White Cross Offshore Wind Farm Environmental Statement

Chapter 15: Shipping and Navigation

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Glossary of Acronyms

Acronym	Definition
AfL	Agreement for Lease
AIS	Automatic Identification System
ALARP	As reasonably low as practicable
AONB	Area of Outstanding Natural Beauty
AoS	Area of Search
AtoN	Aids to Navigation
BEIS	Department for Business, Energy and Industrial Strategy
CBRA	Cable Burial Risk Assessment
CEA	Cumulative Effect Assessment
CGOC	Coastguard Operations Centre
CHA	Competent Harbour Authority
CLV	Cable Lay Vessel
DECC	Department of Energy and Climate Change
DSC	Digital Selective Calling
EIA	Environmental Impact Assessment
ERCOP	Emergency Response and Cooperation Plan
ES	Environmental Statement
EU	European Union
FSA	Formal Safety Assessment
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HMCG	His Majesty's Coastguard
HSE	Health and Safety Executive
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
IHO	International Hydrographic Organisation
IMO	International Maritime Organization
IOER	Integrated Offshore Emergency Response
IPC	Infrastructure Planning Commission
IWRAP	IALA Waterway Risk Assessment Programme
km	Kilometre
Km^2	Square kilometre
LAT	Lowest Astronomical Tide
LPA	Local Planning Authority
LPS	Local Port Service
m	Metre
MAIB	Marine Accident Investigation Branch

Acronym	Definition
MCA	Maritime and Coastguard Agency
MCAA	Marine and Coastal Access Act
MGN	Marine Guidance Note
MHPA	Milford Haven Port Authority
MHWS	Mean High Water Springs
MMO	Marine Management Organisation
MPS	Marine Policy Statement
MSFD	Marine Strategy Framework Directive
MW	Megawatts
nm	Nautical Mile
NPS	National Policy Statement
NPPG	The National Planning Practice Guidance
NRA	Navigational Risk Assessment
NtM	Notice to Mariners
O&M	Operation and Maintenance
OFTO	Offshore Transmission Owner (OFTO)
OSP	Offshore Substation Platform
OSPAR	The Convention for the Protection of the Marine Environment of the North-East Atlantic
OWF	Offshore Wind Farm
OWL	Offshore Wind Ltd
PDE	Project Design Envelope
PIANC	Permanent International Association of Navigational Congresses
PLBs	Personal Locator Beacons
PPE	Personal Protective Equipment
QHSE	Quality, Health, Safety- and Environment
REZ	Renewable Energy Zone
RNLI	Royal National Lifeboat Association
ROV	Remotely Operated Vehicle
RYA	Royal Yachting Association
SAR	Search and Rescue
SHA	Statutory Harbour Authority
SOLAS	Safety of Life at Sea
SOV	Service Operation Vehicle
TCE	The Crown Estate
TH	Trinity House
TSS	Traffic Separation Scheme
UK	United Kingdom

Acronym	Definition
UKC	Under Keel Clearance
UKHO	United Kingdom Hydrographic Office
UKSAR	United Kingdom Search and Rescue Helicopter
VHF	Very High Frequency
VMS	Vessel Monitoring Systems
VTS	Vessel Traffic Services
WTG	Wind Turbine Generator

Glossary of Terminology

Defined Term	Description
Agreement for Lease	An Agreement for Lease (AfL) is a non-binding agreement between a landlord and prospective tenant to grant and/or to accept a lease in the future. The AfL only gives the option to investigate a site for potential development. There is no obligation on the developer to execute a lease if they do not wish to.
Applicant	Offshore Wind Limited
Commitment	A term used interchangeably with mitigation. Commitments are Embedded Mitigation Measures. Commitments are either Primary (Design) or Tertiary (Inherent) and embedded within the assessment at the relevant point in the EIA (e.g. at Scoping). The purpose of commitments is to reduce and/or eliminate Likely Significant Effects (LSE's), in EIA terms.
Cumulative effects	The effect of the Project taken together with similar effects from a number of different projects, on the same single receptor/resource. Cumulative effects are those that result from changes caused by other past, present or reasonably foreseeable actions together with the Project.
Department for Business, Energy and Industrial Strategy (BEIS)	Government department that is responsible for business, industrial strategy, science and innovation and energy and climate change policy and consent under Section 36 of the Electricity Act.
Development Area	The area comprising the Onshore Development Area and the Offshore Development Area
Environmental Impact Assessment (EIA)	Assessment of the potential impact of the proposed Project on the physical, biological and human environment during construction, operation and decommissioning.
Export Cable Corridor	The area in which the export cables will be laid, either from the Offshore Substation or the inter-array cable junction box (if no offshore substation), to the NG Onshore Substation comprising both the Offshore Export Cable Corridor and Onshore Export Cable Corridor.
Generation Assets	The infrastructure of the Project related to the generation of electricity within the windfarm site, including wind turbine generators, substructures, mooring lines, seabed anchors and inter-array cables.
In-combination effects	In-combination effects are those effects that may arise from the development proposed in combination with other plans and projects proposed/consented but not yet built and operational.
Inter-array cables	Cables which link the wind turbines to each other and the Offshore Substation Platform, or at the inter-array cables junction box (if no offshore substation). Array cables will connect the wind turbines to one and other and to the Offshore Substation (if utilised). The initial section for the inter-array cables will be freely suspended in the water column below the substructure (dynamic sections) while the on seabed sections of the cables will be buried where possible.

Defined Term	Description
Landfall	Where the offshore export cables come ashore.
Mitigation	Mitigation measures have been proposed where the assessment identifies that an aspect of the development is likely to give rise to significant environmental impacts, and discussed with the relevant authorities and stakeholders in order to avoid, prevent or reduce impacts to acceptable levels. For the purposes of the EIA, two types of mitigation are defined: ▪ Embedded mitigation: consisting of mitigation measures that are identified and adopted as part of the evolution of the project design, and form part of the project design that is assessed in the EIA ▪ Additional mitigation: consisting of mitigation measures that are identified during the EIA process specifically to reduce or eliminate any predicted significant impacts. Additional mitigation is therefore subsequently adopted by OWL as the EIA process progresses.
Offshore Development Area	The Windfarm Site (including wind turbine generators, substructures, mooring lines, seabed anchors, inter-array cables and Offshore Substation Platform (as applicable)), Offshore Export Cable Corridor to MHWS at the Landfall, and the trenchless crossing underneath the Taw Estuary from MHWS to MHWS. This encompasses the part of the project that is the focus of this application and Environmental Statement and the parts of the project consented under Section 36 of the Electricity Act and the Marine and Coastal Access Act 2009.
Offshore Export Cables	The cables which bring electricity from the Offshore Substation Platform or the inter-array cables junction box to the Landfall.
Offshore Export Cable Corridor	The proposed offshore area in which the export cables will be laid, from Offshore Substation Platform or the inter-array cable junction box to the Landfall.
Offshore Infrastructure	All of the offshore infrastructure including wind turbine generators, substructures, mooring lines, seabed anchors, Offshore Substation Platform and all cable types (export and inter-array). This encompasses the infrastructure that is the focus of this application and Environmental Statement and the parts of the project consented under Section 36 of the Electricity Act and the Marine and Coastal Access Act 2009.
the Offshore Project	The Offshore Project for the offshore Section 36 and Marine Licence application includes all elements offshore of MHWS. This includes the infrastructure within the windfarm site (e.g. wind turbine generators, substructures, mooring lines, seabed anchors, inter-array cables and Offshore Substation Platform (as applicable)) and all infrastructure associated with the export cable route and landfall (up to MHWS) including the cables and associated cable protection (if required).

Defined Term	Description
Offshore Substation Platform	A fixed structure located within the Windfarm Site, containing electrical equipment to aggregate the power from the wind turbines and convert it into a more suitable form for export to shore
Onshore Development Area	The onshore area above MLWS including the underground onshore export cables connecting to the White Cross Onshore Substation and onward to the NG grid connection point at East Yelland. The onshore development area will form part of a separate Planning application to the Local Planning Authority (LPA) under the Town and Country Planning Act 1990.
Onshore Export Cables	The cables which bring electricity from MLWS at the Landfall to the White Cross Onshore Substation and onward to the NG grid connection point at East Yelland.
Onshore Export Cable Corridor	The proposed onshore area in which the export cables will be laid, from MLWS at the Landfall to the White Cross Onshore Substation and onward to the NG grid connection point at East Yelland.
Onshore Infrastructure	The combined name for all infrastructure associated with the Project from MLWS at the Landfall to the NG grid connection point at East Yelland. The onshore infrastructure will form part of a separate Planning application to the Local Planning Authority (LPA) under the Town and Country Planning Act 1990.
the Onshore Project	The Onshore Project for the onshore TCPA application includes all elements onshore of MLWS. This includes the infrastructure associated with the offshore export cable (from MLWS), landfall, onshore export cable and associated infrastructure and new onshore substation (if required).
Offshore Wind Limited	Offshore Wind Ltd (OWL) is a joint venture between Cobra Instalaciones Servicios, S.A., and Flotation Energy Ltd
the Project	the Project is a proposed floating offshore windfarm called White Cross located in the Celtic Sea with a capacity of up to 100MW. It encompasses the project as a whole, i.e. all onshore and offshore infrastructure and activities associated with the Project.
Project Design Envelope	A description of the range of possible elements that make up the Project design options under consideration. The Project Design Envelope, or 'Rochdale Envelope' is used to define the Project for Environmental Impact Assessment (EIA) purposes when the exact parameters are not yet known but a bounded range of parameters are known for each key project aspect.
Safety zones	A marine zone outlined for the purposes of safety around a possibly hazardous installation or works / construction area
Service operation vessel	A vessel that provides accommodation, workshops and equipment for the transfer of personnel to turbine during OMS. Vessels in service today are typically up to 85m long with accommodation for about 60 people.
Scour protection	Protective materials to avoid sediment being eroded away from the base of the foundations as a result of the flow of water.

Defined Term	Description
White Cross Offshore Windfarm	100MW capacity offshore windfarm including associated onshore and offshore infrastructure.
Wind Turbine Generators (WTG)	The wind turbine generators convert wind energy into electrical power. Key components include the rotor blades, nacelle (housing for electrical generator and other electrical and control equipment) and tower. The final selection of project wind turbine model will be made post-consent application.
Windfarm Site	The area within which the wind turbines, Offshore Substation Platform and inter-array cables will be present.
National Grid Connection	The point at which the White Cross Offshore Windfarm connects into the distribution network at East Yelland substation and the distributed electricity network. From East Yelland substation electricity is transmitted to Alverdiscott where it enters the national transmission network

15. Shipping and Navigation

15.1 Introduction

1. This chapter of the Environmental Statement (ES) presents the potential impacts of the offshore components (up to Mean High Water Springs) of the White Cross Offshore Windfarm Project (the Offshore Project) on Shipping and Navigation. Specifically, this chapter considers the potential impact of the Offshore Project seaward of Mean High-Water Springs (MHWS) during its construction, operation and maintenance, and decommissioning phases.

2. The ES has been finalised with due consideration of pre-application consultation to date (see **Chapter 7: Consultation**) and the ES will accompany the application to the Marine Management Organisation (MMO) on behalf of the Secretary of State for Business for The Department for Business, Energy and Industrial Strategy (BEIS) for Section 36 Consent and relevant Marine Licences under the Marine and Coastal Access Act (MCAA) (2009).

3. This ES chapter:

   - Presents the existing environmental baseline established from desk studies, marine traffic surveys and consultation
   - Presents the potential environmental effects on Shipping and Navigation arising from the Offshore Project, based on the information and , analysis within the Navigation Risk Assessment (NRA) undertaken by Nash Maritime (**Appendix 15.A**)
   - Identifies any assumptions and limitations encountered in compiling the environmental information
   - Highlights any necessary monitoring and/or mitigation measures which could prevent, minimise, reduce or offset the possible environmental effects identified in the Environmental Impact Assessment (EIA) process.

15.2 Policy, legislation and guidance

4. **Chapter 3: Policy and Legislative Context** describes the wider policy and legislative context for the Offshore Project. The principal policy and legislation used to inform the assessment of potential impacts on Shipping and Navigation for the Offshore Project are outlined in this section.

15.2.1 National Policy Statements

5. The specific assessment requirements for Shipping and Navigation are set out within the overarching National Policy Statement (NPS) for Renewable Energy Infrastructure (EN-3) and are summarised in **Table 15.1**. It is noted that the NPS for Renewable Energy Infrastructure (EN-3) is in the process of being revised. Draft versions were published for consultation in September 2021 (BEIS, 2021). A review of the draft versions has been undertaken in the context of this ES chapter. No new requirements applicable to shipping and navigation were identified within the draft EN-3 document (BEIS, 2021).

6. NPSs are statutory documents which set out the government's policy on specific types of Nationally Significant Infrastructure Projects (NSIPs) and are published in accordance with the Planning Act 2008. Although the Offshore Project is not an NSIP, it is recognised that due to its size of 100MW and its location in English waters, certain NPS are considered relevant to the Offshore Project and decision-making and are referred to in this ES.

Table 15.1 Summary of NPS EN-3 provisions relevant to Shipping and Navigation

Summary	How and where this is considered in the ES
"Applicants should establish stakeholder engagement with interested parties in the navigation sector early in the development phase of the proposed offshore windfarm and this should continue throughout the life of the development including during the construction, operation and maintenance, and decommissioning phases. Such engagement should be taken to ensure that solutions are sought that allow offshore windfarms and navigation uses of the sea to successfully co-exist." **- EN-3, paragraph 2.6.153.**	Consultation held to date with interested parties is detailed in **Section 15.3.8**.
"Assessment should be underpinned by consultation with the MMO, Maritime and Coastguard Agency (MCA), the relevant General Lighthouse Authority, 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." - **EN-3 paragraph 2.6.154.**	Consultation held to date with interested parties and regulators, including MCA and Trinity House is detailed in **Section 15.3.8.**
"Information on internationally recognised sea lanes is publicly available and this should be considered by applicants prior to undertaking assessments. The assessment should include reference to any relevant, publicly available data available on the Maritime Database." - **EN-3, paragraph 2.6.155.**	Datasets considered within the NRA are detailed in **Section 15.1.1**. This includes publicly available information pertaining to sea lanes and commercial routeing.

Summary	How and where this is considered in the ES
"Applicants should undertake an NRA in accordance with relevant Government guidance prepared in consultation with the MCA and the other navigation stakeholders listed above." - **EN-3, paragraph 2.6.156.**	An NRA has been undertaken in accordance with Marine Guidance Note (MGN) 654 and International Maritime Organisation (IMO) Formal Safety Assessment (FSA) guidance and is contained within **Appendix 15.A**.
"The navigation risk assessment will for example necessitate: • a survey of vessels in the vicinity of the proposed windfarm; • a full NRA of the likely impact of the windfarm on navigation in the immediate area of the windfarm in accordance with the relevant marine guidance; • cumulative and in-combination risks associated with the development and other developments (including other renewable projects) in the same area of sea. - **EN-3, paragraph 2.6.157.**	MGN 654 compliant vessel traffic surveys have been undertaken and are detailed in **Table 15.10**. An NRA has been undertaken in accordance with MGN 654 and IMO FSA guidance and is contained within **Appendix 15.A**. A cumulative and in-combination assessment has been undertaken and is detailed in **Section 15.8.2**.
"Where there is a possibility that safety zones will be sought around offshore infrastructure, potential effects should be included in the assessment on navigation and shipping." **- EN-3, paragraph 2.6.158.**	500m safety zones are assumed during construction, major maintenance and decommissioning. Operational phase safety zones are not assumed. Safety zones have been considered in the impact assessment contained in **Section 15.5**, **Section 15.6**, **Section 15.7** and **Section 15.8.**
"Where the precise extents of potential safety zones are unknown, a realistic worst-case scenario should be assessed. Applicants should consult the MCA and refer to the Government guidance on safety zones." **- EN-3, paragraph 2.6.159.**	500m safety zones are assumed during construction, major maintenance and decommissioning. Operational phase safety zones are not assumed.
"The potential effect on recreational craft, such as yachts, should be considered in any assessment." **- EN-3, paragraph 2.6.160.**	Impacts to recreational and fishing vessels have been considered within the NRA (**Appendix 15.A**) and within the impact assessment contained in **Section 15.5**, **Section 15.6**, **Section 15.7** and **Section 15.8**.
"The Infrastructure Planning Commission (IPC) should not grant development consent in relation to the construction or extension of an offshore windfarm if it considers that interference with the use of recognised sea lanes essential to international navigation is likely to be caused by	Impacts to commercial routeing and sea lanes are assessed in **Section 15.5.1, Section 15.6.1, Section 15.7.1** and **Section 15.8.1.**

Summary	How and where this is considered in the ES
the development. The use of recognised sea lanes essential to international navigation means: (a) anything that constitutes the use of such a sea lane for the purposes of article 60(7) of the United Nations Convention on the Law of the Sea 1982; or (b) any use of waters in the territorial sea adjacent to Great Britain that would fall within paragraph (a) if the waters were in a Renewable Energy Zone (REZ)." **- EN-3, paragraph 2.6.161.**	
"The IPC should be satisfied that the site selection has been made with a view to avoiding or minimising disruption or economic loss to the shipping and navigation industries with particular regard to approaches to ports and to strategic routes essential to regional, national and international trade, lifeline ferries and recreational users of the sea. Where a proposed development is likely to affect major commercial navigation routes, for instance by causing appreciably longer transit times, the IPC should give these adverse effects substantial weight in its decision making. There may, however, be some situations where reorganisation of traffic activity might be both possible and desirable when considered against the benefits of the windfarm proposal. Such circumstances should be discussed with the MCA and the commercial shipping sector and it should be recognised that alterations might require national endorsement and international agreement and that the negotiations involved may take considerable time and do not have a guaranteed outcome**." - EN-3, paragraph 2.6.162.**	Impacts to existing vessel routeing is assessed in **Section 15.5.1, Section 15.6.1, Section 15.7.1** and **Section 15.8.1**. Impacts to access to nearby ports are assessed in **Section 15.5.1, Section 15.5.2, Section 15.5.5, Section 15.6.1, Section 15.6.2**, **Section 15.6.5**, **Section 15.7.1**, **Section 15.7.2** and **Section 15.7.5**. Further details on changes to transit times and existing routing is contained within the NRA (**Appendix 15.A**). (**Appendix 15.A**).
"Where a proposed offshore windfarm is likely to affect less strategically important shipping routes, a pragmatic approach should be employed by the IPC. For example, vessels usually tend to transit point to point routes between ports (regional, national and international). Many of these routes are important to the shipping and ports industry as is their contribution to the UK economy. In such circumstances the IPC should expect the applicant to minimise negative impacts to as low as reasonably practicable (ALARP). Again, there may be some situations where reorganisation of traffic	Impacts to existing vessel routeing is assessed in **Section 15.5.1, Section 15.6.1, Section 15.7.1** and **Section 15.8.1**. Impacts to access to nearby ports are assessed in **Section 15.5.1, Section 15.5.2, Section 15.5.5, Section 15.6.1, Section 15.6.2**, **Section 15.6.5**, **Section 15.7.1**, **Section 15.7.2** and **Section 15.7.5**.

Summary	How and where this is considered in the ES
activity might be both possible and desirable when considered against the benefits of the windfarm application and such circumstances should be discussed with the MCA and the commercial shipping sector." - **EN-3, paragraph 2.6.163.**	Further details on changes to transit times and existing routing is contained within the NRA (**Appendix 15.A**).
"A detailed Search and Rescue Response Assessment should be undertaken prior to commencement of construction should consent for the offshore windfarm be granted. This assessment could be secured by a requirement to any consent. However, where there are significant concerns over the frequency or the consequences of such incidents, a full assessment may be required before the application can be determined." **- EN-3, paragraph 2.6.164.**	Impacts to search and rescue are assessed in **Section 15.5.6, Section 15.6.6, Section 15.7.6** and **Section 15.8.5**. The requirement to complete an Emergency Response and Cooperation Plan (ERCOP) is embedded in the Offshore Project design (**Section 15.3.4.1**). The turbine layout will be agreed with the MCA and Trinity House (TH) prior to construction.
"The IPC should not consent applications which pose unacceptable risks to navigational safety after all possible mitigation measures have been considered."**- EN-3, paragraph 2.6.165.**	All hazards were assessed to be ALARP within the NRA (**Appendix 15.A**) and are assessed as **not significant** in EIA terms in the impact assessment.
"The IPC should be satisfied that the scheme has been designed to minimise the effects on recreational craft and that appropriate mitigation measures, such as buffer areas, are built into applications to allow for recreational use outside of commercial shipping routes. In view of the level of need for energy infrastructure, where an adverse effect on the users of recreational craft has been identified, and where no reasonable mitigation is feasible, the IPC should weigh the harm caused with the benefits of the scheme." **- EN-3, paragraph 2.6.166.**	Impacts to recreational and fishing vessels have been considered within the NRA (**Appendix 15.A**) and within the impact assessment contained in **Section 15.5**, **Section 15.6**, **Section 15.7** and **Section 15.8**.
"Providing proposed schemes have been carefully designed by the applicants, and that the necessary consultation with the MCA and the other navigation stakeholders listed above has been undertaken at an early stage, mitigation measures may be possible to negate or reduce effects on navigation to a level sufficient to enable the IPC to grant consent. The MCA will use the NRA as described in paragraph 2.6.156 above when advising the IPC on any mitigation measures proposed." **- EN-3, paragraph 2.6.167.**	Mitigation measures embedded in the design are outlined in **Section 15.3.4.1**. Additional mitigation measures proposed are outlined in the impact assessment and summarised in **Table 15.21**.
"The IPC should, in determining whether to grant consent for the construction or extension of an offshore wind farm, and what requirements to include in such a consent, have regard to the	All hazards were assessed to be ALARP within the NRA (**Appendix 15.A**) and are assessed as **not significant** in EIA terms in the impact assessment.

Summary	How and where this is considered in the ES
extent and nature of any obstruction of or danger to navigation which (without amounting to interference with the use of such sea lanes) is likely to be caused by the development." **- EN-3, paragraph 2.6.168.**	
"In considering what interference, obstruction or danger to navigation and shipping is likely and its extent and nature, the IPC should have regard to the likely overall effect of the development in question and to any cumulative effects of other relevant proposed, consented and operational offshore wind farms." **- EN-3, paragraph 2.6.169.**	All hazards were assessed to be ALARP within the NRA (**Appendix 15.A**). All impacts, including cumulative effects, and are assessed as **not significant** in EIA terms in the impact assessment.

15.2.2 Legislation and guidance

7. In addition to the NPS, there are a number of pieces of guidance applicable to the assessment of shipping and navigation. These include:

- Marine Guidance Note (MGN) 654 (Merchant and Fishing) Safety of Navigation: Offshore Renewable Energy Installations (OREIs) – Guidance on United Kingdom (UK) Navigational Practice, Safety and Emergency Response (MCA, 2021)
- MGN 372 (Merchant and Fishing) OREIs: Guidance to Mariners Operating in the Vicinity of UK OREIs (MCA, 2008)
- Methodology for Assessing the Marine Navigational Safety & Emergency Response Risks of OREI (MCA, 2021)
- Revised Guidelines for Formal Safety Assessment for use in the Rule-Making Process (IMO, 2018)
- International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) Recommendation G 1162 on The Marking of Man-Made Offshore Structures (IALA, 2021)
- The RYA Position on Offshore Renewable Energy Developments: Paper 1 (of 4) – Wind Energy (RYA, 2019)
- Permanent International Association of Navigational Congresses (PIANC) WG161 Interaction Between Offshore Windfarms and Maritime Navigation (PIANC, 2018)
- Nautical Institute (2013) The Shipping Industry and Marine Spatial Planning
- G+ Integrated Offshore Emergency Response (IOER) (2019) Good practice guidelines for offshore renewable energy developments

- Health and Safety Executive (HSE) and MCA (2017). Regulatory expectations on moorings for floating wind and marine devices
- Standard Marking Schedule for Offshore Installations (Department of Energy and Climate Change (DECC, 2011a)
- South-West Inshore and South-West Offshore Marine Plan (MMO, 2021).

8. **Table 15.2** provides a summary of the key guidance from the South-West Marine Plan relevant to shipping and navigation.

Table 15.2 Summary of South-West Marine Plan sections relevant to Shipping and Navigation.

Summary	How and where this is considered in the ES.
"Only proposals demonstrating compatibility with current port and harbour activities will be supported. Proposals within statutory harbour authority areas or their approaches that detrimentally and materially affect safety of navigation, or the compliance by statutory harbour authorities with the Open Port Duty or the Port Marine Safety Code, will not be authorised unless there are exceptional circumstances. Proposals that may have a significant adverse impact upon future opportunity for sustainable expansion of port and harbour activities, must demonstrate that they will, in order of preference: Avoid; Minimise; and Mitigate adverse impacts so they are no longer significant. If it is not possible to mitigate significant adverse impacts, proposals should state the case for proceeding." – **South-West Marine Plan, paragraph SW-PS-1**.	Impacts to access to nearby ports are assessed in **Section 15.5.1, Section 15.5.2, Section 15.5.5, Section 15.6.1, Section 15.6.2, Section 15.6.5 Section 15.7.1, Section 15.7.2** and **Section 15.7.5.**
"Proposals that require static sea surface infrastructure or that significantly reduce under-keel clearance must not be authorised within or encroaching upon International Maritime Organization routeing systems unless there are exceptional circumstances." – **South-West Marine Plan, paragraph SW-PS-2.**	Impacts associated with the export cable (including under-keel clearance) are assessed within **Section 15.5.5, Section 15.6.5** and **Section 15.7.5**. Impacts to under-keel clearance as a result of the windfarm site moorings are assessed in **Section 15.5.7, Section 15.6.7** and **Section 15.8.6**.

Summary	How and where this is considered in the ES.
	Impacts to existing vessel routeing is assessed in **Section 15.5.1, Section 15.6.1, Section 15.7.1** and **Section 15.8.1.** Further detail on deviations to existing routing is contained within the NRA (**Appendix 15.A**).
"Proposals that require static sea surface infrastructure or that significantly reduce under-keel clearance which encroaches upon high density navigation routes, strategically important navigation routes, or that pose a risk to the viability of passenger services, must not be authorised unless there are exceptional circumstances." – **South-West Marine Plan, paragraph SW-PS-3.**	Impacts to existing vessel routeing is assessed in **Section 15.5.1, Section 15.6.1, Section 15.7.1** and **Section 15.8.1**. Further detail on deviations to existing routing is contained within the NRA (**Appendix 15.A**).

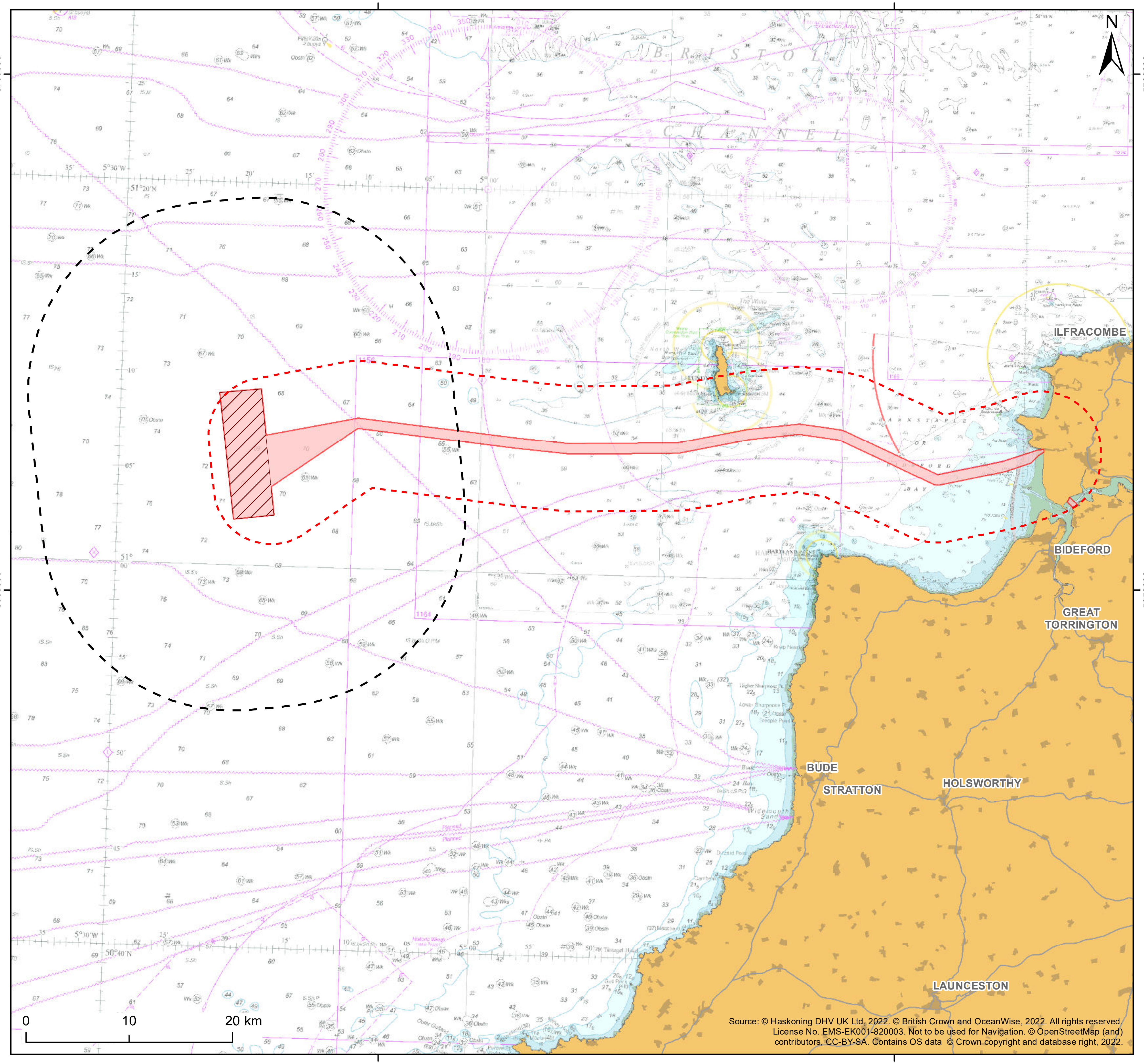
15.3 Assessment methodology

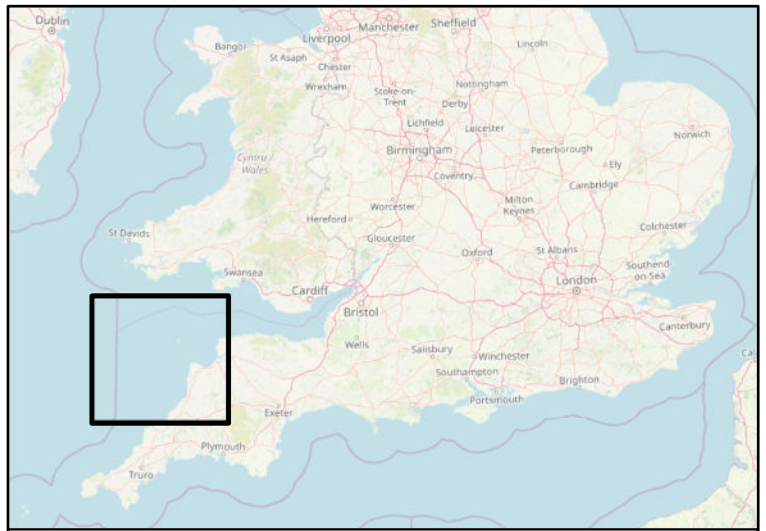
15.3.1 Study area

9. Details of the location of the Offshore Project and the offshore infrastructure are set out within **Chapter 5: Project Description.**

10. The Shipping and Navigation study area is defined by the distance over which impacts on shipping and navigation from all offshore project elements may occur and the location of any receptors that may be affected by those potential impacts.

11. The study area for shipping and navigation is defined as an area 10nm from the generation assets search area and 3nm from export cable search area. This has been established using professional judgement and industry best practice and is supported by the NRA (**Appendix 15.A**). The study area is shown in **Figure 15.1**.





Legend:
- Windfarm Site
- Offshore Development Area
- 10nm Wind Farm Site Shipping and Navigation Study Area
- 3nm Offshore Cable Corridor Shipping and Navigation Study Area

Client:	Project:
Offshore Wind Ltd.	White Cross Offshore Windfarm

Title:

Shipping and Navigation Study Area

Figure: 15.1 | Drawing No: PC2978-RHD-ZZ-XX-DR-Z-0453

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P02	03/03/2023	AB	RW	A3	1:375,000
P01	14/12/2022	AB	RW	A3	1:375,000

Co-ordinate system: WGS 1984 UTM Zone 30N

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15.3.2 Approach to assessment

12. The assessment methodology for shipping and navigation differs to the overarching EIA Methodology presented in **Chapter 6: EIA Methodology**. The methodology mirrors that utilised within the NRA in compliance with the IMO FSA process as required by MGN 654. The matrix was discussed with stakeholders during the hazard workshop and revised to reflect their feedback. Further details on the risk assessment criteria and methodology are contained within the NRA (**Appendix 15.A**).

15.3.2.1 Impact assessment criteria

13. The IMO FSA guidance defines a hazard as potential to threaten human life, health, property or the environment, the realisation of which results in an incident or accident. The potential for a hazard to be realised (i.e. likelihood) can be combined with an estimated or known consequence of outcome and this combination is termed "risk". The terms used to define frequency of occurrence and severity of consequence are outlined in **Table 15.3** and **Table 15.4**.

Table 15.3 Definition of terms relating to frequency of occurrence.

Rank	Description	Definition
1	Remote	<1 occurrence per 1,000 years
2	Extremely unlikely	1 per 100 – 1,000 years
3	Unlikely	1 per 10 – 100 years
4	Reasonably probable	1 per 1 – 10 years
5	Frequent	Yearly

14.

Table 15.4 Definition of terms relating to severity of consequence

Rank	Description	Definition People	Property	Environment	Business
1	Negligible	No Perceptible Impact	No Perceptible Impact or less than £10,000	No Perceptible Impact	No Perceptible Impact
2	Minor	Slight injury(s)	£10,000-£100,000	Tier 1 Local assistance required	Local negative publicity, short term loss of revenue to port/Offshore Wind Farm (OWF) £10,000-£100,000
3	Moderate	Multiple minor or single	£100,000-£1million	Tier 2 Limited external assistance required	Widespread negative publicity, temporary suspension of activities at

Rank	Description	Definition People	Property	Environment	Business
		serious injury			port/OWF £100,000 Local publicity -£1million
4	Serious	Multiple serious injury or single fatality	£1million-£10million	Tier 2 Regional assistance required	National negative publicity, prolonged closure or restrictions to port/OWF £1million National publicity -£10million
5	Major	More than one fatality	>£10million	Tier 3 National assistance required	International negative publicity, serious disruption to operations to port/OWF >£10million International publicity

15. The significance of the effect upon shipping and navigation is determined by combining the frequency of occurrence and severity of consequence to establish the overall risk (**Table 15.5**).

16. Potential impacts identified within the assessment as major are regarded as significant in EIA terms. Impacts identified within the assessment as moderate are regarded as significant in EIA terms unless assessed to be ALARP within the NRA FSA. Definitions of each level of significance in EIA terms are provided in **Table 15.6**.

Table 15.5 Significance of an impact - resulting from each combination of frequency of occurrence and severity of consequence

Risk Matrix							
Severity of consequences	**Major**	**5**	Broadly Acceptable (low risk)	Tolerable (medium risk)	Unacceptable (high risk)	Unacceptable (extreme risk)	Unacceptable (extreme risk)
	Serious	**4**	Broadly Acceptable (low risk)	Broadly Acceptable (low risk)	Tolerable (medium risk)	Unacceptable (high risk)	Unacceptable (extreme risk)
	Moderate	**3**	Broadly Acceptable (negligible risk)	Broadly Acceptable (low risk)	Tolerable (medium risk)	Tolerable (medium risk)	Unacceptable (high risk)
	Minor	**2**	Broadly Acceptable (negligible risk)	Broadly Acceptable (low risk)	Broadly Acceptable (low risk)	Broadly Acceptable (low risk)	Tolerable (medium risk)
	Negligible	**1**	Broadly Acceptable (negligible risk)	Broadly Acceptable (negligible risk)	Broadly Acceptable (negligible risk)	Broadly Acceptable (low risk)	Broadly Acceptable (low risk)
			1	**2**	**3**	**4**	**5**
			Remote	**Extremely unlikely**	**Unlikely**	**Reasonably probable**	**Frequent**
			Frequency of Occurrence				

Table 15.6 Definition of impact significance

Hazard Risk Rating	Tolerability	Description	EIA Significance
Negligible Risk	Broadly Acceptable	Generally regarded as not significant and adequately mitigated. Additional risk reduction should be implemented if reasonably practicable and proportionate	Negligible Impact is not significant
Low Risk			Minor Impact is not significant
Medium Risk	Tolerable (if ALARP)	Generally regarded as within a zone where the risk may be tolerable in consideration of the project. Requirement to properly assess risks, regularly review and implement risk controls to maintain risks to within ALARP where possible.	Moderate Impact may be significant or not-significant (**Chapter 6: EIA Methodology**)
High Risk **Extreme Risk**	Unacceptable	Generally regarded as significant and unacceptable for project to proceed without further review.	Major Impact is Significant

15.3.3 Worst-Case Scenario

17. In accordance with the assessment approach to the Project Design Envelope (PDE), or 'Rochdale Envelope', set out in **Chapter 6: EIA Methodology**, the impact assessment for shipping and navigation has been undertaken based on a realistic worst-case scenario of predicted impacts. The PDE for the Offshore Project is detailed in **Chapter 5: Project Description**.

18. **Table 15.7** presents the realistic worst-case scenario elements considered for the assessment of shipping and navigation.

Table 15.7 Definition of realistic worst-case scenario details relevant to the assessment of impacts in relation to Shipping and Navigation

Impact	Realistic worst-case scenario	Rationale
Construction		
Impact 1: Impact on Vessel Traffic Routeing **Impact 2: Impact on Milford Haven Operations**	**Project characteristics** Minimum lease period: 25 years **WTGs** Maximum number WTGs installed: 8 Min Air draught above MHWS: 22m Maximum rotor diameter: 262m Minimum in-row spacing: 1,110m Minimum inter-row spacing: 2,200m **Indicative construction programme (turbines)** January 2025 – October 2027 including 10 months offshore construction. **Potential construction/Assembly Ports under consideration:** H&W Belfast, Port Talbot, Hunterston, Falmouth, Bristol Port **Indicative construction vessels (turbines)** Total number of vessels: 12 including, 4 x barge, 2 x small tug, 1 x anchor handling tug, 1 x Service Operation Vessel (SOV) Total number of vessel movements: 56 Total days on site: 90 **Offshore Substation Platform (OSP)** Maximum width: 50m Maximum height: 80m (relative to Lowest Astronomical Tide (LAT)).	The worst-case displacement will result from the worst-case wind farm site area plus any buoyed construction area including 500m construction safety zones.
Impact 3: Impact on Risk of Allision		The worst-case impact on contact risk will result from the maximum number of turbines installed over the largest possible area with minimum turbine spacing.
Impact 4: Impact on Risk of Collision		The worst-case displacement will result from the worst-case wind farm site area plus any buoyed construction area including 500m construction safety zones. The worst-case displacement may push traffic closer together increasing encounter potential.
Impact 5: Impact of Export Cable and Inter-array Cables on Vessel Safety and Activities	**Inter-array cables** Maximum length of inter-array cabling: 29.76km Minimum burial depth: 3m Maximum cable and pipeline crossings: 0	The worst-case scenario for the cable corridor is the maximum length of export cable and infield cables plus any construction buffers/safety zones. The

Impact	Realistic worst-case scenario	Rationale
	Maximum crossing height: 7m Maximum length of protected cabling: 3,200m Maximum cable protection height: 1.8m **Indicative construction programme (inter-array cables)** 2-6 months between Q2 to Q3 2027 (pre-trenching, lay and burial. Pre and post-lay surveys. Rock placement where necessary). **Indicative construction vessels** Maximum vessels required: 8 (Cable Lay Vessel, cable support vessel, pre-trenching / dredging vessel, seabed preparation vessel, survey vessel, cable burial / jetting, rock placement vessel, commissioning vessel, crew transfer). Maximum vessel movements: 40 Maximum days on site: 70	worst-case in terms of under-keel clearance is the maximum height of cable protection when considered with the minimum water depth.
	Offshore Export Cable Maximum number of cables: 2 Length per cable: 93.6km Installation corridor width: 25m Spacing between each installation corridor: 50m Minimum burial depth: 0.5m Maximum number of anchor points for cable laying vessel: 12 Maximum length of protected cabling: 34,080m Maximum height of cable protection: 1m Number of cable/pipeline crossings: 8 Maximum cable crossing height: 1.8m **Indicative construction programme (export cable)** 6-12 months Maximum vessels required: 15 (Cable Lay Vessel (CLV), cable support vessel, landfall cable installation vessels (numerous during pull-in	

Impact	Realistic worst-case scenario	Rationale
	activities), pre-trenching / dredging vessel, seabed preparation vessel, survey vessel, cable burial / jetting, rock placement vessel, commissioning vessel, crew transfer). Maximum vessel movements: 40 Maximum days on site: 300	
Impact 6: Impact on Search and Rescue	**Project characteristics** Minimum lease period: 25 years **WTGs** Maximum total project capacity of turbines installed: 100MW Maximum number WTGs installed: 8 Min Air draught above MHWS: 22m Maximum rotor diameter: 262m Minimum in-row spacing: 1,110m Minimum inter-row spacing: 2,200m **Construction programme (turbines)** January 2025 – October 2027 including 10 months offshore construction. **Potential construction/Assembly Ports under consideration:** H&W Belfast, Port Talbot, Hunterston, Falmouth, Bristol Port **Indicative construction vessels (turbines)** Total number of vessels: 12 including, 4 x barge, 2 x small tug, 1 x anchor handling tug, 1 x SOV Total number of vessel movements: 56 Total days on site: 90 **OSP** Maximum width: 50m Maximum height: 80m (relative to (LAT)).	The worst-case impact on search and rescue is layout driven and will result from the maximum number of turbines with minimum turbine spacing.
Impact 7: Impact on Under Keel Clearance and Snagging Risk (windfarm site)	**Moorings** Maximum anchor diameter 10 x 10m Maximum footprint per turbine: 2,424m^2	The worst-case scenario for under-keel clearance and snagging is presented by the maximum length and number of

Impact	Realistic worst-case scenario	Rationale
	Indicative Construction programme (moorings) Mooring hook-up to substructures: Q3 2026 to Q3 2027 Anchor and mooring pre-laid prior to substructure arriving at site. Once substructure on site anchor handling tug used to pull in mooring line fair lead and connect to substructure. **Indicative construction vessels (moorings)** Number of vessels: 8 2 x anchor handling tug, 2 x chain supply vessel, 1 x Remotely Operated Vehicle (ROV) vessel Total number of vessel movements: 66 Total days on site: 53	moorings with consideration of the minimum water depth.
Operation		
Impact 1: Impact on Vessel Traffic Routeing **Impact 2: Impact on Milford Haven Operations**	**Project characteristics** Minimum lease period: 25 years **Turbines** Maximum number WTGs installed: 8 Min Air draught above MHWS: 22m Maximum rotor diameter: 262m Minimum in-row spacing: 1,110m Minimum inter-row spacing: 2,200m **Indicative maintenance vessels** ROV and SOV vessels Maximum vessel movements: 40 per year Maximum days on site: 91 per year **OSP** Maximum width: 50m Maximum height: 80m (relative to (LAT)). **Vessel movements**	The worst-case displacement will result from the worst-case wind farm site area plus any buoyage including any safety zones during major maintenance.
Impact 3: Impact on Risk of Allision		The worst-case impact on contact risk will result from the maximum number of turbines installed over the largest possible area with minimum turbine spacing.
Impact 4: Impact on Risk of Collision		The worst-case displacement will result from the worst-case wind farm site area plus any buoyage including any safety zones during major maintenance. The worst-case displacement may push traffic closer together increasing encounter potential.

Impact	Realistic worst-case scenario	Rationale
Impact 8: Impact on Communications, Radar and Positioning Systems	Maximum number of 2,400 crew transfer and O&M vessels transiting to and from the Windfarm Site during lifetime of the Project.	The worst-case for communications, radar and positioning systems is presented by the maximum size and number of turbines/ infrastructure at the minimum proximity to routeing.
Impact 5: Impact of Export Cable on Vessel Safety and Activities	**Inter-array cables** Maximum length of inter-array cabling: 29.76km Minimum burial depth: 0.5m Maximum cable and pipeline crossings: 3 Maximum crossing height: 1.8m Maximum length of protected cabling: 3,200m Maximum cable protection height: 1m **Offshore Export Cable** Maximum number of cables: 2 Length per cable: 93.6km Installation corridor width: 25m Spacing between each installation corridor: 50m Minimum burial depth: 0.5m Maximum number of anchor points for cable laying vessel: 12 Maximum length of protected cabling: 34,080m Maximum height of cable protection: 1m Number of cable/pipeline crossings: 8 Maximum cable crossing height: 1.8m	The worst-case scenario for the cable corridor is the maximum length of export cable and infield cables plus any safety zones during major maintenance. The worst-case in terms of under-keel clearance is the maximum height of cable protection when considered with the minimum water depth.
Impact 6: Impact on Search and Rescue	**Project characteristics** Minimum lease period: 25 years **WTGs** Maximum total project capacity of turbines installed: 100MW Maximum number WTGs installed: 8 Min Air draught above MHWS: 22m Maximum rotor diameter: 262m Minimum in-row spacing: 1,110m Minimum inter-row spacing: 2,200m	The worst-case impact on search and rescue is layout driven and will result from the maximum number of turbines with minimum turbine spacing.

Impact	Realistic worst-case scenario	Rationale
	Indicative maintenance vessels ROV and SOV vessels Maximum vessel movements: 40 per year Maximum days on site: 91 per year **OSP** Maximum width: 50m Maximum height: 80m (relative to (LAT)).	
Impact 7: Impact on Under Keel Clearance and Snagging Risk	**Moorings** Maximum anchor diameter 10 x 10m Maximum footprint per turbine: 2,424m^2	The worst-case scenario for under-keel clearance and snagging is presented by the maximum length and number of moorings with consideration of the minimum water depth.
Impact 9: Impact of Turbine Breakout on Vessel Safety	**WTGs** Maximum total project capacity of turbines installed: 100MW Maximum number WTGs installed: 8 Min Air draught above MHWS: 22m Maximum rotor diameter: 262m Minimum in-row spacing: 1,110m Minimum inter-row spacing: 2,200m **Moorings** Maximum anchor diameter 10 x 10m Maximum footprint per turbine: 2,424m^2	The worst-case for turbine breakout is presented by the maximum number of turbines over the largest area. Moorings will be required to comply with industry standard regulations to reduce the likelihood of breakout.
Decommissioning		
No decision has yet been made regarding the final decommissioning strategy. It is also recognised that legislation and industry best-practice change over time. The detail and scope of decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and will be agreed with the regulator. It is anticipated that for the purposes of a worst-case scenario, the impacts will be no greater than those identified in the construction phase.		

15.3.4 Summary of Mitigation

15.3.4.1 Embedded Mitigation

19. This section outlines the embedded mitigation relevant to the shipping and navigation assessment, which has been incorporated into the design of the Offshore Project (**Table 15.8**). Where additional mitigation measures are proposed, these are detailed in the impact assessment.

Table 15.8 Embedded mitigation measures relevant to the shipping and navigation assessment

Mitigation embedded into the design of the Offshore Project	Description	Component /Activity Mitigated
Promulgation and Awareness		
Notice to Mariners (NtM)	To ensure that the appropriate authorities are informed of works being carried out in waters adjacent to the Offshore Project. To include: • UK Hydrographic Office (UKHO) • MCA • Kingfisher • TH • RYA • Local Ports and Harbours • Oil and Gas Operators • MMO.	All direct impacts of project.
Site Marking and Charting	Site is marked on nautical charts including an appropriate chart note.	All direct impacts of project.
Safety Zone	Application and use of safety zones of up to 500m from platform edge (at sea level) during construction/major maintenance and decommissioning phases. Safety zones shall be of appropriate configuration, extent and application to specified vessels of identified primary risk of sub-sea equipment to fishing and snagging hazard.	Risk of allision with structures.
Fishing Liaison and Coexistence Plan	Provision of detailed project information to fishermen, such as site and export cable route location for upload into fish plotters	Fishing hazards, including snagging of cables.
Emergency Response		

Mitigation embedded into the design of the Offshore Project	Description	Component /Activity Mitigated
ERCOP	Emergency Response Co-Operation Plan with agreement of MCA.	Reduction of consequences of incidents.
Marine Pollution Contingency Plan	Measures will be adopted to ensure that the potential for release of pollutants from construction and operation and maintenance activities is minimised, which will include planning for accidental spills and responding to all potential contaminant releases.	Reduction of consequences of incidents.
Periodic Exercises	Periodic emergency management and response exercises will be run by the Applicant, in conjunction with Coastguard Operations Centre (CGOC) and Search and Rescue (SAR).	Reduction of consequences of incidents.
Incident Investigation and Reporting	There are statutory incident reporting requirements and expectations: • Marine Accident Investigation Branch (MAIB) (Merchant Shipping Act) • HSE (RIDDOR) • Harbour Authority under Port Marine Safety Code. Risk assessments to be reviewed following incidents, and additional risk controls identified if appropriate.	Reduction of likelihood of incident reoccurrence.
Site Design		
Aids to Navigation	Suitable Aids to Navigation (AtoN) lighting and marking the OWF site shall be undertaken complying with IALA Recommendations G1162 (IALA, 2021), to be finalised and approved in consultation with MCA and TH through an Aids to Navigation Management Plan. Fog horns to alert vessels to the position of structures when visibility is poor. Note planned update to O-139 to include painting reference from waterline (not HAT). Wind turbine generator (WTG) informal naming/associated markings shall not interfere with formal AtoN's.	Risk of allision with structures.

Mitigation embedded into the design of the Offshore Project	Description	Component /Activity Mitigated
	Automatic Identification System (AIS) transponders to be placed on periphery corner WTGs	
Buoyed Construction Area	Buoys deployed around construction work in windfarm site in line with THLS requirements and may include a combination of cardinal and/or safe water marks. To be finalised and approved in consultation with MCA and THLS through an Aids to Navigation Management Plan.	Risk of allision with structures or collision with construction vessels.
Hydrographic Surveys	MGN 654 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 and the UKHO. Further information can be found in MGN 654 Annex 4 supporting document titled 'Hydrographic Guidelines for Offshore Developers'.	Risk of grounding or snagging of cables.
Cable Burial Risk Assessment (CBRA) (Appendix 8.C) and periodic validation surveys	CBRA to be undertaken pre-construction, including consideration of Under Keel Clearance (UKC). All subsea cables will be either fully buried (where ground conditions permit and burial tool performance allows), partially buried (buried but not to target depth) with rock protection, or surface laid with rock protection. Selected methods will be based on the CBRA and the protection will be periodically monitored and maintained as practicable. No more than 5% reduction in water depth (referenced to Chart Datum) will occur at any point on the cable route without prior written approval from the Licensing Authority.	Risk of grounding or snagging of cables.
Air Draught Clearance	Wind turbine blades will have at least 22 m clearance above MHWS. Noting these are floating, not fixed structures.	Risk of allision/contact with structures.
Layout Plan and Lines of Orientation	WTG layout plan to be agreed with MCA and THLS prior to construction	Risk of allision/contact with

Mitigation embedded into the design of the Offshore Project	Description	Component /Activity Mitigated
	and either maintain two lines of orientation or propose a suitable layout that is acceptable to the MCA/TH.	structures and ensuring access for SAR.
Electromagnetic interference minimisation	A Cable Specification and Installation Plan will be prepared as part of the Code of Construction Practice. This will include the technical specification of offshore electrical circuits, and a desk-based assessment of attenuation of electro-magnetic field strengths, shielding and cable burial depth in accordance with industry good practice.	Impact on navigation and communications equipment.
Construction Method Statement and Programme Decommissioning Plan	Construction programme and plan to be submitted to MCA and TH for consultation. Where possible, construction to follow linear progression avoiding disparate construction sites across development area. Agreement of a decommissioning plan prior to decommissioning.	Risk of allision with structures or collision with construction vessels.
Moorings Design	Adherence with HSE/MCA guidance "Regulatory expectations on moorings for floating wind and marine devices".	Breakout
Operational Management		
Marine Operating Guidelines	Project vessels during construction and co-ordination during operation and maintenance to ensure project vessels do not present unacceptable risks to each other or third parties. Project marine traffic coordination plans to be made available to all maritime users. Information and warnings will be distributed via Notices to Mariners and other appropriate media (e.g. Admiralty Charts and fishermen's awareness charts) to enable vessels and operators to effectively and safely navigate around the windfarm site and activities during the Offshore Export Cable Corridor construction.	Risk of allision with structures or collision with vessels.
Vessel Standards	All work vessels operating on behalf of projects will be required to adhere with the following:	Risk of allision with structures or collision with vessels.

Mitigation embedded into the design of the Offshore Project	Description	Component /Activity Mitigated
	• MCA Vessel Coding (e.g. Small Commercial vessel (SCV)) • Appropriate Insurance • Crewed by suitably trained/qualified personnel • AIS (Class A/B) • very high frequency (VHF) (Ch16) • Mooring Arrangements.	
Personal Protective Equipment (PPE)	All personnel will wear the correct PPE suitable for the location and role at all times, as defined by the relevant Quality, Health, Safety and Environment (QHSE) documentation. This will include the use of Personal Locator Beacons (PLBs).	Minimising risk of loss of life.
Guard Vessels	Provision of guard vessel in vicinity of windfarm site during construction or major maintenance to monitor 3rd party vessel traffic and intervene with warnings as necessary.	Risk of allision with structures or collision with construction vessels.
Inspection and Maintenance Programme	Regular maintenance regime by the Applicant to check the Offshore Project infrastructure, its fittings and any signs of wear and tear. This should identify any faults which might result in a failure.	Minimising risk of project asset failure.
Training	Developers are responsible for ensuring that all staff engaged on operations are competent to carry out the allocated work.	Minimising risk of loss of life.
Compliance with International, UK and Flag State Regulations inc. IMO conventions	Compliance from all vessels associated with the proposed project with international maritime regulations as adopted by the relevant flag state (e.g. International Convention for the Prevention of Collision at Sea (COLREGS) (IMO, 1972) and International Convention for the Safety of Life at Sea (SOLAS (IMO, 1974)	Risk of allision with structures or collision with vessels.
Vessel health and safety requirements	As industry standard mitigation, the Applicant will ensure that all project related vessels meet both IMO	Minimising risk of loss of life.

Mitigation embedded into the design of the Offshore Project	Description	Component /Activity Mitigated
	conventions for safe operation as well as HSE requirements, where applicable. This shall include the following good practice: • Windfarm associated vessels will comply with international maritime regulations • All vessels, regardless of size, will be required to carry AIS equipment on board • All vessels engaged in activities will comply with relevant regulations for their size and class of operation and will be assessed on whether they are appropriate for activities they are required to carry out • All marine operations will be governed by operational limits, tidal conditions, weather conditions, and vessel traffic information. • Walk to work solutions will be utilised where relevant.	
Site Monitoring		
Continuous Watch	Continuous watch by multi-channel VHF, including Digital Selective Calling (DSC).	Responding to incidents swiftly.

15.3.5 Baseline data sources

15.3.5.1 Desktop Study

20. A desk study was undertaken as part of the NRA to obtain information on shipping and navigation (**Appendix 15.A**). Data were acquired within the study area through a detailed desktop review of existing studies and datasets and raw data was acquired through a vessel survey in line with MGN 654 requirements. Agreement was reached with consultees that the data collected, and the sources used to define the baseline characterisation for shipping and navigation are appropriate to inform the NRA and EIA.

21. Data used to inform the assessment are presented in **Table 15.9**.

Table 15.9 Data sources used to inform the shipping and navigation assessment

Source	Summary
Marine Traffic	One year's high-fidelity Automatic Identification Systems data (AIS) from April 2021 to March 2022.
MMO	2019 anonymised AIS data. 2019 Vessel Monitoring Systems (VMS) data
European Marine Observation and Data Network (EMODNet)	2019 vessel density grids.
RYA	Coastal Atlas of Recreational Boating (2022).
Oslo and Paris Conventions (OSPAR)	European Union (EU) VMS 2017 data.
Department for Transport (DfT)	Shipping statistics (2000 to 2021).
MAIB	Accidents (UK) (1992-2001).
Royal National Lifeboat institute (RNLI)	Incident callout data (2010 -2019).
DfT	SAR helicopter taskings.
The Crown Estate (TCE)	Marine Aggregate dredging licenses (2022). Offshore renewables (2022).
North Sea Transition Authority	Oil and gas activity (2022).
Admiralty	Nautical charts (2022).
Admiralty Total Tide	Tidal data.
Sailing Directions UKHO (2022). NP37 - Admiralty Sailing Directions: West Coast of England and Wales Pilot. 21st Edition.	MetOcean data.

15.3.5.2 Site specific survey

22. Site-specific surveys were undertaken in accordance with MGN 654 requirements to inform the NRA and EIA, as agreed with the statutory consultees. A summary of the surveys is outlined in **Table 15.10**. Further information on the surveys is located within the NRA (**Appendix 15.A**).

Table 15.10 Summary of site-specific survey data

Survey name and year	Summary
Vessel Traffic Survey (Winter, 2022)	14-day vessel traffic survey to obtain winter radar, AIS and visual data across the study area between 25-Jan-22 and 07-Feb-22.
Vessel Traffic Survey (Summer, 2022)	14-day vessel traffic survey to obtain radar, AIS and visual data across the study area between 15-Jun-22 to 28-Jun-22.

15.3.6 Data limitations

23. Data limitations exist where data relies on vessels carrying AIS, which can result in under-representation of smaller vessels, typically, small fishing and recreational

vessels. Vessel traffic surveys are undertaken in accordance with MGN 654, which include radar and visual surveys to supplement AIS data and to ensure that the activities of non-AIS vessels are captured.

24. Since March 2020, COVID-19 has substantially impacted both recreational and commercial vessel movements. As such datasets that precede the pandemic have been assessed to benchmark those collected within the last 12 months.

15.3.7 Scope

25. Upon consideration of the baseline environment, the project description outlined in **Chapter 5: Project Description**, and the Scoping Opinion (Case reference: EIA/2022/00002), potential impacts upon shipping and navigation have been scoped in or out. These impacts are outlined, together with a justification for why they are or are not considered further, in **Table 15.11** and **Table 15.12** respectively.

Table 15.11 Summary of impacts scoped in relating to shipping and navigation

Potential Impact	Justification
Impact on Vessel Traffic Routeing	The presence of the windfarm site may result in deviations to existing traffic routeing.
Impact on Milford Haven Operations	The presence of the windfarm site may result in deviations to traffic routeing to/from Milford Haven and tanker waiting operations.
Impact on Risk of Allision	The presence of the windfarm site and associated infrastructure may increase the risk of allisions in vicinity of the windfarm site.
Impact on Risk of Collision	The presence of the windfarms site may result in deviations to existing routeing which may force vessel traffic closer together. The addition of project vessels may increase the likelihood of encounters in proximity to the Offshore Project.
Impact of Export Cable on Vessel Safety and Activities	The presence of the export cable may reduce under keel clearance and increase the risk of cable snagging.
Impact on Search and Rescue	The presence of the windfarm site may interfere with search and rescue operations.
Impact on Under Keel Clearance and Snagging Risk (windfarm site)	The windfarm site moorings may reduce under keel clearance and increase snagging risk from vessel anchors and fishing gear in vicinity of the windfarm site.
Impact on Communications, Radar and Positioning Systems	The presence of the windfarm site may interfere with vessel communication and navigation systems.
Impact of Turbine Breakout on Vessel Safety	If a turbine were to breakout, it could become a hazard to navigating vessels.

26.

Table 15.12 Summary of impacts scoped out relating to shipping and navigation

Potential Impact	Justification
Cumulative effect on under-keel-clearance (export cable)	Impacts are localised to the cable area and of limited spatial influence.
Cumulative effect on snagging risk (export cable)	Impacts are localised to the cable area and of limited spatial influence.

15.3.8 Consultation

27. Consultation regarding shipping and navigation has been conducted throughout the EIA and has been a key part of the development of the Offshore Project. An overview of the Offshore Project consultation process is presented within **Chapter 7: Consultation.**

28. A summary of the key issues raised during consultation specific to shipping and navigation is outlined in **Table 15.13**, together with how these issues have been considered in the production of this ES.

Table 15.13 Consultation responses

Consultee	Date, Document, Forum	Comment	Where addressed in the ES
MCA/TH	Scoping	Effects associated with cable route in relation to water depth reductions, particularly under keel clearance within estuaries will need to be assessed. It was noted that two cables already cross the estuary and a lot of small training boats are used within estuary.	Impacts associated with the export cable are assessed within **Section 15.5.5**, **Section 15.6.5** and **Section 15.7.5**.
MCA/TH	Scoping	There may be high levels of fishing in the region which should be reviewed as part of the process. A recreational route between Padstow and Milford Haven is also present.	Impacts to recreational and fishing vessels have been considered within the NRA (**Appendix 15.A**) and within the impact assessment contained in **Section 15.5**, **Section 15.6**, **Section 15.7** and **Section 15.8**. Fishing impacts are further assessed in **Chapter 14 Commercial Fisheries**.
MCA/TH	Scoping	It was highlighted that there is a new version of Annex 5 of MGN 654 and that IALA O-139 was in the process of being updated by the end of the year. SAR checklist required to be completed. It was requested that standard NRA terminology be utilised.	The latest MGN 654 and G1162 guidance has been followed (**Section 15.2.2**) The SAR checklist has been completed and is included within the NRA (**Appendix 15.A**).
MCA/TH	Scoping	Mooring arrangements and third-party verification of moorings will be required.	The requirement for agreement of mooring arrangements is embedded into the Offshore Project design (**Section 15.3.4.1**).
MMO	Scoping Opinion	With reference to 'Cumulative effect on UKC – construction, operation and maintenance, and decommissioning'. The Applicant states "Localised impacts (for example, those associated with the presence of the cable) are likely to be scoped out of the cumulative assessment as their impacts are	Noted.

Consultee	Date, Document, Forum	Comment	Where addressed in the ES
		of limited spatial influence." The MMO agrees that this can be scoped out of the assessment as no pathways for cumulative effects are expected.	
MMO	Scoping Opinion	With reference to 'Cumulative effect on snagging risk-construction, operation and maintenance, and decommissioning.' The Applicant states "Localised impacts (for example, those associated with the presence of the cable) are likely to be scoped out of the cumulative assessment as their impacts are of limited spatial influence." The MMO considers that not enough information is presented on the cumulative assessment to be able to scope this out of the ES at this stage.	Cumulative effects on snagging are assessed in **Section 15.8.6**.
MMO	Scoping Opinion	With reference to 'Cumulative effect on marine navigation equipment and SAR – construction, operation and maintenance, and decommissioning.' The Applicant states "Localised impacts (for example, those associated with the presence of the cable) are likely to be scoped out of the cumulative assessment as their impacts are of limited spatial influence." The MMO considers that cumulative effect on marine navigation equipment and Search and Rescue should be screened into the assessment.	Cumulative effects on communications, radar and positioning systems are assessed in **Section 15.8.7**.
MMO	Scoping Opinion	The development area carries a significant amount of through traffic to major ports, with a number of important shipping routes in close proximity, and attention needs to be paid to routing, particularly in heavy weather ensuring shipping can continue to make safe passage without large-scale deviations. The likely cumulative and in combination effects on shipping routes should also	Impacts on vessel traffic routeing including adverse weather routes are assessed in **Sections 15.5.1**, **15.6.1** and **15.8.1**. Impacts to Milford Haven operations are assessed in **Sections 15.5.2, 15.6.2** and **15.8.2**.

Consultee	Date, Document, Forum	Comment	Where addressed in the ES
		be considered, the impact on navigable sea room and include an appropriate assessment of the distances between wind farm boundaries and shipping routes as per MGN 654.	Cumulative effects are assessed in **Section 15.7.1**. Further detail on impact to navigable searoom is contained in the NRA (**Appendix 15.A**).
MMO	Scoping Opinion	A Navigational Risk Assessment will need to be submitted in accordance with MGN 654 (and MGN 372) and the MCA Methodology for Assessing the Marine Navigation Safety & Emergency Response Risks of OREI. This NRA should be accompanied by a detailed MGN 654 Checklist.	An MGN 654 compliant NRA has been undertaken and is contained in **Appendix 15.A** accompanied by a completed MGN 654 checklist.
MMO	Scoping Opinion	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 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.	Noted. The requirement for layout agreement with the MCA prior to construction is embedded into the Offshore Project design (**Section 15.3.4.1**).
MMO	Scoping Opinion	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 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	Impacts resulting from the cable are assessed in **Sections 15.5.5**, **15.6.5** and **15.7.5**. A CBRA has been undertaken to assess the feasibility of cable burial along the length of the cable route prior to construction – see **Appendix 8.C**.

Consultee	Date, Document, Forum	Comment	Where addressed in the ES
		increase, such as at the trenchless technique location.	
MMO	Scoping Opinion	From the Scoping Report the MCA understands regulatory mooring expectations is identified as a mitigation measure and confirms this guidance should be followed and that a Third-Party Verification of the mooring arrangements will be required.	Noted.
MMO	Scoping Opinion	Particular consideration will need to be given to the implications of the site size and location on SAR resources and Emergency Response Co-operation Plan. Attention should be paid to 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 DSC) that can cover the entire wind farm sites and their surrounding areas. A SAR checklist will also need to be completed to be consulted on with consultation with MCA.	Noted. Impacts to SAR are assessed in **Section 15.5.6**. **15.6.6** and **15.7.6**. Impacts to communications, radar and positioning systems are assessed in **Section 15.6.8**. The requirement to complete an ERCOP is embedded in the Offshore Project design (**Section 15.3.4.1**).
MMO	Scoping Opinion	MGN 654 Annex 2 requires that hydrographic surveys should fulfil the requirements of the 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 appropriate.	Noted. The requirement to undertake hydrographic surveys to IHO Order 1a standard is embedded in the Offshore Project design (**Section 15.3.4.1**).

Consultee	Date, Document, Forum	Comment	Where addressed in the ES
MMO	Scoping Opinion	The possible cumulative and in-combination effects on navigation should be adequately assessed.	Cumulative and in-combination effects are assessed in **Section 15.7.1**.
MMO	Scoping Opinion	TH considers 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 TH. This will include the necessity for the aids to navigation to meet the internationally recognised standards of availability and the reporting thereof.	The requirement for IALA compliant AtoN developed in consultation with MCA and TH is embedded in the Offshore Project design (**Section 15.3.4.1**).
MMO	Scoping Opinion	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	Noted. A decommissioning plan will be prepared during detailed design and refined during the Offshore Project's lifetime. The decommissioning activities will be compliant with the relevant legislation, guidance and policy requirements at the time of decommissioning.

Consultee	Date, Document, Forum	Comment	Where addressed in the ES
		cost of which would need to be met by the developer/operator	
MMO	Scoping Opinion	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.	Impacts resulting from the cable are assessed in **Sections 15.5.5, 15.6.5** and **15.7.5**. A CBRA has been undertaken to assess the feasibility of cable burial along the length of the cable route prior to construction – see **Appendix 8.C**.
MMO	Scoping Opinion	The ES 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 in to the routes of larger commercial vessels.	An MGN 654 compliant NRA, assessing navigational issues for commercial and recreational vessels has been undertaken and is contained in **Appendix 15.A**. The impact assessment assessing impacts to commercial and recreational vessels is contained in **Section 15.5, Section 15.6, Section 15.7** and **Section 15.8**.
MCA	07/01/2022	The MCA commented on the proposed summer survey occurring in June rather than the standard peak summer period of July/August. It was proposed that additional supplementary data such as AIS over a longer period should be used to supplement the data from the survey.	Additional AIS data has been sourced to inform the vessel traffic analysis (NRA, **Appendix 15.A**).

Consultee	Date, Document, Forum	Comment	Where addressed in the ES
MCA	15/03/2022	The ES 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; and The likely squeeze of small craft into the routes of larger commercial vessels.	An MGN 654 compliant NRA, assessing navigational issues for commercial and recreational vessels has been undertaken and is contained in **Appendix 15.A**. The impact assessment assessing impacts to commercial and recreational vessels is contained in **Section 15.5, Section 15.6, Section 15.7** and **Section 15.8**.
MCA	15/03/2022	The likely cumulative and in combination effects on shipping routes should also be considered, in addition to the impact on navigable sea room which should include an appropriate assessment of the distances between windfarm boundaries and shipping routes as per MGN 654.	Cumulative effects to vessel traffic routeing are assessed in **Section 15.7.1**. Further detail on impact to navigable searoom is contained in the NRA (**Appendix 15.A**).
MCA	15/03/2022	From the document we understand that the applicant intends to do a vessel traffic survey which will be undertaken to the standard of MGN 654 i.e, at least 28 days which is to include seasonal data (two 14-day surveys) collected from a vessel-based survey using AIS, radar and visual observations to capture all vessels navigating in the study area.	Vessel traffic surveys have been undertaken in accordance with MGN 654 requirements and are outlined in **Table 15.10** and detailed within the NRA (**Appendix 15.2**).
Trinity House	15/03/2022	We consider that this development will need to be marked with marine aids to navigation by the developer/operator in accordance with the general	The requirements for lighting and marking and ongoing consultation with Trinity House is incorporated as an

Consultee	Date, Document, Forum	Comment	Where addressed in the ES
		principles outlined in IALA 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.	embedded mitigation (**Section 15.3.4.1**).
Trinity House	15/03/2022	Assessment of impact on existing aids to navigation.	There are no aids to navigation in close proximity to the Offshore Project. The closest are on Lundy.
Trinity House	15/03/2022	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 windfarm) 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 requirement for a decommissioning plan is embedded in the Offshore Project design (**Section 15.3.4**).
Trinity House	15/03/2022	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	A CBRA has been undertaken to assess the feasibility of cable burial along the length of the cable route prior to

Consultee	Date, Document, Forum	Comment	Where addressed in the ES
		protection which lies clear of the surrounding seabed, the impact on navigation and the requirement for appropriate risk mitigation measures needs to be assessed.	construction, including consideration of UKC – see **Appendix 8.C**. All subsea cables will be either fully buried (where ground conditions permit and burial tool performance allows), partially buried (buried but not to target depth) with rock protection, or surface laid with rock protection. Selected methods will be based on the risk assessment and the protection will be periodically monitored and maintained as practicable. No more than 5% reduction in water depth (referenced to Chart Datum) will occur at any point on the cable route without prior written approval from the Licensing Authority.
North Devon Fishermen's Association, Cornish Fish Producers Association	28/07/2022	Meeting with fishing representatives to discuss the potential impacts of the project on fishing vessel navigation. The fishermen raised concerns regarding the export cable and cable burial depth as there is the possibility that fishing gear can snag leading to potentially significant consequences.	A CBRA has been undertaken to assess the feasibility of cable burial along the length of the cable route prior to construction, including consideration of UKC – see **Appendix 8.C**. All subsea cables will be either fully buried, partially buried with rock protection, or surface laid with rock protection. Impacts associated with the export cable are assessed in **Section 15.5.5, Section 15.6.5 and Section 15.7.5**.
MCA **Trinity House**	04/08/2022	Concerns regarding the cumulative effects on tankers waiting for entry to Milford Haven.	Impacts to Milford Haven Operations are assessed in **Section 15.5.2, Section 15.6.2** and **Section 15.7.2.**

Consultee	Date, Document, Forum	Comment	Where addressed in the ES
Chamber of Shipping Milford Haven Port Authority			Fishing impacts are further assessed in **Chapter 14 Commercial Fisheries**.
Torridge Council / Bideford and Appledore harbour Master	11/08/2022	There was no issues raised regarding potential impacts on port operations.	Noted.
Associated British Ports	07/07/2022	Response to a letter issued to shipping and navigation stakeholders in the wider area. There were no specific issues raised and it was considered that mitigation measures employed in other similar developments would be appropriate.	Noted.
National Federation of Fishermen's Organisations	03/08/2022	Response to a letter issued to shipping and navigation stakeholders in the wider area. The risks related to snagging of moorings and the export cables was raised as a significant issue. Emphasis was placed on the completion of a Cable Burial Risk Assessment including consultation with the fishing industry. It is stated that the presence of moorings for the turbines presents such a hazard that, during the operation of the windfarm, it will be permanently unsafe to operate either static or mobile fishing gear in the footprint of the windfarm.	Impacts associated with the export cable are assessed in **Section 15.6.5**, **Section 15.7.5** and **Section 15.8.5**. A CBRA has been undertaken to assess the feasibility of cable burial along the length of the cable route prior to construction, including consideration of UKC – see **Appendix 8.C**. Impacts to under keel clearance and snagging risk as a result of the windfarm moorings are assessed in **Section 15.5.7**, **Section 15.6.7** and **Section 15.8.6**. Fishing impacts are further assessed in **Chapter 14 Commercial Fisheries**.

15.4 Existing environment

29. This section describes the existing environment in relation to the shipping and navigation study area. It has been informed by a review of the data sources listed in **Section 15.1.1**.

15.4.1 Current baseline

30. A detailed overview of the baseline environment is located within the NRA (**Appendix 15.A).**

31. The windfarm site area and cable route are in an area of general navigation in UK waters with the MCA as the responsible authority for safe navigation. The windfarm site is outside of any Vessel Traffic Services (VTS) or Local Port Service (LPS) areas. There are no ports or harbours in the vicinity of the windfarm site.

32. The offshore export cable makes landfall in Bideford Bay which is located north of the mouth of the Taw-Torridge Estuary. The River Torridge is within the Port of Bideford Competent Harbour Authority (CHA) area but outside of its Statutory Harbour Authority (SHA) area. This means that the powers available to the Port of Bideford Harbour Master relating to the navigation of vessels granted through the port's local legislation cannot be used for vessels navigating in the vicinity of the offshore export cable corridor. Pilotage in the CHA area is mandatory for vessels over 50m in length. Lundy Harbour lies withing the offshore export cable corridor study area. The island is owned by the Landmark Trust with a ferry service operating between Bideford, Ilfracombe and the island.

33. There are no IMO routeing/reporting measures or recommended channels in the study area. The transit between the Traffic Separation Scheme (TSS) "Off Land's End between Seven Stones and Longships" and "Off Smalls" passes 18nm to the west of the windfarm site.

34. There are two lighthouses on Lundy marking the northern and southern sides of the island. A red beacon exhibiting Fl.R.3s3M marks the jetty for the ferry. At the entrance to the River Torridge there is a safe water mark indicating the beginning of the fairway. This floating mark is located adjacent to the cable corridor route.

35. The local coastguard base for the region is the Milford Haven CGOC. The CGOC is co-located with the Milford Haven Port Authority (MHPA) offices and the VTS centre. His Majesty's Coastguard's (HMCG) Aviation Branch provides aviation-based search and rescue via the UK SAR Helicopter (UKSARH) programme. HMCGs helicopter assets are located at St. Athan, Wales and Newquay, Cornwall.

36. There are no charted anchorages or waiting areas in the study area. Small boat anchorages are shown in the inshore waters to the east of Lundy Island, and within the River Torridge/Taw.

37. There is some evidence in the AIS data (**Table 15.9**) of waiting vessels. The majority of anchoring/waiting positions identified are from fishing vessels, likely working static gear. Immediately adjacent to the approaches to Bideford several, mainly small vessels, are identified as potentially anchoring (speed <0.5knots) infrequently. One general cargo ship was recorded for approximately 24 hours 1.5nm from the pilot boarding station. No fishing or recreational craft were recorded anchoring at cable landfall, likely due to the firing practice area and relatively little shelter compared to other bays.

38. Consultation with the Bideford Harbour Master determined that anchoring would likely be elsewhere, such as in the shelter of Lundy or at Clovelly Roads and is infrequent (less than once a year).

39. Consultation and a review of the tanker traffic identified that large tankers loiter in the vicinity of the Windfarm Site. These vessels are bound for Milford Haven, however, are requested to wait off the coast more than 10nm from St Anne's Head until there is available berth space in the port.

15.4.1.1 Offshore Activities

40. No oil and gas sites are located close to the study area.

41. Two subsea cables are identified crossing the cable corridor:

- One fibre optic subsea cable crosses the export cable corridor. This cable is the Pan European Crossing (UK-Ireland) running between Bude Bay and Rosslare. The cable was established in 2020 with a designed end of life of 2025
- The TGN Atlantic cable which runs between New Jersey, USA and Pottington, UK, with landfall in Bideford Bay

42. There are no aggregate extraction areas identified in the study area. The closest active aggregate extraction area is Nobel Banks off the South Wales coast approximately 37nm north-east of the windfarm site. There are two closed disposal sites in the cable corridor study area. These are Hartland Point Disposal Area and Morte Bay Disposal Area.

43. No other offshore renewable projects are located in the study area. The closest proposed windfarm is the Valorous project which is located 18km from the Windfarm Site.

44. The export cable corridor intersects two firing practice areas; D110 and X5105. No restrictions are placed on the rights of vessels to transit the areas at any time and both areas are operated with a clear range procedure with exercises and firing only taking place when the areas are considered to be clear of vessels.

15.4.1.2 Baseline navigation activities

45. Vessel traffic analysis by vessel type was undertaken for the AIS data obtained for the period 01-Apr-2021 to 31-Mar-2022. Radar and visual data collected during the 2x 14 day traffic surveys was used to supplement the understanding of small craft movements. Further detail and analysis are contained within the NRA (**Appendix 15.A**).

46. In total, between 20 and 80 transits per month intersected the Windfarm Site, and between 250 and 500 transits intersected the study area. These vessels are mostly fishing and tanker vessels, although numerous cargo ships and recreational craft were also recorded. More than half of the vessels are less than 50m in length and 70% have draughts less than 10m.

47. The cable corridor extends across the main approaches to the Bristol Channel from Lands End as well as ferry routes to Lundy, recreational cruising routes and fishing grounds. The majority of vessels intersecting the cable corridor are cargo vessels and inshore recreational vessels during the summer months. Inshore transits vary seasonally with up to 650 transits per month in summer compared to <300 in winter. The majority of these vessels are less than 50m in length and 3m in draught.

15.4.1.2.1Cargo

48. Cargo vessels include dry cargo, such as container ships, bulk carriers and general cargo ships. There are numerous cargo vessel tracks shown throughout the study area. In general, these vessels are on a north-east to south-west orientation, passing from Land’s End to the north of Lundy before turning into the Bristol Channel. A smaller number of cargo ships are shown transiting to the west and into the Atlantic. Eighty cargo vessel tracks were identified within the windfarm site, the largest of which were 292m bulk carriers transiting to/from Port Talbot. The cable route is intersected by both the north and south Lundy routes.

15.4.1.2.2Tanker

49. Tankers include commercial vessels carrying liquid cargo such as oil and chemicals. Tankers are seen mostly to the west of the windfarm site, heading to/from Milford Haven. Eighty-two individual tanker tracks intersected with the Windfarm Site, the largest of which were 299m LNG tankers. There is additionally evidence of tanker

loitering in and around the windfarm site whilst waiting for berth availability at Milford Haven (**Section 15.6.2**).

15.4.1.2.3 Passenger

50. A total of five passenger vessels passed through the windfarm site over the assessed one-year of AIS, all of which were cruise ships >100m length overall. The primary focal point of cruise vessels was Lundy, which cruise ships were noted circumnavigating. It is noted that there was an increase in British Isles cruising following the COVID-19 pandemic. A ferry route additionally exists within the study area, operating between Lundy, Ilfracombe and Bideford.

15.4.1.2.4 Recreational

51. Seventy-six recreational vessels were recorded by AIS passing through the windfarm site. Given their alignment and distance offshore they are likely to be transiting through the area rather than using the local ports. There was a wide distribution of recreational vessel tracks with routes being taken to avoid commercial shipping.

52. The vessel traffic survey results show strong seasonality with 25 recreational tracks in the summer period compared with just two tracks in the winter period. Offshore cruising routes are not considered to be of high intensity with between one and two recreational transits through the windfarm site 10nm study area per day.

53. There was a large concentration of recreational vessel tracks crossing the cable route through Bideford Bay and the coastal area between Lundy and the mainland with multiple tracks out of Bideford and Clovelly. The RYA Coastal Atlas defines the Torridge estuary as a "General Boating Area" and a sailing club and moorings are located within the estuary. The bay itself offers little shelter from prevailing westerlies and therefore cruising yachts tend to anchor elsewhere.

15.4.1.2.5 Fishing

54. Fishing vessels are present throughout the study area with over 10,000 hours of fishing time recorded by VMS in 2019 in parts of the Windfarm Site. It was stated during consultation that the area is fished with both static and mobile gear. Vessels fishing the site include local craft, particularly from Padstow, but also international vessels from France, Belgium and Ireland. Similarly to recreational activity, fishing shows seasonality with 53 vessel tracks identified by the summer survey compared to two in the winter survey.

55. Fishing activity is also evident within Bideford Bay and near to cable landfall. Local boats tow gear between Bideford fairway buoy and Baggy Point. Potting is common throughout the year.

15.4.1.2.6 Tugs and service craft

56. Tug and service vessel tracks follow principal shipping routes used by other vessels in the area or coastal routes when using the local ports. Many of these routes are centred on Milford Haven or the Bristol Channel to Land's End route. There were 23 tracks in the AIS dataset which crossed the Windfarm Site comprising a range of tugs and service vessels.

15.4.1.2.7 Principal routes

57. Principal routes were identified within the study area in accordance with MGN 654 90th percentile corridor principle (**Appendix 15.A**) to establish commercial shipping routes in proximity to the Offshore Project. The results of the assessment are shown in **Table 15.14**.

58. In total, 33,554 vessel tracks were classified into routes. The highest frequency route was the Land's End to Bristol Channel route located 12nm from the Windfarm Site boundary. Three routes intersected the Windfarm Site accounting for 625 transits (2%).

Table 15.14 Principal routes

Route	Description	Frequency/ Vessels per Year	Minimum Distance from the Offshore Project (nm)	Notes
1	Lands End to Bristol Channel (South Lundy)	2,201	12	Route between "TSS Off Land's End Between Seven Stones and Longships" and the Bristol Channel, passing to the south of Lundy. Mostly cargo vessels (89%), with a small number of tankers and tug or service vessels. 49% of these were under 100m, and 47% between 100 and 200m. The largest vessel was a 294m container ship.
2	Ilfracombe to Lundy	219	24	Route between Ilfracombe and Lundy, principally the Oldenburg passenger vessel and small charter boats.
3	Lands End to Bristol Channel (North Lundy)	565	The southern footprint of the Windfarm Site is intersected by this route, although route	Route between "TSS Off Land's End Between Seven Stones and Longships"/"TSS West of the Scilly Isles" and

Route	Description	Frequency/ Vessels per Year	Minimum Distance from the Offshore Project (nm)	Notes
			continues for 8.2nm south-east of the Windfarm Site.	the Bristol Channel, passing to the north of Lundy. Mostly cargo vessels (78%) and tankers (20%). 15% under 100m, 66% between 100 and 200m and 19% greater than 200m. Largest vessel 294m container ship.
4	Lands End (East Isles of Scilly) to Milford Haven	521	3.0	Route between "TSS Off Land's End Between Seven Stones and Longships" and Milford Haven. Mostly tankers (84%) and tug or service vessels (9.6%). 25% under 100m, 65% between 100 and 200m and 10% greater than 200m. Largest vessels are 290-300m LNG tankers.
5	Lands End (West Isles of Scilly) to Milford Haven	651	8.1	Route between "TSS West of the Scilly Isles"/Atlantic Ocean and Milford Haven. Mostly tankers (88%) and cargo (9%). 44% under 200m, 42% between 200-300m and 13% greater than 300m. Largest vessels are 345m LNG tankers.
6	South Ireland to Bristol Channel	300	5.3	Route between Atlantic Ocean south of Ireland and Bristol Channel. Mostly cargo (76%) and tankers (15%). 30% under 100m, 45% between 100 and 200m and 25% greater than 200m. Largest vessels are 290-300m container ships, bulk carriers and LNG tankers.
7	Lands End (East Isles of Scilly) to	60	The route intersects the Windfarm Site.	Route between "TSS Off Land's End Between Seven Stones and Longships" and

Route	Description	Frequency/ Vessels per Year	Minimum Distance from the Offshore Project (nm)	Notes
	Milford Haven (Easterly Route)			Milford Haven, however, vessels take a more easterly route than Route 4. Mostly tug and service (52%) and tankers (27%). 62% under 100m, 33% between 100 and 200m and 5% greater than 200m.
8	Padstow to Milford Haven	11	3.8	Route between Padstow and Milford Haven, mostly used by tug and service vessels under 100m.
9	Atlantic to Bristol Channel	29	The northern footprint of the Windfarm Site is intersected by this route.	Route between Atlantic Ocean and the Bristol Channel. Mostly cargo vessels (97%) and tankers (3%). 0% under 100m, 79% between 100 and 200m and 21% greater than 200m. Largest vessel is a 292m bulk carrier.
10	Lands End to Irish Sea	26	15	A small proportion of vessels passing from the Lands End TSS and Irish Sea, are recorded making a deviation into the vicinity of the study area. These include cargo and tankers between 82m and 274m.

15.4.1.3 Maritime incidents

59. MAIB data (1992 – 2021) and RNLI data (2008 - 2020) was analysed as described within **Table 15.9**. Within the Windfarm Site, twenty-three navigationally significant incidents were recorded between both datasets between 2008 and 2020 (0.9 incidents per year). Fourteen of the twenty-three incidents involved mechanical failures or damage to a vessel, including five commercial vessels, six fishing vessels, two yachts and one passenger vessel. Four incidents involved flooding of fishing vessels, including the sinking of a fishing vessel in 1992, the only incident in the study area to be classified as very serious by the MAIB. One near miss was reported between a yacht

and a cargo ship. In October 2020, a small general cargo vessel lost containers during adverse weather in the western portion of the Celtic Sea, outside of the study area.

60. Within the export cable corridor, 272 navigationally significant incidents were recorded between 2008 and 2020 averaging 17.9 per year. Seventy-nine percent occurred within five nm of the cable landfall or within the River Taw or Torridge. Seventy-five percent of the total number of incidents in the export cable corridor involved recreational craft, with 17% accounted for by fishing vessels. The two most frequent incident types were mechanical failure (62%) or capsize, flooding or damage due to adverse weather (17%). Twenty-two groundings were recorded, involving four fishing vessels, 16 recreational craft, one SAR craft and one passenger boat. Six near misses were recorded by traffic funnelled between Lundy and Bideford Bay involving recreational, fishing and cargo vessels. Six collisions were also recorded, mostly involving recreational and fishing vessels, all of which occurred within the harbour or inshore at Lundy. There was one incident of a fishing vessel snagging a cable south of Lundy. Four incidents within the cable corridor were categorised as very serious by the MAIB. These included two sinkings of fishing vessels, a fatality of a kayaker through a heart attack and the capsize of a pleasure angling vessel with the loss of one life. A further six incidents were classified as serious, all of which occurred near to the cable landfall.

15.4.2 Do nothing scenario

61. The Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended) require that "an outline of the likely evolution thereof without implementation of the development as far as natural changes from the baseline scenario can be assessed" is included within the ES (EIA Regulations, Schedule 4, Paragraph 3). From the point of assessment, over the course of the development and operational lifetime of the Offshore Project (operational lifetime anticipated to be a minimum of 25 years), long-term trends mean that the condition of the baseline environment is expected to evolve. This section provides a qualitative description of the evolution of the baseline environment, on the assumption that the Offshore Project is not constructed, using available information and scientific knowledge of shipping and navigation.

62. Analysis of the future case traffic profile has been undertaken within the NRA (**Appendix 15.A**). The DfT publishes historical and projected port statistics, including annual freight quantities and transits which can be used as an indicator of long-term trends. Projected freight traffic into UK major ports, produced by the DfT in 2019 is shown in **Figure 15.2**. Port traffic is forecast to remain relatively flat in the short term but grow in the long term, with tonnage 39% higher in 2050 compared to 2016. This

equates to approximately a 15% increase in national freight tonnage by 2035. Liquid bulk traffic (principally crude oil) has the largest forecasted decreases, continuing a historical trend. Similarly, general cargo is forecast to decrease, in line with the historic decreasing trend, which is likely driven by increased containerisation of goods. Dry bulk traffic is forecast to have a relatively large decrease in the short term, driven primarily by demand for coal being projected to fall. In the long term, the decrease associated with coal will be offset primarily by biomass resulting in an overall increase. Motor vehicles, Twenty-foot Equivalent Units (TEUs) Lift On/ Lift Off (Lo-Lo) and Roll On/Roll Off (Ro-Ro) are all forecast to grow strongly, driven by economic growth.

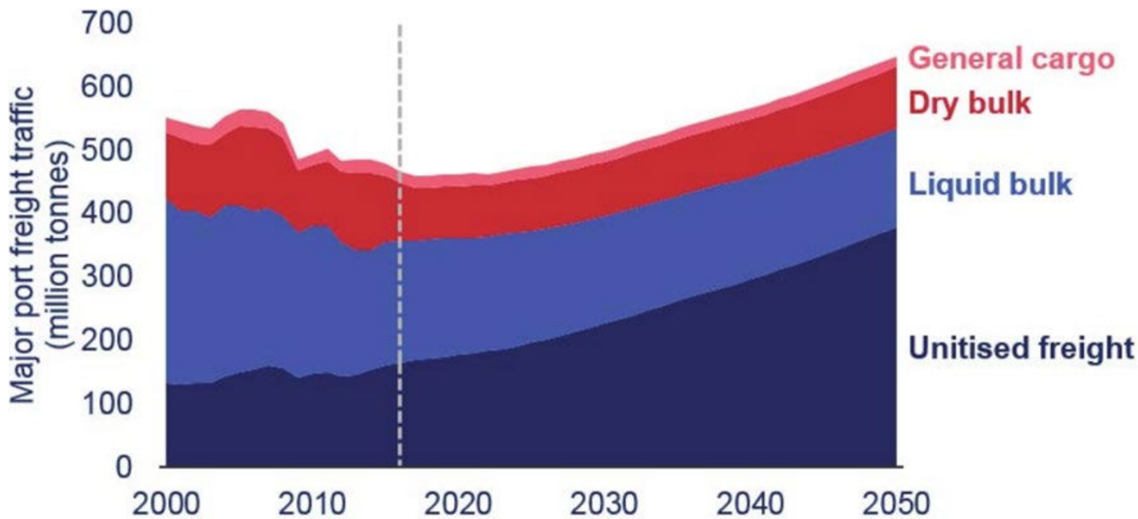

Figure 15.2 UK port freight projections (DfT, 2019)

63. More locally to the study area, large fluctuations of freight figures for Appledore, Barnstaple and Bideford are evident within the historic data showing a general overall decline in annual freight (**Figure 15.3**). It is noted in the DfT report that UK ports were affected by measures to prevent and reduce the global spread of Covid-19 throughout 2020, as well as the UK exiting the European Union at the end of 2020 with a 9% decrease in tonnage handled by UK ports in 2020 compared to 2019.

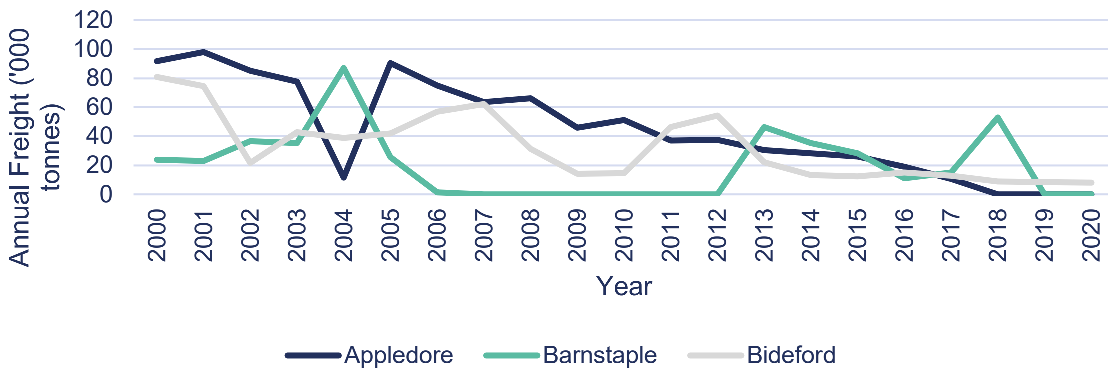

Figure 15.3 Annual freight to local ports (DfT 2021)

15.5 Potential Impacts during construction

64. The potential impacts during construction of the Offshore Project have been assessed for shipping and navigation. A description of the potential effect on shipping and navigation caused by each identified impact is given in this section.

15.5.1 Impact 1: Impact on vessel traffic routeing

65. The construction of an OWF in otherwise navigable waters may necessitate vessels to deviate from their existing routes to avoid the obstruction. This can result in impacts to passage planning such as increased transit distance and time that could, in a worst-case make some services unviable.

15.5.1.1 Frequency of occurrence

66. Principal and adverse weather routes are discussed in **Section 15.4.1**. While three of the 90th percentile corridors overlap with the Windfarm Site, the route centrelines are clear of the Windfarm Site. Of the major routes (>100 transits per year), only one 90th percentile route intersects the Windfarm Site; the route between Land's End and the Bristol Channel (north of Lundy). There is 8nm of clear searoom to the south-east of the Windfarm Site available for navigation and therefore impacts to this route are considered negligible. Further no appreciable differences in routeing were identified for adverse weather events assessed between 2021 and 2022. The frequency of occurrence is therefore, considered to be **extremely unlikely**.

15.5.1.2 Severity of consequence

67. The severity of consequence is considered **negligible** given the level of disturbance and deviations required, and when considering the embedded mitigation that will be in place to monitor and communicate construction activities.

15.5.1.3 Significance of effect

68. Overall, the frequency of occurrence is deemed to be **extremely unlikely**, and the severity of consequence is considered to be **negligible**. The effect is, therefore, considered to be of **negligible** significance, which is **not significant** in EIA terms.

15.5.1.4 Further mitigation

69. No additional mitigation above that embedded in the Offshore Project design (**Section 15.3.4.1**) is proposed.

15.5.2 Impact 2: Impact on Milford Haven operations

70. The study area is utilised by tankers whilst waiting for berths at Milford Haven. This area is used as it provides a safe waiting location given the relatively low density of vessel traffic and the lack of obstructions to navigation. The presence of the Windfarm Site has the potential to displace loitering tankers either further west or north.

15.5.2.1 Frequency of occurrence

71. The Offshore Project is located more than 30nm from Milford Haven, and therefore the majority of loitering is located further north. However, some tanker tracks do extend far enough south to be located near to the Windfarm Site. These activities may extend for more than several days for each vessel. Approximately 100 unique vessels were loitering within 10nm of the study area over the course of the year of assessed AIS data. The frequency of occurrence is deemed to be **extremely unlikely**.

15.5.2.2 Sensitivity of consequence

72. The severity of consequence is considered **negligible** given the available space between St. Ann's head and the Windfarm Site. Milford Haven Port Authority currently request vessels to stand off Saint Ann's Head at a distance of 10nm or more. There is approximately 32nm between the Windfarm Site and Saint Ann's Head meaning that there is still sufficient searoom to the north for vessels to anchor.

73. If the tankers are displaced further west, there is potential for them to interact with the main traffic routes between Milford Haven and the TSSs to the south. However, there is approximately 8nm between the Windfarm Site and the closest route. Given the considerable searoom to the north it is unlikely the tankers would loiter further west.

15.5.2.3 Significance of effect

74. The location of the Windfarm Site means that there is considerable searoom available to the north allowing tankers to loiter. It is noted that during the vessel traffic surveys,

when a survey vessel was present within the Windfarm Site, tankers loitered to the north-west to maintain safe searoom.

75. Overall, the frequency of occurrence is deemed to be **extremely unlikely** and the severity of consequence is considered to be **negligible**. The effect is, therefore, considered to be of **negligible** significance, which is **not significant** in EIA terms.

15.5.2.4 Further mitigation

76. No additional mitigation above that embedded in the Offshore Project design (**Section 15.3.4.1**) is proposed.

15.5.3 Impact 3: Impact on risk of allision

77. A vessel is most likely to contact a windfarm structure due to human error or mechanical failure, which could be exacerbated by other factors such as a failure of an AtoN.

15.5.3.1 Frequency of occurrence

78. Historical analysis of incidents (**Section 15.1**) involving OWFs identified that those vessels most likely to come into contact with a turbine are project vessels engaged in construction activities as opposed to third-party vessels. Smaller vessels such as fishing and recreational vessels, typically operate in closer proximity to windfarms and are therefore more likely to make contact with wind turbines than larger commercial vessels. Analysis of historic incidents reveals few allisions are recorded by non-project vessels, however, anecdotal evidence of allisions involving fishing and recreational vessels may suggest that such occurrences are underreported.

79. Quantitative assessment within the NRA assessed the likelihood of a contact between a vessel navigating within the area and infrastructure of the Windfarm Site to be one in 606 years (**Appendix 15.A**).

80. The recreational cruising route between Land's End and Milford Haven passes through the Windfarm Site. However, there is sufficient searoom to safely pass around the site. Therefore, it is **unlikely** that a recreational vessel would contact a turbine.

81. The Windfarm Site is located adjacent to several major routes into the Bristol Channel, Irish Sea and Milford Haven. However, there is considerable searoom around the site (**Appendix 15.A**) to facilitate safe navigation and, therefore, the risk of contact is **unlikely**.

82. The proximity of loitering tankers adjacent to Milford Haven could result in drifting contacts with the Wind Turbine Generators (WTGs). However, it is anticipated that these activities would be relocated away from the site (**Section 15.5.2**).

83. Compared to conventional OWFs with fixed monopiles (where fishermen routinely fish within the Windfarm Site) the presence of subsurface infrastructure makes it more likely that fishermen would avoid the Windfarm Site due to the potential risk to safety and damage or loss of gear through snagging with moorings. The risk of a fishing vessel contacting a floating turbine is therefore reduced. Overall, the frequency of occurrence is deemed to be **unlikely.**

15.5.3.2 Severity of consequence

84. Were a recreational vessel to allide with a Wind Turbine Generator (WTG), a glancing blow with minor damage is the most credible outcome. Any drifting allisions would similarly be of low impact and, therefore, have low consequences.

85. Were a fishing vessel allision to occur, through for example mechanical breakdown or human error, the most likely outcome would be a glancing contact with minor damage. However, it is possible (in a worst credible scenario) that a fishing vessel could capsize with the potential for loss of life.

86. Should a large commercial vessel allide with a WTG, for example a drifting contact by a tanker, there is potential for multiple serious injuries and serious damage in a worst credible scenario, however, this is considered unlikely.

15.5.3.3 Significance of effect

87. Overall, the frequency of occurrence is deemed to be **unlikely** and the severity of consequence is considered to be **moderate**. The effect is, therefore, considered to be of **moderate** significance, which is **not significant** in EIA terms given its assessment as ALARP within the NRA. The NRA considers the risk as ALARP as allisions typically resulted in some minor injuries and damage. Fatalities and the loss of the vessel in such a situation are a feasible outcome, but it is considered unlikely during the Offshore Project lifecycle. This risk can be managed through adherence to industry best practice vessel standards, marine operating guidelines and training abord project vessels.

15.5.3.4 Further mitigation

88. No additional mitigation above that embedded in the Offshore Project design (**Section 15.3.4.1**) is proposed.

15.5.4 Impact 4: Impact on risk of collision

89. The construction of an OWF in an otherwise navigable area can constrain shipping routes and result in pinch points or areas of high vessel traffic density, with the potential to increase the number of encounters or potential collision situations.

90. An increase in vessels within the study area, due to the introduction of construction vessels may increase potential encounter and collision scenarios. These vessels, including, high-speed catamarans, may cross-cut established routeing to access wind-farm sites.

91. Blind spots may result from windfarm sites blocking or hindering the view of other navigating vessels or aids to navigation which could increase the risk of collision by reducing the capability for early and effective collision avoidance.

15.5.4.1 Frequency of occurrence

92. Collision modelling was undertaken within the NRA (**Appendix 15.A**) which determined a risk of collision of once in 490 years. Near misses of project vessels with other users have been reported at other windfarm projects, with project vessels accounting for 82% of recorded incidents at windfarm sites between 2008 and 2009 (**Appendix 15.A**). The O&M base for the Offshore Project has not yet been determined but it is anticipated that the number of daily vessel movements during the construction phase would be low, with a total of 40 vessel trips estimated during turbine construction, suggesting a relatively minor impact on collision risk along the route between the OWF and the O&M base.

93. The Windfarm Site is located adjacent to several major routes into the Bristol Channel, Irish Sea and Milford Haven. The assessment has identified minimal impact on vessel routeing (**Section 15.5.1**) reducing the occurrence of pinch points and areas of high vessel traffic density that may occur as a result of rerouting. It is, therefore, considered that there is considerable searoom around the site to facilitate safe navigation. As such, no discernible increase in third-party collision risk was predicted by the collision modelling. The frequency of occurrence is therefore deemed to be **extremely unlikely**.

15.5.4.2 Severity of consequence

94. Collisions involving larger commercial vessels carry a higher potential consequence, however, collisions involving small craft such as fishing and recreational craft are typically more frequent and typically result in a lower consequence outcome. A collision event between two small vessels may result in serious damage and multiple major injuries in a worst-credible scenario, however, minor injuries and negligible damage is more likely.

95. Impacts to visual navigation can increase collision risk. Given the relatively low traffic density near to the Windfarm Site, the small number and diameter of the turbines and the distance to other navigation aids or hazards, the Offshore Project is not considered to have an appreciable impact on visual navigation. The severity of consequence is considered to be **moderate**.

15.5.4.3 Significance of effect

96. Overall, the frequency of occurrence is deemed to be **extremely unlikely** and the severity of consequence is considered to be **moderate**. The effect is, therefore, considered to be of **minor** significance, which is **not significant** in EIA terms.

15.5.4.4 Further mitigation

97. No additional mitigation above that embedded in the Offshore Project design (**Section 15.3.4.1**) is proposed.

15.5.5 Impact 5: Impact of export cable on vessel safety and activities

98. The laying of the export cable and any associated safety zone may be disruptive to navigating vessels. Given the close proximity of the cable route to the approach channel into Bideford, it is important that constant access is available into the harbour for all vessel users.

99. Subsea cables can pose a hazard to navigating vessels as a result of anchor and fishing gear strikes where gear attached to the vessel may snag the cable/cable protection. Where the export cable is protected by means such as rock protection/armouring, this may reduce the navigable depth of water and increase the risk of grounding.

15.5.5.1 Frequency of occurrence

100. There is no evidence of commercial anchoring in close proximity to the offshore export cable corridor and there are no charted anchorages. Anchoring of smaller vessels occurs away from the proposed offshore export cable corridor. There is no evidence of recreational vessel anchoring near to the landfall.

101. The most likely snagging risk is presented by fishing. There is significant fishing activity along the cable route near to the Windfarm Site and the landfall (**Section 15.4.1**) with over 10,000 hours of fishing time recorded by VMS in 2019 in parts of the Windfarm Site.

102. The cable is intended to be fully buried up to a depth of 3m, or where this is not possible, protected using other measures such as rock armouring. Embedded mitigations in the form of cable burial and adequate protection would mitigate the risk of snagging reducing the frequency of occurrence. The frequency of occurrence is deemed to be **extremely unlikely.**

15.5.5.2 Severity of consequence

103. Assuming adequate protection, it is unlikely that a yacht's anchor would either snag or damage the cable.

104. Were a fishing vessel to snag the cable, the most likely outcome is loss of gear and potentially minor damage to the cable. A worst credible outcome is the loss of the fishing vessel were it to capsize. However, this is considered unlikely.

105. Any additional protection at crossings with existing cables are likely to be in relatively deep water and as such would not appreciably impact UKC. The deepest draught vessels recorded entering the buoyed channel to Bideford Harbour are between 5 and 6 metres and navigate the channel at high tide. Any cable protection in this area should, therefore, not compromise access to the harbour. The severity of consequence is considered to be **moderate**.

15.5.5.3 Significance of effect

106. Cable burial would mitigate the risk of snagging. The feasibility of cable burial along the length of the cable route will be established by the CBRA (see **Appendix 8.C**).

107. Coordination of cable laying activities with the local harbour and harbour users would deconflict any impacts resulting from cable laying activities.

108. Overall, the frequency of occurrence is deemed to be **extremely unlikely** and the severity of consequence is considered to be **moderate**. The effect is, therefore, considered to be of **minor** significance, which is **not significant** in EIA terms.

15.5.5.4 Further mitigation

109. No additional mitigation above that embedded in the Offshore Project design (**Section 15.3.4.1**) is proposed.

15.5.6 Impact 6: Impact on search and rescue

15.5.6.1 Significance of effect

110. Impacts to SAR are mitigated through design (turbine spacing) and adherence to an ERCOP, which are embedded into the Offshore Project design. The design of the

windfarm should be such to enable both helicopter and vessel access and therefore safeguard HM Coastguard obligations to SAR within the UK Search and Rescue Region. Agreement of turbine layout with the MCA is required prior to commencement of construction activities. It is, therefore, assumed that impacts to SAR will be effectively mitigated by adherence to regulatory and MGN 654 requirements.

111. Overall, the frequency of occurrence is deemed to be **remote** and the severity of consequence is considered to be **negligible** given embedded mitigation. The effect is, therefore, considered to be of **negligible** significance, which is **not significant** in EIA terms.

15.5.6.2 Further mitigation

112. No additional mitigation above that embedded in the Offshore Project design (**Section 15.3.4.1**) is proposed.

15.5.7 Impact 7: Impact on under keel clearance and snagging risk (Windfarm Site)

113. Floating WTGs are typically moored to the seabed through a spread of subsurface mooring cables and chains. These moorings, or transmission cabling, can pose a risk to navigating vessels through a reduction in UKC or snagging of anchors or fishing gear.

15.5.7.1 Frequency of occurrence

114. A worst-case mooring spread of 600m radius from each WTG has been assumed, as per industry precedent. The majority of vessels (where the draught is known) are less than 10m in draught (**Appendix 15.A**). Whilst the catenary of the moorings is not known at this stage, it is likely that as distance from the WTG increases, the moorings will become exponentially closer to the seabed. Therefore, the risk to UKC would be experienced where deep draught vessels navigate within close proximity to the WTGs.

115. Given that the worst-case mooring spread radius of 600m is considerably less than the MGN 372 2nm recommended passing distance from an OWF, it is considered that the risk of a deep draught vessel contacting the moorings is remote.

116. The risk of snagging of fishing gear on the moorings or cables was raised by consultees. Consultation determined that fishermen would likely self-exclude themselves from a floating OWF in order to mitigate any risk of snagging with the moorings. Overall, the frequency of occurrence is deemed to be **unlikely**.

15.5.7.2 Severity of consequence

117. Given the lack of any surface marking of mooring extent, it is considered reasonably credible that fishing gear could become entangled in the subsurface Offshore Project infrastructure. Snagging of underwater obstructions can lead to gear loss and has resulted in capsize and loss of life aboard fishing vessels within the UK. The severity of consequence is considered to be **moderate** given embedded mitigation.

15.5.7.3 Significance of effect

118. OWFs are routinely constructed in two phases, with the moorings installed, before the WTGs. Therefore, it is feasible that there may be a period of time during which the moorings are in place without the surface infrastructure, during which time the risks of snagging are greatly increased. Embedded mitigation such as Notice to Mariners and other warnings will be necessary to mitigate this risk. Temporary buoyage or a guard vessel may also be considered.

119. Overall, the frequency of occurrence is deemed to be **unlikely** and the severity of consequence is considered to be **moderate** given embedded mitigation. The effect is, therefore, considered to be of **moderate** significance, which is **not significant** in EIA terms given its assessment of ALARP within the NRA. The NRA considers the risk as ALARP due the implementation of measures to promulgate the mooring arrangements directly to fishermen and mark hazards on charts. This will provide sufficient warning to enable fishermen to avoid either of these hazards. During construction of the windfarm, when subsurface moorings may have been installed prior to tow out of the WTGs, specific risk controls should be implemented (such as buoyage or guard vessels) given the greater potential for snagging.

15.5.7.4 Further mitigation

120. No additional mitigation above that embedded in the Offshore Project design (**Section 15.3.4.1**) is proposed.

15.6 Potential Impacts during operation and maintenance

121. The potential impacts of the operation and maintenance on shipping and navigation caused by each identified impact are assessed and summarised in this section.

15.6.1 Impact 1: Impact on vessel traffic routeing

122. The presence of an OWF in otherwise navigable waters may necessitate vessels to deviate from their existing routes to avoid the obstruction. This can result in impacts

to passage planning such as increased transit distance and time that could, in a realistic worst-case scenario make some services unviable.

15.6.1.1 Frequency of occurrence

123. Principal and adverse weather routes are discussed in **Section 15.4.1**. While three of the 90th percentile corridors overlap with the Windfarm Site, the route centrelines are clear of the Windfarm Site. Of the major routes (>100 transits per year), only one 90th percentile route intersects the Windfarm Site; the route between Land's End and the Bristol Channel (north of Lundy). There is 8nm of clear searoom to the south-east of the Windfarm Site available for navigation and therefore impacts to this route are considered negligible. Further, no appreciable differences in routeing were identified for adverse weather events assessed between 2021 and 2022. The frequency of occurrence is therefore, considered to be **extremely unlikely**.

15.6.1.2 Severity of consequence

124. The severity of consequence is considered **negligible** given the level of disturbance and deviations required, and when considering the embedded mitigation that will be in place to monitor and communicate operational activities.

15.6.1.3 Significance of effect

125. It is recognised that during adverse weather, vessels may take less direct routes to minimise the impact of the conditions on the vessel. During adverse weather events assessed between 2021 and 2022, there were no appreciable differences in vessel routeing are identified with the exception of a reduction in vessel traffic numbers (particularly small recreational craft).

126. Given the size of the Windfarm Site, the availability of unobstructed searoom adjacent to the Windfarm Site and the low intensity of recreational users, impacts on recreational routeing are not anticipated to be significant.

127. Overall, the frequency of occurrence is deemed to be **extremely unlikely**, and the severity of consequence is considered to be **negligible**. The effect is, therefore, considered to be of **negligible** significance, which is **not significant** in EIA terms.

15.6.1.4 Further mitigation

128. No additional mitigation above that embedded in the Offshore Project design (**Section 15.3.4.1**) is proposed.

15.6.2 Impact 2: Impact on Milford Haven operations

129. The study area is utilised by tankers whilst waiting for berths at Milford Haven. This area is used as it provides a safe waiting location given the relatively low density of vessel traffic and the lack of obstructions to navigation. The presence of the Windfarm Site has the potential to displace loitering tankers further west or north.

15.6.2.1 Frequency of occurrence

130. The Windfarm Site is located more than 30nm from Milford Haven, and therefore the majority of loitering is located further north. Approximately 100 unique vessels were noted loitering within the study area in 2019. However, some tanker tracks do extend far enough south to be located near to the Windfarm Site. These activities may extend for more than several days for each vessel. The frequency of occurrence is deemed to be **extremely unlikely**.

15.6.2.2 Sensitivity of consequence

131. The severity of consequence is considered **negligible** given the available space between St. Ann's head and the Windfarm Site. Milford Haven Port Authority currently request vessels to stand off Saint Ann's Head at a distance of 10nm or more. There is approximately 32nm between the Windfarm Site and Saint Ann's Head meaning that there is still sufficient searoom to the north for vessels to anchor.

132. If the tankers are displaced further west, there is potential for them to interact with the main traffic routes between Milford Haven and the TSSs to the south, however, there is approximately 8nm between the Windfarm Site and the closest route. Given the considerable searoom to the north it is unlikely the tankers would loiter further west.

15.6.2.3 Significance of effect

133. The location of the Windfarm Site means that there is considerable searoom available to the north allowing tankers to loiter. It is noted that during the vessel traffic surveys, when a survey vessel was present within the Windfarm Site, tankers loitered to the north-west to maintain safe searoom.

134. Overall, the frequency of occurrence is deemed to be **extremely unlikely** and the severity of consequence is considered to be **negligible**. The effect is, therefore, considered to be of **negligible** significance, which is **not significant** in EIA terms.

15.6.2.4 Further mitigation

135. No additional mitigation above that embedded in the Offshore Project design (**Section 15.3.4.1**) is proposed.

15.6.3 Impact 3: Impact on risk of allision

136. A vessel is most likely to contact a windfarm structure due to human error or mechanical failure, which could be exacerbated by other factors such as a failure of AtoN.

15.6.3.1 Frequency of occurrence

137. Historical analysis of incidents (**Section 15.1**) involving OWFs has identified that those vessels most likely to come into contact with a turbine are project vessels engaged in construction or maintenance activities as opposed to third-party vessels. Smaller vessels such as fishing and recreational vessels, typically operate in closer proximity to windfarms and are therefore more likely to make contact with wind turbines than larger commercial vessels. Analysis of historic incidents reveals few allisions are recorded by non-project vessels, however, anecdotal evidence of allisions involving fishing and recreational vessels may suggest that such occurrences are underreported.

138. Quantitative assessment within the NRA assessed the likelihood of a contact between a vessel navigating within the area and infrastructure of the Windfarm Site to be one in 606 years (**Appendix 15.A**).

139. The recreational cruising route between Land's End and Milford Haven passes through the Windfarm Site. However, there is sufficient searoom to safely pass around the site and it is unlikely that a recreational vessel would contact a turbine.

140. The Windfarm Site is located adjacent to several major routes into the Bristol Channel, Irish Sea and Milford Haven. However, there is considerable searoom around the site (**Appendix 15.A**) to facilitate safe navigation and, therefore, the risk of contact is not considered likely.

141. The proximity of loitering tankers adjacent to Milford Haven could result in drifting contacts with the WTGs. However, it is anticipated that these activities would be relocated away from the site.

142. Compared to conventional OWFs with fixed monopiles (where fishermen routinely fish within the windfarm site) the presence of subsurface infrastructure makes it more likely that fishermen would avoid the Windfarm Site due to the potential risk to safety and damage or loss of gear through snagging with moorings. The risk of a fishing vessel contacting a floating turbine is therefore reduced. Overall, the frequency of occurrence is deemed to be **unlikely.**

15.6.3.2 Severity of consequence

143. Were a recreational vessel to contact a WTG, a glancing blow with minor damage is the most credible outcome. Any drifting allisions would similarly be of low impact and therefore have low consequences.

144. Were a fishing vessel contact to occur, through for example mechanical breakdown or human error, the most likely outcome would be a glancing contact with minor damage. However, it is possible (in a worst credible scenario) that a fishing vessel could capsize with the potential for loss of life.

145. Should a large commercial vessel allide with a WTG, for example a drifting contact by a tanker, there is potential for multiple serious injuries and serious damage in a worst credible scenario, however, this is considered unlikely. Therefore, the severity of consequence is considered to be **moderate**.

15.6.3.3 Significance of effect

146. Overall, the frequency of occurrence is deemed to be **unlikely** and the severity of consequence is considered to be **moderate**. The effect is, therefore, considered to be of **moderate** significance, which is **not significant** in EIA terms given its assessment as ALARP within the NRA. The NRA considers the risk as ALARP as allisions typically resulted in some minor injuries and damage. Fatalities and the loss of the vessel in such a situation are a feasible outcome, but it is considered unlikely during the Offshore Project lifecycle. This risk can be managed through adherence to industry best practice vessel standards, marine operating guidelines and training provision to personnel abord project vessels.

15.6.3.4 Further mitigation

147. No additional mitigation above that embedded in the Offshore Project design (**Section 15.3.4.1**) is proposed.

15.6.4 Impact 4: Impact on risk of collision

148. The presence of an OWF in an otherwise navigable area can constrain shipping routes and result in pinch points or areas of high vessel traffic density, with the potential to increase the number of encounters or potential collision situations.

149. An increase in vessels within the study area, due to the introduction of maintenance vessels may increase potential encounter and collision scenarios. These vessels, typically high-speed catamarans, may cross-cut established routeing to access wind-farm sites.

150. Blind spots may result from windfarm sites blocking or hindering the view of other navigating vessels or aids to navigation which could increase the risk of collision by reducing the capability for early and effective collision avoidance.

15.6.4.1 Frequency of occurrence

151. Collision modelling was undertaken within the NRA (**Appendix 15.A**) which determined a risk of collision of once in 490 years. Near misses of project vessels with other users have been reported at other windfarm projects, with project vessels accounting for 82% of recorded incidents at windfarm sites between 2008 and 2009 (**Appendix 15.A**). The O&M base for the Windfarm Site has not yet been determined but it is anticipated that the number of maintenance vessel movements would be low at approximately 40 per year, suggesting a relatively minor impact on collision risk along the route between the OWF and the O&M base.

152. The Windfarm Site is located adjacent to several major routes into the Bristol Channel, Irish Sea and Milford Haven. The assessment has identified minimal impact on vessel routeing (**Section 15.5.1**) reducing the occurrence of pinch points and areas of high vessel traffic density that may occur as a result of rerouting. It is, therefore, considered that there is considerable searoom around the site to facilitate safe navigation. As such, no discernible increase in third-party collision risk was predicted. The frequency of occurrence is therefore deemed to be **extremely unlikely**.

15.6.4.2 Severity of consequence

153. Collisions involving larger commercial vessels carry a higher potential consequence, however, collisions involving small craft such as fishing and recreational craft are typically more frequent and typically result in a lower consequence outcome. A collision event between two small vessels may result in serious damage and multiple major injuries in a worst-credible scenario, however, minor injuries and negligible damage is more likely. The severity of consequence is considered to be **moderate**.

15.6.4.3 Significance of effect

154. Given the relatively low traffic density near to the Windfarm Site, the small number and diameter of the turbines and the distance to other navigation aids or hazards, the Offshore Project is not considered to have an appreciable impact on visual navigation. Project vessels but will be required to comply with the principals of good seamanship and COLREGs.

155. Overall, the frequency of occurrence is deemed to be **extremely unlikely** and the severity of consequence is considered to be **moderate**. The effect is, therefore, considered to be of **minor** significance, which is **not significant** in EIA terms.

15.6.4.4 Further mitigation

156. No additional mitigation above that embedded in the Offshore Project design (**Section 15.3.4.1**) is proposed

15.6.5 Impact 5: Impact of export cable on vessel safety and activities

157. Subsea cables can pose a hazard to navigating vessels as a result of anchor and fishing gear strikes where gear attached to the vessel may snag the cable/cable protection. Where the export cable is protected by means such as rock protection/armouring, this may reduce the navigable depth of water and increase the risk of grounding.

15.6.5.1 Frequency of occurrence

158. The cable is intended to be fully buried, typically to a depth of 1m or where this is not possible, protected using other measures such as rock armouring.

159. There is no evidence of commercial anchoring in close proximity to the cable route and no charted anchorages. Anchoring of smaller vessels occurs away from the proposed cable corridor. There is no evidence of recreational vessel anchoring near to the cable landfall.

160. The most likely snagging risk is presented by fishing. There is significant fishing activity along the cable route near to the Windfarm Site and the landfall (**Section 15.4.1**). The frequency of occurrence is deemed to be **extremely unlikely.**

15.6.5.2 Severity of consequence

161. Assuming adequate protection, it is unlikely that a yacht's anchor would either snag or damage the cable.

162. Were a fishing vessel to snag the cable, the most likely outcome is loss of gear and potentially minor damage to the cable. A worst credible outcome is the loss of the fishing vessel were it to capsize. However, this is considered unlikely.

163. Any additional protection at crossings with existing cables are likely to be in relatively deep water and as such would not appreciably impact UKC. The deepest draught vessels recorded entering the buoyed channel to Bideford Harbour are between 5 and 6 metres and navigate the channel at high tide. Any cable protection

in this area should, therefore, not compromise access to the harbour. The severity of consequence is considered to be **moderate**.

15.6.5.3 Significance of effect

164. Cable burial would mitigate the risk of snagging. The feasibility of cable burial along the length of the cable route will be established by the CBRA (see **Appendix 8.C**).

165. Coordination of maintenance activities with the local harbour and harbour users would deconflict any impacts resulting from cable maintenance activities.

166. Overall, the frequency of occurrence is deemed to be **extremely unlikely** and the severity of consequence is considered to be **moderate**. The effect is, therefore, considered to be of **minor** significance, which is **not significant** in EIA terms.

15.6.5.4 Further mitigation

167. No additional mitigation above that embedded in the Offshore Project design (**Section 15.3.4.1**) is proposed.

15.6.6 Impact 6: Impact on search and rescue

15.6.6.1 Significance of effect

168. Impacts to SAR are mitigated through design (turbine spacing) and adherence to an ERCOP, which are embedded into the Offshore Project design. The design of the windfarm should be such to enable both helicopter and vessel access and therefore safeguard HM Coastguard obligations to SAR within the UK Search and Rescue Region. Agreement of turbine layout with the MCA is required prior to commencement of construction activities. It is therefore assumed that impacts to SAR will be effectively mitigated by adherence to regulatory and MGN 654 requirements.

169. Overall, the frequency of occurrence is deemed to be **remote** and the severity of consequence is considered to be **negligible** given embedded mitigation. The effect is, therefore, considered to be of **negligible** significance, which is **not significant** in EIA terms.

15.6.6.2 Further mitigation

170. No additional mitigation above that embedded in the Offshore Project design (**Section 15.3.4.1**) is proposed.

15.6.7 Impact 7: Impact on under keel clearance and snagging risk (Windfarm Site)

171. Floating WTGs are typically moored to the seabed through a spread of subsurface mooring cables and chains. These moorings, or transmission cabling, can pose a risk to navigating vessels through a reduction in UKC or snagging of anchors or fishing gear.

15.6.7.1 Frequency of occurrence

172. A worst case mooring spread of 600m radius from each WTG has been assumed, as per industry precedent. The majority of vessels (where the draught is known) are less than 10m in draught (**Appendix 15.A**). Whilst the catenary of the moorings is not known at this stage, it is likely that as distance from the WTG increases, the moorings become exponentially closer to the seabed. Therefore, the risk to UKC would be experienced where deep draught vessels navigate within close proximity to the WTGs.

173. A worst-case mooring spread radius of 600m is considerably less than the MGN372 2nm recommended passing distance from an OWF, it is considered that the risk of a deep draught vessel contacting the moorings is remote as the vessel would be likely to contact the WTG in the same event at such proximity.

174. The risk of snagging of fishing gear on the moorings or cables was raised by consultees. Consultation determined that fishermen would likely self-exclude themselves from a floating OWF in order to mitigate any risk of snagging with the moorings. Overall, the frequency of occurrence is deemed to be **unlikely**.

15.6.7.2 Severity of consequence

175. Given the lack of any surface marking of mooring extent, it is considered reasonably credible that fishing gear could become entangled in the subsurface project infrastructure. Snagging of underwater obstructions can lead to gear loss and has resulted in capsize and loss of life aboard fishing vessels within the UK. The severity of consequence is considered to be **moderate** given embedded mitigation.

15.6.7.3 Significance of effect

176. Overall, the frequency of occurrence is deemed to be **unlikely** and the severity of consequence is considered to be **moderate** given embedded mitigation. The effect is, therefore, considered to be of **moderate** significance, which is **not significant** in EIA terms given its assessment of ALARP within the NRA. The NRA considers the risk as ALARP due the implementation of measures to promulgate the mooring arrangements directly to fishermen and by marking hazards on charts. This will provide sufficient warning to enable fishermen to avoid either of these hazards. During construction of the windfarm, when subsurface moorings may have been installed

prior to tow out of the WTGs, specific risk controls should be implemented (such as buoyage or guard vessels) given the greater potential for snagging.

15.6.7.4 Further mitigation

177. No additional mitigation above that embedded in the Offshore Project design (**Section 15.3.4.1**) is proposed.

15.6.8 Impact 8: Impact on communications, radar and positioning systems

178. Windfarm sites may adversely impact equipment used for navigation, collision avoidance or communications. The sound generated by the turbines could additionally mask navigational sound signals from vessels or aids to navigation. Equipment that may be adversely impacted is discussed below:

- VHF: VHF is essential for communication between vessels and the shore and could be blocked by the presence of turbines
- AIS: AIS enhances the identification between vessels for collision avoidance. AIS signal could be blocked or interfered with by the presence of turbines
- Global Navigation Satellite System (GNSS): GNSS (such as Global Positioning Systems (GPS)) is used for satellite positioning systems and navigation. Satellite reception could be impacted by the presence of turbines
- Marine radar: Marine radar is used for both collision avoidance and vessel navigation. Wind turbines, like other structures, can result in spurious returns such as side lobes, echoes, reflections and blanketing
- Shore radar: Similar to marine radars, shore radars could be impacted by the wind turbines
- Compass: Compasses are used for vessel navigation. These are potentially impacted by electromagnetic interference from the WTGs or cables. The degree of this impact is related to the depth of water, cable design and alignment with the earth's magnetic field.

Significance of effect

179. Various studies have been undertaken into the effects of windfarms on navigation equipment. Notable studies include:

- MCA and QinetiQ (2004). Results of the electromagnetic investigations and assessments of marine radar, communications and positioning systems undertaken at the North Hoyle windfarm by QinetiQ and the Maritime and Coastguard Agency

- BWEA (2007). Investigation of Technical and Operational Effects on Marine Radar Close to Kentish Flats Offshore Windfarm
- Ocean Studies Board's Division on Earth and Life Studies (2022). Wind Turbine Generator Impacts to Marine Vessel Radar.

180. In each instance, the studies found no appreciable impact on navigation safety. More information is provided within the NRA (**Appendix 15.A**). Overall, the frequency of occurrence is therefore deemed to be **remote** and the severity of consequence is considered to be **negligible**. The effect is, therefore, considered to be of **negligible** significance, which is not significant in EIA terms.

15.6.8.1 Further mitigation

181. No additional mitigation above that embedded in the Offshore Project design (**Section 15.3.4.1**) is proposed.

15.6.9 Impact 9: Impact of turbine breakout on vessel safety

182. Mooring systems are designed to resist extreme conditions such as 50-year return period events. Were the moorings to partially or completely fail, a turbine could become displaced or break free and become a navigational hazard to other vessels.

15.6.9.1 Frequency of occurrence

183. Given the relatively low density of traffic, low likelihood of breakout and continued visibility of the WTG in the event of a breakout, the likelihood of impact on navigating vessels is considered very low.

15.6.9.2 Severity of consequence

184. If a turbine were to breakout, it would still be marked and visible to other navigating vessels and the most likely scenario is that a navigating vessel would avoid the obstruction. In a worst-credible scenario minor injuries and minor damage may occur with serious implications to business (caused by schedule delays, for example), however, this is considered unlikely.

15.6.9.3 Significance of effect

185. The moorings will be subject to the requirement of the Regulatory Expectations on Moorings for Floating Wind and Marine Devices (HSE/MCA, 2017) and inspections and monitoring will be carried out throughout the operational phase with a response plan to be included within the ERCOP.

186. Overall, the frequency of occurrence is deemed to be **extremely unlikely** and the severity of consequence is considered to be **moderate** given embedded

mitigation. The effect is, therefore, considered to be of **minor** significance, which is not significant in EIA terms.

15.6.9.4 Further mitigation

187. Three additional mitigations may be considered to mitigate the risk of breakout further:

- Provide GPS tracking of each WTGs with geofenced alarms to identify excursion from site
- Turbines to be fitted with dormant AIS transponders which can be remotely activated were the turbine to break free, providing greater visibility to navigating vessels
- Put in place agreement with towage providers for emergency arrangements to recover a turbine were it to breakout from site.

15.6.9.5 Residual effect

Should the proposed additional mitigations be taken forwards the frequency of occurrence would be reduced to **remote**. The severity of consequence would stay the same (**moderate**). The effect is, therefore, considered to be of **negligible** significance, which is not significant in EIA terms.

15.7 Potential Impacts during decommissioning

188. The potential impacts of the decommissioning of the Offshore Project have been assessed on shipping and navigation. A description of the potential effect on shipping and navigation caused by each identified impact is given in this section. It is noted that the impacts during decommissioning are considered largely the same as during construction.

15.7.1 Impact 1: Impact on vessel traffic routeing

189. No decision has been made regarding the final decommissioning policy for the Offshore Project as it is recognised that industry best practice, rules and legislation change over time. The decommissioning methodology would be finalised nearer to the end of the lifetime of the Offshore Project to be in line with current guidance, policy and legalisation at that point. Any such methodology would be agreed with the relevant authorities and statutory consultees. The decommissioning works are likely to be subject to a separate licencing and consenting approach.

190. The anticipated decommissioning activities are outlined in **Section 5.10** of **Chapter 5: Project Description.** The potential impacts of the decommissioning of the Offshore Project have been assessed for shipping and navigation on the

assumption that decommissioning methods will be similar or of a lesser scale than those deployed for construction. Displacement of vessels within the study area could arise from the presence of structures undergoing decommissioning and the vessels associated with decommissioning of turbines, infield and offshore cables.

15.7.1.1 Frequency of occurrence

191. As for construction, each vessel type will experience displacement to a varying degree, depending on activity frequency and geographical spread across the study area. At the point of decommissioning, routeing with consideration of the windfarm will be well established reducing impacts to established vessel routeing. The frequency of occurrence is therefore, considered to be **extremely unlikely**.

15.7.1.2 Severity of consequence

192. As for construction, buoyed areas would be established during decommissioning activities and NtM and other methods of information promulgation would also ensure that vessels are able to effectively plan to minimise deviations.

193. The severity of consequence is considered **negligible** considering the embedded mitigation that will be in place to monitor and communicate decommissioning activities and given the level of disturbance and deviations required.

15.7.1.3 Significance of effect

194. The impacts in EIA terms are considered to be the same as during construction, with detailed mitigation measures to be identified within the Decommissioning Programme. Overall, the frequency of occurrence is therefore deemed to be **extremely unlikely**, and the severity of consequence is considered to be **negligible**. The effect is, therefore, considered to be of **negligible** significance, which is not significant in EIA terms.

15.7.1.4 Further mitigation

195. No additional mitigation above that embedded in the Offshore Project design (**Section 15.3.4.1**) is proposed.

15.7.2 Impact 2: Impact on Milford Haven operations

196. The study area is utilised by tankers whilst waiting for berths at Milford Haven. This area is used as it provides a safe waiting location given the relatively low density of vessel traffic and the lack of obstructions to navigation. The presence of the Windfarm Site has the potential to displace loitering tankers either further west or north.

15.7.2.1 Frequency of occurrence

197. The Windfarm Site is located more than 30nm from Milford Haven, and therefore the majority of loitering is located further north. However, some tanker tracks do extend far enough south to be located near to the Windfarm Site. These activities may extend for more than several days for each vessel. During decommissioning, 500m safety zones will be enforced, however, these are unlikely to impact on tankers which will maintain a suitable distance from the Windfarm Site and as such are unlikely to be impacted by decommissioning activities. The frequency of occurrence is deemed to be **extremely unlikely**.

15.7.2.2 Sensitivity of consequence

198. The severity of consequence is considered **negligible** given the available space between St. Ann's head and the Windfarm Site. Milford Haven Port Authority currently request vessels to stand off Saint Ann's Head at a distance of 10nm or more. There is approximately 32nm between the Windfarm Site and Saint Ann's Head meaning that there is still sufficient searoom to the north for vessels to anchor and maintain an appropriate distance from the Windfarm Site and any associated decommissioning activities.

15.7.2.3 Significance of effect

199. The location of the Windfarm Site means that there is considerable searoom available to the north allowing tankers to loiter. It is noted that during the vessel traffic surveys, when a survey vessel was present within the Windfarm Site, tankers loitered to the north-west to maintain safe searoom.

200. Overall, the impact is considered the same as during the construction phase. The frequency of occurrence is deemed to be **extremely unlikely** and the severity of consequence is considered to be **negligible**. The effect is, therefore, considered to be of **negligible** significance, which is not significant in EIA terms.

15.7.2.4 Further mitigation

201. No additional mitigation above that embedded in the Offshore Project design (**Section 15.3.4.1**) is proposed.

15.7.3 Impact 3: Impact on risk of allision

202. A vessel is most likely to contact a windfarm structure due to human error or mechanical failure, which could be exacerbated by other factors such as a failure of AtoN. During decommissioning there is potential for allision with structures that are not yet fully decommissioned.

15.7.3.1 Frequency of occurrence

203. Historical analysis of incidents (**Section 15.1**) involving OWFs has identified that those vessels most likely to come into contact with a turbine are project vessels engaged in construction activities as opposed to third-party vessels. Smaller vessels such as fishing and recreational vessels, typically operate in closer proximity to windfarms and are therefore more likely to make contact with wind turbines than larger commercial vessels. Analysis of historic incidents reveals few allisions are recorded by non-project vessels, however, anecdotal evidence of allisions involving fishing and recreational vessels may suggest that such occurrences are underreported.

204. Quantitative assessment within the NRA assessed the likelihood of a contact between a vessel navigating within the area and infrastructure of the Windfarm Site to be one in 606 years (**Appendix 15.A**).

205. The recreational cruising route between Land's End and Milford Haven passes through the Windfarm Site. However, there is sufficient searoom to safely pass around the site. Therefore, it is unlikely that a recreational vessel would contact a turbine.

206. The Windfarm Site is located adjacent to several major routes into the Bristol Channel, Irish Sea and Milford Haven. However, there is considerable searoom around the site (**Appendix 15.A**) to facilitate safe navigation and, therefore, the risk of contact is not considered likely.

207. The proximity of loitering tankers adjacent to Milford Haven could result in drifting contacts with the WTGs. However, it is anticipated that these activities would be relocated away from the site.

208. Compared to conventional OWFs with fixed monopiles (where fishermen routinely fish within the windfarm site) the presence of subsurface infrastructure makes it more likely that fishermen would avoid the windfarm site due to the potential risk to safety and damage or loss of gear through snagging with moorings. The risk of a fishing vessel contacting a floating turbine is therefore reduced.

209. By the point of decommissioning, the windfarm would have been established and promulgated through charting and other communication means for a number of years. Vessels will be experienced navigating through the study area. Safety zones enforced during the decommissioning phase of the Offshore Project will help deconflict traffic with the windfarm structures reducing the likelihood of contact. Overall, the frequency of occurrence is deemed to be **unlikely.**

15.7.3.2 Severity of consequence

210. Were a recreational vessel to contact a WTG, a glancing blow with minor damage is the most credible outcome. Any drifting allisions would similarly be of low impact and therefore have low consequences.

211. Were a fishing vessel contact to occur, through for example mechanical breakdown or human error, the most likely outcome would be a glancing contact with minor damage. However, it is possible (in a worst credible scenario) that a fishing vessel could capsize with the potential for loss of life.

212. Should a large commercial vessel allide with a WTG, for example a drifting contact by a tanker, there is potential for multiple serious injuries and serious damage in a worst credible scenario, however, this is considered unlikely. Overall, the severity of consequence is considered to be **moderate**.

15.7.3.3 Significance of effect

213. Overall, the frequency of occurrence is deemed to be **unlikely** and the severity of consequence is considered to be **moderate**. The effect is, therefore, considered to be the same as the construction phase scoring **moderate** significance assuming embedded mitigations, which is not significant in EIA terms given its assessment as ALARP within the NRA. The NRA considers the risk as ALARP as allisions typically resulted in some minor injuries and damage. Fatalities and the loss of the vessel in such a situation are a feasible outcome, but it is considered unlikely during the Offshore Project lifecycle. This risk can be managed through adherence to industry best practice vessel standards, marine operating guidelines and the provision of training to personnel abord project vessels.

15.7.3.4 Further mitigation

214. No additional mitigation above that embedded in the Offshore Project design (**Section 15.3.4.1**) is proposed.

15.7.4 Impact 4: Impact on risk of collision

215. Decommissioning activities at an OWF in an otherwise navigable area can further constrain shipping routes due to the presence of safety zones and the presence of vessels associated with decommissioning. Additionally, the increase in vessel traffic associated with vessels undertaking decommissioning activities may increase vessel traffic density in vicinity of the Windfarm Site with the potential to increase the number of encounters or potential collision situations.

216. An increase in vessels within the study area, due to the introduction of decommissioning vessels may increase potential encounter and collision scenarios. These vessels, typically high-speed catamarans, may cross-cut established routeing to access wind-farm sites, but will be required to comply with the principals of good seamanship and COLREGs.

217. Blind spots may result from windfarm sites blocking or hindering the view of other navigating vessels or aids to navigation which could increase the risk of collision by reducing the capability for early and effective collision avoidance.

15.7.4.1 Frequency of occurrence

218. Collision modelling was undertaken within the NRA (**Appendix 15.A**) which determined a risk of collision of once in 490 years. Near misses of project vessels with other users have been reported at other windfarm projects, with project vessels accounting for 82% of recorded incidents at windfarm sites between 2008 and 2009 (**Appendix 15.A**).

219. The Windfarm Site is located adjacent to several major routes into the Bristol Channel, Irish Sea and Milford Haven. The assessment has identified minimal impact on vessel routeing (**Section 15.5.1**) reducing the occurrence of pinch points and areas of high vessel traffic density that may occur as a result of rerouting. It is, therefore, considered that there is considerable searoom around the site to facilitate safe navigation. As such, similarly to the construction and operational phase assessments, no discernible increase in third-party collision risk was predicted. Further, by the time of decommissioning routeing with consideration of the Windfarm Site would be well established, reducing the likelihood of a collision due to human error. Overall, the frequency of occurrence is deemed to be **extremely unlikely**.

15.7.4.2 Severity of consequence

220. Collisions involving larger commercial vessels carry a higher potential consequence, however, collisions involving small craft such as fishing and recreational craft are typically more frequent and typically result in a lower consequence outcome. A collision event between two small vessels may result in serious damage and multiple major injuries in a worst-credible scenario, however, minor injuries and negligible damage is more likely.

221. Given the relatively low traffic density near to the Windfarm Site, the small number and diameter of the turbines and the distance to other navigation aids or hazards, the Offshore Project is not considered to have an appreciable impact on visual navigation. Overall, the severity of consequence is considered to be **moderate**.

15.7.4.3 Significance of effect

222. The significance of effect is deemed to be the same as that during construction. Overall, the frequency of occurrence is deemed to be **extremely unlikely** and the severity of consequence is considered to be **moderate**. The effect is, therefore, considered to be of **minor** significance, which is not significant in EIA terms.

15.7.4.4 Further mitigation

223. No additional mitigation above that embedded in the Offshore Project design (**Section 15.3.4.1**) is proposed.

15.7.5 Impact 5: Impact of export cable on vessel safety and activities

224. Subsea cables can pose a hazard to navigating vessels as a result of anchor and fishing gear strikes where gear attached to the vessel may snag the cable/cable protection. The decommissioning of the export cable and any associated safety zone may be disruptive to navigating vessels. Given the close proximity of the cable route to the approach channel into Bideford, it is important that constant access is available into the harbour for all vessel users.

15.7.5.1 Frequency of occurrence

225. There is no evidence of commercial anchoring in close proximity to the cable route and no charted anchorages. Anchoring of smaller vessels occurs away from the proposed cable corridor. There is no evidence of recreational vessel anchoring near to the cable landfall.

226. The most likely snagging risk is presented by fishing. There is significant fishing activity along the cable route near to the Windfarm Site and the landfall (**Section 15.4.1**).

227. Snagging potential during decommissioning is considered the same as during construction. The frequency of occurrence is deemed to be **extremely unlikely**.

15.7.5.2 Severity of consequence

228. Were a fishing vessel to snag the cable, the most likely outcome is loss of gear. A worst credible outcome is the loss of the fishing vessel were it to capsize, however, this is considered unlikely. The severity of consequence is considered to be **moderate**.

15.7.5.3 Significance of effect

229. Coordination of decommissioning activities with the local harbour and harbour users would deconflict any impacts resulting from cable removal activities.

230. Overall, the frequency of occurrence is deemed to be **extremely unlikely** and the severity of consequence is considered to be **moderate**. The effect is, therefore, considered to be of **minor** significance, which is **not significant** in EIA terms.

15.7.5.4 Further mitigation

231. No additional mitigation above that embedded in the Offshore Project design (**Section 15.3.4.1**) is proposed.

15.7.6 Impact 6: Impact on search and rescue

15.7.6.1 Significance of effect

232. Impacts to SAR are mitigated through design (turbine spacing) and adherence to an ERCOP, which are embedded into the Offshore Project design. The design of the windfarm should be such to enable both helicopter and vessel access at any stage of the Offshore Project and therefore safeguard HM Coastguard obligations to SAR within the UK Search and Rescue Region. It is therefore assumed that impacts to SAR are effectively mitigated by adherence to regulatory and MGN 654 requirements.

233. Overall, the frequency of occurrence is deemed to be **remote** and the severity of consequence is considered to be **negligible** given embedded mitigation. The effect is, therefore, considered to be of **negligible** significance, which is not significant in EIA terms.

15.7.6.2 Further mitigation

234. No additional mitigation above that embedded in the Offshore Project design (**Section 15.3.4.1**) is proposed.

15.8 Potential cumulative effects

235. The approach to Cumulative Effect Assessment (CEA) is set out in **Chapter 6: EIA Methodology**. Only projects which are reasonably well described and sufficiently advanced to provide information on which to base a meaningful and robust assessment have been included in the CEA. Projects which are sufficiently implemented during the site characterisation for the Offshore Project have been considered as part of the baseline for the EIA. Where possible Offshore Wind Limited (OWL) has sought to agree with stakeholders the use of as-built project parameter information (if available) as opposed to consented parameters to reduce over-

precaution in the cumulative assessment. The scope of the CEA was therefore established on a topic-by-topic basis with the relevant consultees.

236. Plans, projects and activities that may result in cumulative effects for inclusion in the CEA are listed in **Table 15.16**. Projects within 50nm have been considered within the CEA for shipping and navigation. In accordance with Planning Inspectorate Advice Note 17 (**Chapter 6: EIA Methodology**) the projects screened in have been informed by a long list which forms an exhaustive list of onshore and offshore plans, projects and activities over a broad study area. It is noted that only projects that have submitted scoping chapters have been considered within the CEA.

237. During consultation, all consultees raised concerns about the cumulative effects when declared projects (Tier 3 without scoping chapters), were taken into account. This is partly the result of the Crown Estate announcement in July 2022 of the Celtic Sea Areas of Search. The significance of these impacts and increases in navigational risk cannot be fully assessed for Tier 3 Celtic projects and the Crown Estate Areas of Search due to the uncertainty around the locations and scale of the developments. Particularly due to the large scale of the declared area required to the necessary footprint to support the proposed project sizes. Future projects should ensure that their respective NRAs address the tolerability of such impacts, accounting for additional details as they become available.

238. The cumulative effect assessment for shipping and navigation was undertaken in two stages. The first stage was to consider the potential for the impacts assessed as part of the project to lead to cumulative effects in conjunction with other projects. The first stage of the assessment is detailed in **Table 15.5**.

Table 15.15 Potential cumulative effects considered for shipping and navigation

Impact	Potential for cumulative effect	Rationale
Impact 1: Impact on Vessel Traffic Routeing	Yes	There is the potential for interaction which may lead to cumulative displacement, rerouting and disruption to adverse weather routeing.
Impact 2: Impact on Milford Haven Operations	Yes	There is potential for interaction which may cumulatively impact Milford Haven Operations, including tanker waiting areas.
Impact 3: Impact on Risk of Allision	Yes	There is potential for interaction which may lead to cumulative allision risk.
Impact 4: Impact on Risk of Collision	Yes	There is potential for interaction which may lead to cumulative collision risk.

Impact	Potential for cumulative effect	Rationale
Impact 5: Impact of Export Cable on Vessel Safety and Activities	No	Impacts associated with the cable are of limited spatial influence. Reduction in UKC must be <5% in accordance with MCA requirements. Existing cables will be considered within the Cable Burial Risk Assessment. Developers of any future cables will undertake similar assessments.
Impact 6: Impact on Search and Rescue	Yes	There is potential for interaction which may lead to cumulative risk.
Impact 7: Impact on Under Keel Clearance and Snagging Risk (Windfarm Site)	Yes	There is potential for interaction which may lead to cumulative effects on UKC.
Impact 8: Impact on Communications, Radar and Positioning Systems	Yes	There is potential for interaction which may lead to cumulative effects on communication systems.
Impact 9: Impact of Turbine Breakout on Vessel Safety	No	Impacts are specific to the Offshore Project and of limited spatial influence.

239. The second stage of the CEA is to evaluate the projects considered for the CEA to determine whether a cumulative effect is likely to arise. The list of considered projects (identified in **Chapter 6: EIA Methodology Section 6.6.11**) and their anticipated potential for cumulative effects are summarised in **Table 15.16**.

Table 15.16 Projects considered within the cumulative effect assessment on shipping and navigation

Project	Status	Distance from Windfarm Site (km)	Included in the CEA?	Rationale
Pembrokeshire Demonstration Zone	Pre-application	15	Yes	Within 50nm. Operational phases would overlap and may have an effect on cumulative vessel routeing.
The Llŷr projects (floating offshore wind)	Pre-application	22	Yes	Within 50nm. Operational phases would overlap and may have an effect on cumulative vessel routeing.
Valorous	Pre-application	18	Yes	Within 50nm. Operational phases would overlap and may have an effect on cumulative vessel routeing.

Project	Status	Distance from Windfarm Site (km)	Included in the CEA?	Rationale
Erebus Floating Wind Demo	Application submitted	38	Yes	Within 50nm. Operational phases would overlap and may have an effect on cumulative vessel routeing.
Minerals Aggregates Site: NOBEL Banks	Operational	53	Yes	Within 50nm. Operational phases would overlap and may have an effect on cumulative vessel routeing. Licence end date 30/06/2031.
Offshore Seabed Mining Lease: Area 1902	Approved	71	Yes	Within 50nm. Operational phases would overlap and may have an effect on cumulative vessel routeing. Licence end date 30/05/2032.
Offshore Minerals Mining lease: Area 1901	Approved	74	Yes	Within 50nm. Operational phases would overlap and may have an effect on cumulative vessel routeing. Licence end date 30/05/2032.
Crown Estate Floating Offshore Wind Areas of Search	HRA. Competitive tender 2023	N/A	No	Large Areas of Search will be divided into smaller project development areas which will be offered to the market via competitive tender in mid-2023. Areas for development unknown at this stage.
South Pembrokeshire Demonstration Zone	Pre-scoping		No	Pre-scoping.
Llwelyn / Petroc	Pre-scoping		No	Pre-scoping.
Gwynt Glas	Pre-scoping		No	Pre-scoping.
Xlinks	Unknown		No	Pre-scoping.

240. Screened in impacts for cumulative assessment are listed in **Table 15.15**. The cumulative effect assessment for shipping and navigation was undertaken in two stages. The first stage was to consider the potential for the impacts assessed as part of the project to lead to cumulative effects in conjunction with other projects. The first stage of the assessment is detailed in **Table 15.15**.

241. Where impacts are localised to the Offshore Project, for example, interactions with the cable corridor, there is no potential for interactions and they have been screened out of the CEA.

15.8.1 Impact 1: Cumulative effect on vessel traffic routeing

242. The construction of an OWF in otherwise navigable waters may necessitate vessels to deviate from their existing routes to avoid the obstruction. Cumulative effects may result where multiple projects are proposed, with the potential to result in cumulative effects to passage planning, for example by increasing transit distances and time which could in a worst-case make some services unviable.

15.8.1.1 Significance of effect

243. Concerns were raised during consultation regarding the scale of declared projects within the Celtic Sea. One route, Lands End to Milford Haven, which is comprised primarily of tankers is identified with the potential to be cumulatively impacted by Erebus, Valourous, Llyr 1 and Llyr 2. It is assumed that these vessels would route to the west of Valorous and Erebus before turning east into Milford Haven. Given the Offshore Project's location away from principal vessel routes and primary port approaches, it's individual contribution to traffic routeing impacts when considered in combination with cumulative projects is low.

244. Overall, the frequency of occurrence is deemed to be **extremely unlikely**, and the severity of consequence is considered to be **negligible**. The effect is, therefore, considered to be of **negligible** significance, which is **not significant** in EIA terms.

15.8.1.2 Further mitigation

245. No additional mitigation above that embedded in the Offshore Project design (**Section 15.3.4.1**)is proposed.

15.8.2 Impact 2: Cumulative effect on Milford Haven operations

246. Erebus, Valorous, Llyr 1 and Lllyr 2 have the potential to impact on vessel traffic bound for Milford Haven. Concerns regarding the cumulative effects on tankers waiting for entry to Milford Haven were raised by stakeholders including Milford Haven Port Authority during consultation (**Table 15.13**).

15.8.2.1 Significance of effect

247. Similarly to Impact 1: Cumulative effect on Vessel Traffic Routeing (**Section 15.8.1**), it is assumed that vessels approaching Milford Haven would route to the west of Valorous and Erebus before turning east towards Milford Haven. Given the

Offshore Project's location away from principal vessel routes and primary port approaches, it's individual contribution to traffic routeing to Milford Haven when considered in combination with cumulative projects is low.

248. Milford Haven Port Authority currently request vessels to stand off Saint Ann's Head at a distance of 10nm or more. There is approximately 32nm between the Windfarm Site and Saint Ann's Head meaning that there is sufficient searoom to the north for vessels to anchor. Erebus, Valorous, Llyr 1 and Llyr 2 are situated to the north of the Windfarm Site approximately 19nm south of St Ann's Head providing 9nm of searoom for tankers waiting for entry to Milford Haven.

249. Given the Offshore Project's location 32nm from Saint Ann's Head, it's individual contribution to impacts to waiting tankers is considered low when considered in combination with cumulative projects, with this impact driven by proposed projects situated to the north. Cumulative effects to tankers loitering while awaiting entry to Milford Haven were assessed as part of the Erebus ES, which summarised that while the presence of Erebus and Valorous would bring waiting tankers closer together, given that they are few in number, and the likelihood of two meeting is low and as such the cumulative effects are not considered to be significantly worse than the Offshore Project in isolation.

250. Overall, the frequency of occurrence is deemed to be **unlikely**, and the severity of consequence is considered to be **negligible**. The effect is, therefore, considered to be of **negligible** significance, which is **not significant** in EIA terms.

15.8.2.2 Further mitigation

251. No additional mitigation above that embedded in the Offshore Project design (**Section 15.3.4.1**) is proposed.

15.8.3 Impact 3: Cumulative effect on risk of allision

15.8.3.1 Significance of effect

252. The addition of the cumulative projects would deviate commercial traffic, such as tankers navigating to the west of the site, further away from the Offshore Project reducing the risk of allision at the Offshore Project. The cumulative effect of on allision is therefore driven by cumulative projects and unchanged with or without the Offshore Project in situ, therefore, the contribution of the Offshore Project to the cumulative effects is not considered appreciable.

253. Smaller vessels such as fishing and recreational vessels, typically operate in closer proximity to windfarms and are therefore more likely to make contact with wind

turbines than larger commercial vessels that will maintain a suitable passing distance from the windfarm sites. Analysis of historic incidents reveals that vessels most likely to come into contact with a turbine are project vessels engaged in construction activities as opposed to third-party vessels. As such, the cumulative effect of allision is considered to be the same as for the operational assessment.

254. Overall, the frequency of occurrence is deemed to be **unlikely** and the severity of consequence is considered to be **moderate**. The effect is, therefore, considered to be of **moderate** significance, which is **not significant** in EIA terms given its assessment as ALARP within the NRA. The NRA considers the risk as ALARP as allisions typically resulted in some minor injuries and damage. Fatalities and the loss of the vessel in such a situation are a feasible outcome, but it is considered unlikely during the Offshore Project lifecycle. This risk can be managed through adherence to industry best practice vessel standards, marine operating guidelines and the provision of training to personnel abord project vessels.

15.8.3.2 Further mitigation

255. No additional mitigation above that embedded in the Offshore Project design (**Section 15.3.4.1**) is proposed.

15.8.4 Impact 4: Cumulative effect on risk of collision

15.8.4.1 Significance of effect

256. The Windfarm Site is located adjacent to several major routes into the Bristol Channel, Irish Sea and Milford Haven. The risk of collision may increase to the west of Erebus, Valorous, Llyr 1 and Llyr 2 as vessel traffic into Milford Haven is concentrated adjacent to the principal route between the Off Smalls TSS and Land's End. Additionally, given Erebus, Valorous, Llyr 1 and Llyr 2's situation to the north of the Offshore Project approximately 19nm south of St Ann's Head, the area available to tankers waiting for entry to Milford Haven is reduced to 9nm with the potential to bring tankers closer together, increasing the risk of collision. Cumulative effects to tankers loitering while awaiting entry to Milford Haven were assessed as part of the Erebus ES, which summarised that while the presence of Erebus and Valorous would bring waiting tankers closer together, given that they are few in number, and the likelihood of two meeting is low and as such the cumulative effect of collision with regard to loitering tankers is not considered to be significantly worse than the Offshore Project in isolation scenario. The Offshore Project's individual contribution to this impact is considered low in combination with cumulative projects, with this impact driven by the proposed projects situated to the north. It is therefore surmised that this impact would exist with or without the Offshore Project, and impacts to collision

may in fact be reduced at the Offshore Project site as a result of the presence of the cumulative projects.

257. Fisheries consultees raised concerns that future proposed floating wind projects, in combination, would greatly limit fishing grounds, offsetting fishing vessels into corridors between the OWFs used by other vessel types increasing the risk of collision. These concerns were detailed in the National Federation of Fishermen's Organisation (NFFO) and Scottish Fishermen's Federation (SFF) report "Spatial Squeeze in Fisheries" (NFFO and SFF, 2022). The relative contribution to the cumulative effect is not considered appreciable given the scale of the Offshore Project.

258. The RYA and MCA raised similar concerns relating to offshore cruising routes. The presence of Llyr 1, Llyr 2, Valorous and the Pembroke Demonstrator Zone would reduce access to the Land's End to Milford Haven and Padstow to Milford Haven cruising routes and create narrow corridors between these developments, which might increase risk. The relative contribution to the cumulative effect is not considered appreciable given the small scale of the Offshore Project and its orientation north-south.

259. Overall, the frequency of occurrence is deemed to be **unlikely** and the severity of consequence is considered to be **minor**. The effect is, therefore, considered to be of **moderate** significance. It is noted that this impact score is driven by cumulative projects to the north of the Project rather than the Offshore Project itself where impacts to collision may in fact be reduced as a result of the presence of the cumulative projects. This impact is considered **not significant** in EIA terms given its assessment as ALARP in the NRA. The NRA considers the risk as ALARP due the implementation of measures to promulgate information regarding the Offshore project during all phases of the project and by marking hazards on charts.

15.8.4.2 Further mitigation

260. No additional mitigation above that embedded in the Offshore Project design (**Section 15.3.4.1**) is proposed.

15.8.5 Impact 5: Cumulative effect on search and rescue

15.8.5.1 Significance of effect

261. OWFs can impact the effectiveness of Search and Rescue. Ensuring turbines are arranged in straight lines, with multiple lines of orientation and turbine spacing can facilitate safe access.

262. A layout plan will be agreed with the MCA and TH prior to construction that will ensure continued SAR access. Discussions with the MCA will include cumulative SAR considerations where applicable. It is considered that given the small scale of the site and spacing proposed between turbines vessel or helicopter access to the site will not be compromised.

263. An increase in incident rates could arise as a result of the cumulative interaction of the Offshore Project with other planned projects, leading to an impact on emergency response resources. Incident analysis within 10nm of the Windfarm Site identified very few incidents, and no collision occurrences. Near to the cable landfall, a greater number of incidents were recorded, this likely correlates with increased recreational activity. Given the low level of incident rates in the study area and that all cumulative projects will be required to comply with layout guidance, it is not considered likely that there will be adverse cumulative effects on search and rescue.

264. Overall, the frequency of occurrence is deemed to be **remote** and the severity of consequence is considered to be **negligible** given embedded mitigation. The effect is, therefore, considered to be of **negligible** significance, which is **not significant** in EIA terms.

15.8.5.2 Further mitigation

265. No additional mitigation above that embedded in the Offshore Project design (**Section 15.3.4.1**) is proposed.

15.8.6 Impact 6: Cumulative effect on under keel clearance and snagging risk (Windfarm Site)

15.8.6.1 Significance of effect

266. All OWF projects are required to discuss changes in water depth of greater than 5% with the MCA. Given that the worst-case mooring spread radius of 600m is considerably less than the MGN372 2nm recommended passing distance from an OWF, it is considered that the risk of a deep draught vessel contacting the moorings is remote as the vessel would be likely to contact the WTG in the same event at such proximity. Impacts resulting from changes to UKC as a result of moorings are, therefore, considered to be localised to the windfarm site areas, and as such, cumulative effects are limited. Further, lack of information and uncertainty exists around the moorings and cabling to be installed at cumulative projects.

267. In addition to reducing UKC in their immediate vicinity, floating windfarm moorings increase the potential for snagging, particularly to fishing vessels whose gear may become entangled in the mooring lines. Consultation determined that fishermen would

likely self-exclude themselves from a floating OWF in order to mitigate any risk of snagging with the moorings. When considered in combination with other cumulative projects, this may lead to a cumulative loss of access to fishing grounds within the study area. The commercial implications resulting from the exclusion of fishing is assessed within **Chapter 14: Commercial Fisheries**.

268. Overall, the frequency of occurrence is deemed to be **unlikely** and the severity of consequence is considered to be **moderate** given embedded mitigation. The effect is, therefore, considered to be of **moderate** significance, which is **not significant** in EIA terms given its assessment of ALARP within the NRA. The NRA considers the risk as ALARP due the implementation of measures to promulgate the mooring arrangements directly to fishermen and by marking hazards on charts. This will provide sufficient warning to enable fishermen to avoid either of these hazards. During construction of the windfarm, when subsurface moorings may have been installed prior to tow out of the WTGs, specific risk controls should be implemented (such as buoyage or guard vessels) given the greater potential for snagging.

15.8.6.2 Further mitigation

269. No additional mitigation above that embedded in the Offshore Project design (**Section 15.3.4.1**) is proposed.

15.8.7 Impact 7: Cumulative effect on communications, radar and positioning systems

15.8.7.1 Significance of effect

270. Experience in UK waters has shown that mariners have become increasingly aware of radar effects and their correct interpretation as more OWFs have become operational. The effects of windfarms are the same as those in other environments such as in close proximity to other vessels or structures. Careful adjustment of radar controls can mitigate impacts to radars.

271. MGN 654 notes that impacts to radars within 0.5nm are very high risk and intolerable. Echoes develop at approximately 1.5nm. Where a route passes within this proximity of a windfarm, interference may be experienced. Given the MGN372 2nm recommended passing distance from an OWF, it is considered that impacts resulting from radar interference are localised and cumulative effects are limited. Further, given the Offshore Project's location away from principal vessel routes and the influence of Erebus, Valorous Llyr 1 and Llyr 2 diverting vessel routeing further to the west, the contribution to impacts on radar and communications resulting from the Offshore

Project itself are considered reduced in comparison to the Offshore Project alone scenario.

272. Existing studies (**Section 15.13**) have found no appreciable impact on navigation safety. More information is provided within the NRA (**Appendix 15.A**). Overall, the frequency of occurrence is therefore deemed to be **remote** and the severity of consequence is considered to be **negligible**. The effect is, therefore, considered to be of **negligible** significance, which is **not significant** in EIA terms.

15.8.7.2 Further mitigation

273. No additional mitigation above that embedded in the Offshore Project design (**Section 15.3.4.1**) is proposed.

15.9 Potential transboundary impacts

274. Given the international nature of shipping and navigation transboundary impacts are possible. These are assessed in terms of impacts to international shipping routes. Impacts to vessel routeing were assessed within the impact assessment which determined that impacts to vessel routeing are **negligible**.

15.10 Inter-relationships

275. Inter-relationship impacts are covered as part of the assessment and consider impacts from the construction, operation and maintenance, or decommissioning of the Offshore Project on the same receptor (or group). A description of the process to identify and assess these effects is presented in **Chapter 6: EIA Methodology**. The potential inter-relationship effects that could arise in relation to Shipping and Navigation include both:

- **Project lifetime effects:** Effects arising throughout more than one phase of the Offshore Project (construction, operation and maintenance, and decommissioning) to interact to potentially create a more significant effect on a receptor than if just one phase were assessed in isolation
- **Receptor led effects:** Assessment of the scope for all relevant effects to interact, spatially and temporally, to create inter-related effects on a receptor (or group). Receptor-led effects might be short term, temporary or transient effects, or incorporate longer term effects.

276. **Table 15.17** sign-posts inter-relationships.

Table 15.17 Shipping and navigation inter-relationships

Topic and description	Related chapter	Where addressed in this Chapter	Rationale
Impacts on fishing vessels (displacement)	**Chapter 14: Commercial Fisheries**	Impacts to fishing vessels that may lead to displacement are discussed in Impact 7 : Impact on Under Keel Clearance and Snagging Risk (**Section 15.5.7** and **Section 15.6.7**).	Safety implications to fishing vessels, including snagging and a reduction in UKC assessed within **Section 15.5.7** and **Section 15.6.7**. These impacts may lead to displacement. The commercial implications of displacement are assessed in **Chapter 14: Commercial Fisheries**.
Impacts on Recreational vessels (displacement)	**Chapter 18: Infrastructure and Other Users** **Chapter 23: Socio-Economics (including Tourism and Recreation)**	Impacts to recreational vessel routeing and displacement are assessed within **Section 15.5.1**, **Section 15.6.1** and **Section 15.7.1**.	The presence of the wind farm site has the potential to displace recreational activities. Displacement may impact access to recreational routes and tourism. Impacts to recreational vessel safety and displacement are assessed within this chapter. Impacts associated with loss of access are addressed in **Chapter 18: Infrastructure and Other Users.**
Impacts on Communications and SAR	**Chapter 17: Civil and Military Aviation**	Impacts to Communications, Radar and Positioning are assessed in **Section 15.6.8.** Impacts to Search and Rescue are assessed in **Section 15.5.6, Section 15.6.6** and **Section 15.7.6**.	Impacts to communications and emergency response, including helicopter access is assessed in **Section 15.5.6, Section 15.6.6** and **Section 15.7.6**. Aviation impacts, including low flying operations is assessed

Topic and description	Related chapter	Where addressed in this Chapter	Rationale
			in **Chapter 17: Civil and Military Aviation**.

15.11 Interactions

277. The impacts identified and assessed in this chapter have the potential to interact with each other, which could give rise to synergistic impacts as a result of that interaction. The areas of interaction between impacts are presented in **Table 15.18**, **Table 15.19** and **Table 15.20**, along with an indication as to whether the interaction may give rise to synergistic impacts. This provides a screening tool for impacts which have the potential to interact.

Table 15.18 Interaction between impacts during construction

Potential impact Construction	Impact 1: Impact on Vessel Traffic Routeing	Impact 2: Impact on Milford Haven Operations	Impact 3: Impact on Risk of Allision	Impact 4: Impact on Risk of Collision	Impact 5: Impact of Export Cable on Vessel Safety and Activities	Impact 6: Impact on Search and Rescue	Impact 7: Impact on Under Keel Clearance and Snagging Risk
Impact 1: Impact on Vessel Traffic Routeing		No	Yes	Yes	No	No	No
Impact 2: Impact on Milford Haven Operations	No		Yes	Yes	No	No	No
Impact 3: Impact on Risk of Allision	Yes	Yes		Yes	No	Yes	No
Impact 4: Impact on Risk of Collision	Yes	Yes	Yes		No	Yes	No
Impact 5: Impact of Export Cable on Vessel Safety and Activities	No	No	No	No		No	Yes
Impact 6: Impact on Search and Rescue	No	No	Yes	Yes	No		No
Impact 7: Impact on Under Keel Clearance and Snagging Risk	No	No	No	No	Yes	No	

Table 15.19 Interaction between impacts during operation and maintenance

Potential impact									
Operation and Maintenance	**Impact 1: Impact on Vessel Traffic Routeing**	**Impact 2: Impact on Milford Haven Operations**	**Impact 3: Impact on Risk of Allision**	**Impact 4: Impact on Risk of Collision**	**Impact 5: Impact of Export Cable on Vessel Safety and Activities**	**Impact 6: Impact on Search and Rescue**	**Impact 7: Impact on Under Keel Clearance and Snagging Risk**	**Impact 8: Impact on Communications, Radar and Positioning Systems**	**Impact 9: Impact of Turbine Breakout on Vessel Safety**
Impact 1: Impact on Vessel Traffic Routeing		No	Yes	Yes	No	No	No	No	No
Impact 2: Impact on Milford Haven Operations	No		Yes	Yes	No	No	No	No	No
Impact 3: Impact on Risk of Allision	Yes	Yes		Yes	No	Yes	No	Yes	Yes
Impact 4: Impact on Risk of Collision	Yes	Yes	Yes		No	Yes	No	Yes	Yes
Impact 5: Impact of Export Cable on Vessel Safety and Activities	No	No	No	No		No	Yes	No	No

Potential impact									
Impact 6: Impact on Search and Rescue	No	No	Yes	Yes	No		No	Yes	Yes
Impact 7: Impact on Under Keel Clearance and Snagging Risk	No	No	No	No	Yes	No		No	No
Impact 8: Impact on Communications, Radar and Positioning Systems	No	No	Yes	Yes	No	Yes	No		No
Impact 9: Impact of Turbine Breakout on Vessel Safety	No	No	Yes	Yes	No	Yes	No	No	

Table 15.20 Interaction between impacts during decommissioning

Potential impact **Decommissioning**	**Impact 1: Impact on Vessel Traffic Routeing**	**Impact 2: Impact on Milford Haven Operations**	**Impact 3: Impact on Risk of Allision**	**Impact 4: Impact on Risk of Collision**	**Impact 5: Impact of Export Cable on Vessel Safety and Activities**	**Impact 6: Impact on Search and Rescue**
Impact 1: Impact on Vessel Traffic Routeing		No	Yes	Yes	No	No
Impact 2: Impact on Milford Haven Operations	No		Yes	Yes	No	No
Impact 3: Impact on Risk of Allision	Yes	Yes		Yes	No	Yes
Impact 4: Impact on Risk of Collision	Yes	Yes	Yes		No	Yes
Impact 5: Impact of Export Cable on Vessel Safety and Activities	No	No	No	No		No
Impact 6: Impact on Search and Rescue	No	No	Yes	Yes	No	

15.12 Summary

278. This chapter has investigated the potential effects on shipping and navigation receptors arising from the Offshore Project. The range of potential impacts and associated effects considered has been informed by the Scoping Opinion, consultation and the NRA (**Appendix 15.A**) with reference to existing policy and guidance. The impacts considered include those brought about directly as well as indirectly.

279. A review of the baseline environment has identified that the site is in more than 60m of water and more than 30nm from both the Welsh and Cornish shorelines. Whilst there are subsea cables adjacent to the windfarm, no other surface offshore features exist within 10nm of the Windfarm Site. The export cable route would, however, make landfall near to the entrance of the River Torridge, where a pilot boarding station, harbour and firing range are located. Search and rescue assets are located along both the Welsh and Cornish/Devon coastlines, with a SAR helicopter stationed at Newquay. These are coordinated from Milford Haven CGOC.

280. Analysis conducted as part of the NRA determined that the dominant shipping routes within the Celtic Sea are from Land's End, due north to the Irish Sea, and from Land's End to the Bristol Channel. The site is clear of both of these routes. The Windfarm Site is adjacent to a route between Land's End and the Bristol Channel, that passes north of Lundy (565 transits per year). A route taken by tankers between Milford Haven and Land's End passes two nautical miles to the northwest (521 transits per year).

281. No passenger services are located near to the Windfarm Site. Regular services operate between the mainland and Lundy and therefore intersect the cable corridor.

282. The majority of recreational movements are offshore cruising yachts, principally in a north-south orientation from Lands' End or Padstow towards Milford Haven. These activities are concentrated along the coast and towards the cable landfalls. There is seasonality in vessel activity, concentrated between April and September, related to fishing and recreational movements.

283. Analysis determined that both static and mobile gear fishing takes place both within the Windfarm Site, and in the vicinity. These include both local UK boats and European vessels. Some trawling and potting activity was evident from the analysis near to the cable landfalls.

284. Tug and service vessel routes are typically aligned with commercial shipping routes between Land's End and Bristol or Milford Haven.

285. Historical incident analysis within 10nm of the Windfarm Site identified very few incidents, and no collision occurrences. Most incidents relate to the effects of adverse weather or mechanical failure. Near to the cable landfalls, a greater number of incidents were recorded correlating with an increase in recreational activity. Analysis of incidents on other projects in the UK, determined that allisions involving project vessels are the most likely to occur.

286. **Table 15.21** presents a summary of the impacts assessed within this ES chapter, along with any commitments, mitigation and the resultant residual effects.

287. Assessment of the impacts throughout the Offshore Project lifecycle has established that while there will be some residual effects during the construction, operation and maintenance, and decommissioning phases, they are not considered significant since they are assessed as ALARP or lower in the NRA. Justification for why they are considered ALARP is given in the relevant impacts in **Sections 15.5, 15.6 and 15.7.**

288. The Windfarm Site is located in an area of low vessel intensity and is not predicted to have an appreciable impact on vessel routes and no appreciable increase in collision risk is anticipated.

289. Impacts on UKC and snagging risk and impacts on allision scored the highest (moderate significance) driven by hazard consequence should an incident occur. Snagging by fishing gear could, in a worst-case event result in capsize and therefore sufficient burial of the cable is recommended where possible. In both instances the frequency of occurrence was considered unlikely. With embedded mitigation in place, both hazards are assessed to be ALARP in the NRA and are therefore **not significant** in EIA terms. The NRA considers these hazards to be ALARP due to the implementation of measures to inform other sea users and to manage vessel traffic associated with the project (see Section **15.5**, **15.6** and **15.7**).

290. The assessment of cumulative effects from the Offshore Project and other developments and activities concluded that cumulative projects would deviate shipping bound for Milford Haven to the west (to pass clear of Erebus, Valorous and Llyr 1 and 2) and, therefore, away from the Offshore Project. These projects additionally reduce the searoom to the north for tankers to loiter on approach to Milford Haven. The contribution of the Offshore Project to cumulative effects is negligible, with the presence of the cumulative projects likely to reduce impacts at the Windfarm Site.

291. Impacts on UKC and snagging risk, allision and collision scored the highest (moderate significance) in the cumulative assessment driven by Erebus, Valorous and

Llyr 1 and 2 in the case of allision and collision, with these hazards considered reduced at the Windfarm Site. In the case of impacts to UKC and snagging, significance was driven by the consequence should an incident occur. In all instances the frequency of occurrence was considered unlikely. With the assumed embedded mitigation in place, all cumulative hazards were assessed to be ALARP within the NRA and are therefore **not significant** in EIA terms.

Table 15.21 Summary of potential impacts for Shipping and Navigation during construction, operation and maintenance, and decommissioning of the Offshore Project

Potential impact	Receptor	Frequency	Consequence	Significance	Potential mitigation measure	Residual effect
Construction						
Impact 1: Impact on Vessel Traffic Routeing	All vessel types	Extremely Unlikely	Negligible	Negligible	None above those embedded	Negligible
Impact 2: Impact on Milford Haven Operations	Milford Haven Port Authority	Extremely Unlikely	Negligible	Negligible	None above those embedded	Negligible
Impact 3: Impact on Risk of Allision	All vessel types	Unlikely	Moderate	Moderate	None above those embedded	Moderate (**not significant**)
Impact 4: Impact on Risk of Collision	All vessel types	Extremely Unlikely	Moderate	Minor	None above those embedded	Minor
Impact 5: Impact of Export Cable on Vessel Safety and Activities	All vessel types	Extremely Unlikely	Moderate	Minor	None above those embedded	Minor
Impact 6: Impact on Search and Rescue	Search and rescue	Remote	Negligible	Negligible	None above those embedded	Negligible
Impact 7: Impact on Under Keel Clearance and Snagging Risk	All vessel types	Unlikely	Moderate	Moderate	None above those embedded	Moderate (**not significant**)
Operation and Maintenance						

Potential impact	Receptor	Frequency	Consequence	Significance	Potential mitigation measure	Residual effect
Impact 1: Impact on Vessel Traffic Routeing	All vessel types	Extremely Unlikely	Negligible	Negligible	None above those embedded	Negligible
Impact on Milford Haven Operations	Milford Haven Port Authority	Extremely Unlikely	Negligible	Negligible	None above those embedded	Negligible
Impact 3: Impact on Risk of Allision	All vessel types	Unlikely	Moderate	Moderate	None above those embedded	Moderate (**not significant**)
Impact 4: Impact on Risk of Collision	All vessel types	Extremely Unlikely	Moderate	Minor	None above those embedded	Minor
Impact 5: Impact of Export Cable on Vessel Safety and Activities	All vessel types	Extremely Unlikely	Moderate	Minor	None above those embedded	Minor
Impact 6: Impact on Search and Rescue	Search and Rescue	Remote	Negligible	Negligible	None above those embedded	Negligible
Impact 7: Impact on Under Keel Clearance and Snagging Risk	All vessel types	Unlikely	Moderate	Moderate	None above those embedded	Moderate (**not significant**)
Impact 8: Impact on Communications, Radar and	All vessel types	Remote	Negligible	Negligible	None above those embedded	Negligible

Potential impact	Receptor	Frequency	Consequence	Significance	Potential mitigation measure	Residual effect
Positioning Systems						
Impact 9: Impact of Turbine Breakout on Vessel Safety	All vessel types	Extremely Unlikely	Moderate	Minor	Provide GPS tracking of each WTGs with geofenced alarms; Turbines to be fitted with dormant AIS transponders; Emergency turbine recovery arrangements.	Negligible
Decommissioning						
Impact 1: Impact on Vessel Traffic Routeing	All vessel types	Extremely Unlikely	Negligible	Negligible	None above those embedded	Negligible
Impact 2: Impact on Milford Haven Operations	Milford Haven Port Authority	Extremely Unlikely	Negligible	Negligible	None above those embedded	Negligible
Impact 3: Impact on Risk of Allision	All vessel types	Unlikely	Moderate	Moderate	None above those embedded	Moderate (**not significant**)
Impact 4: Impact on Risk of Collision	All vessel types	Extremely Unlikely	Moderate	Minor	None above those embedded	Minor

Potential impact	Receptor	Frequency	Consequence	Significance	Potential mitigation measure	Residual effect
Impact 5: Impact of Export Cable on Vessel Safety and Activities	All vessel types	Extremely Unlikely	Moderate	Minor	None above those embedded	Minor
Impact 6: Impact on Search and Rescue	Search and rescue	Remote	Negligible	Negligible	None above those embedded	Negligible
Cumulative						
Impact 1: Impact on Vessel Traffic Routeing	All vessel types	Extremely Unlikely	Negligible	Negligible	None above those embedded	Negligible
Impact 2: Impact on Milford Haven Operations	Milford Haven Port Authority	Unlikely	Negligible	Negligible	None above those embedded	Negligible
Impact 3: Impact on Risk of Allision	All vessel types	Unlikely	Negligible	Negligible	None above those embedded	Negligible
Impact 4: Impact on Risk of Collision	All vessel types	Unlikely	Minor	Moderate	None above those embedded	Moderate
Impact 6: Impact on Search and Rescue	Search and Rescue	Remote	Negligible	Negligible	None above those embedded	Negligible
Impact 7: Impact on Under Keel Clearance	All vessel types	Unlikely	Moderate	Moderate	None above those embedded	Moderate

Potential impact	Receptor	Frequency	Consequence	Significance	Potential mitigation measure	Residual effect
and Snagging Risk						
Impact 8: Impact on Communications, Radar and Positioning Systems	All vessel types	Remote	Negligible	Negligible	None above those embedded	Negligible

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WHITE CROSS

White Cross Offshore Wind Farm Environmental Statement

Appendix 15.A: Navigational Risk Assessment

NASH MARITIME

WHITE CROSS OWF NRA

Navigation Risk Assessment

Offshore Wind Limited

Document No: FLO-WHI-REP-0011 | R04-00

18-Nov-22

PROJECT INFORMATION

PROJECT TITLE	White Cross OWF NRA
REPORT TITLE	Navigation Risk Assessment
CLIENT	Offshore Wind Limited
CLIENT ADDRESS	12 Alva Street, Edinburgh EH2 4QG

DOCUMENT CONTROL

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EXECUTIVE SUMMARY

White Cross Offshore Windfarm (OWF) is a proposed floating offshore windfarm located in the Celtic Sea with a capacity of up to 100MW. The Project is being developed by Offshore Wind Ltd (OWL) a joint venture between Cobra Instalaciones Servicios, S.A., and Flotation Energy plc.

A Navigation Risk Assessment (NRA) has been conducted by NASH Maritime, recognising that OWFs have potential impacts on navigational safety as highlighted under the United Nations Convention on the Law of the Sea (UNCLOS), the National Policy Statements and Marine Plans. The NRA methodology has been conducted in accordance with the Maritime and Coastguard Agency's (MCA's) Marine Guidance Note (MGN) 654 and the International Maritime Organisation's (IMO's) Formal Safety Assessment approach to risk assessment. Where appropriate, additional guidance and lessons learnt have been referred to within the NRA.

Consultation has been conducted with both regulators and stakeholders, and feedback received through scoping responses, consultation meetings, hazard workshops and written correspondence has been addressed. A review of the baseline environment has identified that the site is in more than 60m of water and is more than 30nm from both the Welsh and Cornish shorelines. Whilst there are subsea cables adjacent to the windfarm, no other surface offshore features exist within 10nm of the windfarm site. The export cable route does however make landfall near to the entrance of the River Torridge, where a pilot boarding station, harbour and firing range are located.

Summer and winter boat based marine vessel traffic surveys were conducted, each of 14 days duration, and supplemented with a full year of 2021-2022 AIS data and other secondary sources. The analysis determined that:

The dominant shipping routes within the Celtic Sea are from Lands End, due north to the Irish Sea, and from Lands End to the Bristol Channel. The site is clear of both of these routes. The windfarm site is adjacent to a route between Lands End and the Bristol Channel, that passes north of Lundy (565 transits per year). A route taken by tankers between Milford Haven and Lands' End passes two nautical miles to the northwest (521 transits per year).

No passenger services are located near to the windfarm site. Regular services operate between the mainland and Lundy and therefore intersect the cable corridor.

The majority of recreational movements are offshore cruising yachts, principally in a north-south orientation from Lands' End or Padstow towards Milford Haven. These activities are concentrated along the coast and towards the cable landfalls.

Analysis determined that both static and mobile gear fishing takes place both within the offshore windfarm site, and in the vicinity. These include both local UK boats and European vessels. Some trawling and potting are evident from the analysis near to the cable landfalls.

Tug and service vessel routes are typically aligned with commercial shipping routes between Lands End and Bristol or Milford Haven.

There is seasonality in vessel activity, concentrated between April and September, related to fishing and recreational movements.

Historical incident analysis within 10nm of the windfarm site identified very few incidents, and no collision occurrences. Most incidents relate to the effects of adverse weather or mechanical failure. Near to the cable landfalls, a greater number of incidents were recorded, this likely

correlates with increased recreational activity. Analysis of incidents on other projects in the UK, determined that allisions involving project vessels are the most likely to occur.

A prediction of future traffic profile during the Project lifecycle was undertaken. Whilst there had been a decline in annual freight tonnage between 2007 and 2020, projections to 2035 by the Department for Transport (DfT) are for a 15% increase. This may be accounted for by larger vessels rather than more transits. Localised freight statistics within the Bristol Channel showed similar patterns as to the national picture. Given a review of the available information, neither fishing nor recreational traffic were expected to substantially differ from the base case.

The impact on vessel routeing of the windfarm site was undertaken. Whilst a route from Lands End to the Bristol Channel (which passes north of Lundy) intersects the site, there was more than eight nautical miles of searoom to the south-east for vessels utilising this route to safely deviate clear. Furthermore, less than two vessels per day navigate this route and the impact on traffic flow and increase in collision risk is not considered to be appreciable. Analysis and consultation with the port authority determined that it is standard practice for tankers to loiter south of Milford Haven until a berth is available. The Project in isolation is not considered to substantially reduce the searoom available to compromise this activity.

The project site is adjacent to several commercial and small craft routes, and therefore there is an inherent risk of allision or contact following mechanical failure or human error. The site will be of small scale and well-marked, with most routes maintaining safe passing distance, therefore the risk of allision is low. The proximity of fishing activity to the windfarm site has been assumed on a precautionary basis to continue and therefore the potential risk of allision by fishing boats due to mechanical failure or human error has been highlighted. The windfarm site is located in an area of low vessel intensity and is not predicted to have an appreciable impact on vessel routes. Therefore, no appreciable increase in collision risk is anticipated.

The export cable is of considerable length and crosses shipping routes and fishing grounds. No commercial anchorages along the route are identified, albeit there is a low likelihood that some vessels may anchor in an emergency. Snagging by fishing gear could result in capsize and therefore sufficient burial of the cable is recommended. The laying of the export cable near to the approaches into the River Torridge should be carefully managed to mitigate any disruption to the harbour.

OWFs can impact the effectiveness of Search and Rescue (SAR). Best practice, including lines of orientation and turbine preparation, can facilitate safe access. The small scale of the site and spacing between turbines is considered to not compromise either vessel or helicopter access to the site. A layout plan should be agreed with the MCA and Trinity House to confirm turbine positioning does not impede SAR, prior to construction. OWFs may also impact on shipboard navigation and communication equipment, particularly marine radar when navigating within 1.5nm of the windfarm. Historical traffic analysis at other project sites and industry best practice suggests that most mariners will maintain a safe buffer from the site and, in conjunction with its small scale, this impact would be mitigated.

The moorings and cabling systems used for floating OWFs can increase the risk of snagging for vessels fishing adjacent to the turbines. The specific mooring arrangements have not been fully developed but mooring and cables systems are likely to up to 1.2km from each turbine. The design of floating Wind Turbine Generator (WTG) moorings to withstand adverse weather events mitigate the risk of turbine breakout, and were it to occur, the risk to passing vessels is very low.

Numerous stakeholders raised concerns regarding cumulative effects when wider Celtic Sea projects were considered. The cumulative assessment (undertaken to support this NRA) has been limited to projects which have submitted Scoping Reports in order to limit uncertainty. These cumulative projects would necessarily deviate shipping bound for Milford Haven to the west (to pass clear of Erebus, Valorous and Llyr 1/2) and therefore away from the Project. These projects might also have potentially significant effects through reducing access and operations at Milford Haven. The contribution of the Project to these aforementioned cumulative impacts are negligible given its small scale and separation from key shipping routes.

A hazard log was developed, and hazard workshops utilised to score the likelihood and consequences of each hazard occurring. Embedded risk controls were included within the assessment that included promulgation and awareness, emergency response, project design and operational management. The risk assessment concluded that:

Three hazards were Medium Risk – Tolerable if As Low as Reasonably Practicable (ALARP). Namely allision or snagging of fishing boats with the WTGs or their moorings, given their frequent activity adjacent to the site. The risk of service vessel allision with the Project infrastructure is an inherent risk of operating OWFs and there have been several previous examples within the UK offshore wind industry.

18 hazards were Low Risk – Broadly Acceptable. This reflects the small scale nature of the site, its location clear of major shipping routes and the risk controls that are put in place.

1 hazard was identified as negligible, as relates to vessels grounding on the cable immediately adjacent to cable landfalls.

Four additional risk controls were explored:

It was concluded that operational phase safety zones were not required as they would be ineffective at mitigating the risks of snagging or allision. This has not been applied for on previous floating OWFs.

The installation of buoyage on a permanent basis to mark the site moorings was considered to be impractical and would pose an additional hazard to navigation.

Enhanced site monitoring was recommended in order to further mitigate against the risk of breakout of WTGs.

The following recommendations are made:

The embedded risk controls identified in this NRA are adopted by the Project.

A risk assessment review is conducted once engineering design principals relating to the moorings/layout of the site and Operation & Maintenance (O&M) base of operations is finalised to ensure the assumptions and conclusions of this NRA remain valid.

Consideration is given to establishing a collaborative working group involving stakeholders and developers to address cumulative shipping and navigation issues associated with offshore wind proposals in the Celtic Sea.

The NRA for the Project OWF concludes that there are no unacceptable risks to navigational safety and the impacts associated with the Project are tolerable with identified mitigation measures.

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FIGURES

TABLES

APPENDICES

ABBREVIATIONS

Abbreviation	Detail
ABP	Associated British Ports
AC	Alternating Current
AIS	Automatic Identification System
ALARP	As Low As Reasonably Practicable
ATBA	Area To Be Avoided
BAS	Burial Assessment Study
BWEA	British Wind Energy Association
CBRA	Cable Burial Risk Assessment
CCTV	Closed Circuit Television
CFPO	Cornish Fish Producers Organisation
CGOC	Coast Guard Operating Centres
CHA	Competent Harbour Authority
COLREGS	International Regulations for Preventing Collisions at Sea
CTV	Crew Transfer Vessel
DECC	Department for Energy And Climate Change
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DSC	Digital Selective Calling
EIA	Environmental Impact Assessment
ERCOP	Emergency Response Cooperation Plan
EMODNet	European Marine Observation and Data Network
ES	Environmental Statement
EU	European Union
FLOW	Floating Offshore Windfarm
FSA	Formal Safety Assessment
GIS	Geographic Information System
GLA	General Lighthouse Authority
GMDSS	Global Maritime Distress and Safety System
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HAT	Highest Astronomical Tide
HM	Harbour Master
HMCG	Her Majesty's Coast Guard
HSE	Health and Safety Executive

Abbreviation	Detail
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
ICES	International Council for the Exploration of the Seas
IFCA	Inshore Fisheries and Conservation Authority
IHO	International Hydrographic Organisation
IMO	International Maritime Organisation
IOER	Integrated Offshore Emergency Response
IPC	Infrastructure Planning Commission
IPS	Intermediate Peripheral Structures
kV	Kilovolts
LNG	Liquified Natural Gas
LPS	Local Port Service
MAIB	Marine Accident Investigation Branch
MCA	Maritime and Coastguard Agency
MCAA	Marine and Coastal Access Act
MDS	Maximum Design Envelope
MEPC	Marine Environment Protection Committee
META	Marine Energy Test Area
MGN	Marine Guidance Note
MHPA	Milford Haven Port Authority
MHWS	Mean High Water Springs
MHWS	Mean High Water Springs
MMO	Marine Management Organisation
MOD	Ministry of Defence
MSC	Marine Safety Committee
MSI	Marine Safety Information
MSL	Mean Sea Level
MW	Megawatt
NCSR	Navigation, Communications and Search and Rescue
NDFA	North Devon Fishermen's Association
NFFO	National Federation of Fishermen's Organisations
NP	Nautical Publication
NPS	National Policy Statement
NRA	Navigation Risk Assessment
NSIP	Nationally Significant Infrastructure Project
OREI	Offshore Renewable Energy Installation
OSP	Offshore Substation Platform

Abbreviation	Detail
OWF	Offshore Wind Farm
OWL	Offshore Wind Ltd
PIANC	The World Association for Waterborne Transport Infrastructure
PINS	Planning Inspectorate
PNT	Position, Navigation and Timing
PPE	Personal Protective Equipment
QHSE	Quality, Health, Safety and Environment
REZ	Renewable Energy Zone
RIDDOR	Reporting of Injuries, Diseases and Dangerous Occurrences Regulations
RNLI	Royal National Lifeboat Institute
ROV	Remotely Operated Vessel
RYA	Royal Yachting Association
SAR	Search and Rescue
SCV	Small Commercial Vessel
SFF	Scottish Fishermen's Federation
SHA	Statutory Harbour Authority
SOLAS	Safety Of Life At Sea
SPS	Significant Peripheral Structure
TEU	Twenty-foot Equivalent Unit
TLP	Tension Leg Platform
TSS	Traffic Separation Scheme
UK	United Kingdom
UKC	Under Keel Clearance
UKHO	United Kingdom Hydrographic Office
UKSARH	United Kingdom Search and Rescue Helicopter
UN	United Nations
UNCLOS	The United Nations Convention on the Law of the Sea 1982
USA	United States of America
UXO	Unexploded Ordnance
VHF	Very High Frequency
VMS	Vessel Monitoring System
VTS	Vessel Traffic Service
WTG	Wind Turbine Generator

1. INTRODUCTION

NASH Maritime Ltd (NASH) has been commissioned by Offshore Wind Ltd to undertake a Navigation Risk Assessment (NRA) for the White Cross Offshore Windfarm (OWF) (hereafter referred to as “the Project”). The NRA will be used to inform the Project Environmental Impact Assessment (EIA). This Technical Report presents the results of the NRA for the Project. The Project is located approximately 28nm off the north Devon coast and is comprised of up to eight floating wind turbine generators (WTGs), inter-array cabling, an export cable to the shore and potentially an offshore substation platform (OSP).

The scope of the assessment and content of this report are provided in **Section 1.1**.

1.1 PURPOSE AND SCOPE OF THE NAVIGATION RISK ASSESSMENT

The Project is seeking a Section 36 consent, under the Electricity Act 1989 and a Marine Licence under the Marine and Coastal Access Act (MCAA) 2009, administered by the Marine Management Organisation (MMO).

The Project has the potential to impact upon the safety and navigation of vessels transiting through or within the vicinity of the Floating Offshore Windfarm (FLOW) development. The NRA is an important requirement for the consenting process for offshore renewable developments and identifies the potential effects and impacts of the Project on shipping and navigation.

This NRA follows the requirements of the Maritime and Coastguard Agency (MCA) Marine Guidance Note (MGN) 654 and accompanying methodology document (MGN654 Annex 1). The scope and objectives of this assessment are as follows:

Review relevant policy, guidance and legislation (Section 2);

Describe the assessment methodology (Section 3);

Describe the Project (Section 4);

Provide a description of the baseline environment (Section 5);

Describe the baseline vessel traffic and risk profile (**Section 6**);

Determine the likely future traffic profile (Section 7);

Identify and assess potential impacts of the Project on shipping and navigation (Section 8) and cumulative impacts (Section 8.12);

Undertake an NRA that identifies and assesses hazards during construction, operation and decommissioning phases of the development (**Section 9**);

Identify risk controls in relation to the Project hazards to reduce the risk to As Low As Reasonably Practicable (ALARP) (**Section 9.3** and **Section 9.6**); and

Provide recommendations in relation to the safety of the development and co-existence of users with regards to shipping and navigation (**Section 10**).

2. POLICY, GUIDANCE AND LEGISLATION

2.1 LEGISLATION AND NATIONAL POLICY

2.1.1 UNCLOS

The United Nations Convention on the Law of the Sea (UNCLOS) (UN, 1982) is an international agreement that establishes a legal framework for all marine and maritime activities. Article 60 concerns artificial islands, installations and structures in the exclusive economic zone. Article 60(7) states that "Artificial islands, installations and structures and the safety zones around them may not be established where interference may be caused to the use of recognized sea lanes essential to international navigation." As per Article 22(4), "The coastal state shall clearly indicate such sea lanes and traffic separation schemes on charts to which due publicity shall be given".

The UK is a signatory of UNCLOS and is written into law through Section 36B of the Electricity Act 1989. The requirement to not interfere with the use of recognised sea lanes essential to international navigation is also explicitly contained within that same section.

2.1.2 National Policy Statement

National Policy Statements (NPS's) set out UK Government policy on different types of national infrastructure developments, i.e. Nationally Significant Infrastructure Projects (NSIPs). Whilst the Project is not a NSIP, this NRA has been undertaken in accordance with the instructions and guidance provided within the NPS for Renewable Energy Infrastructure (EN-3) (as per NPS EN-3 1.2.5). **Table 1** provides a summary of the guidance provided by NPS EN-3 that is relevant to shipping and navigation. At the time of undertaking this NRA, NPS EN-3 is being revised, however, the draft wording as relates to shipping and navigation has not been substantially altered.

2.1.3 South West Marine Plan

NPS EN-3 indicates that the decision-maker should take account of the policies and plans in the area as relevant. As such, the South West Marine Plan published by the Department for Environment, Food and Rural Affairs (Defra) in 2021 has been considered in this assessment.

Table 3 provides a summary of the key guidance from the South West Marine Plan relevant to shipping and navigation.

Table 1: NPS EN-3 guidance relevant to shipping and navigation.

NPS Reference	NPS Requirement	NRA Reference
2.6.153	Applicants should establish stakeholder engagement with interested parties in the navigation sector early in the development phase of the proposed offshore windfarm 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 windfarms and navigation uses of the sea to successfully co-exist	Stakeholder consultation undertaken is described in **Section 3.3.1**
2.6.154	Assessment should be underpinned by consultation with the Marine MMO, MCA, the relevant General Lighthouse Authority, 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.	Stakeholder consultation undertaken is described in **Section 3.3.1**
2.6.155	Information on internationally recognised sea lanes is publicly available and this should be considered by applicants prior to undertaking assessments. The assessment should include reference to any relevant, publicly available data available on the Maritime Database	An overview of International Maritime Organisation (IMO) routeing/reporting measures and recommended channels within the study area is presented in **Section 5.2.2**. Datasets used to inform the NRA are summarised in **Section 3**.
2.6.156	Applicants should undertake a NRA in accordance with relevant Government guidance prepared in consultation with the MCA and the other navigation stakeholders listed above.	**Section 9** presents the findings of the NRA. Stakeholder consultation undertaken to inform the NRA process is described in **Section 3.3.1.**
2.6.157	The navigation risk assessment will for example necessitate: • a survey of vessels in the vicinity of the proposed windfarm; • a full NRA of the likely impact of the windfarm on navigation in the immediate area of the windfarm in accordance with the relevant marine guidance; and • cumulative and in-combination risks associated with the development and other developments (including other windfarms) in the same area of sea	2 x 14 day vessel traffic surveys were conducted in compliance with the requirements under MGN654, survey findings are presented in **Section 6.1.** The NRA is presented in **Section 9** and has been produced in accordance with MGN654 and follows the IMO's FSA. The cumulative impacts of the Project on vessel routeing, collision and contact, in combination with multiple developments, are examined in **Section 8.12**. Further commentary on the cumulative impacts on shipping and navigation is provided in **Section 9.7**.

NPS Reference	NPS Requirement	NRA Reference
2.6.158	Where there is a possibility that safety zones will be sought around offshore infrastructure, potential effects should be included in the assessment on navigation and shipping.	**Section 9.6.1** discusses safety zones which are not recommended as a risk control measure for the Project.
2.6.159	Where the precise extents of potential safety zones are unknown, a realistic worst-case scenario should be assessed. Applicants should consult the MCA and refer to the Government guidance on safety zones.	
2.6.160	The potential effect on recreational craft, such as yachts, should be considered in any assessment.	Impacts on recreational craft are assessed throughout **Section 8**.

Table 2: Relevant shipping and navigation IPC decision making requirements from NPS EN-3.

NPS Reference	NPS Requirement	NRA Reference
2.6.161	The Infrastructure Planning Commission (IPC) should not grant development consent in relation to the construction or extension of an offshore windfarm if it considers that interference with the use of recognised sea lanes essential to international navigation is likely to be caused by the development. The use of recognised sea lanes essential to international navigation means: (a) anything that constitutes the use of such a sea lane for the purposes of article 60(7) of the United Nations Convention on the Law of the Sea 1982; or (b) any use of waters in the territorial sea adjacent to Great Britain that would fall within paragraph (a) if the waters were in a Renewable Energy Zone (REZ)	Location of sea lanes in **Section 5.2.2** and impacts on vessel traffic routeing in **Section 8.2**.
2.6.162	The IPC should be satisfied that the site selection has been made with a view to avoiding or minimising disruption or economic loss to the shipping and navigation industries with particular regard to approaches to ports and to strategic routes essential to regional, national and international trade, lifeline ferries and recreational users of the sea. Where a proposed development is likely to affect major commercial navigation routes, for instance by causing appreciably longer transit times, the IPC should give these adverse effects substantial weight in its decision making. There may, however, be some situations where reorganisation of traffic activity might be both possible and desirable when considered against the benefits of the windfarm proposal. Such circumstances should be discussed with the MCA and the commercial shipping sector and it should be recognised that alterations might	Impacts on vessel traffic routeing are discussed in **Section 8.2**.

NPS Reference	NPS Requirement	NRA Reference
	require national endorsement and international agreement and that the negotiations involved may take considerable time and do not have a guaranteed outcome	
2.6.163	Where a proposed offshore windfarm is likely to affect less strategically important shipping routes, a pragmatic approach should be employed by the IPC. For example, vessels usually tend to transit point to point routes between ports (regional, national and international). Many of these routes are important to the shipping and ports industry as is their contribution to the UK economy. In such circumstances the IPC should expect the applicant to minimise negative impacts to ALARP. Again, there may be some situations where reorganisation of traffic activity might be both possible and desirable when considered against the benefits of the windfarm application and such circumstances should be discussed with the MCA and the commercial shipping sector.	Impacts on vessel traffic routeing are discussed in **Section 8.2**.
2.6.164	A detailed SAR Response Assessment should be undertaken prior to commencement of construction should consent for the offshore windfarm be granted. This assessment could be secured by a requirement to any consent. However, where there are significant concerns over the frequency or the consequences of such incidents, a full assessment may be required before the application can be determined.	Impacts to Search and Rescue are contained in **Section 8.7**.
2.6.165	The IPC should not consent applications which pose unacceptable risks to navigational safety after all possible mitigation measures have been considered.	Impacts to navigation are described in **Section 8** and an NRA presented in **Section 9**. Designed in risk controls are described in **Section 9.3** and additional risk control measures are outlined in **Section 9.6**.
2.6.166	The IPC should be satisfied that the scheme has been designed to minimise the effects on recreational craft and that appropriate mitigation measures, such as buffer areas, are built into applications to allow for recreational use outside of commercial shipping routes. In view of the level of need for energy infrastructure, where an adverse effect on the users of recreational craft has been identified, and where no reasonable mitigation is feasible, the IPC should weigh the harm caused with the benefits of the scheme.	Impacts on recreational craft are assessed throughout **Section 8** and an NRA presented in **Section 9**.
2.6.167	Providing proposed schemes have been carefully designed by the applicants, and that the necessary consultation with the MCA and the other navigation stakeholders listed above has been undertaken at an early stage, mitigation measures may be	Impacts to navigation are described in **Section 8** and an NRA presented in **Section 9**.

NPS Reference	NPS Requirement	NRA Reference
	possible to negate or reduce effects on navigation to a level sufficient to enable the IPC to grant consent. The MCA will use the NRA as described in paragraph 2.6.156 above when advising the IPC on any mitigation measures proposed.	Consultation with the MCA is presented in **Section 3.3.1**. Designed in risk controls are described in **Section 9.3** and additional risk control measures are outlined in **Section 9.6.**
2.6.168	The IPC should, in determining whether to grant consent for the construction or extension of an offshore wind farm, and what requirements to include in such a consent, have regard to the extent and nature of any obstruction of or danger to navigation which (without amounting to interference with the use of such sea lanes) is likely to be caused by the development.	Impacts to navigation are described in **Section 8** and an NRA presented in **Section 9**. Designed in risk controls are described in **Section 9.3** and additional risk control measures are outlined in **Section 9.6.**
2.6.169	In considering what interference, obstruction or danger to navigation and shipping is likely and its extent and nature, the IPC should have regard to the likely overall effect of the development in question and to any cumulative effects of other relevant proposed, consented and operational offshore wind farms.	Potential cumulative impacts are explored in **Section 8.12**.

Table 3: South West Marine Plan guidance relevant to shipping and navigation

Paragraph	Key Provisions	NRA Reference
SW-PS-1	Only proposals demonstrating compatibility with current port and harbour activities will be supported. Proposals within statutory harbour authority areas or their approaches that detrimentally and materially affect safety of navigation, or the compliance by statutory harbour authorities with the Open Port Duty or the Port Marine Safety Code, will not be authorised unless there are exceptional circumstances. Proposals that may have a significant adverse impact upon future opportunity for sustainable expansion of port and harbour activities, must demonstrate that they will, in order of preference: • Avoid;	Impacts to commercial vessel routes into ports and harbours is assessed throughout **Section 8**. Impact to Milford Haven Operations assessed in **Section 8.3.** Impacts to Appledore/Bideford are assessed through the impacts **Section 8.6**.

Paragraph	Key Provisions	NRA Reference
	• Minimise; and • Mitigate adverse impacts so they are no longer significant. If it is not possible to mitigate significant adverse impacts, proposals should state the case for proceeding.	
SW-PS-2	Proposals that require static sea surface infrastructure or that significantly reduce under-keel clearance must not be authorised within or encroaching upon IMO routeing systems unless there are exceptional circumstances	Location of IMO adopted routeing measures outlined in **Section 5.2.2** and impacts on vessel traffic routeing in **Section 8.2**.
SW-PS-3	Proposals that require static sea surface infrastructure or that significantly reduce under-keel clearance which encroaches upon high density navigation routes, strategically important navigation routes, or that pose a risk to the viability of passenger services, must not be authorised unless there are exceptional circumstances.	Impacts on vessel traffic routeing in **Section 8.2**.
SW-PS-4	Proposals promoting or facilitating sustainable coastal and/or short sea shipping as an alternative to road, rail or air transport will be supported where appropriate.	Future case traffic profile presented in **Section 7.**

2.2 PRIMARY GUIDANCE

2.2.1 MGN 654

The principal guidance document for NRAs is the MCA's MGN654 (2021). MGN654 describes the potential shipping and navigation issues which should be considered by developers when proposing offshore renewable energy installations (OREIs). Annex 1 (2021) of the MGN provides a detailed methodology for assessing the marine navigational safety risks of OREIs. In particular, by following the methodology, the NRAs are:

Proportionate to the scale of the development and magnitude of risks.

Based on the risk assessment approach of the Formal Safety Assessment (FSA)

Capable of utilising techniques and methods which produce results which are acceptable to the Government.

Compare the base case and future case risks in the study area before predicting the impacts of the OREIs on that risk through a hazard log.

Determine which risk controls should be put in place to minimise the risks to ALARP.

Several annexes are associated with MGN654 and have been utilised to support this NRA:

- Annex 1 provides a standardised format for submissions which is described in **Table 4**.
- Annex 2 provides guidance on windfarm-shipping route interactions.
- Annex 3 provides guidance on Under Keel Clearance.
- Annex 4 provides hydrography guidelines.
- Annex 5 contains guidance on requirements, guidance and operational considerations for search and rescue and emergency response.
- An MGN654 checklist is provided in Annex 6, which is included as **Appendix B** of this NRA.

Table 4: MGN 654 Annex 1 Methodology for Assessing the Marine Navigational Safety & Emergency Response Risks of Offshore Renewable Energy Installations

The Following Content is Included:	Compliant Yes/No	Comments
A risk claim is included supported by a reasoned argument and evidence	Yes	The risk assessment conducted in **Section 9:** • Data analysis (**Section 6**) • Consultation (**Section 3.3.1**) • Review and discussion of impacts (**Section 8**) Therefore, a risk claim is made in **Section 10.**
Description of the marine environment	Yes	A description of the baseline marine environment is provided in **Section 5.**
Description of the OREI development and how it changes the marine environment	Yes	A description of the OREI development is provided in **Section 4**. Potential impacts are described in **Section 9.**
Analysis of the Marine Traffic	Yes	A detailed analysis of the baseline vessel traffic is provided in **Section 6.2**. **Section 7** presents the future baseline traffic profile. The impacts of the OREIs on that traffic is contained within **Section 8**
Status of the hazard log	Yes	The navigational risk assessment is provided in **Section 9**. The hazard log is provided in **Appendix A.**
Navigation Risk Assessment	Yes	The navigational risk assessment is provided in **Section 9**.
Search and Rescue overview and assessment	Yes	Existing search and rescue provision is described in **Section 5.5**.. An assessment of impacts of the Project to search and rescue is provided in **Section 8.7**.
Emergency Response Overview and Assessment	Yes	Existing search and rescue provision is described in **Section 5.5.** An assessment of impacts of the Project to search and rescue is provided in **Section 8.7**.
Status of Risk control log	Yes	Embedded mitigation are contained within **Section 4.7**. Additional risk controls are provided in **Section 9.6**.
Major Hazards Summary	Yes	A summary of the principal impacts of the Project are contained within **Section 8**.
Statement of Limitation	Yes	Any limitations or assumptions of this assessment are reported in their relevant sections.
Through Life Safety Management	Yes	Embedded mitigation are contained within **Section 4.7**. Additional risk controls are provided in **Section 9.6**.

2.2.2 Formal Safety Assessment Process and Methodology

The IMO FSA process has been applied within this NRA. The guidelines for FSA were approved in 2002 and were most recently amended in 2018 by MSC-MEPC.2/Circ.12/Rev.2.

The FSA is a structured and systematic methodology, aimed at enhancing maritime safety, including protection of life, health, the marine environment and property, by using risk analysis and, if appropriate, cost-benefit assessment. The IMO FSA guidance defines a hazard as "a potential to threaten human life, health, property or the environment", the realisation of which results in an incident or accident. The potential for a hazard to be realised (i.e. likelihood) can be combined with an estimated or known consequence of outcome and this combination is termed "risk". There are five steps within the FSA process.

Step 1: Identification of hazards;

Step 2: Risk analysis;

Step 3: Risk control options;

Step 4: Cost-benefit assessment (if applicable); and

Step 5: Recommendations for decision making.

2.3 ADDITIONAL GUIDANCE AND LESSONS LEARNT

Additional guidance is available and has been used to inform this NRA. This guidance is summarised in **Table 5** and **Table 6.**

Table 5: Summary of additional relevant guidance.

Guidance	Description
MGN372: OREIs: Guidance to Mariners Operating in the Vicinity of UK OREIs (MCA, 2008).	Guidance to support passage planning near offshore renewable energy installations off the UK coast.
International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) G1162 The Marking of Offshore Man-Made Structures (IALA, 2021).	Guidance on the lighting and marking arrangements for OWFs.
RYA Position of Offshore Renewable Energy Developments: Wind Energy (RYA, 2019).	Describes key impacts of OWFs on recreational activities.
PIANC WG161 Interaction Between Offshore Windfarms and Maritime Navigation (PIANC, 2018).	Provides guidelines and recommendations on impacts on mitigations for shipping routes near OWFs.
Nautical Institute (2013) The Shipping Industry and Marine Spatial Planning	Guidance on benefits and risks of marine spatial planning for shipping and navigation.
G+ IOER (2019) Good practice guidelines for offshore renewable energy developments	Guidance on emergency response for OWFs.
Health and Safety Executive (HSE) and MCA (2017). Regulatory expectations on moorings for floating wind and marine devices	Guidance on foundations and mooring arrangements for floating wind and marine devices.

Table 6: Lessons learnt and supporting studies.

Guidance	Description
MCA and QinetiQ (2004) Results of the electromagnetic investigations and assessments of marine radar, communications and positioning systems undertaken at the North Hoyle windfarm by QinetiQ and the Maritime and Coastguard Agency	Reporting of trial on impacts of OWF on shipboard equipment.
MCA (2005) Offshore Windfarm Helicopter Search and Rescue Trials Undertaken at the North Hoyle Windfarm	Reporting of trial on impacts of OWF on SAR equipment and activities.
British Wind Energy Association (BWEA) (2007). Investigation of Technical and Operational Effects on Marine Radar Close to Kentish Flats Offshore Windfarm.	Reporting of trial on impacts of OWF on shipboard equipment.
MCA (2019) MCA report following aviation trials and exercises in relation to offshore windfarms	Reporting of trial on impacts of OWF on SAR equipment and activities and the implications on OWF design.
Rawson and Brito (2021) Assessing the validity of navigation risk assessments: a study of offshore windfarms in the UK.	Analysis of historical incidents in UK OWFs.
Ocean Studies Board's Division on Earth and Life Studies (2022). Wind Turbine Generator Impacts to Marine Vessel Radar.	Review of impacts of OWFs on marine radar.

3. NRA METHODOLOGY AND DATA SOURCES

The NRA has been produced in accordance with MGN654 (see **Section 2.2.1**) and follows the IMO's FSA (**Section 2.2.2**). This assessment considers all identified impacts of the Project on shipping and navigation receptors. **Figure 2** provides a workflow of the FSA approach as is applied within this NRA. The FSA defines a risk as "the combination of frequency and the severity of the consequence" (IMO, 2018). Therefore, the likelihood and consequence of these impacts are assessed through the collection and analysis of relevant datasets and through consultation. Details on the risk criteria and matrix methodology are contained within **Section 9**.

3.1 DEFINITION OF STUDY AREA

The study area for the EIA is defined as an area 10nm from generation assets search area and 3nm from export cable search area. The proposed study areas have been agreed with consultees and are consistent with industry best practice for shipping and navigation chapters.

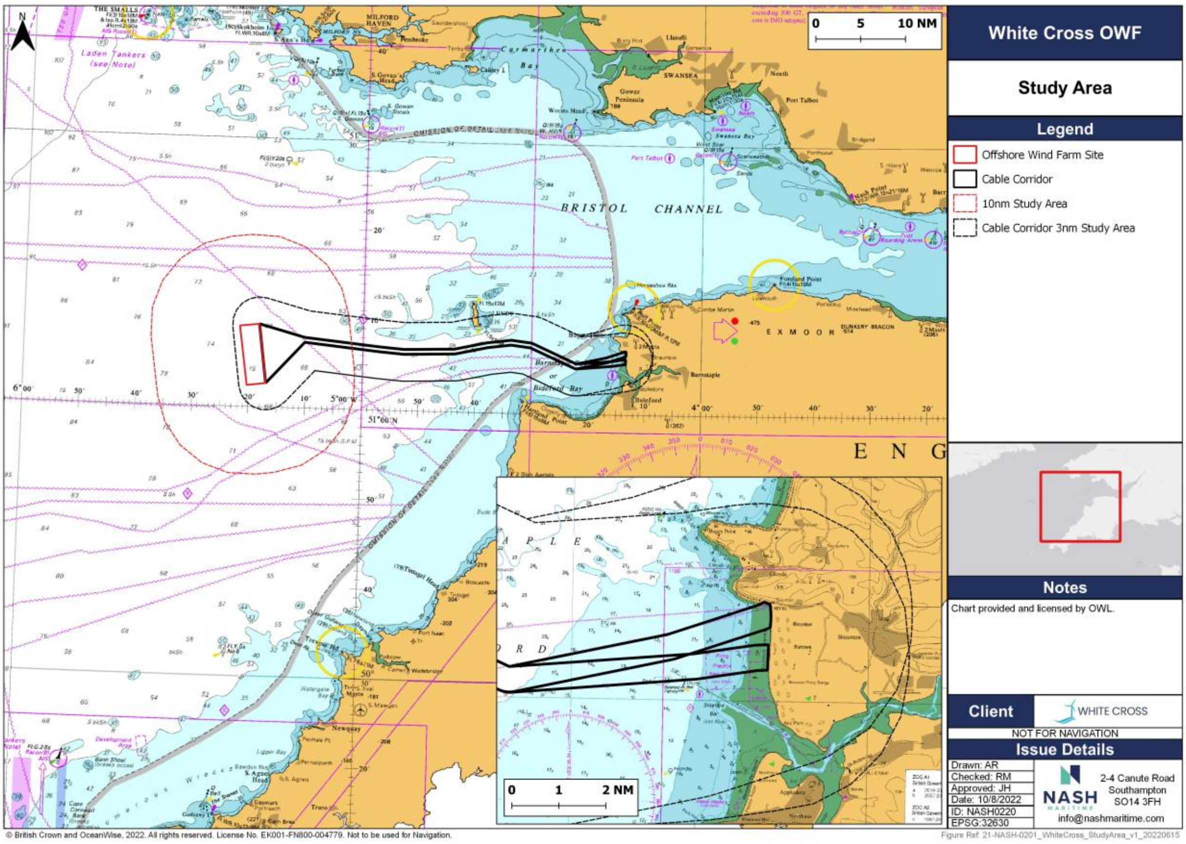


Figure 1: Study area.

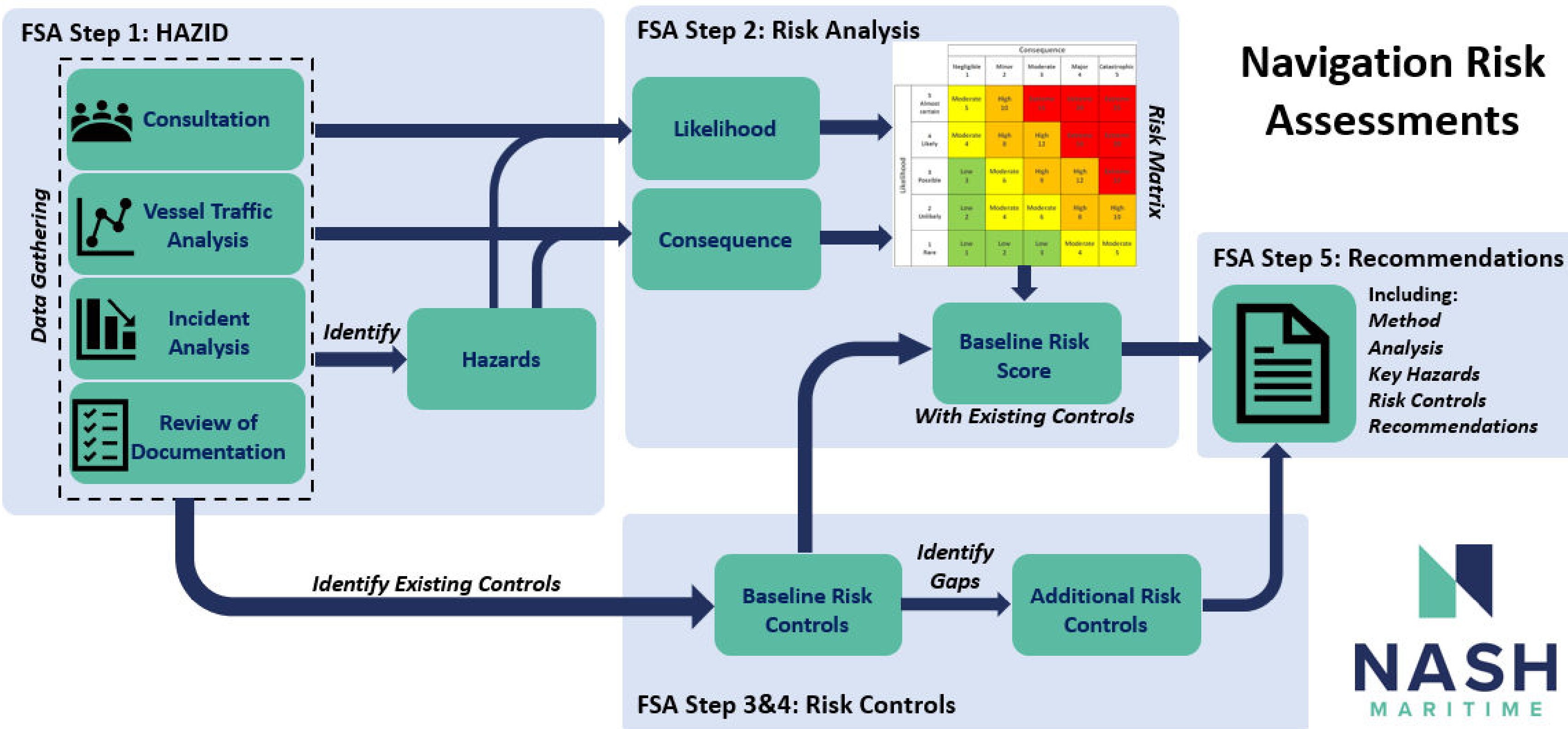


Figure 2: NRA methodology.

3.2 IALA RISK MANAGEMENT TOOL - METHODOLOGY - QUANTITATIVE RISK MODELLING

The IALA Waterway Risk Assessment Program (IWRAP Mk II) is a quantitative tool for calculating the frequency of collisions, groundings and allisions for vessels navigating a given waterway. The tool was developed by IALA to support coastal states in conducting risk assessments to address obligations under International Convention on the Safety of Life at Sea (SOLAS) Chapter V. The tool has been presented at the IMO (e.g. NAV 52/17/2 and SN.1/Circ.296) and used by Denmark and Sweden to support the assessment of new routeing measures (NCSR 5/INF.3). IALA (2017) Guideline G1123 contains guidance on implementing the tool and the underlying mechanics are presented in Friis-Hansen (2008).

IWRAP modelling has a number of stages:

Data Preparation;

Vessel traffic legs are created that represent shipping routes and Automatic Identification System (AIS) data is used to determine the volume and types of traffic, and distribution across that leg;

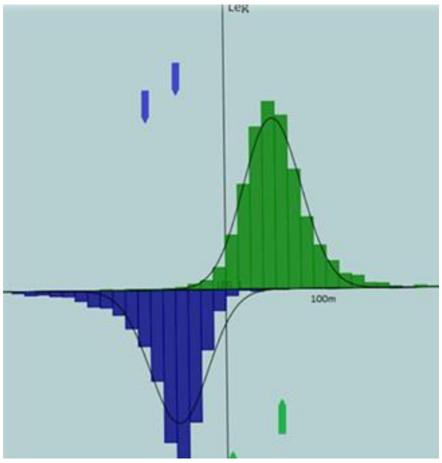
These legs are connected into a network with waypoints where legs cross or join together;

Other hazards, such as bathymetry and fixed installations are inputted into the model.

Risk Calculation;

Where these legs intersect with one another or physical hazards, the proportion of traffic on that leg at risk is calculated; and

To account for the ability of the crew to avoid these hazards, a causation factor is used (in the order of 1 in 10,000) to represent the probability of human error or mechanical failure leading to an incident.



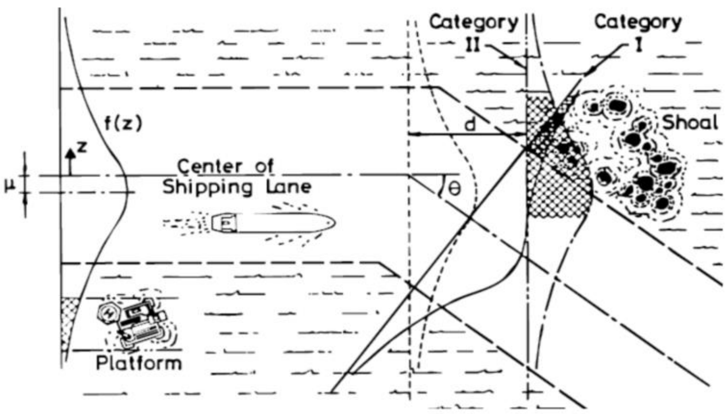


Figure 3: IWRAP traffic leg and grounding/allision calculation.

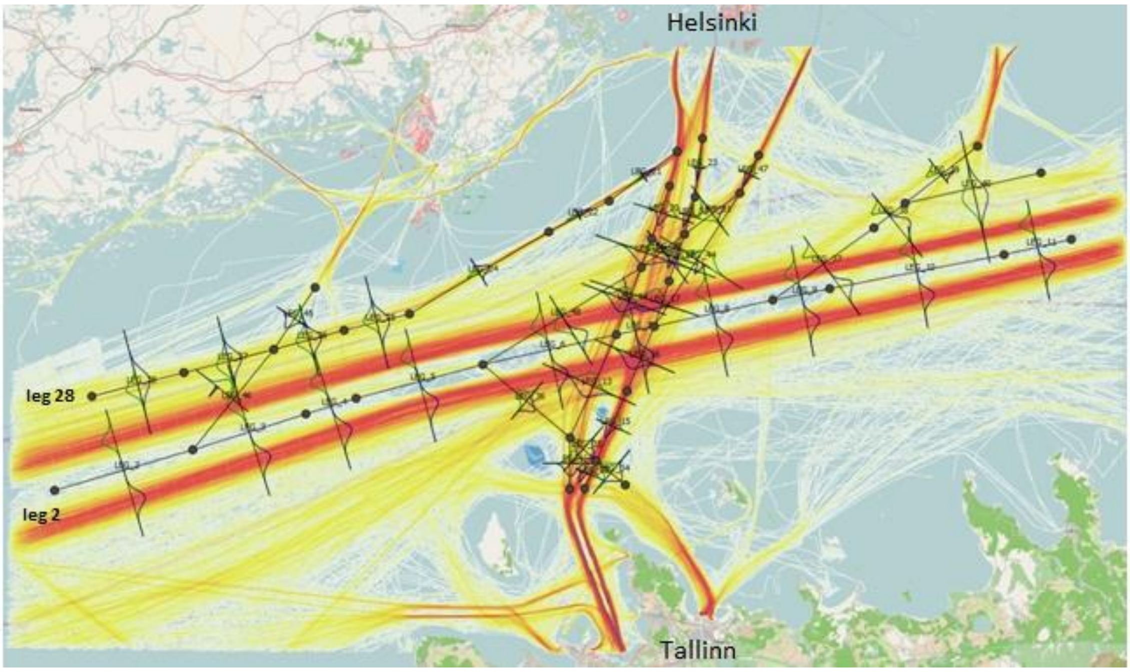


Figure 4: IWRAP MKII model example, Gulf of Finland (Source: IALA).

3.3 SUMMARY OF DATA SOURCES AND INFORMATION GATHERED

3.3.1 Consultation and Engagement

Consultation meetings and letters were sent to relevant navigational stakeholders to provide information on the Project and request input into the NRA process.

Meeting invites were issued to the following organisations:

MCA;

Trinity House;

Chamber of Shipping;

Milford Haven Port Authority;

Royal Yachting Association (RYA);

Cruising Association;

North Devon Yacht Club;

Torridge District Council;

North Devon Fishermen's Association; and

Cornish Fish Producers Organisation.

Consultation letters were sent to the following organisations:

Padstow Harbour;

Newquay and St Ives Harbours;

Port of Ilfracombe;
Port Isaac;
Boscastle Harbour;
Newquay Harbour;
Associated British Ports;
Cardiff Harbour;
Bristol Harbour;
Burry Port Marina;
Port of Saundersfoot;
Milford Haven Marina;
Devon and Severn Inshore Fisheries and Conservation Authority (IFCA)
National Federation of Fishermen's Organisations;
South and West Wales Fishing Communities;
Sea-Fisheries Protection Authority;
Lundy Island – National Trust; and
Ministry of Defence (MoD).

Table 7 summarises consultation responses that have been received.

Table 7: Consultation summary.

Date	Consultee	Source	Purpose and Issues Raised	Response to Issues Within This NRA
07-Jan-22	MCA	Meeting	Initial meeting with the MCA to discuss the proposed methodology for the NRA and the vessel traffic surveys. The MCA commented on the proposed summer survey occurring in June rather than the standard peak summer period of July/August. It was proposed that additional supplementary data such as AIS over a longer period should be used to supplement the data from the survey.	Additional AIS data has been used in the vessel traffic analysis. Datasets used are listed in **Section 3.3.2**.
15-Mar-22	MCA	Scoping response	The Environmental Statement 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; and • The likely squeeze of small craft into the routes of larger commercial vessels.	Navigational issues for both commercial and recreational craft have been considered in **Section 8** and **Section 9.5.**
15-Mar-22	MCA	Scoping response	The development area carries a significant amount of through traffic to major ports, with a number of important shipping routes in close proximity, and attention needs to be paid to routing, particularly in heavy weather ensuring shipping can continue to make safe passage without large-scale deviations.	Vessel traffic routeing has been identified in **Section 6.2.4** and deviations assessed in **Section 8.2**.

Date	Consultee	Source	Purpose and Issues Raised	Response to Issues Within This NRA
15-Mar-22	MCA	Scoping response	The likely cumulative and in combination effects on shipping routes should also be considered, the impact on navigable sea room and include an appropriate assessment of the distances between windfarm boundaries and shipping routes as per MGN 654.	Cumulative impacts have been assessed in **Section 8.12**.
15-Mar-22	MCA	Scoping response	From the document we understand that the applicant intends to do a vessel traffic survey will be undertaken to the standard of MGN 654 i.e, at least 28 days which is to include seasonal data (two 14-day surveys) collected from a vessel-based survey using AIS, radar and visual observations to capture all vessels navigating in the study area.	Information regarding the vessel traffic survey is provided in **Section 6.1**.
15-Mar-22	Trinity House	Scoping response	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 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.	The requirements for lighting and marking as well as the need to consult on plans with Trinity House is referenced in item **DES1** of **Table 29**.
15-Mar-22	Trinity House	Scoping response	Assessment of impact on existing aids to navigation.	There are no aids to navigation in the vicinity of the Project location. The closest aids to navigation are on Lundy as per **Section 5.2.3**.

Date	Consultee	Source	Purpose and Issues Raised	Response to Issues Within This NRA
15-Mar-22	Trinity House	Scoping response	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 windfarm) 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.	A decommissioning plan will be developed as detailed in **Section 4.3.3**.
15-Mar-22	Trinity House	Scoping response	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	The requirements for lighting and marking as well as the need to consult on plans with Trinity House is referenced in item **DES1** of **Table 29**.
28-Jul-22	North Devon Fishermen's Association, Cornish Fish Producers Association	Stakeholder consultation	Meeting with fishing representatives to discuss the potential impacts of the Project on fishing vessel navigation. The fishermen raised concerns regarding the export cable and cable burial depth as there is the possibility that fishing gear can snag leading to potentially significant consequences.	The requirement for a Cable Burial Risk Assessment is included as item **DES4** of **Table 29**. Charting is included as **PROM2** and the Fisheries Liaison Plan is **PROM4** of the same table.
04-Aug-22	MCA Trinity House Chamber of Shipping Milford Haven Port Authority	Hazard Workshop	Hazard workshop with regulators and Harbour Authority to discuss the potential impact of the Project and the identified hazards. Each hazard was discussed in turn and concerns were raised about the cumulative impacts on tankers waiting for entry to Milford Haven.	The cumulative impacts including the impacts on tankers loitering is covered in **Section 8.12**.
11-Aug-22	Torridge Council	Stakeholder consultation	Meeting with the Harbour Master for the ports of Bideford and Appledore to discuss the potential impacts of the Project. There was no issues raised regarding potential impacts on port operations.	No issues raised.

Date	Consultee	Source	Purpose and Issues Raised	Response to Issues Within This NRA
07-Jul-22	Associated British Ports	Consultation letter	Response to a letter issued to shipping and navigation stakeholders in the wider area. There were no specific issues raised and it was considered that mitigation measures employed in other similar developments would be appropriate.	Embedded risk controls including industry best practice have been presented in **Table 29.**
03-Aug-22	National Federation of Fishermen's Organisations	Consultation letter	Response to a letter issued to shipping and navigation stakeholders in the wider area. The risks related to snagging of moorings and the export cables was raised as a significant issue. Emphasis was placed on the completion of a Cable Burial Risk Assessment including consultation with the fishing industry. It is stated that the presence of moorings for the turbines presents such a hazard that, during the operation of the windfarm, it will be permanently unsafe to operate either static or mobile fishing gear in the footprint of the windfarm.	The effects of moorings and the export cable have been assessed in **Section 8.6**, **Section 8.10** and **Section 9.5**.

3.3.2 Vessel Traffic Datasets

Vessel traffic data from several sources was utilised to determine baseline conditions:

High fidelity AIS Data for April 2021 to March 2022 for study area (Source: MarineTraffic);

14 day winter vessel traffic survey (25-Jan-22 to 07-Feb-22) collecting AIS, radar and visual observations;

14 day summer vessel traffic survey (15-Jun-22 to 28-Jun-22) collecting AIS, radar and visual observations;

MMO 2019 anonymised AIS Data;

European Marine Observation and Data Network (EMODNet) 2019 vessel density grids;

RYA Coastal Atlas 2022;

UK Vessel Monitoring System (VMS) 2019 Data;

OSPAR EU VMS 2017 Data; and

DfT Shipping Statistics (Up to 2021).

3.3.3 Accident Datasets

Four accident datasets were utilised to support this assessment:

Marine Accident Investigation Branch (MAIB) accidents database (1992-2021);

Royal National Lifeboat institute (RNLI) incident data (2010-2019); and

DfT SAR Helicopter taskings.

3.3.4 Other Datasets

Other datasets were utilised to support this assessment:

Marine Aggregate dredging licenses (Crown Estate 2022);

Offshore Renewables (Crown Estate 2022);

Oil and Gas Activity (Oil and Gas Authority, 2022);

Admiralty Charts (2022);

Admiralty Sailing Directions;

Tidal Data (Admiralty Total Tide); and

MetOcean Data (Sailing Directions).

3.3.5 Effects of COVID-19

Since early 2020, COVID-19 has substantially impacted recreational and commercial vessel movements both globally and locally. It is therefore possible that the data collected between 2020 and 2022 may be influenced by the COVID-19 pandemic. As such, where appropriate, datasets that precede the pandemic have been used to benchmark those collected within the last 12 months.

4. PROJECT DESCRIPTION

This section provides an overview of the Project by setting out its main components, as outlined within the Scoping Report (2022). It also gives an overview of the main activities that will be undertaken during construction, operation, and decommissioning.

4.1 GENERATION ASSETS

4.1.1 Layout

The turbine positions within the windfarm site (see **Figure 1**) will be refined following further data gathering. A layout plan will be submitted to the MCA and Trinity House for review prior to installation.

4.1.2 Wind Turbine Generators

The size and capacity of the wind turbines will be decided at a later stage, prior to final investment decision. Technology develops rapidly and the available sizes of turbines are expected to increase over the coming years. The current wind turbine design envelope for the Project is outlined in **Table 8**.

Table 8: Wind turbine maximum design envelope.

Wind Turbine Generator Parameter	Range to be Considered
WTG capacity (MW)	12 – 24
Turbine type	3-bladed, with horizontal axis
Maximum Rotor Diameter (m)	262
Maximum Number of wind turbines	8
Individual Rotor swept area (m2)	38,000 – 70,700
Max Tip Height (m) above Mean Sea Level (MSL)	~345
Minimum Air Draught Clearance from Mean High Water Springs (MHWS) (m)	22
Minimum Separation Distance Between Turbines (m)	1,100

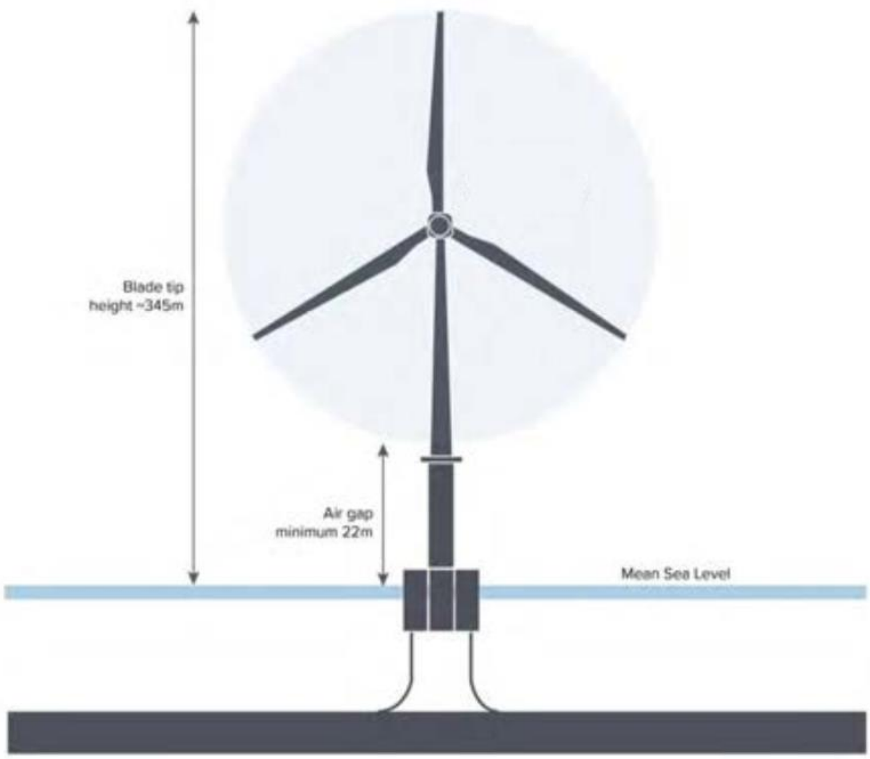


Figure 5: Wind turbine design envelope.

4.1.3 Wind Turbine Floating Substructure

The floating substructure provides a base for the installation of the wind turbine. The substructure as defined here has three key components:

1. the mooring system, which anchors the structure to the seabed;
2. the substructure, a floating structure that supports the wind turbine; and
3. the transition, which provides the connection from the substructure to the wind turbine tower. Substructures are typically made of tubular steel columns.

Conventional fixed substructures are less suitable for deeper waters (>50m), and floating substructures, where water depth presents less of an issue, could be a viable option. In addition to allowing turbines to be installed in deeper waters further from shore, floating structures offer benefits in that their construction is largely yard based, with less offshore construction activity, therefore reducing the impacts of offshore construction, the cost and scheduling uncertainties traditionally associated with more conventional windfarm construction.

The substructure is typically constructed and the turbine installed in a dry dock or inshore, thus reducing the high costs of assembly and installation at sea. Once complete it is towed to site where it is attached to the preinstalled moorings and inter-array cables. The substructure is then fully ballasted by pumping water, moorings are picked up and tensioned, the electrical cable head pulled-in and the Wind Turbine commissioned.

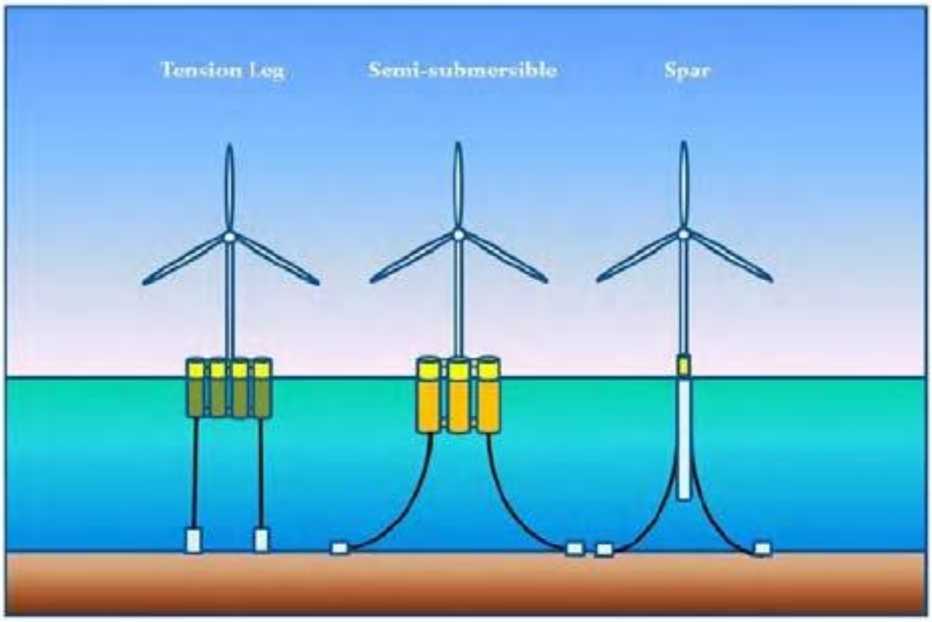


Figure 6: Types of floating turbine systems.

Substructure options include (see Carbon Trust, 2015, for a comparison of the strengths and weaknesses of each):

Tension Leg: A semi-submerged buoyant structure, anchored to the seabed with tensioned mooring lines, which provide stability. The shallow draft and tension stability allows for a smaller and lighter structure, but this design increases stresses on the tendon and anchor system. There are also challenges with stability during towing, the installation process and increased operational risks if a tendon fails. It is considered the least mature technology of the three options outlined in this section. This mooring option is also considered less favourable environmentally than drag embedment anchors. Examples include: PelaStar (by Glosten); Blue H Tension Leg Platform (TLP) (by Blue H Group); Eco TLP (by DBD Systems); GICON-SOF (by GICON).

Semi-submersible platform: A buoyancy stabilised platform which floats semi-submerged on the surface of the ocean whilst anchored to the seabed with catenary mooring lines. Often requires a large and heavy structure to maintain stability. A relatively shallow draught allows for more flexible application, increased port options (for construction and maintenance) and simpler installation. Examples include: WindFloat (by Principle Power); Damping Pool (by IDEOL); SeaReed (by DCNS)

Spar-buoy: A cylindrical ballast-stabilised structure which gains its stability from having the centre of gravity lower in the water than the centre of buoyancy. Thus, while the lower parts of the structure are heavy, the upper parts are usually lighter, thereby raising the centre of buoyancy. The simple structure of the spar-buoy is typically easy to fabricate and provides good stability, but the large draught requirement can create logistical challenges during assembly, transportation, and installation (and decommissioning), and can constrain deployment to waters >100m depth. Therefore, this option is not anticipated to be used for the Project. Examples include: Hywind (by Equinor); Sway (by Sway); Advanced Spar (by Japan Marine United).

Given the depth of the Windfarm Site, OWL is likely to use the semi-submersible technology type), with **Table 9** describing the design parameters.

Table 9: Turbine floating substructure parameters.

Turbine Floating Substructure Parameters	Value
Overall length of each face (m)	~100
Draught in operation (m)	12 – 18 (indicative range)
Freeboard (in operation) (m)	10 – 16 (indicative range)
Total substructure unit height (m)	22 – 34 (indicative range

4.1.4 Mooring System

The floating substructures described require moorings to anchor the turbine to the seabed in order to maintain position. The type and number of anchors and moorings used for the Project will depend on:

The type of floating substructure;

Loads imposed on the mooring system by the substructure/WTG assembly by prevailing metocean conditions on site;

Geotechnical; and

environmental considerations.

The anchoring system options being considered are detailed in **Table 10**.

Table 10: Mooring system options.

Wind Turbine Substructure Anchoring Options	Options
Sub-structure types	Tension Leg, Semi-sub and Spar-buoy
Number of mooring lines	Depends on sub structure type
Mooring types	Depends on sub structure type
Anchor types	Drag Embedment Anchors, Torpedo Anchors, Gravity Based Anchors, Suction Anchors and Micro-piling (if required for Tension Leg Platforms)
Anchor mass	To be determined
Mooring lines	Anchor chain, Mooring cables, polyester mooring lines
Pennant wires/buoys	Temporary surface buoys during construction, Permanent submersible buoys at seabed for Remotely Operated Vehicle (ROV) recovery
Mooring line radius	To be determined

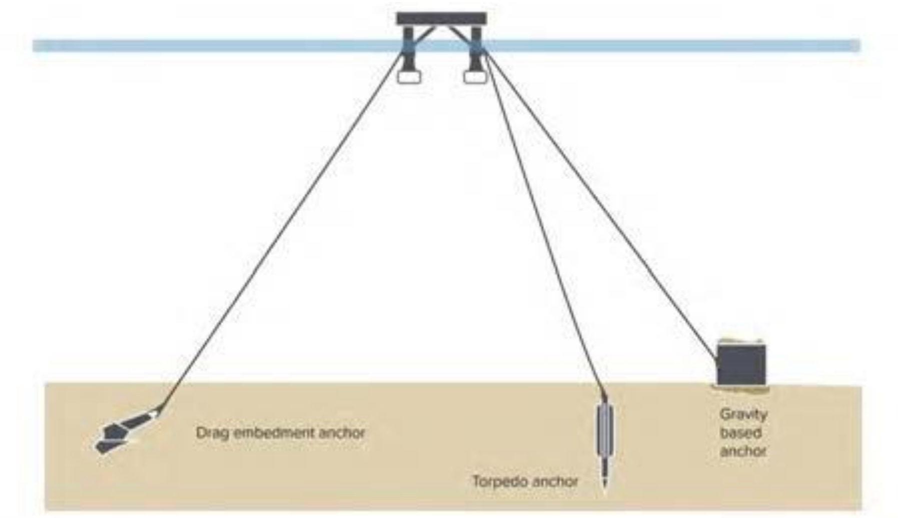


Figure 7: Types of anchoring systems.

4.2 TRANSMISSION ASSETS

4.2.1 Inter-Array and export cables

Array cables connect the turbines to each other and to the Offshore Substation. The array cables are expected to be 66kV to 132kV alternating current (AC). The length of each array cable will depend on the final layout. A realistic maximum distance of array cables will be defined for the purposes of the EIA and used as the basis for the assessments.

Electricity from the Offshore Substation will be transmitted via one subsea export cable to shore. The export cable (up to 220kV AC) is likely to run from the Offshore Substation to a transition joint bay at the landfalls. The transition joint bay connects the offshore cable and Onshore Export Cable. The export cable will be installed in an individual trench and protected in line with good industry practice.

Appropriate cable protection will be determined for the array cables following detailed geophysical studies and undertaking a Cable Burial Risk Assessment (CBRA). It is intended that the inter-array and export cables will be buried in the seabed, typically to a depth of 1m, but may range from 0.5m - 3m, and can be buried via several techniques depending on the seabed conditions along the route. Burial techniques can include ploughing, jetting, trenching or post-lay burial. Where cable burial is not possible alternative cable protection measures could be used. This includes rock placement, grout / sandbags, concrete mattresses and polyethylene ducting. It is unlikely that the cables will be surface laid without protection, but if required, this will be assessed through the CBRA with appropriate additional risk control measures to ensure such risks are Tolerable.

It is likely that the export cable will have to cross other cables. Formal agreements with regards to existing cable crossings will be entered into by OWL and the existing owners / operators, with the installation techniques discussed and agreed to ensure integrity of the existing infrastructure and any new cables associated with the Project. Several techniques can be utilised, including tubular products, concrete mattresses, and rock placement.

4.2.2 Substation

If required, an offshore substation will step up the generated power to a higher AC voltage for transmission ashore. This will comprise a topside platform installed on a foundation, approximately 60x60m in size. The likely foundations will be a jacket or gravity based structure.

4.3 CONSTRUCTION AND DECOMMISSIONING

4.3.1 Seabed preparation

Some form of seabed preparation may be required. Seabed preparation includes seabed levelling, ground reinforcement cutting and removal of any out of service cables and removing surface and subsurface debris such as boulders, fishing nets, lost anchors etc. If debris are present below the seabed then excavation may be required for access and removal. Any unexploded ordnances found with live ammunition will be detonated and any remaining debris removed, where practicable.

Consent for Unexploded Ordnance (UXO) removal will be sought in a future Marine Licence application when geophysical survey data of suitable spatial resolution is available to identify and quantify UXO risk.

4.3.2 Marine Operations

Following seabed preparation a typical turbine construction sequence (with a nominal 2-year duration) is as follows:

Install mooring system

Install scour protection (for mooring system and substation) and inter array cables;

Install substructure;

Install turbine tower;

Install nacelle; and

Install blades.

The mooring system and turbines are likely to be installed by using jack-up vessels. Given this sequence, it is likely that the installation of the seabed infrastructure may occur prior to the surface infrastructure, and there may be a gap where underwater hazards exist without surface marking.

The wind turbine components of the tower, nacelle and blades will typically be transported from the onshore fabrication site or port to the Windfarm Site via a transportation barge or an installation vessel. For the installation of the Offshore Substation, it is expected that a heavy lift installation vessel or jack-up vessel with up to six legs will be required.

The export cable will be installed by an installation vessel. Similar to the inter-array cables, installation of the offshore cable typically is undertaken by ploughing, jetting, trenching or post-lay burial depending on the soil conditions along the cable route.

4.3.3 Decommissioning

At the end of the operational lifetime of the Project, provisionally anticipated to be a minimum 25 years. The decommissioning sequence will be undertaken in reverse of the construction sequence, involving similar types and numbers of vessels and equipment.

Offshore it is anticipated that all structures above the seabed will be removed. All electrical cables will be left in-situ to minimise environmental impacts associated with their removal. The possibility of removing the subsea cables and leaving structures above the seabed in-situ with appropriate navigation markers will also be assessed.

At this stage, the full detail of the required decommissioning activities is unknown. A decommissioning plan will be prepared during detailed design and developed and refined during the Project's lifetime and as decommissioning approaches. To reflect future best practice and new technologies, the approach and methodologies of the decommissioning activities will be compliant with the relevant legislation, guidance and policy requirements at the time of decommissioning.

4.4 OPERATIONS AND MAINTENANCE ACTIVITIES

Across the operational life of the Project, O&M activities can be split into three main categories as follows:

Scheduled maintenance;

Unscheduled maintenance; and

Emergency / special maintenance (in the event of major equipment breakdown and repairs).

The strategy for operation and maintenance will be finalised based on the location of a suitable port / harbour, yet to be defined. In choosing a suitable port / harbour there will be requirements to ensure sufficient access to a fleet of vessels with the capabilities to complete any required O&M activities. The overall O&M strategy will also reflect the technical specification (once known) including wind turbine type, electrical transmission design and final project layout.

At this stage, the high-level offshore activities will include but not be limited to the following:

Wide ranging inspections of mooring system, transition pieces, blades, safety equipment, Offshore Substation equipment, etc;

System performance assessments and fault-finding;

Replacement of lubricants, oils, filters, etc;

Painting and coating application of turbines, etc;

Replacement of wind turbine parts including bearings, gearboxes, generators, nacelles, transformers and blades;

Minor repair and replacements including access ladders, corrosion protection system including anodes and protective coatings, secondary steel, boat landings, cable penetrations and ducting, aids to navigation;

Removal of marine growth and guano;

Structural surveys;

Periodic cable burial surveys, including any crossings and at interfaces at subsurface structures;

Reburial or other remedial actions of inter-array cables, export cable and crossings array cables;

Repair or replacement of export and array cables; and

Replenishment of rock protection as additional cable and scour protection.

4.5 MAXIMUM DESIGN ENVELOPE

Based on a review of the Project description and scoping report, the Maximum Design Envelope (MDS) used in this NRA is summarised in **Table 11**.

Table 11: Maximum Design Envelope for NRA.

Parameter	Justification	Value
Maximum Number of Turbines	Greatest number of turbines has greatest impact on S&N receptors.	8
Minimum Air Draught Clearance from MHWS	Greatest risk of striking turbine blades is lowest air draught clearance.	22m
Maximum rotor diameter	Greatest impact on SAR access from minimum corridor width.	262m
Maximum Spread of Mooring Lines	Maximum spread of subsurface infrastructure has greatest risk of snagging anchors/fishing gear.	Approximately 600m
Maximum Excursion of WTG from Centrepoint	Maximum movement of WTG from centre increases potential risk of allision.	Approximately 30m
Minimum Separation Distance Between Turbines	Greatest impact from narrowest corridors.	1,100m
Maximum Number of Substations/Booster Stations	Greatest impact from greatest number of structures.	1 Offshore Substation, 0 Boosters (subject to detailed electrical design)
Maximum Operational Duration	Greatest duration of project has greatest exposure to risk.	Approximately 25 years.
Maximum Construction/ Decommissioning Duration	Greatest disruption and vessel activities across longest construction duration.	Construction: 2 years (cable installation, seabed prep, foundation installation, anchoring, hook-up, etc) Decommissioning: TBC (likely less than 2 years)

Parameter	Justification	Value
Maximum Number of Construction/Decom Vessel Movements per Day/Week	Greatest disruption as a result of the most number of vessel movements.	5 per day
Maximum Number of O&M Vessel Movements per Day/Week	Greatest disruption as a result of the most number of vessel movements.	0.1 per day
Indicative Construction/Decom/ O&M Base	Project vessel movements impacts upon other S&N activities.	Construction base within 300km of the Project O&M base within 50km of the Project
Minimum export cable burial depth/length buried	Minimum cable burial depth over the greatest length has greatest risk of snagging or anchors/fishing gear.	Max overall length: 187.2km (2 cables, worst case) Max burial depth: 3.0m (subject to BAS/CBRA) Max % unburied length: 10% (pending geophys/geotech) Max protection height: 1.8m (assumed) Max % protection length: 10% (pending geophys/geotech)
Minimum inter-array cable burial depth/length buried	Minimum cable burial depth over the greatest length has greatest risk of snagging or anchors/fishing gear.	Max overall length: 39km Max burial depth: 3.0m (subject to BAS/CBRA) Max % unburied length: 20% (pending geophys/geotech) Max protection height: 1.8m (assumed) Max % protection length: 20% (pending geophys/geotech)

4.6 NAVIGATIONAL MARKERS, LIGHTING AND CHARTING

Marking and lighting requirements for man-made offshore devices are described in IALA Recommendation G1162 2021 (previously O-139 2013). An Aids to Navigation (AtoN) Plan should be developed with the General Lighthouse Authorities and MCA.

G1162 outlines the following specific recommendations made for offshore wind turbines (see **Figure 8**):

Isolated WTGs, Met Masts and Other Structures are recommended to be:

Marked with a white light flashing Mo (U) ≤15s, and with a nominal range of 10 Nautical miles.

Have AtoN mounted below the lowest point of the arc of any rotor blades. They shall ideally be located at a height of at least six metres above HAT.

Have AtoN that comply with IALA recommendations and have an availability of not less than 99.0% (IALA Category 2).

For marking of floating wind turbine structures, it is recommended that:

Competent authorities take into account the interaction between aviation lights and the shipping in the area.

Ideally lights are located not less than six metres and not more than 30 metres above HAT.

The marine lights should have a large vertical divergence, in order to maximize visibility at range to the mariner. The divergence should enable the AtoN to be visible to mariners from the immediate vicinity of the structure to the maximum luminous range of the light. IALA Guideline G1065 gives advice on the vertical divergence of lights.

The structures should be painted yellow all round from the waterline to a height of 15m.

The mooring system may require additional buoyage to mark the hazardous limits.

Lettering: It is recommended that each structure, displays identification panels with black letters or numbers one metre high on a yellow background visible in all directions.

Painting: Fixed structures should be painted yellow all around from the level of Highest Astronomical Tide (HAT) up to at least 15 metres.

Hazard Warning Signals: Consideration may also be given to the provision of hazard warning signals where appropriate, taking into account the prevailing visibility and vessel traffic conditions. The range of such hazard warning signals should not be less than two nautical miles.

AIS/Racons: Where there is a requirement to remotely identify a particular structure a radar beacon (racon) and/or an AIS AtoN may be fitted.

A significant peripheral structure (SPS) will include the structures on the corners/periphery of an OWF as determined by the competent authority. It is recommended that:

These lights display a Special mark characteristic, flashing yellow, with a minimal nominal range of five nautical miles.

The competent authority (MCA) may consider the synchronization of all SPS of the same light characteristic.

In the case of a large or extended OWF, the distance between SPS should not normally exceed three nautical miles.

On large windfarms consideration should be given to using different light characteristics for marking SPS on corners of windfarms to those marking structures along the periphery of the windfarm.

SPS - lights visible from all directions in the horizontal plane. It is recommended to synchronize these lights in order to display a Special mark characteristic, flashing yellow, with a range of not less than five nautical miles.

Intermediate peripheral structures (IPS) may be considered selected on the periphery of an OWF:

Are marked with flashing yellow lights.

The flash character of these lights shall be distinctly different from those displayed on the SPS, with a nominal range of two nautical miles.

Have a lateral distance between IPS or the nearest SPS which will not normally exceed two nautical Miles.

Intermediate structures on the periphery of an OWF other than the SPS - marked with flashing yellow lights which are visible to the mariner from all directions in the horizontal plane with a flash character distinctly different from those displayed on the SPS and with a range of not less than 2 Nautical miles.

Promulgation: Notices to Mariners and the relevant Hydrographic Office must be informed of the marking, location and extent of any man-made structure, to permit the appropriate marking.

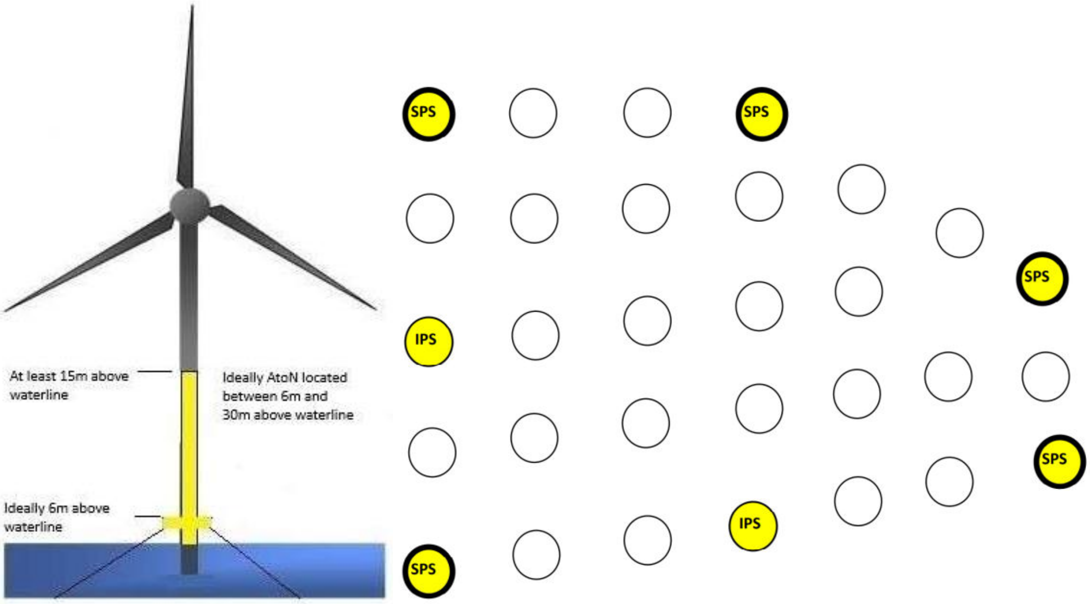


Figure 8: IALA G1162 OWF marking recommendations.

4.7 EMBEDDED MITIGATION

A list of embedded mitigation for the Project is contained within **Section 9.3**.

5. OVERVIEW OF THE BASELINE ENVIRONMENT

5.1 ADMIRALTY CHARTS

The Project area is well charted and covered by the following navigational charts:

Admiralty Chart 1156 – Trevose Head to Hartland Point;

Admiralty Chart 1160 – Harbours in Somerset and North Devon;

Admiralty Chart 1164 – Hartland Point to Ilfracombe;

Admiralty Chart 1165 – Bristol Channel, Worms Head to Watchet; and

Admiralty Chart 1178 – Approaches to Bristol Channel.

5.2 PRINCIPAL NAVIGATIONAL FEATURES

Key relevant navigational features relating to management of vessels and safety of navigation are described in this section and shown in **Figure 9**.

5.2.1 Responsible Authorities – MCA

The windfarm site area and cable route are in an area of general navigation in UK waters with the MCA as the responsible authority for safe navigation.

5.2.2 IMO Routeing/Reporting Measures and Recommended Channels

There are no IMO routeing/reporting measures or recommended channels in the study area. The transit between the Traffic Separation Scheme (TSS) “Off Land’s End between Seven Stones and Longships” and “Off Smalls” passes 18nm clear to the west of the windfarm site.

5.2.3 Aids to Navigation

There are two lighthouses on Lundy marking the northern and southern sides of the island. A red beacon exhibiting Fl.R.3s3M marks the jetty for the ferry.

At the entrance to the River Torridge there is a safe water mark indicating the beginning of the fairway. This floating mark is located adjacent to the cable corridor route.

5.2.4 Vessel Traffic Services

The windfarm site is outside of any Vessel Traffic Service (VTS) or Local Port Service (LPS) areas. The export cable corridor landfalls are within the Port of Bideford Competent Harbour Authority (CHA) area but outside of its Statutory Harbour Authority (SHA) area. This means that the powers available to the Port of Bideford Harbour Master relating to the navigation of vessels granted through the port’s local legislation cannot be used for vessels navigating in the vicinity of the export cable corridor.

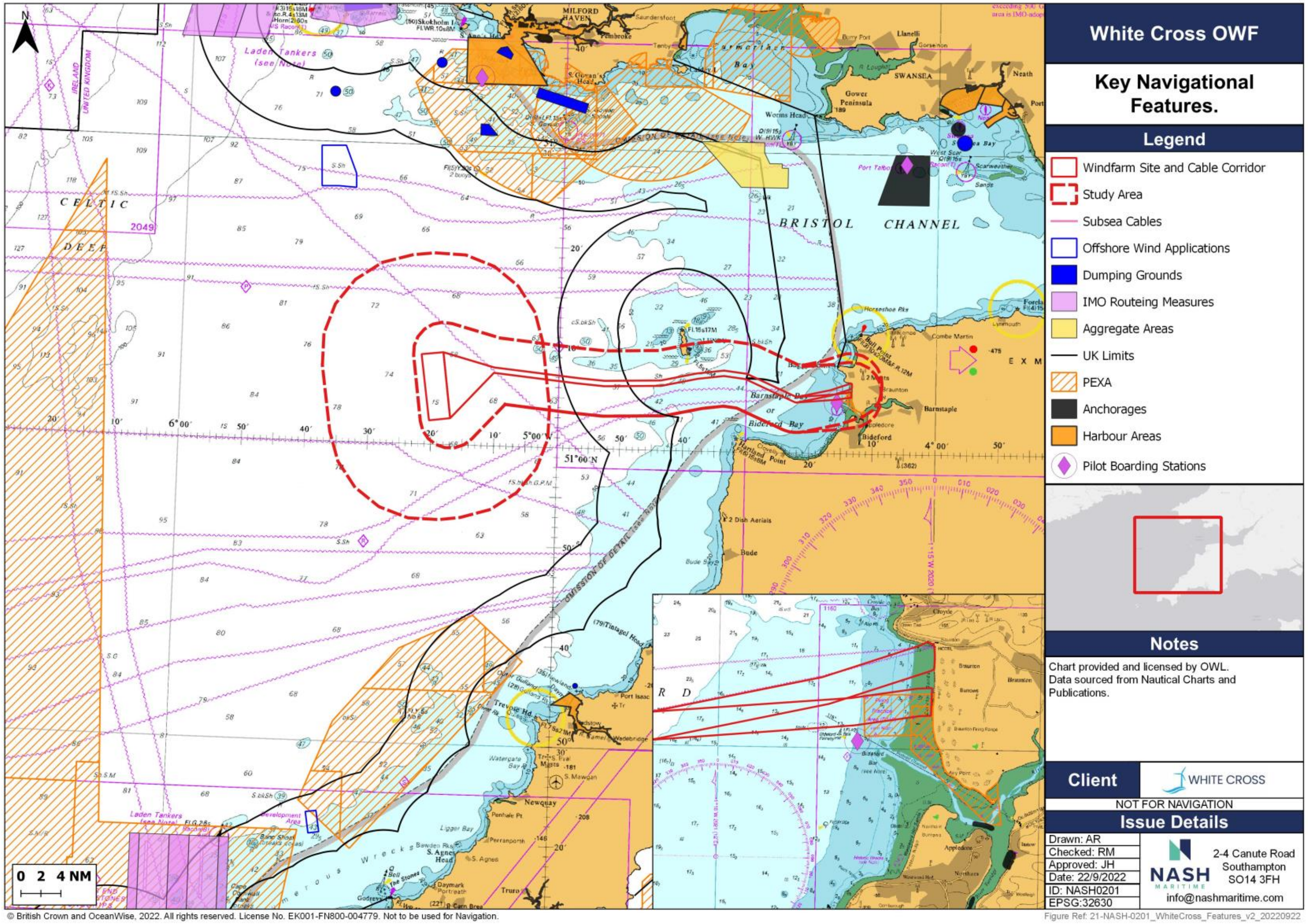


Figure 9: Navigational features in study area.

5.2.5 Pilotage

The cable corridor is within the CHA area with respect to marine pilotage. Pilotage in the CHA area is mandatory for vessels over 50m in length. This area is defined in the Bideford (Pilotage) Harbour Revision Order 1988 as:

"The limits within which the Authority shall have jurisdiction for the purposes of pilotage under Part I of the Pilotage Act 1987 shall include (in addition to the Harbour) the area cross hatched pink on the signed plan, being so much of the area outside the Harbour as lies within all that area of sea foreshore and land as is covered by the sea at Mean High Water Springs south of a line from the western-most extremity of Baggy Point to position latitude 51° 08' .6N, longitude 4° 16' .9W, and east of longitude 4° 16' .9W including the estuary of the Rivers Taw and Torridge, the river Taw to Barnstaple Bridge, but excluding the tidal waters of Braunton Pill, and the River Torridge to the existing boundary of the Bideford Harbour."

5.3 LOCAL PORTS AND HARBOURS

There are no ports or harbours within 10nm of the windfarm site. The export cable landfalls are in Bideford Bay which is located approximately 1 nm north of the mouth of the River Torridge which is the start of the SHA Area of the Port of Bideford. The SHA area for Bideford is defined in Article 4 of the Bideford Harbour Act 1925 as:

"The limits of the harbour within which the Corporation shall have authority to exercise its powers conferred by the Act of 1828 and this Act and within which the powers of the harbour master may be exercised shall subject to the provisions of this Act comprise the quay and wharf and harbour."

Lundy Harbour lies withing the cable corridor study area. The island is owned by the Landmark Trust with a ferry service operating between Bideford, Ilfracombe and the island. There are no other ports or harbours in the windfarm site study area or cable corridor study area. **Table 12** identifies the other ports and harbours in the vicinity along with the minimum distance to either the windfarm site or export cable corridor.

Table 12: Key ports and harbours in Celtic Sea.

Port	Minimum Distance
Ilfracombe Harbour	7 nm
Port of Bude	17 nm
Boscastle Harbour	25 nm
Padstow Harbour	32 nm
ABP Swansea	31.5 nm
Port Talbot	32 nm
Milford Haven	32 nm

5.4 METOCEAN CONDITIONS

5.4.1 Wind and Wave Climate

MetOcean information for the area has been provided by Admiralty Sailing Directions NP-37 West Coast of England and Wales. The closest station to the windfarm site is located at Chivenor (51° 05' N 004° 09' W) with information presented in **Figure 10**.

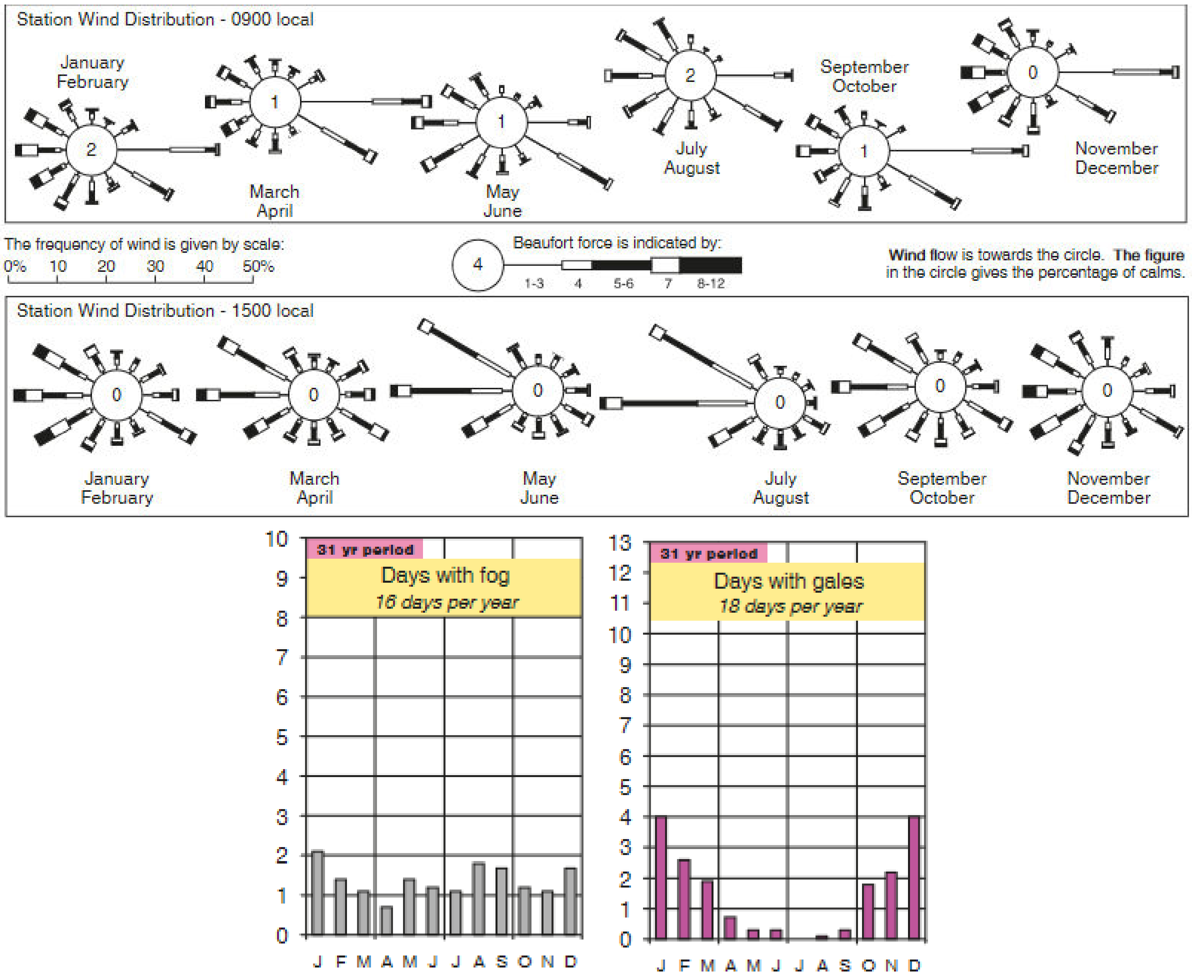


Figure 10: MetOcean conditions – Chivenor.

5.4.2 Tide and Current

Tidal diamond "K" from Admiralty Chart 1178 located 5.5nm southwest of the windfarm site is presented in **Table 13** providing context of tidal current rates and directions in spring and neap tidal cycle conditions. There are no tidal limitations at the windfarm site or on the cable route.

Table 13 Details for tidal diamond "K" on Admiralty Chart 1178.

Hours		Tidal Stream	Rate at Spring Tide (kn)	Rate at Neap Tide (kn)
Before high water	6	199°	0.5	0.2
	5	132°	0.5	0.2
	4	092°	0.8	0.3
	3	074°	1.0	0.4
	2	063°	1.1	0.5
	1	050°	0.9	0.4
High Water		028°	0.6	0.2
After high water	1	323°	0.4	0.2
	2	278°	0.7	0.3
	3	263°	1.0	0.4
	4	252°	1.0	0.4
	5	240°	1.0	0.4
	6	216°	0.6	0.3

5.5 SEARCH AND RESCUE

The local coastguard base for the region is the Milford Haven Coastguard Operations Centre (CGOC). The CGOC is co-located with the Milford Haven Port Authority (MHPA) offices and the VTS centre.

Her Majesty's Coastguard's (HMCG) Aviation Branch provides aviation-based search and rescue via the UK SAR Helicopter (UKSARH) programme. HMCG's helicopter assets are located at St Athan, Wales and Newquay, Cornwall airbases.

The UKSARH stations and RNLI locations are presented in **Table 14** along with the equipment available and the minimum distance to the windfarm site.

Table 14: Search and Rescue facilities.

Facility	Resources	Minimum Distance to Windfarm Site
Appledore Lifeboat Station	Tamar Class Lifeboat B Class Atlantic 85 Inshore	40.8nm
Clovelly Lifeboat Station	B Class Atlantic 85 Inshore	33.5nm
Ilfracombe Lifeboat Station	Shannon Class Lifeboat D Class Inshore	45.0nm
St Athan SAR	AW189 Helicopter	36.5nm
Newquay SAR	Sikorsky S-92 Helicopter	74.0nm

5.6 OTHER OFFSHORE ACTIVITIES

5.6.1 Oil and Gas

No oil and gas sites were identified near the study area.

5.6.2 Subsea Cables

Two subsea cables are identified crossing the cable corridor:

One fibre optic subsea cable crosses the export cable corridor. This cable is the Pan European Crossing (UK-Ireland) running between Bude Bay and Rosslare. The cable was established in 2020 with a designed end of life of 2025.

The TGN Atlantic cable runs between New Jersey, USA and Pottington, UK, with landfall in Bideford Bay.

5.6.3 Aggregates

There are no aggregate extraction areas identified in the study area. The closest active aggregate extraction area is Nobel Banks off the South Wales coast approximately 37nm north-east of the windfarm site.

5.6.4 Dredging Areas and Spoil Grounds

There are two closed disposal sites in the cable corridor study area. These are Hartland Point Disposal Area and Morte Bay Disposal Area.

5.6.5 Other Offshore Renewable Projects

No other offshore renewable projects are located in the study area. The Erebus Floating Wind Demo located 18nm to the north-west is in Application. Other developments are proposed (see **Section 8.12**) but are not yet at Scoping or Application stage.

5.6.6 Anchorages and Offshore Waiting Areas

There are no charted anchorages or waiting areas in the study area. Small boat anchorages are shown in the inshore waters to the east of Lundy Island, and within the River Torridge/Taw.

There is evidence of waiting vessels proximate to the study area which is identified in further detail in **Section 6.2.2**.

5.6.7 Practice and Exercise Areas

The export cable corridor intersects two firing practice areas namely D110 and X5105. No restrictions are placed on the rights of vessels to transit the areas at any time and both areas are operated with a clear range procedure with exercises and firing only taking place what the areas are considered to be clear of vessels.

6. DESCRIPTION OF EXISTING MARINE ACTIVITIES

6.1 VESSEL TRAFFIC SURVEY

In addition to the datasets described in **Section 3.2**, 2x14 day vessel traffic surveys were conducted in compliance with the requirements under MGN654. Therefore, full coverage of all transits through the study area could be obtained using the following data sets:

Commercial vessel traffic that are required to carry AIS under SOLAS are captured through the vessel traffic surveys and 2021-2022 datasets;

Recreational and fishing captured through AIS for those vessels that choose to do so and through radar for those that do not; and

Visual observations to identify non-AIS vessel types.

Table 15: Vessel traffic survey details.

Attributes	Winter	Summer
Vessel	Karelle (28m Fishing Vessel) 	Morning Star (23m Fishing Vessel) 
Dates	25-Jan-22 to 07-Feb-22	15-Jun-22 to 28-Jun-22
Downtime	None	None
Survey Area	Windfarm Site + 10nm	Windfarm Site + 10nm
Total Vessels Recorded (Array Area + 10nm)	74 (5.3/day)	136 (9.7/day)
Total Vessels Recorded (Windfarm Site)	7 (0.5/day)	36 (2.6/day)
Cargo	25	25
Fishing	2	53
Passenger	0	1
Recreational	2	25
Tanker	38	60
Tug and Service	7	9

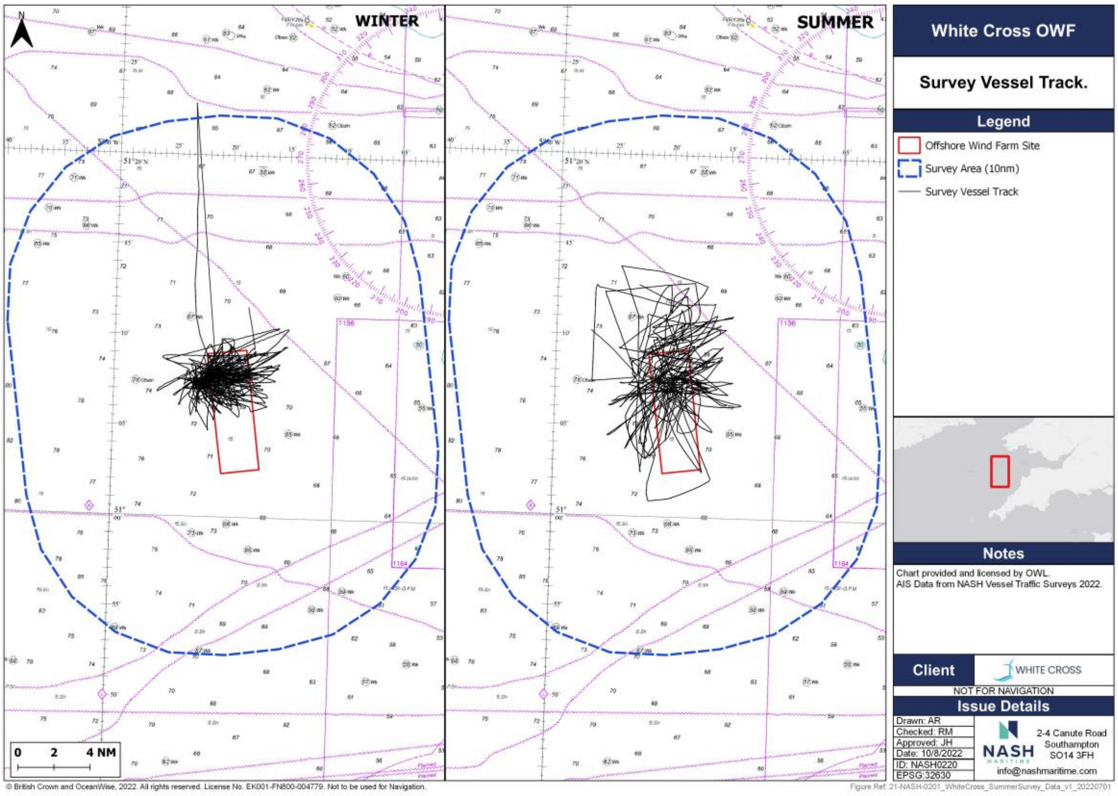


Figure 11: Winter and summer survey vessel tracks.

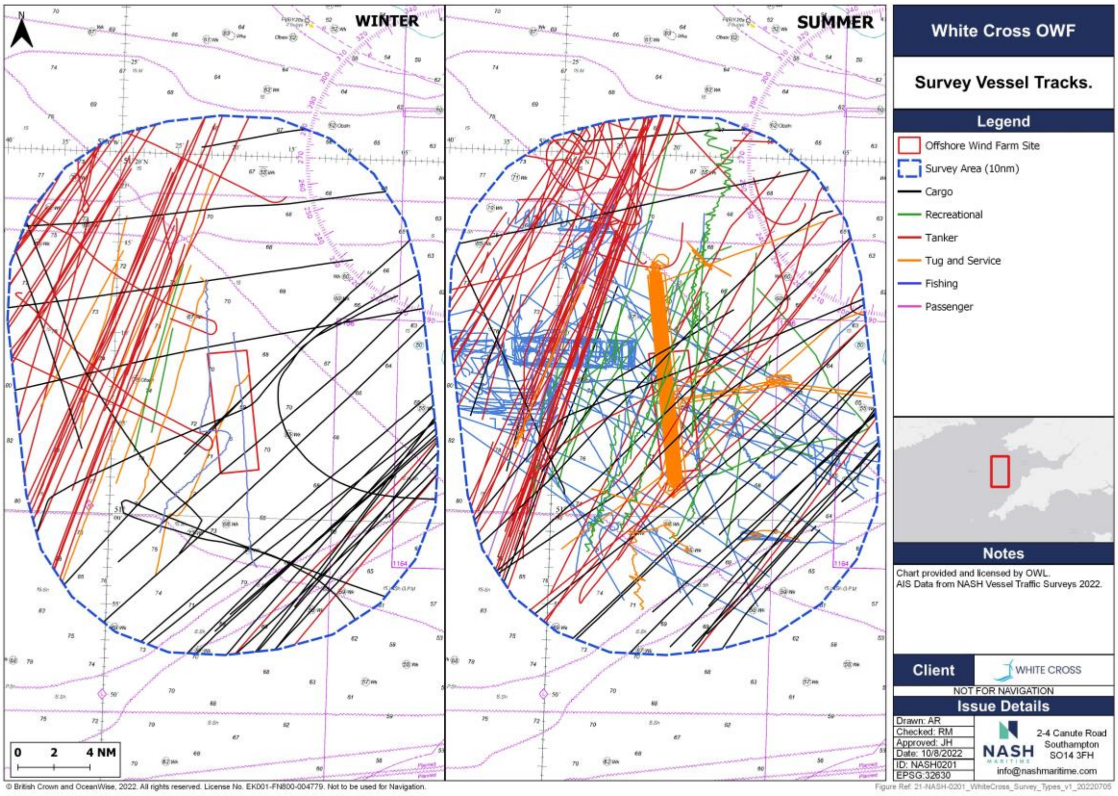


Figure 12: Winter and summer vessel tracks.

6.2 VESSEL TRAFFIC ANALYSIS

6.2.1 Overview

Figure 13 provides vessel density for all craft from AIS data in the vicinity of the study area for 2021. The areas with highest vessel density are the main commercial route through the area to the west of the windfarm site and at the entrance to Milford Haven north of the windfarm site. Other notable areas of higher vessel density are:

The route between the TSS Off Land's End and the Bristol Channel to the south of the windfarm site;

The route between the TSS Off Land's End and Milford Haven to the west of windfarm site; and

The route between the Irish Sea and the Bristol Channel to the North of the windfarm site.

There is an area of higher vessel density in the south-eastern part of the windfarm site 10nm study area which is partly an alternate route between the TSS Off Land's End and the Bristol Channel passing north of Lundy.

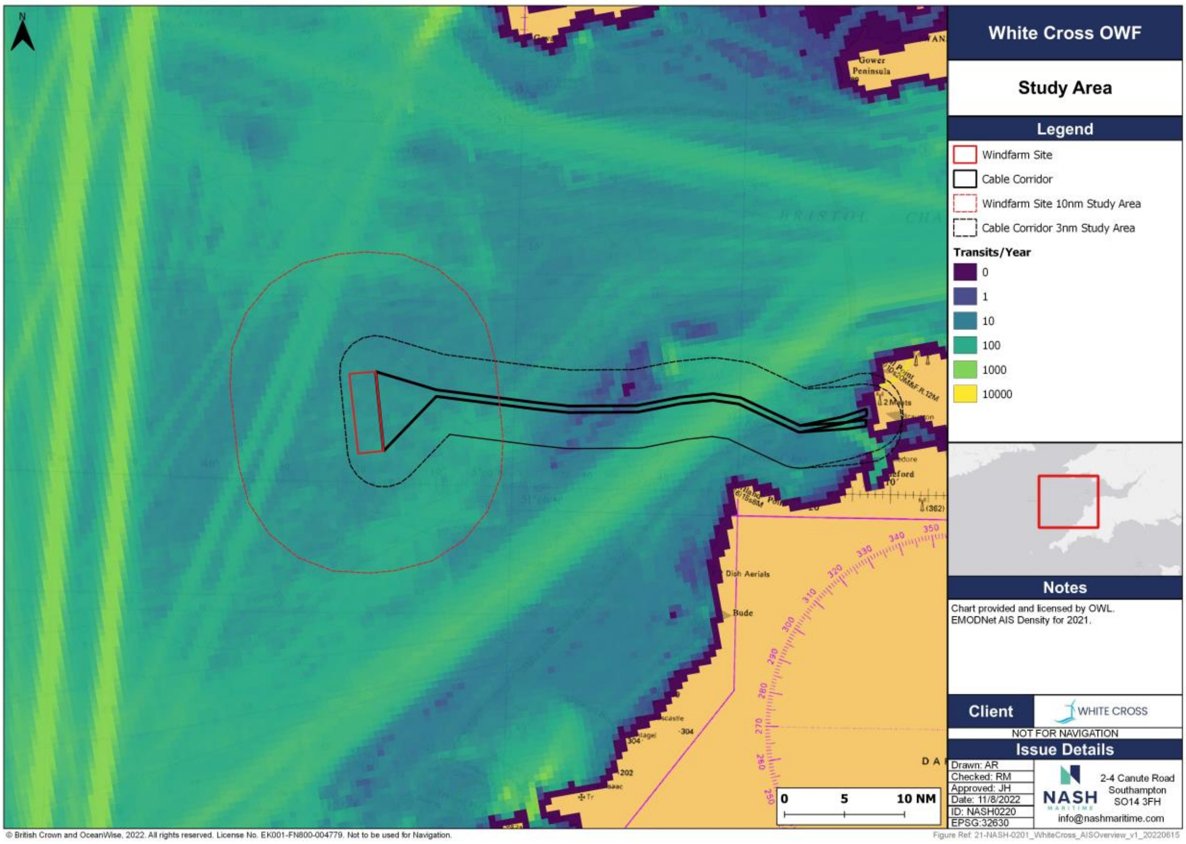


Figure 13: Vessel density.

6.2.2 Vessel Traffic by Vessel Type

The following sections consider the vessel traffic by types for AIS data obtained for the period 01-Apr-2021 to 31-Mar-2022. The collection of radar and visual data during the 2x 14 day traffic surveys was used to supplement the understanding of small craft movements in the study area. Where appropriate, reference is made to consultation feedback.

6.2.2.1 Cargo

Cargo vessels are defined as large commercial craft carrying dry cargo, such as container ships, bulk carriers and general cargo ships. There are numerous cargo vessel tracks shown throughout the windfarm site study area and the cable route as shown in **Figure 14**. In general, these vessels are on a north-east to south-west orientation, passing from Land's End, to the north of Lundy before turning into the Bristol Channel. A smaller number of cargo ships are shown transiting to the west and into the Atlantic.

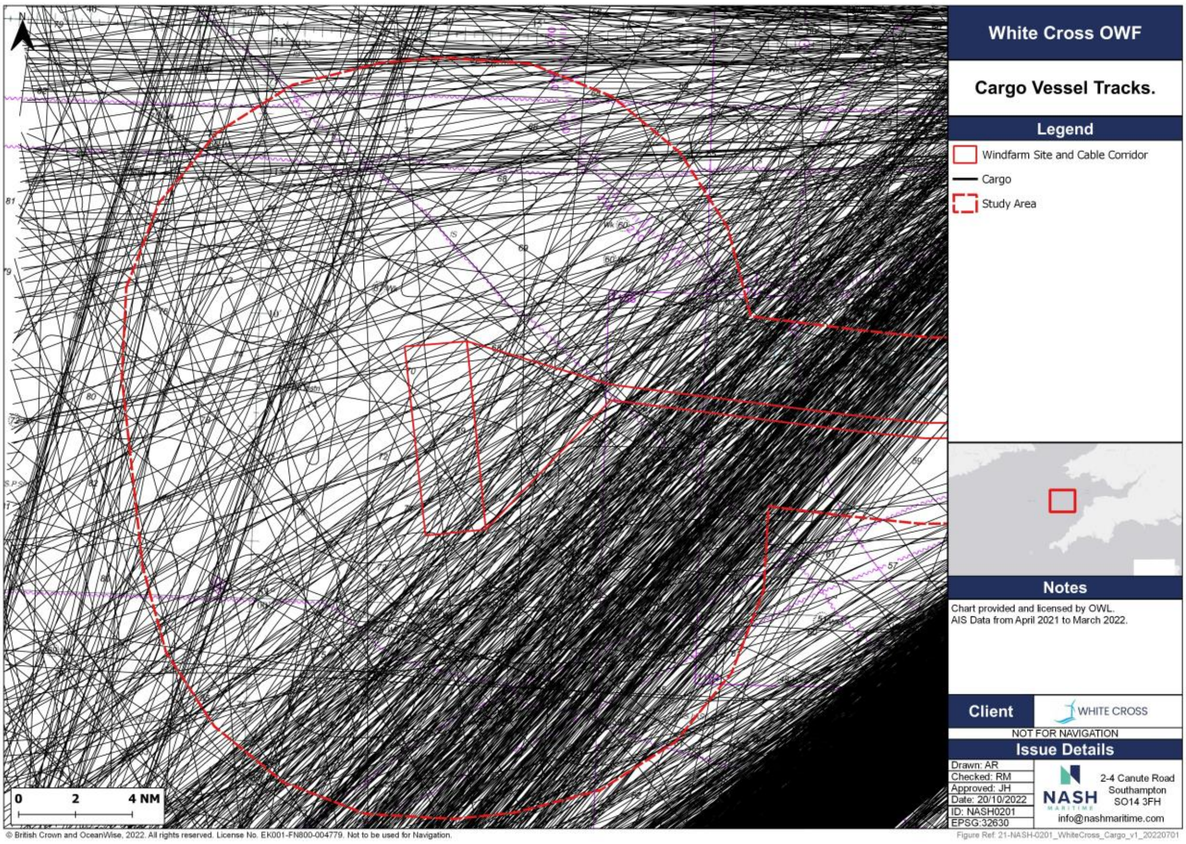
Within the windfarm site 10nm study area there are many diverging tracks which is partly due to the lack of natural features in the area that will constrain navigation into more clearly defined routes. There were 80 cargo vessel tracks through the windfarm site, the largest of which were 292m bulk carriers transiting to/from Port Talbot. The most frequently used port for cargo vessels crossing the windfarm site was Portbury with 28 of the tracks either to or from the port. Other ports with frequent vessel call were Port Talbot with 19 associated tracks and Newport with 13 tracks.

The cable route is intersected by both the north Lundy route and a more frequently transited south Lundy route, that is typically used by smaller vessels of less than 200 metres in length. A small number of cargo ships each year call at Appledore.

6.2.2.2 Tanker

Tankers are defined as commercial vessels carrying liquid cargo such as oil and chemicals. **Figure 15** shows tanker tracks through the study area which are seen mostly to the west of the windfarm site, heading to/from Milford Haven. The largest of the tankers in the area are Liquified Natural Gas (LNG) tankers of 299m length. There were a total of 82 individual tanker tracks which intersected with the windfarm site with the majority (60) transiting to or from Milford Haven. A smaller number of tankers proceeding further into the Bristol Channel route either north or south of Lundy.

There is also evidence of tanker loitering in the windfarm site and its vicinity whilst waiting for berth availability at Milford Haven (see **Section 6.2.5**). A minor route crossing the south-eastern corner of the windfarm site can be seen which is also used for vessels bound for Milford Haven. Most of these tankers (63%) were over 200m in length.



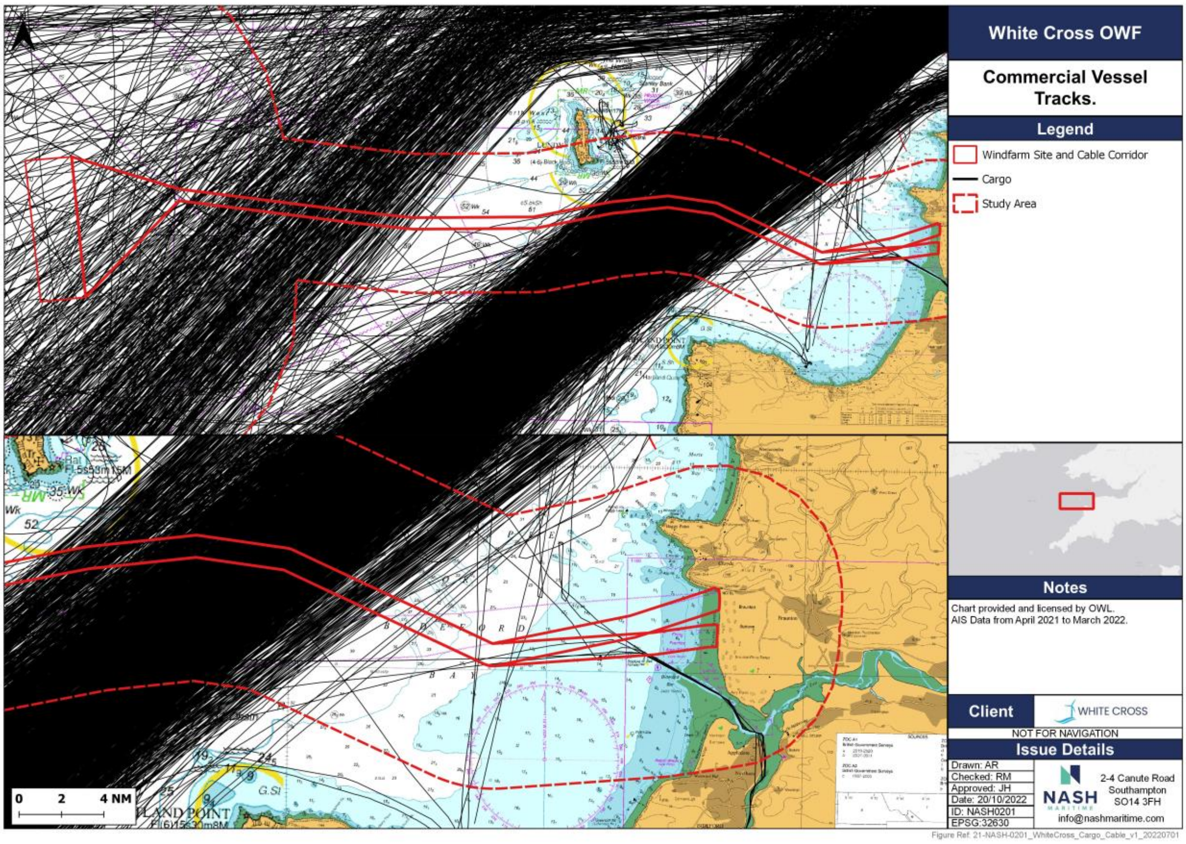


Figure 14: Cargo vessel tracks.

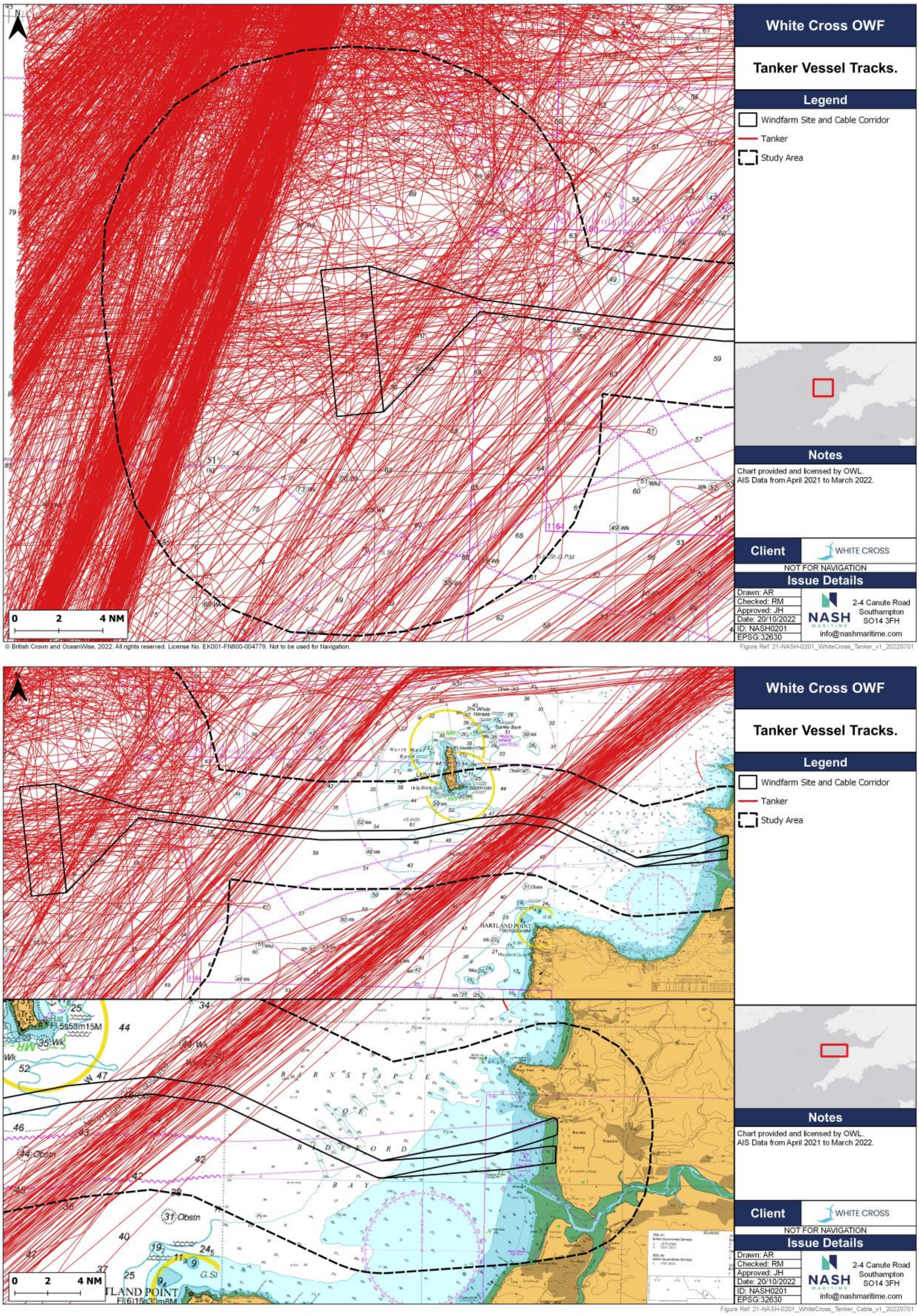


Figure 15: Tanker tracks.

6.2.2.3 Passenger

Passenger vessel tracks through the study area have been split between vessels under 100m and those over 100m in **Figure 16**. This allows differentiation between cruise ships visiting the area which will be over 100m in length and the local ferries/tour boats which are smaller.

There was a total of five passenger vessel tracks that passed through the windfarm site which were all over 100m in length. Three of these tracks were for the cruise ship Britannia engaged on British Isles cruises, one track was the cruise ship Disney Magic and one was the Stena Vinga which was operating a route between Cherbourg and Rosslare.

When cruise vessels resumed operation following the COVID-19 pandemic, there was an increase in British Isles cruising compared with pre-COVID itineraries. This means that compared with 2019 there is an increased number of cruise vessel tracks through the area.

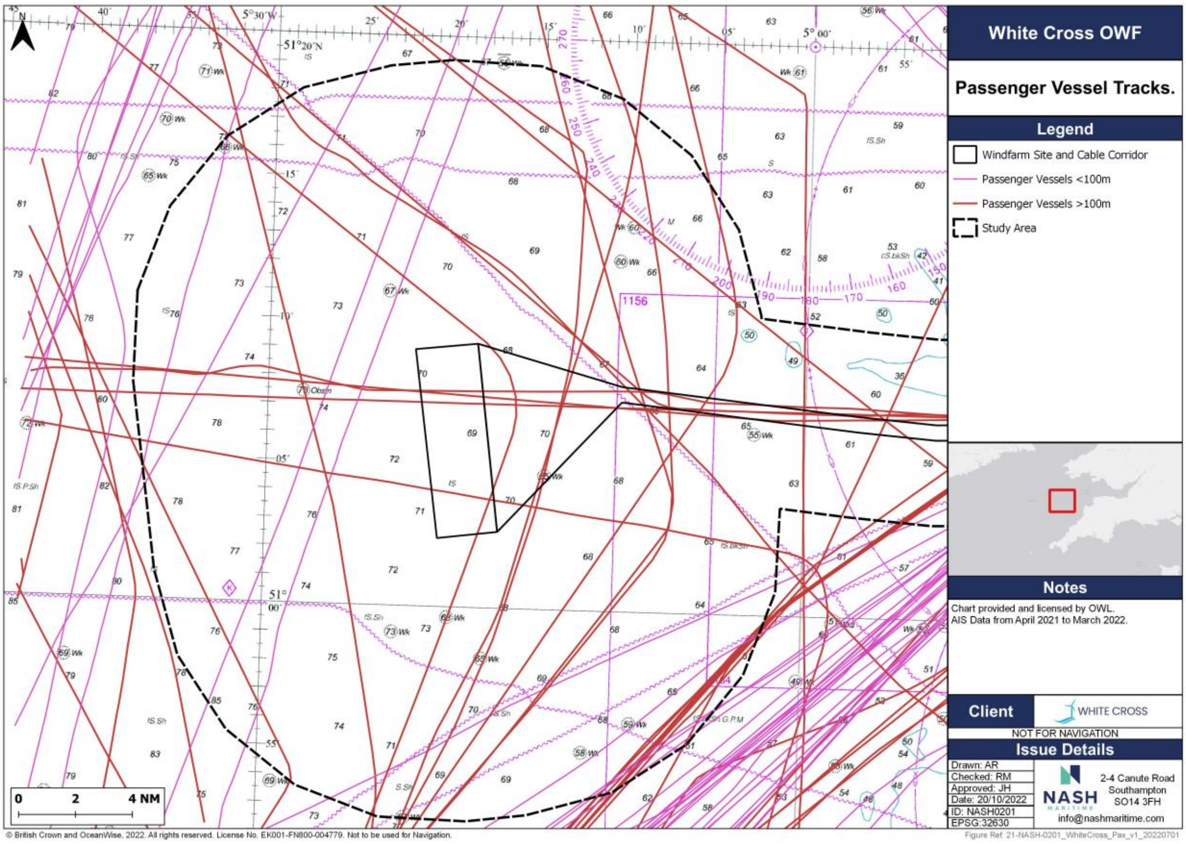
The focal point for most of the tracks shown in **Figure 16** is Lundy with vessels shown circumnavigating it. There is also a regular passenger route which is the Lundy ferry which operates between the island, Ilfracombe and Bideford.

6.2.2.4 Recreational

There are 76 recreational vessel tracks passing through the windfarm site, as shown in **Figure 17**. These tracks are mainly aligned in a north-east to south-west orientation and, given the distance offshore they are likely to be transiting through the area rather than using the local ports. There is a wide distribution of recreational vessel tracks due to a lack of natural navigational hazards constraining traffic meaning that routes can be taken to avoid commercial shipping.

The vessel traffic survey results indicated that there was seasonality to the recreational vessel tracks in the area. There were 25 recreational tracks in the summer period from 15-Jun-22 to 28-Jun-22 compared with two tracks in the winter period comprising 25-Jan-22 to 07-Feb-22. With between one and two recreational transits through the windfarm site 10nm study area, these offshore cruising routes are not considered to be of high intensity.

There is a large concentration of recreational vessel tracks crossing the cable route through Bideford Bay and the coastal area between Lundy and the mainland. These tracks indicate the routes used by vessels operating out of local ports showing multiple tracks from Bideford and Clovelly. The RYA Coastal Atlas defines the Torridge estuary as a “General Boating Area” and a sailing club and moorings are located within the estuary. The bay itself offers little shelter from prevailing westerlies and therefore cruising yachts tend to anchor elsewhere. Furthermore, it is evident that Lundy is a popular cruising destination, with routes evident from the north, south and east.



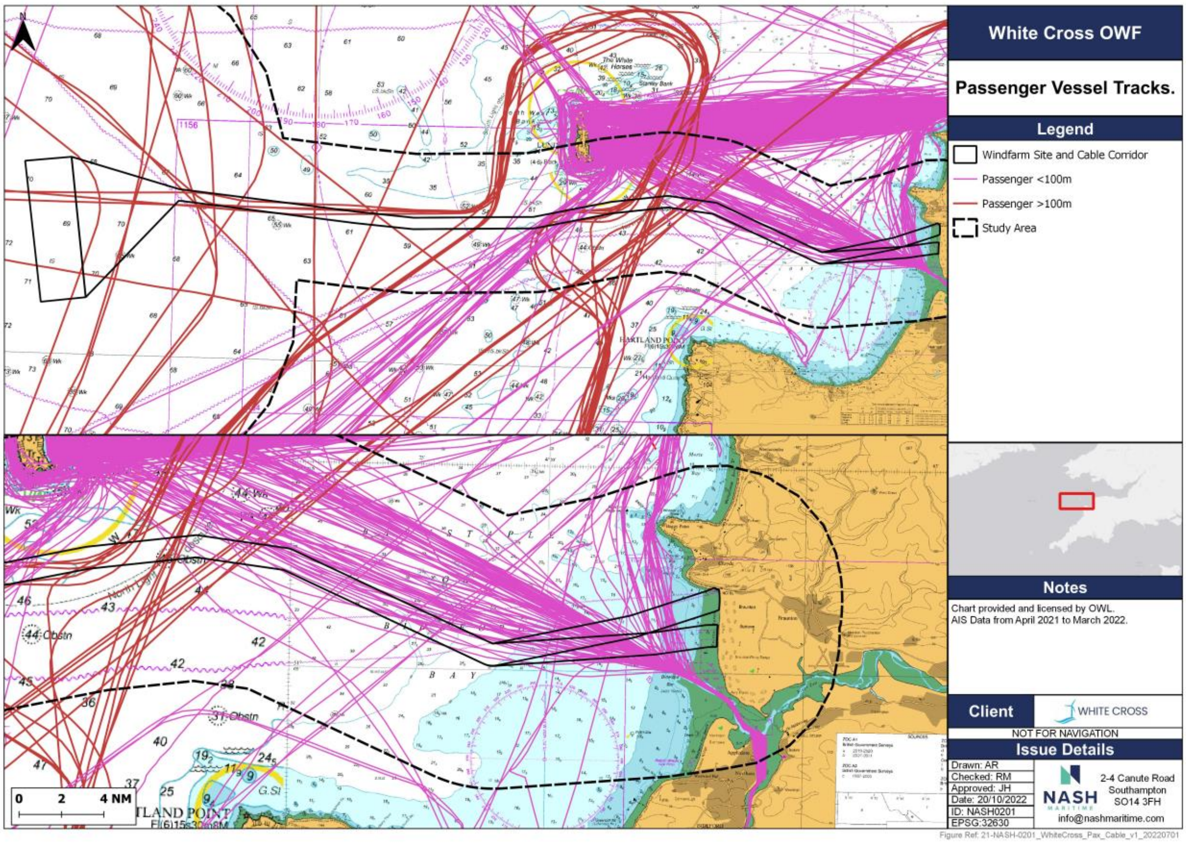
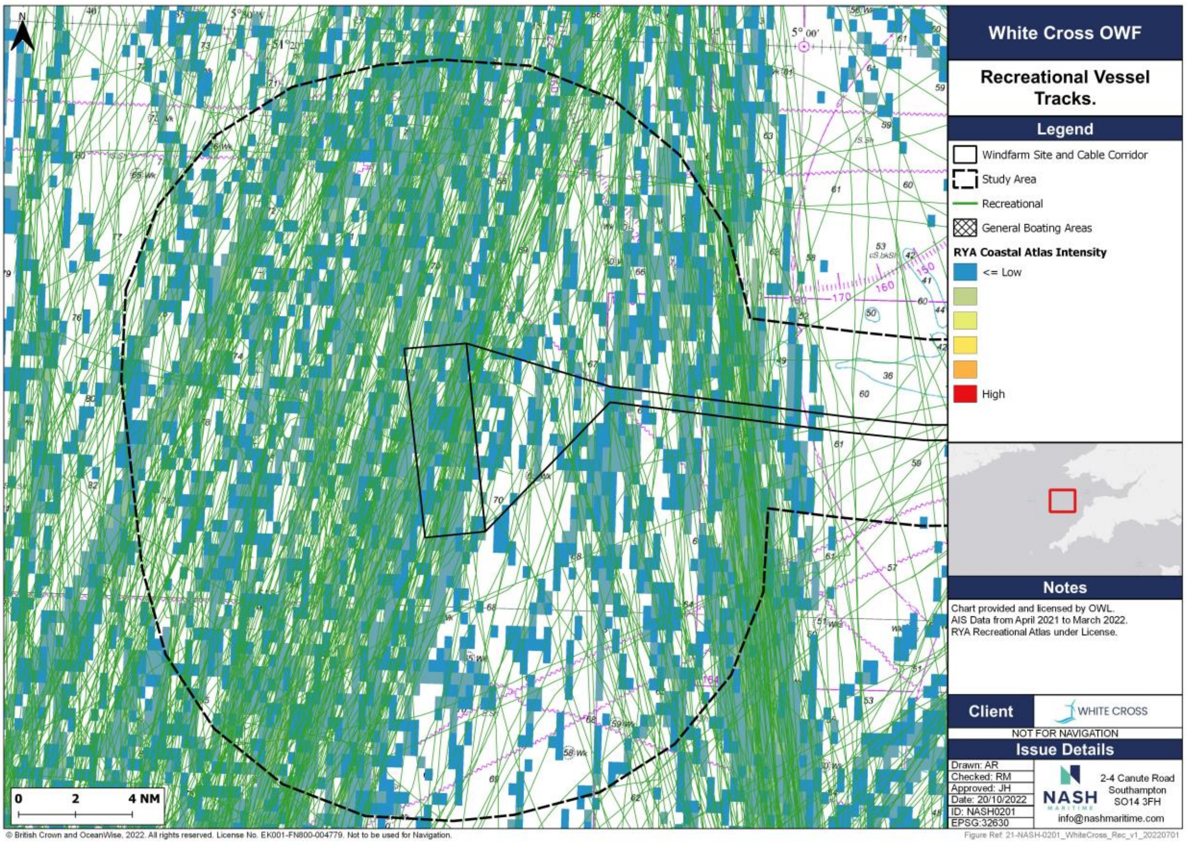


Figure 16: Passenger vessel tracks.



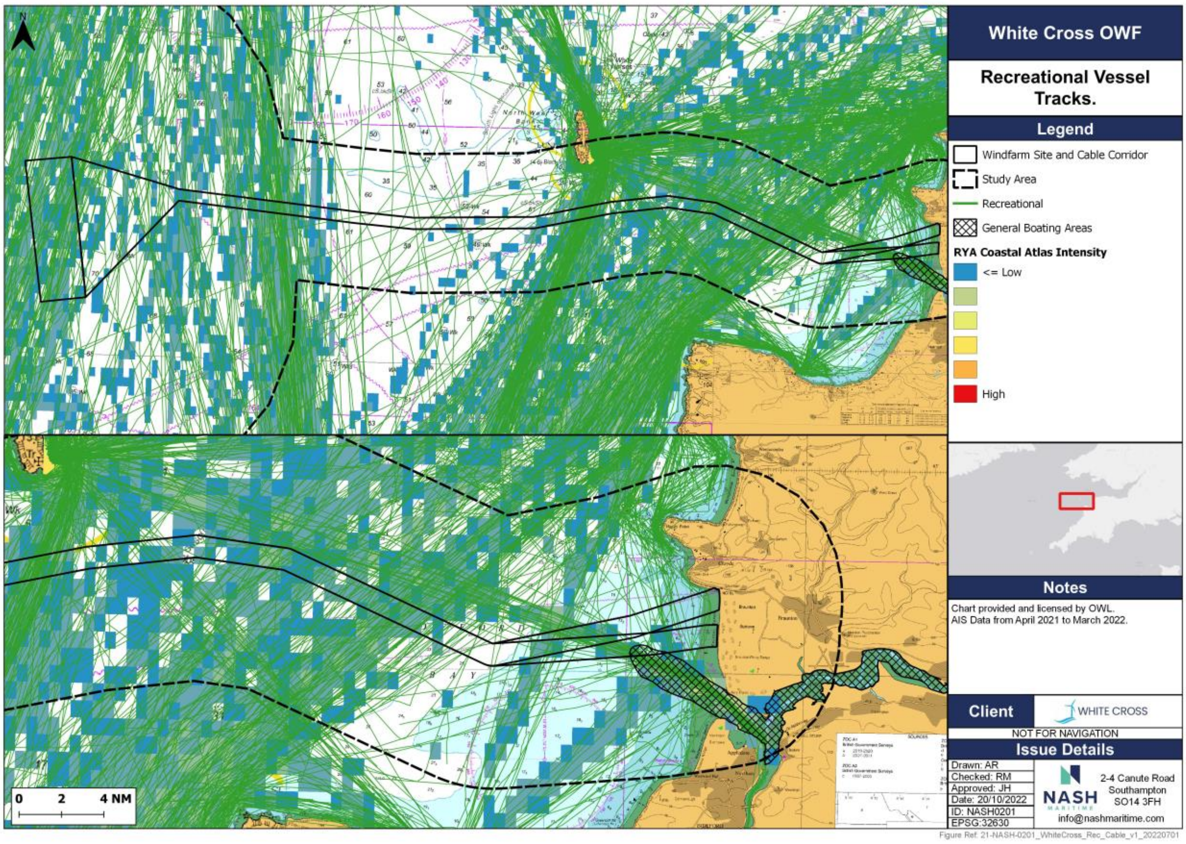


Figure 17: Recreational vessel activity.

6.2.2.5 *Fishing*

Fishing vessel AIS tracks and VMS data for 2019 have been presented in **Figure 19**. There are fishing vessel tracks shown throughout the area and sections of the windfarm site have been recorded as having over 10,000 hours of fishing time in 2019, as recorded with VMS data. During consultation it was discussed that the area is fished with both static and mobile gear. Vessels fishing the site include local craft, particularly from Padstow, but also international vessels from France, Belgium and Ireland.

The vessel traffic survey results indicated that there was seasonality to the fishing vessel tracks in the area. There were 53 fishing tracks in the summer period from 15-Jun-22 to 28-Jun-22 compared with two tracks in the winter period comprising 25-Jan-22 to 07-Feb-22. This seasonality is explored further in **Figure 18**, demonstrating that Summer to Autumn fishing is more intense than during the winter months.

Fishing activity is also evident within Bideford Bay and near to cable landfalls. Local boats tow gear between Bideford fairway buoy and Baggy Point and potting is common throughout the year.

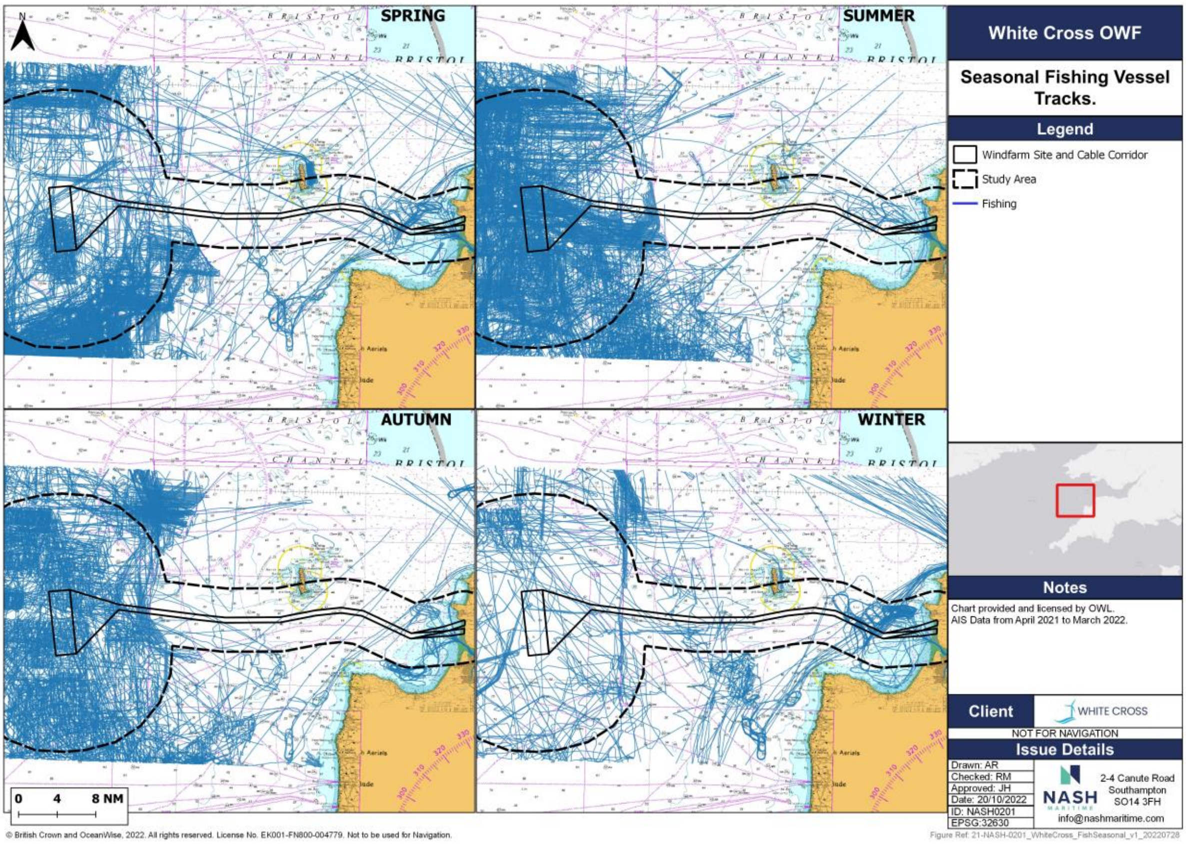


Figure 18: Seasonality of fishing activity (AIS 2021-2022).

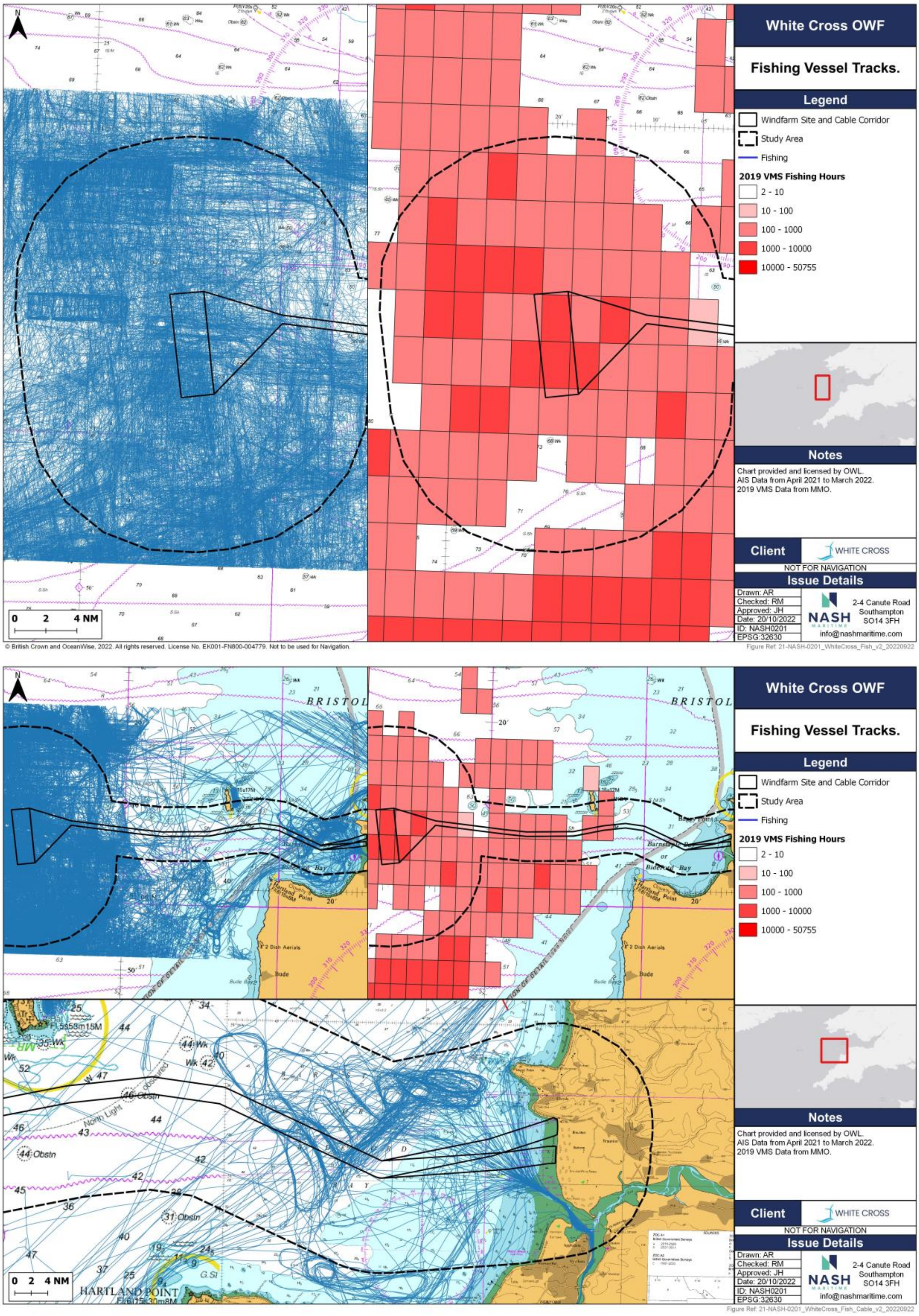


Figure 19: Fishing vessel activity.

6.2.2.6 Tug and Service

Tracks for the following vessel types are presented in **Figure 20**:

Tug and workboat;

Offshore supply or windfarm support vessel;

Dredgers;

Naval or law enforcement

Pilot vessel and port tender

Research or survey vessel;

Search and rescue; and

Other.

It can be seen that the tug and service vessel tracks follow the principal shipping routes used by other vessels in the area or staying coastal when using the local ports. Many of these routes are centred on Milford Haven or the Bristol Channel to Lands End route. There were 23 tracks in the AIS dataset which crossed the windfarm site comprising a range of the different types of tug and service vessels.

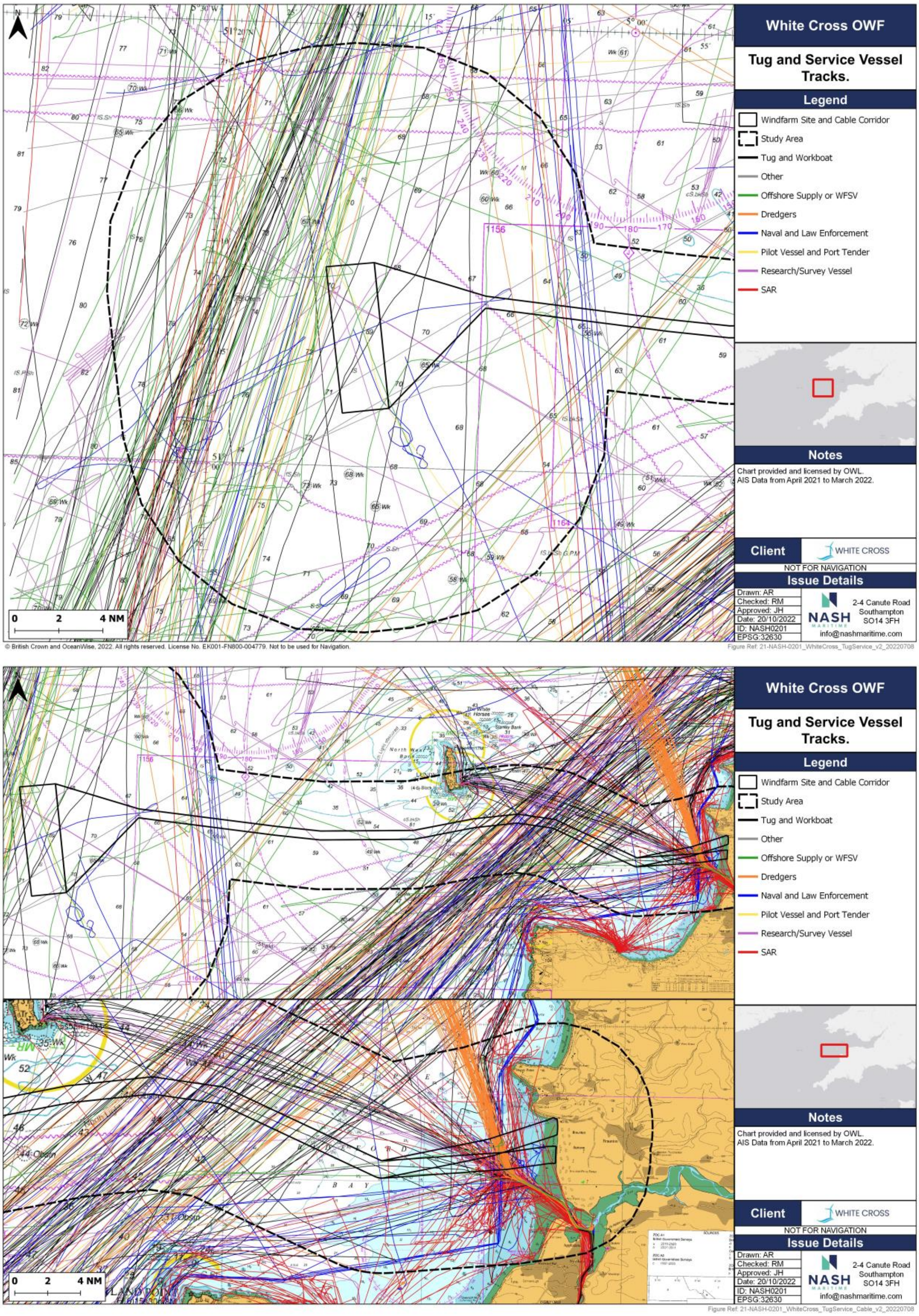


Figure 20: Tug and service vessel tracks.

6.2.3 Vessel Traffic by Size

The AIS vessel tracks for the windfarm site have been separated by vessel length and presented in **Figure 21**. For vessels of 0-20m and 20-50m there is less defined routeing through the area compared with larger vessels.

There are notable vessel tracks for larger vessels 200-400m in length through the windfarm site in an east-west orientation. These are likely to be tankers loitering for an available berth before entering Milford Haven.

Larger vessels tend to have a deeper draught and so will need to use deeper water when on passage through an area. This means that larger vessels will usually pass through an area further away from the coast compared with smaller vessels unless they are approaching a port in that area.

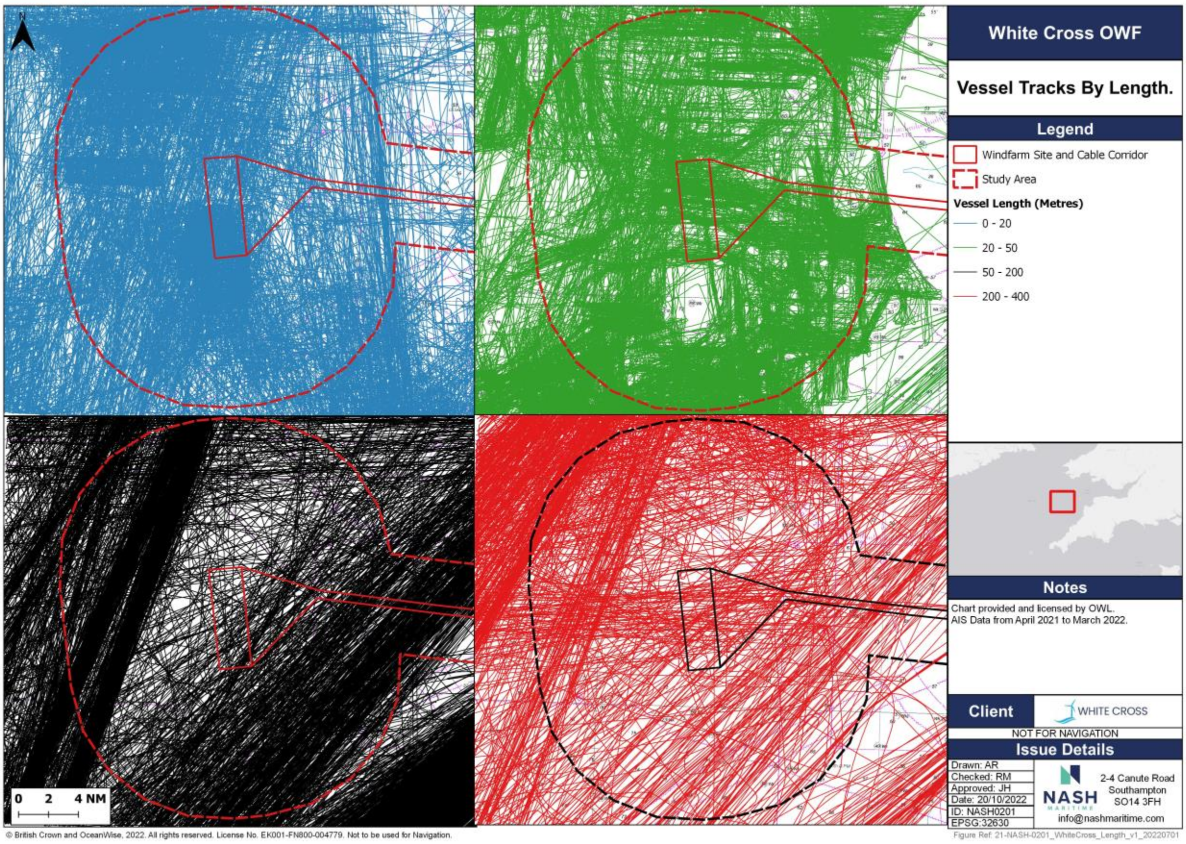


Figure 21: Vessel tracks by vessel length (windfarm site).

Figure 22 shows vessel tracks by vessel length for the cable route. There is a notable area in the 20-50m vessel track category where there is a large amount of tracks to the west and very limited tracks to the east. The curve formed by this feature follows the 12nm limit for territorial waters indicating that the feature is due to non-British based fishing vessels operating in the area.

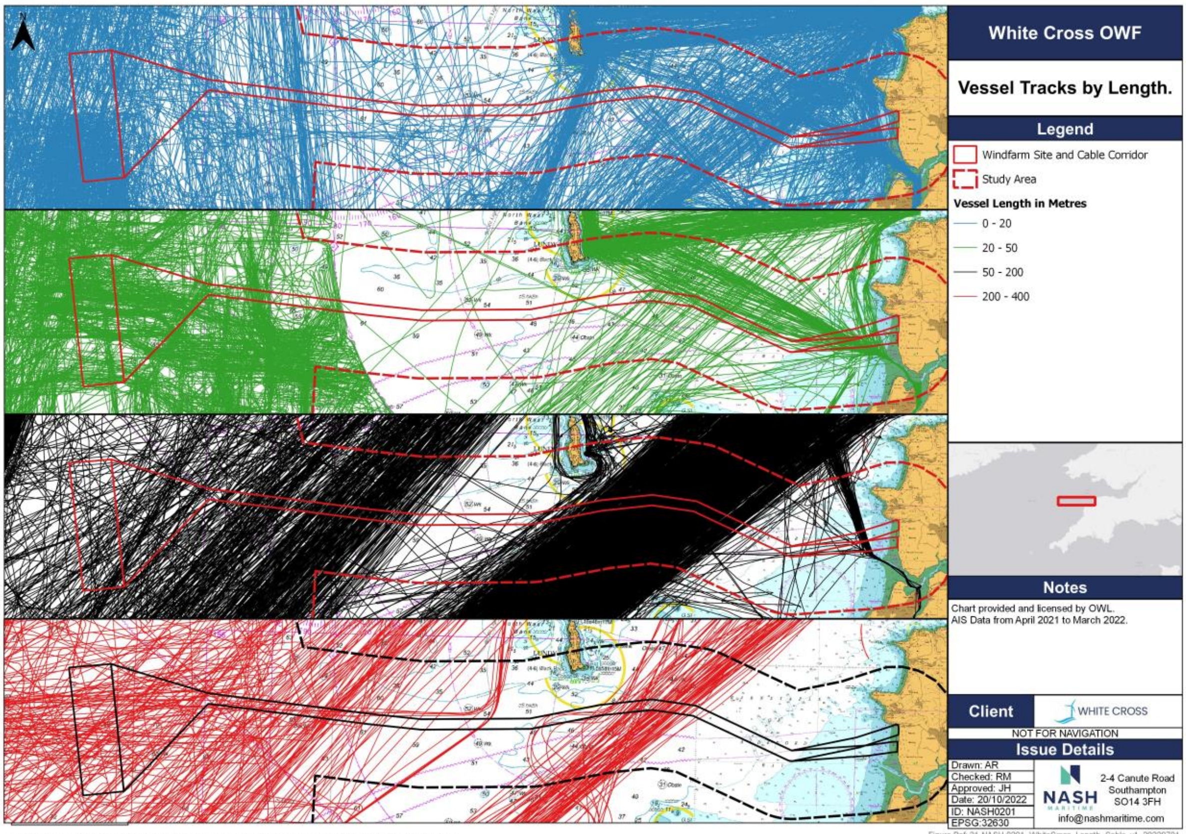


Figure Ref: 21-NASH-0201_WhiteCross_Length_Cable_v1_20220701

Figure 22: Vessel tracks by vessel length (cable route).

6.2.4 Identification of Vessel Routes

MGN654 (MCA, 2021) provides guidance regarding the definition of shipping routes in order to inform OWF assessments. To account for variation of tracks taken by vessels, the guidance note establishes the 90th percentile corridor principles, the central portion of traffic on a route containing the majority of vessel traffic. **Figure 23** shows a schematic of how the 90th percentile routes can be defined. The analysis was limited only to cargo, tanker, passenger and tug or service vessels over 50m in length.

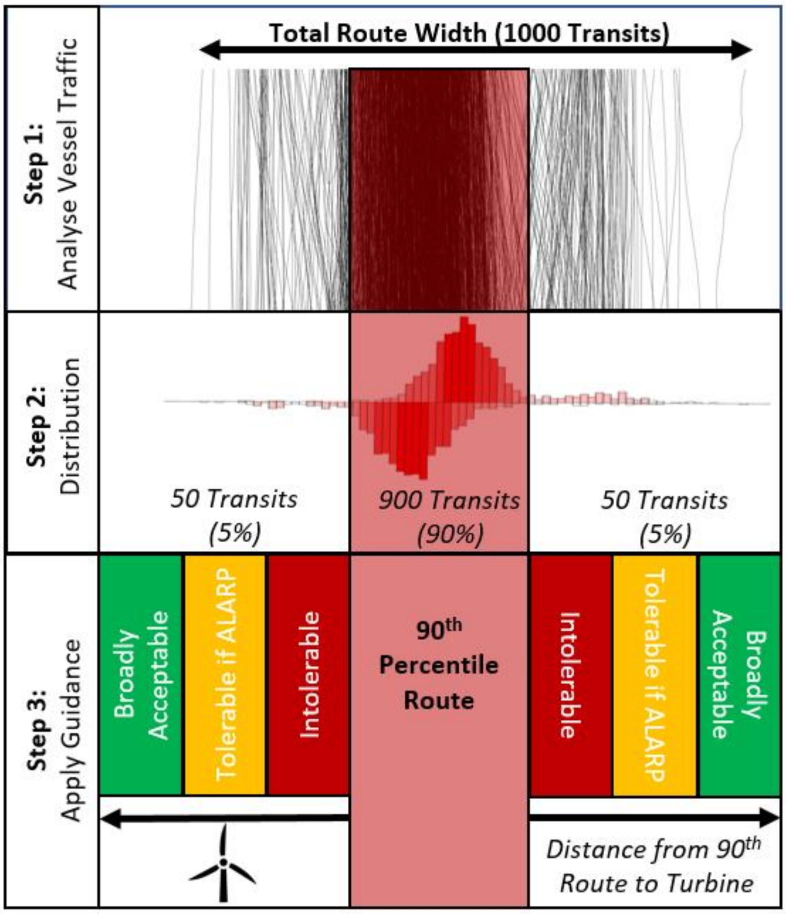
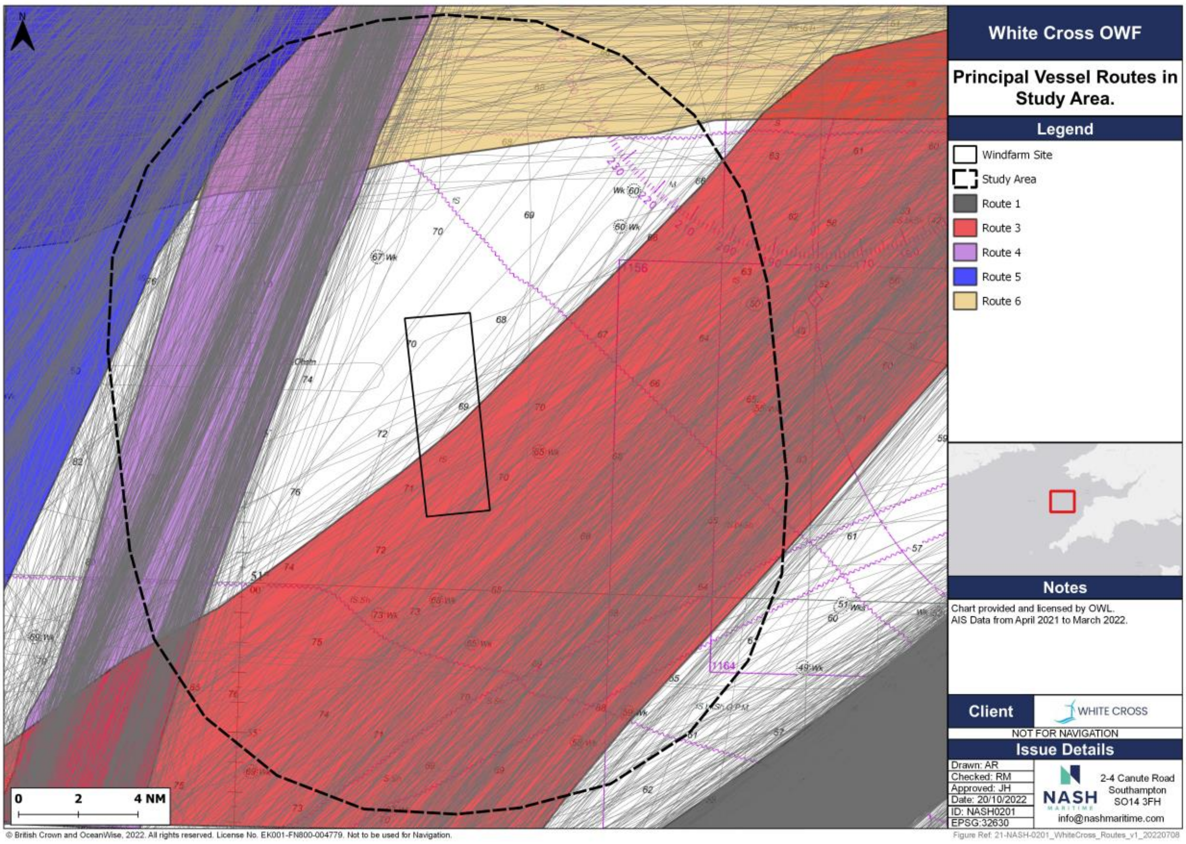


Figure 23: MGN654 90th percentile workflow.

The AIS data were processed and 10 different routes were identified within the study area. Each route was then classified into 90th percentile routes, as per the methodology outline above - see **Figure 24** below. **Table 16** provides summary details of each of these 10 routes, with the number of transits and vessel type included. In total, 33,554 vessel tracks were classified onto the routes, and routes which intersected the windfarm site accounted for 625 transits (circa 2%):



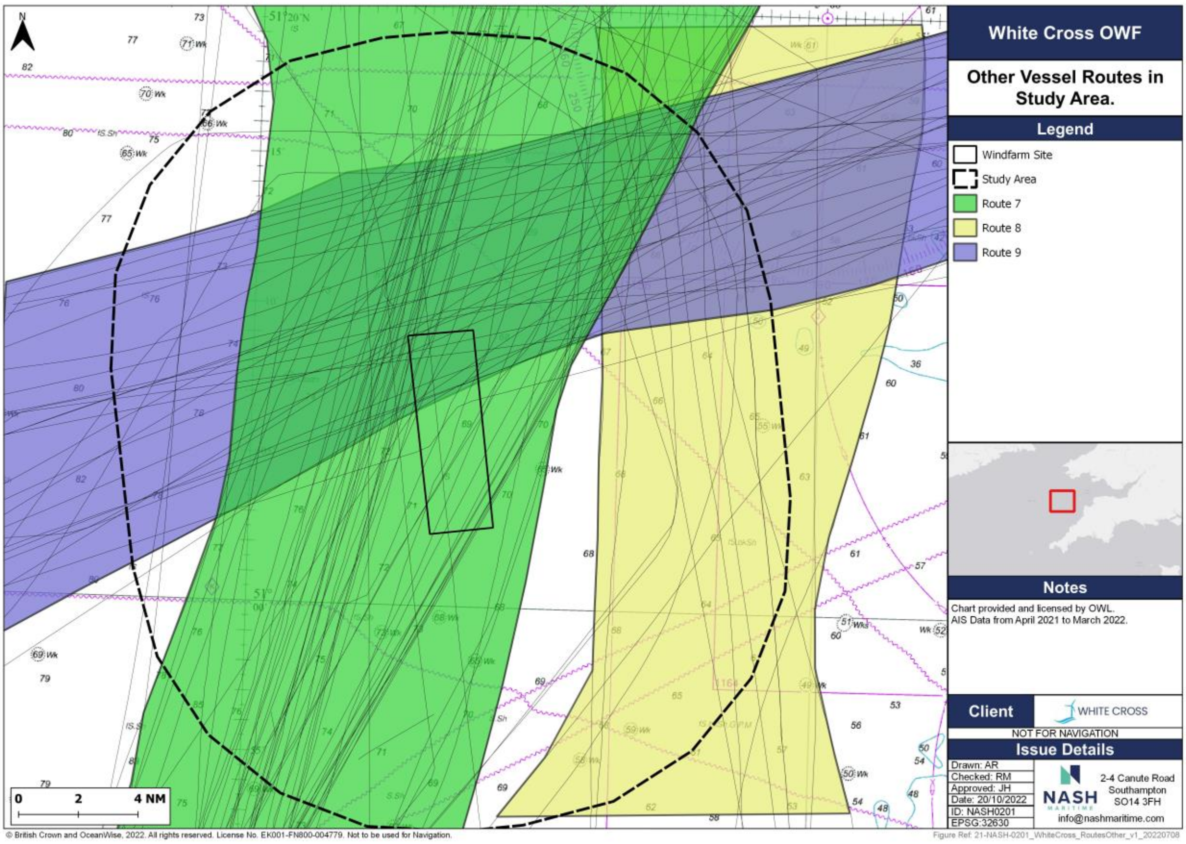


Figure 24: Primary (top) and secondary (bottom) vessel routes in study area.

Table 16: Principal routes in study area.

Route	Description	Frequency/ Year	Notes
1	Lands End to Bristol Channel (South Lundy)	2201	Route between "TSS Off Land's End Between Seven Stones and Longships" and the Bristol Channel, passing to the south of Lundy. Minimum route distance to the Project of 12nm. Mostly cargo vessels (89%), with a small number of tankers and tug or service vessels. 49% under 100m, 47% between 100 and 200m. Largest vessel 294m container ship.
2	Ilfracombe to Lundy (not shown)	219	Route between Ilfracombe and Lundy, principally the Oldenburg passenger vessel and small charter boats.
3	Lands End to Bristol Channel (North Lundy)	565	Route between "TSS Off Land's End Between Seven Stones and Longships"/"TSS West of the Scilly Isles" and the Bristol Channel, passing to the north of Lundy. The southern footprint of the windfarm site is intersected by this route, although route continues for 8.2nm south-east of the Project site. Mostly cargo vessels (78%) and tankers (20%). 15% under 100m, 66% between 100 and 200m and 19% greater than 200m. Largest vessel 294m container ship.
4	Lands End (East Isles of Scilly) to Milford Haven	521	Route between "TSS Off Land's End Between Seven Stones and Longships" and Milford Haven. The 90th percentile route is 3.0nm from the Project. Mostly tankers (84%) and tug or service vessels (9.6%). 25% under 100m, 65% between 100 and 200m and 10% greater than 200m. Largest vessels are 290-300m LNG tankers.
5	Lands End (West Isles of Scilly) to Milford Haven	651	Route between "TSS West of the Scilly Isles"/Atlantic Ocean and Milford Haven. The 90th percentile route is 8.1nm from the Project. Mostly tankers (88%) and cargo (9%). 44% under 200m, 42% between 200-300m and 13% greater than 300m. Largest vessels are 345m LNG tankers.

Route	Description	Frequency/ Year	Notes
6	South Ireland to Bristol Channel	300	Route between Atlantic Ocean south of Ireland and Bristol Channel. The 90th percentile route is 5.3nm from the Project. Mostly cargo (76%) and tankers (15%). 30% under 100m, 45% between 100 and 200m and 25% greater than 200m. Largest vessels are 290-300m container ships, bulk carriers and LNG tankers.
7	Lands End (East Isles of Scilly) to Milford Haven (Easterly Route)	60	Route between “TSS Off Land’s End Between Seven Stones and Longships” and Milford Haven, however, vessels take a more easterly route than Route 4. The route directly intersects the Project. Mostly tug and service (52%) and tankers (27%). 62% under 100m, 33% between 100 and 200m and 5% greater than 200m.
8	Padstow to Milford Haven	11	Route between Padstow and Milford Haven, mostly used by tug and service vessels under 100m. The 90th percentile route is 3.8nm from the Project site.
9	Atlantic to Bristol Channel	29	Route between Atlantic Ocean and the Bristol Channel. The northern footprint of the Project is intersected by this route. Mostly cargo vessels (97%) and tankers (3%). 0% under 100m, 79% between 100 and 200m and 21% greater than 200m. Largest vessel is a 292m bulk carrier.
10	Lands End to Irish Sea (via Study Area) (not shown)	26	A small proportion of vessels passing from the Lands End TSS and Irish Sea, are recorded making a deviation into the vicinity of the study area. These include cargo and tankers between 82m and 274m.

6.2.5 Anchoring and Waiting Vessels

Vessels which have been identified as anchoring or drifting from the available vessel traffic data have been presented in **Figure 25**. These were determined by filtering all AIS data to records with speeds less than 0.5 knots. Near to the windfarm site, the majority of positions highlighted are fishing vessels, likely working static gear. Much of the export cable route up to the landfalls is relatively clear of any stationary vessels up until the cable landfalls. Immediately adjacent to the approaches to Bideford, several vessels are identified as potentially anchoring infrequently. These include military vessels, buoy-laying vessels (Galatea) and dredgers, but mostly are small craft such as lifeboats and workboats. One general cargo ship was recorded for approximately 24 hours 1.5nm from the pilot boarding station. No fishing or recreational craft were recorded anchoring at the cable landfalls, likely due to the firing practice area and relatively little shelter compared to other bays. However, consultation with the Bideford Harbour Master determined that anchoring would likely be elsewhere, such as in the shelter of Lundy or at Clovelly Roads and is infrequent (less than once a year).

During consultation and a review of the tanker traffic data (see **Section 6.2.2.2**), it was identified that large tankers loiter in the vicinity of the Project site. These vessels were identified as bound for Milford Haven, however, until there was available berth space they were requested to wait off the coast more than 10nm from St Anne's Head. **Figure 26** shows the density of where this activity is occurring following a review of non-transit tanker tracks from the 2021-2022 AIS data. The Project is located more than 30nm from Milford Haven, and therefore the majority of loitering is located further north. However, some tanker tracks do extend far enough south to be located near to the windfarm site. These activities may extend for more than several days for each vessel.

It is notable that during the vessel traffic surveys, where the survey vessel was on station at the Project site, tankers loitered further north-west in order to maintain safe searoom.

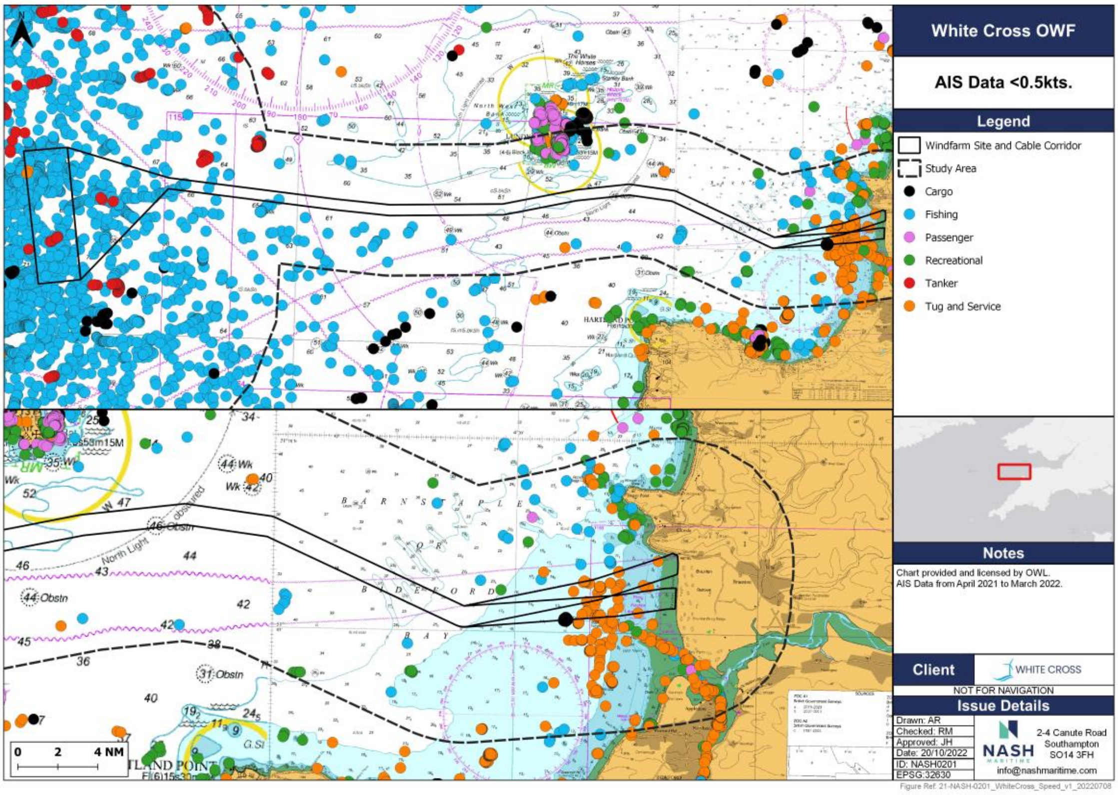


Figure 25: Anchoring and waiting vessels adjacent to cable route.

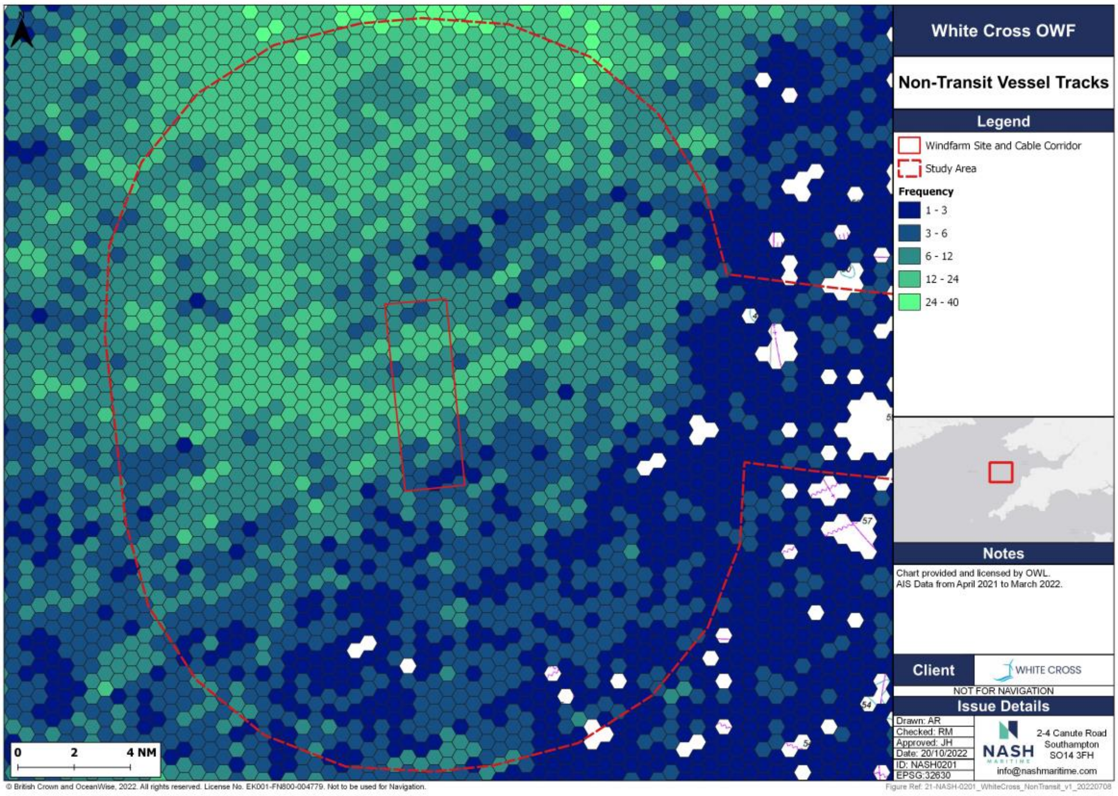
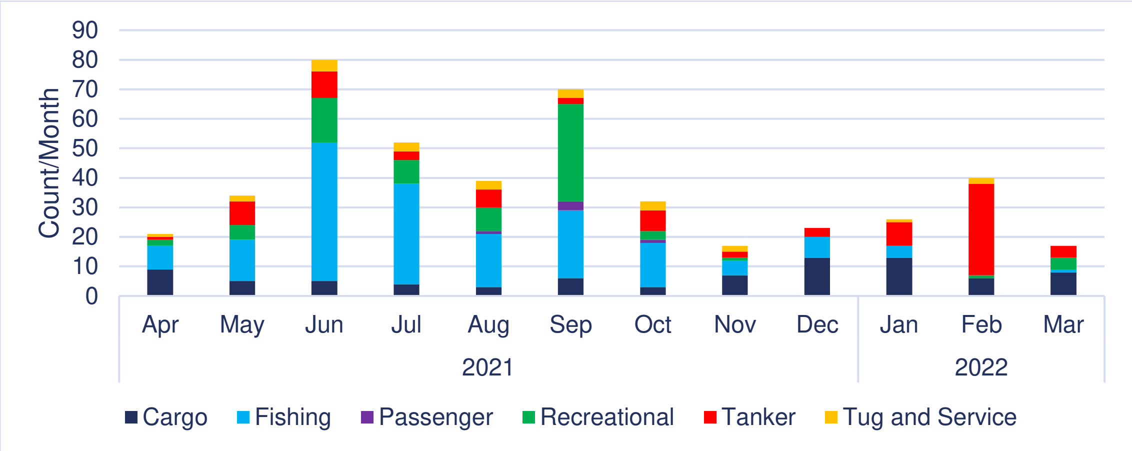


Figure 26: Non-transit vessel track density.

6.2.6 Transit Counts and Seasonality for windfarm site and Cable Route

6.2.6.1 Windfarm Site Intersections

Figure 27 and **Figure 28** shows the numbers of vessels transiting through the windfarm site and within 10nm of the windfarm site. The analysis demonstrates that between 20 and 80 transits per month intersect the windfarm site, and between 250 and 500 transit within 10nm. These vessels are mostly fishing and tanker vessels, although numerous cargo ships and recreational craft were recorded. More than half of the vessels are less than 50m in length and 70% have draughts less than 10m.



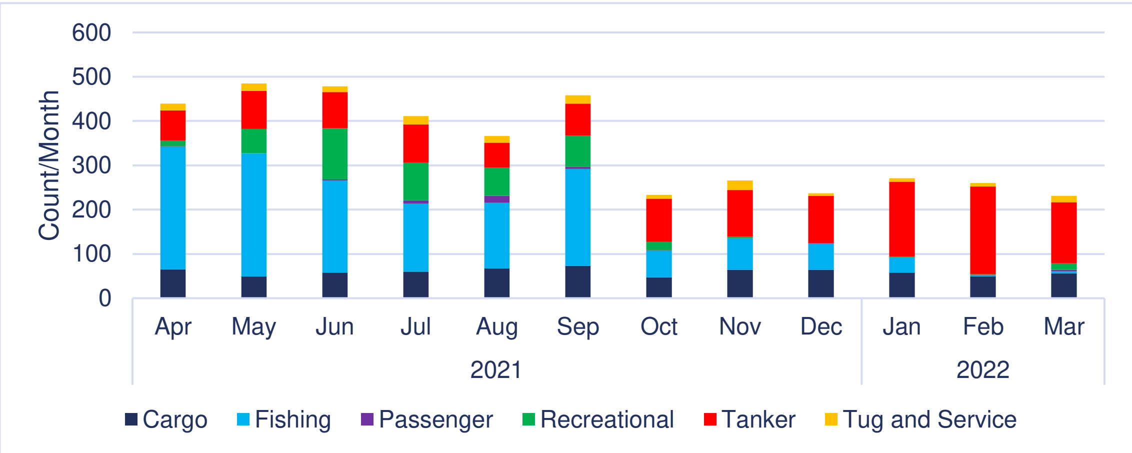


Figure 27: Vessel counts through windfarm site (top) and within 10nm of windfarm site (bottom).

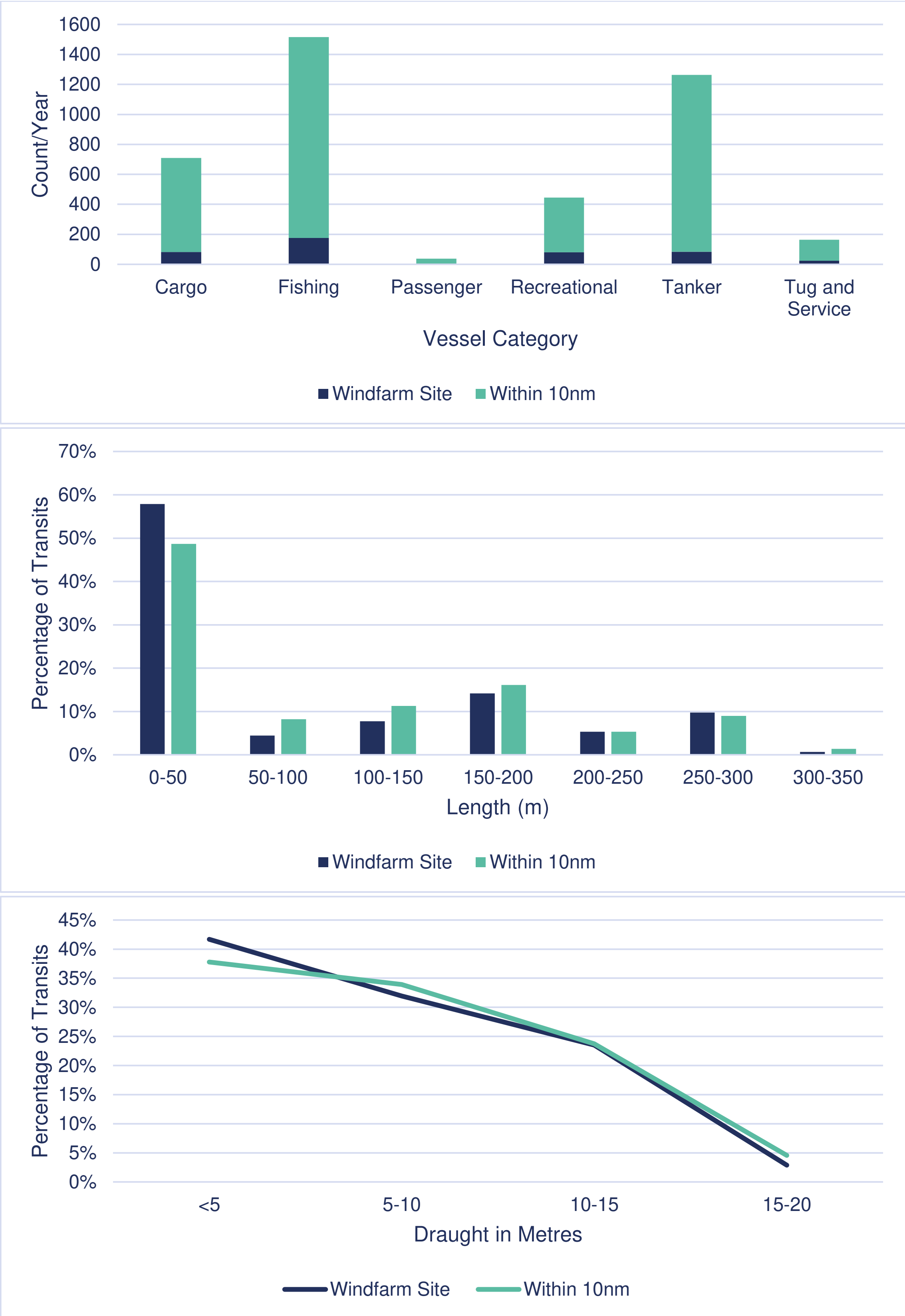


Figure 28: Vessel counts through windfarm site and within 10nm of windfarm site by type (top), length (middle) and draught (bottom).

6.2.6.2 Cable Route Intersections

Figure 29 detail statistics of vessels which were recorded crossing the export cable route between April 2021 and March 2022. The cable corridor extends across the main approaches to the Bristol Channel from Lands End, ferry routes to Lundy, recreational cruising routes and fishing grounds. Therefore, the absolute numbers of vessels are high, but consist mostly of cargo vessels offshore, and recreational vessels inshore during the summer months. There is seasonality with up to 650 transits per month in summer compared to less than 300 in winter. The majority of these vessels are less than 50m in length and 3m in draught.

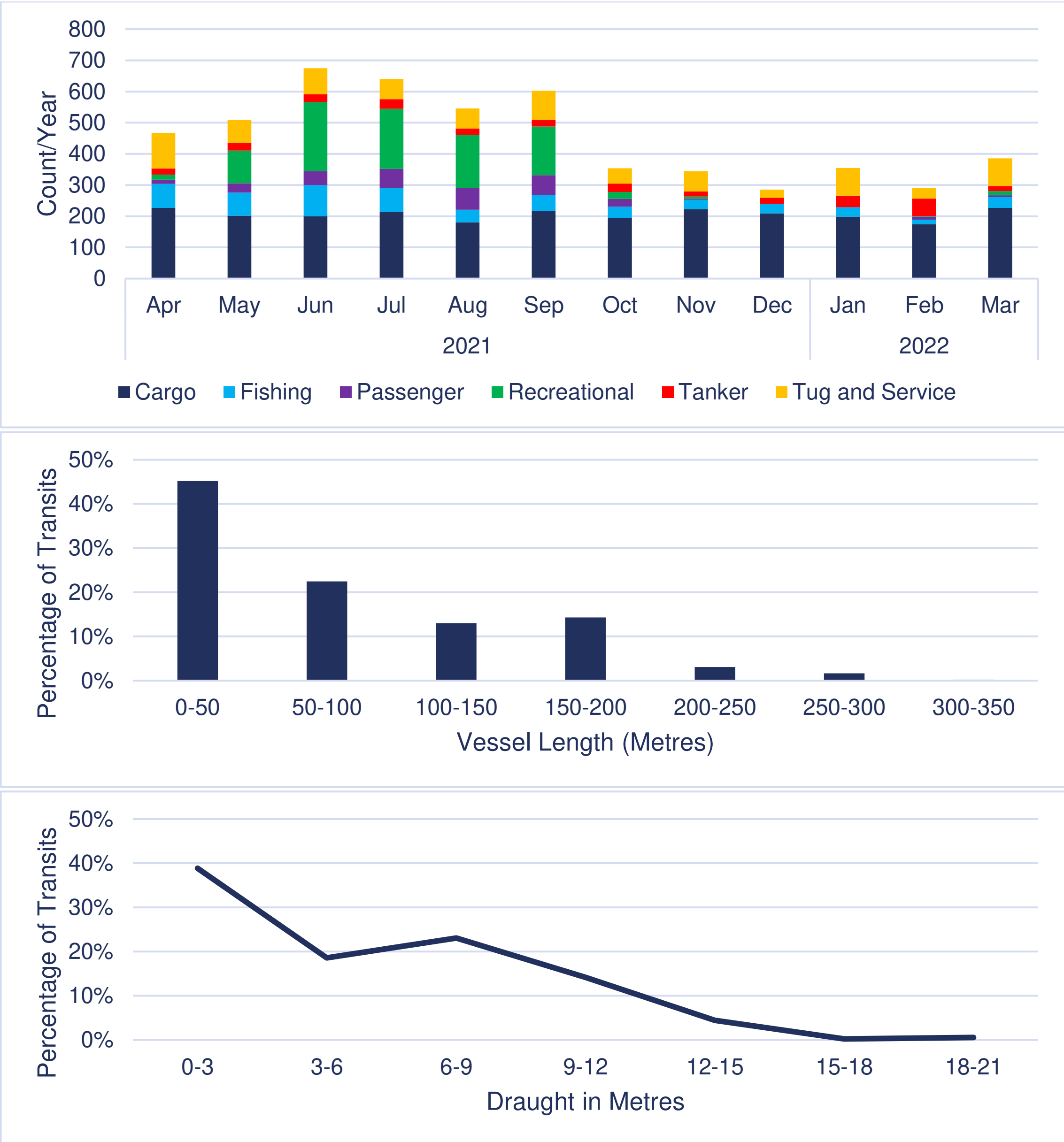


Figure 29: Vessel counts through cable route by type and month (top), length (middle) and draught (bottom).

6.3 MARITIME INCIDENTS

6.3.1 Incidents within Study Area

Figure 30 shows navigational incidents recorded in the study area between the MAIB (1992-2021) and RNLI (2008-2020) databases. In processing the incidents, non-navigational incidents have been removed, such as shore based activities (e.g. people cut off by the tide or swimmers in distress). Furthermore, duplicate values recorded in both databases have been removed.

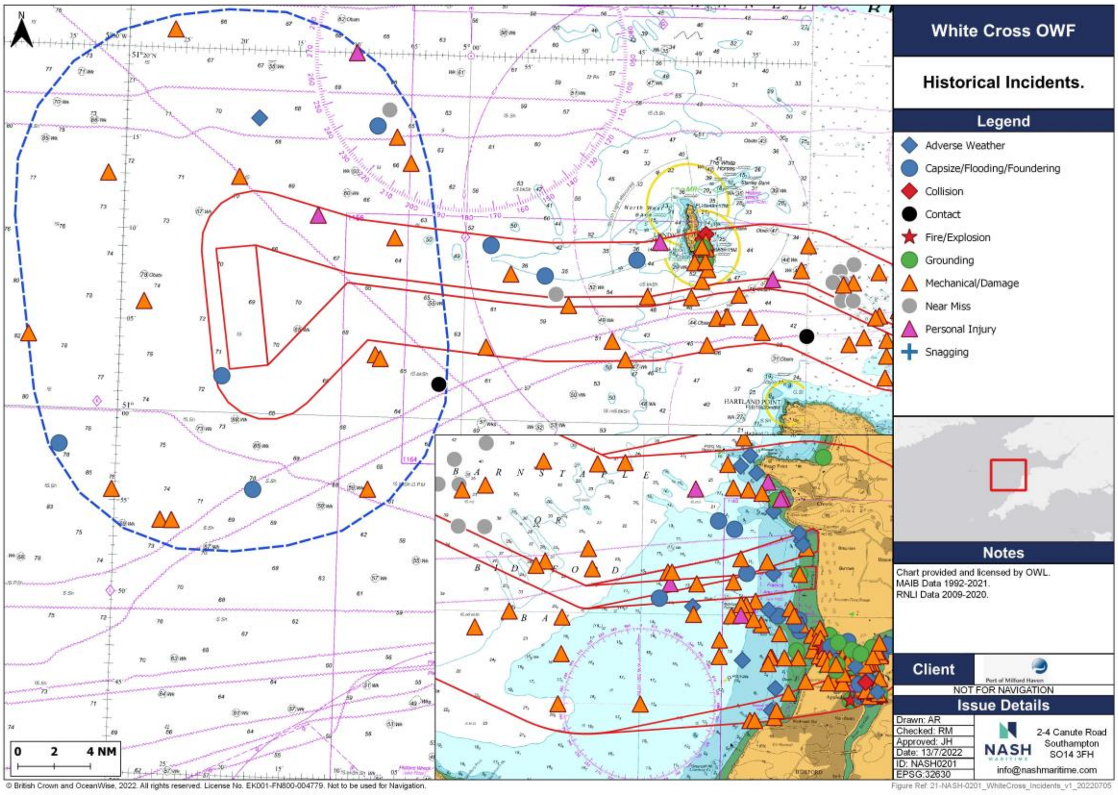


Figure 30: Historical incidents in study area.

Figure 31 compares the number of incidents per year between the windfarm site study area and cable route. Within the windfarm site, 23 incidents are recorded, a 2008-2020 average of 0.9 incidents per year. Within the export cable corridor, 272 incidents are recorded, a 2008-2020 average of 17.9 per year.

Within the windfarm site study area, 14 of the 23 incidents involve mechanical failures or damage to a vessel, including five commercial vessels, six fishing vessels, two yachts and a passenger vessel. Four incidents involved flooding of fishing vessels, including the sinking of a fishing vessel in 1992, the only incident classified by the MAIB as Very Serious in the study area. One near miss was reported between a yacht and a cargo ship. Other incidents involving personal injury are not considered navigationally relevant. In October 2020, a small general cargo vessel lost containers during adverse weather in the western portion of the Celtic Sea.

Within the export cable corridor, 79% occurred within 5nm of cable landfalls or within the River Taw or Torridge. 75% of the total number of incidents in the export cable corridor involve recreational craft, with 17% accounted for by fishing vessels. The two most frequent incident types are mechanical failure aboard vessels (62%) and capsize, flooding or adverse weather (17%). 22 groundings are recorded, involving four fishing vessels, 16 recreational craft, one SAR craft and one passenger boat.

Six near misses are recorded involving traffic funnelled between Lundy and Bideford Bay involving recreational, fishing and cargo vessels. Six collisions are also recorded, mostly involving recreational and fishing vessels, all of which occurred within the harbour or inshore at Lundy. One incident of a fishing vessel snagging a cable south of Lundy was recorded.

Four incidents within the cable corridor were categorised as Very Serious by the MAIB. These included two sinkings of fishing vessels, a fatality of a kayaker through a heart attack and the capsize of a pleasure angling vessel with the loss of one life. A further six incidents were classified as Serious, all of which occurred near to the cable landfalls.

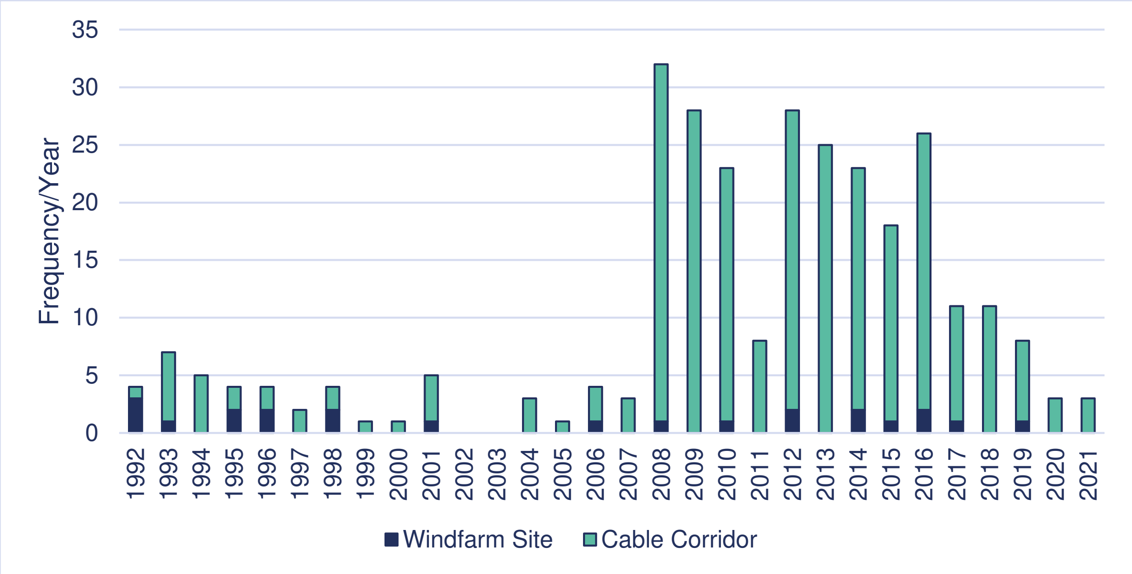


Figure 31: Incidents per year (note RNLI data applicable 2008-2020 only).

Based on the database analysis, **Table 17** and **Table 18** present the base case annual accident frequency per vessel type and accident type for the windfarm site study area and export cable corridor respectively. This analysis has been limited to the years 2008-2020 to ensure consistency between the MAIB and RNLI databases. In summary, the incident frequencies across the windfarm site are low and mostly involve mechanical failure aboard fishing vessels. The accident frequency within the cable corridor is higher due to its significant length and proximity to the harbour at Bideford. However, most of these incidents involve mechanical failure and recreational or fishing vessels.

Table 17: MAIB/RNLI accident frequencies in windfarm site per year (2008-2020).

	Cargo	Fishing	Passenger	Recreational	Tanker	Total
Adverse Weather	0.00	0.00	0.00	0.08	0.00	0.08
Capsize/Flooding/Foundering	0.00	0.15	0.00	0.00	0.00	0.15
Mechanical/Damage	0.15	0.08	0.08	0.15	0.00	0.46
Personal Injury	0.00	0.00	0.08	0.00	0.08	0.15
Total	0.15	0.23	0.15	0.23	0.08	0.85

Table 18: MAIB/RNLI accident frequencies in cable corridor per year (2008-2020).

	Cargo	Fishing	Passenger	Recreational	Tanker	Tug and Service	Total
Adverse Weather	0.00	0.08	0.00	1.69	0.00	0.00	1.77
Capsize/Flooding/Foundering	0.00	0.23	0.00	1.38	0.00	0.00	1.62
Collision	0.00	0.08	0.00	0.31	0.00	0.00	0.38
Fire/Explosion	0.00	0.00	0.00	0.08	0.00	0.00	0.08
Grounding	0.00	0.15	0.08	1.15	0.00	0.08	1.46
Mechanical/Damage	0.15	1.15	0.23	10.15	0.08	0.15	11.92
Near Miss	0.08	0.08	0.00	0.00	0.00	0.00	0.15
Personal Injury	0.00	0.00	0.08	0.92	0.00	0.08	1.08
Total	0.23	1.77	0.38	15.69	0.08	0.31	18.46

6.3.2 Incidents Associated with Other Offshore Windfarms

To better understand the types and frequency at which navigational incidents might occur with the proposed projects, analysis was conducted of historical accidents associated with UK operational OWFs. Analysis was conducted of the MAIB database (2010-2019), RNLI databases (2008-2019), MAIB reports and news reports, to account for a period of maximum activity within the offshore wind industry.

In total, 69 incidents were identified between 2010 and 2019 (see **Table 19**). This includes six collisions between vessels, 29 allisions of a vessel with a fixed structure, 21 groundings and 13 near misses. Where the information is available, 36% occurred within the windfarm site, 43% occurred within ports or harbours and 20% occurred on-transit between the two. Incidents involving project craft accounted for 82% of incidents (such as Crew Transfer Vessels (CTVs) or construction vessels). Few allisions are recorded by a non-project vessel, however, anecdotally evidence of allisions involving fishing and recreational vessels suggests that such occurrences are underreported.

Table 19: Accident frequency for OWF relevant incidents between 2010-2019 in UK.

Vessel	Allision	Collision	Grounding	Near Miss
Project Vessel	27	9	21	15
Fishing	2	0	0	2
Recreational	0	2	0	4
Other	0	1	0	5

From the historical incident records and using an estimate of the number of years of operation for UK OWFs, incident rates per an average project are derived (see **Table 20**) (see Rawson and Brito, 2022). The accident return rates are generally low, between 10 and 45 operational years between incidents, the majority accounted for by project vessels. Therefore, over a typical 25-35 year operational duration it would be expected that a typical project would experience three allisions, two groundings and one collision or near miss. It is notable that there are no recorded accidents involving large commercial shipping and offshore windfarms in the UK. Nor did any of the recorded navigational incidents across the UK sector result in loss of life.

Table 20: Average incident rate per project between 2010-2019 in UK.

Incident Type	N	Rate	Return Period
Collision	6	0.022	45.4
Grounding	21	0.077	13.0
Near Miss	13	0.048	20.9
Total Allision	29	0.107	9.4
Project Vessel Allisions	27	0.099	10.1
Fishing Allisions	2	0.007	136.9
Total	69	0.254	3.9

7. FUTURE CASE TRAFFIC PROFILE

7.1 COMMERCIAL TRAFFIC

To provide insight into the potential future commercial traffic through the area, the historic trends of local ports, the major ports in the region and the UK as a whole can be considered. **Figure 32** provides the annual freight amounts for these ports from DfT data. The data show a decline in port freight in 2020 at both the national and port level, respectively. The DfT report that UK ports were affected by measures to prevent and reduce the global spread of Covid-19 throughout 2020, as well as the UK exiting the European Union at the end of 2020. The DfT report a 9% decrease in tonnage handled by UK ports in 2020 compared to 2019. However, given the lifting of COVID-19 related restrictions, it is anticipated that port freight will continue to return to pre-pandemic levels.

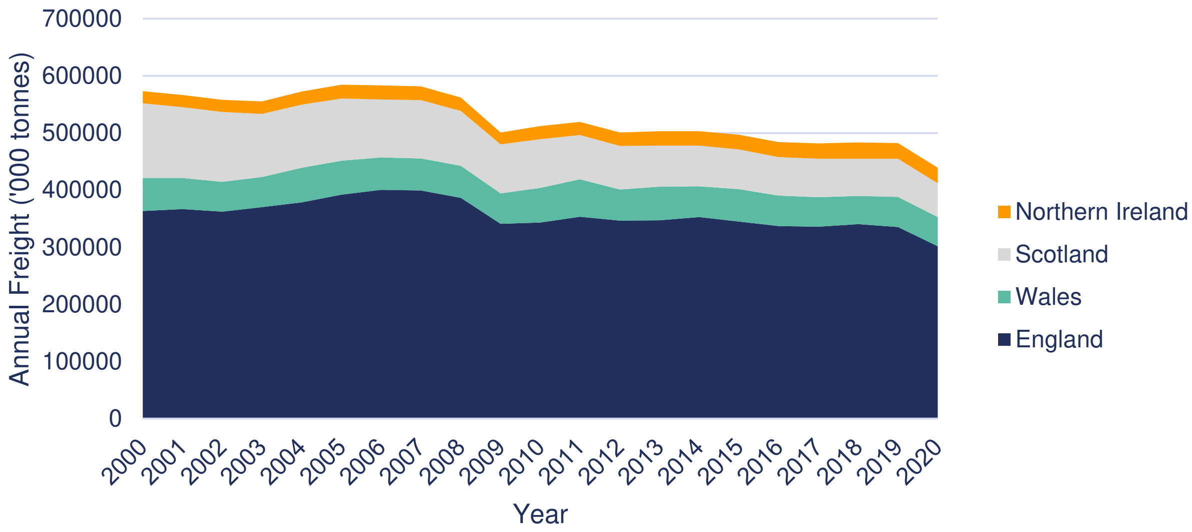


Figure 32: Annual port freight tonnage. (Source: DfT 2021).

Figure 33 shows projected freight traffic into UK major ports, produced by the DfT in 2019. Overall, port traffic is forecast to remain relatively flat in the short term but grow in the long term, with tonnage 39% higher in 2050 compared to 2016. This equates to approximately a 15% increase in national freight tonnage by 2035. The long term growth in port traffic is driven by increases in unitised freight traffic, which compensates for decreases in other freight in the short term. Liquid bulk traffic (principally crude oil) has the largest forecasted decreases, continuing a historical trend. Similarly, general cargo is forecast to decrease, in line with the historic decreasing trend, which is likely driven by increased containerisation of goods. Dry bulk traffic is forecast to have a relatively large decrease in the short term, driven primarily by demand for coal being projected to fall. In the long term, dry bulk traffic the decrease associated with coal will be offset primarily by biomass resulting in a forecast to increase. Motor vehicles, Twenty-foot Equivalent Unit (TEU) forecast for Lift On-Lift Off (Lo-Lo) and the unit forecast for Roll On-Roll Off (Ro-Ro) are all forecast to grow strongly, driven by economic growth.

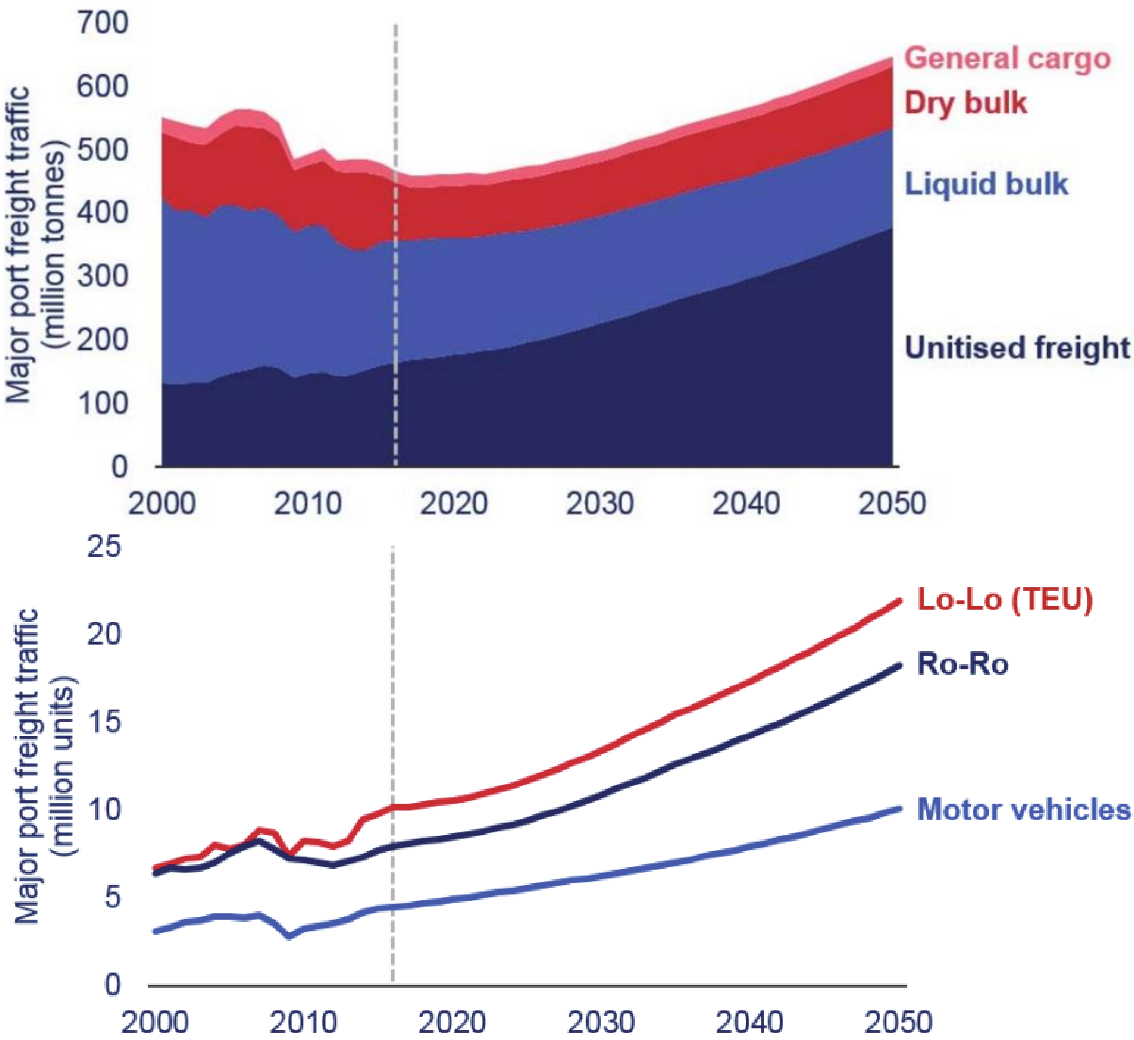


Figure 33: UK port freight projections (DfT, 2019).

More locally to the study area, a decline in annual freight is evident in the DfT data (see **Figure 34**). Furthermore, there are large fluctuations of freight figures for Appledore, Barnstaple and Bideford.

Figure 34: Annual freight for regional major ports and local ports (Source: DfT 2021).

7.2 FISHING

Historical fisheries analysis by the MMO for ICES Rectangle 31E4 shows a variation in landings between 2015 and 2019. In 2015, this was 95 tonnes, increasing to 172 tonnes in 2016, but reducing to 45 tonnes in 2018. It is anticipated that fishing activity is unlikely to change over the next 5 years, with both UK and non-UK vessels continuing to be active in the region. In the event that there is a reduction in non-UK fishing activity due to restrictions, it is anticipated that this will be balanced by an increase in UK fleet capacity. it is therefore envisaged that fishing activity levels will remain constant for the next 15 to 20 years.

7.3 RECREATIONAL

The RYA Water Sports Participation Survey conducted in 2019 found that the proportion of adults participating in boating activities has fluctuated between 6% and 8% between 2002 and 2018. Between 2008 and 2018, the proportion participating in yacht cruising, motor boating and power boating have remained consistent at 0.8%, 1.1% and 0.7% respectively. More recent data published in the 2021 Water Sports Participation Survey is greatly influenced by

COVID-19 with a considerable variation between 2021 and 2022 due to national/local lockdowns.

Therefore, it is unlikely that there will be an appreciable change in the number of recreational users due to macro trends.

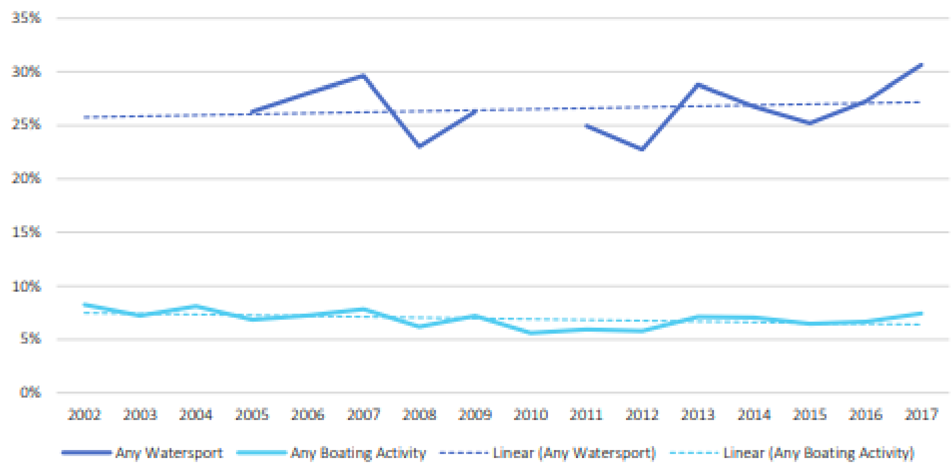


Figure 35: Recreational participation (Watersports Survey).

7.4 INCREASES IN TRAFFIC ASSOCIATED WITH THE PROJECT

The Project will require some additional vessel movements to perform maintenance and inspection activities (see **Section 4.4**). The numbers of vessels and O&M base are unknown at the time of assessment. However, on previous floating OWFs, vessel movements are in the order of one CTV visit per day. More major maintenance such as mooring line replacement or turbine tow back to port might be expected to occur approximately every five years.

7.5 FUTURE CASE SCENARIO

Figure 36 shows the proposed future case scenario, including identified cumulative projects. Only projects which have submitted Scoping Chapters are to be included within the cumulative assessment (see **Section 8.12**). Existing projects are included within the baseline (see **Section 5**).

Table 21: List of potential future case scenario projects.

Project	Status	Interaction with the Project
	Post-Scoping	
Marine Energy Test Area (META)	Active	Located at Milford Haven, negligible cumulative impact.
Aggregate Area NOBEL Banks	Active	34nm to north-east. Aggregates are not permanently operated so cumulative impacts are temporary.
WaveHub/WindHub	Active	41nm to south-west and clear of traffic routes. Negligible cumulative impact.

Project	Status	Interaction with the Project
Erebus (100MW 7-10 WTGs)	Application Submitted (20-Dec-21)	17.9nm to the north-west, potential impacts on vessel traffic bound for Milford Haven and offsetting fishing vessel movements.
Valorous (300MW 18-31 WTGs)	Scoping (26-Feb-21)	10nm to north-west, potential impacts on vessel traffic bound for Milford Haven and offsetting fishing vessel movements.
Llyr 1/2 (2x100MW Up to 8 WTGs)	Scoping (07-Apr-22)	9nm to north, potential impacts on vessel traffic bound for Milford Haven and offsetting fishing vessel movements.
Pembrokeshire Demo Zone (90MW Wind and 90MW wave)	Scoping (22-Feb-2018)	19nm to north-east, potential impacts on vessel traffic bound for Milford Haven or Bristol Channel and offsetting fishing vessel movements.
	Pre-Scoping	
South Pembrokeshire Demo Zone	Pre-Scoping	16nm to north-east, potential impacts on vessel traffic bound for Milford Haven or Bristol Channel and offsetting fishing vessel movements.
Llwelyn (300MW 20 WTGs) / Petroc (300MW 20 WTGs)	Pre-Scoping	Sites within 8nm to west, potential impacts on vessel traffic bound for Milford Haven or Bristol Channel and offsetting fishing vessel movements.
Gwynt Glas (1GW c. 60WTGs)	Pre-Scoping	Site within 8nm to west, potential impacts on vessel traffic bound for Milford Haven or Bristol Channel and offsetting fishing vessel movements.
Crown Estate Celtic Sea Areas of Search	N/A (Announced 05-Jul-22)	Sites identified in close proximity to the Project, potential cumulative impacts dependent upon site configurations.
Xlinks	N/A (Announced 26-Sep-21)	Cable landfall is intended to be in Bideford Bay, potential impacts on fishing and recreational vessel activity.

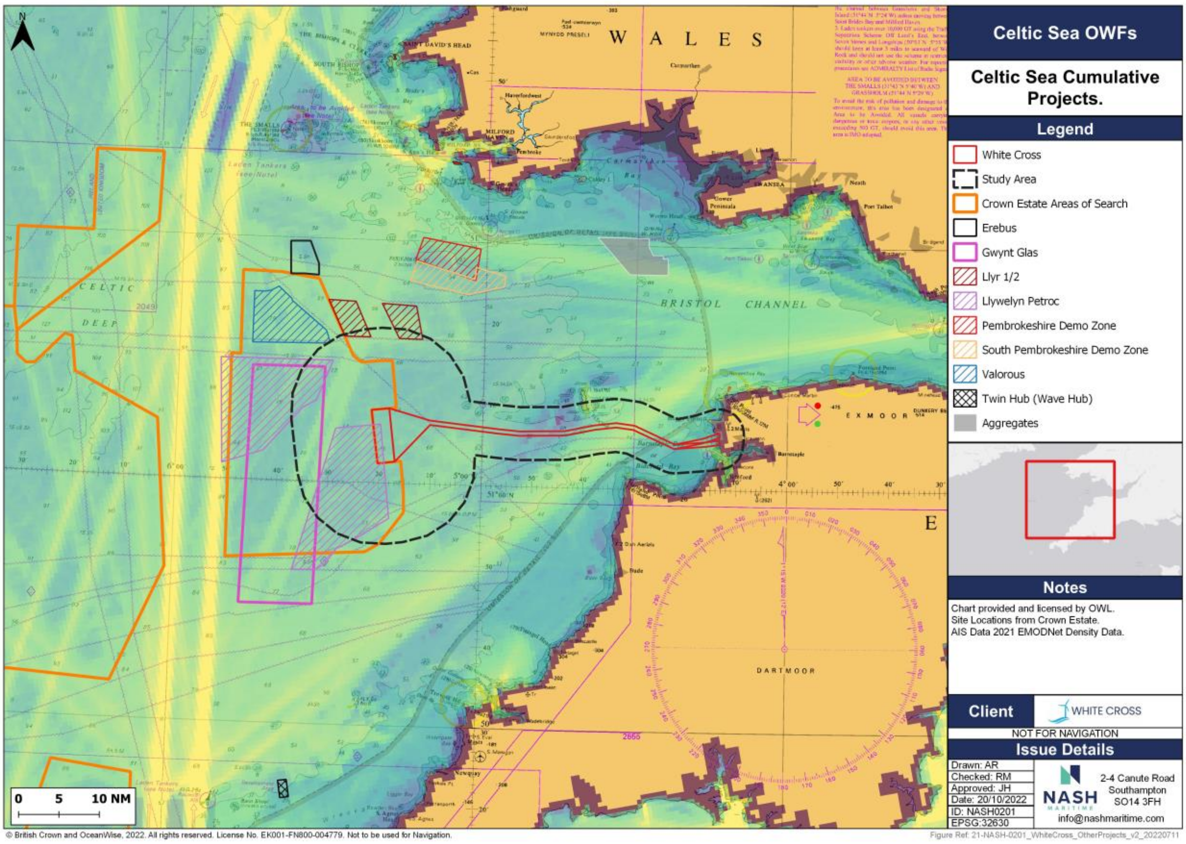


Figure 36: Key potential cumulative projects.

8. POTENTIAL IMPACT ASSESSMENT

8.1 IMPACT IDENTIFICATION

Following consultation with stakeholders, analysis of data and a review of guidance, 11 potential impacts of the Project were identified on shipping and navigation.

Table 22: Impacts scoped into assessment.

Number	Impact	Description
1	Vessel Traffic Routeing	The project could adversely impact vessel traffic routes, including commercial and ferry routes, that make services unviable.
2	Milford Haven Operations	The project could adversely impact operations at local ports and harbours, such as through disruption of anchorages, pilot boarding or other essential activities.
3	Risk of Allision/Contact	The project could have unacceptable impacts on the risk of allision or contact between navigating vessels and surface structures.
4	Risk of Collision	The project could have unacceptable impacts on the risk of collision between navigating vessels, such as through the creation of choke points or increased vessel movements.
5	Export Cable Route on Vessel Safety and Activities	The export cable route could pose a hazard to fishing or anchoring operations.
6	Search and Rescue	The project design could inhibit search and rescue access for vessels or aircraft during an emergency.
7	Visual Navigation and Collision Avoidance	The project could block or hinder visual navigation which could increase the risk of collision, allision or grounding.
8	Communications, Radar and Positioning Systems	The project infrastructure could interfere with shipboard or land-based equipment essential to communications or positioning.
9	Under Keel Clearance of Mooring Systems and Potential Snagging	The moorings, cables or other subsurface infrastructure could pose a risk of snagging to vessels in close vicinity to the Project.
10	Turbine Breakout	The turbines could become detached from their moorings during adverse weather and pose a risk to navigating vessels.
11	Cumulative Impacts	The combination of other proposed projects in the Celtic Sea could exacerbate the above impacts.

Due to a lack of information, several impacts could not be fully addressed within this NRA and therefore should be considered by contractors prior to commencing works. These include the tow-out of the turbines from the construction base to the site and any wet storage of turbines prior to installation. Where appropriate, risk controls identified in **Section 9.3** address these impacts.

8.2 IMPACT ON VESSEL TRAFFIC ROUTEING

The construction of an OWF in otherwise navigable waters necessitates vessels to deviate there existing routes to avoid the obstruction. This can result in increased transit distance and time that might make some services unviable or make passage planning challenging for bridge teams.

Figure 37 shows the principal vessel routes identified from the vessel traffic analysis (see **Section 6**) with the 90th percentile corridors within the study area. The centrelines of all routes are well clear of the Project. Whilst the Project intersects the 90th percentile of Route 3 between Lands End and the Bristol Channel (north of Lundy), there is 8nm of clear searoom to the south-east of the site available for navigation. Therefore, no appreciable impacts on vessel routeing are anticipated.

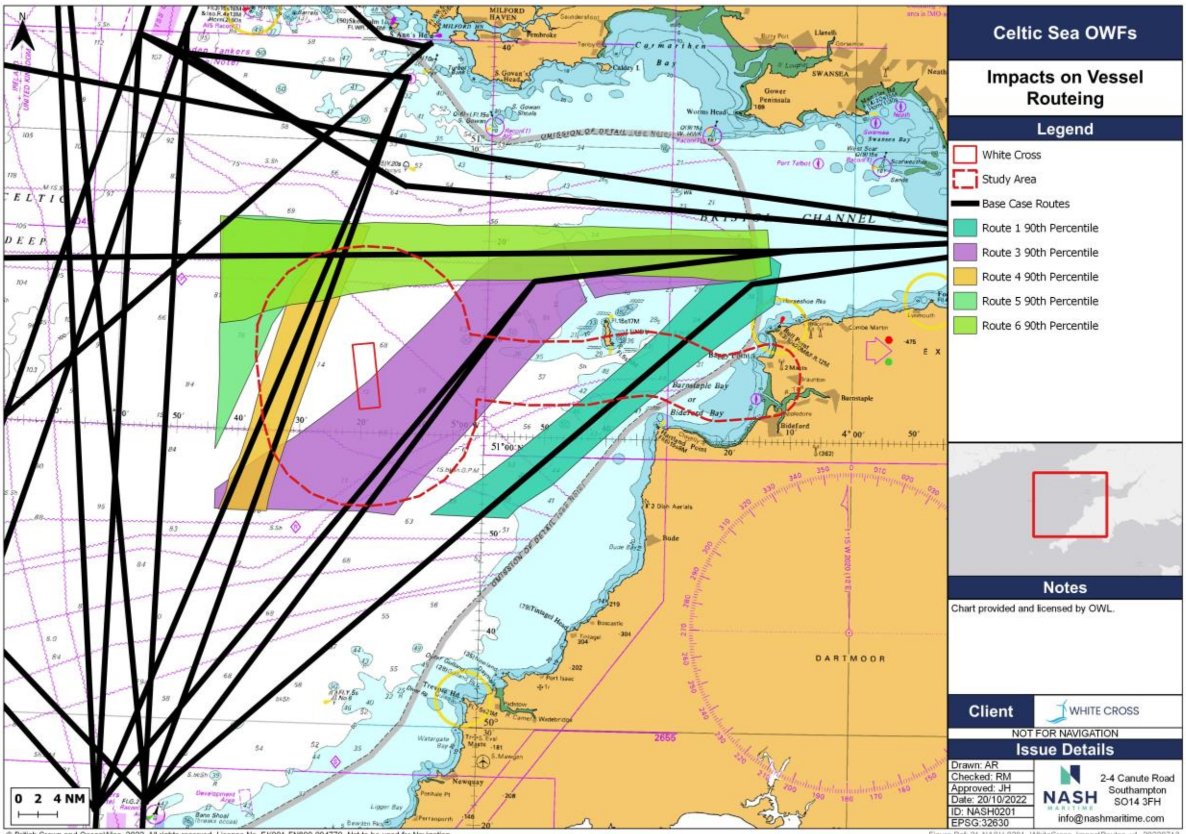


Figure 37: Impact on vessel routeing from the Project.

It is recognised that during adverse weather, vessels may take less direct routes to minimise the impact of the conditions on the vessel. **Figure 38** shows the tracks recorded during four MetOffice named storms in 2021-2022. With the exception of a reduction in vessel traffic numbers (particularly small craft), no appreciable differences in vessel routeing are identified.

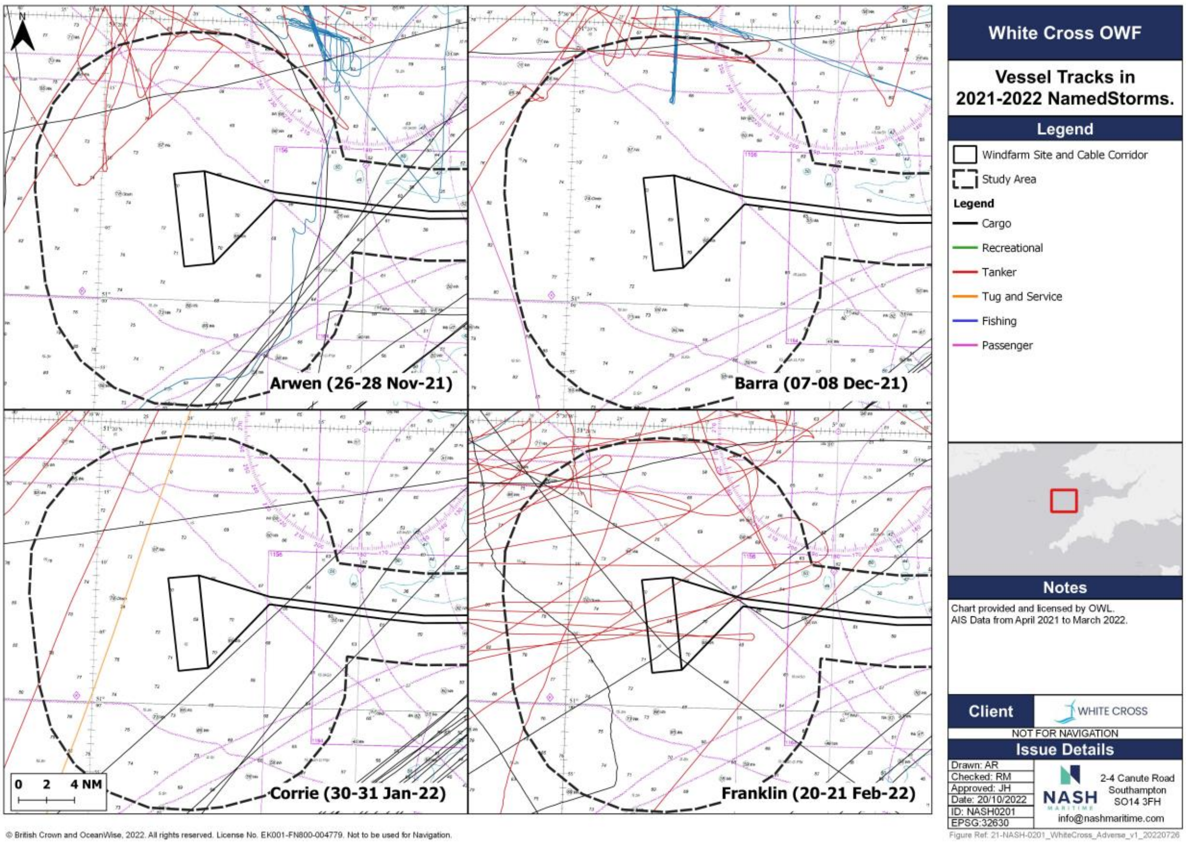


Figure 38: Vessel tracks during 2021-2022 MetOffice named storms.

Given the size of the site, the availability of unobstructed searoom adjacent to the site and the low intensity of recreational users, impacts on recreational routeing are not anticipated to be significant.

8.3 IMPACT TO MILFORD HAVEN OPERATIONS

Vessel traffic data has identified the presence of tankers loitering in the study area whilst waiting for berths at Milford Haven (see **Section 6.2.5**). This area is used as it is considered to provide a safe location, given the relatively low density of vessel traffic and the lack of obstructions to navigation. The presence of the Project has the potential to displace this traffic either further west or north.

The location of the Project means that there is considerable searoom available to the north allowing tankers to loiter. Milford Haven Port Authority currently request vessels to stand off Saint Ann's Head at a distance of 10nm or more. There is approximately 32nm between the Project boundary and Saint Ann's Head meaning that there is still sufficient searoom to the north for vessels to anchor. If the tankers are displaced further west, there is potential for them to interact with the main traffic routes between Milford Haven and the TSSs to the south. There is approximately 8nm between the Project and the closest route. Given the considerable searoom to the north it is unlikely the tankers would loiter further west when it would be more advantageous to move north. This means that there are no appreciable impacts on Milford Haven operations due to the Project.

8.4 IMPACT ON RISK OF ALLISION/CONTACT

Historical analysis of incidents involving OWFs has identified that those vessels most likely to come into contact with a turbine are the Project construction and maintenance vessels given their operational requirements (see **Section 6.3.2**).

For other vessels navigating through the area they may come into contact with a Project WTG through human error or mechanical failure, exacerbated by other factors such as a failure of Aids to Navigation. The analysis of vessel routes in **Section 6** has identified that the Project is located adjacent to several major routes into the Bristol Channel, Irish Sea and Milford Haven. However, there is considerable searoom around the site to facilitate safe navigation and therefore the risk of contact is not considered likely. The close proximity of loitering tankers adjacent to Milford Haven could result in drifting contacts with the WTGs. However, it is anticipated that these activities would be relocated away from the site (**Section 8.3**) and any drifting allisions would be of low impact and therefore have low consequences.

The IWRAP risk analysis tool (see **Section 3.2**) was utilised to quantitively assess the likelihood of a contact between vessels navigating within the study area and a Project WTG. The model determined a risk of allision of once in 606 years ($1.65x10^{-3}$), which is considered very unlikely during the Project lifecycle.

The windfarm site is located a considerable distance from the shore and therefore most recreational craft would be on passage (see analysis in **Section 6** and consultation in **Section 3.3.1**). The recreational cruising route between Lands End and Milford Haven passes through the site. However, the site would be well marked and there is sufficient searoom to safely pass around the site. Therefore, it is unlikely that a recreational vessel would contact a turbine. Were it to do so, a glancing blow with minor damage is the most credible outcome.

During consultation, the risk of contact was mostly identified by fishermen. In **Section 6.2.2.5** it can be seen that there is evidence of fishing activity around the windfarm site. Compared to conventional OWFs with fixed monopiles (where fishermen routinely fish within the windfarm site) the presence of subsurface infrastructure makes it more likely that fishermen would avoid the windfarm site due to the potential risk to safety and damage or loss of gear. Several consultees described the windfarm site as becoming a no-go area for fishing. Therefore, there will be a natural tendency to offset their activities from the windfarm site and the risk of potentially contacting a turbine is reduced. Were a contact to occur, through for example mechanical breakdown or human error, the most likely outcome would be a glancing contact with minor damage. However, it is possible (although unlikely) that the fishing vessel could capsize with the potential for loss of life.

8.5 IMPACT ON RISK OF COLLISION

An OWF can increase the risk of collision in two ways. Firstly, the construction of an OWF in an otherwise navigable area can constrain shipping routes and result in pinch points or areas of high vessel traffic density. This would increase the number of encounters between vessels and the number of potential collision situations, which might increase the risk of collision. The analysis of vessel routes in **Section 6** has identified that the Project is located adjacent to several major routes into the Bristol Channel, Irish Sea and Milford Haven. However, there is considerable searoom around the site to facilitate safe navigation.

The IWRAP risk analysis tool was utilised to quantitively assess the likelihood of a collision between vessels navigating within the study area. The model determined a risk of collision of once in 490 years (2.03×10^{-3}), and given the minimal impact on vessel routeing, no discernible increase in collision risk was predicted.

Secondly, the risk of collision can be heightened through additional vessel movements. Particularly during construction/decommissioning or during O&M where there will be more vessel movements between the windfarm site and the O&M base. These vessels are typically high-speed catamarans, and there have been incidents on other projects of collisions or near misses with other users (**Section 6.3.2**). The O&M base for the Project has not yet been determined but it is anticipated that the number of daily vessel movements would be low, suggesting a relatively minor impact on collision risk along the route between the OWF and the O&M base. Furthermore, these vessels will be required to comply with the principals of good seamanship and International Regulations for Preventing Collisions at Sea (COLREGs).

8.6 IMPACT OF EXPORT CABLE ON VESSEL SAFETY AND ACTIVITIES

Subsea cables are both at risk of anchor or fishing gear strikes and can pose a hazard to navigating vessels were gear attached to the vessel to become snagged. The preferred route of the export cable is shown within this report. However, the final route will be confirmed following completion of project data gathering and a cable burial risk assessment. The cable is intended to be fully buried, typically to a depth of 1m or where this is not possible, protected using other measures such as rock armouring. A CBRA will be undertaken to determine the appropriate level of protection.

Analysis of anchoring activity is contained within **Section 6.2.5**: The following observations are made

There is no evidence of commercial anchoring in close proximity to the cable route and no charted anchorages.

Some anchoring of small commercial vessels (dredgers and general cargo) to the south of Bideford Bay, but well clear of the preferred export cable routes.

There is no evidence of recreational vessel anchoring near to the cable landfalls, given its exposure to prevailing conditions, however, there may be small day boats without AIS. Given adequate protection, it is unlikely that a yacht's anchor would either snag or damage the cable.

The vessel traffic data shows fishing activity along the cable route, but particularly near to the windfarm site and landfalls (within Bideford Bay). Were a fishing vessel to snag the cable, the most likely outcome is loss of gear and potentially minor damage to the cable. A worst credible outcome however is the loss of the fishing vessel as it capsizes, and potential fatalities. Cable burial would mitigate the risk of snagging, and a cable burial risk assessment is recommended to ensure these risks are adequately addressed for the types of gear used within the study area.

Where the export cable is protected by other means, such as rock protection/armouring, this may reduce the depth of water and increase the risk of grounding. The MCA and RYA recommend that any protection should not reduce the depth of water (referenced to Chart Datum) by more than 5%. AIS records vessels within 500m of Saunton Sands and it likely that numerous other small craft including dinghies and jet skis are active in this area. Therefore, cable burial is recommended up until the cable landfalls. Any additional protection at crossings with existing cables are likely to be in relatively deep water and therefore is not anticipated to appreciably impact Under Keel Clearance near to the preferred cable landfalls in Bideford Bay, this includes the approach channel into Bideford. The deepest draught vessels recorded entering the buoyed channel are between 5 and 6 metres, and these navigate the channel on the high tide. Any cable protection in this area should not compromise the access to the harbour.

The laying of the export cable, and any major maintenance, can be disruptive to other navigating vessels, in particular if a safety zone is used around the cable laying vessel. Given the close proximity of the cable route to the approach channel into Bideford, it is important that constant access is available into the harbour for all vessel users. Therefore, coordination of these activities with local harbour users is recommended to try and deconflict these impacts. If required, temporary relocation of the fairway buoy to the south of the cable route and additional aids to navigation could be considered if cable laying or maintenance is prolonged.

8.7 IMPACT TO SEARCH AND RESCUE

In the unlikely event of an incident, SAR assets are required to access the site or surrounding area without risk to themselves. In particular, wind turbines can pose a hazard to SAR helicopters and therefore the design of the windfarm should be such to enable helicopter access and therefore safeguard HM Coastguard obligations to SAR within the UK Search and Rescue Region. An Emergency Response and Cooperation Plan (ERCOP) is required to facilitate information sharing regarding the OWF and SAR organisations. The principals of SAR access for OWFs are contained in MGN654 Annex 5, and can be summarised as:

Lines of Orientation – developers should maintain two lines of orientation unless a safety case is produced, and additional mitigation is proposed, that one line of orientation is tolerable. This allows multiple directions for aircraft entry and improves access, whilst a linear regular grid is both more efficient and safer for conducting SAR.

SAR Lanes – to be of sufficient width to enable safe transit of an SAR helicopter between the turbines. MGN654 Annex 5 recommends turbine spacing (blade tips to blade tips) of greater than 500m.

Helicopter Refuge Areas – in larger developments (>10nm width), a refuge area clear of turbines may be required to enable aircrews to reorientate themselves and change direction safely.

Turbine Preparation – to support winching of a casualty, the WTG needs to be configured to a specific position as requested by the SAR crew. This might include rotating the nacelle to 90 degrees from the wind, and both locking and positioning the blades to facilitate SAR access (e.g. Y configuration - see MGN654 Annex 5).

Several trials have been conducted by HMCG and MCA in SAR at OWFs (see MCA, 2005; 2019). They found that searching within an OWF is more complex than in open sea and there may be a delay for entry into an OWF whilst the crew familiarise themselves with the site and layouts. During poor visibility, the importance of linear SAR lanes of sufficient width was identified as of most importance. When transiting through an OWF, all communications and navigation equipment was reported to be operated successfully with WTGs identifiable through radar. Unfamiliarity with transiting and winching in vicinity of WTGs results in slower speeds and delays which increases fuel consumption and may make searches less effective. Concerns have also been raised regarding visual identification of casualties as WTGs block the view, particularly during rough weather.

The above principles and trials, whilst applicable to the Project, have been conducted on larger OWFs with more turbines. The spacing between turbines is aimed at 1,100 metres and therefore there would be sufficient space for SAR helicopter access through the Project. The project design would also enable surface SAR assets (such as RNLI lifeboats) to safely navigate through the site and between the WTGs. Therefore, the impacts of the Project are considered to be lessened.

The Marine License would typically stipulate that the MMO, in consultation with the MCA and Trinity House, must agree to the design layout in order to ensure that access of SAR assets is not compromised.

8.8 IMPACT ON VISUAL NAVIGATION AND COLLISION AVOIDANCE

MGN 654 notes that an OWF could block or hinder the view of other vessels or any navigational feature such as the coastline or aids to navigation. This may result in “blind spots” between vessels which could increase the risk of collision by reducing the capability for early and effective collision avoidance.

Given the relatively low traffic density near the windfarm site, the small number and diameter of the turbines and the distance to other navigation aids or hazards, this is not considered to have an appreciable impact.

8.9 IMPACT ON COMMUNICATIONS, RADAR AND POSITIONING SYSTEMS

MGN 654 notes that an OWF may have adverse impacts on the equipment used for navigation, collision avoidance or communications. A significant body of work has been conducted to examine these impacts in detail, and reference is made to the following studies:

MCA and QinetiQ (2004). Results of the electromagnetic investigations and assessments of marine radar, communications and positioning systems undertaken at the North Hoyle windfarm by QinetiQ and the Maritime and Coastguard Agency;

BWEA (2007). Investigation of Technical and Operational Effects on Marine Radar Close to Kentish Flats Offshore Windfarm; and

Ocean Studies Board’s Division on Earth and Life Studies (2022). Wind Turbine Generator Impacts to Marine Vessel Radar.

Table 23 provides a summary of these potential impacts, for which there are not anticipated to be any appreciable effects.

Table 23: Summary of impacts on equipment.

Impact on	Overview
Very High Frequency (VHF)	VHF is essential for the communication between vessels and shore. VHF radio waves could be blocked or interfered with by the presence of turbines. The 2004 QinetiQ study found no noticeable effect on VHF communications both ship-shore and ship-ship within or adjacent to the windfarm. A trial aboard SAR helicopters (MCA, 2005) also determined no significant impact on VHF direction finding capabilities. Therefore, no appreciable impact on VHF communications is anticipated.

Impact on	Overview
AIS	AIS enhances the identification between vessels for collision avoidance. AIS signal could be blocked or interfered with by the presence of turbines. The QinetiQ study found no noticeable effect on AIS reception. Therefore, no appreciable impact on AIS communications is anticipated.
Global Navigation Satellite System (GNSS)	GNSS (such as Global Positioning System (GPS)) is used for satellite positioning systems and navigation. Satellite reception could be impacted by the presence of turbines. The QinetiQ study found no noticeable effect on GPS reception, even in very close proximity to the WTGs. Therefore, no appreciable impact on GPS is anticipated.
Marine Radar	Marine radar is used for both collision avoidance and vessel navigation. Wind turbines, like other structures, can result in spurious returns such as side lobes, echoes, reflections and blanketing. These effects were studied extensively in both the QinetiQ (2004) and BWEA (2006) studies. Both studies determined that the reduced capability to track small vessels within OWFs and the risk of losing acquired targets should be considered by mariners navigating adjacent to OWFs. Some of these effects can also be mitigated by careful adjustment of radar controls, such as Gain. Based on this, the MCA developed a shipping route template (MGN654) that placed the extent of these effects at 1.5nm, increasing as the vessels transit closer to the turbines. Intolerable impacts may be experienced up to 0.5nm from the OWF. Historical evidence suggests that most vessels pass more than 0.5nm from an OWF and therefore these effects are lessened. Adjacent to the Project site, the density of traffic is low and there are few other navigational hazards. The relatively few turbines compared to those on which these studies are based may also lessen these impacts. Furthermore, it is likely that the majority of vessels within the central Celtic Sea would have AIS fitted to mitigate some of these impacts. Therefore, no appreciable impact on navigation safety due to impacts on marine radar is anticipated.
Shore Radar	Similar to marine radars, shore radars could be impacted by the wind turbines. The Project is well clear of any ports and harbours, and any VTS coverage. Therefore, no appreciable impact on shore radar for managing navigational safety is anticipated.
Noise	The sound generated by the turbines could mask navigational sound signals from vessels or aids to navigation. Whilst turbines make an audible sound whilst rotating, the low density of shipping and distance to other navigational marks makes this potential impact negligible. Furthermore, maritime regulations for audibility of a ship's whistle are well in excess of the typical WTG sound emissions even at very close range. Therefore, no appreciable impact on navigation safety from increased noise is anticipated.
Compass	Compasses are used for vessel navigation. These are potentially impacted by electromagnetic interference from the WTGs or cables. The degree of this impact is related to the depth of water, cable design and alignment with the earth's magnetic field. Whilst this has impact has not been directly observed in studies, it is possible that small vessel compasses could be impacted near to cable landfall. However, it is considered likely that small craft would navigate visually near to cable landfall and therefore the impact on navigation safety is reduced. Therefore, no appreciable impact on navigation safety from electromagnetic interference is anticipated.

8.10 IMPACT ON UNDER KEEL CLEARANCE OF MOORING SYSTEMS AND POTENTIAL SNAGGING

Floating offshore wind turbines are typically moored to the seabed through a spread of subsurface mooring cables and chains. These moorings, or transmission cabling, can pose a risk to navigating vessels through the reduction in under keel clearance or snagging of anchors or fishing gear.

The project design envelope (see **Section 4**) notes that the engineering specifications of the specific mooring system has not been determined at the time of the NRA. Therefore, an approximate spread of 600m radius moorings from each WTG has been assumed, as per industry precedent. Two principal methods of moorings exist, firstly a steel catenary that descends sharply from the substructure before spreading along the seabed in a less sharp manner. Secondly, the use of buoyancy modules on the moorings or cabling within the water column. In both cases, a risk of snagging or contacting the moorings exists.

Analysis of vessel draughts within the windfarm site is shown in **Figure 39** and demonstrates that the majority of vessels (where the draught is known) are less than 10m in draught. Whilst the catenary of the moorings is not known at this stage, it is likely that as distance from the WTG increases, the moorings become exponentially closer to the seabed. Therefore, the risk to under keel clearance would be experienced where deep draught vessels navigate within close proximity to the WTGs. Given that the worst case mooring spread of 1.2km is considerably less than the MGN372 2nm recommended passing distance from an OWF, it is considered that the risk of a deep draught vessel contacting the moorings is remote and would be likely to contact the WTG in the same event. These assumptions will require confirmation following further design iterations of the Project.

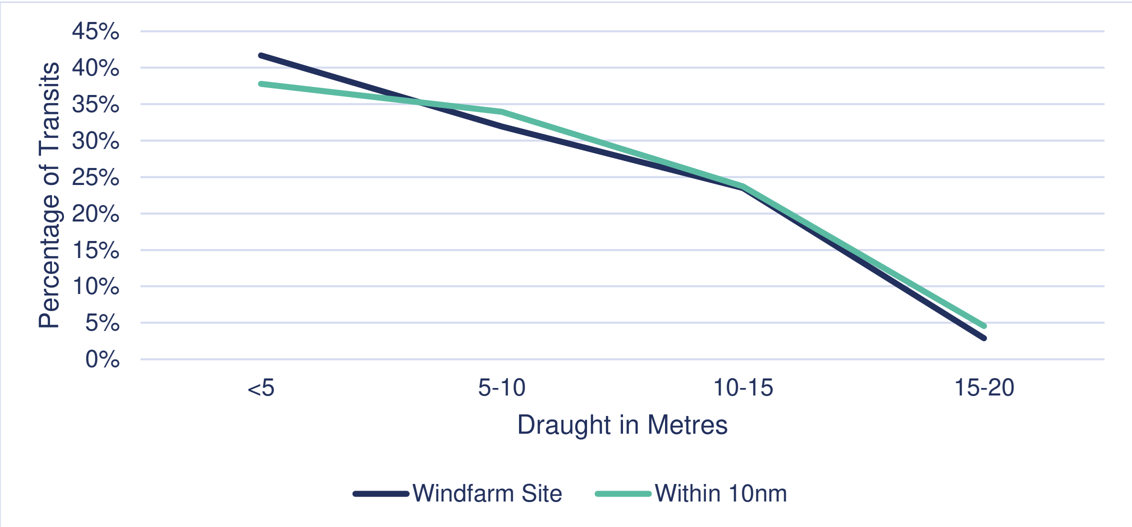


Figure 39: Vessel counts through Windfarm Site and within 10nm of Windfarm Site by draught.

A second hazard relates to snagging fishing gear on the moorings or cables, this was raised by consultees and is pertinent given known fishing activities within the Celtic Sea. Snagging of underwater obstructions can lead to gear loss but has resulted in capsize and loss of life aboard fishing vessels within the UK. Consultation determined that fishermen would likely self-exclude themselves from a floating OWF in order to mitigate any risk, albeit this would result in a loss of potential fishing grounds. Therefore, fishermen will seek to maintain a safe distance from the moorings, although this is more challenging than the WTGs themselves, given the lack of any surface marking of their extent. Therefore, it is considered a reasonably credible hazard that fishing gear could become entangled in the subsurface project infrastructure.

Finally, it was noted that floating OWFs are routinely constructed in two phases. The seabed is prepared, and the moorings are installed, before the WTGs themselves are towed and installed at the site. Therefore, it is feasible that there may be a period of time during which the moorings are in place without the surface infrastructure, during which time the risks of snagging are greatly increased, as the potential risks are less conspicuous and rely on receiving Notice to Mariners or other warnings of the site status. During this time, specific risk controls should be considered to mitigate this risk, such as temporary buoyage or a guard vessel.

8.11 IMPACT OF TURBINE BREAKOUT ON VESSEL SAFETY

Were the moorings to partially or completely fail, and the turbine become displaced from position or break free, it could become a navigational hazard to other vessels. The mooring systems are designed to resist extreme conditions such as a 50-year return period event.

The moorings will be subject to the requirement of the Regulatory expectations on moorings for floating wind and marine devices (HSE/MCA, 2017). These requirements mandate that the installation will be subject to the Construction (Design and Maintenance) Regulations 2015 which requires risks to be managed by the application of the principles of prevention. It also imposes the need for inspection and monitoring of the moorings during the operational phase.

Were the turbines to breakout, they will still be marked and visible to other navigating vessels and a response plan will be included within the ERCOP with additional measures such as failure warning measures and tracking devices as well as response and recovery procedures. These measures will assist other navigating vessels to identify and avoid the hazard. Given the relatively low density of traffic, low likelihood of breakout and continued visibility of the WTG were it to breakout, the risk of collision is therefore considered very low.

8.12 CUMULATIVE EFFECTS

The Celtic Sea and Bristol Channel is an area of interest for the Crown Estate and offshore developers and therefore numerous proposals for OWFs are being considered. To understand the cumulative impacts of the Project in combination with multiple developments (**Section 7.5),** this section reviews the impacts on vessel routeing, collision and contact. Only projects which have submitted Scoping have been included within this cumulative assessment. This is in accordance with the Planning Inspectorate Advice Note Seventeen “Cumulative effects assessment relevant to nationally significant infrastructure projects”.

Figure 40 presents the anticipated impacts on vessel routeing as a result of the Project in combination with other notable OWFs which have made Scoping submissions. The combination of Erebus, Llyr 1/2 and Valorous may have potentially significant impacts on vessel access into Milford Haven from the south-west. The layouts of these aforementioned projects, as shown, do not have sufficient corridors between them for the size of vessels bound for Milford Haven terminals, (see **Figure 40).** It is assumed that tankers departing Lands End would route to the west of Valorous and Erebus before turning east into Milford Haven. Milford

Haven Port Authority have raised concerns regarding the combination of these impacts to vessel access and loitering offshore for arriving tankers.

The addition of the cumulative projects would therefore deviate traffic away from the Project:

This would reduce the risk of allision as fewer tankers would be navigating to the west of the site; and

The risk of collision may increase to the west of the Welsh projects, as vessel traffic into Milford Haven is concentrated adjacent to the principal route between the Off Smalls TSS and Lands End.

It is notable that each of these impacts would exist with or without the Project in situ, and therefore the contribution of the Project to the cumulative impacts is not considered appreciable.

Figure 41 shows the intensity of fishing activity in the Celtic Sea, with identified cumulative projects. Fisheries consultees raised concerns that future proposed projects would, in combination, greatly limit fishing grounds given their likely floating nature. Therefore, fishing vessels would be offset into corridors between the OWFs used by other vessel types and increase the risk of collision. These concerns were detailed in the National Federation of Fishermen's Organisation (NFFO) and Scottish Fishermen's Federation (SFF) report "Spatial Squeeze in Fisheries" (NFFO and SFF, 2022). Given the small scale of the Project, its relative contribution to the cumulative impact is not considered appreciable.

Furthermore, **Figure 42** shows a similar outlook for recreational cruising. The RYA and MCA have detailed similar concerns, as relate to offshore cruising routes. Given the routes identified in **Section 6.2.2.4**, which pass from Lands End to Milford Haven and Padstow to Milford Haven, the presence of Llyr 1/2, Valorous and Pembroke Demonstrator Zone in particular would reduce access and create narrow corridors between these developments, which might increase risk. Given the small scale of the Project, and its orientation north-south, its relative contribution to the cumulative impact is not considered appreciable.

The principal impacts on communication and navigation equipment from a OWF are related to radar, but limited to within 1.5nm. Most vessels would route at least 1nm from an OWF for safety and mitigating the greatest effects on radar. The presence of multiple projects in close proximity might make this impossible as vessels can't maintain this separation. Given that all cumulative projects are at least 10nm away, this would not occur and so any cumulative impact on radar would be negligible. Similarly any potential cumulative effects to SAR response is considered to be negligible given the distances between projects.

During consultation, all consultees raised concerns about the cumulative impacts when declared projects (Tier 3 without scoping chapters), were taken into account. This is partly the result of the Crown Estate announcement in July 2022 of the Celtic Sea Areas of Search. The significance of these impacts and increases in navigational risk cannot be fully assessed for Tier 3 Celtic Sea projects and the Crown Estate Areas of Search due to the uncertainty around the locations and scale of the developments. Particularly due to the large scale of the declared area required to the necessary footprint to support the proposed project sizes. Therefore, the above section has only qualitatively addressed these potential future impacts. However, future projects should ensure that their respective NRAs address the tolerability of such impacts, accounting for additional details as they become available.

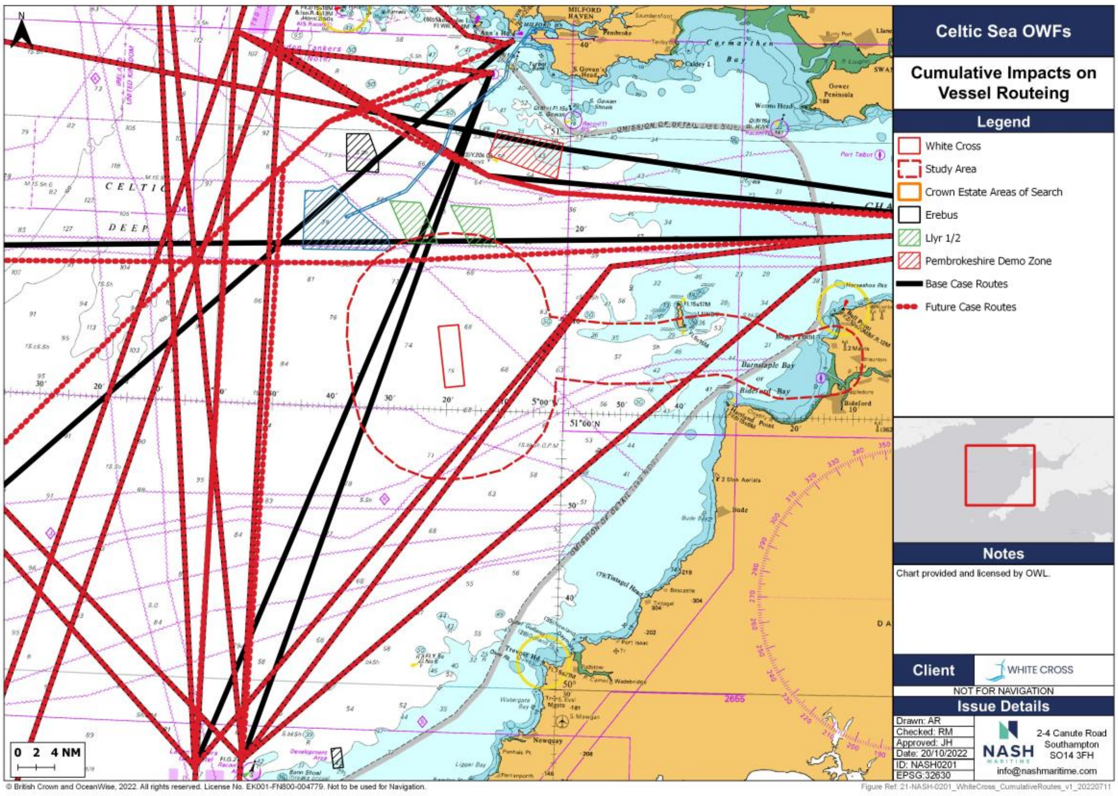


Figure 40: Impact on vessel routeing from the Project and scoping boundaries of cumulative projects.

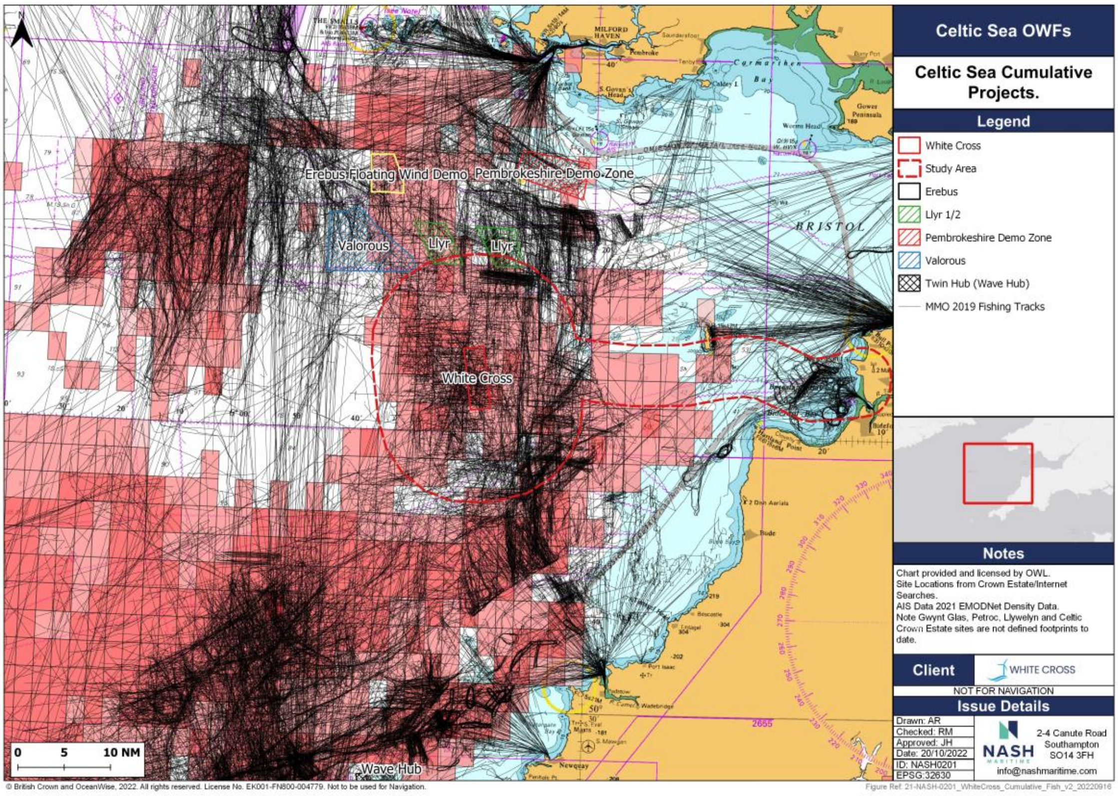


Figure 41: Fishing activity and cumulative projects.

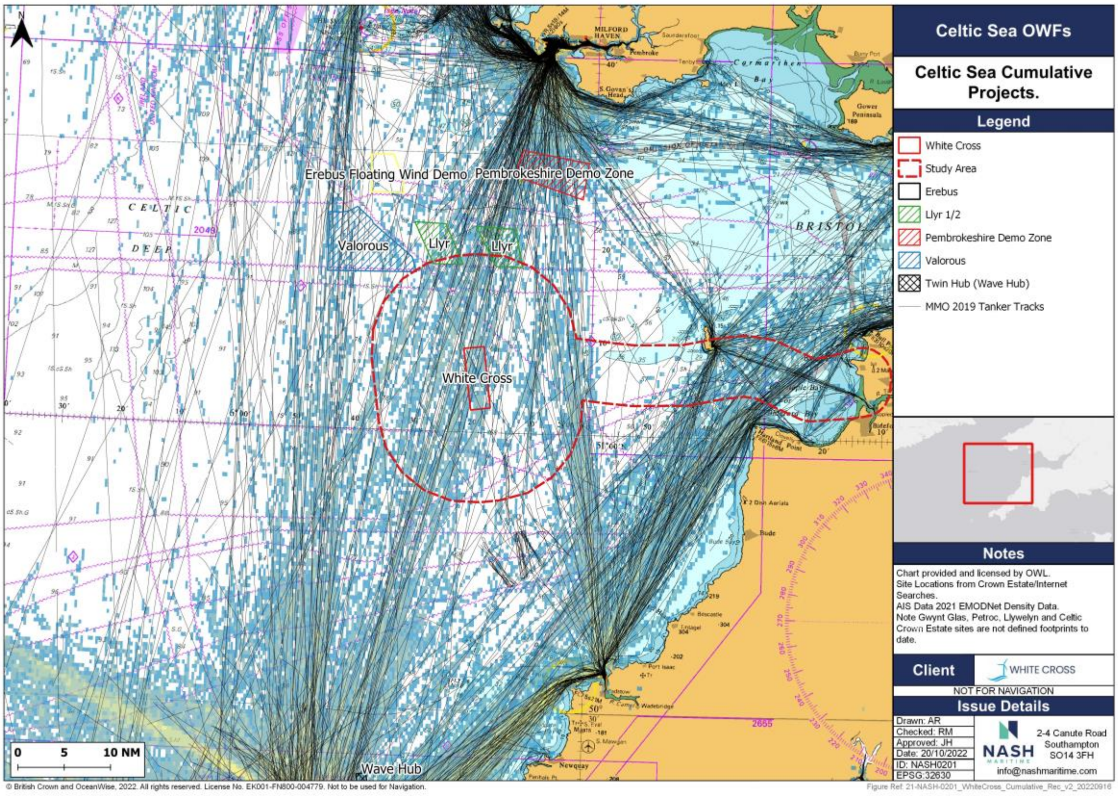


Figure 42: Recreational activity and cumulative projects.

9. NAVIGATIONAL RISK ASSESSMENT

The NRA has been produced in accordance with MGN654 and follows the IMO's FSA (see **Section 2.2**).

9.1 HAZARD IDENTIFICATION

This assessment considers all identified hazards of the Project on shipping and navigation receptors. In developing the hazard log, consideration was given to project phases, areas, hazard types and vessel types.

Three phases were considered, construction (C), operation and maintenance (O), and decommissioning (D). To be concise, and reflect similar impacts during construction and decommissioning, these two categories were combined in all cases. Similarly, given the small scale nature of the works and project, several hazards were deemed to have similar risk scores irrespective of their project phase.

Three areas were identified:

Area 1: Windfarm site, within 10nm.

Area 2: Export cable corridor, within 3nm.

Area 3: The route to/from the O&M base.

Five hazard types were identified:

Collision between two navigating vessels.

Allision/contact between a navigating vessel and surface infrastructure.

Grounding of a navigating vessel on the seabed.

Snagging of fishing gear or anchors on subsurface infrastructure (moorings/cables).

Breakout of WTG from moorings.

Seven vessel types were identified, which are described in **Table 24**. Given the exponential combinations of vessel types in collisions, the hazard log has grouped these hazard types into large or small vessels, to reflect the broadly similar consequences that could be expected following an incident, whilst maintaining a manageable number of hazards.

Table 24: Vessel type definitions.

Vessel #	Vessel Types / Receptors	Includes	Collision Refined Vessel Types
1	Commercial vessels	Cargo (Container, Bulk, Reefer, General etc.) Tugs Offshore Supply Ships Dredgers	Large Vessels
2	Passenger vessels	Passenger Ferry Freight Ferry Cruise Ship	Large Vessels

Vessel #	Vessel Types / Receptors	Includes	Collision Refined Vessel Types
3	Tankers	Tanker (Oil, Chemical etc.)	Large Vessels
4	Fishing	Trawlers Fishing Boats	Small Vessels
5	Recreational	Yachts Pleasure Boats	Small Vessels
6	OWF Construction Vessels	Crew Transfer Vessels Other Small Project Craft Construction Vessels	Large Vessels
7	OWF Service Vessels	Crew Transfer Vessels Other Small Project Craft	Small Vessels

In total, 22 hazards were identified which are summarised in **Table 25**.

Table 25: Hazard identification.

Hazard Id #:	Phase (C/O/D)	Area	Hazard Type	Hazard Title
1	C/O/D	1	Collision	Collision of Large Vessels with Large Vessels
2	C/O/D	1	Collision	Collision of Large Vessels with Small Vessels
3	C/O/D	1	Collision	Collision of Small Vessels with Small Vessels
4	C/O/D	1	Allision in situ	Allision in situ of Commercial vessels with WTGs
5	C/O/D	1	Allision in situ	Allision in situ of Tankers with WTGs
6	C/O/D	1	Allision in situ	Allision in situ of Fishing Vessels with WTGs
7	C/O/D	1	Allision in situ	Allision in situ of Recreational Vessels with WTGs
8	C/D	1	Allision in situ	Allision in situ of OWF Construction Vessels with Project Infrastructure
9	O	1	Allision in situ	Allision in situ of OWF Service Vessels with Project Infrastructure
10	C/O/D	1	Allision in situ	Allision in situ of Passenger Vessels with WTGs
11	C/O/D	2	Snagging Cable	Snagging Cable by large vessels
12	C/O/D	2	Snagging Cable	Snagging Cable by Fishing Vessels
13	C/O/D	1	Snagging moorings	Fishing Vessels Snagging WTG Moorings
14	C/O/D	2	Grounding	Grounding of Fishing Vessels on Cable Route
15	C/O/D	2	Grounding	Grounding of Recreational Vessels on Cable Route
16	C/O/D	1	Breakout	Breakout of Turbine Posing Hazard to Other Vessels
17	C/D	2	Collision	Collision of Large Vessels with Large Vessels during Cable Installation

Hazard Id #:	Phase (C/O/D)	Area	Hazard Type	Hazard Title
18	C/D	2	Collision	Collision of Large Vessels with Small Vessels during Cable Installation
19	C/D	2	Collision	Collision of Small Vessels with Small Vessels during Cable Installation
20	C/O/D	3	Collision	Project Vessel in Collision during Transit/In O&M Base
21	C/O/D	3	Allision	Project Vessel in Allision during Transit/In O&M Base
22	C/O/D	3	Grounding	Project Vessel in Grounding during Transit/In O&M Base

9.2 METHODOLOGY

Having identified all relevant impacts and hazards as a result of the Project, a hazard log is constructed as described in MGN654 Annex 1 (Annex D). Whilst there is no generally accepted standard for risk matrices, the following is proposed as suitable for the Project and is consistent with industry best practice. The matrix was also discussed with stakeholders during the hazard workshop and revised to reflect their feedback. Each hazard is scored based on its predicted frequency of occurrence (**Table 26**) and consequence (**Table 27**). Each hazard is scored on frequency of occurrence and severity of consequence for two scenarios, the 'most likely' and 'worst credible'. Severity of consequence with each hazard under both scenarios is considered in terms of damage to:

People

Property

Environment

Business

The combination of the frequency and consequence scores for each scenario are then combined to produce an overall risk score, which is used to assign hazard risk rating in the Project risk matrix (**Figure 43**). The tolerability of these risks with regards to significance and acceptability with or without further action are shown in **Table 28**.

Table 26: Frequency of occurrence criteria.

Rank	Definition	Description	Definition
1	Remote	Remote probability of occurrence at project site and few examples in wider industry.	<1 occurrence per 1,000 years
2	Extremely Unlikely	Extremely unlikely to occur at project site and has rarely occurred in wider industry.	1 per 100 – 1,000 years
3	Unlikely	Unlikely to occur at project site during project lifecycle and has occurred at other OWFs.	1 per 10 – 100 years
4	Reasonably Probable	May occur once or more during OWF lifecycle.	1 per 1 – 10 years

5	Frequent	Likely to occur multiple times during OWF lifecycle.	Yearly

Table 27: Severity of consequence categories and criteria.

Rank	Description	People	Property	Environment	Business
1	Negligible	Minor injuries	No Perceptible Impact or less than £10,000	No Perceptible Impact	Minimal impact on activities.
2	Minor	Multiple minor injuries	£10,000-£100,000	Tier 1 Local assistance required	Local negative publicity. Short term loss of revenue to port/OWF. Temporary interruption of commercial services.
3	Moderate	Multiple major injuries	£100,000-£1million	Tier 2 Limited external assistance required	Widespread negative publicity. Temporary suspension of activities at port/OWF. Short term interruption of commercial services.
4	Serious	Single fatality	£1million-£10million	Tier 2 Regional assistance required	National negative publicity. Prolonged closure or restrictions to port/OWF. Long term interruption of commercial services.
5	Major	Multiple fatalities	>£10million	Tier 3 National assistance required	International negative publicity. Serious disruption to operations to port/OWF. Permanent interruption of commercial services.

Risk Matrix							
Severity of consequence	Major	5	5	10	15	20	25
	Serious	4	4	8	12	16	20
	Moderate	3	3	6	9	12	15
	Minor	2	2	4	6	8	10
	Negligible	1	1	2	3	4	5
			1	2	3	4	5
			Remote	Extremely unlikely	Unlikely	Reasonably probable	Frequent
			Frequency of Occurrence				

Figure 43: Risk matrix.

Table 28: Tolerability and risk ratings.

Hazard Scores	Acceptability	Description
Negligible Risk (1.0-3.99)	Broadly Acceptable	Generally regarded as not significant and adequately mitigated. Additional risk reduction should be implemented if reasonably practicable and proportionate
Low Risk (4.0-8.99)		
Medium Risk (9.0-14.99)	Tolerable if ALARP	Generally regarded as within a zone where the risk may be tolerable in consideration of the Project. Requirement to properly assess risks, regularly review and implement risk controls to maintain risks to within ALARP where possible.
High Risk (15.0-19.99)	Unacceptable	Generally regarded as significant and unacceptable for project to proceed without further review.
Extreme Risk (20.0-25.0)		

9.3 DESIGNED IN RISK CONTROL MITIGATION

Table 29 describes industry standard risk controls that are considered embedded in the risk assessment process rather than additional requirements.

Table 29: Embedded risk controls.

ID	Title	Description	Risks Mitigated	Requirement
Promulgation and Awareness (PROM)				
PROM1	Notice to Mariners	To ensure that the appropriate authorities are informed of works being carried out in waters adjacent to the Projects. To include: -UKHO -MCA -Kingfisher -Trinity House -RYA -Local Ports and Harbours -Oil and Gas operators -MMO	All direct impacts of project.	Typical License Condition
PROM2	Site Marking and Charting	Site is marked on nautical charts including an appropriate chart note.	All direct impacts of project.	Typical License Condition
PROM3	Safety Zone	Application and use of safety zones of up to 500m from platform edge (at sea level) during construction/major maintenance and decommissioning phases. Safety zones shall be of appropriate configuration, extent and application to specified vessels of identified primary risk of sub-sea equipment to fishing and snagging hazard.	Risk of allision with structures.	Application under Electricity Regulations 2007
PROM4	Fisheries Liaison and Coexistence Plan	Provision of detailed project information to fishermen, such as site and export cable route location for upload into fish plotters	Fishing hazards, including snagging of cables.	Typical License condition
Emergency Response (EMER)				
EMER1	ERCOP	Emergency Response Co-Operation Plan with agreement of MCA.	Reduction of consequences of incidents.	Typical License condition

ID	Title	Description	Risks Mitigated	Requirement
EMER2	Marine Pollution Contingency Plan	Measures will be adopted to ensure that the potential for release of pollutants from construction and operation and maintenance activities is minimised, which will include planning for accidental spills and responding to all potential contaminant releases.	Reduction of consequences of incidents.	Typical License Condition
EMER3	Periodic Exercises	Periodic emergency management and response exercises will be run by developer, ran in conjunction with CGOC/SAR.	Reduction of consequences of incidents.	Industry best practice
EMER4	Incident Investigation and Reporting	There are statutory incident reporting requirements and expectations: -MAIB (Merchant Shipping Act) -HSE (RIDDOR) -Harbour Authority under Port Marine Safety Code Risk assessments to be reviewed following incidents, and additional risk controls identified if appropriate.	Reduction of likelihood of incident reoccurrence.	Industry best practice
Site Design (DES)				
DES1	Aids to Navigation	Suitable AtoN lighting and marking the OWF site shall be undertaken complying with IALA Recommendations G1162 (IALA, 2021), to be finalised and approved in consultation with MCA and Trinity House through an Aids to Navigation Management Plan. Fog horns to alert vessels to the position of structures when visibility is poor. Note planned update to O-139 to include painting reference from waterline (not HAT). WTG informal naming/associated markings shall not interfere with formal AtoN's. AIS transponders to be placed on periphery corner WTG's	Risk of allision with structures.	Typical License Condition

ID	Title	Description	Risks Mitigated	Requirement
DES2	Buoyed Construction Area	Buoys deployed around construction work in windfarm site in line with Trinity House requirements and may include a combination of cardinal and/or safe water marks. To be finalised and approved in consultation with MCA and Trinity House through an AtoN Management Plan.	Risk of allision with structures or collision with construction vessels.	Typical License Condition
DES3	Hydrographic Surveys	MGN 654 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 and the UKHO. Further information can be found in MGN 654 Annex 4 supporting document titled 'Hydrographic Guidelines for Offshore Developers', available on website.	Risk of grounding or snagging of cables.	Typical License condition
DES4	Cable Burial Risk Assessment and periodic validation surveys	CBRA to be undertaken pre-construction, including consideration of under keel clearance. All subsea cables will be either fully buried (where ground conditions permit and burial tool performance allows), partially buried (buried but not to target depth) with rock protection, or surface laid with rock protection. Selected methods will be based on the risk assessment and the protection will be periodically monitored and maintained as practicable. No more than 5% reduction in water depth (referenced to Chart Datum) will occur at any point on the cable route without prior written approval from the Licensing Authority.	Risk of grounding or snagging of cables.	Typical License Condition
DES5	Air Draught Clearance	Wind turbine blades will have at least 22 m clearance above MHWS.	Risk of allision/contact with structures.	Typical License Condition / MGN654 Recommendation

ID	Title	Description	Risks Mitigated	Requirement
DES6	Layout Plan and Lines of Orientation	WTG layout plan to be agreed with MCA and Trinity House prior to construction and either maintain two lines of orientation or propose a suitable layout that is acceptable to the MCA/Trinity House.	Risk of allision/contact with structures and ensuring access for SAR.	Typical License condition
DES7	Electromagnetic interference minimisation	A Cable Specification and Installation Plan will be prepared as part of the Code of Construction Practice. This will include the technical specification of offshore electrical circuits, and a desk-based assessment of attenuation of electro-magnetic field strengths, shielding and cable burial depth in accordance with industry good practice.	Impact on navigation and communications equipment.	Industry best practice
DES8	Construction/Decommissioning Method Statement and Programme	Construction/Decommissioning programme and plan to be submitted to MCA and Trinity House for consultation. Where possible, construction and decommissioning to follow linear progression avoiding disparate construction sites across development area. Coordination with local ports and harbours during cable laying/removal.	Risk of allision with structures or collision with construction vessels.	Typical License condition
DES9	Moorings Design	Adherence with HSE/MCA guidance "Regulatory expectations on moorings for floating wind and marine devices".	Breakout	Industry best practice
Operational Management (OPS)				
OPS1	Marine Operating Guidelines	Project vessels during construction and co-ordination during O&M to ensure project vessels to not present unacceptable risks to each other or third parties. Project marine traffic coordination plans to be made available to all maritime users. Information and warnings will be distributed via Notices to Mariners and other appropriate media (e.g. Admiralty Charts and fishermen's awareness charts) to enable vessels and operators to effectively and safely navigate around the windfarm site and	Risk of allision with structures or collision with vessels.	Typical License condition

ID	Title	Description	Risks Mitigated	Requirement
		activities during the offshore cable corridor construction.		
OPS2	Vessel Standards	All work vessels operating on behalf of projects: -MCA Vessel Coding (e.g. small commercial vessel). -Appropriate Insurance. -Crewed by suitably trained/qualified personnel. -AIS (Class A/B). -VHF (Ch16). -Mooring Arrangements.	Risk of allision with structures or collision with vessels.	Industry best practice
OPS3	Personal Protective Equipment (PPE)	All personnel will wear the correct PPE suitable for the location and role at all times, as defined by the relevant Quality, Health, Safety and Environment (QHSE) documentation. This will include the use of Personal Locator Beacons (PLB's).	Minimising risk of loss of life.	Industry best practice
OPS4	Guard Vessels	Provision of guard vessel in vicinity of windfarm site during construction or major maintenance to monitor 3rd party vessel traffic and intervene with warnings as necessary.	Risk of allision with structures or collision with construction vessels.	MGN654 recommendation.
OPS5	Inspection and Maintenance Programme	Regular maintenance regime by developer to check the Project infrastructure, its fittings and any signs of wear and tear. This should identify any failings which might result in a failure.	Minimising risk of project asset failure.	Industry best practice
OPS6	Training	Developers are responsible for ensuring that all staff engaged on operations are competent to carry out the allocated work.	Minimising risk of loss of life.	Industry best practice
OPS7	Compliance with International, UK and Flag State Regulations inc. IMO conventions	Compliance from all vessels associated with the proposed project with international maritime regulations as adopted by the relevant flag state (e.g. COLREGS and SOLAS)	Risk of allision with structures or collision with vessels.	Industry best practice
OPS8	Vessel health and safety requirements	As industry standard mitigation, the Applicant will ensure that all project related vessels meet both IMO conventions for safe operation as well as HSE	Minimising risk of loss of life.	Industry best practice

ID	Title	Description	Risks Mitigated	Requirement
		requirements, where applicable. This shall include the following good practice: • Windfarm associated vessels will comply with International Maritime Regulations; • All vessels, regardless of size, will be required to carry AIS equipment on board; • All vessels engaged in activities will comply with relevant regulations for their size and class of operation and will be assessed on whether they are "fit for purpose" for activities they are required to carry out; and • All marine operations will be governed by operational limits, tidal conditions, weather conditions and vessel traffic information. • Walk to work solutions will be utilised.		
Site Monitoring (MON)				
MON1	Continuous Watch	Continuous watch by multi-channel VHF, including Digital Selective Calling (DSC).	Responding to incidents swiftly.	MGN654 Recommendations

9.4 HAZARD SCORING

The identified hazards were assessed by the project team and a hazard log was prepared. The hazard log was then refined at three hazard workshops for which stakeholders (identified in **Section 3.3.1)** were invited to attend:

Fisheries hazard workshop – 28-Jul-2022. Attended by representatives from North Devon Fishermen's Association and Cornish Fish Producer's Organisation.

Regulatory/commercial hazard workshop – 04-Aug-2022. Attended by Maritime and Coastguard Agency, Trinity House, Chamber of Shipping and Milford Haven Port Authority.

Cable landfalls hazard workshop – 11-Aug-2022. Attended by harbour master of Bideford.

9.5 RESULTS

Table 30 lists the 22 identified hazards and is ranked by the overall risk score. Three hazards have been scored as "Medium Risk – Tolerable if ALARP", 18 hazards have been scored "Low Risk – Broadly Acceptable" and one hazard has been scored Negligible Risk.

The highest scoring hazard, at 9.6, is the risk of allision between a project vessel and the WTGs/associated infrastructure. The nature of these operations necessarily requires approach to, and transit adjacent to, these structures and therefore these vessels are potentially most likely to come into contact. There have been several examples within the UK were such incidents have occurred (see **Section 6.3.2**), however they typically resulted in some minor injuries and damage. Fatalities and the loss of the vessel in such a situation are a feasible outcome, but it is considered unlikely during the Project lifecycle. This risk can be managed through adherence to industry best practice vessel standards, marine operating guidelines and training abord project vessels.

Both the second and third highest scoring hazards, at 9.4 and 9.2 respectively, relate to a fishing vessel either contacting the WTGs or snagging the WTG moorings. The analysis and consultation conducted to support this NRA identified that both static and mobile gear fishing takes place in close proximity to the windfarm site, (see **Section 6.2.2.5**). Through mechanical failure or human error, fishing boats could strike the WTGs and whilst fatalities and rapid sinking of the fishing vessel are possible, minor injuries and damage to the fishing vessel are more likely. Furthermore, whilst there is uncertainty around the specific mooring arrangements to be used by the Project, an approximate spread of 600m moorings pose a hazard of snagging to fishing boats working grounds immediately adjacent to the site (see **Section 8.10**). Snagging gear has resulted in capsize and loss of life for fishing boats historically in the UK and therefore the potential consequences have been scored highly. In both cases, promulgation of the mooring arrangements directly to fishermen and marking on charts should provide sufficient warning to enable fishermen to avoid either of these hazards. During construction of the windfarm, when subsurface moorings may have been installed prior to tow out of the WTGs, specific risk controls should be implemented (such as buoyage or guard vessels) given the greater potential for snagging.

Allisions involving other vessel types were also assessed. The propensity for tankers to loiter near the windfarm site (see **Section 6.2.5**) and the proximity of the route between Milford Haven and Lands' End (see **Section 6.2.4**), resulted in a relatively higher risk of contact for tankers, at 8.4, but within the Low Risk – Broadly Acceptable category. Whilst the potential consequences are high, with the potential for major pollution and damage, there is considered to be sufficient searoom to the north and west to enable these activities to continue at a safe distance. Commercial vessel allisions, scored at 5.8, carries less potential for pollution as a result of an incident, and the lower exposure of cargo vessels as compared to tankers has resulted in a lower likelihood score. Construction vessel allision, at 7.3, is considered to occur at relatively slow speeds and will have a short-term duration. Recreational craft allision, scored at 6.4, is less likely due to the relatively few yachts which cross the Celtic Sea (approximately two per day during summer see **Section 6.2.2.4**), but has the potential to result in injuries and loss of life. This risk is partly mitigated by the specification of minimum air draught from MHWS that ensures blade clearance over yacht masts. Whilst the achievable air draught may be reduced in extreme weather conditions, during which time the turbine will move, it is highly unlikely that yachts would choose to sail in such conditions and would likely give a wider safe passing distance in accordance with good seamanship. Finally, passenger vessels carry a high potential for loss of life but has not been scored highly at 4.8 given the low vessel numbers within the study area (see **Section 6.2.2.3**). In all cases the turbines will be well lit and well-marked to ensure that bridge teams can effectively plan passages clear of the site.

Collisions can occur as a result of the Project displacing vessel traffic and creating choke points or corridors that increase vessel encounters. The considerable searoom available to vessels within the central Celtic Sea to enable safe passage planning around the Project would suggest that the increase in likelihood following the Project would not be appreciably different for all vessel types (see **Section 8.5**). Collisions involving small craft such as fishing and recreational craft are typically more frequent than for larger commercial vessels, albeit they carry a higher potential consequence. All collision hazards have been assessed as 7.2 or below and therefore are Low Risk – Broadly Acceptable.

The export cable route and landfall carries some additional hazards. Snagging of the cable by commercial vessels is unlikely given the low anchoring frequency (see **Section 6.2.5**) and due to the low consequence to the vessel, has been given a low risk score at 4.1. Due to the propensity for trawling near to the cable landfalls, and along the cable corridor, snagging of fishing gear is considered more likely, and carries a greater potential for capsize and loss of life and has therefore been scored 7.4. As the water depths become shallower immediately adjacent to landfall, any cable protection that compromises Under Keel Clearance could increase the risk of grounding. Analysis and consultation suggested that very few vessels would navigate near to Saunton Sands as it is an exposed lee shore. Scores for fishing and recreational grounding are given 3.7 and 5.3 respectively.

Details on the O&M activities for the Project are not fully developed, but the additional movements of crew transfer or maintenance vessels carries some additional inherent risk. The risks of grounding, allision and collision of these movements have been assessed as Low Risk – Broadly Acceptable. Whilst industry best practice should be followed and these movements can be managed, additional assessment should be considered to ensure that the O&M base and passage plan is compatible with safe navigation.

Finally, breakout of the turbine is not considered likely due to the mooring design specifications to withstand a 1 in 50 year metocean event (see **Section 8.11**). Were the turbine to breakout, it would be highly unlikely to strike another vessel due to the low vessel traffic density and its size, consequently a score of 5.4 is assigned.

Table 30: Ranked hazard list.

Hazard ID	Hazard Rank	Hazard title	Phase (C/O/D)	Area	Overall Risk Score	Overall Risk Rating
9	1	Allision in situ of OWF Service Vessels with Project Infrastructure	O	1	9.6	Medium Risk - Tolerable (if ALARP)
6	2	Allision in situ of Fishing Vessels with WTGs	C/O/D	1	9.4	Medium Risk - Tolerable (if ALARP)
13	3	Fishing Vessels Snagging WTG Moorings	C/O/D	1	9.2	Medium Risk - Tolerable (if ALARP)
5	4	Allision in situ of Tankers with WTGs	C/O/D	1	8.4	Low Risk - Broadly Acceptable
21	5	Project Vessel in Allision during Transit/In O&M Base	C/O/D	3	7.5	Low Risk - Broadly Acceptable
12	6	Snagging Cable of Fishing Vessels	C/O/D	2	7.4	Low Risk - Broadly Acceptable
8	7	Allision in situ of OWF Construction Vessels with Project Infrastructure	C/D	1	7.3	Low Risk - Broadly Acceptable
20	8	Project Vessel in Collision during Transit/In O&M Base	C/O/D	3	7.2	Low Risk - Broadly Acceptable
3	9	Collision of Small Vessels with Small Vessels	C/O/D	1	7.1	Low Risk - Broadly Acceptable
7	10	Allision in situ of Recreational Vessels with WTGs	C/O/D	1	6.4	Low Risk - Broadly Acceptable
22	11	Project Vessel in Grounding during Transit/In O&M Base	C/O/D	3	6.4	Low Risk - Broadly Acceptable
19	12	Collision of Small Vessels with Small Vessels during Cable Installation	C/D	2	6.3	Low Risk - Broadly Acceptable
4	13	Allision in situ of Commercial vessels with WTGs	C/O/D	1	5.8	Low Risk - Broadly Acceptable
16	14	Breakout of Turbine Posing Hazard to Other Vessels	C/O/D	1	5.4	Low Risk - Broadly Acceptable
15	15	Grounding of Recreational Vessels on Cable Route	C/O/D	2	5.3	Low Risk - Broadly Acceptable
1	16	Collision of Large Vessels with Large Vessels	C/O/D	1	5.1	Low Risk - Broadly Acceptable
2	17	Collision of Large Vessels with Small Vessels	C/O/D	1	5.1	Low Risk - Broadly Acceptable
10	18	Allision in situ of Passenger Vessels with WTGs	C/O/D	1	4.8	Low Risk - Broadly Acceptable

Hazard ID	Hazard Rank	Hazard title	Phase (C/O/D)	Area	Overall Risk Score	Overall Risk Rating
17	19	Collision of Large Vessels with Large Vessels during Cable Installation	C/D	2	4.3	Low Risk - Broadly Acceptable
18	20	Collision of Large Vessels with Small Vessels during Cable Installation	C/D	2	4.1	Low Risk - Broadly Acceptable
11	21	Snagging Cable of large vessels	C/O/D	2	4.1	Low Risk - Broadly Acceptable
14	22	Grounding of Fishing Vessels on Cable Route	C/O/D	2	3.7	Negligible Risk - Broadly Acceptable

9.6 ADDITIONAL RISK CONTROL MITIGATION

9.6.1 Operational Safety Zones

Section 104 of the Energy Act 2004 enables developers to apply for a safety zone to be established for any phase in the life of an OREI. These can be made to protect safety of people, protect the installation against damage and prevent loss of gear. In practice, it is common for applications to be made for OWF safety zones during construction, decommissioning and/or major maintenance activities (DECC, 2011).

The regulations provide for safety zones of 50 metres during the operational phase of an OREIs life. Operational safety zones are not considered necessary for conventional fixed WTGs. Floating OWFs (Erebus, Kincardine and Blyth) have each considered the potential benefits of operational safety zones, however, none have proposed to apply for them. The reasoned basis is that:

The subsurface infrastructure extends more than 50 metres from the platform and would therefore be ineffective against snagging risks.

Whilst the excursion of a floating turbine may be up to 50m due to wind and waves, the risk of allision/contact is not reduced given the far greater distances at which vessels are predicted to pass.

Other risk controls, such as promulgation, lighting and charting are considered to be more effective at mitigating such risks.

Given the small scale of the Project and consideration of the aforementioned reasoning for exclusion, this risk control has not been recommended for the Project.

9.6.2 Buoyage

Whilst temporary buoyage during construction has been identified as a suitable risk control during the NRA, several consultees identified the potential permanent usage of buoyage for the Project. Permanent buoyage, particularly located around the limits of the mooring infrastructure, would provide additional warning to vessels not to approach close, and would reduce the risk of snagging in particular.

Practical challenges were identified during consultation relating to the successfully marking of the site with buoyage. It was noted that the wind turbines would be more conspicuous for passing traffic than the buoyage would be, and likely be more reliable with a greater uptime. In addition, a large number of buoys may be required to mark the whole site, and consideration of their light phasing given to deconflict with the wind turbines themselves. The buoys would need to be regularly moved, or removed, where turbines were taken from the site for major maintenance, which would be difficult to administer and confusing for local traffic. Furthermore, they would pose an additional hazard to other vessels, and offset traffic further from the site.

Given the effectiveness of other risk controls and the additional impacts that buoyage would have on navigation, this risk control has not been recommended for the Project. Furthermore, during consultation with the MCA and Trinity House, it was determined that all current floating OWF applications have similarly concluded not to include operational phase buoyage.

9.6.3 Site Monitoring

An additional risk posed by floating turbines as opposed to fixed turbines is the potential for breakout from the Project site during extreme weather. Mooring design specifications are such that they should hold in more than a 1 in 50 year weather event, in compliance with industry best practice. To mitigate the risk of a breakout further, three additional considerations subject to design may be considered:

Provide GPS tracking of each WTGs with geofenced alarms to identify excursion from site.

Turbines to be fitted with dormant AIS transponders which can be remotely activated were the turbine to break free, providing greater visibility to navigating vessels.

Put in place agreement with towage providers for emergency arrangements to recover a turbine were it to breakout from site.

9.6.4 Temporary Relocation of Fairway Buoy

Given the proximity of the cable corridor to the Bideford Fairway Buoy, its temporary relocation should be considered during installation of the export cable. This should include further discussion with the Bideford Harbour Master to determine the necessity and appropriate location, particularly if cable laying is prolonged.

Any potential relocation would also require consultation with Trinity House as the GLA and a Temporary Notice to Mariners would need to be issued to promulgate the information to harbour users.

9.7 RISK ASSESSMENT SUMMARY

The NRA contained in **Section 9.5** has determined that subject to the inclusion of embedded risk controls, the the Project does not pose an unacceptable risk to navigational safety. Following a review of possible additional risk controls, it is determined that for the three hazards scored as Medium Risk ("*Allision in situ of OWF Service Vessels with Project*

Infrastructure", "*Allision in situ of Fishing Vessels with WTGs*" and "*Fishing Vessels Snagging WTG Moorings*") are ALARP and therefore the risk is Tolerable.

9.8 CUMULATIVE IMPACTS ON SHIPPING AND NAVIGATION

Section 8.12 considered the cumulative projects which have submitted Scoping and determined that the individual contribution of the Project to these cumulative impacts is low, and that the risks of collision or allision at the Project site would be similar if not lower due to re-routeing around Valorous, Llyr 1, Llyr 2 and the Project.

Several stakeholders have raised concerns on the considerable scale of declared projects within the Celtic Sea, particularly following Crown Estate announcements in July 2022. **Section 8.12** identified that whilst there was uncertainty around these proposals, it is likely that potentially significant cumulative effects on navigational safety, commercial routeing, fishing and recreational activity are likely to be experienced. Future projects should ensure that their respective NRA's address the tolerability of such impacts, accounting for additional details as they become available.

These cumulative challenges are best addressed through establishing a strategic working group between developers and key stakeholders to ensure that key impacts to shipping and navigation are collectively identified, and appropriate mitigation put in place.

10. CONCLUSIONS AND RECOMMENDATIONS

10.1 CONCLUSIONS

This assessment has reached the following conclusions:

1. An NRA has been conducted recognising that OWF have potential impacts on navigational safety as highlighted under UNCLOS, the National Policy Statements and Marine Plans.
2. The NRA methodology has been conducted in accordance with the MCA's MGN654 and IMO Formal Safety Assessment approach to risk assessment. Where appropriate, additional guidance and lessons learnt from previous NRAs have been referred to within this NRA.
3. Consultation has been conducted with both regulators and stakeholders, and feedback received through scoping responses, consultation meetings, hazard workshops and written correspondence has been addressed.
4. The project description has been reviewed to determine a Maximum Design Scenario against which the NRA is undertaken. Where there is uncertainty regarding specific engineering details of moorings, substructures and O&M activities, a conservative approach to assessment has been undertaken.
5. A review of the baseline environment has identified that the site is in more than 60m of water and more than 30nm from both the Welsh and Cornish shorelines. Whilst there are subsea cables adjacent to the windfarm, no other surface offshore features exist within 10nm of the windfarm site. The export cable route would however make landfall near to the entrance of the River Torridge, where a pilot boarding station, harbour and firing range are located.
6. Search and rescue assets are located along both the Welsh and Cornish/Devon coastlines, with an SAR helicopter stationed at Newquay. These are coordinated from Milford Haven CGOC.
7. Summer and winter boat based marine vessel traffic surveys were conducted, each of 14 days duration, and supplemented with a full year of 2021-2022 AIS data, and other secondary sources. The surveys determined that:
    a. The dominant shipping routes within the Celtic Sea are from Lands End, due north to the Irish Sea, and from Lands End to the Bristol Channel. The site is clear of both of these routes. The windfarm site is adjacent to a route between Lands End and the Bristol Channel, that passes north of Lundy (565 transits per year). A route taken by tankers between Milford Haven and Lands' End passes two nautical miles to the northwest (521 transits per year).
    b. No passenger services are located near to the windfarm site. Regular services operate between the mainland and Lundy and therefore intersect the cable corridor.
    c. The majority of recreational movements are offshore cruising yachts, principally in a north-south orientation from Lands' End or Padstow towards Milford Haven.

These activities are concentrated along the coast and towards the cable landfalls.

d. Analysis determined that both static and mobile gear fishing takes place both within the offshore windfarm site, and in the vicinity. These include both local UK boats and European vessels. Some trawling and potting is evident from the analysis near to the cable landfalls.

e. Tug and service vessel routes are typically aligned with commercial shipping routes between Lands End and Bristol or Milford Haven.

f. There is seasonality in vessel activity, concentrated between April and September, related to fishing and recreational movements.

8. Historical incident analysis within 10nm of the windfarm site identified very few incidents, and no collision occurrences. Most incidents relate to the effects of adverse weather or mechanical failure. Near to the cable landfalls, a greater number of incidents were recorded, this likely correlates with increased recreational activity. Analysis of incidents on other projects in the UK, determined that allisions involving project vessels are the most likely to occur.

9. A prediction of future traffic profile was undertaken during the Project lifecycle. Whilst there had been a decline in annual freight tonnage between 2007 and 2020, projections to 2035 by the DfT were for a 15% increase. This may be accounted for by larger vessels rather than more transits. Localised freight statistics within the Bristol Channel showed similar patterns as to the national picture. Neither fishing nor recreational traffic were expected to substantially differ from the base case.

10. The impact on vessel routeing of the windfarm site was undertaken. Whilst a route from Lands End to the Bristol Channel (which passes north of Lundy) intersects the site, there was more than eight nautical miles of searoom to the south-east for vessels to safely deviate clear. Furthermore, less than two vessels per day navigate this route and the constriction of traffic flow and increase in collision risk is not considered to be appreciable.

11. Analysis and consultation determined that it is standard practice for tankers to loiter south of Milford Haven until a berth is available. The Project in isolation is not considered to substantially reduce the searoom available to conduct this.

12. The project site is adjacent to several commercial and small craft routes, and therefore there is an inherent risk of allision or contact following mechanical failure/human error. The site is of small scale and well-marked, with most routes maintaining safe passing distance, therefore the risk of allision is low. The proximity of fishing activity to the windfarm site has been assumed on a precautionary basis to continue and therefore the potential risk of allision by fishing boats due to mechanical failure or human error has been highlighted.

13. The windfarm site is located in an area of low vessel intensity and is not predicted to have an appreciable impact on vessel routes. Therefore, no appreciable increase in collision risk is anticipated.

14. The export cable is of considerable length and crosses shipping routes and fishing grounds. No commercial anchorages along the route are identified, albeit there is a

low likelihood that some vessels may anchor in an emergency. Snagging by fishing gear could result in capsize and therefore sufficient burial of the cable is recommended.

15. The laying of the export cable near to the approaches into the River Torridge should be carefully managed to mitigate any disruption to the harbour.

16. OWFs can impact the effectiveness of Search and Rescue. Best practice, including lines of orientation and turbine preparation, can facilitate safe access. The small scale of the site and spacing between turbines is considered to not compromise either vessel or helicopter access to the site. A layout plan should be agreed with the MCA and Trinity House to confirm turbine positioning does not impede SAR, prior to construction.

17. OWFs can impact on shipboard navigation and communication equipment, particularly marine radar when navigating within 1.5nm of the windfarm. Historical traffic analysis and industry best practice suggests that most mariners will maintain a safe buffer from the site and, in conjunction with its small scale, this impact would be mitigated.

18. The moorings and cabling systems used for floating OWFs can increase the risk of snagging for vessels fishing adjacent to the turbines. The specific mooring arrangements have not been fully developed but mooring and cables systems are likely to extend less than 1km from each turbine.

19. The design of floating WTG moorings to withstand adverse weather events mitigate the risk of turbine breakout, and were it to occur, the risk to passing vessels is very low.

20. Numerous stakeholders raised concerns regarding cumulative effects when wider Celtic Sea projects were considered. The cumulative assessment (undertaken to support this NRA) has been limited to projects which have submitted Scoping Chapters in order to limit uncertainty. These cumulative projects would necessarily deviate shipping bound for Milford Haven to the west (to pass clear of Erebus, Valorous and Llyr 1 and 2) and therefore away from the Project. These projects might also have potentially significant effects through reducing access and operations at Milford Haven. The contribution of the Project to these aforementioned cumulative impacts are negligible.

21. Embedded risk controls were identified that included promulgation and awareness, emergency response, project design and operational management.

22. A hazard log was developed and hazard workshops utilised to score the likelihood and consequences of each hazard occurring. The risk assessment concluded that:

    a. Three hazards were Medium Risk – Tolerable if ALARP. Namely allision or snagging of fishing boats with the WTGs or their moorings, given their frequent activity adjacent to the site. The risk of service vessel allision with the Project infrastructure is an inherent risk of operating OWFs and has several previous examples within the UK.

    b. 18 hazards were Low Risk – Broadly Acceptable. This reflects the small scale nature of the site, its location clear of major shipping routes and the risk controls that are put in place.

   c. 1 hazard was identified as negligible, as relates to vessels grounding on the cable immediately adjacent to cable landfall.

23. Three additional risk controls were explored:

   a. It was concluded that operational phase safety zones were not required as they would be ineffective at mitigating the risks of snagging or allision. This has not been applied for on previous floating OWFs.

   b. The installation of buoyage on a permanent basis to mark the site moorings was considered to be impractical and would pose an additional hazard to navigation.

   c. Enhanced site monitoring is recommended in order to further mitigate against the risk of breakout of WTGs.

10.2 RECOMMENDATIONS

The following recommendations are made:

1. The risk controls identified in **Section 9.3** are adopted by the project.
2. A risk assessment review is conducted once engineering design principals relating to the moorings/layout of the site and O&M base of operations is finalised to ensure the assumptions and conclusions of this NRA remain valid.
3. Consideration is given to establishing a collaborative working group involving stakeholders and developers to address cumulative shipping and navigation issues associated with offshore wind proposals in the Celtic Sea.

10.3 SUMMARY

The NRA for the Project concludes that there are no unacceptable risks to navigational safety and the impacts associated with the Project are Tolerable with identified mitigation measures.

References

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Appendix A
Risk Assessment

Hazard ID	Hazard Rank	Hazard title	Hazard type	Area	Phase (C/O/D)	Designed in Mitigation	Possible causes	Realistic Most Likely Consequences	Realistic Most Likely Scores					Realistic Worst Credible Consequences	Realistic Worst Credible Scores					Overall Risk Score	Overall Risk Rating
									People	Property	Environment	Business	Frequency		People	Property	Environment	Business	Frequency		
1	16	Collision of Large Vessels with Large Vessels	Collision	1	C/O/D	Notice to Mariners; Site Marking and Charting; ERCOP; Layout Plan and Lines of Orientation.	Human Error/Poor Seamanship; Failure to Comply with COLREGs; Fatigue; Radar Interference from WTGs; Mechanical Failure; Adverse Weather; Avoidance of Small Craft; Reduced Visibility;	No injuries Minor damage No pollution Minor publicity	1	2	1	2	3	Multiple fatalities Major property damage Major pollution International publicity	5	5	5	5	1	5.1	Low Risk - Broadly Acceptable
2	17	Collision of Large Vessels with Small Vessels	Collision	1	C/O/D	Notice to Mariners; Site Marking and Charting; ERCOP; Incident Investigation and Reporting; Layout Plan and Lines of Orientation; Marine Operating Guidelines; Vessel Standards; Training; Compliance of Project Vessels; Vessel Traffic Monitoring.	Increased Project Vessel Movements; Human Error/Poor Seamanship; Failure to Comply with COLREGs; Fatigue; Radar Interference from WTGs; Mechanical Failure; Adverse Weather; Avoidance of Small Craft; Reduced Visibility;	Minor Injuries Minor damage No pollution Minor publicity	2	2	1	2	3	Multiple fatalities Serious damage Moderate pollution National publicity	5	4	3	4	1	5.1	Low Risk - Broadly Acceptable
3	9	Collision of Small Vessels with Small Vessels	Collision	1	C/O/D	Notice to Mariners; Site Marking and Charting; ERCOP; Periodic Exercises; Incident Investigation and Reporting; Layout Plan and Lines of Orientation; Marine Operating Guidelines; Vessel Standards; Training; Compliance of Project Vessels; Vessel Traffic Monitoring.	Increased Project Vessel Movements; Human Error/Poor Seamanship; Failure to Comply with COLREGs; Fatigue; Radar Interference from WTGs; Mechanical Failure; Adverse Weather; Reduced Visibility;	Minor Injuries Negligible damage No Pollution Negligible publicity	2	1	1	1	4	Multiple major injuries Serious damage Moderate pollution National publicity	4	4	3	4	2	7.1	Low Risk - Broadly Acceptable

Hazard ID	Hazard Rank	Hazard title	Hazard type	Area	Phase (C/O/D)	Designed in Mitigation	Possible causes	Realistic Most Likely Consequences	Realistic Most Likely Scores					Realistic Worst Credible Consequences	Realistic Worst Credible Scores					Overall Risk Score	Overall Risk Rating
									People	Property	Environment	Business	Frequency		People	Property	Environment	Business	Frequency		
4	13	Allision in situ of Commercial vessels with WTGs	Allision in situ	1	C/O/D	Notice to Mariners; Site Marking and Charting; Safety Zones; ERCOP; Periodic Exercises; Incident Investigation and Reporting; Aids to Navigation; Air Draught Clearance; Layout Plan and Lines of Orientation; Vessel Traffic Monitoring.	Presence of WTGs; Increased Project Vessel Movements; Human Error/Poor Seamanship; AtoNs Failure; Fatigue; Radar Interference from WTGs; Mechanical Failure; Adverse Weather; Avoidance of Small Craft; Reduced Visibility;	No injuries Minor damage No pollution Moderate publicity	1	2	1	3	3	Multiple serious injuries Serious damage Moderate pollution National publicity	4	4	3	5	1	5.8	Low Risk - Broadly Acceptable
5	4	Allision in situ of Tankers with WTGs	Allision in situ	1	C/O/D	Notice to Mariners; Site Marking and Charting; Safety Zones; ERCOP; Periodic Exercises; Incident Investigation and Reporting; Aids to Navigation; Air Draught Clearance; Layout Plan and Lines of Orientation; Vessel Traffic Monitoring.	Presence of WTGs; Increased Project Vessel Movements; Human Error/Poor Seamanship; AtoNs Failure; Fatigue; Radar Interference from WTGs; Mechanical Failure; Adverse Weather; Avoidance of Small Craft; Reduced Visibility;	Negligible injuries Minor damage Minor pollution Moderate publicity	1	2	2	3	3	Multiple serious injuries Serious damage Serious pollution International publicity	4	4	4	5	2	8.4	Low Risk - Broadly Acceptable
6	2	Allision in situ of Fishing Vessels with WTGs	Allision in situ	1	C/O/D	Notice to Mariners; Site Marking and Charting; Safety Zones; Fishing Liaison Plan; ERCOP; Periodic Exercises; Incident Investigation and Reporting; Aids to Navigation; Air Draught Clearance; Layout Plan and Lines of Orientation.	Presence of WTGs; Increased Project Vessel Movements; Human Error/Poor Seamanship; AtoNs Failure; Fatigue; Radar Interference from WTGs; Mechanical Failure; Adverse Weather; Avoidance of Small Craft; Reduced Visibility;	Slight injuries Minor damage No pollution Local publicity	2	2	1	2	4	Multiple serious injuries/single fatality Moderate damage Minor pollution National publicity	4	4	2	4	3	9.4	Medium Risk - Tolerable (if ALARP)

Hazard ID	Hazard Rank	Hazard title	Hazard type	Area	Phase (C/O/D)	Designed in Mitigation	Possible causes	Realistic Most Likely Consequences	Realistic Most Likely Scores					Realistic Worst Credible Consequences	Realistic Worst Credible Scores					Overall Risk Score	Overall Risk Rating
									People	Property	Environment	Business	Frequency		People	Property	Environment	Business	Frequency		
7	10	Allision in situ of Recreational Vessels with WTGs	Allision in situ	1	C/O/D	Notice to Mariners; Site Marking and Charting; Safety Zones; ERCOP; Periodic Exercises; Incident Investigation and Reporting; Aids to Navigation; Air Draught Clearance; Layout Plan and Lines of Orientation.	Presence of WTGs; Increased Project Vessel Movements; Human Error/Poor Seamanship; AtoNs Failure; Fatigue; Radar Interference from WTGs; Mechanical Failure; Adverse Weather; Avoidance of Small Craft; Reduced Visibility;	Slight injuries Minor damage No pollution Local publicity	2	2	1	2	3	Multiple serious injuries/single fatality Moderate damage Minor pollution Moderate publicity	4	3	2	4	2	6.4	Low Risk - Broadly Acceptable
8	7	Allision in situ of OWF Construction Vessels with Project Infrastructure	Allision in situ	1	C/D	Notice to Mariners; Site Marking and Charting; Safety Zones; ERCOP; Periodic Exercises; Incident Investigation and Reporting; Aids to Navigation; Air Draught Clearance; Layout Plan and Lines of Orientation; Vessel Traffic Monitoring.	Presence of WTGs; Increased Project Vessel Movements; Human Error/Poor Seamanship; AtoNs Failure; Fatigue; Radar Interference from WTGs; Mechanical Failure; Adverse Weather; Avoidance of Small Craft; Reduced Visibility;	Neg. injuries Minor damage No pollution Minor disruption to activities	1	2	1	2	4	Multiple serious injuries/single fatality Serious damage Minor pollution Serious disruption to operations	4	4	2	4	2	7.3	Low Risk - Broadly Acceptable
9	1	Allision in situ of OWF Service Vessels with Project Infrastructure	Allision in situ	1	O	Notice to Mariners; Site Marking and Charting; Safety Zones; ERCOP; Periodic Exercises; Incident Investigation and Reporting; Aids to Navigation; Air Draught Clearance; Layout Plan and Lines of Orientation; Marine Operating Guidelines; Vessel Standards; Training; Compliance of Project Vessels.	Presence of WTGs; Increased Project Vessel Movements; Human Error/Poor Seamanship; AtoNs Failure; Fatigue; Radar Interference from WTGs; Mechanical Failure; Adverse Weather; Avoidance of Small Craft; Reduced Visibility;	Minor injuries Minor damage No pollution Negligible business	2	2	1	2	4	Multiple serious injuries/single fatality Moderate damage Moderate pollution Serious disruption to operations	4	4	3	4	3	9.6	Medium Risk - Tolerable (if ALARP)

Hazard ID	Hazard Rank	Hazard title	Hazard type	Area	Phase (C/O/D)	Designed in Mitigation	Possible causes	Realistic Most Likely Consequences	Realistic Most Likely Scores					Realistic Worst Credible Consequences	Realistic Worst Credible Scores					Overall Risk Score	Overall Risk Rating
									People	Property	Environment	Business	Frequency		People	Property	Environment	Business	Frequency		
10	18	Allision in situ of Passenger Vessels with WTGs	Allision in situ	1	C/O/D	Notice to Mariners; Site Marking and Charting; Safety Zones; ERCOP; Periodic Exercises; Incident Investigation and Reporting; Aids to Navigation; Air Draught Clearance; Layout Plan and Lines of Orientation; Vessel Traffic Monitoring.	Presence of WTGs; Increased Project Vessel Movements; Human Error/Poor Seamanship; AtoNs Failure; Fatigue; Radar Interference from WTGs; Mechanical Failure; Adverse Weather; Avoidance of Small Craft; Reduced Visibility;	No injuries Minor damage No pollution Moderate publicity	2	2	1	3	2	Multiple serious injuries/single fatality Serious damage Moderate pollution National publicity	5	4	3	5	1	4.8	Low Risk - Broadly Acceptable
11	21	Snagging Cable of large vessels	Snagging Cable	2	C/O/D	Notice to Mariners; Site Marking and Charting; Safety Zones; Incident Investigation and Reporting;	Insufficient Lookout Inadequate Passage Planning Human Error/Fatigue Poor Visibility in Area Charts not up to date	No injuries Minor damage to cable No pollution Moderate disruption to OWF	1	1	1	3	2	No injuries Serious damage to cable No pollution Serious disruption to OWF	1	2	1	5	1	4.1	Low Risk - Broadly Acceptable
12	6	Snagging Cable of Fishing Vessels	Snagging Cable	2	C/O/D	Notice to Mariners; Site Marking and Charting; Safety Zones; Incident Investigation and Reporting;	Insufficient Lookout Inadequate Passage Planning Human Error/Fatigue Poor Visibility in Area Charts not up to date	Slight injuries Minor damage No pollution Local publicity	2	2	1	2	4	Multiple serious injuries/single fatality Moderate damage Minor pollution Moderate disruption to OWF	4	4	2	3	2	7.4	Low Risk - Broadly Acceptable
13	3	Fishing Vessels Snagging WTG Moorings	Snagging moorings	1	C/O/D	Notice to Mariners; Site Marking and Charting; Safety Zones; Incident Investigation and Reporting;	Insufficient Lookout Inadequate Passage Planning Human Error/Fatigue Poor Visibility in Area Charts not up to date	Slight injuries Minor damage No pollution Local publicity	2	2	1	2	4	Multiple serious injuries/single fatality Moderate damage Minor pollution Moderate disruption to OWF	4	4	2	3	3	9.2	Medium Risk - Tolerable (if ALARP)
14	22	Grounding of Fishing Vessels on Cable Route	Grounding	2	C/O/D	Notice to Mariners; Site Marking and Charting; Incident Investigation and Reporting;	Insufficient Lookout Inadequate Passage Planning Human Error/Fatigue Poor Visibility in Area Equipment or Mechanical Failure on Vessel Reduced Seakeeping due to Tidal or Weather Constraints Interaction with project vessel Charts not up to date	No injuries Minor damage No pollution Local publicity	1	2	1	2	2	Multiple serious injuries/single fatality Serious damage Moderate pollution Serious business	4	4	3	4	1	3.7	Negligible Risk - Broadly Acceptable

Hazard ID	Hazard Rank	Hazard title	Hazard type	Area	Phase (C/O/D)	Designed in Mitigation	Possible causes	Realistic Most Likely Consequences	Realistic Most Likely Scores					Realistic Worst Credible Consequences	Realistic Worst Credible Scores					Overall Risk Score	Overall Risk Rating
									People	Property	Environment	Business	Frequency		People	Property	Environment	Business	Frequency		
15	15	Grounding of Recreational Vessels on Cable Route	Grounding	2	C/O/D	Notice to Mariners; Site Marking and Charting; Incident Investigation and Reporting;	Insufficient Lookout Inadequate Passage Planning Human Error/Fatigue Poor Visibility in Area Equipment or Mechanical Failure on Vessel Reduced Seakeeping due to Tidal or Weather Constraints Interaction with project vessel Charts not up to date	Slight injuries Neg damage No pollution Neg business	2	1	1	1	2	Multiple serious injuries/single fatality Moderate damage Minor pollution Serious business	4	3	2	4	2	5.3	Low Risk - Broadly Acceptable
16	14	Breakout of Turbine Posing Hazard to Other Vessels	Breakout	1	C/O/D	Hydrographic Survey Construction Method Statement and Programme Inspection and Maintenance Programme	Equipment or Mechanical Failure for Turbine Mooring System Insufficient Maintenance	Negligible injuries Neg damage No pollution Minor Business	1	1	1	3	3	Minor injuries Minor damage Minor pollution Serious business	3	3	2	5	1	5.4	Low Risk - Broadly Acceptable
17	19	Collision of Large Vessels with Large Vessels during Cable Installation	Collision	2	C/D	Notice to Mariners; Site Marking and Charting; ERCOP; Layout Plan and Lines of Orientation.	Human Error/Poor Seamanship; Failure to Comply with COLREGs; Fatigue; Radar Interference from WTGs; Mechanical Failure; Adverse Weather; Avoidance of Small Craft; Reduced Visibility;	No injuries Minor damage No pollution Minor publicity	1	2	1	2	2	Multiple fatalities Major property damage Major pollution International publicity	5	5	5	5	1	4.3	Low Risk - Broadly Acceptable
18	20	Collision of Large Vessels with Small Vessels during Cable Installation	Collision	2	C/D	Notice to Mariners; Site Marking and Charting; ERCOP; Incident Investigation and Reporting; Layout Plan and Lines of Orientation; Marine Operating Guidelines; Vessel Standards; Training; Compliance of Project Vessels; Vessel Traffic Monitoring.	Increased Project Vessel Movements; Human Error/Poor Seamanship; Failure to Comply with COLREGs; Fatigue; Radar Interference from WTGs; Mechanical Failure; Adverse Weather; Avoidance of Small Craft; Reduced Visibility;	Minor Injuries Minor damage No pollution Minor publicity	2	2	1	2	2	Multiple fatalities Serious damage Moderate pollution National publicity	5	4	3	4	1	4.1	Low Risk - Broadly Acceptable

Hazard ID	Hazard Rank	Hazard title	Hazard type	Area	Phase (C/O/D)	Designed in Mitigation	Possible causes	Realistic Most Likely Consequences	Realistic Most Likely Scores					Realistic Worst Credible Consequences	Realistic Worst Credible Scores					Overall Risk Score	Overall Risk Rating
									People	Property	Environment	Business	Frequency		People	Property	Environment	Business	Frequency		
19	12	Collision of Small Vessels with Small Vessels during Cable Installation	Collision	2	C/D	Notice to Mariners; Site Marking and Charting; ERCOP; Periodic Exercises; Incident Investigation and Reporting; Layout Plan and Lines of Orientation; Marine Operating Guidelines; Vessel Standards; Training; Compliance of Project Vessels; Vessel Traffic Monitoring.	Increased Project Vessel Movements; Human Error/Poor Seamanship; Failure to Comply with COLREGs; Fatigue; Radar Interference from WTGs; Mechanical Failure; Adverse Weather; Reduced Visibility;	Minor Injuries Negligible damage No Pollution Negligible publicity	2	1	1	1	3	Multiple serious injuries/single fatality Serious damage Moderate pollution National publicity	4	4	3	4	2	6.3	Low Risk - Broadly Acceptable
20	8	Project Vessel in Collision during Transit/In O&M Base	Collision	3	C/O/D	Notice to Mariners; ERCOP; Periodic Exercises; Incident Investigation and Reporting; Marine Operating Guidelines; Vessel Standards; Training; Compliance of Project Vessels.	Increased Project Vessel Movements; Human Error/Poor Seamanship; Failure to Comply with COLREGs; Fatigue; Mechanical Failure; Adverse Weather; Reduced Visibility;	Minor Injuries Minor damage No Pollution Minor business	2	2	1	2	3	Multiple fatalities Moderate damage Minor pollution National publicity	5	4	2	4	2	7.2	Low Risk - Broadly Acceptable
21	5	Project Vessel in Allision during Transit/In O&M Base	Allision	3	C/O/D	Notice to Mariners; ERCOP; Periodic Exercises; Incident Investigation and Reporting; Marine Operating Guidelines; Vessel Standards; Training; Compliance of Project Vessels.	Increased Project Vessel Movements; Human Error/Poor Seamanship; Fatigue; Mechanical Failure; Adverse Weather; Reduced Visibility;	Minor Injuries Minor damage No Pollution Minor business	2	2	1	2	4	Multiple serious injuries/single fatality Moderate damage Minor pollution National publicity	4	4	2	4	2	7.5	Low Risk - Broadly Acceptable
22	11	Project Vessel in Grounding during Transit/In O&M Base	Grounding	3	C/O/D	Notice to Mariners; ERCOP; Periodic Exercises; Incident Investigation and Reporting; Marine Operating Guidelines; Vessel Standards; Training; Compliance of Project Vessels.	Increased Project Vessel Movements; Human Error/Poor Seamanship; Fatigue; Mechanical Failure; Adverse Weather; Reduced Visibility;	Negligible Injuries Negligible damage No Pollution Minor business	1	2	1	2	3	Multiple serious injuries/single fatality Moderate damage Minor pollution National publicity	4	4	2	4	2	6.4	Low Risk - Broadly Acceptable

Appendix B
MGN654 Checklist

MGN 654 (M+F) Safety of Navigation: Offshore Renewable Energy Installations – Guidance on UK Navigational Practice, Safety and Emergency Response

MGN Section	Yes/No	Comments
4. Planning Stage – Prior to Consent		
4.5 Site and Installation Co-ordinates: Developers are responsible for ensuring that formally agreed co-ordinates and subsequent variations of site perimeters and individual OREI structures are made available, on request, to interested parties at relevant project stages, including application for consent, development, array variation, operation and decommissioning. This should be supplied as authoritative Geographical Information System (GIS) data, preferably in Environmental Systems Research Institute (ESRI) format. Metadata should facilitate the identification of the data creator, its date and purpose, and the geodetic datum used. For mariners' use, appropriate data should also be provided with latitude and longitude coordinates in WGS84 (ETRS89) datum.		
4.6 Traffic Survey – includes		
All vessel types	✓	Analysis of all vessel types within the study area is contained within **Section 6.**
At least 28 days duration, within either 12 or 24 months prior to submission of the Environmental Impact Assessment Report	✓	An MGN654 compliant vessel survey (during 2022) has been conducted and is described in **Section 6.1**.
Multiple data sources	✓	**Section 3.3** describes the vessel traffic, incident and secondary data sources used to inform the NRA.
Seasonal variations	✓	Seasonality has been accounted for within the 2x 14 day traffic surveys (**Section 6.1**) and is referenced throughout **Section 6**.
MCA consultation	✓	Consultation with the MCA has been conducted (see **Section 3.3.1**).
General Lighthouse Authority consultation	✓	Consultation with Trinity House has been conducted (see **Section 3.3.1**).
Chamber of Shipping and shipping company consultation	✗	Consultation with the Chamber of Shipping has been conducted (see **Section 3.3.1**).
Recreational and fishing vessel organisations consultation	✓	Consultation with the NDFA and CFPO has been conducted (see **Section 3.3.1**). Invitations to consult have been issued to recreational bodies.
Port and navigation authorities consultation, as appropriate	✓	Consultation with Milford Haven Port Authority and the Torridge Harbour Master has been conducted (see **Section 3.3.1**).
4.6.d Assessment of the cumulative and individual effects of (as appropriate):		
i. Proposed OREI site relative to areas used by any type of marine craft.	✓	Vessel traffic analysis within the study area is described in **Section 6**.
ii. Numbers, types and sizes of vessels presently using such areas	✓	Vessel traffic analysis within the study area is described in **Section 6**. This includes statistical analysis of vessel activity in **Section 6.2.6**.
iii. Non-transit uses of the areas, e.g. fishing, day cruising of leisure craft, racing, aggregate dredging, personal watercraft etc.	✓	Vessel traffic analysis within the study area is described in **Section 6**.
iv. Whether these areas contain transit routes used by coastal, deep-draught or international scheduled vessels on passage.	✓	Vessel traffic analysis within the study area is described in **Section 6**, including identification of key shipping routes in **Section 6.2.4**.

MGN Section	Yes/No	Comments
v. Alignment and proximity of the site relative to adjacent shipping routes	✓	Vessel traffic analysis within the study area is described in **Section 6**, including identification of key shipping routes in **Section 6.2.4**.
vi. Whether the nearby area contains prescribed routeing schemes or precautionary areas	✓	Navigational features are highlighted in **Section 5**.
vii. Proximity of the site to areas used for anchorage (charted or uncharted), safe haven, port approaches and pilot boarding or landing areas.	✓	Navigational features are highlighted in **Section 5**. Analysis of anchoring activity is contained within **Section 6.2.5**.
viii. Whether the site lies within the jurisdiction of a port and/or navigation authority.	✓	Navigational features are highlighted in **Section 5**.
ix. Proximity of the site to existing fishing grounds, or to routes used by fishing vessels to such grounds.	✓	Analysis of fishing vessel activity is contained within **Section 6.2.2.5**.
x. Proximity of the site to offshore firing/bombing ranges and areas used for any marine military purposes.	✓	Navigational features are highlighted in **Section 5**.
xi. Proximity of the site to existing or proposed submarine cables or pipelines, offshore oil / gas platform, marine aggregate dredging, marine archaeological sites or wrecks, Marine Protected Area or other exploration/exploitation sites	✓	Navigational features are highlighted in **Section 5**.
xii. Proximity of the site to existing or proposed OREI developments, in co-operation with other relevant developers, within each round of lease awards.	✓	Navigational features are highlighted in **Section 5**. Future proposed OREIs are described in **Section 7.5**.
xiii. Proximity of the site relative to any designated areas for the disposal of dredging spoil or other dumping ground	✓	Navigational features are highlighted in **Section 5**.
xiv. Proximity of the site to aids to navigation and/or Vessel Traffic Services (VTS) in or adjacent to the area and any impact thereon.	✓	Navigational features are highlighted in **Section 5**.
xv. Researched opinion using computer simulation techniques with respect to the displacement of traffic and, in particular, the creation of 'choke points' in areas of high traffic density and nearby or consented OREI sites not yet constructed.	✓	The impact on vessel routeing is assessed within **Section 8.2**.
xvi. With reference to xv. above, the number and type of incidents to vessels which have taken place in or near to the proposed site of the OREI to assess the likelihood of such events in the future and the potential impact of such a situation.	✓	Analysis of historical incident data is contained within **Section 6.3.**

MGN Section	Yes/No	Comments
xvii. Proximity of the site to areas used for recreation which depend on specific features of the area		Analysis of recreational traffic is contained within **Section 6.2.2.4**.
4.7 Predicted Effect of OREI on traffic and Interactive Boundaries – where appropriate, the following should be determined:		
a. The safe distance between a shipping route and OREI boundaries.	✓	The impact on vessel routeing is assessed within **Section 8.2** and the impact on allision risk is contained within **Section 8.4**.
b. The width of a corridor between sites or OREIs to allow safe passage of shipping.	✓	The cumulative impacts of multiple OREIs is assessed within **Section 8.12**.
4.8. OREI Structures – the following should be determined:		
a. Whether any feature of the OREI, including auxiliary platforms outside the main generator site, mooring and anchoring systems, inter-device and export cabling could pose any type of difficulty or danger to vessels underway, performing normal operations, including fishing, anchoring and emergency response.	✓	The risks of snagging on project infrastructure are assessed in **Section 8.6** and **8.10**.
b. Clearances of fixed or floating wind turbine blades above the sea surface are *not less than 22 metres (*above MHWS for fixed). Floating turbines allow for degrees of motion.	✓	The risk of allision with wind turbine blades is assessed in **Section 8.4** and risk controls are described in **Section 9.3**.
c. Underwater devices i. changes to charted depth ii. maximum height above seabed iii. Under Keel Clearance	 ✓ ✓ ✓	The impact on UKC and contact risk with moorings are assessed in **Section 8.6** and **8.10**.
d. Whether structure block or hinder the view of other vessels or other navigational features.	✓	Impacts on visual navigation and collision avoidance are considered within **Section 8.8**.
4.9 The Effect of Tides, Tidal Streams and Weather: It should be determined whether:		
a. Current maritime traffic flows and operations in the general area are affected by the depth of water in which the proposed installation is situated at various states of the tide i.e. whether the installation could pose problems at high water which do not exist at low water conditions, and vice versa.	✓	Analysis of tidal conditions are given in **Section 5.4**. The impact on UKC is assessed in **Section 8.6** and **8.10**.
b. The set and rate of the tidal stream, at any state of the tide, has a significant affect on vessels in the area of the OREI site.	✓	Analysis of tidal conditions are given in **Section 5.4**. Collision (**Section 8.5**) and allision (**Section 8.4)** assessments consider the impact of metocean conditions.
c. The maximum rate tidal stream runs parallel to the major axis of the proposed site layout, and, if so, its effect.	✓	Analysis of tidal conditions are given in **Section 5.4**. Collision (**Section 8.5**) and allision (**Section 8.4)** assessments consider the impact of metocean conditions.

MGN Section	Yes/No	Comments
d. The set is across the major axis of the layout at any time, and, if so, at what rate.	✓	Analysis of tidal conditions are given in **Section 5.4**. Collision (**Section 8.5**) and allision (**Section 8.4)** assessments consider the impact of metocean conditions.
e. In general, whether engine failure or other circumstance could cause vessels to be set into danger by the tidal stream, including unpowered vessels and small, low speed craft.	✓	Analysis of tidal conditions are given in **Section 5.4**. Collision (**Section 8.5**) and allision (**Section 8.4)** assessments consider the impact of metocean conditions.
f. The structures themselves could cause changes in the set and rate of the tidal stream.	✓	No effect anticipated.
g. The structures in the tidal stream could be such as to produce siltation, deposition of sediment or scouring, affecting navigable water depths in the windfarm area or adjacent to the area	✓	Analysis of tidal conditions are given in **Section 5.4**. The impact on UKC is assessed in **Section 8.6** and **8.10**.
h. The site, in normal, bad weather, or restricted visibility conditions, could present difficulties or dangers to craft, including sailing vessels, which might pass in close proximity to it.	✓	Adverse weather impacts are assessed within **Section 8.2**.
i. The structures could create problems in the area for vessels under sail, such as wind masking, turbulence or sheer.	✓	Analysis of tidal conditions are given in **Section 5.4**. Collision (**Section 8.5**) and allision (**Section 8.4)** assessments consider the impact of metocean conditions.
j. In general, taking into account the prevailing winds for the area, whether engine failure or other circumstances could cause vessels to drift into danger, particularly if in conjunction with a tidal set such as referred to above.	✓	Analysis of tidal conditions are given in **Section 5.4**. Collision (**Section 8.5**) and allision (**Section 8.4)** assessments consider the impact of metocean conditions.
4.10 Assessment of Access to and Navigation Within, or Close to, an OREI To determine the extent to which navigation would be feasible within the OREI site itself by assessing whether:		
a. Navigation within or close to the site would be safe: i. for all vessels, or ii. for specified vessel types, operations and/or sizes. iii. in all directions or areas, or iv. in specified directions or areas. v. in specified tidal, weather or other conditions	✓	Impacts to vessel routeing are assessed in **Section 8.2**.
b. Navigation in and/or near the site should be prohibited or restricted:	✓	Embedded risk controls are outlined in **Section 9.3.**

MGN Section	Yes/No	Comments
i. for specified vessels types, operations and/or sizes. ii. in respect of specific activities, iii. in all areas or directions, or iv. in specified areas or directions, or v. in specified tidal or weather conditions.		
c. Where it is not feasible for vessels to access or navigate through the site it could cause navigational, safety or routeing problems for vessels operating in the area e.g. by preventing vessels from responding to calls for assistance from persons in distress	✓	Impacts to vessel routeing are assessed in **Section 8.2**.
d. Guidance on the calculation of safe distance of OREI boundaries from shipping routes has been considered	✓	Vessel routes are identified in **Section 6.2.4**.
4.11 Search and rescue, maritime assistance service, counter pollution and salvage incident response.		
The MCA, through HM Coastguard, is required to provide Search and Rescue and emergency response within the sea area occupied by all offshore renewable energy installations in UK waters. To ensure that such operations can be safely and effectively conducted, certain requirements must be met by developers and operators.		
a. An ERCOP will be developed for the construction, operation and decommissioning phases of the OREI.	✓	Impacts to search and rescue are considered within **Section 8.7**. Embedded risk controls are outlined in **Section 9.3.**
b. The MCA's guidance document *Offshore Renewable Energy Installation: Requirements, Advice and Guidance for Search and Rescue and Emergency Response* for the design, equipment and operation requirements will be followed.	✓	Impacts to search and rescue are considered within **Section 8.7**. Embedded risk controls are outlined in **Section 9.3.**
c. A SAR checklist will be completed to record discussions regarding the requirements, recommendations and considerations outlined in the above document (to be agreed with MCA)		Impacts to search and rescue are considered within **Section 8.7**. Embedded risk controls are outlined in **Section 9.3.**
4.12 Hydrography - In order to establish a baseline, confirm the safe navigable depth, monitor seabed mobility and to identify underwater hazards, detailed and accurate hydrographic surveys are included or acknowledged for the following stages and to MCA specifications:		
i. Pre-construction: The proposed generating assets area and proposed cable route	✓	Embedded risk controls are outlined in **Section 9.3.**
ii. On a pre-established periodicity during the life of the development	✓	Embedded risk controls are outlined in **Section 9.3.**

MGN Section	Yes/No	Comments
ii. Post-construction: Cable route(s)	✓	Embedded risk controls are outlined in **Section 9.3.**
iii. Post-decommissioning of all or part of the development: the installed generating assets area and cable route	✓	Embedded risk controls are outlined in **Section 9.3.**
4.13 Communications, Radar and Positioning Systems - To provide researched opinion of a generic and, where appropriate, site specific nature concerning whether:		
a. The structures could produce radio interference such as shadowing, reflections or phase changes, and emissions with respect to any frequencies used for marine positioning, navigation and timing (PNT) or communications, including GMDSS and AIS, whether ship borne, ashore or fitted to any of the proposed structures, to: i. Vessels operating at a safe navigational distance ii. Vessels by the nature of their work necessarily operating at less than the safe navigational distance to the OREI, e.g. support vessels, survey vessels, SAR assets. iii. Vessels by the nature of their work necessarily operating within the OREI.	✓	Impact on communications, radar and positioning systems are considered within **Section 8.9**.
b. The structures could produce radar reflections, blind spots, shadow areas or other adverse effects: i. Vessel to vessel; ii. Vessel to shore; iii. VTS radar to vessel iv. Racon to/from vessel	✓	Impact on communications, radar and positioning systems are considered within **Section 8.9**.
c. The structures and generators might produce sonar interference affecting fishing, industrial or military systems used in the area.	✓	Impact on communications, radar and positioning systems are considered within **Section 8.9**.
d. The site might produce acoustic noise which could mask prescribed sound signals.	✓	Impact on communications, radar and positioning systems are considered within **Section 8.9**.
e. Generators and the seabed cabling within the site and onshore might produce electro-magnetic fields affecting compasses and other navigation systems.	✓	Impact on communications, radar and positioning systems are considered within **Section 8.9**.
4.14 Risk mitigation measures recommended for OREI during construction, operation and decommissioning. Mitigation and safety measures will be applied to the OREI development appropriate to the level and type of risk determined during the Environmental Impact Assessment (EIA).The specific measures to be employed will be selected in consultation with the Maritime and Coastguard Agency and will be listed in the developer's Environmental Statement (ES). These will be consistent with international standards contained in, for example, the Safety of Life at Sea (SOLAS)		

MGN Section	Yes/No	Comments
Convention - Chapter V, IMO Resolution A.572 (14)[3] and Resolution A.671(16)[4] and **could include any or all** of the following:		
i. Promulgation of information and warnings through notices to mariners and other appropriate maritime safety information (MSI) dissemination methods.	✓	Embedded risk controls are outlined in **Section 9.3.**
ii. Continuous watch by multi-channel VHF, including Digital Selective Calling (DSC).	✓	Embedded risk controls are outlined in **Section 9.3.**
iii. Safety zones of appropriate configuration, extent and application to specified vessels[1]	✓	Embedded risk controls are outlined in **Section 9.3.**
iv. Designation of the site as an area to be avoided (ATBA).	✓	Embedded risk controls are outlined in **Section 9.3.**
v. Provision of AtoN as determined by the GLA	✓	Embedded risk controls are outlined in **Section 9.3.**
vi. Implementation of routeing measures within or near to the development.	✓	Embedded risk controls are outlined in **Section 9.3.**
vii. Monitoring by radar, AIS, CCTV or other agreed means	✓	Embedded risk controls are outlined in **Section 9.3.**
viii. Appropriate means for OREI operators to notify, and provide evidence of, the infringement of safety zones.	✓	Embedded risk controls are outlined in **Section 9.3.**
ix. Creation of an Emergency Response Cooperation Plan with the MCA's Search and Rescue Branch for the construction phase onwards.	✓	Embedded risk controls are outlined in **Section 9.3.**
x. Use of guard vessels, where appropriate	✓	Embedded risk controls are outlined in **Section 9.3.**
xi. Update NRAs every two years e.g. at testing sites.		Embedded risk controls are outlined in **Section 9.3.**
xii. Device-specific or array-specific NRAs	✓	Embedded risk controls are outlined in **Section 9.3.**
xiii. Design of OREI structures to minimise risk to contacting vessels or craft	✓	Embedded risk controls are outlined in **Section 9.3.**
xiv. Any other measures and procedures considered appropriate in consultation with other stakeholders.	✓	Embedded risk controls are outlined in **Section 9.3.**

[1] As per SI 2007 No 1948 "The Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations 2007.

Appendix C
Consultation Letter

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Ref: 21-NASH-0201-0200-001

27-Jun-2022

By Email

SUBJECT: Stakeholder Consultation on Navigation Impacts for the Proposed White Cross Floating Offshore Wind Farm

Dear Stakeholder,

Introduction

NASH Maritime is undertaking the Shipping and Navigation (S&N) assessment as part of the Environmental Impact Assessment (EIA) for the proposed White Cross floating offshore wind (FLOW) project in the Celtic Sea. The project is being developed by Offshore Wind Ltd with the EIA for the project being led by Royal Haskoning DHV.

Figure 1 shows the project which is located 24 nm west of Lundy with the cable route making landfall in Bideford Bay. Further project information is available online at https://whitecrossoffshorewind.com/

We are therefore writing to advise you of the proposals and, as a potential marine stakeholder, invite your input and feedback as part of the S&N assessment which is being undertaken for the EIA.

Navigation Risk Assessment and Stakeholder Consultation

The EIA process requires identification of any potential hazards or impacts that the development could have on shipping and navigation and includes a Navigation Risk Assessment (NRA). In order to analyse vessel traffic in the area for the NRA, NASH Maritime have collected vessel traffic information including AIS and Radar data from vessel-based surveys together with other records and incident data.

The objectives of stakeholder consultation are to ensure that all potential hazards or impacts that the development could have on shipping and navigation are identified and appropriately assessed. It also seeks to ensure that any relevant applicable risk control measures have been identified which may eliminate or reduce risk to acceptable levels. In consideration of this we are keen to hear consultee views prior to **05-Aug-22** (using the contact details provided above and preferably by email) on:

- Whether the proposed development of the array area and/or cable route is likely to impact the routing of any specific vessels or your organisation during construction, operation or decommissioning phases.
- Whether the proposed development of the array area and/or cable route is likely to pose any concerns to safety of navigation or specific hazards during construction, operation or decommissioning phases. Where hazards are identified it would be helpful

if you can provide commentary on the potential likelihood and consequence of these hazards to people, property, business and the environment.

- Potential suitable risk controls or means to mitigate impacts on routing or safety of navigation.

Hazard Workshop

We are planning to hold a hazard workshop with stakeholders to assess the risks of the project on navigational safety and identify relevant risk control measures.

- We intend to hold the workshop at Barnstaple (Venue TBC).
- On the following dates: w/c **25-Jul-22** (Day TBC).
- A virtual ("Microsoft Teams") attendance option will be available.

It would be appreciated if you could confirm your interest in attending the hazard workshop either in person or remotely by **08-Jul-22** and indicate your preferred format of attendance. We will confirm workshop meeting dates and venue by **11-Jul-22** and contact all interested parties.

Should you require any further information to support your review and response then please do not hesitate to contact us using any of the details provided at the top of this letter.

Yours sincerely,

NASH Maritime Ltd

Enclosures:

Figure 1: Study Area.

Figure 2: Vessel Traffic Routes in Study area.

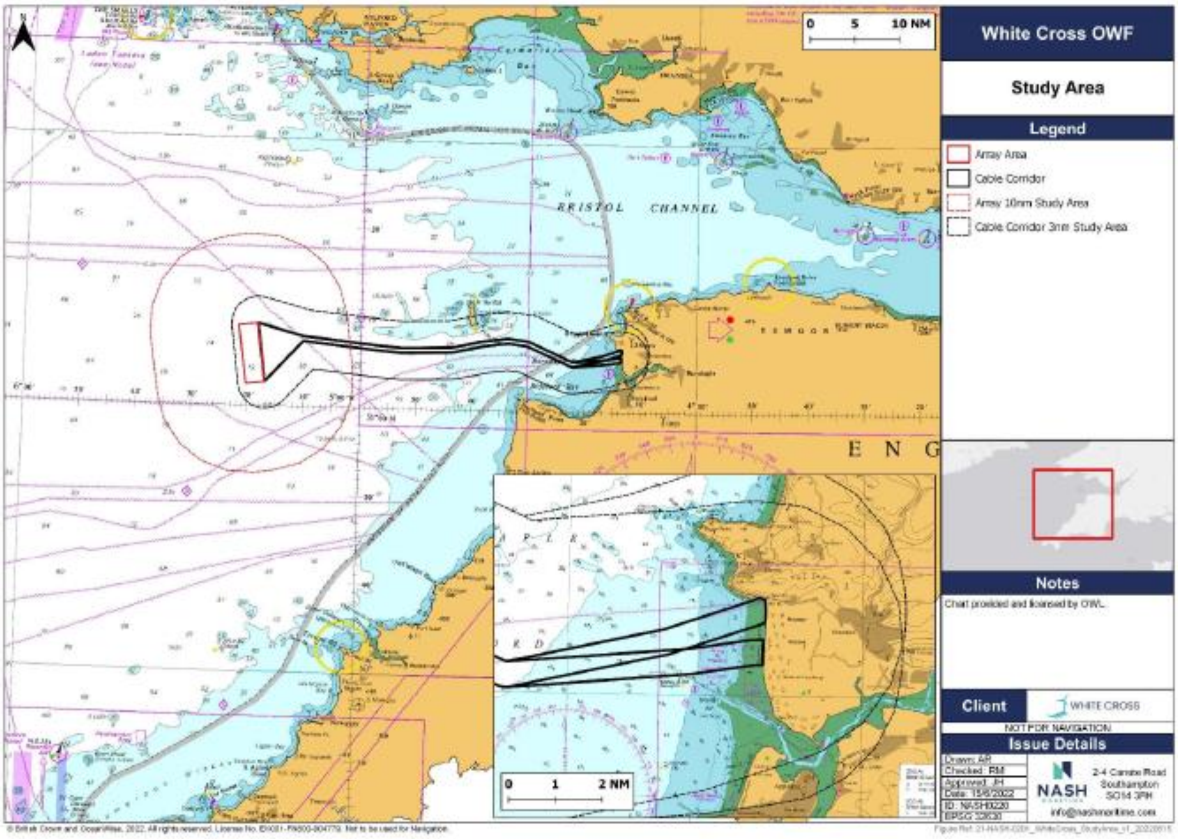

Figure 1 Study area.

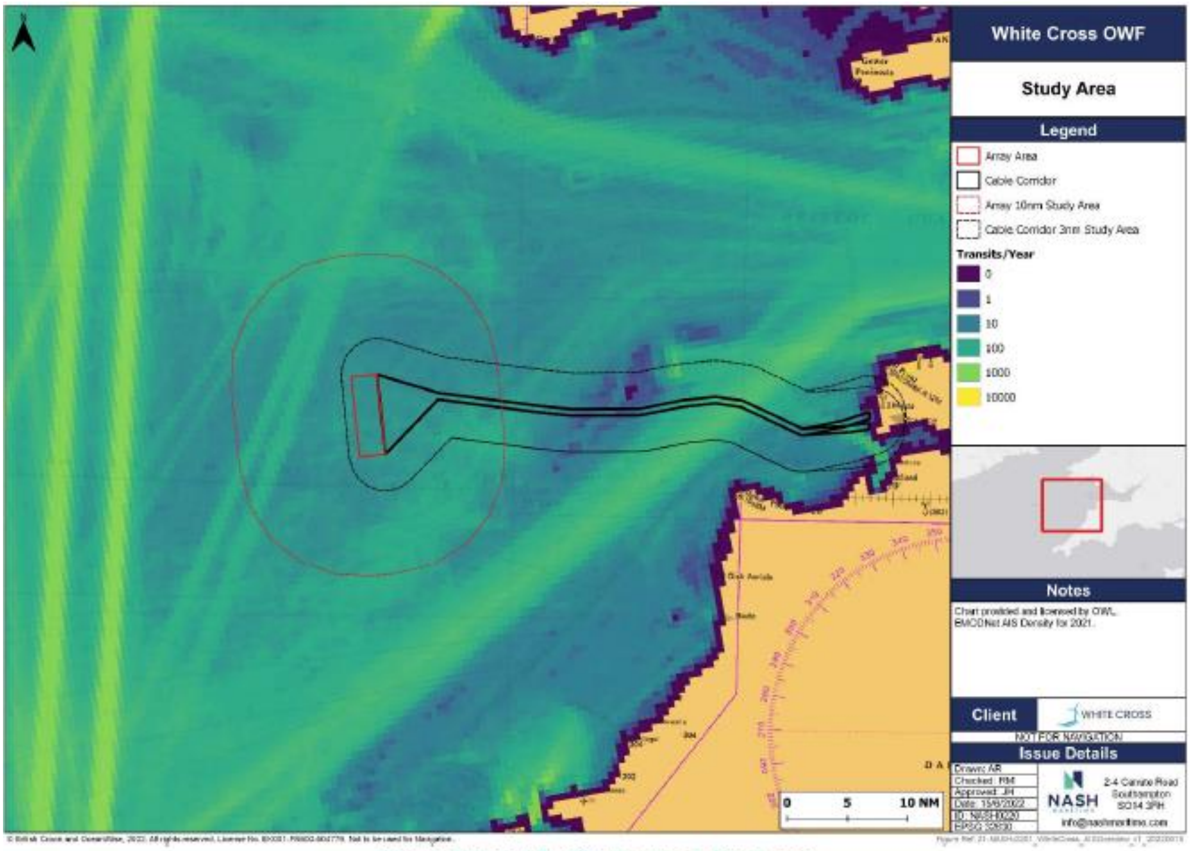

Figure 2 Vessel Traffic Routes in Study area.

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