable, tolerable, or unacceptable. The ES should clearly set out how the risk assessment approach leads to an assessment of significance of effect consistent/compatible with the terminology used in the ES, for which the intended approach is set out in Chapter 5 (paragraphs 5.7.12 to 5.7.13) of the Scoping Report.	The assessment methodology is described in Section 15.6, which includes details around how the FSA translates into EIA terminology in terms of significance.
9 September 2022 Scoping Opinion Secretary of State	**Cumulative impact assessment – assumptions** Noting the Scoping Report states that it will include changes to baseline routeing associated with submitted or consented Offshore Wind farm (OWF) projects, notably Hornsea Three and Hornsea Four, the ES should clearly state any assumptions made with regards to the baseline.	The baseline is summarised in Section 15.4. Projects screened in on a cumulative basis are shown in Section 15.8.
9 September 2022 Scoping Opinion	**Future baseline** The ES should identify a future baseline for vessel movements and explain how this has been	Post wind farm routeing has been established in Volume 2, Appendix 15.1: NRA. The final

Date and consultation phase/type	Consultation and key issues raised	Section where comment addressed
Secretary of State	established, taking into account the existing sea users and the numerous proposed OWF projects in the vicinity.	NRA will consider potential future case traffic increases.
8 September 2022 Regular Operators, Email Correspondence StenaLine	Presence of the Project will impact vessel routeing and extend current transit lengths as will require re-routeing as well as creating additional safety concerns. Vessels will never transit through the array area but will continue to pass in close proximity.	Likely Post wind farm routeing has been established in Volume 2, Appendix 15.1: NRA. Associated impact assessment is provided in Section 15.7.
15 September 2022 Regular Operators, Email Correspondence Bore Ltd	As long as baseline space remains between Outer Dowsing Shoal and Triton Knoll, Bore suggested there would be limited concern. The optional shallow track to the east of Outer Dowsing Bank cannot be used post wind farm so vessels will route between Outer Dowsing Bank and Triton Knoll OWF. Therefore important that the width between Outer Dowsing Bank and Triton Knoll OWF is not reduced as above. Noted on a cumulative basis if vessels rerouted inshore of Triton Knoll OWF they would need to account for the Humber anchorage areas.	Likely Post wind farm routeing has been established in Volume 2, Appendix 15.1: NRA. This includes consideration of adverse weather transits. Associated impact assessment is provided in Section 15.7.
30 September 2022 Regular Operators, Email Correspondence P&O Ferries	Vessels will only be affected by Project vessels crossing transit routes. Stated general experience that UK project vessel movements are “well managed and promulgated”.	Impacts associated with project vessels are assessed in Section 15.7.
10 November 2022 Hazard Workshop MCA	**Vessel Displacement** Many factors need to be considered when regarding vessel displacement in this specific area including navigational features and water	Impacts associated with displacement are assessed in Section 15.7.

Date and consultation phase/type	Consultation and key issues raised	Section where comment addressed
	depts etc. Hornsea projects and Dudgeon Extension should be considered for impacts on displacement and future traffic patterns.	Cumulative impacts are assessed in Section 15.8.
10 November 2022 Hazard Workshop Boskalis Aggregate	**Marine Aggregate Dredging** Aggregate activity will continue to become more intense in the area in coming years but will be limited to the boundary of the already assigned dredging areas so minimal impact will occur.	Impacts associated with commercial vessel displacement are assessed in Section 15.7.
10 November 2022 Hazard Workshop National Federation of Fishermen's Organisations	**Fishing Vessels** Although fisheries in the area are seasonal, whelk, crab and lobster potting is common and static gear vessels will likely continue to fish within the array depending on final layout. Displacement of commercial vessels will impact static fishing gear in new areas. Main concern with project vessels is gear interaction and not collision.	Impacts associated with fishing vessels are assessed in Section 15.7. Further assessment is provided in Volume 1, Chapter 14: Commercial Fisheries.
10 November 2022 Hazard Workshop Cruising Association	**Recreational Vessels** Sail vessels will be more reluctant to transit through the array area when compared with motor vessels. Recreational vessels will avoid main commercial routes and so will move in regard to areas of higher activity or displacement as a result of the Project placement.	Impacts associated with recreational vessels are assessed in Section 15.7.
10 November 2022 Hazard Workshop Humber Pilotage	**Impacts to Ports** Impact on Humber Ports will depend on the levels of construction traffic mobilising from the Humber region.	Impacts associated with project vessels are assessed in Section 15.7.

15.3.3 As identified in Volume 1, Chapter 4: Site Selection and Consideration of Alternatives and Volume 1, Chapter 3: Project Description, the Project design envelope has been refined and will be refined further prior to DCO submission. This process is reliant, in part, on stakeholder consultation feedback.

15.3.4 Design amendments to the array area are of particular relevance to this chapter given the site boundaries within which surface piercing structures will be placed will impact how vessels route post wind farm.

15.4 Baseline Environment

Study Areas

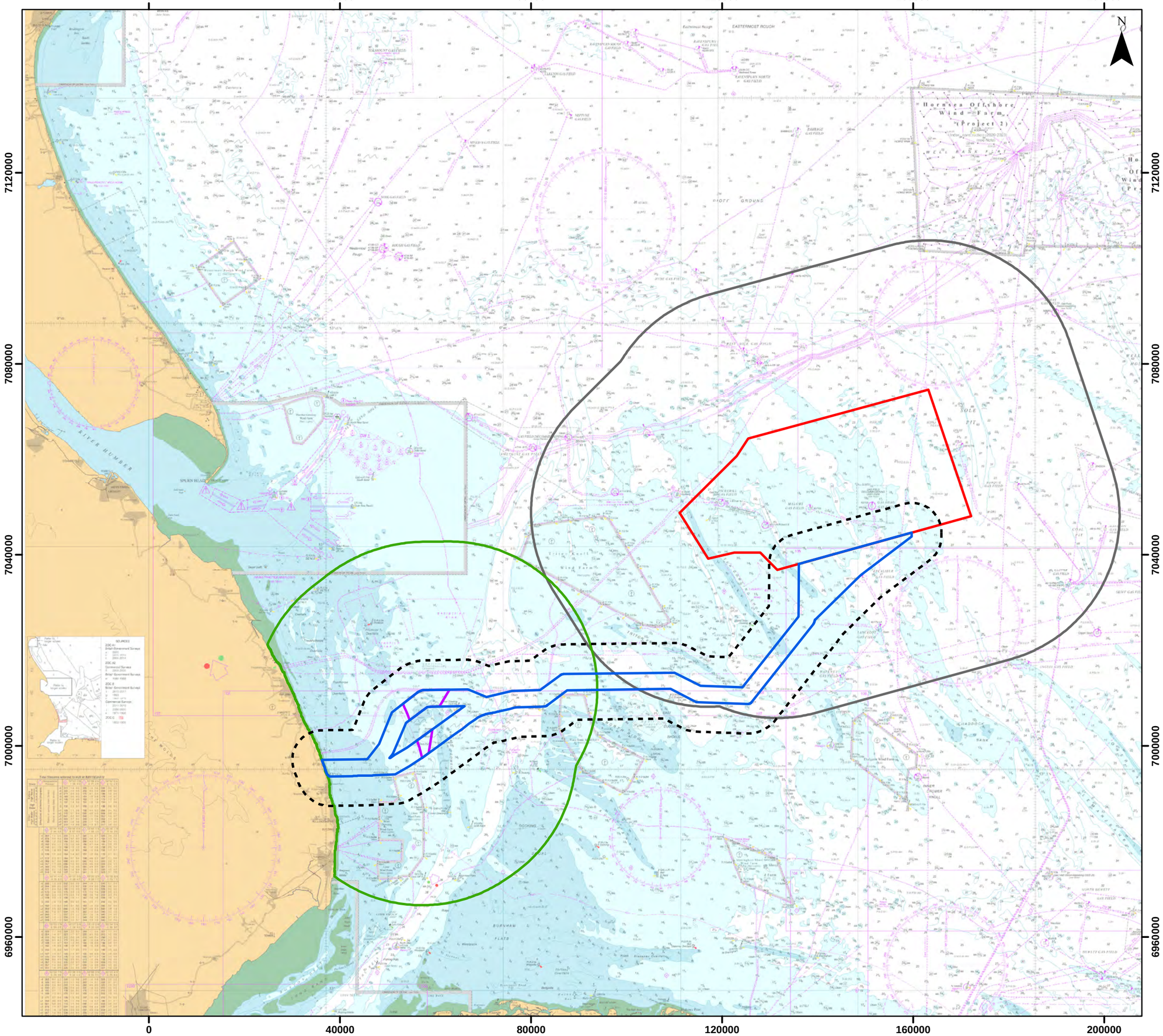
15.4.1 The shipping and navigation study area has been defined as a 10nm buffer of the array area.

15.4.2 The 10nm study area is considered standard for shipping and navigation assessment given it typically captures relevant routeing in the region while still remaining site specific. It has been used in the majority of UK offshore wind farm shipping and navigation assessments. Recent examples include Hornsea Project Three Offshore Wind Farm, the Norfolk Vanguard Offshore Wind Farm and the Norfolk Boreas Offshore Wind Farm, all of which were awarded consent.

15.4.3 The Export Cable Corridor (ECC) study area has been defined as a 2nm buffer of the Offshore ECC.

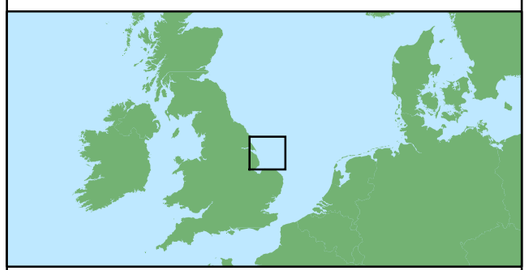
15.4.4 The study areas are presented in Figure 15.1 in relation to the array area and Offshore ECC. It is noted that the study area approach has been agreed with the MCA, Trinity House and CoS during consultation (see Section 15.3).

15.4.5 For the purposes of PEIR, high level assessment has also been undertaken within a 10nm study area of the Offshore Reactive Compensation Platform (ORCP) search area. This is included in Figure 15.1.



Legend

- Array Area
- Shipping and Navigation Study Area
- Offshore ECC
- ECC Study Area
- ORCP Search Area
- ORCP Search Area Study Area



Coordinate System: WGS 1984 World Mercator

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Preliminary Environmental Information Report

Overview of Study Areas

Figure 15.1

OUTER DOWSING OFFSHORE WIND

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Data Sources

15.4.6 Baseline data collection has been undertaken to establish the shipping and navigation baseline within the study areas.

15.4.7 The main data sources used to characterise the shipping and navigation baseline relative to the Project are outlined in Table 15.3.

Table 15.3: Summary of Baseline Data Sources

Data Source	Date	Summary	Coverage of Study Area
Vessel traffic survey, summer and winter 2022	2 August – 15 August 2022	Summer vessel traffic survey data consisting of AIS, Radar and visual observations for the shipping and navigation study area recorded from a dedicated survey vessel on-site for 14 full days.	Full coverage of shipping and navigation study area.
	15 November – 29 November 2022	Winter vessel traffic survey data consisting of AIS, Radar and visual observations for the shipping and navigation study area recorded from a dedicated survey vessel on-site for 14 full days.	Full coverage of shipping and navigation study area.
Vessel traffic survey, winter 2023	9 January – 23 January 2023	Winter vessel traffic survey data consisting of AIS, Radar, and visual observations for the ORCP search area study area recorded from a dedicated survey vessel on-site for 14 full days. A second 14-day survey is planned post PEIR.	Full coverage of ORCP search area study area.
Anatec	2 August – 15 August 2022	14-day AIS data for the Offshore ECC recorded from coastal receivers.	Full coverage of ECC study area.
Anatec	1 April 2021 – 31 March 2022	12-months AIS data for the shipping and navigation study area recorded from coastal receivers.	Full coverage of shipping and navigation study area.
Anatec	2022	ShipRoutes database.	Full coverage of shipping and navigation study area.
Marine Accident Investigation Branch (MAIB)	2000-2019	Maritime incident data including the locations and details of all MAIB reported incidents.	Full coverage of study areas.

Data Source	Date	Summary	Coverage of Study Area
RNLI	2000-2019	Maritime incident data including the locations and details of all RNLI reported incidents.	Full coverage of study areas.
DfT	2015-2022	Maritime incident data including the locations and details of all UK civilian SAR helicopter taskings.	Full coverage of study areas.
The Crown Estate (TCE)	2022	Marine aggregate dredging areas (licenced and active).	Full coverage of study areas.
United Kingdom Hydrographic Office (UKHO)	2020/21/22	Admiralty Charts 1187, 1190, and 1503, also historical mapping.	Full coverage of study areas.
UKHO	2021	*Admiralty Sailing Directions NP54 North Sea (West) Pilot*	Full coverage of study areas.

15.4.8 The final NRA will incorporate the following data sources to ensure full compliance with MGN 654 vessel traffic survey requirements:

- 14-day winter 2022 vessel traffic survey AIS, Radar and visual observations); and
- RYA Coastal Atlas (RYA, 2019).

Existing Environment

Navigational Features

15.4.9 A plot of the key navigational features within and in proximity to the array area are presented in Figure 15.2. Further details are provided in Volume 2, Appendix 15.1: NRA.

15.4.10 The key navigational features identified within and in proximity to the Project are then summarised in Table 15.2.

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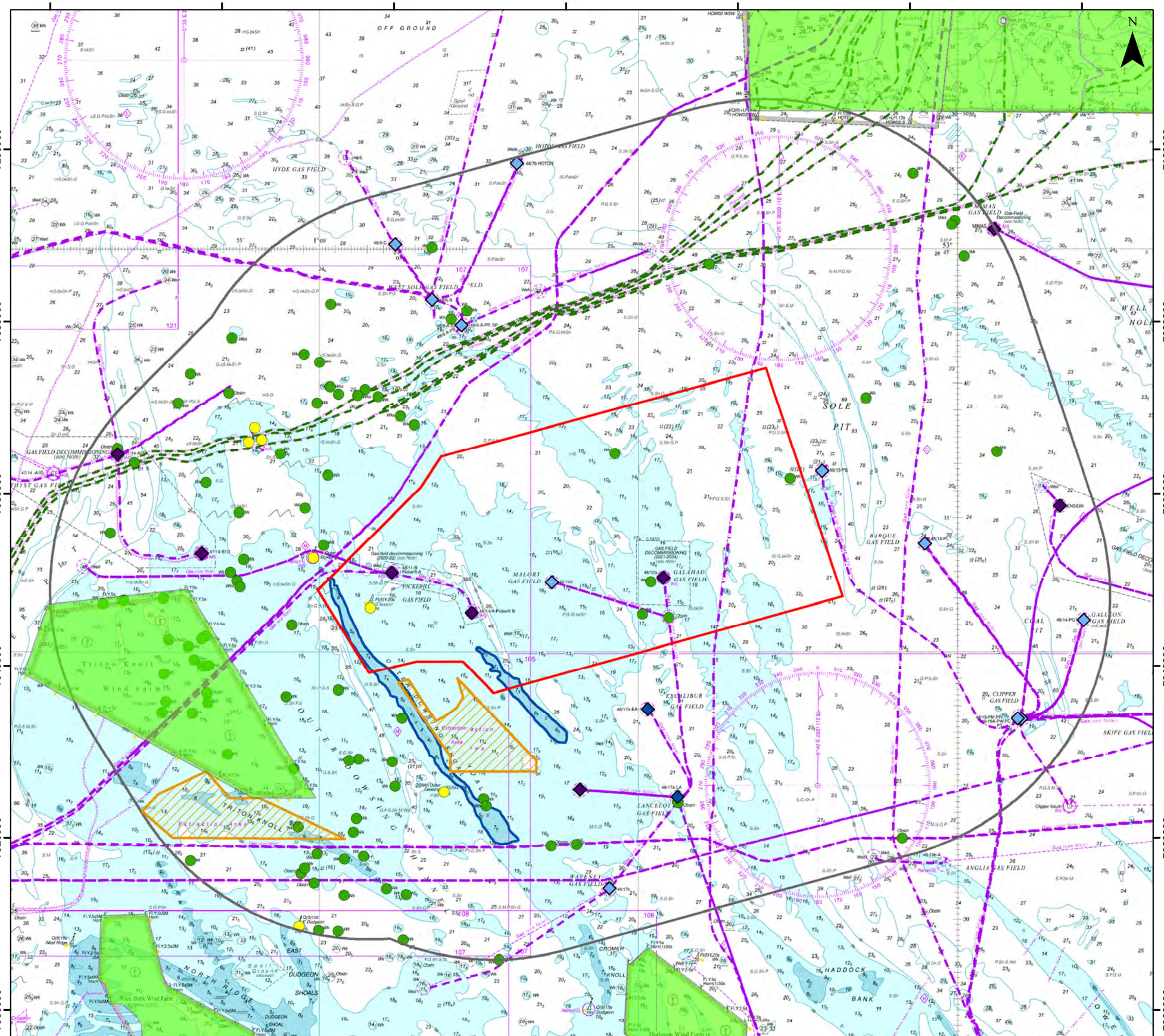


Legend

- Array Area
- Shipping and Navigation Study Area

Navigational Features

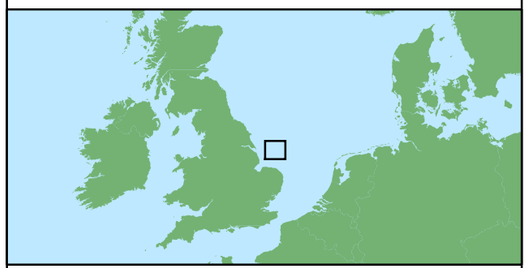
- Aid to Navigation
- Wreck or Obstruction

Oil and Gas Platform

- Operational
- Operational (Decommissioning Planned)
- Decommissioned / Decommissioning
- Cable
- Pipeline
- 10m Contour
- Marine Aggregate Dredging Area

Other Wind Farms

- Active/In Operation



Coordinate System: WGS 1984 World Mercator

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Scale: 1:425,000

Preliminary Environmental Information Report

Navigational Features

Figure 15.2

OUTER DOWSING OFFSHORE WIND

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Table 15.4: Summary of Navigational Features

Navigational Feature	Details
Other OWF developments	Triton Knoll Offshore Wind Farm lies directly west of the array area, approximately 4nm, and was fully commissioned and operational in January 2022. Other operational wind farms in proximity to the array area and Offshore ECC include: ▪ Dudgeon, approximately 7nm south of the Offshore ECC ▪ Hornsea Project One, approximately 11.6nm northeast of the array area ▪ Hornsea Project Two, approximately 9nm northeast of the array area ▪ Race Bank and Inner Dowsing bordering the south of the Offshore ECC.
IMO routeing measures	There are no IMO Routeing measures in proximity to the Project array area or ECC. However, the Inner Approaches Traffic Separation Scheme (TSS) consisting of three outer TSSs from a NE, E, and SE direction merging into a TSS into the Humber is located 22nm to the west of the array area.
Aids to Navigation (AtoN)	An AtoN is situated at the western extent of the array area, between Outer Dowsing Shoal and Pickerill gas field. Other key AtoNs to the array area include the Northern Outer Dowsing Light Buoy, a north cardinal mark located approximately 1nm to the northwest of the array area above the Outer Dowsing Shoal; the Mid Outer Dowsing Light Buoy, a lateral mark west of the Outer Dowsing Shoal approximately 4nm to the south west; the East Dudgeon Light Buoy.
Marine aggregate dredging areas	There are several marine aggregate dredging areas defined by TCE in proximity to the Project. The key areas include Outer Dowsing areas 515/1, 6nm to south west of array area, and 515/2, immediately south west. The Inner Dowsing exploration and option area 1850 intersects the offshore ECC approximately 6nm offshore (see Volume 2, Appendix 15.1: Navigational Risk Assessment).
Ports and Harbours	Although not shown in Figure 15.2, there are several ports and harbours in the proximity to the Project. The closest to the array area is Wells Harbour approximately 32nm to the south west of the array area on the Norfolk coast. Wells Harbour is described by Admiralty Sailing Directions as a "*small port for fishing and recreational craft*" (UKHO, 2021) and so the closest commercial port or harbour is the Port of Immingham, approximately 38nm to the west at the entrance to the Humber.
Pilot boarding stations	Four pilot boarding stations are present within the Humber competent harbour area 25nm to the west of the array area.
Oil and gas features	Oil and gas structures within the array include the partially decommissioned Pickerill Gas Field and its two offshore platforms

Navigational Feature	Details
	Pickerill A and B[1], the pending decommissioning Galahad Gas Field and its Galahad platform[2], and the operational Malory Gas Field and its Malory platform. Three wells are present within the array area. Barque PB Platform is positioned 0.7nm to the immediate east of the array area.
Offshore Reactive Compensation Platform (ORCP)	Two ORCPs are situated approximately 5nm to the north west of the array area and are associated with Hornsea Project One and Hornsea Project Two.
Spoil grounds	There are two areas of spoil ground in close proximity to the Offshore ECC. One area of spoil ground intersects the Offshore ECC approximately 6nm from the coast. Another area, although disused, is present 1.4nm south of the Offshore ECC. A spoil ground is also located 12nm north of the array area.
Anchorage areas	The only designated anchorage area located in the wider region is the Humber Deep Water Anchorage located approximately 18.5nm west of the array area.
Military Practice and Exercise Areas (PEXAs)	Donna Nook firing practice area is located north of the Offshore ECC at the south of the Humber entrance. There are no restrictions placed on the right to transit a military PEXA at any time although mariners are advised to exercise caution. Exercises and firing only occur when the area is considered to be clear of all shipping.
Subsea cables	There are a number of subsea cables in proximity to the Project including the export cables for Hornsea Project One and Two which make landfall on the Yorkshire Coast.
Subsea pipelines	There are several charted pipelines in proximity to the Project from offshore subsea assets to shore (including pipeline bundles), noting that pipelines between assets are also present within the array area. These include decommissioned pipelines and pipelines that are planned to be decommissioned.
Charted wrecks	There are five charted wrecks within the array area and eight within the Offshore ECC.
Shallow banks	The shallow banks within the wider area are referenced in Figure 15.2 by 10m contours and are of key relevance to shipping and navigation. Of note is the Outer Dowsing Shoal which intersects the western extent of the array area.

[1] It is noted that Pickerel A and B have had their topside removed at the time of writing and jacket expected to be removed in line with Amethysts jackets in 2023.

[2] Galahad platform is expected to be decommissioned before 2025 and is already carbon free.

Array Area

15.4.11 A plot of vessel traffic recorded via AIS, Radar and visual observation over 14 full days between 2 August and 15 August 2022 (summer) within the shipping and navigation study area is presented in Figure 15.3 colour-coded by vessel type.

15.4.12 Following this, a plot of vessel traffic recorded via AIS, Radar and visual observation over 14 full days between 15 November and 29 November 2022 (winter) within the shipping and navigation study area is presented in Figure 15.4 colour-coded by vessel type.

15.4.13 Additionally, 12-months of AIS data (April 2021-March 2022) is presented in Volume 2, Appendix 15.1: NRA. The data recorded during a winter 2022 survey will be incorporated into the final NRA, noting the initial report has been appended to Volume 2, Appendix 15.1: NRA for reference.

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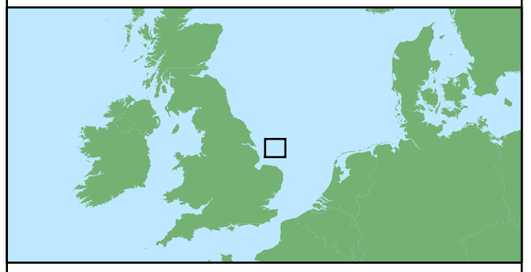
N

Legend

- Array Area
- Shipping and Navigation Study Area

Vessel Type

- Unspecified
- Fishing
- Military
- Dredging/Underwater Ops
- Tug
- Passenger
- Cargo
- Tanker
- Other
- Recreational
- Oil and Gas
- Wind Farm



Coordinate System: WGS 1984 World Mercator

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14 Days Survey Data by Vessel Type (August 2022)

Figure 15.3

OUTER DOWSING OFFSHORE WIND

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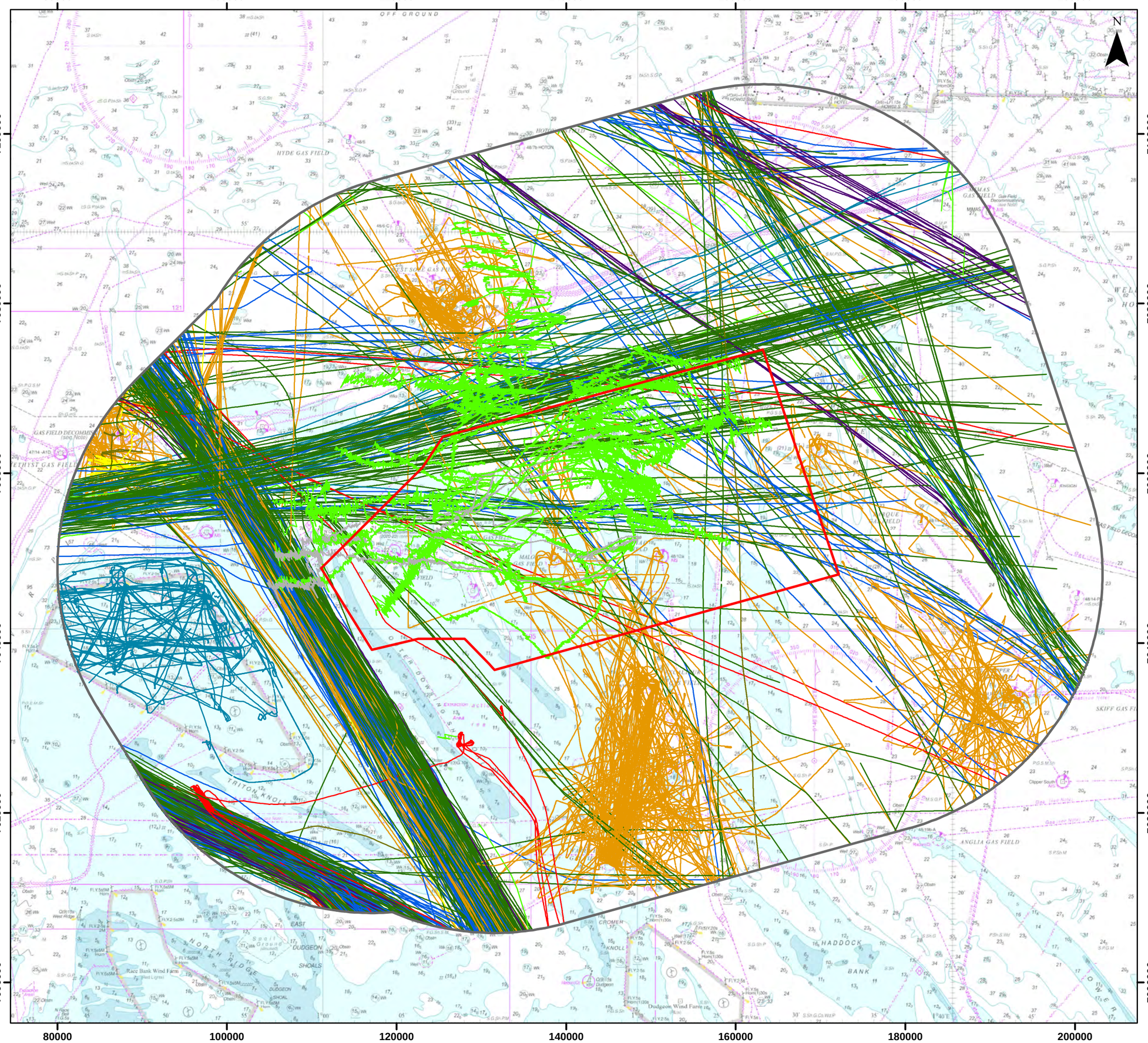

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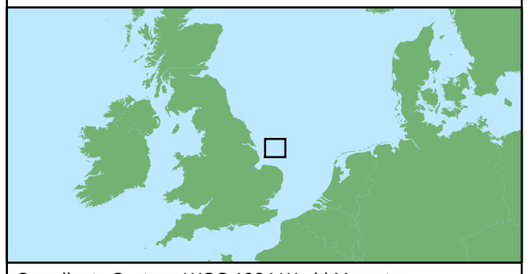
Legend

- Array Area
- Shipping and Navigation Study Area

Vessel Type

- Unspecified
- Fishing
- Dredger/Underwater Ops
- Tug
- Passenger
- Cargo
- Tanker
- Other
- Oil and Gas
- Wind Farm



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Preliminary Environmental Information Report

14 Days Survey Data by Vessel Type (November 2022)

Figure 15.4

OUTER DOWSING OFFSHORE WIND

Date: 11/05/2023
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Revision: 0.2

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15.4.14 Throughout the summer survey, approximately 99% of vessel tracks were recorded via AIS with the remaining 1% recorded via Radar. There was an average of between 64 and 65 unique vessels per day recorded within the shipping and navigation study area. An average of ten unique vessels per day were recorded intersecting the array area.

15.4.15 Throughout the winter survey, approximately 97% of vessel tracks were recorded via AIS with the remaining 3% recorded via Radar. There was an average of 58 unique vessels per day recorded within the shipping and navigation study area. An average of nine unique vessels per day were recorded intersecting the array area.

15.4.16 The main vessel types recorded within the shipping and navigation study area during the summer survey period were cargo vessels (43% of all traffic), tankers (17%) and oil and gas vessels (14%). During the winter survey period the main vessel types were also cargo vessels (46%), tankers (21%), and oil and gas vessels (15%).

15.4.17 Length overall (LOA) was available for <99% of vessels recorded throughout both survey periods. The average length of vessels during the summer and winter survey periods were 111 metres (m) and 122m, respectively. The longest vessel recorded transiting through the shipping and navigation study area during the summer survey period was a passenger cruise liner measuring at 296m routeing to Rotterdam, The Netherlands. The longest vessel recorded during the winter survey period was a bulk carrier measuring at 250m routeing to Glensanda, UK.

15.4.18 Vessel draught was available for approximately 91% of vessels recorded throughout the summer survey period and 94% of all vessels recorded through the winter survey period. The average vessel draught was 5.2m and 5.7m for summer and winter, respectively.

15.4.19 Main commercial routes have been identified using the principles set out in MGN 654 (MCA, 2021). Vessel traffic data is assessed and vessels transiting at similar headings and locations are identified as a main route and can consist of multiple vessels or a single vessel making the same transit regularly. A total of 13 main commercial routes were identified within the shipping and navigation study area from the vessel traffic survey data and consultation, with full details provided in Volume 2, Appendix 15.1: NRA.

15.4.20 Details of each of the main routes including the average number of vessels per day, main destination ports and main vessel types are provided in Table 15.5. It is noted that the main route destination ports reflect the most frequently broadcast destinations via AIS on each route and vessels on any particular route may not be transiting between the ports specified. Further, the main routes reflect key directions of vessel traffic routeing within the shipping and navigation study area; there are additional commercial vessel movements operating outside of these routes.

Table 15.5: Description of Main Commercial Routes

Route No.	Average Vessels per Day	Description
1	16	**Humber Ports – Rotterdam (The Netherlands).** Primarily cargo vessels (59%) and tankers (29%). Includes P&O Ferries and Stena Line commercial ferry routes.

Route No.	Average Vessels per Day	Description
2	12	**Tees – Rotterdam (The Netherlands).** Primarily cargo vessels (53%) and tankers (34%). Used by DFDS Seaways commercial ferry operator (on the Newcastle-Amsterdam route) as an adverse weather route.
3	4	**Humber Ports – Cuxhaven (Germany).** Primarily cargo vessels (88%). Used by DFDS Seaways commercial ferry operator (on Immingham-Cuxhaven route).
4	2	**Tees Port – Rotterdam (The Netherlands).** Primarily cargo vessels (68%).
5	2	**Newcastle – Amsterdam (The Netherlands).** Primarily passenger vessels (79%). Used by DFDS Seaways commercial ferry operator (on the Newcastle-Amsterdam and Newcastle/North Shields-IJmuiden routes).
6	2	**Tees – Rotterdam (The Netherlands).** Primarily cargo vessels (49%) and tankers (41%).
7	1	**Humber Ports – Cuxhaven (Germany).** Primarily cargo vessels (88%).
8	1	**Tees Port – Rotterdam (The Netherlands).** Primarily cargo vessels (90%).
9	<1	**Humber Ports – Bremerhaven/Hamburg (Germany).** Primarily cargo vessels (90%).
10	<1	**Humber Ports – Cuxhaven (Germany).** Primarily cargo vessels (81%).
11	<1	**Humber Ports – Rotterdam (The Netherlands).** Primarily tankers (81%).
12	<1	**Tees – Amsterdam (The Netherlands).** Cargo vessels (35%), tankers (25%), passenger vessels (19%), and oil and gas vessels (19%). Used by DFDS Seaways commercial ferry operator (the Newcastle-Amsterdam route) as an adverse weather route.
13	<1	**Humber Ports – Hornsea OWFs.** Route used by construction, operation and maintenance vessels to the Hornsea offshore wind projects from the Humber.

15.4.21 Oil and gas vessels were recorded both in transit and also engaged in activities within the shipping and navigation study area with an average of nine unique oil and gas vessels per day were recorded during both summer and winter survey periods. Oil and gas fields in the area which had high levels of activity include Clipper, Barque, Galleon, Amethyst, and West Sole. Great Yarmouth, UK, was the most common destination for vessels on transit during both survey periods.

15.4.22 Fishing vessels were mainly recorded to the north and within the array area, with an average of two unique vessels per day within the shipping and navigation study area during both summer and winter survey periods. This included both vessels engaged in fishing (i.e., gear may have been deployed) and in transit. Vessel activity within the array area was greater during the winter.

15.4.23 For the purposes of the shipping and navigation assessment, recreational vessels are considered to be those between 2.4m and 24m LOA, including sailing and motor craft and those involving in racing, recreational diving and recreational sea fishing. Throughout the summer survey period an average of one unique recreational vessel per day was recorded within the shipping and navigation study area with approximately 85% of recreational vessel tracks recorded via AIS and the remaining 15% recorded via Radar. No recreational vessels were recorded during the winter survey period, but this is expected given the distance offshore and the time of year the survey was carried out.

15.4.24 Marine aggregate dredgers were noted carrying out dredging activity at the two TCE aggregate dredging areas (Outer Dowsing 515/1 and 515/2) located to the southwest of the array area during both summer and winter survey periods. Less than one unique aggregate dredger was recorded per day within the shipping and navigation study area during the summer survey period with an average of one unique aggregate dredger recorded per day during the winter survey period.

15.4.25 No vessels were deemed to be at anchor during the two survey periods within the shipping and navigation study area.

Export Cable Corridor

15.4.26 Full details of the vessel traffic assessment undertaken for the Offshore ECC are provided in Volume 2, Appendix 15.1: NRA.

15.4.27 Throughout the data period, there was an average of 58 unique vessels per day recorded within the Offshore ECC study area and an average of 55 unique vessels per day were recorded intersecting the Offshore ECC (equating to 95% of all traffic in the ECC study area).

15.4.28 The main vessel types recorded within the Offshore ECC study area during the survey period were cargo vessels (50%), tankers (16%), and wind farm vessels (14%).

15.4.29 LOA was available for <99% of vessels recorded throughout the data period. The average length of vessels was 99m with the longest vessel recorded transiting through the ECC study area being a Ro-Ro measuring at 238m travelling to Immingham, UK. Vessel draught was available for approximately 89% of vessels recorded throughout the survey period. The average vessel draught was 4.6m.

15.4.30 One unique tanker and one wind farm support vessel were recorded at anchor within the ECC study area near the landfall location. The tanker spent a total of seven-days at anchor whilst the wind farm support vessel was anchored for a total of three-days.

Offshore Reactive Compensation Station

15.4.31 Full details of the vessel traffic assessment undertaken for the ORCP search area are provided in Volume 2, Appendix 15.1: NRA.

15.4.32 Throughout the data period, there was an average of 44 unique vessels per day recorded within the ORCP search area study area and an average of one unique vessel per day recorded intersecting the ORCP search area (equating to 2% of all traffic in the ORCP search area study area).

15.4.33 The main vessel types recorded within the ORCP search area study area during the survey period were cargo vessels (66%), tankers (12%), and wind farm vessels (9%).

15.4.34 LOA was available for <99% of vessels recorded throughout the data period. The average length of vessels was 102m with the longest vessel recorded transiting through the ORCP search area study area being two unique Ro-Ros measuring at 238m. Vessel draught was available for approximately 94% of vessels recorded throughout the survey period. The average vessel draught was 4.7m.

15.4.35 Six unique cargo vessels and four unique tankers, were recorded at anchor within the ORCP search area study area. Most of these vessels at anchor were positioned at the north-west of the ORCP search area study area and were likely waiting berth at Humber ports as implied by their AIS broadcast destinations.

Maritime Incidents

15.4.36 Full assessment of maritime incidents of relevance to the Project are described in detail within Volume 2, Appendix 15.1: NRA. A summary of the main incident datasets assessed are presented below.

Search and Rescue

15.4.37 The Bristow Group provide helicopter SAR operations in the UK and have been operating their service since April 2015. The closest SAR base to the Project is located at Humberside Airport, approximately 40nm from the array area. Data was produced by the DfT on civilian SAR helicopter activity in the UK by the Bristow Group on behalf of the MCA.

15.4.38 A total of 50 unique SAR helicopter taskings were undertaken for incidents within the shipping and navigation study area between April 2015 and March 2022, corresponding to an average of six taskings per year. The majority of these taskings were “rescue/recovery” (88%). Nine SAR helicopter taskings were undertaken within the array area itself with eight being “rescue/recovery” and one “search”.

15.4.39 A total of 26 unique SAR helicopter taskings were undertaken for incidents within the ECC study area between April 2015 and March 2022, corresponding to an average of three taskings per year. The majority of these taskings were “rescue/recovery” (69%). Two SAR helicopter taskings were undertaken within the Offshore ECC itself, with both being “rescue/recovery”.

15.4.40 A total of 34 unique SAR helicopter taskings were undertaken for incidents within the ORCP search area study area between April 2015 and March 2022, corresponding to an average of four taskings per year. The majority of these taskings were “rescue/recovery” (47%) and “search” (26%). One SAR helicopter taskings were undertaken within the ORCP search area itself, a “rescue/recovery”.

Royal National Lifeboat Institution

15.4.41 The relevant Royal National Lifeboat Institution (RNLI) region for the Project is the East division with several RNLI stations situated in proximity to the Project, the closest being Mablethorpe approximately 29nm to the west of the array area. A total of 18 unique incidents were responded to by the RNLI within the shipping and navigation study area between 2010 and 2019, corresponding to an average of approximately two incidents per year. Of all the unique incidents recorded within the shipping and navigation study area, the most frequently recorded incident types were "Machinery Failure" (28%), "Flooding/Foundering" (17%), and "Unspecified" (17%). The most common casualty types were "Fishing Vessels" (39%), Oil and Gas Rig/Support (22%), and "Recreational Vessels (22%).

15.4.42 A total of 64 unique incidents were responded to by the RNLI within the ECC study area between 2010 and 2019, corresponding to an average of six to seven incidents per year. Throughout the 10-year period, ten incidents occurred within the Offshore ECC itself. Of all the unique incidents recorded within the ECC study area, the most frequently recorded incident types were "Person in Danger" (31%), "Unspecified" (22%), and "Vessel in Trouble" (16%). The most common casualty types were "Person in Danger" (41%) and "Other (Non-Vessel Based)" (23%).

15.4.43 A total of 363 unique incidents were responded to by the RNLI within the ORCP search area study area between 2010 and 2019, corresponding to an average of 36 incidents per year. Throughout the 10-year period, no incidents occurred within the ORCP search area itself. Of all the unique incidents recorded within the ORCP search area study area, the most frequently recorded incident types were "Person in Danger" (47%), "Unspecified" (20%), and "Machinery Failure" (11%). The most common casualty types were "Person in Danger" (46%), "Unspecified (18%), "Recreational (Powered)" (16%), and "Personal Craft" (10%).

Maritime Accident Investigation Branch Incident Data

15.4.44 All UK flagged vessels and non-UK flagged vessels in UK territorial waters (12nm from coast), at a UK port or carrying passengers to a UK port are required to report accidents to the MAIB. A total of 13 unique incidents were reported to the MAIB within the shipping and navigation study area between 2010 and 2019, which corresponds to an average of between one and two incidents per year. No incidents were reported within the array area itself. The most frequently reported incident types were "*Accident to Person*" (31%) and "*Flooding/Floundering"* (23%). The most frequently reported vessel types were "other commercial" (62%) and fishing vessels (31%).

15.4.45 A total of five unique incidents were reported to the MAIB within the ECC study area between 2010 and 2019, which corresponds to an average of one incident every two-years. Throughout the 10-year period, no incidents were reported within the Offshore ECC itself, the closest being an "Accident to Person" 0.1nm to the north of the Offshore ECC relating to a passenger vessel in 2010. The most common incident types recorded were "Accident to Person" (40%) and "Flooding/Floundering" (40%) with one "Fire/Explosion" incident record. The most frequently recorded vessel type involved in these incidents were other commercial (80%) with one passenger vessel incident recorded.

15.4.46 A total of 21 unique incidents were reported to the MAIB within the ORCP search area study area between 2010 and 2019, which corresponds to an average of 2 incident every year. Throughout the 10-year period, no incidents were reported within the ORCP search area itself, the closest being an "Flooding/Foundering" 2.2nm to the west of the ORCP search area relating to a commercial workboat in 2009. The most common incident types recorded were "Accident to Person" (29%), "Hazardous Incident" (19%), and "Machinery Failure" (14%). The most frequently recorded vessel type involved in these incidents were other commercial (38%), fish catching/processing (19%), and dry cargo (19%).

Future Baseline

15.4.47 Future traffic levels are dependent on market conditions, and fluctuations are therefore difficult to predict, however the current accepted trend is that vessel size will increase, as per a study undertaken by the International Transport Forum (ITF) at the Organisation for Economic Cooperation and Development (OECD) on the impact of 'Mega Ships' (OECD/ITF, 2015). The final NRA will consider future case traffic growth scenarios both with and without the Project.

15.4.48 The installation of OWFs in the UK is set to continue and there are a number of projects at varying stages of development with further projects expected to meet the UK Government's renewable energy targets.

15.4.49 In terms of oil and gas, it should be considered that ongoing decommissioning of North Sea infrastructure means it is likely that platforms in the area will be removed, which may increase available searoom and therefore lead to changes in vessel routeing patterns.

15.4.50 Fishing vessel trends are discussed and considered further in Volume 1, Chapter 14: Commercial Fisheries.

15.5 Basis of Assessment

Scope of the Assessment

15.5.1 As detailed in the Scoping Report (Outer Dowsing Offshore Wind, 2022), no impacts were scoped out of the NRA process. The NRA has considered the established baseline and the assessment undertaken at PEIR stage to identify which impacts scoped into the NRA require further assessment within the PEIR.

15.5.2 It is noted that the Project Design includes potential for use of ORCPs within the Offshore ECC. These have only been assessed at a high level at PEIR stage for shipping and navigation. If they remain within the final design envelope then appropriate assessment will be included within the final NRA to accompany the DCO application, noting the associated assessment and data collection requirements would be agreed with the MCA and Trinity House. The final NRA will also assess a reduced array area boundary, noting that it is intended that this will be reduced from 500km^2 to 300km^2 post PEIR.

Impacts Scoped in for Assessment

15.5.3 The following impacts have been scoped into this assessment:

- Construction:

- Impact 1: Displacement of vessels leading to increased collision risk between third-party vessels;
- Impact 2: Restriction of adverse weather routeing;
- Impact 3: Increased vessel-to-vessel collision risk between a third-party vessel and project vessel;
- Impact 4: Increased vessel to structure allision risk (powered, drifting, and internal navigation);
- Impact 5: Reduction of emergency response provision including SAR capability.

- Operation and maintenance:
  - Impact 1: Displacement of vessels leading to increased collision risk between third-party vessels;
  - Impact 2: Restriction of adverse weather routeing;
  - Impact 3: Increased vessel-to-vessel collision risk between a third-party vessel and project vessel;
  - Impact 4: Increased vessel to structure allision risk (powered, drifting, and internal navigation);
  - Impact 5: Reduction of emergency response provision including SAR capability;
  - Impact 6: Reduction of under keel clearance; and
  - Impact 7: Increased anchor/gear interaction with subsea cables.
- Decommissioning:
  - Impact 1: Displacement of vessels leading to increased collision risk between third-party vessels;
  - Impact 2: Restriction of adverse weather routeing;
  - Impact 3: Increased vessel-to-vessel collision risk between a third-party vessel and project vessel;
  - Impact 4: Increased vessel to structure allision risk (powered, drifting, and internal navigation);
  - Impact 5: Reduction of emergency response provision including SAR capability.

15.5.4 Impacts associated with Interference with marine navigation, communications, and position-fixing equipment have been assessed in Volume 2, Appendix 15.1: NRA.

Impacts Scoped out of Assessment

15.5.5 No impacts were scoped out of the NRA process.

Realistic Worst Case Scenario

15.5.6 The following section identifies the Maximum Design Scenario (MDS) in environmental terms, defined by the project design envelope.

Table 15.6: Maximum design scenario for shipping and navigation for the Project alone

Potential effect	Maximum design scenario assessed	Justification
Construction		
Impact 1: Displacement of vessels leading to increased collision risk between third-party vessels.	▪ Maximum extent of buoyed construction area assuming full build out of array area; ▪ Up to 93 Wind Turbine Generators (WTGs) and six offshore platforms in the array area; ▪ Construction phase up to four years; and ▪ 500m safety zones around structures where active construction is ongoing, 50m safety zones otherwise.	Largest area over maximum period will lead to maximum displacement.
Impact 2: Restriction of adverse weather routeing.	▪ Maximum extent of buoyed construction area assuming full build out of array area; ▪ Up to 93 WTGs and six offshore platforms in the array area; ▪ Construction phase up to four years; and ▪ 500m safety zones around structures where active construction is ongoing, 50m safety zones otherwise.	Largest area over maximum period will lead to maximum potential for restriction of adverse weather routeing options.
Impact 3: Increased vessel-to-vessel collision risk between a third-party vessel and project vessel.	▪ Maximum extent of buoyed construction area assuming full build out of array area; ▪ Up to 93 WTGs and six offshore platforms in the array area; ▪ Up to 351km of array cables; ▪ Up to 124km of interconnector cables; ▪ Up to 515km of export cables; ▪ Construction phase up to four years; and ▪ Up to 127 project vessels with a total of up to 3,051 return trips.	Maximum number of construction vessels will lead to maximum third party collision risk.
Impact 4: Increased vessel to structure allision risk (powered, drifting, and internal navigation).	▪ Maximum extent of buoyed construction area assuming full build out of array area; ▪ Up to 93 WTGs and six offshore platforms in the array area; ▪ Construction phase up to four years; and	Maximum number of structures will lead to maximum allision risk.

Potential effect	Maximum design scenario assessed	Justification
	▪ 500m safety zones around structures where active construction is ongoing, 50m safety zones otherwise.	
Impact 5: Reduction of emergency response provision including Search and Rescue (SAR) capability.	▪ Maximum extent of buoyed construction area assuming full build out of array area; ▪ Up to 93 WTGs and six offshore platforms in the array area; ▪ Up to 351km of array cables; ▪ Up to 124km of interconnector cables; ▪ Up to 515km of export cables; ▪ Construction phase up to four years; and ▪ Up to 127 project vessels with a total of up to 3,051 return trips.	Maximum number of construction vessels will lead to largest potential for increased incident rates.
Operation and Maintenance		
Impact 1: Displacement of vessels leading to increased collision risk between third-party vessels.	▪ Maximum extent (i.e., full build out) of array area; ▪ Up to 93 WTGs and six offshore platforms in the array area; ▪ Operational life up to 35-years; and ▪ 500m safety zones around structures where major maintenance is ongoing.	Largest area over maximum period will lead to maximum displacement.
Impact 2: Restriction of adverse weather routeing.	▪ Maximum extent (i.e., full build out) of array area; ▪ Up to 93 WTGs and six offshore platforms in the array area; ▪ Operational life up to 35-years; and ▪ 500m safety zones around structures where major maintenance is ongoing.	Largest area over maximum period will lead to maximum potential for restriction of adverse weather routeing options.
Impact 3: Increased vessel-to-vessel collision risk between a third-party vessel and project vessel.	▪ Maximum extent (i.e., full build out) of array area; ▪ Up to 93 WTGs and six offshore platforms in the array area; ▪ Up to 351km of array cables; ▪ Up to 124km of interconnector cables; ▪ Up to 515km of export cables; ▪ Operational life up to 35-years; and ▪ Up to 2,216 return trips per year from project vessels.	Maximum number of project vessels will lead to maximum third party collision risk.

Potential effect	Maximum design scenario assessed	Justification
Impact 4: Increased vessel to structure allision risk (powered, drifting, and internal navigation).	▪ Maximum extent (i.e., full build out) of array area; ▪ Up to 93 WTGs and six offshore platforms in the array area; ▪ Operational life up to 35-years; and ▪ 500m safety zones around structures where major maintenance is ongoing.	Maximum number of structures will lead to maximum allision risk.
Impact 5: Reduction of emergency response provision including Search and Rescue (SAR) capability.	▪ Maximum extent (i.e., full build out) of array area; ▪ Up to 93 WTGs and six offshore platforms in the array area; ▪ Up to 351km of array cables; ▪ Up to 124km of interconnector cables; ▪ Up to 515km of export cables; ▪ Operational life up to 35-years; and ▪ Up to 2,216 return trips per year from project vessels.	Maximum number of project vessels will lead to largest potential for increased incident rates.
Impact 6: Reduction of Under Keel Clearance.	▪ Maximum extent (i.e., full build out) of array area; ▪ Up to 93 WTGs and six offshore platforms in the array area; ▪ Up to 351km of array cables; ▪ Up to 124km of interconnector cables; ▪ Up to 515km of export cables; ▪ Maximum height of rock berm of 3m, up to 25% of export cable requiring external protection. ▪ Operational life up to 35-years.	Maximum length of subsea cable and maximum extent of protection over longest period leading to maximum under keel interaction risk.
Impact 7: Increased anchor/gear interaction with subsea cables.	▪ Maximum extent (i.e., full build out) of array area; ▪ Up to 93 WTGs and six offshore platforms in the array area; ▪ Up to 351km of array cables; ▪ Up to 124km of interconnector cables; ▪ Up to 515km of export cables; ▪ Maximum height of rock berm of 3m, up to 25% of export cable requiring external protection. ▪ Operational life up to 35-years.	Maximum length of subsea cable over longest period leading to maximum anchor/gear interaction risk.

Potential effect	Maximum design scenario assessed	Justification
Decommissioning		
Analogous to construction phase.		

Embedded Mitigation

15.5.7 Mitigation measures that were identified and adopted as part of the evolution of the project design (embedded into the project design) or considered as industry standard for shipping and navigation and that are relevant to shipping and navigation are listed in Table 15.7. Details as to how these mitigations are secured are provided in Volume 2, Appendix 15.1: NRA.

Table 15.7: Embedded mitigation relating to shipping and navigation

Project phase	Mitigation measures embedded into the project design
Compliance with MGN 654	The Project will comply with MCA requirements as detailed within MGN 654 and its annexes.
Charting	Project infrastructure (including structures and subsea cables) will be charted.
Promulgation of information	Circulation of relevant project information including via all usual means (e.g., Kingfisher Bulletin, Notice/Notifications to Mariners).
Buoyed construction area	Buoyed construction area in agreement with Trinity House.
Application for safety zones	Application for safety zones around structures during construction and periods of major maintenance: ▪ 500m around structures where construction is ongoing; ▪ 50m around all structures prior to commissioning of the Project; and ▪ 500m around structures where major maintenance is ongoing.
Marine coordination	Marine coordination and communication to manage project vessel movements.
Lighting and marking	Lighting and marking in agreement with Trinity House, MCA, and CAA, and in compliance with International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) G1162 (IALA, 2021).
Guard vessels	Guard vessel(s) as required by risk assessment at the time of the specific operation.
Layout design	Ongoing consultation with MCA and Trinity House in relation to layout design, including MCA and Trinity House sign off on final layout.
Blade clearance	Blade clearance in line with RYA requirements (RYA, 2019) and MGN 654 to ensure potential for recreational mast interaction with the blades is minimised.
Cable protection	Undertaking a Cable burial risk assessment process pre-construction to determine required cable protection and monitoring requirements

15.6 Assessment Methodology

Overview

15.6.1 The assessment of shipping and navigation impacts has been based on the FSA methodology noting this is the international standard for marine risk assessment, and is the approach required by the MCA under MGN 654, specifically Annex 1 (MCA, 2021).

15.6.2 The following sections describe the FSA methodology applied in the Volume 2, Appendix 15.1: NRA and this chapter.

Impact Assessment Methodology

15.6.3 The criteria for determining the significance of each impact are based on the severity of consequence and frequency of occurrence, as determined by Volume 2, Appendix 15.1: NRA. The definitions for severity of consequence and frequency of occurrence in the NRA and this chapter are outlined in Table 15.8 and Table 15.9, respectively.

Table 15.8: Severity of Consequence Definitions

Consequence	Description/reason
Major	▪ Multiple fatalities to people; ▪ Total loss of property; ▪ Tier 3 environmental damage with national assistance required; and ▪ International reputational risk to business.
Serious	▪ Multiple serious injuries or single fatality to people; ▪ Damage to property resulting in critical risk to operations; ▪ Tier 2 environmental damage with regional assistance required; and ▪ National reputational risk to business.
Moderate	▪ Multiple minor or single serious injury to people; ▪ Damage to property not critical to operations; ▪ Tier 2 environmental damage with limited external assistance required; and ▪ Local reputational risk to business.
Minor	▪ Slight injury(s) to people; ▪ Minor damage to property, i.e., superficial damage; ▪ Tier 1 environmental damage with local assistance required; and ▪ Minor reputational risk to business limited to users.
Negligible	No perceptible risk to people, property, the environment or business.

Table 15.9: Frequency of Occurrence Definitions

Frequency	Definition
Frequent	Yearly
Reasonably Probable	One per one to ten years
Remote	One per 10 to 100 years
Extremely Unlikely	One per 100 to 10,000 years
Negligible	Less than one occurrence per 10,000 years

15.6.4 The significance of the impact upon shipping and navigation is then determined via a risk matrix as presented in Table 15.10. As shown, all impacts are determined to be either broadly acceptable, tolerable, or unacceptable based on the input frequency and consequence ranking.

15.6.5 For the purposes of the shipping and navigation assessment, impacts determined as being of Unacceptable significant are considered a 'significant' effect in terms of the EIA Regulations (2017). Impacts determined to be tolerable are not significant assuming the risks have been reduced to ALARP.

Table 15.10: Matrix to determine effect significance

		Frequency of Occurrence				
		Negligible	*Extremely Unlikely*	*Remote*	*Reasonably Probable*	*Frequent*
Severity of Consequence	*Negligible*	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Tolerable
	Minor	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Tolerable	Tolerable
	Moderate	Broadly Acceptable	Broadly Acceptable	Tolerable	Tolerable	Unacceptable
	Serious	Broadly Acceptable	Tolerable	Tolerable	Unacceptable	Unacceptable
	Major	Tolerable	Tolerable	Unacceptable	Unacceptable	Unacceptable

15.6.6 It is noted that the NRA uses FSA terminology as required under MGN 654 (MCA, 2021). In particular, use of the term "hazard" in the NRA is equivalent to "impact" within the EIA, and "risk" in the NRA is equivalent to "significance".

Assumptions and Limitations

15.6.7 The limitations associated with the vessel traffic survey data and other data sources are discussed in detail in Volume 2, Appendix 15.1: NRA.

15.6.8 The shipping and navigation baseline and impact identification has been undertaken based upon the information available and responses received at the time of preparation. It has been assessed based upon an MDS, in particular noting that the locations of structures will not be finalised until post-consent. This approach ensures that whatever is constructed will fall within the worst-case parameters already assessed.

15.7 Impact Assessment

Impact 1 Displacement of vessels leading to increased collision risk between third party vessels

15.7.1 Construction or decommissioning activities and the presence of surface piercing structures within the array area may result in the displacement of vessels from pre-existing routes and activities. This displacement may result in an increased risk of a collision between third-party vessels.

15.7.2 During the construction phase, the array area will be marked as a buoyed construction area. There will be no restriction on entry into the buoyed construction area other than through any active safety zones, noting the Cardinal Marks (buoys) do advise Mariners to avoid the area.

15.7.3 Experience at other OWF projects indicates that areas of active construction will generally be avoided by vessels observing the buoyed construction area, and therefore it is likely that the ongoing construction works will displace existing traffic from within the array area. The same scenario is likely during the decommissioning phase i.e., the array area will be marked as a buoyed decommissioning area, and it is likely that vessels will avoid the ongoing works.

15.7.4 During the operational phase, there would again be no restriction on transits into the array area assuming any active major maintenance safety zones are avoided.

15.7.5 During consultation, displacement was raised as a concern by vessel operators including DFDS and Stena (see Section 15.3). The potential for displacement leading to an increase in collision risk was also raised including by the MCA.

Commercial Vessels

Commercial Vessel Routeing

15.7.6 Based on the deviations assessment undertaken in Volume 2, Appendix 15.1: NRA, of the 13 main commercial routes identified, five are anticipated to deviate to avoid the structures within the array area. The deviations to these five routes are summarised as follows:

- **Route 3:** four vessels per day. Likely vessels will transit further north to increase passing distance from array area. Estimated journey distance increase of < 0.1nm.
- **Route 7:** one vessel per day. Intersects array area, vessels anticipated to pass to the north post wind farm. Estimated journey distance increase of 1.2nm.
- **Route 8:** one vessel per day. Intersects array area, vessels anticipated to pass to the west post wind farm. Estimated journey distance increase of 2.4nm.
- **Route 9:** one vessel per day. Intersects array area, vessels anticipated to pass to the north post wind farm. Estimated journey distance increase of 4.6nm.
- **Route 12:** < 1 vessel per day. Used by DFDS as an adverse weather route. Likely vessels will pass further north (a minor deviation) to increase passing distance from array area. Estimated journey distance increase of 0.2nm.

15.7.7 Baseline routeing in the area is observed to be largely dictated by the numerous sand banks and the existing surface piercing infrastructure (both renewables and oil and gas). In the future case scenario routeing of vessels deviating west of the array area will be dictated by the presence of the Outer Dowsing Bank, with these vessels merging with established routes. Vessels deviating to the north will likely pass between the array area and the platforms at the West Sole field (dependent on decommissioning status), again on routes already established by other vessels.

15.7.8 The most likely consequences of vessel displacement will be increased journey times and distance for affected third-party vessels. This was highlighted by commercial ferry operators (DFDS and Stena) during consultation. As a worst case, there may be disruption to existing schedules, particularly for the commercial ferry operators using the region. However, given the size of the deviations anticipated and the ability to effectively passage plan, disruptions to schedule are expected to be minimal.

15.7.9 It is noted that there is likely to be some minor displacement associated with the ORCP search area, depending on the final location of the ORCP(s). This will be assessed further post PEIR.

Collision Risk

15.7.10 Historical incident data assessed in Volume 2, Appendix 15.1 NRA indicates that to date no collision incidents between third-party vessels have occurred directly as a result of a UK offshore wind farm. However, given vessels will be displaced, it is likely that there will be increased encounters and hence a potential for collision risk to also increase.

15.7.11 Based on the quantitative assessment of vessel to vessel collision risk undertaken in Volume 2, Appendix 15.1: NRA, the return period of a vessel being involved in a collision pre wind farm was estimated at 31-years, reflective of the traffic volumes in the area. This broadly aligns with the findings of the baseline incident assessment (see Section 15.4) which identified one collision incident occurring within the ten year period of RNLI data studied (with no collisions indicated from the twenty-years of MAIB data). The collision incident occurred 9nm east of the array area and involved an oil and gas vessel (the data did not specify the other vessel involved).

15.7.12 The corresponding post wind farm return period was estimated at 26-years which represents an increase of approximately 19%. The change in collision risk was observed to be primarily associated with routeing to the north and west of the array area.

15.7.13 In adverse weather including reduced visibility, third-party vessels may experience limitations regarding visual identification of other third-party vessels, either when passing opposing sides of the buoyed construction/decommissioning areas (with partially constructed or deconstructed WTGs) and operational array area, or when navigating internally within the operational array area (small craft only). These limitations may increase the potential for an encounter. However, this will be mitigated by the application of the COLREGs (including Rule 6 Safe Speeds and Rule 19 Conduct of Vessels in Restricted Visibility) in adverse weather conditions.

15.7.14 The most likely consequences in the event of an encounter between two or more third-party vessels is the implementation of avoidance action in line with the COLREGs, with the vessels involved able to resume their respective passages with no long-term consequences.

15.7.15 Should an encounter develop into a collision incident, it is most likely to involve minor contact resulting in minor damage to the vessels with no harm to people. As a worst case (with very low frequency of occurrence) one or both of the vessels may experience substantial damage or founder with PLL and pollution, with this outcome more likely where one of the vessels is a small craft (e.g., fishing vessel, recreational vessel). It is noted that the final NRA will include quantitative assessment of both PLL, and pollution associated with the Project.

15.7.16 Vessel traffic monitoring will be undertaken throughout the construction phase to characterise changes to routeing patterns. These will be compared against the anticipated deviations determined in Volume 2, Appendix 15.1: NRA to allow a comprehensive review of the mitigation measures applied at the time.

15.7.17 It is noted that there is likely to be some minor displacement associated with the ORCP search area and hence changes in collision risk, depending on the final location of the ORCP(s). This will be assessed further post PEIR.

Commercial Vessel Third Party Activities

15.7.18 As shown via the vessel traffic assessment (see Section 15.4), dredging and oil and gas activities do take place in the vicinity. Of note is the Outer Dowsing extraction area (area 515/2) located near the south western part of the array area, and various oil and gas platforms, including Malory which is within the array area and is currently still active. Further assessment of third party activities is provided in Volume 1, Chapter 18: Infrastructure and Other Marine Users.

15.7.19 It was estimated that less than one marine aggregate dredger per week intersected the array area based on the long term AIS assessed in Volume 2, Appendix 15.1: NRA. It is considered likely that these vessels would deviate around the array as opposed to transiting through. Feedback from Boskalis (a key marine aggregate dredger operator in the area) during the hazard workshop (see Section 15.3) was that any impact on marine aggregate dredging activity was likely to be minimal given the local dredging areas do not intersect the array area. The feedback indicated marine aggregate dredgers tend to transit from the south and as such significant deviations to vessel transits are also not expected.

15.7.20 Given the presence of oil and gas infrastructure within the array area, in particular Malory for which there are no known decommissioning plans, it will be necessary for oil and gas vessels to enter into the array area to access the infrastructure. Consultation is ongoing with the relevant oil and gas operators to ensure suitable access is maintained and as such the assessment will be updated post PEIR to account for these discussions.

15.7.21 Vessels to the Hornsea projects were observed to typically pass north of the array area and as such no impact is anticipated.

15.7.22 As for main commercial routes, the most likely consequence will be increased journey times and distances for affected third-party vessels.

Promulgation of Information and Passage planning

15.7.23 All vessels operating in the area expected to comply with national and international flag state regulations (including the COLREGs and SOLAS) and will have a raised level of awareness of construction and decommissioning activities given the promulgation of information relating to the Project. This includes the charting of the buoyed construction/decommissioning area on relevant nautical charts and the use of safety zones. The physical presence of the buoyed construction/decommissioning area itself will also serve to maximise awareness. Similarly, during the operational phase infrastructure will be appropriately marked on relevant nautical charts and by that stage awareness of the array area will be high given its established presence over the construction phase.

15.7.24 All vessels proceeding to sea are expected to comply with flag state regulations including Regulation 34 of SOLAS Chapter V – which states that "*the voyage plan shall identify a route which […] anticipates all known navigational hazards and adverse weather conditions*" (IMO, 1974) – and IMO Resolution A.893(21) on the Guidelines for Voyage Planning (IMO, 1999). The promulgation of information relating to the Project will assist and facilitate such passage planning.

Small Craft (Fishing and Recreational Vessels)

Small Craft Displacement

15.7.25 The vessel traffic survey data shows transits from recreational vessels and fishing vessels through the array area occur (noting the survey captured both AIS and non AIS traffic). This aligns with the findings of the long term AIS analysis within Volume 2, Appendix 15.1: NRA.

15.7.26 As for commercial vessels, there will be no restriction on small craft entering the array area during any phase other than through active safety zones. However, based on experience at previously under construction OWFs, commercial fishing vessels and recreational vessels may choose not to navigate internally within the buoyed construction/decommissioning area. Therefore, some displacement of transits by small craft during the construction and decommissioning phases may occur.

15.7.27 For the operational phase, based on experience at existing operational OWFs, it is anticipated that commercial fishing vessels and recreational vessels may choose to navigate internally within the array area, particularly in favourable weather conditions.

15.7.28 Feedback during the hazard workshop was that the area is commonly used by potters (i.e., vessels laying and hauling static gear pots) in particular (season dependent), and post wind farm use of the area is likely to depend on the final layout noting commercial impacts to fishing vessels are considered in Volume 1, Chapter 14: Commercial Fisheries. Recreational representation at the workshop indicated no initial concerns, however noted that sailing vessels may be more likely to avoid the array area than motor cruisers.

15.7.29 The most likely consequence of small craft displacement is changes to vessel's existing routines but without any safety impact.

Collision Risk Involving Small Craft

15.7.30 There is anticipated to be an increase in commercial vessel density and hence collision risk around the northern and western wind farm peripheries. Given recreational and fishing transits are known to occur in both these areas based on the vessel traffic survey data, there may be increased encounters between small craft and larger commercial vessels. It is noted that feedback during the hazard workshop was that recreational vessels would tend to avoid commercial vessel routeing, however within this area recreational vessels do already transit with commercial vessels in the area between the Outer Dowsing Bank and Triton Knoll OWF.

15.7.31 In the event of a collision incident involving a small craft (with comparatively weaker structural integrity due to hull materials) compared to a larger commercial vessel, the likelihood of a worst case outcome (the small craft foundering with PLL and pollution) will be greater.

Embedded Mitigation Measures

15.7.32 Embedded mitigation measures identified as relevant to reducing the significance of risk are as follows:

- Appropriate marking on Admiralty charts;
- Promulgation of information;
- Buoyed construction / decommissioning area;
- Application for safety zones; and
- Lighting and marking.

Significance of Risk

15.7.33 The frequency of occurrence, severity of consequence, and significance of risk due to vessel displacement is presented in Table 15.11 alongside the resulting significance of risk.

Table 15.11: Risk Rankings for displacement of vessels leading to increased collision risk between third party vessels

Phase	Worst Case Consequences	Frequency of Occurrence	Severity of Consequence	Significance of Risk
Construction	Displacement with effects on schedule and collision incident occurs with vessel damage, PLL, and/or pollution.	Remote	Serious	Tolerable
O&M		Remote	Serious	Tolerable
Decommissioning		Remote	Serious	Tolerable

15.7.34 This impact will be re-assessed post PEIR once array area reduction has been applied.

Impact 2 Restriction of Adverse Weather Routeing

15.7.35 The presence of the structures within the array area could restrict adverse weather routeing options in the study area.

15.7.36 Adverse weather includes wind, wave, and tidal conditions as well as reduced visibility can hinder a vessel's normal route and/or speed of navigation. Adverse weather routes are defined as significant course adjustments to mitigate vessel movement in adverse weather conditions. When transiting in adverse weather conditions, a vessel is likely to encounter various kinds of weather and tidal phenomena, which may lead to severe roll motions, potentially causing damage to cargo, equipment and/or danger to persons on board. The sensitivity of a vessel to these phenomena will depend on the actual stability parameters, hull geometry, vessel type, vessel size and speed.

15.7.37 The presence of structures within or near to any adverse weather routes may prevent the route from being utilised during adverse conditions. Mitigations for vessels include adjusting their heading to position themselves 45° to the wind, altering or delaying sailing times, reducing speed and/or potentially cancelling journeys.

All Users

15.7.38 DFDS noted during consultation limited concern with the King Seaways and Princess Seaways adverse weather routeing (Route 12), however stated that routeing between Immingham and Cuxhaven would be affected, with a route preferred for use during certain adverse conditions intersecting the array area. This route is used when sea conditions further north are such that the typically used Immingham to Cuxhaven route (Route 7) would require additional time in port to secure cargo i.e., there would be a commercial impact on DFDS if Route 7 could not be used.

15.7.39 Lighting and marking will be defined in consultation with Trinity House as required, and this will include consideration of requirements during periods of poor visibility (e.g., sound signals) to ensure the structures within the array area are detectable in adverse conditions, noting the structures will also be charted. Under COLREGS (IMO, 1972), vessels are also required to take appropriate measures with regards to determining a safe speed, taking into account various factors including the state of visibility, the state of the wind, sea, and current as well as the proximity of navigational hazards.

15.7.40 The most likely consequences are considered to be displacement from existing adverse weather routeing options but with no safety risk. As a worst case, there may be effects on schedules with limited safety risk.

Embedded Mitigation Measures

15.7.41 Embedded mitigation measures identified as relevant to reducing the significance of risk are as follows:

- Appropriate marking on Admiralty charts;
- Promulgation of information; and
- Lighting and marking.

Significance of Risk

15.7.42 The frequency of occurrence, severity of consequence, and significance of risk due to restriction of adverse weather routeing is presented in Table 15.12 alongside the resulting significance of risk.

Table 15.12: Risk rankings for restriction of adverse weather routeing

Phase	Worst Case Consequences	Frequency of Occurrence	Severity of Consequence	Significance of Risk
Construction	Displacement from normal adverse weather preference with effects on schedule due to additional time in port and limited safety risks.	Remote	Serious	Tolerable
O&M		Remote	Serious	Tolerable
Decommissioning		Remote	Serious	Tolerable

15.7.43 This impact will be re-assessed post PEIR once array area reduction has been applied.

Impact 3 Increased vessel-to-vessel collision risk between a third-party vessel and project vessel

15.7.44 Increases in wind farm vessel activity associated with the Project could lead to increased collision rates in the area with third party vessels.

15.7.45 The construction, operation, and decommissioning of the Project will necessitate the use of various types of vessels. These vessels will increase traffic volumes within the area, which may lead to an increase in collision risk to third party vessels.

In Isolation – All Users

15.7.46 During construction, it is estimated that up to 127 vessels could be used with a total of up to 3,051 return trips. It is likely that vessel numbers will be similar during the decommissioning phase. During the operational phase up to 2,216 annual trips are estimated. It is likely that some project vessels will be Restricted in Ability to Manoeuvre (RAM), noting that project vessels would likely be undertaking the associated activities within the array area or Offshore ECC.

15.7.47 From historical incident data, there have been two instances of third-party vessels colliding with a project vessel associated with a UK offshore wind farm. In both incidents moderate vessel damage was reported with no harm to persons. It is noted that the two incidents occurred in 2011 and 2012, and awareness of offshore wind farm developments and the application of the measures has improved or been refined considerably in the interim, with no further collision incidents reported since despite an increase in offshore wind activity and infrastructure.

15.7.48 Project traffic movements will be managed via marine coordination for the purposes of ensuring any disruption to third party traffic is minimised. Details of the Project including in relation to vessels will be promulgated meaning areas where increased wind farm vessel traffic will be present are detailed to third party users maximising awareness.

15.7.49 Safety zones around structures where active construction/decommissioning and major maintenance works are ongoing will also be applied for to protect both third party and project vessels. Details of authorised safety zones will be promulgated in addition to details of the associated activities, meaning awareness for all third-party users will be maximised.

15.7.50 In periods of adverse visibility, third-party vessels may experience limitations regarding visual identification of any Project vessels entering or exiting the buoyed construction/decommissioning areas or array area. However, this will be mitigated by the application of the COLREGs (including Rule 6 Safe Speeds and Rule 19 Conduct of Vessels in Restricted Visibility) in adverse weather conditions and Project vessel compulsory AIS carriage.

15.7.51 The most likely consequences in the event of an encounter between a third-party and project vessel is the implementation of avoidance action in line with the COLREGs, with the vessels involved able to resume their respective passages with no long-term consequences.

15.7.52 Should an encounter develop into a collision incident, it is most likely to involve minor contact resulting in minor damage to the vessels with no harm to people (as noted in incidents occurred to date as assessed in Volume 2, Appendix 15.1: NRA). As a worst case, one of the vessels could founder with PLL and pollution, with this outcome more likely where one of the vessels is a small craft with comparatively weaker structural integrity given hull materials (e.g., fishing vessel, recreational vessel, or CTV).

Embedded Mitigation Measures

15.7.53 Embedded mitigation measures identified as relevant to reducing the significance of risk are as follows:

- Appropriate marking on Admiralty charts;
- Promulgation of information;
- Buoyed construction/decommissioning area;
- Application for safety zones;
- Marine Coordination;
- Compliance of project vessels with the international marine regulations including COLREGs and SOLAS; and
- Guard vessel(s) as required by risk assessment.

Significance of Risk

15.7.54 The frequency of occurrence, severity of consequence, and significance of risk due to third party to project vessel collision is presented in Table 15.13 alongside the resulting significance of risk.

Table 15.13: Risk rankings for third party to project vessel collision

Phase	Worst Case Consequences	Frequency of Occurrence	Severity of Consequence	Significance of Risk
Construction	Collision incident occurs with vessel damage, PLL, and/or pollution.	Extremely unlikely	Serious	Broadly acceptable
O&M		Extremely unlikely	Serious	Broadly acceptable
Decommissioning		Extremely unlikely	Serious	Broadly acceptable

Impact 4 Increased vessel to structure allision risk

In Isolation – All Users

Powered Vessel to Structure Allision Risk

15.7.55 Full quantitative allision modelling including for vessels under power will be run post PEIR. On a preliminary basis, based on the post wind farm routeing (as assessed in Volume 2, Appendix 15.1: NRA) powered allision risk is likely to be greatest to the west and north peripheries given likely post wind farm traffic volumes in these areas. However, it is noted that the shallows of the Outer Dowsing Bank mean larger vessels would be likely to anchor or ground prior to making contact with the turbines.

15.7.56 From historical incident data (as assessed in Volume 2, Appendix 15.1: NRA), there have been two instances of a third-party vessel alliding with an operational wind farm structure in the UK. These incidents both involved a fishing vessel, with a RNLI lifeboat attending on both occasions.

15.7.57 Vessels are expected to comply with national and international flag state regulations (including the COLREGs and SOLAS) and will be able to passage plan a route which minimises risk given the promulgation of information relating to the Project, including the charting of infrastructure on relevant nautical charts. On approach, the operational lighting and marking on the structures will also assist in maximising awareness and project vessels will as required alert a vessel on a closing approach with a structure. During construction, the array area will be marked as a buoyed construction area, with temporary lighting used to mark individual structures. Pre commissioning safety zones of 50m will also be applied for. Similar mitigations are likely to be applied during the decommissioning phase.

15.7.58 Should a powered allision incident occur, the consequences will depend on multiple factors including the energy of the contact, structural integrity of the vessel involved, and the sea state at the time of the contact. Small craft including commercial fishing vessels and recreational vessels are considered most vulnerable to the hazard given the potential for a non-steel construction.

15.7.59 With considerations for lesson learned the most likely consequences are minor damage with the vessel involved able to resume passage and undertake a full inspection at the next port of call. As a worst case, the vessel may founder leading to PLL and pollution.

15.7.60 It is noted that there will be allision risk associated with the ORCP(s). This will be assessed further post PEIR.

Drifting Vessel to Structure Allision

15.7.61 A drifting vessel scenario may develop into an allision situation where the vessel is in proximity to a structure and the direction of the wind and/or tide is such as to direct the vessel towards the structure. The final NRA will quantitatively model this scenario accounting for the local tidal conditions and wind direction probabilities.

15.7.62 From historical incident data, there have been no instances of a third-party vessel alliding with an operational wind farm structure in the UK whilst Not Under Command (NUC).

15.7.63 In circumstances where a vessel drifts towards a structure, there are actions which the vessel may take to prevent the drift incident developing into an allision situation. Powered vessels may be able to regain power prior to reaching the array area (i.e., by rectifying any fault). Failing this, the vessel's emergency response procedures would be implemented which may include an emergency anchoring event following a check of the relevant nautical charts to ensure the deployment of the anchor will not lead to other risks (such as anchor snagging on a subsea cable), or the use of thrusters (depending on availability and power supply).

15.7.64 Where the deployment of the anchor is not possible (e.g., for small craft), any project vessels on-site may be able to render assistance in liaison with the MCA and in line with SOLAS obligations (IMO, 1974). This response will be managed via the coastguard and marine coordination, and depends on the type and capability of vessels on site. This would be particularly relevant for sailing vessels relying on metocean conditions for propulsion, noting if the vessel becomes adrift in proximity to a structure there may be limited time to render assistance.

15.7.65 Should a drifting allision incident occur, the consequences will be similar to those outlined for a powered allision incident, including the determining factors. However, the speed at which the contact occurs is likely to be lower than for a powered allision.

15.7.66 It is noted that there will be drifting allision risk associated with the ORCP(s). This will be assessed further post PEIR.

Internal Vessel to Structure Allision Risk

15.7.67 Commercial vessels are not anticipated to navigate internally within the array area and therefore the likelihood of an internal allision risk for commercial vessels is considered negligible. Vessels navigating within the array area are most likely to be small craft (e.g., fishing, recreation). The final NRA will include quantitative modelling assessment of internal allision risk to fishing vessels.

15.7.68 As with any passage, a vessel navigating internally within the array is expected to passage plan in accordance with SOLAS Chapter V (IMO, 1974). The lighting and marking of the structures in the array area as required by Trinity House, MCA and CAA including MGN 654 compliant unique identification marking of structures in an easily identifiable pattern will assist with minimising the risk of a mariner becoming disoriented whilst navigating internally. The layout itself will be agreed with MCA and Trinity House, noting that these discussions will include consideration of surface internal navigation.

15.7.69 For recreational vessels under sail navigating internally within the array area, there is also potential for effects such as wind shear, masking and turbulence to occur. From previous studies of offshore wind developments, it has been concluded that WTGs do reduce wind velocity downwind of a WTG (MCA, 2022) but that no negative effects on recreational craft have been reported on the basis of the limited spatial extent of the effect, and its similarity to that experienced when passing a large vessel or close to other large structures (such as bridges) or the coastline. In addition, no practical issues have been raised by recreational users to date when operating in proximity to existing offshore wind developments.

15.7.70 An additional allision risk associated with the WTG blades applies for recreational vessels with a mast when navigating internally within the array area. However, the minimum blade tip clearance will align as a minimum with the minimum clearance the RYA recommend for minimising allision risk (RYA, 2019) and which is also noted in MGN 654.

15.7.71 It will also be necessary for oil and gas vessels to enter into the array area to access the relevant oil and gas infrastructure, most notably the Malory platform (assuming that it remains in active production at the point of the construction of the Project). Suitable access within the layout will be discussed with the relevant operators.

15.7.72 Should an internal allision incident occur, the consequences will be similar to those outlined for a powered allision incident, including the determining factors. However, as with a drifting allision incident, the speed at which the contact occurs will likely be lower than for an external powered allision.

Embedded Mitigation Measures

15.7.73 Embedded mitigation measures identified as relevant to reducing the significance of risk are as follows:

- Compliance with MGN 654 (MCA, 2021) and its annexes;
- Appropriate marking on Admiralty charts;
- Promulgation of information;
- Buoyed construction / decommissioning area;
- Application for safety zones;
- Lighting and marking;
- Blade clearance in excess of RYA and MCA requirements; and
- Compliance of project vessels with the international marine regulations including COLREGs and SOLAS.

Significance of Risk

15.7.74 The frequency of occurrence, severity of consequence, and significance of risk due to vessel allision is presented in Table 15.14 alongside the resulting significance of risk.

Table 15.14: Risk rankings for vessel to structure allision risk

Phase	Worst Case Consequences	Frequency of Occurrence	Severity of Consequence	Significance of Risk
Construction	Allision incident with the vessel foundering, leading to PLL, and/or pollution.	Extremely unlikely	Serious	Broadly acceptable
O&M		Extremely unlikely	Serious	Broadly acceptable
Decommissioning		Extremely unlikely	Serious	Broadly acceptable

Impact 5 Reduction of emergency response provision including SAR capability

15.7.75 The presence of structures within the array area and associated vessel activities may result in an increased likelihood of an incident occurring which requires an emergency response and may reduce access for surface and air SAR assets.

Emergency Response Resources

15.7.76 During construction, it is estimated that up to 127 vessels could be used with a total of up to 3,051 return trips. It is likely that vessel numbers will be similar during the decommissioning phase. During the operational phase up to 2,216 annual trips are estimated. These vessels will increase the likelihood of an incident requiring an emergency response and subsequently increase the likelihood of multiple incidents occurring simultaneously, diminishing emergency response capability.

15.7.77 Based on the incident data studied, baseline incident rates are low in the area, reflective of the distance offshore. Additionally, based on the number of collision and allision incidents associated with UK offshore wind farms reported to date (as assessed in Volume 2, Appendix 15.1: NRA), there is an average of one incident per 1,511 operational WTG years (as of December 2022). Therefore, the Project itself is not expected to result in a marked increase in the frequency of incidents requiring an emergency response.

15.7.78 Should an incident occur in proximity to the array area, it is likely that a project vessel would be well equipped to assist under SOLAS obligations (IMO, 1974) and in liaison with the MCA, potentially as the first responder. This is reflected in past experience, with 12 known instances of a vessel (or persons on a vessel) being assisted by an industry vessel associated with a nearby UK OWF as detailed in Volume 2, Appendix 15.1: NRA.

15.7.79 The most likely consequences in the event of an incident in the region requiring an emergency response is that emergency responders are able to assist without any limitations on capability. As a worst case, there could be a delay to a response request due to a simultaneous incident associated with the Project leading to PLL, pollution, and vessel damage. However, this worst case scenario is considered highly unlikely.

Search and Rescue Access

15.7.80 The physical presence of surface piercing structures may restrict access for SAR responders, either due to the incident in question occurring within the array area or the array area obstructing the most effective path to an incident further offshore. This is more likely to be an issue in periods of adverse weather conditions, noting under such conditions it is likely that SAR helicopters would only enter into the array area from low altitude. The Applicant will ensure the associated layout design principles detailed in MGN 654 are applied in consultation with the MCA.

15.7.81 The assessment of SAR helicopter taskings data indicated that while taskings do occur in the area, the majority are rescue / recovery operations to the local oil and gas infrastructure as opposed to SAR operations (88% of the total were detailed as "Rescue/Recovery").

15.7.82 The Applicant will agree an ERCoP with the MCA to ensure appropriate procedures are in place in the event of an emergency incident. A SAR Checklist will also be agreed to ensure any SAR mitigations required by the MCA are implemented for the Project.

15.7.83 The final layout and structure identification system will be agreed with both the MCA and Trinity House post consent, noting it will be MGN 654 compliant.

15.7.84 The most likely consequences in the event of a SAR operation is that SAR assets are able to fulfil their objectives without any limitations on capability. As a worst case, it may not be possible to undertake an effective search. However, given compliance with MGN 654 for the final layout, this is considered highly unlikely.

Embedded Mitigation Measures

15.7.85 Embedded mitigation measures identified as relevant to reducing the significance of risk are as follows:

- Compliance with MGN 654 (MCA, 2021) and its annexes;
- Marine Coordination;
- Layout approval;
- Compliance of project vessels with the international marine regulations including COLREGs and SOLAS; and
- Guard vessel(s) as required by risk assessment.

Significance of Risk

15.7.86 The frequency of occurrence, severity of consequence, and significance of risk due to Reduction of emergency response provision including SAR capability is presented in Table 15.15 alongside the resulting significance of risk.

Table 15.15: Risk rankings for reduction of emergency response provision including SAR capability

Phase	Worst Case Consequences	Frequency of Occurrence	Severity of Consequence	Significance of Risk
Construction	Delay to a response request and inability to	Extremely unlikely	Major	Tolerable

Phase	Worst Case Consequences	Frequency of Occurrence	Severity of Consequence	Significance of Risk
O&M	undertake an effective search leading to vessel damage, PLL, and pollution.	Extremely unlikely	Major	Tolerable
Decommissioning		Extremely unlikely	Major	Tolerable

Impact 6 Reduction of Under Keel Clearance

15.7.87 Any changes in under keel clearance as a result of the Project could lead to a risk of under keel interaction to passing vessels.

All Users

15.7.88 The use of external protection for the cables may be necessary if target burial depths cannot be met. This could lead to reductions in under keel clearance for passing vessels, and potential grounding/interaction risk. The need for and location of any external cable protection will be determined via the cable burial risk assessment which will be undertaken post consent.

15.7.89 The maximum height of external protection via rock berm is anticipated to be 3m, with potentially up to 25% of the export cable route requiring protection to be implemented.

15.7.90 As required under MGN 654 and as will be detailed within the DCO, the Applicant will consult with the MCA and Trinity House in any instances where water depths are reduced by more than 5% as a result of cable protection to determine whether additional mitigation is necessary to ensure the safety of passing vessels. This aligns with the RYA's recommendation that the "*minimum safe under keel clearance over submerged structures and associated infrastructure should be determined in accordance with the methodology set out in MGN 543 [since superseded by MGN 654]*" (RYA, 2019).

15.7.91 The most likely consequence is a reduction in navigable depths but vessels are still able to transit over the area without contact being made. As a worst case, a vessel may make contact with the cable protection potentially leading to foundering, PLL and/or pollution.

Embedded Mitigation Measures

15.7.92 Embedded mitigation measures identified as relevant to reducing the significance of risk are as follows:

- Compliance with MGN 654 (MCA, 2021) and its annexes;
- Appropriate marking on Admiralty charts;
- Promulgation of information;
- Cable burial and protection including monitoring; and
- Guard vessel(s) as required by risk assessment.

Significance of Risk

15.7.93 The frequency of occurrence, severity of consequence, and significance of risk due to reduction of under keel clearance is presented in Table 15.16 alongside the resulting significance of risk.

Table 15.16: Risk rankings for reduction of under keel clearance

Phase	Worst Case Consequences	Frequency of Occurrence	Severity of Consequence	Significance of Risk
O&M	Vessel transits over and contacts the cable protection resulting in vessel damage, injury/fatality and/or pollution	Extremely unlikely	Serious	Broadly acceptable

Impact 7 Increased anchor/gear interaction risk with subsea cables

15.7.94 The presence of subsea cables may result in an interaction risk with anchors or fishing gear.

15.7.95 Scenarios that could lead to cable interaction include:

- Vessel dragging anchor over subsea cable following anchor failure;
- Vessel anchoring in an emergency over cable (e.g., to avoid drifting into a structure, of into an area of busy traffic);
- Vessel dropping anchor inadvertently (e.g., mechanical failure); or
- Negligent anchoring (e.g., use of out of date charts, neglecting to raise anchor when departing anchorage).

15.7.96 There is also a risk that deployed fishing gear may interact with subsea cables.

All Users – Vessel Anchors

15.7.97 The project may utilise up to 351km of inter array cables, 124km of interconnector cables, and 515km of export cable. Burial will be the primary form of protection, with external protection used where identified as necessary via the cable burial risk assessment.

15.7.98 There are no charted anchorages in proximity to the Offshore ECC, however instances of anchoring activity were recorded in the nearshore area during the summer vessel traffic survey. In terms of the array area, anchoring activity within the study area was observed to be limited based on the 12-months analysis.

15.7.99 Burial depths and the need for any external protection will be determined via the cable burial risk assessment process. This will consider baseline vessel activity including in terms of anchored vessel locations, general traffic volumes, and vessel size and type to determine potential anchor sizes. Protection will also be monitored to ensure it remains an effective mitigation.

15.7.100 All cables will be charted on appropriate charts meaning mariners are aware of their presence. In any anchoring scenario, an interaction risk exists only where the anchoring occurs in proximity to a subsea cable and it is anticipated that the charting of infrastructure will inform any decision to anchor, as per Regulation 34 of SOLAS (IMO, 1974).

15.7.101 The most likely consequences in the event of a vessel anchoring over a subsea cable is that no interaction occurs given the protection applied to the cable (by burial or other means). Should an interaction occur, historical incident data suggests that the consequences would be negligible, with no damage caused to the vessel or cable. As a worst case, a snagging incident could occur to a small vessel with damaged caused to the anchor and/or the cable, compromising the stability of the vessel.

Fishing Vessels – Gear

15.7.102 As for vessel anchors, there is a risk that fishing gear may interact with subsea cables. It is the responsibility of the fishermen to dynamically risk assess whether it is safe to undertake fishing activities within the array area and to make a decision as to whether or not to fish. This decision will be informed by a number of factors, which will include the charted locations of subsea cables. Fishermen will similarly be required to take account of the charted presence of subsea cables within the Offshore ECC.

15.7.103 Active fishing activity is considered further in Volume 1, Chapter 14: Commercial Fisheries.

Embedded Mitigation Measures

15.7.104 Embedded mitigation measures identified as relevant to reducing the significance of risk are as follows:

- Compliance with MGN 654 (MCA, 2021) and its annexes;
- Appropriate marking on Admiralty charts;
- Promulgation of information;
- Buoyed construction/decommissioning area;
- Cable burial and protection including monitoring; and
- Guard vessel(s) as required by risk assessment.

Significance of Risk

15.7.105 The frequency of occurrence, severity of consequence, and significance of risk due to potential anchor/gear interaction risk is presented in Table 15.17 alongside the resulting significance of risk.

Table 15.17: Risk rankings for increased anchor/gear interaction risk with subsea cables.

Phase	Worst Case Consequences	Frequency of Occurrence	Severity of Consequence	Significance of Risk
O&M	Damaged caused to the or loss of anchor/gear and/or the cable, leading to compromised stability of the vessel.	Extremely unlikely	Moderate	Broadly acceptable

15.8 Cumulative Impact Assessment

15.8.1 The overarching cumulative impact assessment methodology is provided in Volume 2, Appendix 5.1: Offshore Cumulative Impact Assessment. Shipping and navigation represent a unique topic due to the nature of vessel routeing spanning a wide spatial area, and as such a bespoke tiering system has been applied as detailed in Volume 2, Appendix 15.1: NRA.

15.8.2 Under this system, the projects and plans selected as relevant to the assessment of impacts to shipping and navigation are based upon an initial screening exercise undertaken on a long list. Each has been considered and scoped in or out on the basis of potential for interaction with main routeing, data confidence, project status and the distance from the array area. This process is summarised in Table 15.18 which shows the projects screened in via the NRA process. It is noted that developments that are either under construction or operational are considered as part of the baseline.

Table 15.18: Projects considered within the shipping and navigation cumulative effect assessment

Development type	Project	Status	Data confidence assessment/phase	Tier
Offshore Wind Farm	Dudgeon Extension	In examination	Medium	1
Offshore Wind Farm	Sheringham Shoal Extension	In examination	Medium	1
Offshore Wind Farm	Hornsea Four	In determination	Medium	1
Offshore Wind Farm	Norfolk Vanguard West	Consented	High	1
Offshore Wind Farm	Hornsea Three	Consented	High	1
Offshore Wind Farm	Dogger Bank South	Scoped	Low	2

15.8.3 The cumulative MDS for the Project is outlined in Table 15.19.

Table 15.19: Cumulative MDS

Impact	Scenario	Justification
Cumulative Displacement of vessels leading to increased collision risk between third party vessels	Project plus other Tier 1/2 offshore wind farms.	Cumulative projects may lead to increased cumulative deviations.
Restrictions of Adverse Weather Routeing	Project plus other Tier 1/2 offshore wind farms.	Cumulative projects may lead to increased restriction of adverse weather routeing options.
Cumulative Increased vessel-to-vessel collision risk between a third-party vessel and project vessel	Project plus other Tier 1/2 offshore wind farms.	Cumulative projects will lead to increased volumes of wind farm vessel traffic.
Cumulative increased vessel to structure allision risk	Project plus other Tier 1/2 offshore wind farms.	Cumulative projects may lead to increased cumulative allision risk.
Cumulative reduction of emergency response provision including SAR capability.	Project plus other Tier 1/2 offshore wind farms.	Cumulative projects may lead to increased cumulative reduction of emergency response provision including SAR capability.

15.8.4 Impacts associated with under keel clearance and subsea cable interaction have been screened out of the cumulative assessment given they are localised to the area around individual cables.

Cumulative Displacement of vessels leading to increased collision risk between third party vessels

15.8.5 Construction or decommissioning activities and the presence of surface piercing structures within the array area in combination with other cumulative developments may result in the displacement of vessels from pre-existing routes and activities. This displacement may result in an increased cumulative risk of a collision between third-party vessels.

All Users

Tier 1

15.8.6 Cumulative displacement was raised as a key concern by DFDS during consultation, in particular associated with cumulative effects of the Project and Hornsea Three on routeing between Immingham and Cuxhaven. Input from DFDS was that the associated vessels will likely go north of the array area and south of Hornsea Three leading to increased transit distance and time on a cumulative basis. There is considered to be suitable sea room to safely accommodate this routeing (noting that the vessels will also need to account for local oil and gas infrastructure) however there will be a commercial impact.

15.8.7 For vessels anticipated to pass west of the array area (i.e., between the Outer Dowsing bank and Triton Knoll), there may be cumulative displacement and collision risk associated with the Dudgeon and Sheringham Shoal Extensions to the south. However, based on the post wind farm routeing assessment this is not expected to represent a large increase in traffic volume when compared against baseline numbers already using these routes.

15.8.8 Certain main routes were observed to interact with both the array area and Norfolk Vanguard West. Vessels on routes interacting with Norfolk Vanguard West may deviate into the DR1 DWR, however this is likely regardless of the presence of the Project.

Tier 2

15.8.9 No main routes identified in the study area interact with Dogger Bank South, and as such there is not considered to be an associated cumulative impact.

Embedded Mitigation Measures

15.8.10 Embedded mitigation measures identified as relevant to reducing the significance of risk are as follows:

- Appropriate marking on Admiralty charts;
- Promulgation of information;
- Buoyed construction/decommissioning area;
- Application for safety zones; and
- Lighting and marking.

Significance of Risk

15.8.11 The frequency of occurrence, severity of consequence, and significance of risk due to cumulative vessel displacement leading to collision risk is presented in Table 15.20 alongside the resulting significance of risk.

Table 15.20: Cumulative risk rankings for displacement of vessels leading to increased collision risk between third party vessels

Phase	Worst Case Consequences	Frequency of Occurrence	Severity of Consequence	Significance of Risk
Construction	Cumulative displacement with effects on schedule and collision incident occurs with vessel damage, PLL, and/or pollution.	Remote	Serious	Tolerable
O&M		Remote	Serious	Tolerable
Decommissioning		Remote	Serious	Tolerable

15.8.12 This impact will be re-assessed post PEIR once array area reduction has been applied.

Cumulative Restrictions of Adverse Weather Routeing

15.8.13 The presence of the structures within the array area in combination with other cumulative developments could restrict adverse weather routeing options in the study area.

All Users

Tier 1

15.8.14 DFDS indicated during consultation the key concern associated with adverse weather was in relation to Route 7 between Immingham and Cuxhaven given if the associated vessels deviate north of the array area, there will be a need for increased time in port to secure cargo under certain sea conditions i.e., a commercial impact. The cumulative impact of Hornsea Three will mean there is an additional commercial impact given these vessels would also require increased transit times and distances to deviate north of the array area and south of Hornsea Three. However, there is considered to be sufficient sea space available to accommodate adverse weather transits in terms of navigational safety.

15.8.15 DFDS indicated limited concerns with adverse weather transits for the Newcastle to Amsterdam routeing.

Tier 2

15.8.16 No adverse weather routeing identified in the study area interacts with Dogger Bank South, and as such there is not considered to be an associated cumulative impact.

Embedded Mitigation Measures

15.8.17 Embedded mitigation measures identified as relevant to reducing the significance of risk are as follows:

- Appropriate marking on Admiralty charts;
- Promulgation of information; and
- Lighting and marking.

Significance of Risk

15.8.18 The frequency of occurrence, severity of consequence, and significance of risk due to cumulative restriction of adverse weather routeing is presented in Table 15.21 alongside the resulting significance of risk.

Table 15.21: Cumulative risk rankings for restriction of adverse weather routeing

Phase	Worst Case Consequences	Frequency of Occurrence	Severity of Consequence	Significance of Risk
Construction	Displacement from normal adverse weather preference with effects on schedule due to	Remote	Serious	Tolerable
O&M		Remote	Serious	Tolerable

Phase	Worst Case Consequences	Frequency of Occurrence	Severity of Consequence	Significance of Risk
Decommissioning	additional time in port and limited safety risks.	Remote	Serious	Tolerable

15.8.19 This impact will be re-assessed post PEIR once array area reduction has been applied.

Cumulative Increased vessel-to-vessel collision risk between a third-party vessel and project vessel

15.8.20 Cumulative increases in wind farm vessel activity associated with the Project including combination with other cumulative developments could lead to increased cumulative collision rates in the area with third party vessels.

All Users

Tier 1

15.8.21 Vessels routeing to the existing Hornsea projects were identified within the study area transiting from the Humber. It is anticipated that similar routeing may be used for vessels associated with Hornsea Three and Four. Depending on origin port there may also be increased wind farm vessel presence associated with other Tier 1 projects.

15.8.22 All wind farm developments are expected to be implementing appropriate vessel management procedures including via marine coordination to ensure any disruption to third party traffic is minimised. It is also expected that all developers will apply for standard safety zones. All project vessels regardless of developer will also be required to comply with COLREGS which will manage encounter situations.

Tier 2

15.8.23 Any cumulative impact associated with Dogger Bank South will depend on origin port of the project vessels. However, the same mitigations as for Tier 1 developments would apply to any project vessel transits through the area.

Embedded Mitigation Measures

15.8.24 Embedded mitigation measures identified as relevant to reducing the significance of risk are as follows:

- Appropriate marking on Admiralty charts;
- Promulgation of information;
- Buoyed construction/decommissioning area;
- Application for safety zones;
- Marine Coordination;
- Compliance of project vessels with the international marine regulations including COLREGs and SOLAS; and
- Guard vessel(s) as required by risk assessment.

Significance of Risk

15.8.25 The frequency of occurrence, severity of consequence, and significance of risk due to cumulative third party to project vessel collision is presented in Table 15.22 alongside the resulting significance of risk.

Table 15.22: Cumulative risk rankings for third party to project vessel collision

Phase	Worst Case Consequences	Frequency of Occurrence	Severity of Consequence	Significance of Risk
Construction	Collision incident occurs with vessel damage, PLL, and/or pollution.	Extremely unlikely	Serious	Broadly acceptable
O&M		Extremely unlikely	Serious	Broadly acceptable
Decommissioning		Extremely unlikely	Serious	Broadly acceptable

Cumulative increased vessel to structure allision risk

15.8.26 The structures within the array area will create cumulative allision risk to third party passing vessels in combination with other cumulative developments.

All Users

Tier 1

15.8.27 Allision risk will be localised to individual areas around developments, and there is considered to be sufficient sea space between the array area and Tier 1 developments to mitigate cumulative allision risk.

15.8.28 All developments will be required to implement lighting and marking in agreement with Trinity House and in line with IALA G1162 (IALA, 2021) and chart structure locations on appropriate nautical charts to ensure the structure positions are clear to passing mariners.

Tier 2

15.8.29 There is not considered to be an increase in cumulative allision risk associated with Dogger Bank South based on its distance from the array area, noting that the same mitigations discussed for Tier 1 developments would apply.

Embedded Mitigation Measures

15.8.30 Embedded mitigation measures identified as relevant to reducing the significance of risk are as follows:

- Compliance with MGN 654 (MCA, 2021) and its annexes;
- Appropriate marking on Admiralty charts;
- Promulgation of information;
- Buoyed construction/decommissioning area;

- Application for safety zones;
- Lighting and marking;
- Blade clearance in excess of RYA and MCA requirements; and
- Compliance of project vessels with the international marine regulations including COLREGs and SOLAS.

Significance of Risk

15.8.31 The frequency of occurrence, severity of consequence, and significance of risk due to cumulative vessel allision risk is presented in Table 15.23 alongside the resulting significance of risk.

Table 15.23: Cumulative risk rankings for vessel to structure allision risk

Phase	Worst Case Consequences	Frequency of Occurrence	Severity of Consequence	Significance of Risk
Construction	Allision incident with the vessel foundering, leading to PLL, and/or pollution.	Extremely unlikely	Serious	Broadly acceptable
O&M		Extremely unlikely	Serious	Broadly acceptable
Decommissioning		Extremely unlikely	Serious	Broadly acceptable

Cumulative reduction of emergency response provision including Search and Rescue (SAR) capability

15.8.32 The presence of structures within the array area and associated vessel activities may result in a cumulative increased likelihood of an incident occurring which requires an emergency response and may reduce access for surface and air SAR assets.

All Users

Tier 1

15.8.33 Given generally low baseline incident rates and noting historical incident data indicates limited vessel based incidents associated with wind farms, it is considered unlikely that there will be a notable increase in incidents on a cumulative basis. Furthermore, there will be additional vessel based resources that would be available at other projects which may be able to assist in the event of an incident occurring in the area (depending on the nature of the incident) through the ERCOP.

15.8.34 All developers will be required to comply with MGN 654 in terms of developments of an ERCoP, agreements of a SAR checklist, and approval of the layout by MCA in terms of SAR access.

Tier 2

15.8.35 Dogger Bank South is considered analogous to Tier 1 developments with regards to this impact.

Embedded Mitigation Measures

15.8.36 Embedded mitigation measures identified as relevant to reducing the significance of risk are as follows:

- Compliance with MGN 654 (MCA, 2021) and its annexes;
- Marine Coordination;
- Layout approval;
- Compliance of project vessels with the international marine regulations including COLREGs and SOLAS; and
- Guard vessel(s) as required by risk assessment.

Significance of Risk

15.8.37 The frequency of occurrence, severity of consequence, and significance of risk due to cumulative reduction of emergency response provision including SAR capability is presented in Table 15.24 alongside the resulting significance of risk.

Table 15.24: Cumulative risk rankings for reduction of emergency response provision including SAR capability

Phase	Worst Case Consequences	Frequency of Occurrence	Severity of Consequence	Significance of Risk
Construction	Delay to a response request and inability to undertake an effective search leading to vessel damage, PLL, and pollution.	Extremely unlikely	Major	Tolerable
O&M		Extremely unlikely	Major	Tolerable
Decommissioning		Extremely unlikely	Major	Tolerable

15.9 Inter-Relationships

15.9.1 Potential effects may arise on receptors from different aspects. For shipping and navigation, the only aspect which could lead to an inter-related effect is commercial fisheries, associated with the displacement of fishing activity due to the presence of the buoyed construction/decommissioning area during construction and decommissioning phases. The displacement of all vessels, including fishing vessels, due to the presence of the buoyed construction/decommissioning area is considered in section 15.7. As such, there are no additional inter-related effects beyond those already assessed for shipping and navigation.

15.10 Transboundary Effects

15.10.1 Transboundary impacts with regard to vessel routeing including to international ports are considered to have been assessed within the cumulative assessment in Section 15.8. Individual transits may have the potential to be associated with vessels that are internationally owned or located, however such individual transits have been captured and considered as part of the baseline assessment of marine traffic as assessed within Volume 2, Appendix 15.1: NRA.

15.10.2 As such no transboundary impacts other than those already assessed are anticipated.

15.11 Conclusions

15.11.1 A summary of the FSA is provided in Table 15.25. This includes a statement of significance in EIA terms for each impact.

Table 15.25: FSA Summary

Description of effect	Effect	Additional mitigation measures	Residual impact
Construction			
Impact 1 Displacement with effects on schedule and collision incident occurs with vessel damage, PLL, and/or pollution.	Vessel displacement	Impact will be revisited post PEIR once array area reductions have been applied.	Tolerable based on current array area. Significance in EIA terms to be confirmed post PEIR.
Impact 2 Restriction of Adverse Weather Routeing	Restriction of Adverse Weather Routeing	Impact will be revisited post PEIR once array area reductions have been applied.	Tolerable based on current array area. Significance in EIA terms to be confirmed post PEIR.
Impact 3 Increased vessel-to-vessel collision risk between a third-party vessel and project vessel	Vessel collision	n/a	Broadly Acceptable Not significant in EIA terms.
Impact 4 Increased vessel to structure allision risk	Vessel allision	n/a	Broadly Acceptable Not significant in EIA terms.
Impact 5 Reduction of emergency response provision including SAR capability.	Reduction of emergency response provision	n/a	Tolerable based on current array area. Significance in EIA terms to be confirmed post PEIR.

Description of effect	Effect	Additional mitigation measures	Residual impact
Operation and Maintenance			
Impact 1 Displacement with effects on schedule and collision incident occurs with vessel damage, PLL, and/or pollution.	Vessel displacement	Impact will be revisited post PEIR once array area reductions have been applied.	Tolerable based on current array area. Significance in EIA terms to be confirmed post PEIR.
Impact 2 Restriction of Adverse Weather Routeing	Restriction of Adverse Weather Routeing	Impact will be revisited post PEIR once array area reductions have been applied.	Tolerable based on current array area. Significance in EIA terms to be confirmed post PEIR.
Impact 3 Increased vessel-to-vessel collision risk between a third-party vessel and project vessel	Vessel collision	n/a	Broadly Acceptable Not significant in EIA terms.
Impact 4 Increased vessel to structure allision risk	Vessel allision	n/a	Broadly Acceptable Not significant in EIA terms.
Impact 5 Reduction of emergency response provision including SAR capability.	Reduction of emergency response provision	n/a	Tolerable based on current array area. Significance in EIA terms to be confirmed post PEIR.
Impact 6 Reduction of under keel clearance	Reduction of under keel clearance	n/a	Broadly Acceptable Not significant in EIA terms.
Impact 7 Increased anchor / gear interaction risk with subsea cables.	Increased anchor / gear interaction risk	n/a	Broadly Acceptable Not significant in EIA terms.
Decommissioning			
Impact 1 Displacement with effects on schedule and collision incident occurs with vessel damage, PLL, and/or pollution.	Vessel displacement	Impact will be revisited post PEIR once array area reductions have been applied.	Tolerable. Significance in EIA terms to be confirmed post PEIR.

Description of effect	Effect	Additional mitigation measures	Residual impact
Impact 2 Restriction of Adverse Weather Routeing	Restriction of Adverse Weather Routeing	Impact will be revisited post PEIR once array area reductions have been applied.	Tolerable Significance in EIA terms to be confirmed post PEIR.
Impact 3 Increased vessel-to-vessel collision risk between a third-party vessel and project vessel	Vessel collision	n/a	Broadly Acceptable Not significant in EIA terms.
Impact 4 Increased vessel to structure allision risk	Vessel allision	n/a	Broadly Acceptable Not significant in EIA terms.
Impact 5 Reduction of emergency response provision including SAR capability.	Reduction of emergency response provision	n/a	Tolerable based on current array area. Significance in EIA terms to be confirmed post PEIR.
Cumulative			
Cumulative displacement with effects on schedule and collision incident occurs with vessel damage, PLL, and/or pollution.	Vessel displacement	Impact will be revisited post PEIR once array area reductions have been applied.	Tolerable based on current array area. Significance in EIA terms to be confirmed post PEIR.
Cumulative restriction of Adverse Weather Routeing	Restriction of Adverse Weather Routeing	Impact will be revisited post PEIR once array area reductions have been applied.	Tolerable based on current array area. Significance in EIA terms to be confirmed post PEIR.
Increased vessel-to-vessel collision risk between a third-party vessel and project vessel	Vessel collision	n/a	Broadly Acceptable Not significant in EIA terms.
Increased vessel to structure allision risk	Vessel allision	n/a	Broadly Acceptable Not significant in EIA terms.
Reduction of emergency response provision including SAR capability.	Reduction of emergency	n/a	Tolerable based on current array area.

Description of effect	Effect	Additional mitigation measures	Residual impact
	response provision		Significance in EIA terms to be confirmed post PEIR.

15.12 References

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