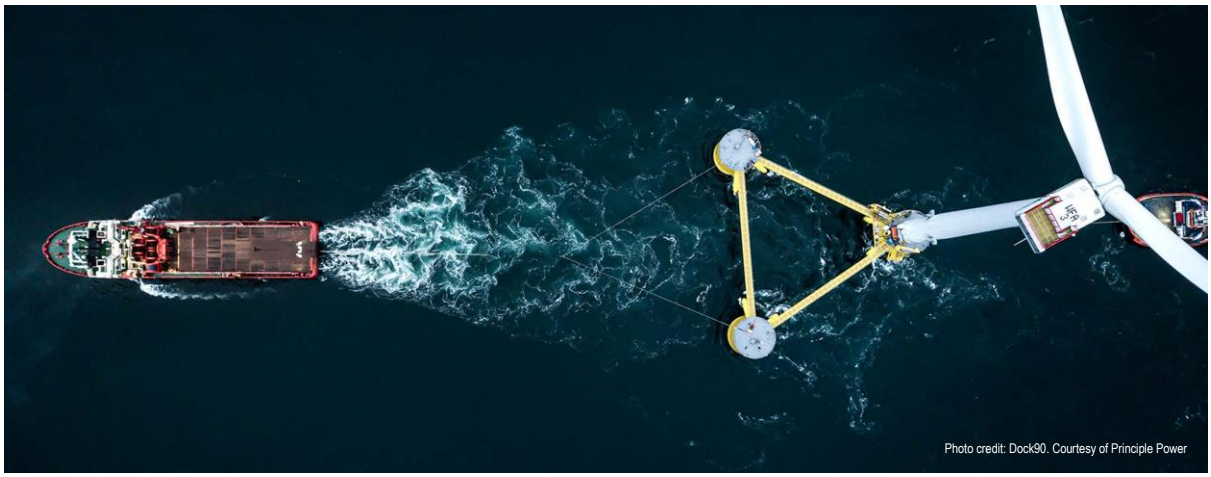


Project Erebus Environmental Statement
Chapter 16: Shipping and Navigation

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Acronyms

Term	Definition
AIS	Automatic Identification System
ALARP	As Low as Reasonably Practicable
ATBA	Area To Be Avoided
AtoN	Aid to Navigation
BEIS	Department for Business, Energy & Industrial Strategy
CBRA	Cable Burial Risk Assessment
CCTV	Closed-circuit Television
CGOC	Coastguard Operations Centre
CHA	Competent Harbour Authority
CIA	Cumulative Impact Assessment
COLREGs	International Regulations for Preventing Collisions at Sea
CoS	Chamber of Shipping
EIA	Environmental Impact Assessment
ERCoP	Emergency Response Cooperation Plan
DSC	Digital Selective Calling
ES	Environmental Statement
FSA	Formal Safety Assessment
GPS	Global Positioning System
HAT	Highest Astronomical Tide
HSE	Health and Safety Executive
HMCG	Her Majesty’s Coast Guard
HWM	High Water Mark
IALA	International Association of Lighthouse Authorities
IMO	International Maritime Organization
KP	Kilometre Point
LAT	Lowest Astronomical Tide
LNG	Liquefied Natural Gas

Term	Definition
LOA	Length Overall
MAIB	Marine Accident Investigation Branch
MCA	Maritime and Coast Guard Agency
META	Marine Energy Test Area
MGN	Marine Guidance Note
MHPA	Milford Haven Port Authority
MMO	Marine Management Organisation
MoD	Ministry of Defence
MOP	Marine Operations Plan
MPS	Marine Policy Statement
MSI	Maritime Safety Information
MSMS	Marine Safety Management System
NDFA	North Devon Fisheries Association
nm	Nautical mile
NPS	National Policy Statement
NRA	Navigation Risk Assessment
NRW	Natural Resources Wales
OREI	Offshore Renewable Energy Installations
OWF	Offshore Wind Farm
PEC	Pilotage Exemption Certificate
PMSC	Port Marine Safety Code
PPE	Personal Protective Equipment
QHSE	Quality, Health, Safety and Environment
RAMS	Risk assessment and method statement
Ro-Ro	Roll on – Roll off
RNLI	Royal National Lifeboat Institution
RYA	Royal Yachting Association
SAR	Search and Rescue
SHA	Statutory Harbour Authority

Term	Definition
SOLAS	Safety of Life at Sea
TOS	Traffic Organisation Service
THLS	Trinity House Lighthouse Service
TSS	Traffic Separation Scheme
UKC	Under Keel Clearance
UKHO	United Kingdom Hydrographic Office
VHF	Very High Frequency (radio communication)
VMS	Vessel Monitoring System
WNMP	Welsh National Marine Plan
WTG	Wind Turbine Generator

Glossary

Term	Definition
Allision	The act of a moving object alliding (crashing) with a fixed object. Also known as contact.
Automatic Identification System (AIS)	A system by which vessels automatically broadcast their identity, key statistics including location, destination, length, speed and current status, e.g. under power. Most commercial vessels and European Union (EU) fishing vessels over 15 m length are required to carry AIS.
Contact	The act of a moving object contacting (crashing) with a fixed object. Also known as allision
Collision	The act or process of colliding (crashing) between two moving objects.
Formal Safety Assessment (FSA)	A structured and systematic process for assessing the risks and costs (if applicable) associated with shipping activity.
International Maritime Organisation (IMO) Routing Measure	Predetermined shipping routes established by the IMO.
Marine Guidance Note (MGN)	A system of guidance notes issued by the UK Maritime and Coastguard Agency (MCA) which provide significant advice relating to the improvement of the safety of shipping at sea, and to prevent or minimise pollution from shipping.
Navigational Risk Assessment (NRA)	A document which assesses the overall impact to shipping and navigation of a proposed Offshore Renewable Energy Installation (OREI) based upon FSA.
Offshore Renewable Energy Installation (OREI)	As defined by Marine Guidance Note 654 (Merchant and Fishing) Safety of Navigation: OREIs – Guidance on UK Navigational Practice, Safety and Emergency Response (MCA, 2021).
Traffic Separation Scheme (TSS)	A traffic management route system ruled by the International Maritime Organization (IMO). The traffic lanes (or clearways) indicate the general direction of the vessels in that zone; vessels navigating within a TSS all sail in the same direction or they cross the lane at an angle as close to 90 degrees (°) as possible.

Chapter 16 Shipping and Navigation

16.1 Introduction

16.1.1.1 The proposed Project Erebus (the Project) is a demonstration scale Floating Offshore Wind (FLOW) development in the Celtic Sea region. The Applicant, Blue Gem Wind, is a joint venture between Simply Blue Energy (SBE) and TotalEnergies, set up to create a new low carbon offshore energy sector in the region; that contributes to climate change targets, supply chain diversification and energy security.

16.1.1.2 This chapter has been prepared by NASH Maritime Ltd, a specialist shipping and navigation and maritime risk management consultancy, on behalf of the Applicant. The chapter has been authored by multiple experts within the team including Maritime Practitioners and Professionals, Navigation Risk Specialists, Chartered Engineers, Marine Scientists and Environmentalists; with over 50 years' collective experience.

16.1.1.3 The array area is located approximately 35 km southwest of the Pembrokeshire coastline, covering an area of 43.5 km^2 in water depths of between 65-85 m. The array area is located outside of the 12 nm limit, but all elements of the Project, array area, offshore export cable corridor and landfall, fall within Welsh territorial waters or the Welsh Zone.

16.1.1.4 The Project comprises six to ten Wind Turbine Generators (WTG) with a total generating capacity up to 100 MW. Each WTG is housed on a semi-submersible floating platform with a mooring system comprising a maximum of five catenary mooring lines, up to 870 m in length, and a range of foundation options including drag embedment anchors, driven piles, drilled piles and/or suction piles. Up to 10 dynamic array cables are proposed, with a lazy wave configuration from the semi-submersible floating platform to the seabed. The offshore export cable, up to 49 km in length, links the array area to landfall at West Angle Bay, Pembrokeshire.

16.1.1.5 This chapter draws upon information presented within several other chapters included within the Environmental Statement (ES), including Chapter 4: Proposed Development Description.

16.1.1.6 This ES chapter presents the results of the Environmental Impact Assessment (EIA) for the potential impacts of the Project on shipping and navigation. Specifically, this chapter considers the potential impacts of the Project below the High Water Mark (HWM) during the construction, operational and maintenance, and decommissioning phases.

16.1.1.7 This chapter draws upon information presented within the Navigation Risk Assessment (NRA), which is included in Volume 3, Technical Appendix 16.1: Navigational Risk Assessment.

16.1.1.8 The purpose of this chapter is to:

- Present the existing baseline for shipping and navigation receptors, established from desk studies, vessel traffic surveys and consultation;
- Identify and present the potential effects on shipping and navigation receptors arising from the Project;
- Identify assumptions and limitations of the data and information presented and used within the assessment; and
- Identify any appropriate monitoring or mitigation measures that could avoid, reduce or compensate for the possible effects identified through the EIA process.

16.2 Legislation, Policy and Guidelines

16.2.1.1 A detailed overview of the relevant policy and legislation for the Project is provided in Chapter 5: Policy and Legislation. The Project is seeking a Section 36 consent, with deemed planning permission, under the Electricity Act 1989 from Welsh Ministers, administered by the Planning and Environment Decisions Wales (PEDW) and a Marine Licence under the Marine and Coastal Access Act (MCAA) 2009 from NRW.

16.2.1.2 The shipping and navigation assessment within this chapter has been undertaken in accordance with key legislation, policy and guidance.

16.2.2 Legislation

16.2.2.1 Relevant legislation documents have been reviewed and considered as part of this assessment.

16.2.2.2 The International Maritime Organization (IMO) International Regulations for Preventing Collisions at Sea 1972 (as amended) (IMO, 1972) were taken into account as part of this assessment. These relate to international collision regulations and global standards for seafarers, as well as international conventions and codes relating to search and rescue, the facilitation of international maritime traffic and the carriage of dangerous goods.

16.2.3 Policy

16.2.3.1 The following planning policies were reviewed and considered as part of this assessment:

- National Policy Statement (NPS) for Renewable Energy Infrastructure (EN-3) (DECC, 2011);
- Welsh National Marine Plan (WNMP) (Welsh Government, 2019); and
- UK Marine Policy Statement (MPS) (HM Government, 2011).

National Policy Statements

16.2.3.2 Although this Project is seeking Section 36 consent under the Electricity Act 1989 and a Marine Licence under the Marine and Coastal Access Act (MCAA) 2009, as opposed to a Development Consent Order (DCO), its size (up to 100 MW) is similar to the minimum threshold (100 MW) for Nationally Significant Infrastructure Projects (NSIPs). As such, guidance relevant to NSIPs is considered relevant to use for this Project. National Policy Statements (NPSs) were developed to provide guidance in the determination of NSIPs. Those relevant for the assessment of impacts on shipping and navigation include[1]:

- Overarching National Policy Statement (NPS) for Energy (EN-1) (Department of Energy and Climate Change (DECC), 2011a); and
- NPS for Renewable Energy Infrastructure (EN-3), July 2011 (DECC, 2011b).

[1] A period of consultation on a set of revised energy NPS's, managed by the Department of Business, Energy and Industrial Strategy (BEIS), ended on 29th November 2021.

16.2.3.3 Guidance relevant to shipping and navigation provided by NPS EN-3 is summarised in Table 16.1. NPS EN-3 provides the primary basis for decisions on applications for Nationally Significant Infrastructure Projects under the Planning Act 2008[2], and such decisions must also have regard to the Marine Policy Statement (MPS) and Welsh National Marine Plan (WNMP) in Wales.

Table 16.1 – Summary of NPS EN-3 guidance relevant to shipping and navigation

NPS Requirement	NPS Reference	ES Reference
Applicants should establish stakeholder engagement with interested parties in the navigation sector early in the development phase of the proposed offshore wind farm and this should continue throughout the life of the development including during the construction, operation, and decommissioning phases. Such engagement should be taken to ensure that solutions are sought that allow offshore wind farms and navigation uses of the sea to successfully co-exist.	EN-3, Paragraph 2.6.153	Stakeholder consultation was undertaken throughout the assessment and is summarised in Section 16.3 and Table 16.4.
Assessment should be underpinned by consultation with the Marine Management Organisation (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	Stakeholder consultation was undertaken with the MMO, MCA, THLS, RYA and relevant recreational and commercial representatives throughout the assessment and is summarised in Section 16.3 and Table 16.4.
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	Review was undertaken of latest navigational charts to identify internationally recognised sea lanes, together with Port of Milford Haven bye-laws, General Directions, Special Directions and Notices to Mariners.
Applicants should undertake a Navigational Risk Assessment (NRA) in accordance with relevant Government guidance prepared in consultation with the MCA and the other navigation stakeholders listed above.	EN-3, Paragraph 2.6.156	A Navigational Risk Assessment has been undertaken in support of this ES chapter and is presented within Volume 3, Technical Appendix 16.1: Navigational Risk Assessment.
The navigation risk assessment will for example necessitate: • a survey of vessels in the vicinity of the proposed wind farm;	EN-3, Paragraph 2.6.157	A vessel traffic survey was undertaken with a full methodology and results presented in Volume 3, Technical Appendix 16.1:

[2] A period of consultation on a set of revised energy NPS's, managed by the Department of Business, Energy and Industrial Strategy (BEIS), ended on 29th November 2021.

NPS Requirement	NPS Reference	ES Reference
• a full NRA of the likely impact of the wind farm on navigation in the immediate area of the wind farm in accordance with the relevant marine guidance; and • cumulative and in-combination risks associated with the development and other developments (including other wind farms) in the same area of sea.		Navigational Risk Assessment.
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	Safety zones are considered within Table 16.11.
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	Safety zones were discussed during consultation summarised in Section 16.3 and Table 16.4.
The potential effect on recreational craft, such as yachts, should be considered in any assessment.	EN-3, Paragraph 2.6.160	Recreational stakeholders were consulted throughout the assessment and recreational craft were considered within the assessment presented in Section 16.6.

UK Marine Policy Statements

16.2.3.4 The UK Marine Policy Statement (MPS) (HM Government, 2011) adopted by all UK administrations in March 2011, provides a framework for preparing marine plans and decisions affecting the marine environment. The MPS outlines the potential environmental impacts relating to shipping and navigation and outlines key issues for consideration. Specific to shipping and navigation, these include:

- Accidental pollution from ships, for example through physical damage caused by groundings or collisions;
- Changes in the available sea space available for the safe navigation of ships;
- Impacts on shipping activity, freedom of navigation and navigational safety; and
- Efficiency and resilience of continuing port operations and further port development.

Welsh National Marine Plan (WNMP)

16.2.3.5 The Welsh Government published and adopted the first WNMP in November 2019 (Welsh Government, 2019). The WNMP covers Welsh inshore and offshore waters and seeks to ensure marine resources are used in a sustainable way, in line with the high-level marine objectives, over its 20- year lifespan.

16.2.3.6 A review of the WNMP has been undertaken, details of specific policies within the WNMP used to inform this assessment are provided in Table 16.2 below.

Table 16.2 – Summary of WNMP guidance relevant to shipping and navigation

WNMP Requirement	WNMP Reference	ES Reference
Proposals should demonstrate how they have considered opportunities for coexistence with other compatible sectors in order to optimise the value and use of the marine area and marine natural resources.	104	Cumulative effects are assessed in Section 16.10 and in Chapter 30: Cumulative Effects.
Aims to safeguard established shipping routes and support sustainable development in the shipping and ports sector.	410	Impacts on shipping routes and MHPA operations are assessed within Section 16.6.
Identifies Milford Haven as the largest liquid bulk port in the UK and highlights the presence of significant energy related traffic at Milford Haven.	414	This has been considered when assessing impacts to MHPA operations in Section 16.6.
Outlines the key shipping activity in the area and the key provisions, including anchorages and pilot boarding places, that play a role in the movement and safe navigation of maritime traffic. Recognises the IMO routes operating as Traffic Separation Scheme areas off Pembrokeshire and identifies the busier traffic areas occurring around areas of access to ports and around headlands.	415	This has been considered when establishing the baseline conditions for assessment in Section 16.5.
Ports and shipping are sensitive to economic trends and the activities of other sectors; such dynamics are variable and therefore difficult to forecast. However, the WNMP states that current trends indicate opportunities to host value added processes such as manufacturing, e.g. supporting and servicing offshore renewable energy, particularly for ports in close proximity to developments.	421	Consultation with MHPA is summarised in Section 16.3 and Table 16.4. Potential impacts are also considered within Chapter 27: Socio-economics, Tourism and Recreation.
Policy **SAF_01 a** applies to all proposals from all sectors (including new Ports and Shipping sector proposals) with the potential to impact upon existing ports, harbours and marinas, including navigation routes within port, harbour and marina boundaries.	434	Consultation with MHPA is summarised in Section 16.3 and Table 16.4. Impacts to MHPA operations are assessed in Section 16.6.
Policy **SAF_01 b** applies to all proposals from all sectors (including new Ports and Shipping sector proposals) with the potential to impact upon established commercial navigation routes, pilot boarding areas and commercial anchorages outside of existing port, harbour and marina boundaries.	435	Impacts to commercial navigation routes, pilot boarding areas and commercial anchorages are assessed in Section 16.6. Additionally, impacts to commercial tankers waiting to enter MHPA are assessed in Section 16.6.

WNMP Requirement	WNMP Reference	ES Reference
These safeguarding policies seek to minimise negative impacts on shipping activity, ensure freedom of navigation and navigational safety which are provided under international law, and protect the efficiency and resilience of continuing port operations, including their economic interests. They do this by ensuring that developments or other activities which may restrict ports and shipping in terms of continuing current operations and responding to future development opportunities are considered and addressed in decision making. They also recognise the significant potential for coexistence of compatible activities with ports and shipping. Displacement of shipping should be avoided where possible.	436	Impacts on shipping and MHPA operations are assessed within Section 16.6.
Public authorities should only issue consent if they are satisfied that the proposal will not adversely impact on navigational safety or have an unacceptable impact on shipping activities and freedom of navigation and are in compliance with national and international maritime law.	437	This ES chapter, and accompanying NRA, identify and present any adverse impacts that could arise from the Project.

16.2.4 Guidance

16.2.4.1 A summary of the primary guidance relevant to shipping and navigation is provided in Table 16.3.

Table 16.3 – Summary of guidance relevant to shipping and navigation

Paragraph	Key Provisions
MGN 654[3] (M+F) Safety of Navigation: Offshore Renewable Energy Installations (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response (MCA, 2021)	Highlights issues that need to be taken into consideration when assessing the impact on navigational safety and emergency responses caused by offshore renewable energy installation. MGN 654 provides guidance on traffic surveys, consultation, structure layout, collision avoidance, impacts on communications, radar and positioning systems and hydrography.
MCA Methodology for Assessing the Marine Navigational Safety & Emergency Response Risks of OREIs (MCA, 2021)	This document is incorporated into MGN 654 as Annex 1 and should be read in conjunction. Its purpose is to be used as guidance for developers in preparing their navigation risk and emergency response assessment and includes a suggested template for preparing NRAs for offshore wind farms.

[3] Marine Guidance Note (MGN) 654 replaced MGN 543 in April 2021.

Paragraph	Key Provisions
MGN 372 Guidance to Mariners Operating in the Vicinity of UK OREIs (MCA, 2008)	Guidance outlining the issues to be considered when planning and undertaking voyages near OREIs off the UK coast.
International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA AISM) 0-139 the Marking of Man-Made Offshore Structures (IALA, 2013).	Provides guidance to national authorities on the marking of offshore structures, including floating wind farms.
IMO Formal Safety Assessment MSC-MEPC.2/Circ.12/Rev.2 (IMO, 2018)	Outlines the process for undertaking marine navigation risk assessments.
RYA Position on Offshore Renewable Energy Developments (RYA, 2019)	Outlines the recreational boating concerns surrounding offshore renewable energy developments.
Regulatory expectations on moorings for floating wind and marine devices – Health and Safety Executive (HSE) and MCA 2017 (MCA, 2017)	Provides guidance on procedures and considerations for ensuring that an OREI and its moorings possess such integrity, throughout its lifecycle, as is reasonably practicable to ensure the health and safety of persons at work and/or those affected by the operation of the device.
RenewableUK Cumulative Impact Assessment (CIA) Guidelines (RenewableUK, 2013)	Provides guidance for cumulative impact assessments in offshore wind farms in the form of 'Guiding Principles'. The guidance aims to ensure that all stakeholders have the same expectation of the CIA process, reduce uncertainty over the CIA process and promote streamlining of the consenting process.

16.3 Consultation and Scoping

16.3.1.1 Consultation was undertaken with key stakeholders throughout the shipping and navigation assessment, in order to better understand existing vessel traffic and identify possible impacts that could result from the Project during construction, operation and decommissioning. Table 16.4 provides a summary of the stakeholders who participated in the consultation process, any concerns raised, and how these have been addressed. Further details of shipping and navigation consultation are presented in the Volume 3, Technical Appendix 2.3: Consultation Plan.

Table 16.4 – Summary of issues raised by consultees

Consultee	Response	Applicant Action
MCA Call: 24/07/19	MCA confirmed a NRA would be required, to include two seasonal AIS and radar traffic surveys (valid for 24 months). Ideally one survey in peak summer and one in winter. MCA quick review identified possible trawling to the south and north east and cable route to the south of Erebus site. Intention will be to avoid in final siting.	

Consultee	Response	Applicant Action
	MCA will respond to EIA Scoping consultation for NRW.	
MCA Call: 08/06/20	Confirmation sought from the MCA on whether the proposed survey methodology and data types were considered appropriate, particularly in light of impacts from the COVID-19 pandemic. MCA agreed that the overall approach was appropriate and the additional information sources would be beneficial.	Survey methodology and data types, agreed during consultation, have been used within this ES Chapter. Comments on mitigation measures have been incorporated – see Table 16.11
MCA Meeting: 20/01/21	Preliminary Consultation Meeting Request to see reference to mooring guidance developed between HSE and MCA and third-party verification of mooring arrangements as per Risk Control 17: Inspection/Monitoring Regime. Safety zones were discussed, and MCA noted that the case for any safety zone would require sufficient justification.	
MCA Meeting: 11/06/20	Safety Zone Meeting Discussion held on whether a safety zone of 50 m (or greater) during the operational phase was necessary. MCA explained that the justification for a safety zone should be based on the following key points and should be clear in how it reduces risk in context with/beyond other risk controls: • Necessity; • Rationale; and • Appropriateness. MCA noted that how the Applicant proposes to monitor the safety zone and non-conformities is important and there should be a clear and credible plan on how this will be achieved. MCA stated that smart/remote and autonomous methods for monitoring would be considered where proposed	
Department for Business, Energy & Industrial Strategy (BEIS) Meeting: 11/06/20	**Safety Zone Meeting** Discussion held on whether a safety zone of 50 m (or greater) during the operational phase is necessary. BEIS noted that loss of sea-space/a right to navigation for mariners would be an important consideration and, particularly cumulatively, as a policy consideration, with the emergence of more floating OWF projects UK wide and if safety zones become more prevalent.	Loss of sea space is considered in Section 16.6, and in the Cumulative Assessment in Section 16.10.
Trinity House Lighthouse Service (THLS)	Preliminary Consultation Meeting When reviewing preliminary risk control mitigation THLS raised point around the inspection and monitoring in the event of incidents in the vicinity of the array area.	The impacts of cable laying within the East Channel have been assessed within

Consultee	Response	Applicant Action
	THLS raised concern over the impacts of cable laying on the East Channel buoy and potential changes to Aids to Navigation due to the proposed cable route. Specifically, if any buoys would be displaced due to the cable route.	Section 16.6 of this ES Chapter.
Milford Haven Port Authority (MHPA) Introductory call: 10/07/20	MHPA want to support the project but there will be key issues on running cables within the curtilage of the waterway, namely: - Cables should not constrain safe navigation and certainly not cross the mid channel. - Cables should be routed so as to minimise impacts on the special features of the SAC and SSSI's. With these in mind the path of least issue will probably enter via the eastern side of east channel hugging the southern bank of the waterway. Another consideration will be that depending on the site location from the main wind farm project. The cables may need to cross the HVDC Greenlink cable.	MHPA comments fed into site selection process and informed route refinement. Cumulative impacts with The Greenlink Interconnector have been assessed within Section 16.10 of this ES Chapter. Consultation sessions were held with the Water Ranger and other recreational groups/users, in order to understand the non-AIS vessel usage of the nearshore area, as detailed in this table
MHPA Meeting: 25/01/21	<u>Preliminary Consultation Meeting</u> Clarifications were provided to MHPA on the platform and semi-submersible floating platform/WTGs design, mooring system and construction phase. Vessel traffic plots were presented and data discussed, impacts of COVID-19 were discussed. MHPA noted need for consideration of Greenlink Interconnector within the assessment. MHPA noted that there are not significant levels of recreational traffic in West Angle Bay in terms of non-AIS vessels. MHPA noted that consultation with the Water Ranger would be beneficial.	
MHPA Meeting: 22/04/21	<u>Hazard Workshop</u> Requested that collision risk between large and small vessels be considered by area, in order to capture area-specific risks. There may be a pinch point within the vicinity of Turbot Bank, and this will be considered as an operational matter.	
MHPA Meeting: 20/05/21	<u>Post Hazard Workshop Meeting</u> MHPA proposed Pilotage Exemption Certificate (PEC) for Project construction vessels within the MHPA area. MHPA would define spatial extent and requirements for limited area PEC for construction and decommissioning phases.	. Area-specific collision risk between large and small vessels has been considered

Consultee	Response	Applicant Action
	It was confirmed that the Project risk assessment undertaken by NASH Maritime does not seek to replicate the MHPA risk assessment although it has been reviewed by the Project team. Concern was raised around the higher density of traffic within port limits and around the East and West Channels compared to the array area and this should be reflected in area-specific hazards and risk scores. It was agreed that risk scores will be broken out by phase for relevant hazards. It was noted that it would be useful for MHPA to have input into the schedule and timing of planned works to minimize impact to vessels using the East Channel and resulting use of West Channel can be managed.	within the NRA and this ES chapter. Impacts to MHPA operation have been assessed within Section 16.6, including effects on vessels using the East and West channels during cable lay.
Chamber of Shipping (CoS) Meeting: 20.01.21	<u>Preliminary Consultation Meeting</u> Confirmed it would be useful to benchmark 2020 data to previous years to identify impacts of the COVID-19 pandemic. Inclusion of commercial operators and regular runners that transit through array area, even if not entering MHPA.	Vessel traffic survey data was analysed and benchmarked against previous years' datasets: full methodology is provided within Volume 3, Technical Appendix 16.1: Navigational Risk Assessment. A full list of consultees contacted is available within Volume 3, Technical Appendix 16.1: Navigational Risk Assessment. RNLI, MAIB and MHPA incident data have been analysed and presented within Section 16.5.
Chamber of Shipping (CoS) Meeting: 22.04.21	<u>Hazard Workshop</u> Clarification was provided that 2020 data will be benchmarked against previous years. Confirmation that long-term Marine Accident Investigation Branch (MAIB) incident data are being used in addition to reference to Royal National Lifeboat Institution (RNLI) and MHPA data.	
Natural Resources Wales (NRW) Scoping Opinion	The following impacts must be scoped into the ES: • The impact of visual intrusion and noise on commercial and recreational craft; • The risk to drifting recreational craft in adverse weather or tidal conditions; • The effect on small craft navigational and communications equipment; and	This ES chapter and supporting Volume 3, Technical Appendix 16.1: Navigational Risk Assessment. have considered the

Consultee	Response	Applicant Action
January 2020	• The likely squeeze of small craft into the routes of larger commercial vessels. A Burial Protection Index study to be included where cable burial is proposed and, if applicable, an anchor penetration study should be considered. An assessment of the impact of, and emergency response to, a semi-submersible floating platform/WTG breaking free of its moorings, along with appropriate risk mitigation measures (e.g. AIS/GPS monitoring of offshore structures). The scoping opinion also outlined requirements surrounding: • Hydrographic survey requirements; • THLS AtoNs; • MCA consultation; • MGN checklist; and • Third-Party verification of the mooring arrangement.	impacts and proposed mitigations outlined in the scoping opinion. The MCA was consulted throughout the NRA process. The MGN checklist is provided in Volume 3, Technical Appendix 16.1: Navigational Risk Assessment. A Burial Protection Index study has been included within Volume 3, Technical Appendix 16.1: Navigational Risk Assessment and the Applicant intends to undertake a Cable Burial Risk Assessment (CBRA).
North Devon Fisheries Association (NDFA) (John Balls) Meeting: 22/04/21	<u>Hazard Workshop</u> Whilst the Project is a comparatively small array site, NDFA raised concern around safety for fishermen fishing in the area, particularly given the increase in infrastructure within the area and other proposed projects. The mooring systems and subsea cables make the array area “high risk” and it is unlikely that fisherman would fish within the area to avoid potential risk to gear, and they are also unlikely to pot within the array area. The array area is effectively a ‘no go’ area to fishing. Confirmation of buoyage would be useful and all information needs to be clearly communicated to the fishing community.	Snagging risk to fishing vessels is assessed in Section 16.6 of this ES Chapter. Potential impacts to fisheries are also considered within Chapter 15: Commercial Fisheries and Volume 3, Technical Appendix 15.1: Commercial Fisheries Technical Report.
S&P Trawlers Meeting: 22/04/21	<u>Hazard Workshop</u> The current array area is in the preferred position from a commercial fishing point of view. There is comparatively little fishing activity within the array area and the location of the array is preferred compared to previous options. Primary concern surrounds the cable as it runs through the central fishing grounds, an area which is heavily towed.	Snagging risk to fishing vessels is assessed in Section 16.6 of this ES Chapter. Potential impacts to fisheries are also considered within Chapter 15:

Consultee	Response	Applicant Action
	Primary concerns related to the cable route include: • Cable burial and seabed movement: concern surrounding movement of the seabed, particularly during winter storms, when the cable could become uncovered. In the event of cable exposure, there is the potential for fishing gear snagging. • Liability relating to snagging events at any point in the lifecycle of the Project. There is concern that in the event that a fishing vessel becomes snagged on the cable, that the fishing vessel/ persons/company involved could be liable for damage to the windfarm or cable. • Reassurance is sought from the fishing community that the cable will be sufficiently buried or protected to prevent potential snagging and clarification is provided around future liability. Suggested that a larger exclusion zone be considered (around semi-submersible floating platform/WTGs) for prudency to discourage and prevent fishing vessels snagging on the mooring system or drifting into the array. Suggested potential 0.5 – 1 nm exclusion zone around the array, considering the length of fishing gear used, fishing vessels and personal experience.	Commercial Fisheries and Volume 3, Technical Appendix 15.1: Commercial Fisheries Technical Report.
Ministry of Defence (MoD) Meeting: 22/04/21	<u>Hazard Workshop</u> Large MoD live firing templates can occupy the entire range area, occurring twice a year. These usually take place in January, seeking periods when there is less shipping to minimise impacts. Templates are planned a minimum of 12 months in advance and can be shared. Cable landfall location/design will not affect the range. Primary concern surrounds recreational vessels being diverted into the range during cable laying, particularly as recreational vessels often do not carry radios.	Impacts on recreational vessel diversions have been assessed within Volume 3, Technical Appendix 16.1: Navigational Risk Assessment and mitigated through the proposed MHPA Waterway management (Risk Control ID 27 as presented in Table 16.11 of this ES Chapter).
Broadside Charters, Dale Email: 08/04/21	Outlined concerns surrounding the Project, primarily surrounding impact on marine life and business operation. In particular: • Increased traffic between the Project site and Milford Haven causing hazards and delays. • Project structures, ‘no go zones’ and service vessels increasing hazards and transit times heading back to Milford Haven. • Vessels converging into routes on the West side to avoid the Project site increasing collision risks. • Obstructions to the charter vessel drifting activities.	Impacts on fishing vessels are assessed in Section 16.6 of this ES Chapter. Cumulative effects are considered in Section 16.1016.10. Potential impacts to fisheries are also considered

Consultee	Response	Applicant Action
	• Specific concerns surrounding impacts on drifting activities: • Drifting activities rely on an unbroken scent trail. Therefore, any interruption caused by needing to avoid project structures or vessels would interrupt the charter vessel operation. • It was felt that any increased activity to the west of the array area would impact charter vessel operation. • Concern over drifting into the array area or increased transit times when having to navigate around the array area. • Noted that there were approximately 8 other charter vessels operating in a similar manner, with some visiting and private vessels. • Concern was raised over the cumulative impacts of the Project and Project Valorous.	within Chapter 15: Commercial Fisheries and Volume 3, Technical Appendix 15.1: Commercial Fisheries Technical Report.
Celtic Charter Email: 13/04/21	Potential impacts to charter vessel activity from the Project were described: • Exclusion zones, or the presence of Project structures, during the lifetime of the Project could impact charter vessel operation. This impact would be worst to the west of the array area when also considering the Off Smalls Traffic Separation Scheme (TSS). • Raised concern over increased traffic around the northwest corner of the array area. • Raised concern over cable laying during the construction phase impacting navigation of recreational and commercial traffic. • Raised concern over cumulative impact of Project Valorous and cable laying during construction. • Impact of increased service vessel traffic associated with the Project on navigation of smaller vessels in the area.	Impacts on fishing vessels are assessed in Section 16.6 of this ES Chapter. Cumulative effects are considered in Section 16.10 Potential impacts to fisheries are also considered within Chapter 15: Commercial Fisheries and Volume 3, Technical Appendix 15.1: Commercial Fisheries Technical Report.
Celtic Charter Meeting: 22/04/21	<u>Hazard Workshop</u> • The charter vessels often undertake drifts near the proposed array area and would therefore be required to cease drift early, if drifting towards the array area. Vessels drifting would have fishing gear deployed during the drift. • Noted that there are other fishing charter vessels that operate within the area. • Reiterated concern over cumulative impact of multiple projects coming forward in the area.	
Milford Haven User Association	**<u>Comments from the Hazard Workshop held on 22 April 2021</u>** It was confirmed that the current array area location has minimal impact on recreational vessels as there are no major routes through this area.	Collision risk and impacts to MHPA operations are considered within Section 16.6 of this ES Chapter.

Consultee	Response	Applicant Action
	The impact of cable laying within the range/port limits on recreational vessels was raised. A primary route for recreational vessels is southeast out of Milford Haven. Cable laying within this area could therefore extend the route for leisure vessels which could make some trips unviable. Liaison between the cable lay vessel and the Castlemartin firing range, to provide agreement on suitable inshore route for leisure vessels, would mitigate this by reducing displacement of leisure vessels. This may also impact tourist and fishing vessels. A southeasterly (inshore) departure route for recreational vessels agreed between MHPA, the range, cable contractor and other groups would be reviewed. Noted that AIS aids to navigation on the semi-submersible floating platform/WTGs could leave vessels unequipped with AIS receiving ability (or radar) at risk of contact in restricted visibility conditions.	Potential impacts to tourism and recreational activities are considered within Chapter 18: Coastal and Marine Infrastructure and Other Users and Chapter 27: Socio-economics, Tourism and Recreation.
Milford Haven Water Ranger	Indicated that there were no major concerns regarding the Project and that the key consideration would surround fishing activity.	None required
Irish Ferries	Telephone call elicited no major concerns.	None required
RYA (National) Letter: 07/04/21	The RYA reiterated their support of well-planned and designed energy projects that consider recreational use and safety and signposted to their position statement for offshore wind energy. The RYA provided detailed comments, which covered: • Accuracy of surveys of recreational traffic that rely solely on AIS data, given that some recreational vessels do not carry AIS transponders. • Emphasis of visual surveys for inshore areas to identify recreational traffic. • Stated 20-30% use of AIS by larger recreational craft within offshore areas and use of radar reflectors. • Identified that cable landfall is located within an RYA General Boating Area and likely high recreational traffic. • The RYA Coastal Atlas indicates that the entrance to Milford Haven is of moderate to high use area for craft fitted with AIS, and moderate use offshore. • RYA AIS intensity data show low recreational use within or immediately east of the array area. Low intensity recreational cruising route between Milford Haven and Land's End. • The RYA will be concerned that construction and operation of the array and cable route does not increase collision, allision or grounding risk to recreational craft; and that risk has been properly assessed, given how recreational craft are likely to be equipped in this area.	Data types and methodology are presented within Volume 3, Technical Appendix 16.1: Navigational Risk Assessment. Effects on recreational vessels are considered in Section 16.6.

Consultee	Response	Applicant Action
	• Proposals should keep disruption of recreational activity to a minimum and not exclude users from areas previously used for recreation.	
South Hook Liquefied Natural Gas (SHLNG) Email 09/04/21	The Terminal would be looking for re-assurances on: • During construction, operation or decommissioning phases there will be no adverse impact on LNG vessels for SHLNG. • Location of the array and cable route will not significantly limit approach to Port of Milford Haven/SHLNG. • Ongoing maintenance of the new facility - there will be a robust plan in place that will limit risk of any unplanned disruption to shipping routes.	Effects on tankers and large commercial vessels are considered in Section 16.6.

16.4 Assessment Methodology and Significance Criteria

16.4.1.1 The shipping and navigation impact assessment deviates from the standard EIA methodology and terminology set out in Chapter 2: Overview of EIA Methodology, although the principles for assessing significance remain the same.

16.4.1.2 The following section provides an overview of the process employed to assess risk to shipping and navigation receptors and describes how the outputs of the NRA have been presented to assess significance of effect in EIA terms. It was requested, by the MCA during a consultation meeting held on 20 January 2021, that the methodology and terminology within the NRA is brought forward into the ES chapter and impact assessment, rather than the standard impact matrix. This approach was subsequently agreed with NRW via email correspondence on 01 March 2021

16.4.1.3 Impacts have been assessed for the following three distinct phases of the proposed project:

- Construction;
- Operation (and maintenance); and
- Decommissioning.

16.4.1.4 The Project Erebus EIA Scoping Report (MarineSpace, 2019) did not identify any effects that should be scoped out of the shipping and navigation assessment.

16.4.2 Study Area

16.4.2.1 The Study Area comprises a 10 km buffer around the array area and offshore export cable corridor (see Volume 2, Figure 16.1). For the NRA, area-specific hazards were defined using two areas:

- Array area; and
- Offshore export cable corridor.

16.4.3 Desk Study

16.4.3.1 Information on shipping and navigation within the array area, offshore export cable corridor and cumulative shipping and navigation Study Area was collected through a desktop review of existing datasets (see Table 16.5).

Table 16.5 - Data Sources

Data Source	Information
AIS data	6 months of AIS data for 2019 (01 July 2019 to 31 December 2019) were procured for the array area and offshore export cable corridor with a 10km buffer 12 months of AIS data from the MMO, from January 2017 to December 2017, were used for the array area and offshore export cable corridor and a wider regional area (approximately 50 km from the array area).
MAIB, RNLI and MHPA Incident data	MAIB incident data between 2010 and 2020 RNLI incident data between 2009 and 2019 MHPA incident data between 2015 and 2020
UK Admiralty charts	1178: Approaches to the Bristol Channel (1:200,000) 1478: Saint Govan's Head to Saint David's Head (1:75,000) 2878: Approaches to Milford Haven (1:25,000)
MMO Vessel Monitoring System (VMS) Fishing data	Fishing vessel data, recorded by the MMO using the VMS, between January 2017 to December 2017
MHPA vessel movement data	Vessel movement data between 2015 and 2020
RYA Coastal Atlas of Recreational Boating (2016)	Recreational vessel routes

16.4.4 Marine Vessel Traffic Surveys

16.4.4.1 Project-specific marine vessel traffic data were collected in accordance with requirements of MGN 654 (MCA, 2021), together with other guidance documents summarised in Section 16.2. Two 14-day marine vessel traffic surveys were conducted during representative summer and winter periods in 2020, totalling a 28-day traffic survey, recording all marine craft using radar, AIS and visual means (Table 16.6).

16.4.4.2 It should be noted that MGN543 was in place at the time of the survey planning in June 2020 but was then replaced with MGN654 in April 2021. The approach to the Project-specific marine vessel traffic survey was reviewed with the MCA prior to the first survey (August 2020) to ensure that any potential changes to the MGN were considered at that time.

Table 16.6 - Marine Vessel Traffic Surveys

Survey	Date Undertaken	Overview
Summer Marine Vessel Traffic Survey (14 days)	06 August 2020 to 23 August 2020	Traffic survey recording all marine craft using radar, AIS and visual means. Due to adverse weather conditions the survey vessel was off station between the 19 August 2020 and 23 August 2020, before returning to complete the remainder of the survey.

Survey	Date Undertaken	Overview
Winter Marine Vessel Traffic Survey (14 days)	22 November 2020 to 08 December 2020	Traffic survey recording all marine craft using radar, AIS and visual means. Due to adverse weather conditions the survey vessel was off station between the 03 December 2020 and 05 December 2020, before returning to complete the remainder of the survey.

16.4.5 Assessment Methodology and Significance Criteria

16.4.5.1 The assessment methodology used within this Chapter deviates from the standard EIA methodology presented within Chapter 2: Overview of EIA Methodology, although the principles remain the same.

16.4.5.2 The standard EIA methodology uses significance ranking matrices to assess potential effect significance, which combine the sensitivity of the receptor with the magnitude of the impact to determine significance of effect.

16.4.5.3 The methodology used within this chapter draws on the NRA methodology to provide a systematic process for assessing the potential for shipping and navigation effects to arise, the spatial extent of effect-receptor interactions, and the potential significance of effect on shipping and navigation receptors. The impact assessment process used within this chapter is informed by the IMO Formal Safety Assessment (FSA) methodology (IMO, 2018), which is detailed in Section 16.4.6 and the NRA (Volume 3, Technical Appendix 16.1: Navigational Risk Assessment).

16.4.5.4 Within this ES chapter, the standard EIA significance terminology is replaced by assignment of tolerability of risk. The objective of the FSA process is to use embedded and additional mitigation measures (or risk controls) to reduce the impact (or risk) to navigational receptors to As Low As Reasonably Practicable (ALARP); or in EIA terms, to reduce the effect to non-significant.

16.4.5.5 It should be noted that whilst the impact assessment within this chapter is informed by the NRA and considers the IMO FSA methodology and terminology, the NRA provides more complex and detailed scoring which has been simplified for the purposes of this ES chapter. There are also additional impacts assessed within this chapter that, whilst discussed and considered within the NRA, are not scored within the NRA using the IMO FSA methodology.

16.4.5.6 As such, the assessments presented within this ES chapter and the NRA may differ slightly in methodology, but the principles, underlying considerations and outcomes remain the same.

16.4.6 Formal Safety Assessment Methodology

16.4.6.1 The shipping and navigation impact assessment was conducted in accordance with the IMO FSA methodology, which is summarised in this section and described in further detail within the NRA (Volume 3, Technical Appendix 16.1: Navigational Risk Assessment).

16.4.6.2 The first step in the FSA is the identification of potential navigational hazards arising from the Project. A hazard is defined as "*something with the potential to cause harm, loss or injury*" (IMO, 2018). Each hazard is associated with a receptor, project phase and geographical area. A receptor is defined as a vessel type or user group.

16.4.6.3 The potential for a hazard to be realised (the likelihood of occurrence) is combined with the estimated severity of consequence to quantify the risk.

16.4.6.4 The FSA process allows potential navigational hazards to be scored based on their likelihood and consequence to people, property, environment and business. Each hazard is assessed under two scenarios: the realistic most likely and the realistic worst credible. The scores for each scenario are combined to produce the Hazard Risk Rating (Table 16.9). Hazards can then be ranked based on their level of risk, and their tolerability assigned using the tolerability matrix shown in Table 16.10.

Severity of Consequence

16.4.6.5 The consequence of a shipping and navigation hazard occurring is defined in Table 16.7.

Table 16.7 – Severity of Consequence

Consequence	Description			
	People	**Property**	**Environment**	**Business**
Negligible	No perceptible impact	No perceptible impact or less than £10,000	No perceptible impact	No perceptible impact
Minor	Slight injury(s)	£10,000-£100,000	Tier 1* oil spill with local assistance required	Local negative publicity, short term loss of revenue to port/offshore wind farm (OWF) £10,000-£100,000
Moderate	Multiple minor or single serious injury	£100,000-£1million	Tier 2* oil spill criteria reached with limited external assistance required	Widespread negative publicity, temporary suspension of activities at port/OWF £100,000 Local publicity -£1million
Serious	Multiple serious or single fatality	£1million-£10million	Tier 2* oil spill criteria reached with regional assistance required	National negative publicity, prolonged closure or restrictions to port/OWF £1million National publicity -£10million
Major	More than one fatality	>£10million	Tier 3* oil spill criteria reached with national assistance required	International negative publicity, serious disruption to operations to port/OWF >£10million International publicity

**This follows the classification system published by the International Petroleum Industry Environmental Conservation Association (IPIECA). The IPIECA classification system includes three tiers of oil spills organised by severity and the response systems required to remedy them (IPIECA, 2015).*

Likelihood of Occurrence

16.4.6.6 The likelihood of a shipping and navigation hazard occurring is defined in Table 16.8. Likelihood of occurrence is interchangeably referred to as frequency within the NRA.

Table 16.8 – Likelihood of Occurrence

Likelihood	Description
Negligible	<1 occurrence per 10,000 years
Extremely unlikely	1 per 100 – 10,000 years
Remote	1 per 10 – 100 years
Reasonably probable	1 per 1 – 10 years
Frequent	Yearly

Tolerability of Risk/Significance of Effect

16.4.6.7 The level of risk to shipping and navigation receptors is determined by correlating the severity of consequence and the likelihood of occurrence, as presented in Table 16.9.

16.4.6.8 Once each hazard has been scored, a risk rating is assigned. The risk rating (as defined in Table 16.9) allows each hazard to be categorized by the tolerability of risk (Table 16.10). Tolerability is divided into three categories:

- Broadly Acceptable;
- Tolerable if ALARP; and
- Intolerable/Unacceptable.

16.4.6.9 For the purposes of the EIA, any hazards assigned with an intolerable/unacceptable level of risk have been deemed significant in EIA terms, whilst hazards with acceptable or tolerable if ALARP level of risk (and below) are deemed non-significant (Table 16.10).

Table 16.9 – Hazard Risk Rating Matrix

		Likelihood of Occurrence				
		Negligible	Extremely unlikely	Remote	Reasonably probably	Frequent
Severity of Consequence	Major	Low Risk	Medium Risk	Significant Risk	High Risk	High Risk
	Serious	Low Risk	Low Risk	Medium Risk	Significant Risk	High Risk
	Moderate	Negligible Risk	Low Risk	Medium Risk	Medium Risk	Significant Risk
	Minor	Negligible Risk	Low Risk	Low Risk	Low Risk	Medium Risk
	Negligible	Negligible Risk	Negligible Risk	Negligible Risk	Low Risk	Low Risk

Table 16.10 – Tolerability Matrix

Hazard Risk Rating	Tolerability	Significance (in EIA terms)
Negligible Risk	Broadly Acceptable	Non-significant
Low Risk	Broadly Acceptable	Non-significant
Medium Risk	Tolerable (if ALARP)	Non-significant
Significant Risk	Intolerable / Unacceptable	Significant
High Risk	Intolerable / Unacceptable	Significant

16.4.7 Standard Mitigation

16.4.7.1 A range of standard mitigation measures has already been applied to the Project as part of the over-arching site selection and iterative design process (see below and Chapter 3: Site Selection and Alternatives). These have been introduced in order to minimise potential effects of the Project on any affected receptors.

16.4.7.2 Standard mitigation measures which the Project has already implemented, or is committed to in the future, to minimise potential effects on shipping and navigation are shown in Table 16.11. The standard mitigation shown in Table 16.11 is considered inherently part of the design of the Project (i.e. “embedded”) and has, therefore, been considered in each assessment (i.e. the determination of consequence and, therefore, significance assumes successful implementation of these measures).

16.4.7.3 Many of these measures are considered standard industry practice for this type of development and others have been developed through the NRA based on stakeholder consultation.

Table 16.11 – Standard Mitigation (Risk Controls)

ID	Title	Details
1	Promulgation of Information	Promulgation of Information and warnings through Notices to Mariners or other appropriate Marine Safety Information (MSI) dissemination methods. Rolling and regular updates during construction phases. Planning and co-ordination between developer and vessel operators
2	Continuous watch	Continuous watch by multi-channel VHF, including Digital Selective Calling (DSC).
3	Vessel Traffic Monitoring (and data collection to MGN654 standard)	Continuous monitoring by radar, AIS, closed circuit television (CCTV) or other agreed means (to minimum of MGN654 standard) during construction and immediate period (3 months) post construction, whilst traffic habituates, to MCA approval. Consider use of guard vessel to achieve this function (see Risk Control ID 9).
4	Safety Zones	Application and use of safety zones of up to 500 m 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. Safety Zones **will not apply** to any part of the offshore export cable and/or array cables. The assessment presented within this chapter also assumes that NO operational safety zones will be implemented within the operational phase of the Project.
5	Advisory safe distances	An advisory safe passing distance of up to 1,000m around work areas (cable landfall proximity) during construction and decommissioning phases, and up to 1,000m advisory safe distances around cable installation/removal or maintenance vessels [where feasible and in agreement with MHPA where within MHPA port limits]. These are advisory and are not enforceable; however, vessels will also be displaying Restricted in Ability to Manoeuvre lights and shapes under COLREGs (IMO, 1972 as amended).
6	Permanent Aids to Navigation Aids to Navigation Management Plan	Suitable Aids to Navigation (AtoN) lighting and marking the Project site shall be deployed, complying with International Association of Lighthouse Authorities (IALA) Recommendations O-139 (IALA, 2013 and due to be updated prior to construction), to be finalised and approved in consultation with MCA and THLS through an AtoN 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 Highest Astronomical Tide (HAT)). WTG informal naming/associated markings shall not interfere with formal AtoNs. AIS transponders to be placed on periphery corner semi-submersible floating platform.

ID	Title	Details
7	Buoyed construction area (Temporary Aids to Navigation)	Buoys deployed around construction work in array area 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 AtoN Management Plan.
8	Emergency Response Co-Operation Plan (ERCoP)	Emergency Response Co-Operation Plan with agreement of MCA. Including: 1. semi-submersible floating platform/WTGs partial/complete breakout response and recovery plan 2. Interface with MHPA and UK National Contingency Plan re: marine pollution. 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.
9	Provision of Guard Vessel	Provision of guard vessel in vicinity of array area to monitor 3rd party vessel traffic and intervene with warnings as necessary. Presence during construction phase and consider immediate period (3 months) post construction whilst traffic habituates, with MCA approval prior to release.
10	Cable Burial Risk Assessment (CBRA) and periodic validation surveys	CBRA to be undertaken pre-construction, including consideration of under keel clearance. Where possible, 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 (note that that the sections of the array cables that leave the semi-submersible floating platform will remain within the water column throughout the operational phase of the project). 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.
11	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)
12	Vessel health and safety requirements	The Applicant will ensure that all project related vessels meet both IMO conventions for safe operation, as well as health, safety and environment requirements, where applicable. This shall include the following good practice: • Project associated vessels will comply with International Maritime Regulations;

ID	Title	Details
		• 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; • All marine operations will be governed by operational limits, tidal conditions, weather conditions and vessel traffic information; and • Walk to work solutions will be utilised.
13	Under Keel Clearance (UKC) Requirements within array area	Minimum UKC to be maintained around turbines to ensure they do not impact on vessels transiting within the array area.
14	Fishing Liaison Plan	Provision of detailed Project information to fishermen, such as site and offshore export cable corridor location and position of any offshore export cable protection for upload into fish plotters
15	Project Vessel Marine Operations Plan, Traffic Co-ordination Plan and Promulgation of Information	Contractor/Vessel Operators to develop Marine Operations Plan (MOP) and, for all activities inside MHPA port limits (and recommended within 5 nautical miles (nm) of MHPA port limits), this shall include comprehensive passage plan in pre-approved format for review and authorisation by MHPA. Pre-deployment meeting shall be held with MHPA, MHPA Pilots and Contractor/Vessel Operator to review MOP, co-ordinate operations, identify and reduce operational disturbance and mitigate risks to navigational safety. 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, and any MHPA lines of communication) to enable vessels and operators to effectively and safely navigate around the array area and activities during the offshore export cable corridor construction.
16	Air Draught Clearance	WTG blades will have 22 m clearance above water level and allow for anticipated range of motion (pitch, roll, yaw, heave, surge and sway), as appropriate.
17	Charting of Array Area	Charting of array area structures (semi-submersible floating platform and subsea mooring/array cable equipment inc. anchor spread patterns) clearly on appropriately scaled nautical charts and electronic charts in line with United Kingdom Hydrogaphic Office (UKHO) standard and using wind farm symbology. Consideration to scaling to ensure sub-sea equipment in vicinity of individual semi-submersible floating platform is visible.
18	Charting of Export Cable	Charting of offshore export cable and landfall infrastructure clearly on appropriately scaled nautical charts and electronic charts in line with UKHO standard in line with UKHO standard and using standard symbology.

ID	Title	Details
19	Layout Plan and Lines of Orientation	Array layout plan to be agreed with MCA and THLS prior to construction and maintain two lines of orientation unless justified and agreed with the MCA.
20	Marine traffic control/Co-ordination	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 (see also Risk Control ID 15).
21	Sub-sea equipment Verification, Inspection and Monitoring regime	Third party verification of mooring (sub-sea) equipment shall be undertaken in line with MCA/HSE developed guidance. Independent and regular audit of all subsea equipment shall be undertaken at appropriate manufacturer recommended intervals during operational phase.
22	WTG Position Monitoring Tracking	Location monitoring device (GPS based) providing warning on breach of semi-submersible floating platform position near/beyond excursion limits and position tracking in event of partial/full breakout. Device should be integrated with AIS transponders (see also Risk Control ID 6: AtoN)
23	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.
24	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).
25	QHSE documentation	Marine QHSE documentation will ensure safe operation on a daily basis, including work vessel operations.
26	Hydrographic survey	Hydrographic surveys will be undertaken pre-consent, post consent and decommissioning in accordance with the MCA's 'Hydrography Guidelines for Offshore Developers'
27	MHPA Waterway management in East Channel works	During period when offshore export cable construction activity is within MHPA limits and approaches (within circa 5 nm), Applicant will liaise with MHPA and ensure MHPA integrated risk based approach is considered for works within MHPA waters. Consideration will be given to introduction of specific routes/measures and protocols for construction works and specific vessels (e.g. regular 'larger' vessels [Irish Ferries], Recreational and Fishing community together with the Castlemartin ranges) using East Channel during defined periods when cable associated works are present in channel. Consideration will be given to navigation lines (and port approaches), relationship of vessel usage of West/East channel and limit state conditions (restricted visibility. limiting metocean conditions). See also Risk Control ID 15.

ID	Title	Details
28	Tow out passage plan risk assessment method statement	A semi-submersible floating platform tow-out passage plan risk assessment and method statement (RAMS) should be undertaken by the Contractor, covering the period between quayside departure and completion of the mooring connection being made. This should consider aspects including: • Risks to project vessels; • Risks to 3rd party vessels (and consequential collision, contact or grounding risks) through reduced manoeuvrability; and • Breakout of the device under tow.

16.4.8 Additional Mitigation and Assessment for Residual Effect Significance

16.4.8.1 The impact assessments and conclusions on significance of effect presented in Section 16.6 assume that these standard mitigation measures listed in Table 16.11 have been successfully implemented. Where significant environmental effects remain even after these standard measures have been factored in, then additional, Project-specific mitigation measures are detailed and the residual significance of effect presented.

16.4.9 Limitations to Assessment

16.4.9.1 The data sources used in this chapter are detailed in Table 16.5 in Section 16.4.3.

16.4.9.2 The marine vessel traffic survey (described in Section 16.4.4) was undertaken during the COVID-19 pandemic in 2020 and, therefore, traffic profiles/activity may have been impacted across the range of marine users and vessel types. In order to obtain as representative a dataset as possible, a data strategy was developed and agreed in advance and in consultation with the MCA during the NRA Data Planning Meeting held on 08 June 2020 and Preliminary Consultation Meeting held on 20 January 2021. This strategy included the collation of additional baseline datasets, including:

- A long term 6 month AIS dataset from 01 July 2019 to 31 December 2019;
- A long term 12 month MMO AIS dataset from 01 January 2017 to 31 December 2017; and
- MHPA port call information from 2015-2020.

16.4.9.3 In order to determine whether the marine vessel traffic survey data (which included AIS, radar and visual records) were representative of the baseline traffic profile within the Study Area, the marine vessel traffic survey data were benchmarked against the datasets listed above.

16.4.9.4 Radar and visual surveys of the nearshore portion of the Study Area were not undertaken. It was agreed during consultation that due to the impact of COVID-19 pandemic and associated Government restrictions, any radar or visual surveys of nearshore recreational activities undertaken after March 2020 would not be representative of long-term baseline activity. Non-AIS vessel use within the area was determined through consultation with recreational users and groups for the following key user groups:

- Small commercial vessels;
- Recreational vessels including cruising yachts, motor vessels and other unpowered sailing or paddle craft; and

- Fishing vessels under 15m.

16.4.9.5 It is considered that the data employed in the assessment are sufficient for the purposes of the assessment presented.

16.5 Baseline Conditions

16.5.1.1 This section summarises the baseline conditions resulting from the studies undertaken on the Project datasets and through stakeholder consultation and workshops. Further information is provided within Volume 3, Technical Appendix 16.1: Navigational Risk Assessment.

16.5.2 Local Ports and Harbours

16.5.2.1 The Milford Haven Port Limits are located 25 km to the northeast of the array area. The Milford Haven Waterway is the largest estuary in Wales and one of the deepest natural harbours in the world. Its sheltered, tidal, waters have led to the waterway being extensively developed and it is the largest port in Wales. It is also a significant UK energy port, in addition to handling liquid bulk, break bulk, dry bulk and infrastructure project cargoes.

16.5.2.2 Major energy marine terminals within the Milford Haven Waterway include Valero Refinery, Valero Pembrokeshire Oil Terminal, Puma Energy, South Hook LNG and Dragon LNG with trade and processed materials being transported domestically and internationally. Pembroke combined-cycle gas turbine (CCGT) Power Station is located on the southern shore of Milford Haven Waterway.

16.5.2.3 The Milford Haven Waterway and Docks are home to a commercial fishing fleet comprising UK and non-UK vessels, and Pembroke Dock facilitates a twice-daily ferry service to Ireland, as well as general and infrastructure project cargo facilities. Pembroke Port is also undergoing significant redevelopment work to accommodate increased marine renewable energy activity in this region.

16.5.2.4 The Milford Haven Waterway also includes a number of smaller harbours and marinas and is popular with marine recreational leisure users.

16.5.3 Existing Vessel and Safety of Navigation Management

Responsible Authorities – MCA and MHPA

16.5.3.1 The array area and majority of the offshore export cable corridor is in an area of general navigation in UK waters, with the MCA as the responsible authority for safe navigation. The site is close to the approaches to Milford Haven Waterway and approximately 11 km of the offshore export cable corridor to the landfall at West Angle Bay is within the port limits of the Port of Milford Haven Statutory Harbour Authority (SHA) and Competent Harbour Authority (CHA) areas managed by MHPA.

16.5.3.2 MHPA actively manages and assesses marine and navigation risk within these limits through a Marine Safety Management System (MSMS), and in accordance with the Port Marine Safety Code (PMSC) which sets out a national standard for port marine safety for harbour authorities and other marine facilities, berths and terminals in the UK. MHPA is responsible for pilotage and conservancy on the waterway and also provides a VTS service actively monitoring the whole waterway.

IMO Routing/Reporting Measures and Recommended Channels

16.5.3.3 Off Smalls TSS is located approximately 22 km to the northwest of the array area. An Area To Be Avoided (ATBA) is located approximately 22 km directly north of the array area, between The Smalls and Grassholm. Vessels laden with oil, gas or noxious liquid substances, and all vessels >500 Gross Tonnes should avoid this area to avoid the risk of pollution by stranding.

16.5.3.4 Two Recommended Channels are situated within the approach to Milford Haven Waterway. The West Channel is used by the largest tankers, whilst the East Channel is available to all vessels suitable to size. Vessels able to use the East Channel are requested to do so when larger tankers are entering or leaving via the West Channel.

Aids to Navigation

16.5.3.5 There are no AtoNs situated within the array area. A west cardinal marker demarcates the western extent of Turbot Bank, 1 km east of the offshore export cable corridor. The West Channel and East Channel coming into Milford Haven are marked with buoys. Row's Rocks, Rat and East Chapel buoys, which demarcate the East Channel, lie within the offshore export cable corridor.

Pilotage

16.5.3.6 MPHA is the CHA and provides Pilotage Directions, as devolved from the Pilotage Act 1987. Pilotage is compulsory within the Haven for all ships, or tug and tow combinations, of 50 m or more LOA except:

- General Lighthouse Authority tenders;
- Ships which are moving from one berth to another within a dock;
- HM ships and certain vessels owned or controlled by HM Government; and
- Vessels that have a holder of a Pilotage Exemption Certificate (PEC) on board.

16.5.3.7 PECs may be granted to the master or chief officer of vessels that regularly trade to the Port of Milford Haven, and can demonstrate a competence equivalent to that of a pilot. Commercial traffic in the area will also variously be subject to other existing port control measures, such as passage planning requirements.

VTS

16.5.3.8 The VTS for the Port of Milford Haven is located at Hubberston Point, Milford Haven. It operates a 24-hour, 7 days a week service for all marine traffic within the VTS area. The VTS operates under the call sign 'Milford Haven Port Control'. Milford Haven Port Control is a Traffic Organisation Service (TOS) defined by the IMO as "*a service to prevent the development of dangerous maritime traffic situations and to provide for the safe and efficient movement of vessel traffic within the VTS area"* MGN 401(M+F).

16.5.3.9 All shipping movements are coordinated by Milford Haven Port Control and the system is mandatory for all vessels over 20 m LOA that are operating within the VTS area. The VTS area comprises the Port Limits and the level of high water on the shores of Milford Haven and the approaches thereto within the Port Limits, including all bays, creeks, pools, inlets and rivers as far as the tide flows.

16.5.4 Search and Rescue (SAR)

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

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

16.5.4.3 RNLI lifeboats are stationed at Angle Lifeboat Station, situated on the southern shore of Milford Haven Waterway, approximately 3 km east of offshore export cable landfall at West Angle Bay. The Angle lifeboats include a Tamar class all weather lifeboat and two inshore D class lifeboats. The Tamar class lifeboat is 16.3 m length overall (LOA) with a range of 250 nm and is capable of 25 knots.

16.5.5 Other Offshore Activities

Oil and Gas

16.5.5.1 There is one historic exploratory wellhead, located approximately 10 km southeast of the array area; and one current licence block in the Study Area. Licence P2287 is operated by ENI UK Limited and is located approximately 38 km north of the Project. The licence commenced in September 2015, and its current status is extant.

16.5.5.2 No oil and gas blocks have been awarded within the Study Area, in recent licensing rounds. There is also no existing, or proposed, gas storage or carbon capture storage infrastructure within the Study Area.

Subsea Cables

16.5.5.3 There are several subsea cables within and near the array area. A subsea cable (SOLAS – Vodafone), passes east to west through the southern portion of the array area. There are currently no subsea cables intersecting the offshore export cable corridor; however, the proposed Greenlink Interconnector (due to be installed 2023/24) will intersect the offshore export cable near landfall, which is considered within the cumulative assessment (Section 16.10).

Aggregates

16.5.5.4 There are no existing licensed, application or aggregate option areas within the Study Area. The closest aggregate area is located in the Bristol Channel, approximately 64 km east of the array area.

Dredging Areas and Spoil Grounds

16.5.5.5 There are two spoil grounds charted within the vicinity of the array site and offshore export cable corridor. The closest spoil ground is charted 9 km north of the array area. The site is named Milford Haven Three (LU169) and has a dredge volume of 100,000 to 500,000 tonnes per year. This is primarily used for finer sediments.

16.5.5.6 A second spoil ground, known as Milford Haven Two (LU168), is located 25 km east of the array area and 4 km south of the offshore export cable corridor, and is used less frequently than LU169 due to its specification for larger grain size sediments.

16.5.5.7 The proposed offshore export cable corridor intersects the footprint of the Milford Haven historic dredge disposal site (LU170), that was used until 1994.

16.5.5.8 Dredging within port limits is managed by MHPA, whilst the licensing of dredged areas and disposal sites is regulated through licensing and consents by NRW.

16.5.5.9 Maintenance dredging activity within Milford Haven Port is undertaken approximately on a 2-3 year frequency, and for a 6-8 week duration.

Other Offshore Renewable Projects

16.5.5.10 Whilst no existing offshore renewable projects have been identified within the area, there are several future inshore and offshore renewable projects currently in the planning process, which are considered within the cumulative assessment (Section 16.10).

16.5.5.11 These include the following:

- META – Phase 1, Pembroke Port;
- META – Phase 2, East Pickard Bay (Bombora);
- META – Phase 2, Warrior Way;
- META – Phase 2, Dale Road; and
- Project Valorous.

Anchorages and Offshore Waiting Areas

16.5.5.12 No formal anchorages exist within or near the array area. Vessels anchoring in Milford Haven Port are required to obtain advice on location from Milford Haven Port Control. Deep-draught vessels (>12 m) are advised not to anchor within 5 miles of Middle Channel Rocks Lighthouse. Dale Roads is the only anchorage for ships between 7 and 12 m draught. Mariners are advised not to anchor within the vicinity of submarine cables.

16.5.5.13 Vessels are known to wait and loiter within the wider approaches to the waterway for a range of operational reasons and prior to embarking a pilot and entering port. The waiting locations have been determined from vessel traffic data analysis.

Practice and Exercise Areas

16.5.5.14 Castlemartin Firing Range (Firing Practice Area) is located approximately 17 km to the northeast of the array area. Approximately 20 km of the offshore export cable corridor lies within the Firing Practice Area. Whilst this range is active, it is actively managed and protected by a range safety vessel. No restrictions are placed on the right to transit the Firing Practice Area at any time and it is operated using a clear range procedure. However, some restrictions have been observed during exercises and vessels wishing to enter the area when ranges are firing should call Range Control or the Range Safety Craft to be given a route that will allow them to pass through without effecting any live firing templates.

16.5.6 Baseline Vessel Traffic Activity

16.5.6.1 Analysis of the baseline vessel traffic profile was undertaken using a composite of AIS and radar data, from 2019 and 2020, covering the Study Area shown in Volume 2: Figure 16.1. A detailed description of the vessel traffic survey and data integration can be found within the NRA (Volume 3, Technical Appendix 16.1: Navigational Risk Assessment). Additional information on vessel activities has been supplemented through stakeholder consultation.

16.5.6.2 Tracks for all vessel types are shown in Volume 2, Figure 16.2 and Figure 16.3. Vessel tracks by length (LOA) and vessel type are presented in Volume 2, Figure 16.4 and Figure 16.5, respectively.

16.5.6.3 Table 16.12 provides a summary of the vessel traffic by type within the Study Area with further analysis presented in the NRA. The array area is located approximately 10km east of the main shipping routes between the Off Smalls TSS and the Land's End TSS. Most vessels transiting passed the array area are either bound for Milford Haven, or are entering the Bristol Channel from the Irish Sea or the Atlantic.

Table 16.12 – Summary of vessel traffic activity by type

Vessel Type	Description
Cargo vessels	Milford Haven does not handle significant dry cargo trade, with two transits per month recorded on average. Several offshore routes are evident, adjacent to the route for small coastal trade entering the Bristol Channel to ports such as Avonmouth, Newport and Cardiff. However, these routes generally pass more than 2 nm from the array area to the north and south. Some small general cargo vessels (<150 m length) are shown to transit between the Bristol Channel and southern Ireland, a route that passes near to the south of the array area.
Tankers	Milford Haven is a major liquid cargo port with more than 1,000 tanker arrivals each year. Within the array area, tankers ranging in size from 90 m through to 345 m are recorded. These include LNG tankers from Qatar, crude oil tankers, oil/chemical tankers and LPG tankers. Vessels transiting through the array area on passage to Milford Haven have mostly originated from the Middle East and America. A significant number of tankers are waiting offshore, transiting at slow speed before being called to enter the port (see Volume 2, Figure 16.6).
Passenger	Several passenger vessel routes operate from Milford Haven. Principally, the ro-ro ferry MS *Isle of Inishmore* (applicable vessel within the project datasets) which is owned by Irish Ferries and operates on the Rosslare-Pembroke service (*Blue Star 1* recently replaced *Isle of Inishmore* on this route), passing clear of the array area but crossing the offshore export cable corridor. Additionally, several passenger boats provide trips to Skomer and Skokholm islands, passing over the offshore export cable corridor and within the vicinity of landfall at West Angle Bay. On occasions, cruise ships enter Milford Haven, including the 198 m *Europa* and the luxury cruise ferry 194 m *W.B.Yeats*, both having originated from Ireland. Only two passenger vessels transited through the array area, namely the cruise ships *Seabourn Ovation* at 210 m and the *Marco Polo* at 176 m, both on passage from Ireland to the Bristol Channel. Similarly, those vessels transiting adjacent to the array area are also cruise ships of a similar size.
Fishing vessels	In the inshore part of the Study Area, there is a relatively high number of small (<15 m) commercial fishing vessels operating out of local ports. Static gear (pots) is the main method of fishing with some netting and trawling. Further offshore, in/around the array area, larger (>15m) UK and non-UK vessels are active. 30 different fishing vessels were recorded during the long term AIS dataset (01 July 2019 to 31 December 2019). including the 140 m *Annelies Ilena and Willem Van Der Zwan* operating out of the Dutch port of Ijmuiden. Charter fishing vessels also operate in the inshore region with some also undertaking shark fishing trips further offshore near the array area.
Recreational	Given the distance of the array area from shore (approximately 45 km), very few recreational craft were recorded transiting near to the array area. Mostly these are sailing vessels on passage, likely from the Irish Sea round Land's End. There are, however, significant recreational movements from Milford Haven based at Pembroke and Milford Marina, but are concentrated in coastal waters. Some recreational activity is recorded near cable landfall in West Angle Bay.

Vessel Type	Description
Tug and service vessels	Escort towage and pilot vessels are required for large commercial shipping movements and are concentrated within six nautical miles of the estuary. Furthermore, range boats are active from the estuary towards the Castlemartin Firing Range. Within the array area, there are few transits of vessels of these types, including cable layers, SAR and research and survey vessels.

Vessel Routes

16.5.6.4 Based on the results of the 2020 vessel traffic surveys, Volume 2, Figure 16.8 marks the key routes within and around the Study Area. The most significant routes are more than 10 nm to the west of the array area, with approximately 9,000 vessels a year utilising the Off Smalls TSS. Secondly, the route inshore of the Smalls is used by the Rosslare ferry, with approximately 2,500 movements per year.

16.5.6.5 Four routes are identified as passing through the Study Area from the Bristol Channel; one passing inshore of the Smalls, two joining the Off Smalls TSS (passing either side of the special yellow marks) and one through to Cork.

16.5.6.6 All of these routes are more than 2 nm from the array area and collectively account for 1,200 movements per year (Volume 2, Figure 16.8).

16.5.6.7 Three routes pass through the Study Area in a southwest-northeast direction. The main route from Land's End to Milford Haven is more than 7 nm clear to the east. Secondly, a minor route is identified between Land's End and inshore of the Smalls with <200 transits a year, passing 1.5 nm from the eastern boundary of the array area. This route consists of mostly 80-200 m cargo and tanker vessels between ports such as Liverpool, Rotterdam and Bilbao, or using the St Brides Bay anchorage. Thirdly, for vessels approaching Milford Haven from the Atlantic, a route of approximately 400 transits a year passes through the array area. These vessels originate from US Ports (Houston), Russia (Sabetta) or Ras Laffan (Qatar), including the largest LNG Tankers. This route is significantly dispersed with not all vessels transiting through the array area.

16.5.7 Historical Incidents

16.5.7.1 Analysis of MAIB, RNLI and MHPA incident data has been conducted to provide additional information on the background frequency and types of incidents which could occur or be exacerbated by the Project. Incidents at the array area are shown in Volume 2, Figure 16.7, which outlines the number and nature of incidents and their proximity to the Project.

16.5.7.2 Incidents within and around the array area are categorised as minor incidents involving small recreational, fishing and tug and service vessels.

16.5.8 Future Baseline Scenario

16.5.8.1 Relevant EIA Regulations (HM Government, 2017) require that "*a description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge*" is included within the ES.

16.5.8.2 As such, the future baseline for shipping and navigation is considered within this section, over the designed Project operation duration of 25 years. An assessment of the future baseline conditions, in the event that the Project does not come forward, has been undertaken.

16.5.8.3 It is anticipated that fishing activity is unlikely to change over the next 5 years as post-Brexit transitional arrangements remain in place, with both UK and non-UK vessels continuing to be active in the region. Past this period, it is anticipated that there may be a reduction in non-UK fishing activity due to restrictions. However, it is further anticipated that this will likely be balanced by an increase in UK fleet capacity. It is, therefore, envisaged that fishing activity levels will remain constant for lifetime of the Proposed Development.

16.5.8.4 Similarly, through analysis of data from the Department for Transport and MHPA, and in consultation with MHPA, it is concluded that the number of cargo vessels, tankers and passenger vessels is unlikely to change substantially over the Project lifetime. Further details on the analysis of the future baseline traffic profile is provided in the NRA (Volume 3, Technical Appendix 16.1: Navigational Risk Assessment).

16.5.8.5 Analysis of the RYA Water Sports Participation Survey, conducted in 2019, has found that it is unlikely that there will be a significant change in the number of recreational users during the Project lifecycle.

16.5.8.6 Overall, the future baseline for shipping and navigation, in the absence of the Project, is considered unlikely to change substantially from that presented in Section 16.5.

16.6 Potential Environmental Effects

16.6.1.1 This section presents the assessment of potential effects on shipping and navigation. Impacts occurring during construction, operation and maintenance and decommissioning phases are described within this Section. Where significant environmental impacts remain after standard measures have been factored in, details of additional mitigation and residual impacts are provided. Further information on the EIA process and methodology is outlined in Section 16.4.

16.6.1.2 In line with the approach adopted in the NRA (Volume 3, Technical Appendix 16.1: Navigational Risk Assessment), for impacts where there is no material difference in the likelihood of occurrence or severity of consequence between the three project phases (construction, operation and maintenance, and decommissioning), the assessment of potential effects is presented in a single combined section. For impacts where there are differences in the likelihood of occurrence or severity of consequence between the three project phases, the assessment of potential effects is presented separately for each phase.

16.6.1.3 Table 16.13 presents the key parameters from the project design envelope (PDE) that have been used to inform each impact assessment for shipping and navigation.

Table 16.13 - Project Design Envelope Parameters Relevant to Potential Shipping and Navigation Impacts

Potential Pathway Change / Impact	Phase			Realistic Worst Case Scenario	Justification
	C	*O*	*D*		
Presence of semi-submersible floating platform/WTG (in place) may lead to vessel-to-structure contact	✓	✓	✓	10 semi-submersible floating platform/WTGs Assumed that all commercial fishing activity excluded from entire array area plus 1 nm buffer	Maximum number of semi-submersible floating platform/WTGs resulting in the greatest risk of contact.
Breakout of semi-submersible floating platform/WTG (adrift) may lead to vessel-to-structure contact	✓	✓	✓	10 semi-submersible floating platform/WTGs	Maximum number of semi-submersible floating platform/WTGs resulting in the greatest risk of breakout.
Snagging with semi-submersible floating platform/WTG moorings, array cables or offshore export cable	✓	✓	✓	*Offshore export cable* 49 km offshore export cable length *Array cables* 23.9 km total length of inter array cable 56,250 m^2 footprint of array cable stablisation 83,380 m^2 footprint of export cable protection 210 m^2 Footprint of HDD exit protection area *Moorings* 35 mooring lines 870 m mooring line length per mooring line Assumed that all commercial fishing activity excluded from entire array area plus 1 nm buffer	Maximum protection footprint and number of mooring lines resulting in greatest risk of snagging.
Presence of project-related vessels, and displacement of vessels from the array area or	✓	✓	✓	***Construction*** Total offshore construction: 8 months	Greatest number of project-related construction vessel movements

Potential Pathway Change / Impact	Phase			Realistic Worst Case Scenario	Justification
	C	*O*	*D*		
offshore export cable corridor, may lead to vessel-to-vessel collision				Total duration of the offshore export cable installation: 152 days (based on sandwave levelling, boulder clearance, PLGR, multipass, installation, post-lay burial and protection installation) Total duration of inter-array cable installation: 88 days Maximum safety zone around construction vessels: 500 m during construction phase. ***Operation and Maintenance*** 2 x 12 hr day (CTV) (transit 1.5-2 hrs) per 24 hour period ***Decommissioning*** It is anticipated that the realistic worst case scenario during the decommissioning phase will be similar to the construction phase.	resulting in the greatest risk of collision.
Presence of cable laying vessel within port limits and approaches may lead to vessel-to-vessel collision	✓			The minimum cable lay rate is 1,000 m/day. The length of offshore export cable between landfall and MHPA port limits is 6 nm, which is approximately 11,000 m. At the slowest rate, the cable laying vessels would be actively laying cable for approximately 11 days within MHPA port limits.	The longest period of cable lay activity within MHPA limits will result in the greatest disruption to East Channel users.
Presence of rock protection may reduce under keel clearance and increase risk of grounding	✓	✓	✓	Reduction in UKC of greater than 5%.	This scenario is localised around landfall where the punchout, exit and any localised protection may reduce UKC beyond 5% in relation to the shallow water depth. The greater

Potential Pathway Change / Impact	Phase			Realistic Worst Case Scenario	Justification
	C	*O*	*D*		
					the reduction in UKC the greater the risk of grounding.
Presence of semi-submersible floating platform/WTG (and associated sub-surface infrastructure) may lead to vessel rerouting	✓	✓	✓	10 semi-submersible floating platform/WTGs Assumed that all commercial fishing activity excluded from entire array area plus 1 nm buffer	Maximum number of semi-submersible floating platform/WTGs resulting in the greatest risk of rerouting.
Presence of cable laying vessels may disrupt usage of the West and East Channel	✓			The minimum cable lay rate is 1,000 m/day. The length of offshore export cable between landfall and MHPA port limits is 6 nm, which is approximately 11,000 m. At the slowest rate, the cable laying vessels would be actively laying cable for approximately 11 days within MHPA port limits.	The longest period of cable lay activity within MHPA limits will result in the greatest disruption to East Channel users.
Presence of semi-submersible floating platform/WTG (and associated sub-surface infrastructure) may disrupt MHPA tanker waiting area	✓	✓	✓	10 semi-submersible floating platform/WTGs Maximum array area of 43.5 km^2	Maximum number of semi-submersible floating platform/WTGs resulting in the maximum disruption. Disruption will occur from beginning of subsea cable installation.
Presence of semi-submersible floating platform/WTG (and associated sub-surface infrastructure) may affect search and rescue operations	✓	✓	✓	10 semi-submersible floating platform/WTGs	Maximum number of semi-submersible floating platform/WTGs resulting in the maximum impact.
Presence of semi-submersible floating	✓	✓	✓	10 semi-submersible floating platform/WTGs	Maximum number of semi-

Potential Pathway Change / Impact	Phase			Realistic Worst Case Scenario	Justification
	C	*O*	*D*		
platform/WTG (and associated sub-surface infrastructure) may affect visual navigation and collision avoidance				Assumed that all commercial fishing activity excluded from entire array area plus 1 nm buffer	submersible floating platform/WTGs resulting in the maximum impact.
Presence of semi-submersible floating platform/WTG (and associated sub-surface infrastructure)may affect communications, radar and positioning systems	✓	✓	✓	10 semi-submersible floating platform/WTGs Assumed that all commercial fishing activity excluded from entire array area plus 1 nm buffer	Maximum number of semi-submersible floating platform/WTGs resulting in the maximum impact.

Presence of semi-submersible floating platform/WTG (in place) may lead to vessel-to-structure contact

16.6.1.4 For this effect, all three phases (construction, operation and maintenance, and decommissioning) are considered together, as there are no significant differences between the likelihood of occurrence or severity of consequence between the phases, that would result in a different level of significance of effect. Although the number of semi-submersible floating platform/WTGs in place will be greatest during the operation and maintenance phase, the embedded mitigation measures across all phases (particularly those relating to lighting and marking of semi-submersible floating platform/WTGs) will reduce the risk of vessel-to-structure contact to an extent that the likelihood of a contact occurring is extremely unlikely or remote (see below) regardless of the number of semi-submersible floating platform /WTGs in place. There is, therefore, no significant difference in the level of risk (and therefore the significance of effect) between the phases.

16.6.1.5 The physical presence of partially or fully constructed infrastructure within the array area may increase the risk of contact between vessels and the semi-submersible floating platform/WTGs. Contact could occur between the semi-submersible floating platform/WTGs and construction vessels, service vessels, fishing vessels, tankers, commercial vessels or recreational vessels. Any vessel may make contact with a semi-submersible floating platform/WTG whilst under power, through human error, steering failure, or whilst drifting through loss of power. This is most likely to occur when vessels are not under command, e.g. due to power failure.

16.6.1.6 The risk of contact between a vessel and the semi-submersible floating platform /WTGs may increase during adverse weather conditions, when strong winds, tides and poor visibility may cause vessels to drift towards the array area. This risk will be present throughout the construction, operation and maintenance, and decommissioning phases of the Project. The risk is present for all vessels navigating within the array area during all phases, which includes commercial vessels, fishing vessels, recreational vessels and tankers. Due to the nature of their operation, OWF construction vessels will only be present during construction; and OWF service vessels will only be present during operation.

Likelihood of Occurrence

16.6.1.7 The likelihood of contact will depend on the number of semi-submersible floating platform/WTGs in place into which vessels may collide, and the number of vessels transiting near the array area.

16.6.1.8 Vessels most likely to make contact with a semi-submersible floating platform/WTG are the OWF construction and service vessels, given their requirement to operate in relatively close proximity to the semi-submersible floating platform/WTGs. There is evidence of fishing activity around the array area, although limited within it. Compared with conventional OWFs with fixed monopiles, where fishermen routinely fish within the array area, the presence of subsurface infrastructure makes it more likely that fishermen will avoid the array area.

16.6.1.9 During the consultation (see Section 16.3), several consultees described the array area as becoming a “no-go area” for fishing. Therefore, there will be a natural tendency to offset fishing activities from the array area and a potential buffer area of approximately 1 nm and, as such, the risk of potentially contacting a semi-submersible floating platform/WTG is reduced. The likelihood of vessel-to-structure contact is considered remote for fishing and OWF construction and service vessels.

16.6.1.10 The likelihood of occurrence for commercial vessels, recreational vessels and tankers is considered to be extremely unlikely. The array area is not situated within any major offshore routes for commercial vessels, with the nearest major shipping route located more than 10 nm to the west. Furthermore, routes into the Bristol Channel typically pass to the north and routes into Milford Haven pass to the north or east of the array area. The array area is located a significant distance from shore with few recreational routes identified either in the data analysis or consultation.

Severity of Consequence

16.6.1.11 The extent of damage a vessel sustains on contact with a structure will depend on the energy of impact, the size and structural integrity of the vessel and structure, as well as the metocean conditions at the time of contact.

16.6.1.12 Given the size of the OWF construction and service vessels, a hard contact resulting in significant damage is a realistic possibility. Were a contact between a fishing vessel and semi-submersible floating platform/WTGs to occur, for example through mechanical breakdown, the most likely outcome would be a glancing contact with minor damage. The severity of consequence is moderate for fishing, OWF construction and service vessels.

16.6.1.13 A powered, commercial, ship making contact with a semi-submersible floating platform/WTG within the array area could result in significant damage to the semi-submersible floating platform/WTGs and the ship, resulting in major damage and pollution. However, given the proximity of these shipping routes, and the addition of the loitering vessels for Milford Haven, a drift contact is more likely, which has a lower potential consequence. In the event of contact between a recreational vessel and a semi-submersible floating platform/WTG, a glancing blow with minor damage is the most credible outcome.

16.6.1.14 Therefore, the severity of consequence for commercial vessels, recreational vessels and tankers is considered to be minor.

Significance of Effect

16.6.1.15 With a remote likelihood of occurrence and moderate severity of consequence, contact between the semi-submersible floating platform/WTGs (in place) and Project construction vessels, service vessels or fishing vessels, is considered to be a **tolerable (if ALARP)** risk, and therefore not significant in EIA terms.

16.6.1.16 With an extremely unlikely likelihood of occurrence and minor severity of consequence, contact between the semi-submersible floating platform/WTGs (in place) and tankers, commercial vessels or recreational vessels, is considered to be a **broadly acceptable** risk, and therefore not significant in EIA terms.

16.6.1.17 This is confirmed by the outcome of the NRA (Volume 3, Technical Appendix 16.1: Navigational Risk Assessment) which concludes that residual contact risk is medium or low for all vessel types.

Additional Mitigation and Residual Effect

16.6.1.18 None of risks identified above is intolerable/unacceptable (which would be significant in EIA terms). Therefore, no additional mitigation is required to reduce the significance to non-significant in EIA terms and the significance of residual effects remains as detailed above.

Breakout of semi-submersible floating platform/WTGs (adrift) may lead to vessel-to-structure contact

16.6.1.19 For this effect, all three phases (construction, operation and maintenance, and decommissioning) are considered together as there are no significant differences between the assessments, or outcomes between the phases.

16.6.1.20 Were the semi-submersible floating platform/WTG moorings to fail, and the semi-submersible floating platform/WTG become free and start to drift, it could become a navigational hazard to other vessels. Complete or partial breakout of the semi-submersible floating platform/WTG would introduce the risk of vessel-to-structure contact whilst the semi-submersible floating platform/WTG is adrift.

16.6.1.21 Should a semi-submersible floating platform/WTG breakout, this risk is present for commercial vessels, fishing vessels, OWF construction and service vessels, recreational vessels and tankers navigating within and around the array area. Due to the nature of their operation, OWF construction vessels will only be present during construction, and OWF service vessels will only be present during operation.

16.6.1.22 Breakout during tow-out will be considered separately by the Contractor through a tow-out passage plan and risk assessment and method statement as described by Risk Control ID 28 within Table 16.11. The tow out risk assessment will be developed in agreement with relevant authorities.

Likelihood of Occurrence

16.6.1.23 The likelihood of occurrence would depend on the likelihood of breakout and the existing vessel traffic activity within the area. The mooring systems are designed to resist extreme conditions such as a 50 year return period event (i.e. significant wave height of 12.5 m, wind speed of 40.4 m/s (1hr based)). Were the semi-submersible floating platform/WTGs to breakout, they will remain marked and visible to other navigating vessels, enabling them to identify and avoid the hazard.

16.6.1.24 Tracking and warning devices will be fitted to each semi-submersible floating platform/WTG, which will notify the Project when a semi-submersible floating platform/WTG exceeds its excursion limits and if the semi-submersible floating platform/WTG experiences partial or full breakout from the mooring system. This will allow an expeditious and appropriate response from the Project and relevant authorities.

16.6.1.25 Therefore, the likelihood of occurrence is extremely unlikely for commercial vessels, fishing vessels, OWF construction and service vessels, recreational vessels and tankers.

Severity of Consequence

16.6.1.26 The extent of damage a vessel sustains on contact with a structure will depend on the energy of impact, the size and structural integrity of the vessel and structure, as well as the metocean conditions and movement of the adrift semi-submersible floating platform/WTG at the time of contact.

16.6.1.27 Given the size of the OWF construction and service vessels, a hard contact with a drifting semi-submersible floating platform/WTG resulting in significant damage is a realistic possibility. Were a contact between a fishing vessel and semi-submersible floating platform/WTG to occur, for example through mechanical breakdown of the fishing vessel, the most likely outcome would be a glancing contact with minor damage.

16.6.1.28 A powered commercial ship making contact with a drifting semi-submersible floating platform/WTG could result in significant damage to the semi-submersible floating platform/WTG and the ship, resulting in major damage and pollution.

16.6.1.29 Given the proximity of these shipping routes, and the addition of the loitering vessels for Milford Haven, a drift contact is more likely which has a lower potential consequence. In the event of contact between a recreational vessel and a semi-submersible floating platform/WTG, a glancing blow with minor damage is the most credible outcome.

16.6.1.30 The severity of consequence is minor for commercial vessels, fishing vessels, OWF construction and service vessels, recreational vessels and tankers.

Significance of Effect

16.6.1.31 With an extremely unlikely likelihood of occurrence and minor severity of consequence, contact between the semi-submersible floating platform/WTGs (adrift) and commercial vessels, fishing vessels, OWF construction and service vessels, recreational vessels, tankers and is considered to be a **broadly acceptable** risk, and therefore not significant in EIA terms.

16.6.1.32 This is confirmed by the outcome of the NRA (Volume 3, Technical Appendix 16.1: Navigational Risk Assessment) which concludes that residual contact risk is low for all vessel types.

Additional Mitigation and Residual Effect

16.6.1.33 None of risks identified above is intolerable/unacceptable (which would be significant in EIA terms). Therefore, no additional mitigation is required to reduce the significance to non-significant in EIA terms and the significance of residual effects remains as detailed above.

Snagging with semi-submersible floating platform/WTGs moorings, array cables or offshore export cable

16.6.1.34 For this impact, the effects associated with each Project phase are considered separately.

Construction

16.6.1.35 The installation and presence, in a temporary or partially installed condition, of mooring lines, array cables and the offshore export cable during the construction phase introduces the risk of anchor or fishing gear snagging. The risk of snagging anchors or fishing gear with the semi-submersible floating platform/WTGs moorings, array cables or the offshore export cable is present for fishing vessels, OWF construction vessels, commercial vessels, recreational vessels and tankers.

16.6.1.36 Subsea cables are at risk of both anchor or fishing gear strikes and can pose a hazard to navigating vessels. The cable is intended to be fully buried or, where this is not possible, protected using rock armouring.

Likelihood of Occurrence

16.6.1.37 The likelihood of occurrence depends on the nature of the temporary condition, number of moorings, burial depth and length of cables as well as the number of vessels likely to drop anchor or deploy fishing gear in the vicinity. The vessel traffic data show limited fishing activity near to landfall (West Angle Bay), therefore, the risk of snagging is reduced.

16.6.1.38 Within the array area, in deeper water where there is greater fishing activity, the risk of snagging on semi-submersible floating platform moorings or array cables is higher. The likelihood of occurrence for snagging is remote for fishing and OWF construction vessels within the array area, and extremely unlikely along the offshore export cable corridor.

16.6.1.39 This is because the offshore export cable will be subject to cable burial or rock protection, reducing the likelihood of snagging. In contrast, the array cables and mooring lines within the array area are present throughout the water column.

16.6.1.40 For recreational vessels, the risk of snagging on the offshore export cable is limited to landfall, where vessels anchor in West Angle Bay. Given adequate protection, it is unlikely that a recreational vessel's anchor would either snag or damage the offshore export cable.

16.6.1.41 There is no evidence of commercial vessels anchoring in the vicinity of the offshore export cable corridor (Section 16.4.3). The presence of the offshore export cable in the East Channel could influence a pilot or master's decision to deploy an anchor in an emergency, such as following engine failure. These events are rare, and it is likely that the prevention of a grounding would be overriding requirement. Therefore, this scenario is not considered likely.

16.6.1.42 The likelihood of occurrence for snagging is extremely unlikely for commercial vessels, recreational vessels and tankers.

Severity of Consequence

16.6.1.43 Were a fishing vessel to snag the moorings, array cables or offshore export cable, the most likely outcome is loss of gear and potentially minor damage to the moorings, array cables or offshore export cable. The severity of consequence is moderate for fishing vessels. Given their size and purpose, the severity of consequence is also moderate for OWF construction vessels.

16.6.1.44 The severity of consequence is minor for commercial vessels, recreational vessels and tankers.

Significance of Effect

16.6.1.45 With a remote likelihood of occurrence and moderate severity of consequence, snagging of semi-submersible floating platform moorings, array cables or the offshore export cable with OWF construction vessels or fishing vessels is considered to be a **tolerable (if ALARP)** risk, and therefore not significant in EIA terms.

16.6.1.46 With an extremely unlikely likelihood of occurrence and minor severity of consequence, snagging of semi-submersible floating platform moorings, array cables or the offshore export cable with commercial vessels, recreational vessels or tankers is considered to be a **broadly acceptable** risk, and therefore not significant in EIA terms.

16.6.1.47 This is confirmed by the outcome of the NRA (Volume 3, Technical Appendix 16.1: Navigational Risk Assessment) which concludes that there is a medium risk of snagging for fishing and OWF construction vessels, and a low risk of snagging for all other relevant vessel types, during construction.

Operation and Maintenance

16.6.1.48 The presence of mooring lines, array cables and the offshore export cable during the operation and maintenance phase introduces the risk of anchor or fishing gear snagging. The risk of snagging anchors or fishing gear with the semi-submersible floating platform moorings, array cables or the offshore export cable is present for fishing vessels, OWF service vessels, commercial vessels, recreational vessels and tankers.

Likelihood of Occurrence

16.6.1.49 Unlike OWF construction vessels, OWF service vessels will not be involved in deployment of semi-submersible floating platform moorings, array cables or offshore export cables except during major maintenance works. They are also not anticipated to routinely deploy in-water equipment or anchor (other than in an emergency situation) and so are, therefore, at a lower risk of snagging. The likelihood of occurrence for snagging is extremely unlikely for OWF service vessels.

Severity of Consequence

16.6.1.50 Given their size and purpose, the severity of consequence is minor for OWF service vessels.

Significance of Effect

16.6.1.51 With an extremely unlikely likelihood of occurrence and minor severity of consequence, snagging of semi-submersible floating platform moorings, array cables or offshore export cable with OWF service vessels is considered to be a **broadly acceptable** risk, and therefore not significant in EIA terms.

16.6.1.52 With a remote likelihood of occurrence and moderate severity of consequence, snagging of semi-submersible floating platform moorings, array cables or the offshore export cable with fishing vessels is considered to be a **tolerable (if ALARP)** risk, and therefore not significant in EIA terms.

16.6.1.53 With an extremely unlikely likelihood of occurrence and minor severity of consequence, snagging of semi-submersible floating platform moorings, array cables or the offshore export cable with commercial vessels, recreational vessels or tankers is considered to be a **broadly acceptable** risk, and therefore not significant in EIA terms.

Decommissioning

16.6.1.54 It is assumed that the level of activity during the decommissioning phase will be equal to or less than during the construction phase. As such, the impact assessment for snagging of semi-submersible floating platform moorings, array cables or the offshore export cable during the construction phase is applicable to the decommissioning phase.

Additional Mitigation and Residual Effect

16.6.1.55 Snagging with semi-submersible floating platform moorings, array cables or offshore export cable was raised as a key concern during stakeholder consultation, particularly by representatives from the fishing community (see Table 16.4). As such, standard (or embedded) mitigation measures for reducing snagging risk have been developed and outlined in Table 16.11. Standard mitigation measures include the implementation of safety zones, suitable aids to navigation, a cable burial risk assessment and periodic validation surveys, fishing liaison plan and charting of the offshore export cable.

16.6.1.56 Standard mitigation measures have been considered within the assessment, and therefore none of risks identified above is intolerable/unacceptable (significant in EIA terms). Therefore, no additional mitigation is required to reduce the significance to non-significant in EIA terms and the significance of residual effects remains as detailed above.

Presence of project-related vessels, and displacement of vessels from the array area or offshore export cable corridor, may lead to vessel-to-vessel collision

16.6.1.57 For this impact, all three phases (construction, operation and maintenance, and decommissioning) are considered together, as there are no significant differences between the likelihood of occurrence or severity of consequence between the phases, that would result in a different level of significance of effect.

16.6.1.58 The Project could increase the risk of vessel-to-vessel collision in two ways.

16.6.1.59 Firstly, the construction of an OWF in an otherwise navigable area can displace vessels from the array area and/or offshore export cable corridor (the latter only during cable laying/removal activities), constraining shipping routes and resulting in pinch points or areas of high density. Although the area from which vessels may be displaced is greatest during the operation and maintenance phase, when the largest amount of infrastructure is present and for the longest duration, the difference in area between the partially and fully constructed array is small relative to the extent of the available sea space and the lack of key shipping routes in the vicinity of the array area, so there is no significant difference in the risk of vessel-to-vessel collision due to displacement (and therefore the significance of effect) between the phases.

16.6.1.60 Secondly, the risk of collision can be heightened due to the presence of additional Project-related vessel movements during all Project phases. Although the number of Project-related vessels will be greater during the construction and decommissioning phases, than during the operation and maintenance phase, the embedded mitigation measures across all phases reduce the risk of vessel-to-vessel collision such that there is no significant difference in the level of risk (and therefore the significance of effect) between the phases.

16.6.1.61 This section does not consider the risk of vessel-to-vessel collision between large vessels due to the presence of the cable laying vessel during construction, which is assessed as a separate impact in the following section due to the specific nature of the collision risk as identified during stakeholder discussions (see Section 16.3).

Likelihood of Occurrence

16.6.1.62 As described in Section 16.5, the array area is well clear of the major shipping routes in the Study Area. Analysis of waiting (loitering) vessels, presented within the NRA (Volume 3, Technical Appendix 16.1: Navigational Risk Assessment), shows that a majority of vessels waiting to enter Milford Haven wait to the east of the array area. Some offsetting of shipping, including loitering vessels, is inevitable due to the presence of OWF construction vessels and partially or fully constructed semi-submersible floating platform/WTGs during the construction and decommissioning phases, and the presence of semi-submersible floating platform/WTGs during the operation and maintenance phase; however, there is significant sea room to support this and, therefore, the increased risk of collision is considered to be negligible.

16.6.1.63 Project construction and service vessels will be required to comply with the principles of good seamanship, COLREGs and regulations of MHPA in order to safely transit within MHPA's port limits. Additionally, given the relatively low number of additional movements this will entail, there is not anticipated to be a substantial increase in collision risk.

16.6.1.64 The likelihood of occurrence is extremely unlikely for collisions between all other vessels within the array area and along the offshore export cable corridor.

Severity of Consequence

16.6.1.65 Collisions between vessels can result in significant damage, pollution or loss of life. Whilst the majority of collisions result in only damage to the two vessels, this can be significant enough to require dry dock and repair, removing them from service. Given the types of vessels operating at Milford Haven, there is also a tangible risk of significant pollution if the collision involved tankers.

16.6.1.66 The severity of consequence is moderate for collision between all other vessels within the array area and along the offshore export cable corridor.

Significance of Effect

16.6.1.67 With an extremely unlikely likelihood of occurrence and moderate severity of consequence, collision between all other vessels within the array area and along the offshore export cable corridor is considered to be a **broadly acceptable** risk, and therefore not significant in EIA terms.

16.6.1.68 This is confirmed by the outcome of the NRA (Volume 3, Technical Appendix 16.1: Navigational Risk Assessment), which concludes that the risk is low for all vessel types.

Additional Mitigation and Residual Effect

16.6.1.69 None of risks identified above is intolerable/unacceptable (significant in EIA terms). Therefore, no additional mitigation is required to reduce the significance to non-significant in EIA terms and the significance of residual effects remains as detailed above.

Presence of cable laying vessel within MPHA port limits and approaches may lead to vessel-to-vessel collision

16.6.1.70 This section considers the effects during the construction and decommissioning phases, as this impact is specific to the presence of cable laying vessels within MHPA limits, which will not be present during the operation and maintenance phase. Although maintenance to the cable within MHPA limits may be required during the operation and maintenance phase, it is unlikely to result in a greater likelihood of occurrence or severity of consequence than the construction or decommissioning phases.

16.6.1.71 This specific potential impact was raised by stakeholders (see Section 16.3) concerned about the increased risk of collision between large vessels, such as tankers, in the approaches to Milford Haven during installation of the offshore export cable. The presence of the cable laying vessel could displace large vessels such that there is an increased risk of collision.

16.6.1.72 During construction, it is anticipated that for between 1-2 weeks the cable laying vessel will be affecting movements into and out of Milford Haven, particularly within the East Channel. Additionally, for the safety of the cable laying vessel and other users, a temporary advisory safe distance of up to 1,000m around the cable laying vessel is proposed during the construction phase. The presence of the cable laying vessel could therefore impact all large vessels utilising the East and West Channels.

16.6.1.73 During decommissioning, the offshore export cable is likely to be removed to ensure that it does not become a hazard to other users of the seabed. The removal of buried cables is not an operation for which there is extensive precedent. However, it is expected that equipment similar to that used for cable installation could be used to reverse the burial process and expose the cables. Once the cables are exposed, grapples would be used to pull the cables onto the deck of the decommissioning vessel, cut them into manageable lengths, and take them to shore.

16.6.1.74 It is assumed that cable removal activities during the decommissioning phase would result in an equal (or less) displacement risk to large vessels than cable laying activities during the construction phase.

Likelihood of Occurrence

16.6.1.75 This impact is localised to the section of the offshore export cable corridor located within MHPA limits and is present for approximately two weeks during construction, and the same, or less, during decommissioning.

16.6.1.76 The likelihood of occurrence is remote for collision between large vessels navigating in the vicinity of the offshore export cable corridor within Milford Haven port limits and its approaches.

Severity of Consequence

16.6.1.77 Collisions between vessels can result in significant damage, pollution or loss of life. Whilst the majority of collisions result in only damage to the two vessels, this can be significant enough to require dry dock and repair, removing them from service. Given the types of vessels operating at Milford Haven, there is also a tangible risk of significant pollution if the collision involved tankers.

16.6.1.78 The severity of consequence is serious for collision between large vessels navigating in the vicinity of the offshore export cable corridor within Milford Haven port limits and its approaches.

Significance of Effect

16.6.1.79 With an extremely remote likelihood of occurrence and serious severity of consequence, collision between large vessels navigating in the vicinity of the offshore export cable corridor and associated advisory safe distance, as per within Milford Haven port limits and its approaches, is considered to be a **tolerable (if ALARP)** risk, and therefore not significant in EIA terms.

16.6.1.80 This is confirmed by the outcome of the NRA (Volume 3, Technical Appendix 16.1: Navigational Risk Assessment), which concludes that the risk is medium (tolerable) for large vessels navigating in the vicinity of the offshore export cable corridor and associated advisory safe distance within Milford Haven port limits and its approaches.

Additional Mitigation and Residual Effect

16.6.1.81 None of risks identified above is intolerable/unacceptable (significant in EIA terms). Therefore, no additional mitigation is required to reduce the significance to non-significant in EIA terms and the significance of residual effects remain as detailed above.

Presence of cable laying vessels may disrupt usage of the West and East Channel

16.6.1.82 This section considers the effects during the construction and decommissioning phases, as this impact is specific to the presence of cable laying vessels within MHPA limits, which will not be present during the operation and maintenance phase. This could impact all vessels utilising the East and West Channels. Although maintenance to the cable within the East and West Channels may be required during the operation and maintenance phase, this is unlikely to result in a greater likelihood of occurrence or severity of consequence than the construction or decommissioning phases.

Construction

16.6.1.83 A potential impact raised by stakeholders was the impact on vessel movements in the approaches to Milford Haven during installation of the offshore export cable. It is anticipated that for between 1-2 weeks the cable laying vessel will be affecting movements into and out of Milford Haven, particularly within the East Channel.

16.6.1.84 For the safety of the cable laying vessel, and other users, a 500 m temporary advisory safe distance around the cable laying vessel is proposed during the construction phase. This would result in several impacts:

- Temporary suspension of the use of the East Channel could cause operational impacts to large vessel movements into Milford Haven through displacement of vessels into the West Channel and potential co-existence conflicts;
- Recreational cruising to the south and southeast may not be feasible for small durations during cable laying; and
- Offsetting recreational users further inshore to avoid cable laying vessels could cause disruption to the firing range and co-existence conflicts.

16.6.1.85 The presence of cable laying vessels will cause disruption for a temporary period but this can be mitigated by continual liaison between the cable laying vessel and MHPA. In particular, the development of a suitable temporary inshore passage and operational co-ordination protocol when the ranges are active, is proposed to reduce displacement of recreational vessels, which would otherwise need to navigate round. These embedded mitigation measures are further described by Risk Control ID 15, 20 and 27 in Table 16.11.

Likelihood of Occurrence

16.6.1.86 This impact is localised to the section of the offshore export cable corridor located within MHPA limits (and the approaches) and is present for approximately two weeks during construction. The likelihood of occurrence is therefore reasonably probable for all vessels using the East and West Channels.

Severity of Consequence

16.6.1.87 The implementation of continual liaison between the cable laying vessel and MHPA, along with an operational co-ordination protocol for when the range is active, will result in a moderate severity of consequence.

Significance of Effect

16.6.1.88 With a reasonably probable likelihood of occurrence and moderate severity of consequence, disruption to operations at MHPA is considered to be a **Tolerable (if ALARP)** and therefore not significant in EIA terms.

Decommissioning

16.6.1.89 The offshore export cable is likely to be removed to ensure that it does not become a hazard to other users of the seabed. The removal of buried cables is not an operation for which there is extensive precedent. However, it is expected that equipment similar to that used for cable installation could be used to reverse the burial process and expose them. Once the cables are exposed, grapples would be used to pull the cables onto the deck of the decommissioning vessel, cut them into manageable lengths, and take them to shore.

16.6.1.90 It is assumed that any cable removal activities during the decommissioning phase would result in equal or less of a risk to shipping and navigation than cable laying activities during the construction phase. As such, the impact assessment for the construction phase as presented above is applicable to the decommissioning phase.

Additional Mitigation and Residual Effect

16.6.1.91 None of risks identified above is intolerable/unacceptable (significant in EIA terms). Therefore, no additional mitigation is required to reduce the significance to non-significant in EIA terms and the significance of residual effects remains as detailed above.

Presence of rock protection may reduce under keel clearance and increase risk of grounding

16.6.1.92 For this impact, all three phases (construction, operation and maintenance, and decommissioning) are considered together, as there are no significant differences between the likelihood of occurrence or severity of consequence between the phases, that would result in a different level of significance of effect. This is because although cable protection will begin to be present in construction phase, as it is deployed, the worst-case scenario occurs when all protection is in place during the operation and maintenance phase. As such, this assessment focusses on the operation and maintenance phase.

16.6.1.93 Any reduction in under keel clearance within West Angle Bay and around landfall due to the presence of external offshore export cable protection and/or rock protection at the HDD exit point, could increase the risk of grounding. This risk would be present for recreational and small fishing vessels which navigate inshore near the landfall.

16.6.1.94 The risk of grounding is localised to the landfall where water depths are shallower. Therefore, the risk of grounding is only relevant to small (<10 m) fishing and recreational vessels.

16.6.1.95 For the very nearshore/landfall portion and between 3m and 5m Lowest Astronomical Tide (LAT) there may be localised protection that reduces the depth beyond the 5% UKC threshold recommended by the RYA and MCA. Specifically, a ‘berm’ made of rock bags will be in place between kilometre point (KP) 0 and KP2. The berm will be 21 m in length, 5 m wide and 1.5 m high and situated at the HDD exit point at KP0.6.

Likelihood of Occurrence

16.6.1.96 As this reduction in depth lies within the line between Thorn Point and East Blockhouse Point, this is considered very localised, and any grounding hazard will likely only relate to small recreational fishing and recreational vessels within West Angle Bay, rather than on transit. Very few vessels navigate within West Angle Bay and, therefore, the likelihood of occurrence for grounding on areas of rock protection is extremely unlikely for fishing and recreational vessels.

Severity of Consequence

16.6.1.97 The vessels that do navigate within West Angle Bay are small and will navigate at low speeds. The severity of consequence for grounding is therefore minor for fishing and recreational vessels.

Significance of Effect

16.6.1.98 With an extremely unlikely likelihood of occurrence and minor severity of consequence, grounding of recreational or fishing vessels is considered to be a **broadly acceptable** risk and therefore not significant in EIA terms.

16.6.1.99 This is confirmed by the outcome of the NRA (Volume 3, Technical Appendix 16.1: Navigational Risk Assessment), which concludes that the risk of grounding is low for fishing and recreational vessels.

Additional Mitigation and Residual Effect

16.6.1.100 None of risks identified above is intolerable/unacceptable (significant in EIA terms). Therefore, no additional mitigation is required to reduce the significance to non-significant in EIA terms and the significance of residual effects remains as detailed above.

Presence of semi-submersible floating platform/WTGs (and associated sub-surface infrastructure) may lead to vessel rerouting

16.6.1.101 For this impact, all three phases (construction, operation and maintenance, and decommissioning) are considered together, as there are no significant differences between the likelihood of occurrence or severity of consequence between the phases, that would result in a different level of significance of effect.

16.6.1.102 The presence of Project structures within the array area will mean that vessels may need to deviate around this area during all Project phases. Although the number of semi-submersible floating platform/WTGs in place will be greatest during the operation and maintenance phase, and therefore the level of deviation may be lower during the construction phase compared to operation and maintenance phase, the likelihood of occurrence and severity of consequence will not differ significantly, regardless of the number of semi-submersible floating platform/WTGs in place. As such, the operational phase is considered within this section as the worst-case scenario. This would impact all commercial vessels utilising the routes identified in Volume 2: Figure 16.8. This impact is therefore considered to impact cargo vessels and tankers.

16.6.1.103 All routes described in Section 16.5.6 are well clear of the array area.

Likelihood of Occurrence

16.6.1.104 The number of vessels that follow established routes in/around the Study Area means that the likelihood of occurrence of some rerouting being required is reasonably probable for tankers and cargo vessels.

Severity of Consequence

16.6.1.105 Given that any deviation due to the Project would be a small proportion of the overall distance travelled by the vessels identified, it is anticipated that the additional deviation around the array area would have a minor severity of consequence.

Significance of Effect

16.6.1.106 With a reasonably probable likelihood of occurrence and minor severity of consequence, vessel rerouting is considered to be a **broadly acceptable** risk and therefore not significant in EIA terms.

Additional Mitigation and Residual Effect

16.6.1.107 None of risks identified above is intolerable/unacceptable (significant in EIA terms). Therefore, no additional mitigation is required to reduce the significance to non-significant in EIA terms and the significance of residual effects remains as detailed above.

Presence of semi-submersible floating platform/WTGs (and associated sub-surface infrastructure) may disrupt MHPA tanker waiting area

16.6.1.108 For this impact, all three phases (construction, operation and maintenance, and decommissioning) are considered together, as there are no significant differences between the likelihood of occurrence or severity of consequence between the phases, that would result in a different level of significance of effect. Although the area from which vessels may be offset is greatest during the operation and maintenance phase, when the largest amount of infrastructure is present and for the longest duration, the difference in area between the partially and fully constructed array is small relative to the extent of the available tanker waiting area, so there is no significant difference in the risk of vessel-to-vessel collision due to offsetting (and therefore the significance of effect) between the phases.

16.6.1.109 During analysis of existing vessel traffic activity (see Section 16.5.6) and stakeholder consultation with MHPA (see Section 16.3), it was noted that large commercial vessels calling at Milford Haven would routinely loiter approximately 10 nm offshore, including within the vicinity of the array area (see Volume 2, Figure 16.6). The presence of Project structures within the array area would offset these vessels, likely to the East. This waiting area is necessary for tankers waiting to enter Milford Haven, and a large reduction in available sea room could impact MHPA operations.

Likelihood of Occurrence

16.6.1.110 Whilst the presence of semi-submersible floating platform/WTGs (and associated sub-surface infrastructure) will inevitably inhibit vessels from waiting within the array area during the construction and operation phases of the Project, there is sufficient unobstructed and quiet sea room to the east for this to not frequently impact tankers waiting to enter Milford Haven. Additionally, the area available for waiting tankers is much larger than the reduction caused by the Project, and therefore impacts a low number of vessels. The likelihood of occurrence is considered to be reasonably probable.

Severity of Consequence

16.6.1.111 The presence of semi-submersible floating platform/WTGs (and associated sub-surface infrastructure) will displace tankers waiting to enter Milford Haven to the east of the array area. This could result in disruption of operations within Milford Haven and a restriction on the number of vessels able to enter or depart the Waterway, but this represents a very small reduction in the available sea room and so displacement is predicted to be minimal.

16.6.1.112 The severity of consequence is therefore considered to be negligible.

Significance of Effect

16.6.1.113 With a reasonably probable likelihood of occurrence and negligible severity of consequence, disruption to tankers waiting to enter MHPA is considered to be a **broadly acceptable** risk and therefore not significant in EIA terms.

Additional Mitigation and Residual Effect

16.6.1.114 None of risks identified above is intolerable/unacceptable (significant in EIA terms). Therefore, no additional mitigation is required to reduce the significance to non-significant in EIA terms and the significance of residual effects remains as detailed above.

Presence of semi-submersible floating platform/WTGs (and associated sub-surface infrastructure) may affect Search and Rescue operations

16.6.1.115 For this impact, the effects of all three phases (construction, operation and maintenance, and decommissioning) are considered together, as there are no significant differences between the likelihood of occurrence or severity of consequence between the phases, that would result in a different level of significance of effect.

16.6.1.116 The presence of partially or fully constructed Project structures could impact Search and Rescue (SAR) operations in the unlikely event of an incident when SAR assets are required to access the array area. In particular, semi-submersible floating platform/WTGs can pose an obstruction hazard to SAR helicopters.

16.6.1.117 *Likelihood of Occurrence*

16.6.1.118 The likelihood of occurrence is dependent on two aspects: the likelihood of SAR assets entering the array area; and the likelihood of Project structures impacting SAR operations within the array area.

16.6.1.119 Given the low baseline incident rate in the area and implementation of Project risk management measures (see Section 116.4.7), it is unlikely that SAR assets will need to enter the array area.

16.6.1.120 The Project is seeking to maintain a minimum of two lines of orientation and the relative spacing between platforms is sufficiently large (up to 3,200 m across wind and 3,500 m down wind between WTGs) that the potential excursion of up to 50 m of platforms around their nominal central location is considered sufficient to reduce risk to surface or aviation SAR, and not inhibit their ability to enter the array area and conduct operations.

16.6.1.121 The likelihood of occurrence of impacts to SAR operations is considered to be extremely unlikely.

Severity of Consequence

16.6.1.122 The potential disruption to SAR operations could lead to aviation or SAR assets not being able to enter the site or the nature of their operation to be constrained. This could result in the SAR operation being delayed and not being undertaken in a timely fashion.

16.6.1.123 The severity of consequence is considered to be moderate on SAR operations.

Significance of Effect

16.6.1.124 With an extremely unlikely likelihood of occurrence and moderate severity of consequence, disruption to SAR operations is considered to be a **broadly acceptable** risk and therefore not significant in EIA terms.

Additional Mitigation and Residual Effect

16.6.1.125 None of risks identified above is intolerable/unacceptable (significant in EIA terms). Therefore, no additional mitigation is required to reduce the significance to non-significant in EIA terms and the significance of residual effects remain as detailed above.

Presence of semi-submersible floating platform/WTGs (and associated sub-surface infrastructure) may affect visual navigation and collision avoidance

16.6.1.126 For this impact, the effects of all three phases (construction, operation and maintenance, and decommissioning) are considered together, as there are no significant differences between the likelihood of occurrence or severity of consequence between the phases, that would result in a different level of significance of effect.

16.6.1.127 Although the potential for disruption to visual navigation and collision avoidance is greatest during the operation and maintenance phase, when the largest amount of infrastructure is present and for the longest duration, the difference in area between the partially and fully constructed array is small relative to the extent of the available sea space and the lack of key shipping routes in the vicinity of the array area (see Section 16.5), so there is no significant difference in the significance of effects on visual navigation and collision avoidance between the phases.

16.6.1.128 The presence of partially or fully constructed Project structures could impact the visual navigation and collision avoidance of vessels navigating in the vicinity of the array area by physically obstructing and hindering the view of other vessels or any navigational features such as the coastline or aids to navigation.

Likelihood of Occurrence

16.6.1.129 Standard mitigation measures include the implementation of suitable aids to navigation, charting of array area and offshore export cable and appropriate promulgation of information, which will reduce disruption to navigation. Given the relatively low traffic density near the array area, the small size of the array area (43.5 km^2), the small diameter of the turbines (up to 242 m) and the distances to other navigation aids or hazards, the likelihood of occurrence is considered to be negligible. As a result, the likelihood of occurrence of any consequential collision is also considered to be negligible.

Severity of Consequence

16.6.1.130 If visual navigation of a vessel is impacted, the vessel may need to use alternative means for collision avoidance, and/or navigate accordingly and with additional precaution in order to avoid collision.

16.6.1.131 The severity of consequence is minor, in the event that visual navigation is disrupted for vessels within or around the array area.

Significance of Effect

16.6.1.132 With a negligible likelihood of occurrence and minor severity of consequence, the effect of visual navigation and collision avoidance is considered to be a **broadly acceptable** risk and therefore not significant in EIA terms.

Additional Mitigation and Residual Effect

16.6.1.133 None of risks identified above is intolerable/unacceptable (significant in EIA terms). Therefore, no additional mitigation is required to reduce the significance to non-significant in EIA terms and the significance of residual effects remains as detailed above.

Presence of semi-submersible floating platform/WTGs (and associated sub-surface infrastructure) may affect communications, radar and positioning systems of active vessels

16.6.1.134 For this impact, all three phases (construction, operation and maintenance, and decommissioning) are considered together, as there are no significant differences between the likelihood of occurrence or severity of consequence between the phases, that would result in a different level of significance of effect.

16.6.1.135 The presence of partially or fully constructed semi-submersible floating platform/WTGs could adversely affect the equipment used for navigation, collision avoidance or communications, such as VHF, AIS, GPS, Radar, noise signals and compasses.

16.6.1.136 Impacts to aviation radar are considered separately within Chapter 17: Aviation and Radar.

16.6.1.137 *Likelihood of Occurrence*

16.6.1.138 A significant body of work has been conducted to examine these impacts within the industry, which is detailed in the NRA (Volume 3, Technical Appendix 16.1: Navigational Risk Assessment). In summary, the size, number and location of Project structures is not anticipated to impact communications, radar and positioning systems of vessels navigating within the vicinity of the array area.

16.6.1.139 The likelihood of occurrence is considered to be negligible. As a result, the likelihood of occurrence of any consequential collision or contact (allision) is also considered to be negligible.

Severity of Consequence

16.6.1.140 If communications, radar or positioning systems of a vessel are impacted the vessel may use alternative means for collision avoidance and or navigate accordingly with additional precaution in order to avoid collision or contact (allision).

16.6.1.141 The severity of consequence is minor, in the event that communication, radar or positioning systems are disrupted for vessels within or around the array area.

Significance of Effect

16.6.1.142 With a negligible likelihood of occurrence and minor severity of consequence, impact to visual navigation and collision avoidance is considered to be a **broadly acceptable** risk and therefore not significant in EIA terms.

Additional Mitigation and Residual Effect

16.6.1.143 None of risks identified above is intolerable/unacceptable (significant in EIA terms). Therefore, no additional mitigation is required to reduce the significance to non-significant in EIA terms and the significance of residual effects remains as detailed above.

16.6.2 Effects on Human Health and Population

16.6.2.1 Potentially, risks to human health arising from the impacts identified within this ES chapter, such as vessel collision, are considered within the assessment presented in Section 116.6.

16.6.2.2 It is therefore concluded that there will be no effects on population or human health in relation to shipping and navigation.

16.7 Additional Mitigation

16.7.1.1 No additional mitigation is required further than the designed-in risk controls outlined in Table 16.11.

16.8 Monitoring

16.8.1.1 The NRA (Volume 3, Technical Appendix 16.1: Navigational Risk Assessment) identified that the following potential monitoring may be undertaken. Details of this monitoring will be included in the Project Environmental Monitoring and Mitigation Plan that will be developed prior to construction:

- The array area to be under continuous monitoring by radar, AIS, closed circuit television (CCTV) or other agreed means (to minimum of MGN654 standard) during construction and immediate period (3 months) post construction, whilst traffic habituates, to MCA approval - Consider use of guard vessel to achieve this function; and
- Location monitoring device (GPS based) providing warning on breach of semi-submersible floating platform/WTGs' position near/beyond excursion limits and position tracking in event of partial/full breakout. Device should be integrated with AIS transponder.

16.9 Inter-Related Effects

16.9.1.1 The assessment of effects arising from construction, operation and decommissioning of the Project indicates that effects on receptors addressed in different aspects of the Project may potentially further contribute to the effects assessed on shipping and navigation and *vice versa*. These are primarily from Chapter 15: Commercial Fisheries.

16.9.1.2 The EIA regulations (2018) require consideration of the inter-relationships between topics that may lead to environmental effects. For example, these occur when a number of separate effects affect a single receptor.

16.9.1.3 For clarity, the areas of interaction between effects are listed below:

- Vessel-to-vessel collision due to presence of Project-related vessels and displacement of vessels from the array area. This has been assessed within Section 16.6 of this chapter, and both Chapter 15: Commercial Fisheries, and Volume 3, Technical Appendix 15.1: Commercial Fisheries Technical Report;
- Vessel-to-structure contact due to presence of semi-submersible floating platform/WTGs (in place). This has been assessed within Section 16.6 of this chapter, and both Chapter 15: Commercial Fisheries, and Volume 3, Technical Appendix 15.1: Commercial Fisheries Technical Report;
- Snagging with semi-submersible floating platform moorings, array cable or the offshore export cable. This has been assessed within Section 16.6 of this chapter, and both Chapter 15: Commercial Fisheries, and Volume 3, Technical Appendix 15.1: Commercial Fisheries Technical Report; and
- Change in navigable water depth. This has been assessed within Section 16.6 of this chapter, and both Chapter 15: Commercial Fisheries, and Volume 3, Technical Appendix 15.1: Commercial Fisheries Technical Report.

16.9.1.4 The scale of effects on shipping and navigation progressively increases during the construction phase, as the semi-submersible floating platform/WTGs and ancillary structures are installed and become operational, and a greater number of vessels are increasingly displaced. Although the temporal effect is lengthened, with the implementation of the proposed mitigation, across the Project lifetime the effects on shipping and navigation are not anticipated to interact in such a way that will result in combined effects of greater significance than the assessments presented for each individual phase.

16.9.1.1 Receptor led effects are those effects with the potential to interact, spatially and temporally, to have a greater effect on the same receptor. The worst case impacts assessed within this ES chapter take these interactions into account and therefore the impact assessments are considered conservative and robust.

16.9.1.2 An increase in vessel numbers, and displacement of vessels into other areas, has the potential to have direct effects on:

- Marine mammals, as assessed in Chapter 12: Marine Mammals with effects no greater than minor adverse significance predicted across all Project phases; and
- Marine ornithology, as assessed in Chapter 11: Offshore Ornithology with effects no greater than minor adverse significance across all project phases.

16.10 Cumulative Effects Assessment

16.10.1.1 A Cumulative Effects Assessment (CEA) has been made, based on existing and proposed developments in the Study Area (Chapter 30: Cumulative Effects). The approach to the CEA is described in Chapter 2: Overview of EIA Methodology and Chapter 30: Cumulative Effects. Cumulative effects are defined as those effects on a receptor that may arise when the development is considered together with other reasonably foreseeable projects.

16.10.1.2 The shipping and navigation CEA takes into consideration the Cumulative Impact Assessment Guidelines issued by RenewablesUK in 2013. The emphasis is on the assessment of potentially significant effects, rather than on comprehensively cataloguing every conceivable effect that might occur (Renewables UK, 2013), thus allowing a meaningful and balanced analysis of the environmental effects.

16.10.1.3 In assessing the potential cumulative effects, it should be noted that proposed and in-development projects may or may not be taken forward. Plans not yet approved are less certain to be brought forward and therefore less certain to contribute to the effects assessed.

16.10.1.4 Reasonably foreseeable projects with the potential to effect shipping and navigation are detailed in Table 16.14. It is noted that Bombora Wave Energy (mWave) is located near the Project landfall at West Angle Bay, however no cumulative effects are anticipated to arise in relation to shipping and navigation during construction, operations and maintenance phases.

Table 16.14 – Developments considered within the Cumulative Effects Assessment

Project	Distance from array (km)	Distance from export cable	Footprint of project area (km)	Construction Timings
Marine Energy Test Area (META)	37.2	1.5	1.52	As a test site deployment and recovery will be dictated by client bookings.

Project	Distance from array (km)	Distance from export cable	Footprint of project area (km)	Construction Timings
				There is no programme, and activity will be managed by NtM and stakeholder updates.
Greenlink Interconnector	17.8	0	0.16	2024
Project Valorous	3.3	9.7	150	2026 to 2028

16.10.1.5 The consideration of projects that could result in potential cumulative effects on shipping and navigation receptors is assessed based on the results of the assessment, a review of the status of other projects, together with the professional judgement of the specialist consultants.

16.10.1.6 The potential cumulative effects of the Pembrokeshire Demonstration Zone (PDZ) have not been considered at the time of writing due to the lack of detail with which to assess the effects of the proposed project. An EIA Scoping Report was produced and issued to NRW in 2018 for a proposed wave/floating wind project however based on discussions with Celtic Sea Power (the 3rd party agents for the PDZ) and recent public presentations by members of Celtic Sea Power, it is understood the PDZ will be repurposed as an offshore electrical hub. In the absence of an updated EIA Scoping Report and insufficient project information to allow the effects to be reasonably understood and a cumulative assessment undertaken, it has been omitted from this assessment.

16.10.1.7 For those reasons identified above, including the absence of EIA Scoping Reports, the potential cumulative effects of the recently announced Llyr 1, Llyr 2 and Whitecross FLOW projects are also omitted from this cumulative assessment.

16.10.1.8 As set out in PINS Guidance Note 17: Cumulative Effects Assessment, the Project proposed an assessment cut-off date of 1 October 2021 to allow the finalisation of the EIA and HRA assessments, even if project information came forward between the cut-off date and submission. This was agreed with NRW Marine Licensing, noting that in the absence of S.36/Marine Licence guidance the Project was drawing upon the best available advice. It is understood that should sufficient detail of these projects come forward following submission the Project may be requested to provide additional information during the determination period.

16.10.2 Construction

16.10.2.1 The construction of a development necessitates increased vessel movements and new structures which could impact navigational safety. It is possible that the construction phase of the Project could overlap with the construction, operation and maintenance, and decommissioning associated with other projects including META, Greenlink and Project Valorous. These potential cumulative effects are considered below.

16.10.2.2 Presence of Project-related vessels, and displacement of vessels from the array area or offshore export cable corridor, may lead to vessel-to-vessel collision. During construction of the Project, there will be an increase in activity of project-related vessels operating between the array area and Milford Haven. These vessels could collide with each other and other vessels, particularly in the approaches to the Port of Milford Haven. This may include traffic associated with other cumulative projects.

16.10.2.3 Whilst unlikely, cable laying operations for the Project could coincide with maintenance activities associated with subsea cables within the Celtic Sea, such as the Greenlink Interconnector. Any risks of collision as a result of these works will require careful management and co-operation between the various stakeholders, which can be achieved by compliance with the embedded mitigation measures, particularly RC ID 1 (promulgation of information), 14 (Fishing Liaison Plan), 15 (Project Vessel Marine Operations Plan, Traffic Co-ordination Plan and Promulgation of Information), 20 (marine traffic coordination) and 27 where relevant (MHPA Waterway management in East Channel works).

16.10.2.4 A 3.3 km (minimum) separation between the Project and Project Valorous could result in increased vessel collisions, as vessels are funnelled. However, the vessel traffic analysis has not identified this as a major route therefore the likelihood of vessels meeting here is low and owing to the minimum spacing, which is likely to be greater than 3.3 km when allowing for the mooring spread (between semi-submersible platforms of the respective projects) the likelihood of two vessels meeting here is not significant.

16.10.2.5 Collectively, the three offshore projects in relatively close proximity, reduce the visual and electronic (radar/AIS) identification of other vessels. However, as the major routes pass around the project sites, it is unlikely that vessels could emerge undetected and pose an additional risk of collision. Furthermore, the research presented in Section 8.8 of the NRA (Volume 3, Technical Appendix 16.1: Navigational Risk Assessment) demonstrates that these effects have not been shown to be significant.

16.10.2.6 A suite of standard mitigation measures is proposed to reduce the risk of vessel-to-vessel collision during the construction of the Project, as described in Section 16.4.7. It is assumed that similar measures will apply to any other marine developments, which will further reduce the risk of vessel-to-vessel collision.

16.10.2.7 The cumulative effects of vessel-to-vessel collision are not considered to be significantly worse than the Project in isolation.

16.10.3 Operation

16.10.3.1 During the operational phase of a Project, the footprint of the Project, and the transits of maintenance vessels, could cause impacts on navigational safety. The operational phase of the Project could coincide with construction, operation and decommissioning works associated with other projects including META, Greenlink and Project Valorous. These potential cumulative effects are considered below.

16.10.3.2 Presence of semi-submersible floating platform/WTG (and associated sub-surface infrastructure) may disrupt the MHPA tanker waiting area. Cumulatively, the three offshore projects reduce the available sea room for loitering vessels waiting for entry into Milford Haven. This could bring them closer together and increase the risk of collision. However, the vessel traffic analysis carried out for the NRA (Volume 3, Technical Appendix 16.1: Navigational Risk Assessment) demonstrated that there are relatively few concurrent waiting vessels, and the risk of two meeting is low.

16.10.3.3 The cumulative effects are not considered to be significantly worse than the Project in isolation.

Presence of semi-submersible floating platform/WTGs (in place) may lead to vessel-to-structure contact

16.10.3.4 The additional infrastructure in the Study Area will necessarily increase the risk of contact between vessels and semi-submersible floating platform/WTGs.

16.10.3.5 Given the orientation of the shipping routes with the other cumulative developments, vessels would necessarily be routed a greater distance from the Project in order to avoid Project Valorous. Therefore, the risk of contact may decrease for the Project.

16.10.3.6 During operational/maintenance activities at Project Valorous, the project support vessels would likely transit past the Project array area to their base. Whilst it is not anticipated they would transit through the array area, a navigational error or mechanical failure in close proximity to the semi-submersible floating platform/WTGs could result in additional contacts.

16.10.3.7 A suite of mitigation measures is proposed to reduce the risk of contact with semi-submersible floating platform, during the operation of the Project, as described in Section 16.4.7. It is assumed that similar measures will apply to any other marine developments, which will further reduce the risk of contact with semi-submersible floating platform.

16.10.3.8 The cumulative effects are not considered to be significantly worse than the Project in isolation.

16.10.3.9 Presence of semi-submersible floating platform/WTGs (and associated sub-surface infrastructure) may lead to vessel rerouting. The development which could cause cumulative impacts on vessel traffic routing is Project Valorous. The Greenlink Interconnector only interacts with the Project offshore export cable close to landfall, so there are no cumulative vessel traffic routing effects.

16.10.3.10 Only one vessel route intersects the Project array area, namely a dispersed route between the Atlantic and Milford Haven. Volume 2, Figure 16.8 shows the possible impacts on vessel routeing.

16.10.3.11 Firstly, a minor route between Land's End and inshore of the Smalls would have a small deviation further west, away from the Project array area. Given the low numbers of vessels on this route, and the minor deviation, the effect on vessel routeing is minor and is considered to be no worse than the Project in isolation.

16.10.3.12 Secondly, a route between the Off Smalls TSS and the Bristol Channel, passing to the south of the special yellow marks, would likely need to pass further north, adjoining the existing route between the same two locations. This may increase the disruption to activities of the Firing Practice Area. Given these vessels are currently travelling further to pass to the south of the mark, the distance travelled by these vessels would be reduced.

16.10.3.13 The cumulative effects are not considered to be significantly worse than the Project in isolation.

16.10.3.14 Presence of Project-related vessels, and displacement of vessels from the array area or offshore export cable corridor, may lead to vessel-to-vessel collision. During operation of the Project, there will be an increase in activity of project-related vessels operating between the array area and Milford Haven, and vessels carrying out maintenance along the offshore export cable. Whilst fewer than the construction phase, these vessels could collide with each other, and other vessels, particularly in the approaches to the Port of Milford Haven. This may include traffic associated with other cumulative projects.

16.10.3.15 Whilst unlikely, cable maintenance operations for the Project could coincide with maintenance activities associated with other subsea cables within the area, particularly the Greenlink Interconnector. Any risks of collision as a result of these works will require careful management and cooperation between the various stakeholders, which can be achieved by compliance with the embedded mitigation measures, particularly Risk Controls 1 (promulgation of information), 14 (Fishing Liaison Plan) and 20 (marine traffic coordination).

16.10.3.16 A 3.3 km separation between the Project and Project Valorous could result in increased vessel collisions, as vessels are funnelled. However, the vessel traffic analysis has not identified this as a major route and, therefore, the likelihood of two vessels meeting here is not significant.

16.10.3.17 Collectively, the three offshore projects in relatively close proximity reduce the visual and electronic (radar/AIS) identification of other vessels. However, as the major routes pass around the project sites, it is unlikely that vessels could emerge undetected and pose an additional risk of collision. Furthermore, the research presented in Section 8.8 of the NRA (Volume 3, Technical Appendix 16.1: Navigational Risk Assessment) demonstrates that these effects have not been shown to be significant.

16.10.3.18 A suite of standard mitigation measures is proposed to reduce the risk of vessel-to-vessel collision during the operation of the Project, as described in Section 116.4.7. It is assumed that similar measures will apply to any other marine developments, which will further reduce the risk of vessel-to-vessel collision.

16.10.3.19 The cumulative effects are not considered to be significantly worse than the Project in isolation.

16.10.4 Decommissioning

16.10.4.1 It is assumed that the level of project-related vessel activity during the decommissioning phase will be equal to or less than during the construction phase. The cumulative assessment for the construction phase as presented above is, therefore, applicable to the decommissioning phase.

16.11 Transboundary

16.11.1.1 Any potential for significant transboundary effects, with regard to shipping and navigation from the Project upon the interests of other EEA States and the UK has been assessed as part of the holistic shipping and navigation EIA. Due to the international nature of shipping and navigation activity, transboundary effects are an integral part of the NRA and EIA and so are considered as part of the assessments presented in this ES chapter.

16.12 Summary

16.12.1.1 The shipping and navigation assessment considers potential impacts to all vessel types that operate within and around the array area and offshore export cable corridor, including cargo vessels, fishing vessels, passenger vessels, recreational vessels, Project-related vessels, tug and service vessels and tankers.

16.12.1.2 The baseline environment for the shipping and navigation assessment was characterised through a desk-based study of existing datasets and Project-specific marine vessel traffic surveys.

16.12.1.3 The survey data and desktop review indicated that the majority of shipping routes pass clear of the Project. Tankers wait offshore before entering the Port of Milford Haven, transiting at slow speed before being called to enter the port. Inshore, there is a relatively high number of small (<15 m) commercial fishing vessels operating out of local ports. Static gear (pots) is the main method of fishing with some netting and trawling. Further offshore, in and around the array area, larger (>15 m) UK and non-UK vessels are active. Given the distance of the array area from shore (approximately 45 km), very few recreational craft were recorded transiting near to the array area, although some recreational activity is recorded near cable landfall in West Angle Bay.

16.12.1.4 A number of potential effects on shipping and navigation, associated with the construction, operation and maintenance, and decommissioning of the Project, were identified. These included: vessel-to-vessel collision due to the presence of Project-related vessels, and displacement of vessels from the array area; vessel contact with offshore Project structures; and snagging and damage to anchors and/or fishing gear on offshore Project structures. With the proposed embedded mitigation measures in place, all of these effects result in effects of broadly acceptable or tolerable (if As Low as Reasonably Practicable (ALARP)) significance.

16.12.1.5 Vessel-to-vessel collision was deemed to be of broadly acceptable or tolerable (if ALARP) significance (not significant in EIA terms) for all vessel types due to the low density of vessel activity in the Project area and the implementation of embedded mitigation measures including Aids to Navigation.

16.12.1.6 Vessel-to-structure contact with Project structures was deemed to be broadly acceptable for tankers, commercial vessels or recreational vessels, and tolerable (if ALARP) for Project construction vessels, service vessels or fishing vessels (not significant in EIA terms), due to the proposed use of safety zones during construction/major maintenance and decommissioning phases, marker buoys and other Aids to Navigation which will be deployed on a device-specific basis.

16.12.1.7 Snagging and damage to anchors and/or fishing gear on offshore Project structures (particularly moorings and cables) was deemed to be of tolerable (if ALARP) significance for Project construction vessels and fishing vessels, and broadly acceptable for all other vessel types (not significant in EIA terms) as cables will be buried in the seabed where possible, and all underwater snagging hazards will be clearly communicated to stakeholders and marked on navigation charts.

16.12.1.8 Cumulative effects from other projects were assessed and predicted to result in effects of broadly acceptable or tolerable (if ALARP) significance (not significant in EIA terms) upon shipping and navigation.

Table 16.15 – Summary of Effects

Impact	Description of Effect	Phase			Tolerability of Potential Effect (assuming standard mitigation implemented)		Additional Mitigation Measure	Tolerability of Residual Effect	
		C	O	D	Tolerability	Beneficial / Adverse		Tolerability	Beneficial / Adverse
Presence of project-related vessels, and displacement of vessels from the array area or offshore export cable corridor, may lead to vessel-to-vessel collision	Collision of Large Vessels with Large Vessels	✓	✓	✓	Tolerable (if ALARP)	Adverse	None	Tolerable (if ALARP)	Adverse
	Collision of Large Vessels with Small Vessels	✓	✓	✓	Broadly Acceptable	Adverse	None	Broadly Acceptable	Adverse
	Collision of Small Vessels with Small Vessels	✓	✓	✓					
Presence of cable laying vessel within port limits and approaches may lead to vessel-to-vessel collision	Collision of Large Vessels with Large Vessels	✓	x	✓	Tolerable (if ALARP)	Adverse	None	Tolerable (if ALARP)	Adverse
Presence of semi-submersible floating platform (in place) may lead to vessel-to-structure contact	Contact/Allision with semi-submersible floating platform (in place) of Fishing Vessels	✓	✓	✓	Tolerable (if ALARP)	Adverse	None	Tolerable (if ALARP)	Adverse
	Contact/Allision with semi-submersible floating platform (in place) of OWF Construction Vessels	✓	x	✓					

Impact	Description of Effect	Phase			Tolerability of Potential Effect (assuming standard mitigation implemented)		Additional Mitigation Measure	Tolerability of Residual Effect	
		C	O	D	Tolerability	Beneficial / Adverse		Tolerability	Beneficial / Adverse
Presence of semi-submersible floating platform (in place) may lead to vessel-to-structure contact	Contact/Allision with semi-submersible floating platform (in place) of OWF Service Vessels		✓		Tolerable (if ALARP)	Adverse	None	Tolerable (if ALARP)	Adverse
	Contact/Allision with semi-submersible floating platform (in place) of Commercial vessels	✓	✓	✓	Broadly Acceptable	Adverse	None	Broadly Acceptable	Adverse
	Contact/Allision with semi-submersible floating platform (in place) of Recreational Vessels	✓	✓	✓					
	Contact/Allision with semi-submersible floating platform (in place) of Tankers	✓	✓	✓					

Impact	Description of Effect	Phase			Tolerability of Potential Effect (assuming standard mitigation implemented)		Additional Mitigation Measure	Tolerability of Residual Effect	
		C	O	D	Tolerability	Beneficial / Adverse		Tolerability	Beneficial / Adverse
Breakout of semi-submersible floating platform/WTGs (adrift) may lead to vessel-to-structure contact	Contact/Allision with semi-submersible floating platform/WTG adrift (due to semi-submersible floating platform/WTGs breakout) of Commercial vessels	✓	✓	✓	Broadly Acceptable	Adverse	None	Broadly Acceptable	Adverse
	Contact/Allision with semi-submersible floating platform/WTGs adrift (due to semi-submersible floating platform/WTGs breakout) of OWF Service Vessels		✓						
	Contact/Allision with semi-submersible floating platform/WTGs adrift (due to semi-submersible floating platform/WTGs breakout) of Fishing Vessels	✓	✓	✓					
	Contact/Allision with semi-submersible floating platform/WTGs adrift (due to semi-submersible floating platform/WTGs breakout) of OWF Construction Vessels	✓		✓					

Impact	Description of Effect	Phase			Tolerability of Potential Effect (assuming standard mitigation implemented)		Additional Mitigation Measure	Tolerability of Residual Effect	
		C	O	D	Tolerability	Beneficial / Adverse		Tolerability	Beneficial / Adverse
Breakout of semi-submersible floating platform/WTGs (adrift) may lead to vessel-to-structure contact	Contact/Allision with semi-submersible floating platform/WTGs adrift (due to semi-submersible floating platform/WTGs breakout) of Recreational Vessels	✓	✓	✓	Broadly Acceptable	Adverse	None	Broadly Acceptable	Adverse
	Contact/Allision with semi-submersible floating platform/WTGs adrift (due to semi-submersible floating platform/WTGs breakout) of Tankers	✓	✓	✓					
Presence of rock protection may reduce under keel clearance and increase risk of grounding	Grounding (offshore export cable corridor only) of Fishing Vessels	✓	✓	✓	Broadly Acceptable	Adverse	None	Broadly Acceptable	Adverse
	Grounding (offshore export cable corridor only) of Recreational Vessels	✓	✓	✓					

Impact	Description of Effect	Phase			Tolerability of Potential Effect (assuming standard mitigation implemented)		Additional Mitigation Measure	Tolerability of Residual Effect	
		C	O	D	Tolerability	Beneficial / Adverse		Tolerability	Beneficial / Adverse
Snagging with semi-submersible floating platform moorings, array cable or export cable	Snagging with semi-submersible floating platform moorings, array cables or export cable of Fishing Vessels	✓	✓	✓	Tolerable (if ALARP)	Adverse	None	Tolerable (if ALARP)	Adverse
	Snagging with semi-submersible floating platform moorings, array cables or export cable of OWF Construction Vessels	✓		✓					
	Snagging with semi-submersible floating platform moorings, array cables or export cable of OWF Service Vessels		✓		Broadly Acceptable	Adverse	None	Broadly Acceptable	Adverse
	Snagging with semi-submersible floating platform moorings, array cables or export cable of Commercial vessels	✓	✓	✓					

Impact	Description of Effect	Phase			Tolerability of Potential Effect (assuming standard mitigation implemented)		Additional Mitigation Measure	Tolerability of Residual Effect	
		C	O	D	Tolerability	Beneficial / Adverse		Tolerability	Beneficial / Adverse
Snagging with semi-submersible floating platform moorings, array cable or export cable	Snagging with semi-submersible floating platform moorings, array cables or export cable of Recreational Vessels	✓	✓	✓	Broadly Acceptable	Adverse	None	Broadly Acceptable	Adverse
	Snagging with semi-submersible floating platform moorings, array cables or export cable of Tankers	✓	✓	✓					
Presence of semi-submersible floating platform/WTG (and associated sub-surface infrastructure) may lead to vessel rerouting	Tanker and Cargo vessels rerouteing due to presence of Project structures	✓	✓	✓	Broadly Acceptable	Adverse	None	Broadly Acceptable	Adverse
Presence of cable laying vessels may disrupt usage of the East and West Channels	Presence of cable layer disrupting usage of the East and West Channels resulting in disruption to MHPA operations	✓			Tolerable (if ALARP)	Adverse	None	Tolerable (if ALARP)	Adverse

Impact	Description of Effect	Phase			Tolerability of Potential Effect (assuming standard mitigation implemented)		Additional Mitigation Measure	Tolerability of Residual Effect	
		C	O	D	Tolerability	Beneficial / Adverse		Tolerability	Beneficial / Adverse
Presence of semi-submersible floating platform/WTG (and associated sub-surface infrastructure) may disrupt MHPA tanker waiting area	Presence of Project structures resulting in insufficient sea room for Tankers waiting to enter MHPA and disruption to MHPA operations	✓	✓	✓	Broadly Acceptable	Adverse	None	Broadly Acceptable	Adverse
Presence of semi-submersible floating platform/WTG (and associated sub-surface infrastructure) may affect search and rescue operations	Presence of Project structures inhibiting search and rescue assets from entering and operating within array area	✓	✓	✓	Broadly Acceptable	Adverse	None	Broadly Acceptable	Adverse
Presence of semi-submersible floating platform/WTG (and associated sub-surface infrastructure) may affect visual navigation and collision avoidance	Presence of Project structures disrupting visual navigation and collision avoidance resulting in increased collision risk	✓	✓	✓	Broadly Acceptable	Adverse	None	Broadly Acceptable	Adverse

Impact	Description of Effect	Phase			Tolerability of Potential Effect (assuming standard mitigation implemented)		Additional Mitigation Measure	Tolerability of Residual Effect	
		C	O	D	Tolerability	Beneficial / Adverse		Tolerability	Beneficial / Adverse
Presence of semi-submersible floating platform/WTG (and associated sub-surface infrastructure) may affect communications, radar and positioning systems	Presence of Project structures disrupting communications, radar and positioning systems resulting in increased collision and contact (allision) risk	✓	✓	✓	Broadly Acceptable	Adverse	None	Broadly Acceptable	Adverse

Table 16.16 – Summary of Cumulative Effects

Receptor	Effect	Cumulative Developments	Tolerability of Cumulative Effect	
			Tolerability	Beneficial/ Adverse
All vessels	Vessel-to-vessel collision	Project Valorous, META and Greenlink Interconnector	Broadly acceptable	Adverse
All vessels	Vessel-to-structure contact	Project Valorous and	Tolerable (if ALARP)	Adverse
Waiting tankers	Disruption to MHPA operations	Project Valorous and	Broadly Acceptable	Adverse
Vessels using identified routes	Vessel rerouting	Project Valorous	Broadly Acceptable	Adverse

16.13 References

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