Morecambe Offshore Windfarm: Generation Assets

Environmental Statement

Volume 5

Chapter 14 Shipping and Navigation

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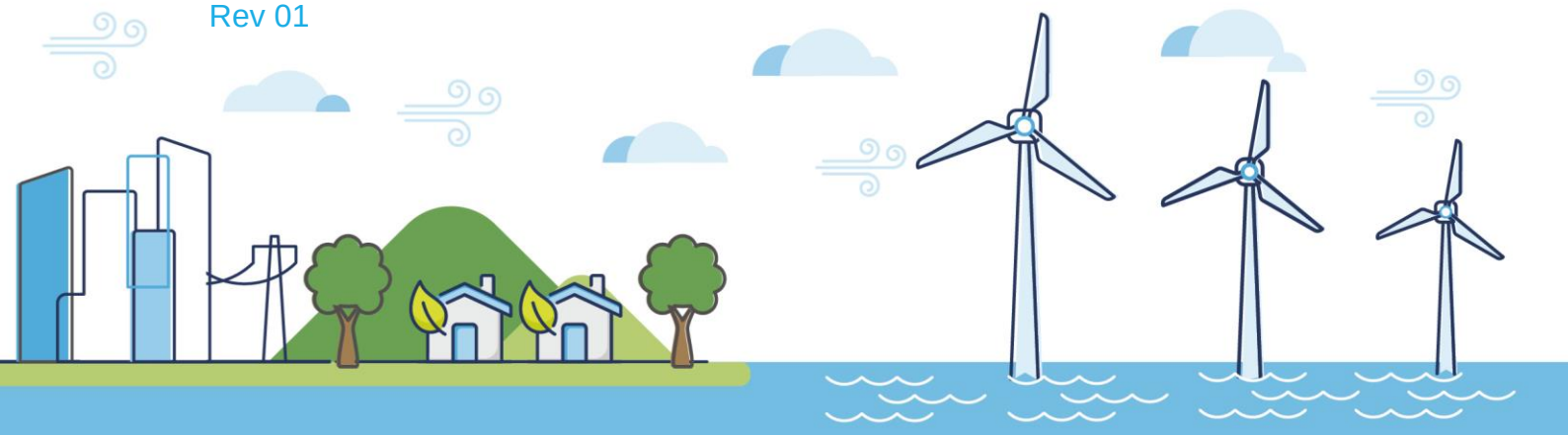

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Glossary of Acronyms

ABP	Associated British Ports
AfL	Agreement for Lease
AIS	Automatic Identification System
ALARP	As Low As Reasonably Practicable
ANIFPO	Anglo-North Irish Fish Producers Organization
AtoN	Aid to Navigation
AyM	Awel y Môr
BEIS	Department of Business, Energy and Industrial Strategy[1]
CBRA	Cable Burial Risk Assessment
CCS	Carbon Capture Storage
CEA	Cumulative Effects Assessment
CGOC	Coast Guard Operations Centre
CHA	Competent Harbour Authority
COLREGS	International Convention for the Prevention of Collision at Sea
CoS	Chamber of Shipping
CPC	Central Processing Complex
CPP	Central Processing Platform
CRNRA	Cumulative Regional Navigation Risk Assessment
CTV	Crew Transfer Vessel
DCO	Development Consent Order
Defra	Department for Environment, Food & Rural Affairs
DESNZ	Department for Energy Security and Net Zero
DfT	Department for Transport
DIO	Defence Infrastructure Organisation
DP	Drilling Platform
DSC	Digital Selective Calling
DWT	Deadweight Tonnes
EIA	Environmental Impact Assessment
ERCoP	Emergency Response and Cooperation Plan
ERRV	Emergency Rescue and Recovery Vessel
ES	Environmental Statement

[1]As of February 2023, the Department of Business, Energy and Industrial Strategy (BEIS) is known as the Department for Energy Security and Net Zero (DESNZ).

FSA	Formal Safety Assessment
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HAT	Highest Astronomical Tide
HAZID	Hazard Identification
HDD	Horizontal Directional Drilling
HMCG	His Majesty's Coastguard
HRA	Habitats Regulations Assessment
HSE	Health and Safety Executive
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
IGOMO	The International Guidance for Offshore Marine Operations
IHO	International Hydrographic Organisation
IMO	International Maritime Organisation
IoM	Isle of Man
IoMSPC	Isle of Man Steam Packet Company
IPMP	In Principle Monitoring Plan
LOA	Length Overall
Lo-Lo	Lift-on/Lift-off
LPS	Local Port Service
LSE	Likely Significant Effect
MAIB	Marine Accident Investigation Branch
MCA	Maritime and Coastguard Agency
MGN	Marine Guidance Note
MHWS	Mean High Water Springs
MMO	Marine Management Organisation
MNEF	Maritime Navigation Engagement Forum
MOD	Ministry of Defence
NPS	National Policy Statement
NRA	Navigational Risk Assessment
NSIP	Nationally Significant Infrastructure Project
NtM	Notice to Mariners
O&G	Oil and Gas
OGA	Oil and Gas Authority
OREI	Offshore Renewable Energy Infrastructure
OSP	Offshore substation platform

PDE	Project Design Envelope
PEIR	Preliminary Environmental Information Report
PEXA	Practice and Exercise Areas
PINS	Planning Inspectorate
PLB	Personal Locator Beacons
PMSC	Port Marine Safety Code
PPE	Personal Protective Equipment
PSV	Platform Supply Vessels
QHSE	Quality Health and Safety Executive
REWS	Radar Early Warning System
REZ	Renewable Energy Zone
RIDDOR	Reporting of Injuries, Diseases and Dangerous Occurrences Regulations
RNLI	Royal National Lifeboat Institute
RoPax	Roll-on/roll-off passenger vessel
Ro-Ro	Roll-on/Roll-off
RSPB	Royal Society for the Protection of Birds
RYA	Royal Yachting Association
SAR	Search and Rescue
SBM	Single Buoy Mooring
SHA	Statutory Harbour Authority
SOLAS	Safety of Life at Sea
SPS	Signification Peripheral Structures
SWFPA	Scottish Whitefish Producers Association
TCPA	Time to Closest Point of Approach
TEU	Twenty-foot Equivalent Units
TH	Trinity House
TSC	Territorial Seas Committee
TSS	Traffic Separation Scheme
UK	United Kingdom
UKC	Under Keel Clearance
UKHO	UK Hydrographic Office
UKSARH	UK Search and Rescue Helicopter
UNCLOS	The United Nations Convention on the Law of the Sea
VHF	Very High Frequency
VMS	Vessel Monitoring System
VTMP	Vessel Traffic Management Plan

VTS	Vessel Traffic Services
WFSV	Wind Farm Service Vessel
WTG	Wind turbine generator

Glossary of Unit Terms

km	kilometre
m	metre
MW	Megawatts
nm	nautical mile

Glossary of Terminology

Allision	The act of striking or collision of a moving vessel against a stationary object.
Applicant	Morecambe Offshore Windfarm Ltd
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 associated with the shipping activity.
Generation assets (the Project)	Generation assets associated with the Morecambe Offshore Windfarm. This is infrastructure in connection with electricity production, namely the fixed foundation wind turbine generators (WTGs), inter-array cables, offshore substation platform(s) (OSP(s)) and possible platform link cables to connect OSP(s).
In-row	The distance separating WTGs in the main rows.
Inter-array cables	Cables which link the WTGs to each other and the OSP(s).
Inter-row	The distance between the main rows.
Landfall	Where the offshore export cables would come ashore.
Marine Guidance Note (MGN)	A system of guidance notes issued by the Maritime and Coastguard Agency which provide significant advice relating to the improvement of the safety of shipping and of life at sea, and to prevent or minimise pollution from shipping.
Morgan and Morecambe Offshore Wind Farms: Transmission Assets	The transmission assets for the Morgan Offshore Wind Project and the Morecambe Offshore Windfarm. This includes the OSP(s)[2], interconnector cables, Morgan offshore booster station, offshore export cables, landfall site, onshore export cables, onshore substations, 400kV cables and associated grid connection infrastructure such as circuit breaker infrastructure. Also referred to in this document as the Transmission Assets, for ease of reading.
Offshore export cables	The cables which would bring electricity from the offshore substation platform to the landfall.
Offshore substation platform(s) (OSP(s))	A fixed structure located within the windfarm site, containing electrical equipment to aggregate the power from the WTGs and convert it into a more suitable form for export to shore.

[2] At the time of writing the Environmental Statement (ES), a decision had been taken that the offshore substation platforms (OSP(s)) would remain solely within the Generation Assets application and would not be included within the Development Consent Order (DCO) application for the Transmission Assets. This decision post-dated the Preliminary Environmental Information Report (PEIR) that was prepared for the Transmission Assets. The OSP(s) are still included in the description of the Transmission Assets for the purposes of this ES as the Cumulative Effects Assessment (CEA) carried out in respect of the Generation/Transmission Assets is based on the information available from the Transmission Assets PEIR.

Platform link cable	An electrical cable which links one or more OSP(s).
Safety Zone	An area around a structure or vessel which should be avoided, as set out in Section 95 of the Energy Act 2004 and the Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations 2007.
Study area	This is an area which is defined for each Environmental Impact Assessment (EIA) topic which includes the windfarm site as well as potential spatial and temporal considerations of the impacts on relevant receptors. The study area for each EIA topic is intended to cover the area within which an effect can be reasonably expected. A study area of 10 nautical miles (nm) around the windfarm site has been assessed in line with industry best-practice for shipping and navigation.
Technical stakeholders	Technical consultees are considered to be organisations with detailed knowledge or experience of the area within which the Project is located and/or receptors which are considered in the EIA and Habitats Regulations Assessment (HRA). Examples of technical stakeholders include Marine Management Organisation (MMO), local authorities, Natural England and Royal Society for the Protection of Birds (RSPB).
Wind Turbine Generator (WTG)	A fixed structure located within the windfarm site that converts the kinetic energy of wind into electrical energy.
Windfarm site	The area within which the WTGs, inter-array cables, OSP(s) and platform link cables would be present.

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14 The future of renewable energy

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14 Shipping and Navigation

14.1 Introduction

14.1 This chapter of the Environmental Statement (ES) considers the potential effects of the proposed Morecambe Offshore Windfarm Generation Assets (the Project) on shipping and navigation. This chapter provides an overview of the existing environment, followed by an assessment of the potential effects and associated mitigation, where identified, for the construction, operation and maintenance, and decommissioning phases.

14.2 The Project includes the Generation Assets to be located within the windfarm site (wind turbine generators (WTGs), inter-array cables, offshore substation platform(s) (OSP(s)) and possible platform link cables to connect OSP(s)). The Environmental Impact Assessment (EIA) of the transmission assets, including offshore export cables to landfall and onshore infrastructure, is part of a separate Development Consent Order (DCO) application as outlined in **Chapter 1 Introduction** (Document Reference 5.1.1).

14.3 This assessment has been undertaken with specific reference to the relevant legislation and guidance, of which the primary source is the National Policy Statements (NPS). Details of these and the methodology used for the EIA and Cumulative Effects Assessment (CEA) are presented in in **Chapter 6 EIA Methodology** (Document Reference 5.1.6) and **Section 14.4** of this chapter.

14.4 The assessment should be read in conjunction with following linked ES chapters and supporting documentation:

- **Chapter 7 Marine Geology, Oceanography and Physical Processes** (Document Reference 5.1.7) – identifies changes in sediment movement arising from the Project
- **Chapter 13 Commercial Fisheries** (Document Reference 5.1.13) - changes in shipping and navigation may cause displacement of commercial fishing activities
- **Chapter 16 Civil and Military Aviation and Radar** (Document Reference 5.1.16) - considers impacts on communications and Search and Rescue (SAR) helicopter operations
- **Chapter 17 Infrastructure and Other Users** (Document Reference 5.1.17) - considers impacts to other marine users operations, which may also include impacts to associated vessel access and Radar Early Warning Systems (REWS) for oil and gas platforms.
- **Chapter 19 Human Health** (Document Reference 5.1.19) - changes in shipping and navigation may cause indirect effects on human health, for example displacement of recreational vessels

- **Chapter 20 Socio-economics, Tourism and Recreation** (Document Reference 5.1.20) - changes in shipping and navigation may cause indirect effects, for example displacement of recreational vessels

14.5 Inter-relationships with these chapters are further described in **Section 14.10**.

14.6 Additional information that has been used to support the Shipping and Navigation assessment includes a navigation risk assessment (NRA) conducted for the Project and a Cumulative Regional Navigation Risk Assessment (CRNRA) which has been conducted with other Irish Sea Round 4 projects:

- **Appendix 14.1 Navigation Risk Assessment** (Document Reference 5.2.14.1)
- **Appendix 14.2 Cumulative Regional Navigation Risk Assessment** (Document Reference 5.2.14.2)

14.1.1 Background and Project updates following Preliminary Environmental Information Report

14.7 The Project Preliminary Environmental Information Report (PEIR) was published for statutory consultation in April - June 2023. As part of the PEIR, an NRA was undertaken for the Project to identify and assess the hazards and risks affecting shipping and navigation.

14.8 A cumulative regional assessment (CRNRA) was also undertaken as part of the PEIR to consider the cumulative navigation hazards and risks associated with the Project and other proposed Irish Sea Round 4 offshore windfarm projects, namely Mona Offshore Wind Project and Morgan Offshore Wind Project Generation Assets. Given the concurrency at which these projects are progressing through the planning process, and that each project is located within 10 nautical miles (nm) of one another, many stakeholders have raised the potential significance of cumulative shipping and navigation effects. In a conventional approach to EIA, each project would progress the cumulative assessment independently within each NRA. Given the proximity of each project and the concurrent NRAs, it was agreed by the respective Applicants to undertake a combined cumulative assessment to address these concerns, and this was welcomed by stakeholders. The objective of the CRNRA is thus to enable The Planning Inspectorate (PINS) and stakeholders to engage with, and understand, the potential cumulative effects of the projects. Adopting this regional (collaborative) approach to assessment also enables the individual projects to quantify and manage the cumulative effects in a coordinated, consistent and efficient manner. The CRNRA dovetails with the individual NRAs of each project.

14.9 The NRA to support the PEIR determined that the impacts of the Project individually would result in hazards that are Tolerable if As Low As Reasonably

Practicable (ALARP). Cumulatively, the CRNRA determined that the proposed Irish Sea Round 4 offshore windfarm projects would result in unacceptable risks to navigation and significant impacts to lifeline ferry schedules.

14.10 Since the publication of the PEIR and considering Section 42 PEIR consultation responses received, all three projects collectively made commitments to address the unacceptable cumulative risks, particularly through changes to site boundaries and increasing the lines of orientation for the windfarm layout.

14.11 The key design changes made by the Project to reduce the impacts were:

- Realignment of the Project's western boundary extent to minimise course changes (and deviation distance) for vessels navigating north-south between the Project and the Mona Offshore Wind Project, and between the Project and the Morgan Offshore Wind Project Generation Assets
- Commitment to two lines of orientation in the layout of surface structures within the Project's windfarm site

14.12 Both these design changes have been included within the embedded mitigation for the Project **Section 14.3.3**.

14.13 The NRA for the Project and the CRNRA have been updated to account for the changes made by the projects through additional data collection, navigation simulations and a further hazard workshop in September 2023 attended by representatives from ferry operators, regulators, commercial bodies, oil and gas operators, ports and fishing community. The results of the updated NRA and CRNRA inform this ES chapter assessment.

14.14 The NRA provided in **Appendix 14.1** presents the updated assessment based on the revised Project boundary and changes and assesses whether the risks have been reduced from that assessed at the PEIR stage.

14.15 The CRNRA provided in **Appendix 14.2** presents the updated assessment of the revised boundaries of all three projects to assess whether all risks have been reduced to either Broadly Acceptable or Tolerable if ALARP based on the additional commitments discussed above. The Morgan and Morecambe Offshore Wind Farms Transmission Assets project was also included as a further project within the updated CRNRA.

14.2 Consultation

14.16 Extensive consultation with shipping and navigation stakeholders has been undertaken by the Applicant. Following early feedback from stakeholders, and concerns around cumulative effects, the Applicant has been coordinating assessments and consultation with the developers of the other Irish Sea

Round 4 offshore windfarm projects, namely Mona Offshore Wind Project and Morgan Offshore Wind Project Generation Assets.

14.17 As part of this consultation, key shipping and navigation stakeholders, including representatives from ferry operators, regulators, commercial bodies, oil and gas operators, ports and fishing community, participated in the NRA and CRNRA process through participation in Formal Safety Assessment (FSA) hazard workshops, during which stakeholders had the opportunity to input into the hazard scoring process and confirm agreement to the outcomes of the workshops.

14.18 Additionally ferry operators participated in full bridge simulations of ferry passages through the Irish Sea to understand, in more detail, potential navigation impacts of the Irish Sea Round 4 projects on existing commercial ferries and to test the viability and safety of commercial ferry transits between and around the projects in normal and adverse weather conditions. These simulations were undertaken initially in 2022 to assess the PEIR boundaries of the projects. Thereafter, simulations were repeated in 2023 to assess whether the revised site boundaries of the projects have improved navigation.

14.19 The Applicant has also participated in the Marine Navigation Engagement Forum (MNEF) which has been established since 2021 to enable the Irish Sea Round 4 offshore windfarm developers to regularly update stakeholders on development plans and progress in relation to the Project, the Mona Offshore Wind Project, the Morgan Offshore Wind Project Generation Assets and the Morgan and Morecambe Offshore Wind Farms Transmission Assets. The MNEF also provides stakeholders a forum to express views or concern on the impacts of the projects for discussion.

14.20 Consultation has been undertaken in line with the general process described in **Chapter 6 EIA Methodology**. The key elements undertaken to inform this ES have included:

- Scoping (Scoping Opinion from PINS received on 2nd August 2022)
- Comments received on the PEIR (including NRA and CRNRA) which was published for statutory consultation in April 2023
- Consultation undertaken as part of the NRA and CRNRA (**Appendix 14.1** and **Appendix 14.2**), including participation of key stakeholders within FSA hazard workshops and full bridge simulator sessions conducted with ferry operators throughout 2022 and 2023
- Targetted consulaton with selected stakeholders as required, and liaison via the MNEF

14.21 The feedback received throughout the above-described consultation has been considered in preparing this ES. The key comments pertinent to this chapter

are shown in **Table 14.1**, alongside details of how the Project team has had regard to the comments received and how they have been addressed within this chapter.

14.22 The consultation process is described further in **Chapter 6 EIA Methodology**.

14.23 Full details on the consultation undertaken throughout the EIA process is presented in Section 6.12 of the Consultation Report (Document Reference 4.1) which is submitted as part of the DCO Application.

Table 14.1 Consultation responses received in relation to shipping and navigation and how these have been addressed in the ES

Consultee	Date	Comment	Response/where addressed in the ES
Scoping Opinion responses			
PINS (ref 3.8.1)	2nd August 2022	The Applicant proposes to scope out cumulative impact on snagging risk for all phases of the Proposed Development. The Scoping Report states that potential snagging risk impacts would be of limited spatial influence. However, the Scoping Report does not provide any evidence to support this conclusion. As shown on Figure 8.23 of the Scoping Report, there are a number of existing or proposed offshore wind farms in the vicinity of the Proposed Development so it appears to the Inspectorate that there could be a cumulative impact. In the absence of information such as evidence demonstrating clear agreement with relevant statutory bodies, the Inspectorate is not in a position to agree to scope this matter from the assessment. Accordingly, the ES should include an assessment of this matter or the information referred to demonstrating agreement with the relevant consultation bodies and the absence of a likely significant effect (LSE).	Where snagging incidents occur, they are specific to each individual project, however these have been considered regionally within the CEA **Section 14.8**. Snagging risk may be a causal factor leading to cumulative effects (displacement of fishing vessels, for example), however, in itself, it does not present a cumulative impact. Impacts associated with displacement of fishing vessels are assessed in **Chapter 13 Commercial Fisheries**.
PINS (ref 3.8.2)	2nd August 2022	Cumulative impacts on marine navigation equipment and SAR are proposed to be scoped out of the ES but the Scoping Report does not provide a justification for this approach. As noted above, the number of offshore wind farms in the Irish Sea is expected to increase. In the absence of information such as evidence demonstrating clear agreement with relevant statutory bodies, the Inspectorate is not in a position to agree to scope this matter from the assessment.	Cumulative effects on communications, radar and positioning are assessed in **Section 14.8**.

Consultee	Date	Comment	Response/where addressed in the ES
		Accordingly, the ES should include an assessment of this matter or the information referred to demonstrating agreement with the relevant consultation bodies and the absence of an LSE.	
PINS (ref 3.8.3)	2nd August 2022	A study area of 10 nautical miles (NM) has been proposed for the shipping and navigation assessment. The ES should explain the rationale behind the choice of study area and, where possible, the approach should be agreed with the relevant consultation bodies.	The study area is described in **Section 14.3.1**. A 10nm study area is in line with industry best practice and is approved by the Maritime and Coastguard Agency (MCA). The CRNRA (**Appendix 14.2**) extends this study area to assess the potential cumulative regional risks of Project with the Mona and Morgan Offshore Wind Projects. Consideration in the CEA is also given to the Morgan and Morecambe Offshore Wind Farms: Transmission Assets and Awel y Môr (AyM) and Mooir Vannin offshore windfarms (OWFs) (**Section 14.8**) which are located outside the 10nm study area.
PINS (ref 3.8.4)	2nd August 2022	The ES should identify a future baseline for vessel movements and explain how this has been established, taking into account the existing sea users and the numerous proposed offshore wind farm projects in the vicinity.	Future vessel traffic profiles are considered in **Section 14.6**.
MCA	14th July 2022	The Environmental Impact Report should supply detail on the possible impact on navigational issues for both commercial and recreational craft, specifically: ▪ Collision Risk ▪ Navigational Safety ▪ Visual intrusion and noise	An assessment of effects has been undertaken in **Section 14.7** and cumulatively in **Section 14.8**, with navigation risks assessed within the NRA (**Appendix 14.1**). A REWS assessment is also provided in **Appendix 17.2 Radar Early Warning System Technical Report** (Document

Consultee	Date	Comment	Response/where addressed in the ES
		▪ Risk Management and Emergency response ▪ Marking and lighting of site and information to mariners ▪ Effect on small craft navigational and communication equipment ▪ The risk to drifting recreational craft in adverse weather or tidal conditions ▪ The likely squeeze of small craft into the routes of larger commercial vessels	Reference 5.2.17.2) of **Chapter 17**, **Infrastructure and Other Users**. The requirement to agree marking and lighting in line with Trinity House (TH) requirements and enforce an Emergency Response and Cooperation Plan (ERCoP) are included as embedded mitigation for the Project (**Section 14.3.3**).
MCA	14th July 2022	The development area carries a significant amount of traffic with a number of important commercial shipping routes to/from United Kingdom (UK) ports and the Irish Sea, particularly lifeline ferries between UK, Isle of Man and Ireland. Attention needs to be paid to routeing, particularly in heavy weather routeing so that vessels can continue to make safe passage without large-scale deviations.	Impacts to routeing, including ferry and commercial vessel routeing are assessed in **Section 14.7** and cumulatively in **Section 14.8**.
MCA	14th July 2022	The likely cumulative and in combination effects on shipping routes should be considered which will be an important issue to assess for this project. It should consider the proximity to other windfarm developments, other infrastructure, and the impact on safe navigable sea room with an appropriate assessment of the distances between Offshore Renewable Energy Infrastructure (OREI) boundaries and shipping routes as per MGN 654.	A CRNRA has been undertaken and is contained in **Appendix 14.2** and summarised in **Section 14.8**. This assesses impacts as a result of reduced navigable sea room between multiple OREI.
MCA	14th July 2022	It is noted that a Navigational Risk Assessment will be submitted in accordance with MGN 654. This should be accompanied by a detailed MGN 654 Checklist.	The NRA is contained in **Appendix 14.1** and includes a completed MGN654 checklist (**Appendix 14.1**, Appendix A).
MCA	14th July 2022	The cumulative impacts of other windfarms in close proximity, in particular the proposed Morgan and Mona	A cumulative regional assessment has been undertaken and is contained in **Appendix**

Consultee	Date	Comment	Response/where addressed in the ES
		offshore wind farms will change routeing. Attention must be paid for ensuring the established shipping routes in the Irish sea, particularly ferry routes, can continue safely without unacceptable deviations.	**14.2** and presented within **Section 14.8**, which assesses effects as a result of reduced navigable sea room between OREIs. Impacts to routeing, including ferry and commercial vessel routeing, are assessed in **Section 14.7** and cumulatively in **Section 14.8**.
MCA	14th July 2022	The turbine layout design will require MCA approval prior to construction to minimise the risks to surface vessels, including rescue boats, and SAR aircraft operating within the site. Any additional navigation safety and/or Search and Rescue requirements, as per MGN 654 Annex 5, will be agreed at the approval stage.	The requirement for MCA approval of turbine layout is included as an embedded mitigation for the Project (**Section 14.3.3**).
MCA	14th July 2022	Attention should be paid to cabling routes and where appropriate burial depth for which a Burial Protection Index study should be completed and subject to the traffic volumes, an anchor penetration study may be necessary. If cable protection measures are required e.g. rock bags or concrete mattresses, the MCA would be willing to accept a 5% reduction in surrounding depths referenced to Chart Datum. This will be particularly relevant where depths are decreasing towards shore and potential impacts on navigable water increase, such as at the Horizontal Directional Drilling (HDD) location.	Potential impacts of snagging on cabling within the windfarm site, both inter-array and platform link cables, are assessed in **Section 14.7.2.6**. Effects resulting from installation of the Morgan and Morecambe Offshore Wind Farms: Transmission Assets are being separately assessed as part of the Transmission Assets DCO application. However, a combined assessment with the Transmission Assets has been considered as part of the CEA in **Section 14.8.3.1**. Embedded mitigations including cable burial risk assessments and hydrographic surveys are included as embedded mitigation (**Table 14.3**).

Consultee	Date	Comment	Response/where addressed in the ES
MCA	14th July 2022	Particular consideration will need to be given to the implications of the site size and location on SAR resources and ERCoP. The report must recognise the level of radar surveillance, Automatic Identification System (AIS) and shore-based Very High Frequency (VHF) radio coverage and give due consideration for appropriate mitigation such as radar, AIS receivers and in-field, Marine Band VHF radio communications aerial(s) (VHF voice with Digital Selective Calling (DSC)) that can cover the entire wind farm sites and their surrounding areas. A SAR checklist will also need to be completed in consultation with MCA, as per MGN 654 Annex 5 SAR requirements.	Impacts to communication, radar and positioning are assessed in **Section 14.7**. A completed MGN654 checklist is found in **Appendix 14.1**.
MCA	14th July 2022	MGN 654 Annex 4 requires that hydrographic surveys should fulfil the requirements of the International Hydrographic Organisation (IHO) Order 1a standard, with the final data supplied as a digital full density data set, and survey report to the MCA Hydrography Manager. Failure to report the survey or conduct it to Order 1a might invalidate the Navigational Risk Assessment if it was deemed not fit for purpose.	The requirement to undertake hydrographic surveys, in line with MGN654 requirements, is included in the embedded mitigation for the Project (**Section 14.3.3**).
Isle of Man Government Department of Infrastructure	11th August 2022	The Territorial Seas Committee (TSC) is of the opinion that the Isle of Man should be identified as one of the main stakeholders given the proximity of the Manx territorial limits and the impact either of these proposed offshore windfarms could have on the island, particularly Morgan.	Noted, the Project has undertaken consultation with the Isle of Man Government including within the MNEF and hazard workshops undertaken to inform both the NRA and CRNRA. Full details are given in the Consultation Report (Document Reference 4.1).
Isle of Man Government Department of Infrastructure	11th August 2022	As an island nation, any significant risk of interference with marine navigation is of concern to the TSC with regard to transport to and from the island, and the shipping lanes in our territorial waters which are used to	Impacts to commercial routes, including ferry routes, are assessed in **Section 14.7.1.1, Section 14.7.1.2**, **Section 14.7.2.1, Section**

Consultee	Date	Comment	Response/where addressed in the ES
		connect the UK and Ireland. These are strategic lifeline routes that the island depends on and it is essential that these are not impacted on, particularly Morgan.	**14.7.2.2, Section 14.7.3.1** and **Section 14.7.3.2** and **Section 14.8**.
Isle of Man Government Department of Infrastructure	11th August 2022	The TSC is particularly concerned about the cumulative impacts from all of the proposed windfarms awarded as part of the Crown Estate's Round 4 project, and would want to see this fully taken into account as part of the EIA.	Cumulative effects are assessed in **Section 14.8** and detailed within the CRNRA (**Appendix 14.2**).
Isle of Man Government Department of Infrastructure	11th August 2022	It is essential that the islands shipping companies, the Isle of Man Steam Packet Company (IoMSPC) and other shipping companies are continuously engaged throughout this process.	The primary operators within the region, including the IoMSPC, have been consulted on the Project, including within the MNEF and hazard workshops undertaken to inform both the NRA and CRNRA. Navigation bridge simulations have also been undertaken with ferry operators, including IoMSPC. Engagement would continue as the Project design and development progresses.
Ministry of Defence (MOD)	21st July 2022	The report correctly identifies that there are no military Practice and Exercise Areas (PEXA) and therefore the MOD has no concerns. However, the development zone does occupy an area containing highly surveyed routes which support defence maritime navigational interests.	Noted. The Applicant has consulted with the MOD and established there is no overlap with the windfarm site and highly surveyed routes.
Trinity House (TH)	21st July 2022	This development will need to be marked with marine aids to navigation by the developer/operator in accordance with the general principles outlined in International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) Guideline G1162 - The Marking of Offshore Man-Made Structures as a risk mitigation measure.	The requirement to agree marking and lighting in line with TH requirements is included in the embedded mitigation for the Project (**Section 14.3.3**).

Consultee	Date	Comment	Response/where addressed in the ES
TH	21st July 2022	Additional aids to navigation such as buoys may be necessary to mitigate the risk posed to the mariner, particularly during the construction phase. All marine navigational marking, which will be required to be provided and thereafter maintained by the developer, will need to be addressed and agreed with Trinity House.	The requirement to agree marking and lighting in line with TH requirements is included as embedded mitigation for the Project (**Section 14.3.3**).
TH	21st July 2022	Assessment of impact on existing aids to navigation.	A review of existing aids to navigation has been undertaken in the NRA (**Appendix 14.1**) and in **Section 14.5**.
TH	21st July 2022	A decommissioning plan, which includes a scenario where on decommissioning and on completion of removal operations an obstruction is left on site (attributable to the wind farm) which is considered to be a danger to navigation and which it has not proved possible to remove, should be considered. Such an obstruction may require to be marked until such time as it is either removed or no longer considered a danger to navigation, the continuing cost of which would need to be met by the developer/operator.	Completion of a decommissioning programme is included as embedded mitigation for the Project (**Section 14.3.3**) and would be completed prior to decommissioning.
TH	21st July 2022	The possible requirement for navigational marking of the export cables and the vessels laying them. If it is necessary for the cables to be protected by rock armour, concrete mattresses or similar protection which lies clear of the surrounding seabed, the impact on navigation and the requirement for appropriate risk mitigation measures needs to be assessed.	Effects resulting from installation of the Morgan and Morecambe Offshore Wind Farms: Transmission Assets (including export cables) are being separately assessed as part of the Transmission Assets DCO application. However, a combined assessment with the Transmission Assets has been considered as part of the CEA in **Section 14.8.3.1**. Potential impacts of snagging on cabling within the Project windfarm site, both inter-

Consultee	Date	Comment	Response/where addressed in the ES
			array and platform link cables, are assessed in **Section 14.7.2.6**.
NRA meetings			
Seatruck Ferries Stena Line Isle of Man Steam Packet Company (IoMSPC)	7th February 2022	Initial meeting with ferry companies to provide an overview of the project and identify key impacts. All ferry operators agreed that the cumulative impact of the developments was the most significant issue, especially in relation to Morgan / Mona sites. Ferry operators were keen to be seen as a body of stakeholders, not individual companies as the project progresses.	A CRNRA (**Appendix 14.2**) has been undertaken to assess the cumulative effects, including those arising as a result of the proximity of the Morgan and Mona Offshore Wind Projects.
Chamber of Shipping (CoS) IoMSPC	9th February 2022	CoS questioned how an NRA will be delivered with so many other projects running concurrently. CoS feels that the Project cannot be assessed in isolation. Other concerns included scheduling/timetabling of ferries and logistics, the time commitment and expenditure required for consultation, and scheduling of Hazard Identification (HAZID) workshops prior to completion of the summer vessel traffic survey. CoS suggested that analysis of AIS data would aid the identification of regular users of the area as key consultees.	A CRNRA (**Appendix 14.2**) has been undertaken to assess the cumulative effects, including those arising as a result of the proximity of Morgan and Mona Offshore Wind Projects. The NRA hazard identification workshops were rescheduled to enable inclusion and consideration of the summer vessel traffic data. Detailed analysis of full fidelity AIS data was undertaken as part of the NRA (**Appendix 14.1**).
MCA	3rd March 2022	Initial meeting to provide an overview of the Project and identify key impacts. The MCA noted that if Morgan, Mona and Morecambe projects are to go ahead, there will need to be changes to the [scoping] red line boundaries. Although MCA appreciate the Project needs to consider capacity, all projects are concerning to the ferry companies.	Since Scoping and PEIR, refinements have been made to the Morecambe, Morgan and Mona project boundaries to improve navigation. The CRNRA (**Appendix 14.2**) has been undertaken to address the cumulative effects, including those arising as a result of the

Consultee	Date	Comment	Response/where addressed in the ES
			proximity of Morgan and Mona and considering the revised project boundaries. Cumulative effects are assessed in **Section 14.8**.
Defence Infrastructure Organisation (DIO)	9th March 2022	Initial meeting to provide an overview of the Project and identify key impacts. DIO suggested the Project completes a pre-application to determine the impact of the Project to Ministry of Defence (MOD) activities to determine potential impacts of the development to line of sight and highlight major MOD activity in the area.	A pre-application request has been completed. Impacts associated with aviation are assessed in **Chapter 16 Civil and Military Aviation and Radar.**
Peel Ports Associated British Ports (ABP) Isle of Man Harbours and Coastguard (IoMHC)	10th March 2022	Initial meeting to provide an overview of the Project and identify key impacts. The cumulative impact of Morecambe with Morgan and Mona projects was raised as a significant concern. Further comments were made on the potential impacts to radar, freight, cargo and passenger services.	A CRNRA (**Appendix 14.2**) has been undertaken to assess the cumulative effects, including those arising as a result of the proximity of Morgan and Mona Offshore Wind Projects to the Project. Impacts to commercial routes, including ferry routes, are assessed in **Section 14.7.1.1, Section 14.7.1.2**, **Section 14.7.2.1, Section 14.7.2.2, Section 14.7.3.1** and **Section 14.7.3.2.** Potential effects on communications, including radar, are assessed in **Section 14.7.2.7**. Cumulative effects are assessed in **Section 14.8**.
Royal Yachting Association (RYA)	12th May 2022	Initial meeting to provide an overview of the Project and identify key impacts. RYA noted the timing of the early August summer vessel traffic survey. RYA considered mid-July to mid-August as optimum period as organised recreational events tend to decline after this. RYA suggested the	AIS data was benchmarked to 2019 pre-COVID-19 AIS data. Following the PEIR, a 2022 AIS dataset has been obtained to provide greater recency for the analysis. A CRNRA (**Appendix 14.2**) has been undertaken to assess the cumulative effects,

Consultee	Date	Comment	Response/where addressed in the ES
		project benchmark survey data with pre-COVID AIS data to ascertain recreational craft seasonality. RYA commented on the south-eastern area of the Project, which is a moderately used area for recreational craft, suggesting a further understanding of recreational use in the area would be beneficial. RYA highlighted the need to consider Morgan, Mona and Morecambe projects together, in particular impacts on recreational craft, ferry routes and increase in space conflict with between maritime users.	including those arising as a result of the proximity of Morgan and Mona to the Project. Radar data was collected as part of the summer survey to capture the optimum period for recreational activities (**Table 14.6)**, in addition to AIS and use of the Coastal Atlas of Recreational Boating to establish recreational vessel activity (**Table 14.7**).
Seatruck Ferries Stena Line IoMSPC CoS MCA TH	9th August 2022	Difficulty to provide comment on individual projects without knowing the cumulative effect of other schemes both planned and unplanned in the area (Seatruck Ferries). How future vessel traffic can be understood in the cumulative assessment (IoMSPC). Impact of the Project on the Liverpool to Belfast ferry route, with concerns over safety and sea miles (Stena Line). Decommissioning schedules for fixed assets and platforms in the Irish Sea and consideration of such in the PEIR (CoS) Increase in passenger traffic on IoMSPC routes, with an additional vessel confirmed transiting the Liverpool/Douglas route (IoMSPC). Displacement of vessels leading to vessel-to-vessel interaction (CoS). Increase in tug and service vessels with risk increasing due to the concentration of vessels in one place (Seatruck Ferries).	A CRNRA (**Appendix 14.2**) has been undertaken to assess the cumulative effects, including those arising as a result of the proximity of Morgan and Mona. Cumulative effects are assessed in **Section 14.8**. Impacts to ferry routes and operations including adverse weather routeing are considered in **Section 14.7**. Future vessel traffic profiles are considered in **Section 14.6**. Oil and gas decommissioning and future vessel traffic associated with oil and gas activity is described in **Section 14.5.1.8** and **Section 14.6.5** and detailed within the Project NRA (**Appendix 14.1**) and **Chapter 17 Infrastructure and Other Users**.

Consultee	Date	Comment	Response/where addressed in the ES
		Future adverse weather routeing is dependent on the outcome of other projects in the area (Seatruck Ferries).	
Hazard Workshops[3]			
First Hazard Workshop October 2022			
Hazard Workshop Attendees	12th October 2022	A hazard workshop for the Project was undertaken to inform the PEIR NRA, during which stakeholders raised a number of key navigation issues in relation to the Project as described below.	Full details of hazard workshop attendees are provided in Section 3.4.1, **Appendix 14.1**.
IoMSPC	12th October 2022	Increase in wind farm service vessel (WFSV) traffic may impact Heysham-Douglas route. Concern about condensing traffic into the 'corridor' between the north of the Project windfarm site and West of Duddon Sand Wind Farm. South-west corner of the Project windfarm site impacts Liverpool-Douglas route and reduces sea room - will increase collision and allision risk. Project windfarm site minimises the adverse weather route options for Manannan. Radar interference from the turbines – may obscure WFSVs exiting the Project windfarm site.	Impacts to commercial routes including ferry routes, are assessed in **Section 14.7.1.1, Section 14.7.1.2, Section 14.7.2.1, Section 14.7.2.2, Section 14.7.3.1** and **Section 14.7.3.2.** Impacts to collision and allision risks are assessed in **Section 14.7.1.3**, **Section 14.7.1.4**, **Section 14.7.2.3, Section 14.7.2.4**, **Section 14.7.3.3** and **Section 14.7.3.4**. Potential effects on communications, including radar, are assessed in **Section 14.7.2.7**. Cumulative effects are assessed in **Section 14.8**.

[3] Information regarding Project hazard workshops has been provided in this table. Details of the hazard workshops that informed the CRNRA are set out in the CRNRA (**Appendix 14.2**)

Consultee	Date	Comment	Response/where addressed in the ES
Seatruck Ferries	12th October 2022	Heysham-Liverpool route may have higher likelihood of collision with inshore vessels e.g. fishing or recreational. Concentrating traffic into the 'corridor' between the north of Project windfarm site and West of Duddon Sand Wind Farm.	Impacts to collision risk and sea room are assessed in **Section 14.7**. Cumulative effects are assessed in **Section 14.8**.
Stena Line	12th October 2022	Commercial impact of ferry route deviation around the Project windfarm site. South-west corner of the Project windfarm site impacts Liverpool-Belfast (east of Isle of Man (IoM)) route and reduces sea room – will increase collision and allision risk. Project construction phase will overlap with the oil and gas decommissioning phase - will increase service vessel traffic in 'corridor' between the north of the Project windfarm site and West of Duddon Sands Wind Farm. Radar interference from the turbines (particularly at night and in poor visibility) – may obscure WFSVs exiting the windfarm site.	Impacts to ferry routeing and communications, radar and positioning are assessed in **Section 14.7**. Cumulative effects are assessed in **Section 14.8**. Future oil and gas decommissioning activities are considered in **Section 14.6**.
MCA	12th October 2022	Increased traffic density in the 'corridor' between the north of the Project windfarm site and West of Duddon Sand Wind Farm, and at the south-west corner of the windfarm site will increase risk profile.	Impacts to ferry routeing and collision risk are assessed in **Section 14.7**. Cumulative effects are assessed in **Section 14.8**.
IoM Department of Infrastructure	12th October 2022	Echoes what was said by the ferry operators.	Noted. See above responses.
Fisheries Liaison Officer	12th October 2022	If the cod quota is increased (albeit this hasn't been done in the last 15 years), there will be an increased	Future fishing activities are considered in **Section 14.6**.

Consultee	Date	Comment	Response/where addressed in the ES
		amount of beam trawler traffic and fishing activity in the Morecambe project area.	
UK Chamber of Shipping	12th October 2022	Project construction phase will overlap with the oil and gas decommissioning phase. This may considerably increase the amount of service vessel traffic in the region. Increased risk of tanker and cargo collision and/or allision at south-west corner of the Project windfarm site. This risk may be further increased by radar interference from the turbines (particularly at night and in poor visibility) – may obscure WFSVs exiting the windfarm site.	Future oil and gas decommissioning activities are considered in **Section 14.6**. Impacts to collision, allision and communications, radar and positioning are assessed in **Section 14.7**.
Spirit Energy	12th October 2022	Traffic will be displaced to the north of the Project windfarm site, toward existing oil and gas infrastructure. Reduced collision detection and less able to see traffic coming from the west. Oil and gas service vessels transiting through the windfarm need access routes. Oil and gas decommissioning vessels are large (up to 300m) and difficult to manoeuvre with challenging angles of approach (possibly through the windfarm).	Impacts to routeing, collision and allision risk are assessed in **Section 14.7**. Existing oil and gas activities and requirements are considered in **Section 14.5**. Future oil and gas decommissioning activities are considered in **Section 14.6**.
Navigation Bridge Simulations and Second Hazard Workshop September 2023[4]			
Stena Line	23rd-25th May 2023	Navigation bridge simulations were undertaken to inform both the PEIR and the ES. Engagement was undertaken with ferry operators to agree the scope of the simulations and simulation scenarios. The	Results are included in **Appendix 14.1**.
Seatruck	22nd-23rd June 2023		

[4] The second hazard workshop was held post-PEIR to reassess the NRA based on the revised windfarm site boundary

Consultee	Date	Comment	Response/where addressed in the ES
IoMSPC	13th-15th September 2023	assessment criteria were agreed with stakeholders together with verification of the ship models being tested. Each simulation session was attended by ferry masters and officers. Realistic traffic scenarios, emergency situations and normal/adverse weather conditions were determined based on the NRA and consultation undertaken with ferry operators	
Hazard Workshop Attendees	29th September 2023	Following PEIR the Project site boundary was revised. A second hazard workshop was undertaken to assess the revised boundary and inform the NRA for the ES. During the workshop stakeholders raised various key navigation issues in relation to the Project as described below. Full details of hazard workshop attendees are provided in **Appendix 14.1**.	Workshop results are reflected in **Appendix 14.1**. During the workshop consensus was reached amongst participants that hazards were either Low Risk – Broadly Acceptable or Medium Risk – Tolerable (if ALARP). Consensus was also reached that no further additional risk controls were identified as being required for the Project. Therefore, the NRA concluded that where risks are scored as Medium, they can be considered to be ALARP and therefore Tolerable without the need for further additional risk control measures.
Anglo-North Irish Fish Producers Organization (ANIFPO), ENI, Harbour Energy, IoM Government, MCA,	29th September 2023	At the workshop: ▪ The Project team introduced the material and methodology ▪ Each hazard was reviewed in turn, with each attendee invited to discuss amongst their tables and score their personalised hazard log. Stakeholders were encouraged to fill out the comments section of each hazard post workshop to provide a higher level of description regarding their scores	Full details of the hazard workshop are contained within **Appendix 14.1**. Feedback obtained within the workshop has been considered both within **Appendix 14.1** and **Section 14.7** of this ES.

Consultee	Date	Comment	Response/where addressed in the ES
Orsted, Peel Ports, Scottish Whitefish Producers Association (SWFPA), Seatruck Group, Spirit Energy, IoMSPC, Stena Line, Fisheries Liaison Officer, UK Chamber of Shipping		▪ Each hazard score was then reviewed as a group with differences in scoring discussed, before a consensus was sought ▪ Once each hazard discussion had come to a close, the summary spreadsheet was 'locked' to capture the concluding scores of the discussion ▪ Risk controls were reviewed and appropriate additional risk controls discussed ▪ Update of hazard risk scores based on the findings of the hazard workshop for inclusion in the NRA	
Statutory consultation feedback on the PEIR			
MMO (ref 8.3)	30th May 2023	Commercial fishing activity should be considered in conjunction with the cumulative effects on commercial shipping routes as spatial squeeze will bring higher likelihood of cross industry conflict in terms of access and potential gear conflicts in areas surrounding the windfarm site. Gear conflicts between differing types of fishing vessels may also increase, due to fishing grounds being diminished by windfarm projects and associated diverted commercial traffic.	Impacts associated with displacement of fishing vessels are assessed in **Chapter 13 Commercial Fisheries**.
MMO (ref 9.1)	30th May 2023	The MMO note that during the decommissioning methodology, it is said that the wind turbines will be cut below seabed level. As this plan involves leaving infrastructure in place, impacts should be assessed for	Impacts associated with the decommissioning of cables and risks associated with leaving them in situ are assessed in **Section 14.7.3.6**.

Consultee	Date	Comment	Response/where addressed in the ES
		post-decommissioning. This is because any infrastructure will remain a hazard to navigation and fishing gear, preventing future fishing activity in the area, beyond the lifespan of the windfarm.	Please also refer to **Chapter 13 Commercial Fisheries**.
Isle of Man Government (IoM) Territorial Seas Committee (TSC)	2nd June 2023	The TSC is particularly concerned about the cumulative impacts from all of the proposed windfarms awarded as part of The Crown Estate's Round 4 project, and would want to see this fully taken into account as part of the subsequent EIA to be submitted as part of the Development Consent Order application. As an island nation, any significant risk of interference with marine navigation is of concern to the TSC with regard to transport to and from the island, and the shipping lanes in our Territorial waters which are used to connect the UK and Ireland. The TSC appreciates that the Isle of Man Steam Packet Company (IOMSPC) has until now been kept involved in this process including early project consultation meetings, and involvement in the navigational bridge simulations. It is essential that the Island's shipping companies, the Isle of Man Steam Packet Company and other shipping companies are continuously engaged throughout this process. Representatives from the TSC have been involved in the Maritime Navigation Engagement Forum encompassing all the neighbouring Round 4 offshore windfarm sites and will continue throughout the duration of this process. The TSC suggests that it might be useful to also include Douglas Port as one of the pilot boarding stations for Liverpool in Table 14.12 given that it is the same distance away (at 29nm north west, as per Table 14.13)	The potential cumulative effects arising from the Irish Sea Round 4 projects are assessed in **Section 14.8** and detailed within the CRNRA (**Appendix 14.2**). Ferry operators, including IoMSPC, participated in the navigational simulations and hazard workshop held to inform the CRNRA. The assessment concludes that with the embedded mitigation measures in place, including the Project boundary changes made since PEIR, the potential effect on navigational safety is moderate ALARP, and therefore not significant in EIA terms. Due to the release of the Scoping Report for the Mooir Vannin OWF in October 2023, after the completion of many of the activities undertaken to inform the CRNRA, an addendum to the CRNRA was prepared to consider the additional cumulative risks that may result to vessel traffic identified within the CRNRA (**Appendix 14.2)**. While unacceptable cumulative navigation risks have been identified when also considering the proposed Mooir Vannin OWF project, the Project is not considered to contribute to these high-risk areas.

Consultee	Date	Comment	Response/where addressed in the ES
		as Point Lynas. Douglas is an important port for both boarding the pilots, as well as providing shelter during periods of adverse weather. It should also be noted that there are Royal National Lifeboat Institute (RNLI) Stations located in Port Erin, Port St. Mary and Peel in the Isle of Man (at 40nm, 41nm, and 3nm).	Updates to **Table 14.12** and **Table 14.14** have been made to include Douglas Port and IoM RLNI stations.
IoM TSC	2nd June 2023	<u>Comment on impact on ferry routeing</u> Of greatest concern to the TSC in respect of shipping and navigation is in respect of the impacts relating to the ferry routeing. The TSC acknowledges that there will be a slight deviation required from IOMSPC vessels in respect of the construction and the operation phases, which could result in 8% re-routeing however it is not envisaged from this analysis that it will require additional travel time (shown in Table 14.19). Confirmation should be sought from the IOMSPC that this mitigation is acceptable to them. It is further acknowledged that adverse weather is not expected to affect the adverse weather routes used by the IOMSPC. The TSC would welcome further engagement with the project team if and when any amendments are considered to the boundary of the site which may minimise impacts to passage. The TSC notes that the findings from the Cumulative Regional Navigational Risk Assessment which identifies that during adverse weather, there is the potential for impact to both IOMSPC routes in terms of additional time in minutes per journey which will, from a commercial perspective add additional costs to the company in terms of fuel to be burned, and any requirements to additional emissions being offset. The	Impacts to ferry routeing are assessed in **Section 14.7.** The Project-alone has no impact to the Douglas/ Heysham or Liverpool/ Douglas passage plans with no increase in journey time for these routes and no direct impact to IoMSPC adverse weather routes. A small reduction in alternative routeing options around the Hamilton North Gas Field is identified associated with the Liverpool/ Douglas route but with no direct impacts to operations. The potential cumulative effects arising from the Round 4 Irish Sea projects on ferry routeing, including in adverse weather, are assessed in **Section 14.8** and detailed within the CRNRA (**Appendix 14.2**). Given the positioning and size of the Morecambe Project, contribution to cumulative effects are minimal.

Consultee	Date	Comment	Response/where addressed in the ES
		TSC notes that in respect of the Douglas Liverpool route and deviations as a result of the Mona Array Area, this addition is forecasted at an additional 17 minutes journey time, while for the Douglas Heysham route to deviate around the Morgan Array Area, it is forecasted at an additional 27 minutes on top of an existing delay. It is however acknowledged in para 14.26 that these impacts are driven by Morgan and Mona rather than Morecambe Bay which has outlined in the Shipping and Navigation Chapter that even during adverse weather conditions, there is no impact to IOMSPC services. The TSC awaits continued engagement to explore the further mitigation measures and residual effects to be considered and proposed by the project teams, particularly in respect of shipping and navigation as part of the cumulative impact assessment. The TSC is deeply concerned about the cumulative impact all of these offshore windfarms could have on its lifeline services and any deviations to well established routes will not be accepted.	
IoM TSC	2nd June 2023	<u>Comment on Cumulative Effect Assessment methodology</u> The TSC acknowledges the inclusion of the site subject to an Agreement for Lease with Ørsted for a proposed offshore windfarm in Isle of Man territorial waters (at 38.2km away from Morecambe Bay Array Area) has been taken into account as part of the EIA methodology as part of the Cumulative Effects Assessment, as set out in Chapter 6 and in the Shipping Chapter 14. The TSC further notes that it has been considered that there is insufficient information available about the project at the minute, however it has been acknowledged at high level at this stage. The TSC is	Consideration of the potential cumulative effects of the Mooir Vannin OWF with the Project, as well as the other Irish Sea Round 4 projects is presented in **Appendix 14.2** (Appendix D) and included in the cumulative assessment in **Section 14.8**. This reflects the information available in the Mooir Vannin OWF Scoping Report (October 2023) submitted since the PEIR submission. Potential effects on SAR are assessed in Sections **14.7.1.5**, **14.7.2.5**, **14.7.3.5** and cumulatively in **Section 14.8**.

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		pleased to see that the site will be further considered at the Environmental Statement stage. It is essential to ensure that there is no barrier or restrictions placed on the ability for Search and Rescue efforts to be hampered as a result of the proposed Morecambe Bay Array Area and indeed, the cumulative impact of all projects identified within the Cumulative Regional Navigation Risk Assessment.	
IoM TSC	2nd June 2023	<u>Comment on The Navigational Risk Assessment</u> The Navigational Risk Assessment includes a summary of a number of main, overarching concerns that the TSC wishes to repeat here as all are applicable in respect of shipping and navigation for the Isle of Man. In particular, the TSC acknowledges that there would be a requirement for the rerouteing of a small proportion of IOMSPC vessels which currently equate to 8% of the total crossings which route through the Morecambe Bay Array Area. It would be necessary for these vessels to follow the path of the greater proportion of IOMSPC journeys within this vicinity, at 2nm to the southwest corner of the Array Area. The TSC would seek confirmation that this is acceptable to the IOMSPC.	Impacts to ferry routeing are assessed in **Section 14.7.** The Project-alone has no impact to the Douglas/Heysham or Liverpool/ Douglas passage plans with no increase in journey time for these routes and no direct impact to IoMSPC adverse weather routes. A small reduction in alternative routeing options around the Hamilton North Gas Field is identified associated with the Liverpool/ Douglas route but with no direct impacts to operations. The potential cumulative effects arising from the Round 4 Irish Sea projects on ferry routeing, including in adverse weather, are assessed in **Section 14.8** and detailed within the CRNRA (**Appendix 14.2**). Given the positioning and size of the Morecambe Project contribution to cumulative effects are minimal. IoMSPC have been part of extensive consultation, noting concerns primarily relate to cumulative effects.
AB Ports	20th April 2023	The Port of Silloth has no objections to this development as it falls outside the main routes to and	Noted, no further action required.

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		from the port, thus it has no effect on our routes, costs or timings for vessel calls.	
Chair of IoM Transformation Board, IoM Government	1st June 2023	I am very supportive of the increase in renewable energy generation to mitigate climate change, but I am concerned that the location of the proposed windfarms will interfere with the Isle of Man ferry routes. Please can you give an assurance that you have engaged with the IoM Steam Packet Company Ltd to ensure wider corridors are planned to reduce possible disruption to our lifeline shipping route, especially the bad weather alternative routes. I expect you have received much feedback from island residents and politicians, but I would appreciate being kept informed of progress.	IoMSPC have been part of extensive consultation. Further details of consultation undertaken with IoMSPC are presented in the NRA (**Appendix 14.1**).
Douglas City Council	1st June 2023	There is a recognition that windfarm projects can significantly impact navigation safety, ship traffic routes, and possibly the ability to respond to at-sea emergencies; Any lengthening of the Steam Packet's voyage from England to Douglas is bound to result in a fare increase for hauliers which would be passed on to the Council by suppliers effected. The exact lengthening of the voyage time needs to be further clarified. If there are sufficiently wide paths through the proposed windfarm, then maybe there won't be any increase in Steam Packet fares required. The impact to the Steam Packet and island residents (and visitors), if this can be worked around, then it should be encouraged.	Impacts to ferry routeing are assessed in **Section 14.7 14.7.** The Project-alone has no impact to the Douglas/ Heysham or Liverpool/ Douglas passage plans with no increase in journey time for these routes and no direct impact to IoMSPC adverse weather routes. A small reduction in alternative routeing options around the Hamilton North Gas Field is identified associated with the Liverpool/ Douglas route but with no direct impacts to operations. The potential cumulative effects arising from the Round 4 Irish Sea projects on ferry routeing, including in adverse weather, are assessed in **Section 14.8** and detailed within the CRNRA (**Appendix 14.2**). Given the positioning and size of the Morecambe Project, contribution to cumulative effects are minimal.

Consultee	Date	Comment	Response/where addressed in the ES
Harbour Energy	2nd June 2023	(Ref 14.6.5 Oil and gas vessels) The Calder platform will require marine access corridors free from temporary or permanent surface infrastructure (except as may from time to time be approved by the Calder Operator) as follows: 1. A radius of 1.8km (1nm) around the Calder platform 2. A 1.8km (1nm) corridor between the Calder and CPP1 platforms 3. 500m each side of the Calder pipelines and subsea cables The marine corridors list above are to ensure the safe passage and manoeuvring of vessels supporting both the operation and future decommissioning activities of the platform and associated subsea facilities.	Following the revision to the windfarm site boundary, the Calder CA-1 platform no longer sits within the windfarm site. The Calder CA-1 platform has now unobstructed access to the north (including access between Calder and the CPP1 platform) and to the west. Embedded mitigation set out in **Chapter 17 Infrastructure and Other Users** (**Table 17.3**) includes that WTG and OSP(s) would be separated from oil and gas platforms with a helideck by a 1.5nm radius, and that WTGs/OSP(s) would not be placed within 500m of pipelines or cables unless agreed otherwise.
Hartford Homes	16th May 2023	As an Island, we are reliant on our sea links for both passenger travel and for all our freight, including the majority of the food that we consume. Any impacts on the sea links, however small, could have a major impact on the Island, particularly during times of inclement sea conditions. In fact, the island already regularly experiences significant disruptions during the winter, including depleted supermarket food shelves, when the boats cannot sail due to poor weather, and this issue could be exasperated by narrowing available sea routes. As we are not experts in maritime matters, we would therefore refer you to the observations of the Isle of Man Steam Packet Company, who have responsibility to maintain the important sea links that the Island is dependent on.	Impacts to ferry routeing are assessed in **Section 14.7.** The Project-alone has no impact to the Douglas/ Heysham or Liverpool/ Douglas passage plans with no increase in journey time for these routes and no direct impact to IoMSPC adverse weather routes. A small reduction in alternative routeing options around the Hamilton North Gas Field is identified associated with the Liverpool/ Douglas route but with no direct impacts to operations. The potential cumulative effects arising from the Round 4 Irish Sea projects on ferry routeing, including in adverse weather, are assessed in **Section 14.8** and detailed within

Consultee	Date	Comment	Response/where addressed in the ES
Isle of Man Steam Packet Company	1st June 2023	The Isle of Man Steam Packet response to the subject consultation (Morecambe Offshore Windfarm Generation Assets), we have no objection and don't anticipate impact on our long-established sea routes of this project when considered in isolation. However, when considering this project along with other planned projects i.e., Morgan, Mona & IOM OWF projects along existing OWF projects, we will have serious concerns on Shipping and Navigational Safety issues which indicated in our due to be submitted response for the Morgan Generation assets. On this basis, we once again urge you to consider the accumulative impact created and as expressed on our meetings and demonstrated during the Navigation simulation taken at HR Wallingford.	the CRNRA (**Appendix 14.2**). Given the positioning and size of the Morecambe Project, contribution to cumulative effects are minimal. The Applicant has engaged with IoMSPC throughout the pre-application period, including participation in navigational simulations and hazard workshops, and a meeting in March 2024 to discuss any residual concerns.
Maritime and Coastguard Agency	31st May 2023	<u>Comments on Navigation Risk Assessment (NRA)</u> We note in Chapter 3.4.2 that two 14-day traffic surveys (radar, AIS and visual) were completed in February 2022 and July to August 2022, which meets the required survey guidelines in MGN 654. This is supported by 2019 AIS data from Marine Traffic, 2019 MCA AIS data published by the MMO, recreational and fishing Vessel Monitoring Systems (VMS) data. Navigation simulations were conducted with the ferry operators followed by a HAZID workshop in October 2022 where several concerns were raised by MCA and navigation stakeholders on the unacceptable collision risks, including cumulative risks. It is understood that since the HAZID workshop amendments have been made to the wind farm boundary and that further traffic surveys and navigation simulations will be completed, followed by an additional HAZID workshop. We expect the NRA to be updated with the additional data	The updated (post-PEIR) NRA and CRNRA which consider the revised Project windfarm site boundary and summarises the additional surveys, navigational simulations and hazard workshops undertaken in consultation with the MCA are presented in **Appendix 14.1** and **Appendix 14.2**, respectively.

Consultee	Date	Comment	Response/where addressed in the ES
		incorporated and MCA will provide further comments once completed. We are content at this stage with regards to the process you have undertaken so far in order to comply with MGN 654 and its annexes, and we welcome the work to be undertaken for addressing the guidance and recommendations in the future.	
Maritime and Coastguard Agency	31st May 2023	Comments on turbine layout The turbine layout design will require MCA agreement prior to construction to minimise the risks to surface vessels, including rescue boats, and Search and Rescue aircraft operating within the site. As such, MCA will seek to ensure all structures are aligned in straight rows and columns, including any platforms. Any additional navigation safety and/or Search and Rescue requirements, as per MGN 654 Annex 5, will be agreed at the approval stage.	The WTG layout would be agreed with the MMO in consultation with MCA and TH prior to construction (as per embedded mitigation **Table 14.3**).
Maritime and Coastguard Agency	31st May 2023	MCA is concerned at this stage on the cumulative impacts of the proposed Mona, Morgan and Morecambe wind farm projects to the safety of navigation in the area, specifically on the reduction of safe navigable sea space and increased collision risk. The traffic density is significant within the area with strategically important passenger and cargo routes between the UK, Isle of Man, Northern Ireland and the Republic of Ireland. The current boundaries of all three wind farms cumulatively pose unacceptable risks to navigation for these passenger and cargo routes.	Issues raised associated with cumulative risk posed by the Mona, Morgan and Morecambe OWF projects have been addressed by boundary changes made since PEIR by all three projects. The updated detailed CRNRA is provided in **Appendix 14.2** and summarised in **Section 14.8**. The assessment concludes that with the embedded mitigation measures in place, including the boundary changes, the potential cumulative effects on navigational safety and routeing are no more than moderate adverse but ALARP, and therefore not significant in EIA terms.
Maritime and Coastguard Agency	31st May 2023	Comment on hydrographic survey data MGN 654 Annex 4 requires that hydrographic surveys should fulfil the requirements of the International IHO	The requirement to undertake hydrographic surveys, in line with MGN654 requirements, is

Consultee	Date	Comment	Response/where addressed in the ES
		Order 1a standard, with the final data supplied as a digital full density data set, and survey report to the MCA Hydrography Manager. This information will need to be submitted, ideally at the EIA Report stage.	included as embedded mitigation for the Project (**Section 14.3.3**).
Maritime and Coastguard Agency	31st May 2023	Comment on safety zones Safety zones during the construction, maintenance and decommissioning phases are supported, however, it should be noted that operational safety zones may have a maximum 50m radius from the individual turbines. A detailed justification would be required for a 50m operational safety zone, with significant evidence from the construction phase in addition to the baseline NRA required supporting the case.	For operation and maintenance activities, the Applicant would seek to agree appropriate safety zones with the MCA around WTGs and work areas to be applied.
Maritime and Coastguard Agency	31st May 2023	Comment on emergency response An Emergency Response Cooperation Plan is required to meet the requirements of MGN 654 Annex 5 and will need to be in place prior to construction. The ERCoP is an active operational document and must remain current at all stages of the project including during construction, operations & maintenance and decommissioning. A SAR checklist will be discussed as the project progresses to track all requirements detailed in MGN 654 Annex 5.	The requirement to produce an ERCoP, with agreement of the MCA, is included as embedded mitigation for the Project (**Section 14.3.3**).
Ørsted – Barrow, Burbo Bank, Burbo Bank Extension, Walney 1, 2, 3, and 4 OWFs	2nd June 2023	Summary of responses The area of the proposed Morecambe Offshore Wind Project has significant amounts of existing shipping activity. The information provided in the PEIR is not clear on the extent to which and the location within which vessel activity would increase during both the construction and operational phases.	Meetings have been undertaken with existing Irish Sea OWF developers to discuss the Project. Additionally, Ørsted attended the MNEF and NRA/CRNRA hazard workshops. The following measures have been included as embedded mitigation for the Project (**Section 14.3.3**) to mitigate potential effects on shipping and navigation. Further

Consultee	Date	Comment	Response/where addressed in the ES
Scottish Power Renewables and Ørsted – West of Duddon Sands OWF		Given there is no information currently available on vessel routes or proposed construction or O+M ports, it is difficult to understand the potential risks to assets associated with the generation and transmission of electricity from Barrow, Burbo Bank and extension, Walney 1 ,2, 3, and 4, and West of Duddon Sands OWFs. It is noted that specific information about wind farm service vessels ("WFSVs") is provided in the PEIR including that that there were that there were 24 WFSV transits per year between Barrow and Off Skerries through the Morecambe wind farm site and that there were 158 WFSVs transits per year passing "north/south between Liverpool and the offshore windfarms to the north", "21 of these tracks passed within 1nm of the north-eastern corner of the wind farm site". Windfarms to the north appear to include Walney 1 and 2 and potentially include Barrow and West of Duddon Sands. WFSVs crossed through the Morecambe windfarm site 18 times between Liverpool and Walney 3 and 4 in 2019. We would appreciate if more information on this could be provided so we can properly understand and respond to the potential impacts and mitigations being proposed. It is important that any solutions properly take into account existing consent conditions and agreements. We would also appreciate being given the opportunity to input into and participate in discussions around navigational risks (including issues of search and rescue lanes and vessel traffic service) and mitigations.	engagement would be sought as Project plans are developed, including: ▪ Safety zones ▪ ERCoP ▪ Aids to Navigation ▪ Layout plan and lines of orientation ▪ Marine Operating Guidelines ▪ Guard vessels ▪ Vessel Traffic Management Plan (VTMP), with an Outline provided as part of the DCO submission (Document Reference 6.9) ▪ CTV passage planning

Consultee	Date	Comment	Response/where addressed in the ES
Ørsted – Barrow, Burbo Bank, Burbo Bank Extension, Walney 1, 2, 3, and 4 OWFs Scottish Power Renewables and Orsted – West of Duddon Sands OWF	2nd June 2023	<u>Comment on emergency response</u> We would be happy to discuss with you appropriate communication and collaboration between Barrow, Burbo Bank and extension, Walney 1 ,2, 3, and 4 and West of Duddon Sands and the Morecambe Offshore Wind Project, and other nearby offshore wind developments in circumstances where emergency responses are required, for example in the event of accidents or pollution spills.	The requirement to produce an ERCoP, with agreement of the MCA, is included as embedded mitigation for the Project (**Section 14.3.3**) and discussions with existing OWF projects have also been initiated.
Ørsted - Isle of Man Wind Farm (Mooir Vannin OWF)	2nd June 2023	We would expect the opportunity, as previously communicated to you, to input into and participate in discussions around navigational risks (including issues of search and rescue lanes and vessel traffic service) and mitigations, as these have the potential to be material to the Isle of Man and the Isle of Man Offshore Wind Farm.	Ørsted attended the MNEF and NRA/CRNRA hazard workshops. An assessment of the potential cumulative effects of Mooir Vannin OWF with the Project and the other Irish Sea Round 4 projects (Morgan and Mona) is presented in **Section 14.8**.
UK Chamber of Shipping	2nd June 2023	The Chamber welcomes this opportunity to respond to the Section 42 PEIR consultation however reiterates its assertion that the proposed developments fail to satisfy Paragraph 2.6.147 of EN-3, which states, “To ensure safety of shipping, it is Government policy that wind farms should not be consented where they would pose unacceptable risks to navigational safety after mitigation measures have been adopted.” The Chamber and its members look forward to engaging with the developers to appraise the additional commitments and risk mitigations and their impact to	It is noted that in response to the navigation safety risks identified within the CRNRA (at PEIR stage) that refinements have been made to the Project boundary since PEIR. The Morgan and Mona projects have also made refinements to their respective site boundaries since PEIR. With embedded mitigation in place, the Project-alone does not have a significant effect on navigational safety (all effects are

Consultee	Date	Comment	Response/where addressed in the ES
		navigational safety, economic impact to the shipping industry and wider supply chains, and environmental impact. Therefore, whilst the Chamber is in overall support for offshore wind developments, it can only presently object to the developments as proposed in the PEIR documentation.	minor adverse or negligible) (**Section 14.7** and **Appendix 14.1**). Consideration of the potential cumulative effects with the Morgan and Mona projects and the Morgan and Morecambe Transmission Assets is presented in the CRNRA (**Appendix 14.2)** and summarised in **Section 14.8**. The assessment concludes that with the embedded mitigation measures in place the potential effects on navigational safety and routeing are no more than moderate adverse but ALARP, and not significant in EIA terms.
Stena Line	2nd June 2023	<u>Response summary</u> Stena Line reiterates that it is not opposed in principle to the development and construction of the Wind Farms and recognises the consultations that have so far taken place. However, the PEIRs have not settled all concerns that Stena Line and other stakeholders have raised. In particular, the Navigation Risk Assessment concludes that the construction as currently planned renders unacceptably high-risk scores. This is especially alarming for Stena Line, as a high and unacceptable risk of collision between passenger / ferry vessels and other commercial vessels was found. The mitigation measures identified have not been implemented and Stena Line notes that many lack detail or practical enforcement. Stena Line provides a lifeline service to local communities and is fully committed to continuing to operate its routes. However, there is a real concern that the impact of the Wind	It is noted that in response to the navigation safety risks identified within the CRNRA (at PEIR stage) that refinements have been made to the Project boundary since PEIR. The Morgan and Mona projects have also made refinements to their respective site boundaries since PEIR. The presence of the Project would necessitate a detour for Stena's Liverpool-Belfast East of IoM (East of Calder oil and gas (O&G)) route (in both normal and adverse weather conditions), increasing transit distance by 1.6nm (**Table 14.19**) which, on a 114nm passage is not considered likely to significantly adversely impact upon ferry operations. With embedded mitigation in place, the Project-alone does not have a significant effect on navigational safety (all

Consultee	Date	Comment	Response/where addressed in the ES
		Farms, as currently set out in the PEIR, on Stena Line's operations by bringing significant additional operational challenges and operating costs to the services it provides which in turn may affect its freight and passenger customers and the communities they serve and reside in.	effects are minor or negligible adverse) (**Section 14.7** and **Appendix 14.1**). Consideration of the potential cumulative effects with the Morgan and Mona projects and the Morgan and Morecambe Transmission Assets is presented in the CRNRA (**Appendix 14.2**) and summarised in **Section14.8**. The assessment concludes that with the embedded mitigation measures in place the potential effects on navigational safety and routeing are no more than moderate adverse but ALARP, and therefore not significant in EIA terms. Due to the release of the Scoping Report for the Mooir Vannin OWF in October 2023, after the completion of many of the activities undertaken to inform the CRNRA, an addendum to the CRNRA was prepared to consider the additional cumulative risks that may result to vessel traffic identified within the CRNRA (**Appendix 14.2**). While unacceptable cumulative navigational risks were identified when also considering the proposed Mooir Vannin OWF project, the Project is not considered to contribute to these high-risk areas. The Applicant has engaged with Stena Line throughout the pre-application process, including a meeting in February 2024 to discuss any residual concerns.

Consultee	Date	Comment	Response/where addressed in the ES
Seatruck Ferries Ltd (ref. 1.1)	2nd June 2023	The presence of the Morgan, Mona and Morecambe wind farms pose a severe risk to the safety of Company vessels, and hence the safety of those on board, in the event vessels become 'not under command' as defined by the International Regulations for Preventing Collisions at Sea.	It is noted that in response to the navigation safety risks identified within the CRNRA (at PEIR stage) that refinements have been made to the Project boundary since PEIR. The Morgan and Mona projects have also made refinements to their respective site boundaries since PEIR. Impacts to ferry routeing are assessed in **Section 14.7.** With embedded mitigation in place, the Project-alone does not have a significant effect on navigational safety (all effects are minor adverse or negligible). It is noted that the Project does not impact the Seatruck routes from either Heysham or Liverpool and has limited contribution to effects on adverse weather routes. Consideration of the potential cumulative effects with the Morgan and Mona projects and the Morgan and Morecambe Transmission Assets is presented in the CRNRA (**Appendix 14.2**) and summarised in **Section 14.8**. The assessment concludes that with the embedded mitigation measures in place the potential effects on navigational safety and routeing are no more than moderate adverse but ALARP, and not significant in EIA terms.
Seatruck Ferries Ltd (ref. 1.2 and 1.3)	2nd June 2023	Company vessels will be hampered by the presence of wind turbines in complying with the International Regulations for Preventing Collisions at Sea, particularly for vessels bound to/from Heysham and Warrenpoint. In complying with the Regulations, vessels strive to keep their starboard sides clear to be able to react effectively to avoid close-quarters situations. The southern infringement of the Morgan Wind Farm and the northern infringement of Mona will hamper vessels in being able to meet this basic act of good seamanship.	
Seatruck Ferries Ltd (ref 1.4)	2nd June 2023	The Company is concerned that the cumulative presence of the Morgan, Mona and Morecambe Wind Farms will create traffic conflicts, previously not generally experienced.	
Seatruck Ferries Ltd (ref 1.5)	2nd June 2023	During summer months recreational vessels are encountered requiring the vessel to deviate from course in order to maintain safe navigation and allow sufficient sea room to pass. Fishing vessel can be encountered year-round and again requirements mean vessel to	Impacts on collision risk as a result of the Project-alone are assessed in **Sections 14.7.1.4, 14.7.2.4, 14.7.3.4**. Consideration of the potential cumulative effects on collision risk is presented in

Consultee	Date	Comment	Response/where addressed in the ES
		allow sufficient sea room to pass. Passing recreational and fishing vessels adds additional distance and time on to the sea passage.	**Appendix 14.2** and summarised in **Section 14.8**.
Seatruck Ferries Ltd (ref 1.6)	2nd June 2023	Response times to a marine casualty may be significantly increased due to wind farm location if a vessel is planning a route to the casualty as vessels may have to circumnavigate the wind farm to reach the casualty.	Impacts on SAR as a result of the Project-alone are assessed in **Section 14.7.1.5** and **Section 14.7.2.5**and. Consideration of the potential cumulative effects on SAR is presented in **Appendix 14.2** and summarised in **Section 14.8**.
Seatruck Ferries Ltd (ref 1.7)	2nd June 2023	Radar interference has been seen on radar equipment saturating the area of windfarm and therefore possible to obscure the location of small craft within the field. See below which is an example of interference on radar due to objects such as a wind farm. it has been seen that a vessel with poor radar reflective properties or lacking in AIS transmission is difficult to detect via radar equipment and therefore can be missed until within visual range and can be difficult to differentiate as above.	Impacts on communications, radar and positioning systems as a result of the Project-alone are assessed in **Section 14.7.2.7.** Consideration of the potential cumulative effects on communications, radar and positioning systems is presented in **Appendix 14.2** and summarised in **Section 14.8**.
Seatruck Ferries Ltd (refs 1.7 and 1.8)	2nd June 2023	All above points with the exception of 1.4 and 1.6 were proved to be to be the case when conducting simulations at HR Wallingford on 8th and 9th September 2022. Further simulations are planned for 22nd and 23rd June 2023. This consultation period is ending before the second round of navigation simulations take place. The consultation period should be extended until all stakeholder ferry companies have completed their simulations taking place during June 2023 at HR Wallingford. Seatruck navigation simulations are scheduled for 22nd and 23rd June 2023.	It is noted that the PEIR consultation did not reflect the updated (refined) project windfarm site boundaries that were included in the second navigation simulations held with Seatruck in June 2023. Further consultation however has been undertaken with Seatruck post PEIR submission, including the navigation simulations and the hazard workshops in September 2023 that took account of the site boundary changes made by the Project and the Morgan and Mona projects.

Consultee	Date	Comment	Response/where addressed in the ES
Spirit Energy Production UK Limited (ref 4)	2nd June 2023	Spirit Energy Production UK Limited wishes to remain part of the Maritime Navigation Engagement Forum to understand the outcomes of the cumulative effects of increased turbines and traffic in the area altering existing marine channels and work being undertaken by the wind farm developers to mitigate any negative impacts on existing area activities. As plans develop and further information becomes available to Spirit, this will require ongoing careful consideration.	Details of the consultation undertaken as part of the CRNRA are presented in **Appendix 14.2**. The MNEF has continued throughout the pre application process with Spirit Energy as a participant. As part of the embedded mitigation (**Table 14.3**) the MNEF would be maintained to facilitate information sharing and identification of additional risk controls.
Spirit Energy Production UK Limited (ref 5 and 8)	2nd June 2023	Cumulative impact of increased marine traffic. The introduction of new activities into the area will increase the aviation and marine traffic movements in the area and this increased level of marine and aviation activity will result in an increased risk of congestion, collision and adverse effects on communications when coupled with the displacement of traffic and re-routeing of commercial and leisure traffic may increase the risk of traffic operating closer to the existing infrastructure. Communications, Radar Early Warning System effectiveness is frequently negatively impaired by the construction and placement of the wind turbines. Proximity of the wind turbines to the existing Oil and Gas infrastructure impairs the efficiency and functionality of the existing Radar Early Warning System for detection of vessels and warning time required by the offshore fixed installation which is a statutory requirement. Further assessment of the radar, sectors and additional means for the traffic monitoring will be required to ensure Spirit compliance with the PFEER regulations. Spirit has shared minimum requirements that must be given consideration prior to finalising development	Impacts on collision risk as a result of the Project-alone are assessed in **Section 14.7.1.4**, **Section 14.7.2.4** and **Section 14.7.3.4**. Consideration of the potential cumulative effects on collision risk is presented in **Appendix 14.2** and summarised in **Section 14.8**. An assessment of impacts to REWS has been undertaken and is included in **Appendix 17.2** and **Section 14.7** Embedded mitigation set out in **Chapter 17 Infrastructure and Other Users** includes that WTGs and OSP(s) would be separated from oil and gas platforms with a helideck by a 1.5nm radius, and that WTGs/OSP(s) would not be placed within 500m of pipelines or cables unless agreed otherwise.

Consultee	Date	Comment	Response/where addressed in the ES
		plans and that further studies will be required to determine impact on the Radar Early Warning System, marine movements, and aviation. Minimum requirements shared to date: ▪ 500m exclusion zone around all oil and gas production platforms ▪ 500m either side of pipelines/cables to inspect and repair ▪ Vessel passing distance/transit corridor of at least 1 nautical mile from each facility ▪ 1 nautical mile corridor East-West of each platform to allow PSV and ERRV[5] access and a 1 nautical mile corridor between Calder and CPP1 Decommissioning vessels and rigs require a minimum of 1 nautical mile corridor to access the platforms, an approach from both East and West of the CPP1 platform and a minimum of 1.5 nautical mile radius around each platform to allow to manoeuvre into position.	
Navigation Directorate, Trinity House	2nd June 2023	Any navigable channels or corridors between Morgan, Mona and Morecambe wind farms must comply with MGN 654. We would welcome your earliest possible consultation regarding proposed turbine layouts, as well as the locations of any other infrastructure, as this matter may well require significant work to reach agreement.	The navigable routes between the Project, Morgan and Mona OWFs have been compared to MGN654 and PIANC guidance documents on the development of routes between adjacent OWFs. All three routes meet guidance requirements even with predicted increased vessel numbers and design vessel size (see **Appendix 14.2**, Section 7.6).

[5] Emergency Rescue and Recovery Vessel

Consultee	Date	Comment	Response/where addressed in the ES
			The final Project layout would be agreed with the MMO in consultation with MCA and TH prior to construction (refer to embedded mitigation for the Project in **Section 14.3.3**).
Key MNEF meetings / joint meetings with Morgan and Mona projects			
MNEF Consultees (see **Appendix 14.1**)	6th May 2022	Online meetings to disseminate information regarding cumulative navigation assessments and discuss any key navigation concerns.	Details of the consultation undertaken as part of the CRNRA, including the MNEF are presented in **Appendix 14.2**
	10th October 2022		
	18th January 2023		
	21st September 2023		
	8th February 2024		
Seatruck	7th December 2023	Morgan, Mona and Morecambe Navigation Assessment updates – with focus on each ferry operator.	Update on assessments provided, noting how safety concerns had been reduced with the revisions to the site boundaries by all three projects.
IoMSPC	11th December 2023		
Stena Line	13th December 2023		
Trinity House	18th December 2023	Update and review of engagement and assessments to date.	Further information is provided in **Appendix 14.1**.
MCA	19th December 2023		

Consultee	Date	Comment	Response/where addressed in the ES
Project-specific meetings			
Stena Line	22nd February 2024	Update to discuss any residual concerns.	See **Section 14.7** for impact assessment and residual effects.
IoMSPC	1st March 2024		

14.3 Scope

14.3.1 Study area

14.24 The windfarm site (encompassing all Project infrastructure) is located in the Eastern Irish Sea and encompasses a seabed area of 87km^2. The nearest point from the windfarm site to shore (coast of northwest England) is approximately 30km.

14.25 The study area for shipping and navigation is shown in **Figure 14.1**. A study area of 10nm around the windfarm site has been assessed in line with industry best-practice for shipping and navigation.

14.26 The CRNRA (**Appendix 14.2**) extends this study area to an area of approximately 6,000 nm² to assess the potential cumulative risks between the Project and the other proposed Irish Sea Round 4 projects (Mona Offshore Wind Project, Morgan Offshore Wind Project Generation Assets, and the Transmission Assets). Consideration in the Cumulative Assessment is also given to the AyM Offshore Wind Farm and Mooir Vannin Offshore Wind Farm (**Section 14.8.3.2**).

14.3.2 Realistic worst-case scenario

14.27 The final design of the Project would be confirmed through detailed engineering design studies that would be undertaken post-consent to enable the commencement of construction. To provide a precautionary but robust impact assessment at this stage of the development process, realistic worst-case scenarios have been defined. The realistic worst-case scenario (having the most impact) for each individual impact is derived from the Project Design Envelope (PDE) to ensure that all other design scenarios would have less or the same impact. Further details are provided in **Chapter 6 EIA Methodology**. This approach is common practice for developments of this nature, as set out in PINS Advice Note Nine: Rochdale Envelope (v3, 2018).

14.28 The realistic worst-case scenarios for the shipping and navigation assessment are summarised in **Table 14.2**. These are based on the project parameters described in **Chapter 5 Project Description** (Document Reference 5.1.5), which provides further details regarding specific activities and their durations. The envelope presented has been refined as much as possible between PEIR and ES, presenting a project description with design flexibility only where it is needed.

Table 14.2 Realistic worst-case scenarios for shipping and navigation

Impact	Worst-case scenario	Notes and rationale
Construction, operation and maintenance phases		
Impact 1: Impact on ferry routeing	**Project characteristics** ▪ Total windfarm site area: 87km^2 ▪ Approximate distance to shore: 30km ▪ Water depth: 18m - 40m ▪ Operational life: 35 years **Wind turbine generators (WTGs)** ▪ Maximum number WTGs installed: 35 ▪ Minimum air draught (rotor clearance above sea level) above highest astronomical tide (HAT): 25m ▪ Maximum rotor diameter: 280m ▪ Minimum in-row6 spacing: 1,060m ▪ Minimum inter-row7 spacing: 1,410m **Construction programme** ▪ 2.5 years **Offshore substation platforms (OSPs)** ▪ Maximum number of OSPs: 2	The worst-case displacement would result from the worst-case windfarm site area plus any buoyed construction area, including 500m construction safety zones.
Impact 2: Impact on commercial vessel routeing		
Impact 3: Impact on risk of allision		The worst-case impact on contact risk would result from the maximum number of WTGs installed over the largest possible area with minimum WTG spacing.
Impact 4: Impact on risk of collision		The worst-case impact on collision risk would result from the worst-case windfarm site area plus any buoyed construction area, including 500m construction safety zones as this may increase displacement and push traffic closer together increasing encounter potential. The introduction of Project vessels may increase traffic locally and increase encounter potential.

[6] Distance between adjacent WTGs within the same main row

[7] Distance between each main row

Impact	Worst-case scenario	Notes and rationale
Impact 5: Impact on search and rescue	▪ Maximum topside width: 50m ▪ Maximum height (above HAT): 50m (excluding helideck and lightning protection), 70m (including helideck and lightning protection) **Construction vessels** ▪ Up to 2,583 return vessel movements per year, and a maximum of 37 vessels on site at any one time. ▪ Port facilities are yet to be determined **Operation/maintenance vessels** ▪ Maximum of 384 return vessel trips during a standard year, with up to three vessels on site at any one time ▪ During a heavy maintenance year (expected to be every fifth year) a maximum of 832 return vessel trips may be required, with up to ten vessels on site at any one time	The worst-case impact on search and rescue is layout driven and would result from the maximum number of WTG/OSPs with minimum WTG/OSP spacing over the largest possible area.
Impact 6: Impact on snagging	**Project characteristics** ▪ Operational life: 35 years **Inter-array and platform link cables** ▪ Maximum length of inter-array and platform link cabling: 80km ▪ Minimum burial depth: 0.5m ▪ Maximum cable and pipeline crossings: 15 ▪ Maximum crossing height: 2.8m	The worst-case scenario for snagging is presented by the maximum length of inter-array cables, minimum burial depth and the maximum cable protection height.

Impact	Worst-case scenario	Notes and rationale
	▪ Maximum footprint of cable protection (including crossings and entries to WTG/OSPs): 216,250m^2 **<u>Construction programme</u>** ▪ Cable installation over approximately 9 months	
Impact 7: Impact on communications, radar and positioning systems	Please refer to the worst-case scenario for Impacts 1-6 listed above.	The worst-case for communications, radar and positioning systems is presented by the maximum number of WTGs/infrastructure at the minimum in-row spacing, and minimum proximity to routeing.
Decommissioning phase		
No decision has yet been made regarding the final decommissioning strategy. It is also recognised that legislation and industry best-practice change over time. The detail and scope of decommissioning works would be determined by the relevant legislation and guidance at the time of decommissioning and would be agreed with the regulator. It is anticipated that for the purposes of a worst-case scenario, the impacts would be no greater than those identified in the construction phase.		

14.3.3 Summary of mitigation embedded in the design

14.29 This section outlines the embedded mitigation relevant to the shipping and navigation assessment, which has been incorporated into the design of the Project (as summarised in **Table 14.3** and reflected in the NRA in **Appendix 14.1** and the CRNRA in **Appendix 14.2**). Where additional mitigation measures are proposed, these are detailed in the impact assessment (**Section 14.7** and **Section 14.8**).

Table 14.3 Embedded mitigation measures related to shipping and navigation

Parameter	Mitigation measures embedded into the design of the Project
Layout Design	To increase manoeuvring space and reduce impact on operators, the Project windfarm site boundary has been revised through a realignment of the western boundary to minimise potential impacts to passage plan routes of ferries and commercial vessels and minimise potential course changes for vessels navigating north-south.
Notice to Mariners (NtM)	NtM issued to ensure that the appropriate authorities and stakeholders are informed of works being carried out in waters surrounding the Project.
Site Marking and Charting	The windfarm site would be marked on nautical charts including an appropriate chart note. Structures would be coloured in line with TH requirements.
Safety zones	Application and use of safety zones of up to 500m measured from the outer edge of the surface infrastructure during construction/major maintenance and decommissioning phases. 50m safety zones would be applied for around partially completed Project structures or complete Project structures undergoing commissioning. 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.
Fisheries Liaison and Coexistence Plan	Provision of detailed Project information to fishermen, such as site and export cable route location for upload into chart plotters.
Continued engagement	Maintain the MNEF as appropriate to facilitate information sharing and management/identification of additional risk controls: ▪ Identify near misses and investigate incidents, disseminating learnings ▪ Coordinate construction activities
Recreational/Fishing Liaison	Ensure nominated persons are able to coordinate and communicate Project activities to recreational and fishing user groups. This includes during specific events (e.g. regattas).

Parameter	Mitigation measures embedded into the design of the Project
ERCoP	Production of an ERCoP with agreement of MCA.
Marine Pollution Contingency Plan	Measures would be adopted to ensure that the potential for release of pollutants from construction, operation and maintenance activities is minimised, which would include planning for accidental spills and responding to all potential contaminant releases.
Periodic Exercises	Periodic emergency management and response exercises would be run by the Applicant, in conjunction with Coast Guard Operations Centre (CGOC)/SAR.
Incident Investigation and Reporting	Compliance with statutory incident reporting requirements and expectations including: ▪ Marine Accident Investigation Branch (MAIB) (Merchant Shipping Act) ▪ Health, Safety and Environment (HSE) Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) ▪ Harbour Authority under Port Marine Safety Code Risk assessments to be reviewed following incidents, and additional risk controls identified if appropriate.
Aids to Navigation	Suitable Aids to Navigation (AtoN) lighting and marking the windfarm site shall be undertaken complying with IALA Recommendations G1162 (IALA, 2021), to be finalised and approved in consultation with MCA and TH through an Aids to Navigation Management Plan. Review use of fog horns to alert vessels to the position of structures when visibility is poor. Note planned update to O-139 to include painting reference from waterline (not HAT). WTG informal naming/associated markings shall not interfere with formal AtoN's. AIS transponders to be placed on periphery corner WTGs.
Buoyed Construction Area	Buoys deployed around construction work in the windfarm site in line with TH requirements and may include a combination of cardinal and/or safe water marks. To be finalised and approved in consultation with MCA and TH through an Aids to Navigation Management Plan.
Hydrographic Surveys	MGN654 requires that hydrographic surveys should fulfil the requirements of the IHO Order 1a standard, with the final data supplied as a digital full density data set, and survey report to the MCA Hydrography Manager and the UK Hydrographic Office (UKHO). Further information can be found in MGN654 Annex 4 supporting document titled 'Hydrographic Guidelines for Offshore Developers', available on website.
Cable Burial Risk Assessment (CBRA) and periodic validation surveys	CBRA to be undertaken pre-construction, including consideration of under keel clearance.

Parameter	Mitigation measures embedded into the design of the Project
	All subsea cables would be either fully buried (where ground conditions permit and burial tool performance allows), partially buried with rock protection, or surface laid with rock protection. Selected methods would be based on the risk assessment and the protection would be periodically monitored and maintained as practicable. No more than 5% reduction in water depth (referenced to Chart Datum) would occur at any point on the cable route without prior written approval from the Licensing Authority.
Air Draught Clearance	WTG blades would have at least 22m clearance above mean high water springs (MHWS) and allow for anticipated range of motion (pitch, roll, yaw, heave, surge and sway), as appropriate.
Layout Plan and Lines of Orientation	WTG layout plan to be agreed with MCA and TH prior to construction and maintain two lines of orientation.
	WTGs and OSP(s) would be separated (using a 1.5nm radius) from oil and gas platforms with a helicopter deck unless agreed otherwise.
Electromagnetic interference minimisation	A Cable Specification, Installation and Monitoring Plan would be prepared. This would 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.
Construction Method Statement and Programme and Decommissioning Method Statement	Construction programme and method statement to be submitted to and approved in writing by the MMO in consultation with relevant SNCB, the MCA and TH . Where possible, construction to follow linear progression avoiding disparate construction sites across the windfarm site.
Marine Operating Guidelines	Project vessels to follow Marine Operating Guidelines during construction and operation and maintenance activities to ensure project vessels do not present unacceptable risks to each other or third parties. Project marine traffic coordination plans to be made available to all maritime users. Information and warnings would be distributed via Notices to Mariners and other appropriate media (e.g. Admiralty Charts and fisher's awareness charts) to enable vessels and operators to effectively and safely navigate around the windfarm site and activities during the offshore cable corridor construction.
Vessel Standards	All work vessels operating on behalf of the Project would have: ▪ MCA Vessel Coding ▪ Appropriate Insurance ▪ Crewed by suitably trained/qualified personnel ▪ AIS (Class A/B) ▪ VHF (**Chapter 16 Civil and Military Aviation and Radar**) ▪ Appropriate mooring arrangements

Parameter	Mitigation measures embedded into the design of the Project
Personal Protective Equipment (PPE)	All personnel would wear the correct Personal Protective Equipment (PPE) suitable for the location and role at all times, as defined by the relevant Quality, Health, Safety and Environment (QHSE) documentation. This would include the use of Personal Locator Beacons (PLB's).
Guard Vessels	Provision of guard vessel in vicinity of windfarm site during construction or major maintenance to monitor third party vessel traffic and intervene with warnings as necessary.
Inspection and Maintenance Programme	Regular maintenance regime by the Applicant to check the Project infrastructure, its fittings and any signs of wear and tear. This should identify any failings which might result in a failure.
Training	The Applicant would be responsible for ensuring that all staff engaged on operations are competent to carry out the allocated work.
Compliance with International, UK and Flag State Regulations inc. International Maritime Organisation (IMO) conventions	Compliance from all vessels associated with the 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).
Vessel health and safety requirements	As industry standard mitigation, the Applicant would ensure that all Project related vessels meet both IMO conventions for safe operation as well as HSE requirements, where applicable. This shall include the following good practice: ▪ Windfarm associated vessels would comply with International Maritime Regulations ▪ All vessels, regardless of size, would be required to carry AIS equipment on board ▪ All vessels engaged in activities would comply with relevant regulations for their size and class of operation and would be assessed by the Project on whether they are 'fit for purpose' for activities they are required to carry out ▪ All marine operations would be governed by operational limits, tidal conditions, weather conditions and vessel traffic information ▪ Walk to work solutions would be utilised
Continuous watch	Continuous watch by multi-channel VHF, including DSC.
Vessel traffic monitoring	Continuous monitoring during construction and immediate period post construction to MCA approval.
Vessel Traffic Management Plan (VTMP)	Development of a VTMP covering aspects of vessel management during the construction phase to set out the measures required to mitigate traffic and transport-related effects resulting from the construction. An Outline plan is

Parameter	Mitigation measures embedded into the design of the Project
	submitted as part of the DCO Application (Document Reference 6.9).
CTV	Develop coordinated passage plans for CTVs that minimises impact on other traffic, could include: ▪ Specified passage plans ▪ Agreed passing protocols/CPA for interactions with commercial shipping (e.g. no crossing within 5nm ahead of commercial vessel underway) ▪ Reporting protocols to be established prior to crossing corridors ▪ Dissemination of passage plans and operations to regular runners and ferry services ▪ Restricted visibility protocols

14.4 Impact assessment methodology

14.4.1 Policy, legislation and guidance

14.4.1.1 UNCLOS

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

14.31 The requirement not to interfere with the use of recognised sea lanes essential to international navigation is also contained within Section 36B of the Electricity Act 1989.

14.4.1.2 National Policy Statements

14.32 The assessment of potential effects on shipping and navigation has been made with specific reference to the relevant NPS. These are the principal decision-making documents for Nationally Significant Infrastructure Projects (NSIPs). Those relevant to the Project are:

- Overarching NPS for Energy (EN-1) (Department for Energy Security and Net Zero (DESNZ, 2023a)
- NPS for Renewable Energy Infrastructure (EN-3) (DESNZ, 2023b)

14.33 The specific assessment requirements for shipping and navigation, as detailed in the NPS EN-1 and EN-3, are summarised in **Table 14.4**, together with an indication of the section of the ES chapter where each is addressed.

Table 14.4 NPS assessment requirements

NPS requirement	NPS reference	ES reference
NPS for Renewable Energy Infrastructure (EN-1)		
It is important that new energy infrastructure does not unacceptably impede or compromise the safe and effective use of any defence assets or operations.	Paragraph 5.5.35	As highlighted in **Section 14.1.1**, MOD maritime activities are not impacted by the Project. Further considerations are given in **Chapter 16 Civil and Military Aviation and Radar** and **Chapter 17 Infrastructure and Other Users**.
NPS for Renewable Energy Infrastructure (EN-3)		
Offshore wind farms and offshore transmission will occupy an area of the sea or seabed. For offshore wind farms in particular it is inevitable that there will be an impact on navigation in and around the area of the site. This is relevant to both commercial and recreational users of the sea who may be affected by disruption or economic loss because of the proposed offshore wind farm and/or offshore transmission.	Paragraph 2.8.178	Impacts to both recreational and commercial stakeholders, including disruption to existing routes, have been assessed in **Section 14.7** and **Section 14.8**. Consultation held with interested parties is detailed in **Section 14.2**, **Table 14.1**.
To ensure safety of shipping applicants should reduce risks to navigational safety to as low as reasonably practicable (ALARP), as described in Section 2.8.331	Paragraph 2.8.179	An NRA has been undertaken in accordance with MGN654 and IMO FSA guidance and is contained within **Appendix 14.1**. All Project-alone effects are considered ALARP. The potential cumulative effects arising from the Irish Sea Round 4 projects are assessed in **Section 14.8** and detailed within the CRNRA (**Appendix 14.2**). Ferry operators, including IoMSPC, participated in the navigational simulations and hazard workshop held to inform the CRNRA. The assessment concludes that with the embedded mitigation measures in place, including the Project boundary changes made since PEIR, the potential effect on navigational safety is

NPS requirement	NPS reference	ES reference
		moderate adverse but as low as reasonably possible (ALARP), and therefore not significant in EIA terms. Due to the release of the Scoping Report for the Mooir Vannin OWF in October 2023, after the completion of many of the activities undertaken to inform the CRNRA, an addendum to the CRNRA was prepared to consider the additional cumulative risks that may result to vessel traffic identified within the CRNRA (**Appendix 14.2**). While unacceptable cumulative navigation risks have been identified when also considering the proposed Mooir Vannin OWF project, the Project is not considered to contribute to these high-risk areas.
Impacts on navigation can arise from the wind farm or other infrastructure and equipment creating a physical barrier during construction and operation.	Paragraph 2.8.182	Project specific and cumulative impacts have been assessed in **Section 14.7** and **Section 14.8** respectively. Consultation held with interested parties, including the MCA, TH, the Chamber of Shipping and the commercial shipping sector is detailed in **Section 14.2**, **Table 14.1**. The Project is not located in the vicinity of recognised sea lanes essential to international navigation as identified in the NRA (**Appendix 14.1**, Section 5.3.3). The nearest TSS is the Liverpool Bay TSS which is located 12.4nm south of the Project, outside of the Project study area.
There may be some situations where reorganisation of shipping traffic activity might be both possible and desirable when considered against the benefits of the wind farm and/or offshore transmission application and such circumstances should be discussed with the government officials, including Secretary of State and Maritime and Coastguard Agency (MCA), and other stakeholders, including Trinity House, as The General Lighthouse Authority consultee, and the commercial shipping sector. It should be recognised that alterations might require national endorsement and international agreement and that the negotiations involved may take considerable time and do not have a guaranteed outcome.	Paragraph 2.8.183	
Applicants should engage with interested parties in the navigation sector early in the pre-application phase of the proposed offshore wind farm or offshore	Paragraph 2.8.184	An NRA has been undertaken in accordance with MGN654 and IMO FSA guidance and is contained

NPS requirement	NPS reference	ES reference
transmission to identify mitigation measures to reduce navigational risk to ALARP, to facilitate proposed offshore wind development. This includes the MMO or NRW in Wales, MCA, the relevant General Lighthouse Authority, such as Trinity House, the relevant industry bodies (both national and local) and any representatives of recreational users of the sea, such as the RYA, who may be affected. This should continue throughout the life of the development including during the construction, operation and decommissioning phases.		within **Appendix 14.1**. All Project-alone effects are considered ALARP. The potential cumulative effects arising from the Irish Sea Round 4 projects are assessed in **Section 14.8** and detailed within the CRNRA (**Appendix 14.2**). Ferry operators, including IoMSPC, participated in the navigational simulations and hazard workshop held to inform the CRNRA. The assessment concludes that with the embedded mitigation measures in place, including the Project boundary changes made since PEIR, the potential effect on navigational safety is moderate adverse but as low as reasonably possible (ALARP), and therefore not significant in EIA terms. Due to the release of the Scoping Report for the Mooir Vannin OWF in October 2023, after the completion of many of the activities undertaken to inform the CRNRA, an addendum to the CRNRA was prepared to consider the additional cumulative risks that may result to vessel traffic identified within the CRNRA (**Appendix 14.2)**. While unacceptable cumulative navigation risks have been identified when also considering the proposed Mooir Vannin OWF project, the Project is not considered to contribute to these high-risk areas. Impacts have been assessed in **Section 14.7** and **Section 14.8**. Consultation held with interested parties, including the MCA, TH, the Chamber of Shipping and RYA is detailed in **Section 14.2**, **Table 14.1**. The continuation of the MNEF, to facilitate information sharing and identification of additional risk controls through construction, operation and decommissioning

NPS requirement	NPS reference	ES reference
		has been committed to within the embedded mitigation for the Project (**Section 14.3.3**, **Table 14.3**).
Engagement should seek solutions that allow offshore wind farms, offshore transmission and navigation and shipping users of the sea to successfully co-exist.	Paragraph 2.8.185	The Applicant has participated in the MNEF which has been established to enable developers to regularly update stakeholders on plans and progress of the Project and the Morgan and Mona Offshore Wind Projects, and for stakeholders to express views or concerns on the impacts of the projects for discussion. Engagement is planned to continue as the Project progresses. Consultation held with interested parties is detailed in **Section 14.2**, **Table 14.1**.
The presence of the wind turbines can also have impacts on communication and shipborne and shore-based radar systems.	Paragraph 2.8.186	Potential effects on communications, including radar, are assessed in **Section 14.7.2.7**. Cumulative effects are assessed in **Section 14.8**. A REWS assessment is also provided (**Appendix 17.2** of **Chapter 17 Infrastructure and Other Users**).
Prior to undertaking assessments applicants should consider information on internationally recognised sea lanes, which is publicly available.	Paragraph 2.8.187	The Project is not located in the vicinity of recognised sea lanes essential to international navigation as identified in the NRA (**Appendix 14.1**, Section 5.3.3). The nearest TSS is the Liverpool Bay TSS which is located 12.4nm south of the Project, outside of the Project study area. Datasets considered within the Project NRA are detailed in **Section 14.4.2**. This includes publicly available and privately sourced information and survey data collected in accordance with the requirements of MGN654.
Applicants should refer in assessments to any relevant, publicly available data available on the Maritime Database.	Paragraph 2.8.188	
Applicants must undertake an NRA in accordance with relevant government guidance prepared in consultation	Paragraph 2.8.189 – 2.8.190	An NRA has been undertaken in accordance with MGN654 and IMO FSA guidance and is contained within **Appendix 14.1**.

NPS requirement	NPS reference	ES reference
with the MCA and the other navigation stakeholders listed above. The navigation risk assessment will for example necessitate: ▪ a survey of vessel traffic in the vicinity of the proposed wind farm; ▪ a full NRA of the likely impact of the wind farm on navigation in the immediate area of the wind farm in accordance with the relevant marine guidance; and ▪ cumulative and in-combination risks associated with the development and other developments (including other wind farms in the same area of sea.		MGN654 compliant vessel traffic surveys have been undertaken and are detailed in **Section 14.4.2.1**. A cumulative assessment and CRNRA has been undertaken and is detailed in **Section 14.8** and **Appendix 14.2**. Impact interactions are considered in **Section 14.11**.
In some circumstances, applicants may seek declaration of a safety zone around wind turbines and other infrastructure. Although these might not be applied until after consent to the wind farm has been granted. The declaration of a safety zone excludes or restricts activities within the defined sea areas including navigation and shipping. Where there is a possibility that safety zones will be sought applicant assessments should include potential effects on navigation and shipping. Where the precise extents of potential safety zones are unknown, a realistic worst-case scenario should be assessed. Applicants should consult the MCA for advice on maritime safety, and refer to the government guidance on safety zones as a part of this process.	Paragraph 2.8.191 – 2.8.194	500m safety zones are assumed during construction, major maintenance and decommissioning activities. Operational phase safety zones outside of major maintenance activities are not assumed. Safety zones have been considered in the impact assessment contained in **Section 14.7**, as well as the Safety Zone Statement (Document Reference 4.5). Applications would be made post-consent, as committed to in the embedded mitigation for the Project (**Section 14.3.3**, **Table 14.3**).

NPS requirement	NPS reference	ES reference
Applicants should undertake a detailed Navigation Risk Assessment, which includes Search and Rescue Response Assessment and emergency response assessment prior to applying for consent. The specific Search and Rescue requirements will then be discussed and agreed post-consent.	Paragraph 2.8.195	An NRA has been undertaken in accordance with MGN654, including Annex 5 which includes the MCA (2021) guidance document on requirements and operational considerations for SAR and Emergency Response within windfarm sites, as well as IMO FSA guidance. The NRA is contained within **Appendix 14.1**. Impacts to SAR are assessed in **Section 14.7**. Impacts to SAR are mitigated through layout design (WTG spacing and two lines of orientation) and the requirement to adhere to an ERCoP (which is included as embedded mitigation in **Section 14.3.3**). The WTG layout and markings would be agreed with the MMO in consultation with the MCA and TH prior to construction.
Mitigation measures will include site configuration, lighting and marking of projects to take account of any requirements of the General Lighthouse Authority.	Paragraph 2.8.259	Mitigation measures including layout design/plan, marking and charting, aids to navigation, buoyed construction area, hydrographic surveys and commitment to two lines of orientation are embedded in the Project, as presented in **Section 14.3.3**.

NPS requirement	NPS reference	ES reference
The Secretary of State should not grant development consent in relation to the construction or extension of an offshore windfarm if it considers that interference with the use of recognised sea lanes essential to international navigation is likely to be caused by the development. The use of recognised sea lanes essential to international navigation means: (a) anything that constitutes the use of such a sea lane for the purposes of article 60(7) of the United Nations Convention on the Law of the Sea 1982; and (b) any use of waters in the territorial sea adjacent to Great Britain that would fall within paragraph (a) if the waters were in a Renewable Energy Zone (REZ).	Paragraph 2.8.326 – 2.8.327	Impacts to commercial routeing are assessed in **Section 14.7**. The Project is not located in the vicinity of recognised sea lanes essential to international navigation as identified in the NRA (**Appendix 14.1**, Section 5.3.3). The nearest TSS is the Liverpool Bay TSS which is located 12.4nm south of the Project, outside of the Project study area. Cumulative effects of the Project, the Morgan Wind Project Generation Assets, the Mona Offshore Wind Project and the Morgan and Morecambe Transmission Assets on traffic routeing in the region are assessed in the CRNRA (**Appendix 14.2**, Section 7.2).
The Secretary of State should be satisfied that the site selection has been made with a view to avoiding or minimising disruption or economic loss to the shipping and navigation industries with particular regard to approaches to ports and to strategic routes essential to regional, national and international trade, lifeline ferries and recreational users of the sea. Where after carrying out a site selection, a proposed development is likely to adversely affect major commercial navigation routes, for instance by causing appreciably longer transit times, the Secretary of State should give these adverse effects substantial weight in its decision making. Where a proposed offshore wind farm is likely to affect less strategically important shipping routes, the Secretary of State should take a pragmatic approach to considering proposals to minimise negative impacts.	Paragraph 2.8.328 – 2.8.330	The site selection process is detailed in **Chapter 4, Site Selection and Alternatives**. Shipping and navigation was a key consideration in the site selection process (including the scale of the Project) and the Project design evolution (including a refinement to the western boundary of the windfarm site made post-PEIR) to minimise potential impacts to passage plan routes of ferries and commercial vessels and minimise potential course changes, route deviations and commercial impacts. Impacts to existing vessel routeing, and by extension approaches to ports, is assessed in **Section 14.7**. Further details on changes to transit times and existing routeing is contained within the NRA (**Appendix 14.1**).

NPS requirement	NPS reference	ES reference
The Secretary of State should be satisfied that risk to navigational safety is as low as reasonably practicable (ALARP). It is government policy that wind farms and all types of offshore transmission should not be consented where they would pose unacceptable risks to navigational safety after mitigation measures have been adopted.	Paragraph 2.8.331	An NRA has been undertaken in accordance with MGN654 and IMO FSA guidance and is contained within **Appendix 14.1**. All Project-alone effects are considered ALARP. The potential cumulative effects arising from the Irish Sea Round 4 projects are assessed in **Section 14.8** and detailed within the CRNRA (**Appendix 14.2**). Ferry operators, including IoMSPC, participated in the navigational simulations and hazard workshop held to inform the CRNRA. The assessment concludes that with the embedded mitigation measures in place, including the Project boundary changes made since PEIR, the potential effect on navigational safety is moderate adverse but as low as reasonably possible (ALARP), and therefore not significant in EIA terms. Due to the release of the Scoping Report for the Mooir Vannin OWF in October 2023, after the completion of many of the activities undertaken to inform the CRNRA, an addendum to the CRNRA was prepared to consider the additional cumulative risks that may result to vessel traffic identified within the CRNRA (**Appendix 14.2**). While unacceptable cumulative navigation risks have been identified when also considering the proposed Mooir Vannin OWF project, the Project is not considered to contribute to these high-risk areas.
The Secretary of State should be satisfied that the scheme has been designed to minimise the effects on recreational craft and that appropriate mitigation measures, such as buffer areas, are built into applications to allow for recreational use outside of commercial shipping routes.	Paragraph 2.8.332 – 2.8.333	Impacts to recreational vessels have been considered within the NRA (**Appendix 14.1**) and within the impact assessment contained in **Section 14.7** and in **Chapter 17 Infrastructure and Other Users**. There is little recreational activity in and surrounding the windfarm site with recreational activity greatest to the south-east of the study area (**Appendix 14.1**, Figures

NPS requirement	NPS reference	ES reference
In view of the level of need for energy infrastructure, where an adverse effect on the users of recreational craft has been identified, and where no reasonable mitigation is feasible, the Secretary of State should weigh the harm caused with the benefits of the scheme.		21 and 22) with recreational activity greatest along the coast.
The Secretary of State should make use of advice from the MCA, who will use the NRA described in paragraphs 2.8.189 and 2.8.190 above.	Paragraph 2.8.334	The Project NRA is provided in **Appendix 14.1** and the CRNRA is provided in **Appendix 14.2.** The MCA has been consulted throughout the pre-application NRA and CRNRA process, including participation in hazard workshops, and has been included in the MNEF. Details of the consultation held is included in **Section 14.2**, **Table 14.1**.
The Secretary of State should have regard to the extent and nature of any obstruction of or danger to navigation which (without amounting to interference with the use of such sea lanes) is likely to be caused by the development in determining whether to grant consent for the construction, or extension, of an offshore wind farm, and what requirements to include in such a consent.	Paragraph 2.8.335	An NRA has been undertaken to assess impacts to navigation safety in accordance with MGN654 (**Appendix 14.1**). Impacts have been assessed in **Section 14.7** and **Section 14.8**. Mitigation measures embedded in the design are outlined in **Section 14.3.3**.

14.4.1.3 Additional relevant policy and guidance

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

- MGN654 (Merchant and Fishing) Safety of Navigation: Offshore Renewable Energy Installations (OREIs) – Guidance on United Kingdom (UK) Navigational Practice, Safety and Emergency Response (MCA, 2021)
- MGN372 (Merchant and Fishing) OREIs: Guidance to Mariners Operating in the Vicinity of UK OREIs (MCA, 2008)
- Methodology for Assessing the Marine Navigational Safety & Emergency Response Risks of OREI (MCA, 2021)
- Revised Guidelines for FSA for use in the Rule-Making Process IMO, 2018)
- The IALA Recommendation G 1162 on The Marking of Man-Made Offshore Structures (IALA, 2022)
- The RYA's Position on Offshore Renewable Energy Developments: Paper 1 (of 4) – Wind Energy (RYA, 2019)
- Standard Marking Schedule for Offshore Installations (DECC, 2011a)
- The United Nations Convention on the Law of the Sea (UNCLOS) (United Nations, 1982)
- Convention on the International Regulations for Preventing Collisions at Sea, 1972 (COLREGs)

North-West Inshore and North-West Offshore Marine Plan

14.35 Provisions of relevance to shipping and navigation from the North-West Marine Plan, published by the Department for Environment, Food and Rural Affairs (Defra) in 2021, are considered in **Table 14.5**.

Table 14.5 North-West Inshore and North-West Offshore Marine Plan guidance relevant to shipping and navigation

Reference	Summary	How and where this is considered in the ES
NW-DD-1	In line with the NPS for Ports, sustainable port and harbour development should be supported. Only proposals demonstrating compatibility with current port and harbour activities will be supported. Proposals within statutory harbour authority (SHA) areas or their approaches that detrimentally and materially affect safety of navigation, or the compliance by SHAs with the	Impacts to vessel routeing, and therefore access to nearby ports, are assessed in **Section 14.7** and **Section 14.8**.

Reference	Summary	How and where this is considered in the ES
	Open Port Duty or the Port Marine Safety Code (PMSC), will not be authorised unless there are exceptional circumstances. Proposals that may have a significant adverse impact upon future opportunity for sustainable expansion of port and harbour activities, must demonstrate that they will, in order of preference: ▪ Avoid ▪ Minimise ▪ Mitigate adverse impacts so they are no longer significant If it is not possible to mitigate significant adverse impacts, proposals should state the case for proceeding.	
NW-DD-2	Proposals that require static sea surface infrastructure or that significantly reduce under-keel clearance must not be authorised within or encroaching upon IMO routeing systems unless there are exceptional circumstances	Locations of IMO routeing are outlined in **Section 14.5**. Potential impacts of snagging on cabling within the windfarm site, both inter-array and platform link cables are assessed in **Section 14.7.2.6**. Impacts to routes, including ferries, are assessed in **Section 14.7** and **Section 14.8**.
NW-DD-3	Proposals that require static sea surface infrastructure or that significantly reduce under-keel clearance which encroaches upon high density navigation routes, strategically important navigation routes, or that pose a risk to the viability of passenger services, must not be authorised unless there are exceptional circumstances.	
NW-DD-4	Proposals promoting or facilitating sustainable coastal and/or short sea shipping, as an alternative to road, rail or air transport, will be supported, where appropriate.	The future case shipping and navigation traffic profile is presented in **Section 14.6**.

14.4.2 Data and information sources

14.4.2.1 Site specific surveys

14.36 Vessel traffic surveys within the study area (defined as a 10nm area around the windfarm site) were undertaken in-line with MGN654 requirements and as agreed with statutory stakeholders. A summary of the survey is presented in **Table 14.6**. Further detail on the vessel traffic surveys is provided in the NRA (**Appendix 14.1**).

Table 14.6 Site specific survey data

Survey name and year	Summary
Vessel Traffic Survey (Winter, 2022)	14-day vessel traffic survey to obtain winter radar, AIS and visual data across the study area between 9th February 2022 and 26th February 2022.
Vessel Traffic Survey (Summer, 2022)	14-day vessel traffic survey to obtain radar, AIS and visual data across the study area between 30th July 2022 and 13th August 2022.
Vessel Traffic Survey Winter 2023)	14-day winter vessel traffic survey undertaken between 27th November 2023 and 13th December 2023 to ensure compliance with MGN654 survey data requirements.

14.4.2.2 Other available sources

14.37 In addition to the survey data outlined in **Section 14.4.2.1**, the data sources outlined in **Table 14.7** were used to inform the baseline assessment within the NRA.

14.38 Given the interconnected nature of the Project and the Morgan and Morecambe Offshore Wind Farms: Transmission Assets, the environmental information for the Transmission Assets PEIR has also been used to inform this chapter (Morgan Offshore Wind Limited and Morecambe Offshore Windfarm Ltd, 2023a).

Table 14.7 Existing data sources used in this chapter

Data source	Date	Data contents
Marine Traffic	2019 and 2022	High-fidelity AIS data
MMO	2019	One year's anonymised AIS data
RYA	2019	RYA Coastal Atlas or Recreational Boating
MMO	2020	UK VMS Data
Department for Transport (DfT)	2000-2022	DfT shipping statistics
MAIB	1992 - 2022	Accidents database
Royal National Lifeboat Institute (RNLI)	2008-2022	RNLI callout data
DfT	2015-2022	SAR helicopter taskings
The Crown Estate	2023	Marine aggregate dredging licenses
The Crown Estate	2023	Location of offshore renewables lease areas
North Sea Transition Authority	2023	Location and status of offshore oil and gas activity
Admiralty	2023	Admiralty charts

Data source	Date	Data contents
Admiralty Total Tide	2019	Tidal data
UKHO Admiralty sailing directions (NP40 Irish Coast Pilot 2019)	2022	Met-ocean data

14.4.3 Impact assessment methodology

14.39 **Chapter 6 EIA Methodology** provides a summary of the general impact assessment methodology applied to the Project. The following sections outline the methodology used to assess the potential impacts on shipping and navigation.

14.40 The EIA assessment methodology for shipping and navigation integrates the EIA process presented in **Chapter 6 EIA Methodology** with that utilised within the Project NRA ensuring compliance with the IMO FSA process and MGN654. This ensures the systematic approach of EIA assessment to identification of significance of effect in EIA terms is maintained while also ensuring MCA compliance and transparency with the NRA assessment. The risk assessment process was discussed with stakeholders during the hazard workshop and revised to reflect their feedback. Further details on the risk assessment criteria and methodology are contained within the Project NRA (**Appendix 14.1**).

14.41 The IMO FSA guidance defines a hazard as potential to threaten human life, health, property or the environment, the realisation of which results in an incident or accident. The potential for a hazard to be realised (i.e. likelihood) can be combined with an estimated or known consequence of outcome and this combination is termed “risk”. The terms used to define frequency of occurrence and severity of consequence are outlined in **Table 14.8** and **Table 14.9**. How a risk score is derived based on the likelihood and each of the four severity scorings is set out in **Table 14.10**.

14.42 The derivation of the significance, in EIA terms, of a risk score is defined in **Table 14.11**. For EIA purposes effect significance scoring minor adverse or less are considered acceptable. Potential effects identified within the assessment as major significance are regarded as significant in EIA terms. Effects identified within the assessment as moderate significance are regarded as significant in EIA terms unless assessed to be ALARP within the NRA.

14.43 Following initial assessment, if the effect does not require additional mitigation (or none is possible), the residual effect would remain the same. If, however, additional mitigation is proposed, an assessment of the post-mitigation residual effect is provided.

Table 14.8 Frequency of occurrence

Rank	Description	Definition
1	Remote	Remote probability of occurrence within the study area and few examples within wider maritime industry. Collision or allision risk - <1 occurrence per 1,000 years
2	Extremely unlikely	Extremely unlikely to occur within the study area and has rarely occurred in wider industry. Collision or allision risk - 1 per 100 – 1,000 years
3	Unlikely	Unlikely to occur within the study area during the Project lifecycle and has occurred at other offshore wind farms. Collision or allision risk - 1 per 10 – 100 years
4	Reasonably probable	May occur once or more during the Project lifecycle. Collision or allision risk - 1 per 1 – 10 years
5	Frequent	Likely to occur multiple times during the Project lifecycle. Collision or allision risk - Yearly

Table 14.9 Severity of consequence per incident occurrence [8]

Rank	Definition	Description			
		People	Property (damage)	Environment[9]	Commercial/reputation
1	Negligible	Minor injury	Less than £10,000	Minor spill no assistance required	Minimal impact on activities.
2	Minor	Multiple minor injuries	£10,000-£100,000	Tier 1 Local assistance required	Local negative publicity. Short term loss of revenue or interruption of services to ports/offshore windfarms/oil and gas/ferries and other marine users.
3	Moderate	Multiple major injuries	£100,000-£1million	Tier 2 Limited external assistance required	Widespread negative publicity. Temporary suspension of activities to ports/offshore windfarms/oil and gas /ferries and other marine users.
4	Serious	Fatality	£1million-£10million	Tier 2 Regional assistance required	National negative publicity. Prolonged closure or restrictions to ports/offshore windfarms/oil and gas/ferries and other marine users.
5	Major	Multiple fatalities	>£10million	Tier 3 National assistance required	International negative publicity. Serious and long term disruption to ports/offshore windfarms/oil and gas/ferries and other marine users.

[8] A severity of consequence is assigned per incident occurrence which does not reflect the Project duration

[9] The three tiered structure, established by IPIECA, enables robust oil spill preparedness and response frameworks to be developed, from small operational spillages to a worst-case release at sea - https://www.ipieca.org/resources/good-practice/tiered-preparedness-and-response/

Table 14.10 Risk matrix

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

Table 14.11 Definition of significance

Risk	Tolerability	Description	EIA significance
Negligible	Broadly Acceptable	Generally regarded as not significant and adequately mitigated. Additional risk reduction should be implemented if reasonably practicable and proportionate	Negligible No discernible change in receptor condition Effect is not significant
Low			Minor Small change in receptor condition Effect is not significant
Medium	Tolerable (if ALARP)	Generally regarded as within a zone where the risk may be tolerable in consideration of the project. Requirement to properly assess risks, regularly review and implement risk controls to maintain risks to within ALARP where possible.	Moderate Intermediate change in receptor condition Effect may be significant or not significant (if ALARP)
High	Unacceptable	Generally regarded as significant and unacceptable for project to proceed without further review.	Major Very large or large change in receptor condition Effect is significant
Extreme			

14.4.4 Cumulative effects assessment methodology

14.44 The CEA considers other plans, projects and activities that may impact cumulatively with the Project. As part of this process, the assessment considers which of the residual effects assessed for the Project on its own have the potential to contribute to a cumulative effect. **Chapter 6 EIA Methodology** provides further details of the general framework and approach to the CEA.

14.45 Cumulative effects which are relevant to shipping and navigation are described and assessed in **Section 14.8** and have been informed by the CRNRA contained in **Appendix 14.2**.

14.46 As described in **Chapter 1 Introduction**, the Transmission Assets associated with the Project are undergoing a separate consent process as part of the Transmission Assets. To enable impacts from the Project and the Transmission Assets to be considered together, a 'combined' assessment is made within the cumulative assessment to identify any key interactions and additive effects (**Section 14.8.3.1**).

14.4.5 Transboundary effects assessment methodology

14.47 **Chapter 6 EIA Methodology** provides details of the general framework and approach to the assessment of transboundary effects.

14.48 Transboundary effects relevant to shipping and navigation are described in **Section 14.9**.

14.5 Existing environment

14.49 A summary of baseline offshore activities, including navigation activities, is outlined in this section. Further information, including met-ocean conditions is contained in the NRA (**Appendix 14.1**).

14.5.1 Baseline offshore activities

14.5.1.1 Responsible authorities

14.50 The study area is in a region of general navigation in UK waters with the MCA as the responsible authority for safe navigation.

14.5.1.2 IMO routeing

14.51 There are no IMO routeing/reporting measures or recommended channels within the study area and accordingly these are not assessed further in relation to Project-alone effects. Cumulative effects are considered in the CRNRA in **Appendix 14.2** and in **Section 14.8**.

14.52 The Liverpool Bay traffic separation scheme (TSS) is the closest routeing measure located approximately 12.4nm south of the Project windfarm site (as shown in Figure 8 of the NRA, **Appendix 14.1**). This TSS deconflicts vessel traffic on passage to/from the Mersey ports and maintains a safe distance between vessels, the oil and gas infrastructure to the north and the Gwynt y Môr Offshore Windfarm to the south. The area surrounding the Douglas Oil Field infrastructure is charted as an Area to be Avoided with the accompanying note: 'The IMO-adopted Area to be Avoided should only be entered by authorised vessels to access the Douglas Oil Field'.

14.5.1.3 Aids to Navigation

14.53 Aids to navigation (AtoNs) marking oil and gas infrastructure are located within the study area. The Calder 110/7a platform is 0.9km to the western boundary of the windfarm site, marked with a white light displaying morse 'U'. The South Morecambe drilling platform (DP3) platform (formally located within the windfarm site) has now been fully decommissioned and removed as well as all associated cardinal markers.

14.54 AtoNs marking the West of Duddon Sands offshore windfarm and the Walney offshore windfarm are present 8nm and 10nm to the north of the study area, respectively. These AtoNs comprise cardinal marks indicating the safe water to the south and east of the West of Duddon Sands offshore windfarm and marking of Signification Peripheral Structures (SPS) for both windfarms.

14.55 The Morecambe West Cardinal mark is located 5nm northeast of the windfarm site, marking the western extent of Shell Flat on the southern approaches to Lune Deep.

14.56 A Single Buoy Mooring (SBM) for mooring vessels transferring oil from Douglas oil field is located 4nm south of the windfarm site.

14.5.1.4 Pilotage

14.57 There are no pilot boarding stations within the study area. The nearest pilot boarding station at Barrow is located 13nm northeast of the windfarm site. The Liverpool pilot boarding station is 15nm southeast within the Port of Liverpool Competent Harbour Authority (CHA) Area. Other nearby pilot boarding stations are shown in **Table 14.12** and **Figure 8** in **Appendix 14.1**.

Table 14.12 Pilot boarding stations

Boarding Station	Distance from Project windfarm site
Barrow	13nm northeast
Liverpool	15nm southeast
Fleetwood and Heysham	18nm northeast
Mostyn Outer	23nm south
Mostyn	24nm southeast
Point Lynas (Liverpool heavy weather)	29nm southwest
Douglas Port (pilot boarding stations for Liverpool)	35nm northwest

14.5.1.5 VTS

14.58 The windfarm site and study area are outside of any Vessel Traffic Service (VTS) or Local Port Service (LPS) areas. VTS or LPS are marine traffic monitoring systems established by harbour or port authorities to provide navigational and weather information to all maritime traffic within the area. The closest VTS is Liverpool to the southeast of the study area. The VTS covers the Liverpool CHA area monitoring vessel traffic through AIS and radar.

14.5.1.6 Local Ports and harbours

14.59 There are no ports or harbours within the study area. Nearby ports and harbours, and their distance from the windfarm site, are shown in **Table 14.13** (also see **Appendix 14.1**, Figure 8). Additional vessels associated with the Project could lead to congestion of traffic, however while the location of the port(s) to supply the Project have not been selected, previous offshore wind projects elsewhere in the UK have successfully mitigated these challenges, particularly through marine coordination of construction activities and liaison with ports and harbours. Effects to ports and harbours are thus assessed as part of routeing effects.

Table 14.13 Nearby ports and harbours

Port	Type	Distance from Project windfarm site
English ports		
Port of Barrow (England)	Commercial port	19nm northeast
Port of Fleetwood (England)	Fishing and recreational port	18nm northeast
Heysham Port (England)	Commercial port	24nm northeast

Port	Type	Distance from Project windfarm site
Port of Liverpool (England)	Major west coast commercial port	25nm southeast
Isle of Man ports		
Douglas Port	Main port for the Isle of Man. Commercial port.	35nm northwest
Laxey Port	Fishing and recreational port	36nm northwest
Castletown Harbour (Isle of Man)	Fishing and recreational port	38nm northwest
Port Erin (Isle of Man)	Fishing and recreational port	43nm northwest
Port St Mary (Isle of Man)	Fishing and recreational port	41nm northwest
Peel (Isle of Man)	Fishing and recreational port	44nm northwest
Welsh ports		
Port of Mostyn (Wales)	Commercial port	27nm southeast
Conwy Harbour (Wales)	Fishing and recreational port	29nm south
Holyhead (Wales)	Commercial port	42nm southwest

14.5.1.7 Search and rescue

14.60 His Majesty's Coastguard's (HMCG) Aviation Branch provides aviation-based search and rescue via the UK Search and Rescue Helicopter (UKSARH) programme. The nearest HMCG helicopter base is located at Caernarfon Airport, Gwynedd and is 47nm southwest of the windfarm site. The Caernarfon Facility provides a 24-hour SAR service, with two Sikorsky S-92 helicopters.

14.61 There are a number of RNLI lifeboat stations within the region. RNLI stations in the east Irish Sea are shown in **Table 14.14** (see **Appendix 14.1,** Figure 10). The nearest lifeboat station is located at Blackpool 15nm east of the windfarm site.

Table 14.14 East Irish Sea RNLI stations

Facility	Resources	Distance from windfarm site
Blackpool	Lifeboat station with three inshore lifeboats, including an Atlantic 85 and two D class lifeboats.	16nm east
Lytham St Annes	Shannon class all-weather lifeboat and a D class inshore boat. Lifeboats are housed in Lytham and St Annes.	16nm east
Fleetwood	Shannon and D class lifeboats.	18nm northeast
Barrow	Tamar class and D class lifeboats.	19nm northeast

Facility	Resources	Distance from windfarm site
Hoylake	Shannon class lifeboat.	24nm southeast
West Kirby	D class lifeboat.	26nm southeast
Rhyl	Shannon class all-weather lifeboat and a D class inshore boat.	26nm south
Llandudno	Shannon class all-weather lifeboat and a D class inshore boat.	27nm south
Morecambe	D class and Hover class lifeboats.	27nm northeast
Douglas (Isle of Man)	Mersey class lifeboat (there are also RNLI stations located in Port Erin, Port St. Mary and Peel in the Isle of Man).	36nm northwest
Moelfre	Tamar class and D class lifeboats.	32nm southwest
New Brighton	Operates a B class Atlantic 85 lifeboat.	25nm southeast

14.5.1.8 Oil and gas

14.62 The study area overlaps with the South Morecambe Gas Field, North Morecambe gas field and the Calder Gas Field. The South Morecambe Gas Field is owned and operated by Spirit Energy. Calder 110/7a is owned by Harbour Energy and operated by Spirit Energy. These fields are supported by offshore infrastructure (platforms, pipelines, cables and wells) and onshore facilities for extracting, transporting and processing reserves. Wells and pipelines associated with these fields overlap with the windfarm site.

14.63 Oil and gas infrastructure located within the study area is shown in **Table 14.15** (see **Appendix 14.1**, Figure 9). The closest gas platforms to the Project windfarm site are the Calder CA1 platform located 0.9km (0.5nm) to the west of the site, and the South Morecambe Central Processing Complex (CPC) located 1.6km (0.9nm) to the north of the site. CPC is comprised of three bridge linked platforms including an accommodation platform (AP1), central production platform (CPP1) and drilling platform (DP1). AP1 and CPP1 combined are referred to as CPC-1. It is noted that the South Morecambe DP3 platform (charted within the windfarm site) has now been decommissioned, with the platform topsides and jacket now removed.

14.64 Further information pertaining to oil and gas activity within the study area and wider east Irish Sea is set out in **Chapter 17 Infrastructure and Other Users**.

Table 14.15 Oil and gas fields within the study area

Name	Type	Shortest distance from Project windfarm site	Status
Calder Gas Field	Normally unmanned	0.2nm west	Producing. Decommissioning expected, but timeline not fully established.
South Morecambe Gas Field	Manned	0.6nm north	Producing. DP3 and DP4 platforms have been decommissioned and removed. Further decommissioning of DP6, DP8 and CPP1 is expected, but timeline not fully established.
North Morecambe Gas Field	Manned	7.4nm north	Producing
Hamilton North Gas Field	Normally unmanned	6.3nm south	Producing
Conwy Oil Field	Manned	7.4nm south	Producing
Crogga Hydrocarbon Licence	n/a	38.9nm north west	The Department of Infrastructure has issued a Seaward Production Innovate Licence to Crogga Limited in respect of the hydrocarbon block 112/25. This licence commenced on 1st January 2019.

14.65 Future oil and gas activities, including decommissioning and carbon capture and storage options are reviewed in **Section 14.6**.

14.5.1.9 Subsea cables

14.66 The Irish Sea has numerous cables, primarily telecommunication connections between the UK and the Isle of Man and Ireland, as well as export cables from existing offshore windfarms.

14.67 In the windfarm site there are power cables supplying the oil and gas infrastructure at the Calder Gas Field and South Morecambe Gas Field along with the GTT/Hibernia Atlantic telecommunications cable traversing the windfarm site in a west-east direction. The telecommunications cable Lanis 1 owned by Vodafone runs along the southern boundary of the windfarm site.

14.68 To the south of the windfarm site, there are five telecommunications cables running from either Blackpool or Southport to either the Republic of Ireland or the Isle of Man. North of the windfarm site there is one power interconnector between Douglas and Blackpool, along with the inter-array cabling and export cables for the other windfarms in the study area. There is also one power cable

passing through the southwest of the study area between Birkenhead and Ardneil Bay, West Kilbride, Scotland (**Appendix 14.1,** Figure 9).

14.5.1.10 Aggregates

14.69 There are no aggregate extraction areas within the windfarm site. The nearest active aggregate extraction area to the windfarm site, and within the study area, is Area 457, 5nm south in Liverpool Bay.

14.5.1.11 Disposal sites

14.70 There is one licensed active disposal area in the study area, 'Site Y' located 9nm to the southeast of the windfarm site.

14.5.1.12 Other offshore windfarm projects

14.71 One existing windfarm is within the shipping and navigation study area, the West of Duddon Sands offshore windfarm 7nm to the north. Other nearby windfarms are detailed in **Table 14.16**.

Table 14.16 Nearby Irish Sea offshore windfarms

Name	Type	Distance to Project windfarm site	Status
West of Duddon Sands Windfarm	Operational windfarm (389-megawatt (MW) capacity)	7nm north	Operational since 2014
Walney Windfarm (including extensions)	Group of operational windfarms (total capacity of 1026MW)	10.1nm north	Operational since 2011, with extensions operational in 2012 and 2018
Barrow Windfarm	Operational windfarm (90MW capacity)	11.4nm north east	Operational since 2006
Ormonde Windfarm	Operational windfarm (150MW capacity)	14.5nm north	Operational since 2012
Gwynt-y-Môr Windfarm	Operational windfarm (576MW capacity)	15.5nm south	Operational since 2015
Burbo Bank Windfarm (including extensions)	Operational windfarm (90MW plus 258MW extension)	15.6nm south east	Operational since 2007, extension operational since 2017
North Hoyle Windfarm	Operational windfarm (60MW capacity)	19.5nm south	Operational since 2004
Rhyl Flats Windfarm	Operational windfarm (90MW capacity)	21.5nm south	Operational since 2009

14.5.1.13 Anchorages and offshore waiting areas

14.72 There are no charted anchorages within the study area. Commercial vessels use the SBM 4nm to the south of the windfarm site as an anchorage when transferring oil from the Douglas oil field. Douglas Bay is used as an anchorage for vessels waiting to enter the Port of Douglas and for cruise vessels when undertaking tendering operations.

14.73 There are two charted anchorages located within the Port of Liverpool CHA area. One lies south of the approaches to Liverpool between the Burbo Bank Extension and Gwynt y Môr Offshore Windfarms. The other is located north of the approaches to the River Mersey.

14.74 Rhyl North is used by vessels waiting for pilotage to the Port of Mostyn, located directly north of the Mostyn Pilot Boarding Station. Heysham Port has a designated anchorage, located in Lune Deep adjacent to the Pilot Boarding Station.

14.5.1.14 Practice and Exercise Areas

14.75 There are no PEXA located in the study area. Firing practice area D406 is located approximately 15nm to the north of the windfarm site. No restrictions are placed on the right to transit the firing practice areas at any time. The firing practice area is operated using a clear range procedure, meaning that firing only takes place when the area is confirmed clear of all shipping.

14.5.2 Baseline navigation activities

14.76 Vessel traffic analysis by vessel type was undertaken for the AIS data obtained for the periods between 1st January 2019 and 31st December 2019, and 1st January 2022 and 31st December 2022. The collection of radar and visual data during the three 14-day vessel traffic surveys (**Section 14.4.2.1**) was used to supplement the understanding of small craft movements. This section presents a summary of the findings. Further detail and analysis is contained within the Project NRA (**Appendix 14.1**).

14.77 Between 63 and 191 (2019 data), and 52 and 129 (2022 data) transits per month intersected the windfarm site. Between 959 and 1,657 (2019 data), and 508 and 1,176 (2022 data) transits per month intersected the study area. Traffic peaks were noted in summer owing primarily to increased ferry operations but increases in recreational and fishing vessels were also noted. Tug and service vessels associated with oil and gas infrastructure and passenger vessels associated with ferry routes make up the majority of these transits.

14.5.2.1 Dry cargo vessels

14.78 In total, there were 484 cargo vessel transits through the study area in 2019, (an average of 1.4/day) and 269 in 2022 (an average of 0.7/day). During the 2022 vessel traffic surveys, 20 cargo vessels were identified during the 28-day survey period (an average of 0.7 vessels/day). A total of 13 cargo vessels were observed during the 14-day winter 2023 survey period (an average of 1 vessel/day).

14.79 Three primary cargo (dry cargo) vessel routes intersect the windfarm site. The Heysham to/from Barrow route and two routes between Liverpool and Ireland/Scotland. All routes are considered low frequency with <1 vessel per day transiting each.

14.80 Cargo vessel tracks passing through the study area (**Appendix 14.1**, Figure 18) include vessels transiting between Dublin, Warrenpoint, Belfast or the Isle of Man and the English ports of Heysham, Barrow or Liverpool. Routes out of Heysham and Barrow transit east-west between the West of Duddon Sands offshore windfarm and the South Morecambe gas field. Routes out of Liverpool either pass 2nm east of the SBM (located 4nm to the south of the windfarm site) and south of the windfarm site, or west of the SBM and through the centre of the windfarm site.

14.5.2.2 Tankers

14.81 There were 272 tanker vessel transits through the study area in 2019 (an average of 0.8/day) and 166 in 2022 (an average of 0.5/day). The vessel traffic surveys identified 15 tanker transits during the 28-day survey period (an average of 0.5 vessels/day) and were observed to be utilising routes identified in the 2019 and 2022 data. A total of eight tankers were observed during the 14-day winter 2023 survey period (an average of 0.6 vessels/day).

14.82 Few tankers transit through the windfarm site (**Appendix 14.1**, Figure 19). In 2019 tanker movements transited the windfarm site nine times in an east-west direction between Barrow and Off Skerries TSS. In 2022 tanker movements were concentrated to the west of the windfarm site which occasionally (seven times) cross the southwestern corner of the windfarm site.

14.83 A north/south route between Larne/Belfast and Liverpool operated by a single vessel, KEEWHIT, is located 5.2nm east of the windfarm site. 23 transits were identified on this route in 2019 which increased to 64 in 2022. KEEWHIT is regularly used for bunkering of other vessels whilst they are in port.

14.5.2.3 Ferries

14.84 Four ferry operators are identified in the Eastern Irish Sea. IoMSPC operate between Douglas, Liverpool and Heysham. Seatruck operate between

Heysham, Liverpool, Warrenpoint and Dublin. Stena Line operate between Liverpool, Heysham and Belfast. Finally, P&O operate between Liverpool and Dublin.

14.85 Seven ferry routes pass through the study area, one passage plan transits directly through the windfarm site (operated by Stena Line) and two transit close to the southwestern edge of the windfarm site (operated by Stena Line and IoMSPC) as detailed in **Table 14.17** (also see **Appendix 14.1**, Figure 36 and Figure 37). The Stena East of IoM (East of Calder) route between Liverpool and Belfast passes northwest-southeast through the centre of the windfarm site. The IoMSPC route between Liverpool and Douglas, and the Stena East of IoM (West of Calder) Liverpool-Belfast route (small overlap with the 90th percentile), pass close to the southwestern most corner, with a small number of vessels overlapping the windfarm site.

14.86 The IoMSPC operates between Douglas on the Isle of Man and either Heysham or Liverpool. The Heysham/Douglas route is the most frequently run route with 1,372 and 1,451 transits/year (3-4/day) in 2019 and 2022 respectively, and passes east-west through the northern region of the study area between the South Morecambe gas field and the West of Duddon Sands offshore windfarm. The Liverpool/Douglas route had 674 vessel transits/year during 2019 and 593 transits/year in 2022, passing northwest/southeast through the study area. The vessel MANANNAN runs a seasonal service on this route, with two transits/day in winter and four transits/day in summer. The route runs primarily west of the SBM through the south of the study area (599 and 551 transits/year in 2019 and 2022). A small proportion of vessels on this route transit east of the SBM (53 and 42 transits/year in 2019 and 2022 respectively), of which 14 and 8 passed through the windfarm site during 2019 and 2022 respectively. During consultation it was confirmed vessels transit east of the SBM on northbound transits to avoid congestion in the Liverpool Bay TSS (thereby exiting the TSS earlier).

14.87 Stena Line operates routes between Belfast and either Liverpool or Heysham. The normal weather route between Heysham and Belfast is out of the study area, however the adverse weather route brings the vessels on a route through the northern extent of the study area (outside the windfarm site) between the South Morecambe gas field and the West of Duddon Sands offshore windfarm. Vessels using the route between Belfast and Liverpool pass either east or west of the Isle of Man dependent on prevailing metocean conditions. Primarily, vessels use the westerly route that passes through the southern region of the study area with 1,442 transits/year (3-4 vessels/day) in 2019 and 1,490 transits/year (4/day) in 2022. Ferries passing east of the Isle of Man transit northwest/southeast on two planned routes. One route passes southwest of the windfarm site to the west of the Calder platform (up to 200 transits/year, < 1 vessel/day). Approximately 80% of traffic using this route is

southbound. On this sub-route 0.5% (one transit) and 1.5% (three transits) of vessels intersected the windfarm site in 2019 and 2022, respectively. The second east of Isle of Man route passes directly through the windfarm site to the east of the Calder platform and is utilised by northbound traffic exiting the Liverpool Bay TSS with 153 transits/year (<1 vessel/day) in 2019 and 196 transits/year (<1/day) in 2022.

14.88 Seatruck operates two east-west routes through the northern section of the study area, between South Morecambe gas field and West of Duddon Sands offshore windfarm: Heysham to Warrenpoint and Heysham to Dublin, totalling 1,490 ferry transits/year (3-4/day) and 1,705 (4-5/day) in 2022. Seatruck also operates a route between Liverpool to Dublin south of the study area.

14.89 P&O ferries operates a route between Liverpool and Dublin which passes south of the windfarm site, outside the study area.

Table 14.17 Ferry routes and crossings within the study area by operator. Routes passing through (90th percentile) the windfarm site (blue), routes passing through the study area (grey)

Ferry operator	Passage plan route	Example vessels (2019-2022)	Approximate annual vessel count (2019)	Approximate annual vessel count (2022)
Stena Line	LIV-BEL East of IOM (West of Calder)[10]	Stena Edda Stena Embla Stena Estrid Stena Horizon Stena Lagan Stena Mersey Stena Forecaster Stena Forerunner Stena Foreteller	200	194
	LIV-BEL East of IOM (East of Calder)		153	196
	LIV-BEL West of IOM		1,442	1,098
IoMSPC	LIV – DOUG[11]	Manannan Ben My Chree	674	593
	HEY-DOUG	Arrow Mannanan Ben My Chree	1,372	1,451
Seatruck	HEY - WAR	Seatruck Performance Seatruck Precision	967	1,099

[10] Route passes outside (southwest) of the windfarm site. On this sub-route one transit and three transits of vessels intersected the windfarm site in 2019 and 2022, respectively.

[11] The passage plan is outside (southwest) of the windfarm site, however 14 and 8 vessels on this route passed through the windfarm site in 2019 and 2022, respectively.

Ferry operator	Passage plan route	Example vessels (2019-2022)	Approximate annual vessel count (2019)	Approximate annual vessel count (2022)
	HEY - DUB	Seatruck Pace Seatruck Panorama	523	606

14.90 During adverse sea conditions, ferries may adopt alternative routeing to reduce the risk of damage and improve passenger comfort, as detailed in **Appendix 14.1**.

14.91 Prevailing southwesterly adverse weather typically results in ferries taking a more southwesterly transit to control the course relative to the conditions and take advantage of the lee from the shore. During adverse weather, Stena Line and IoMSPC routes tend to transit to the southwest of the study area, towards the prevailing conditions.

14.92 On three occasions in 2022 Seatruck adverse weather routes passed through the windfarm site as a result of particular metocean conditions. However, the typical adverse weather routes do not pass through the windfarm site.

14.5.2.4 Cruise ships

14.93 Cruise vessels visit the ports of Liverpool and Douglas. Approximately 18 cruise ships were recorded transiting the study area in 2019, this number decreased to six in 2022. These vessels were on a southeast/northwest route and transited the southern region of the study area on voyage between Liverpool and Ireland or Douglas. No cruise ships were identified passing through the windfarm site in either 2019 or 2022.

14.94 One cruise ship, the 89m length overall (LOA) CORINTHIAN, was identified in the summer vessel traffic survey to the north of the windfarm site on passage to Barrow. The closest passing cruise ship was Amadea (193m LOA) passing 1.5nm southwest of the windfarm site on passage between Liverpool and Douglas (summer 2022) (**Appendix 14.1**, Figure 20).

14.5.2.5 Recreational

14.95 There is little recreational activity in the windfarm site with recreational activity greatest to the south-east of the study area (**Appendix 14.1**, Figures 21 and 22). No recreational tracks were recorded in the 2022 or 2023 winter survey and 12 tracks were recorded during the summer survey, six of which intersected the windfarm site. The 2022 AIS data also shows the study area is characterised by low levels of cruising vessel tracks, with only 26 tracks crossing the windfarm site.

14.96 Recreational vessels remain predominantly along the coast, particularly along the entrance to Liverpool, and around Holyhead, Douglas and Rhyl. Offshore cruising routes are present between Liverpool and the Isle of Man, Heysham/Barrow and Conwy Bay with vessels transiting to/from clubs and marinas.

14.5.2.6 Fishing

14.97 Fishing activity occurs across the study area throughout the year (**Appendix 14.1**, Figures 23 and 24). During the hazard workshop, it was discussed that the area is used primarily by vessels using static gear, with very little trawling activity. Belgian beam trawlers were noted as making periodic visits to the area. Where high concentrations of vessels appear in close proximity to oil and gas installations, these are likely being use for guard vessel purposes or other survey works as opposed to fishing.

14.98 Fishing vessel activity during vessel traffic surveys was concentrated to the south and southwest of the study area during winter and within the northern half of the study area during summer. South and south western sections of the windfarm site have been recorded as having over 10,000 hours of fishing time in 2020 from VMS data (**Appendix 14.1**, Figure 25).

14.99 Further information is located in **Chapter 13 Commercial Fisheries**.

14.5.2.7 Tug and service vessels

14.100 Tug and service vessels include CTVs, oil and gas vessels and associated support vessels, dredgers, SAR vessels, tugs and pilot vessels.

14.101 Sixteen CTV tracks crossed southeast/northwest through the windfarm site in 2019 between Liverpool and the Walney Extension offshore windfarm (see **Appendix 14.1**, Figure 26). CTVs transiting southwest/northeast between Barrow and Off Skerries TSS additionally transited through the windfarm site accounting for 22 transits/year. Transits through the eastern region of the study area passed north/south between Liverpool and the offshore windfarms to the north, totalling 157 transits/year. 21 of these tracks passed within 1nm of the north-eastern corner of the windfarm site.

14.102 In 2022, 18 CTVs were recorded transiting the windfarm site in a southeast/northwest or southwest/northeast direction, although only two were recorded transiting southwest/northeast. The eastern region of the study area remained frequently transited by CTVs travelling north-south, though the 157 transits recorded in 2019 decreased to 71 in 2022.

14.103 Oil and gas service vessels mostly operate out of Heysham or Liverpool. Oil and gas associated supply ships and standby safety vessels have a high intensity within the windfarm site and study area owing to the presence of oil

and gas platforms in close proximity to the windfarm site (Section 14.5.1.8). In 2019, approximately 1.5 vessels per day passed through the windfarm site and 11.5 vessels per day operated within the study area. In 2022, activity decreased with one vessel per day transiting the windfarm site, and 7.5 vessels per day entering the in the study area.

14.104 During both 2019 and 2022, dredgers and pilot vessels were present within the east and southeast of the study area in small numbers. A low use dredger route between Heysham and the Off Skerries TSS passes through the windfarm site. SAR vessels are dispersed throughout the study area.

14.5.2.8 Principal routes

14.105 Principal routes were identified in the study area in accordance with MGN654 90th percentile corridor principles to establish commercial shipping routes in proximity to the Project (**Appendix 14.1**, Figure 33). There are 13 commercial vessel 90th percentile routes with <1 vessel movement/day that intersect the study area, of which six intersect the windfarm site (**Table 14.18**). All routes with more than one vessel movement per day operate outside of the study area and are on transit to/from the Port of Liverpool.

Table 14.18 Significant commercial (dry cargo and tanker) vessel routes intersecting the windfarm site

Passage plan route	Route direction	Annual vessel count (2019)	Annual vessel count (2022)	Basecase route distance (nm)
LIV-East of IOM (West of Calder)	Southward/Northward	20	13	72.4
LIV-East of IOM (East of Calder)	Southward/Northward	20	14	70.1
HEY-Off Skerries TSS	Eastward	35	10	68.6
	Westward	18	7	72.5
BAR-Off Skerries TSS	Eastward	22	13	67.4
	Westward (South of Calder Gas Field)	17	4	71.8

14.106 No repeatable adverse weather routeing behaviours taken by commercial vessels were identified, likely due to the low number of commercial vessels operating in the area. It is anticipated that commercial vessels would route to avoid adverse impacts to cargo and crew in poor weather.

14.5.2.9 Anchoring and waiting vessels

14.107 The highest intensity of anchored vessel activity takes place outside of the study area on the eastern coast of Anglesey near the Point Lynas Pilot Boarding Station (**Appendix 14,1**, Figure 39). Anchoring or loitering within the study area occurs at non-charted anchorage areas, notably around oil and gas infrastructure north of the windfarm site and the southern extent of the study area. No anchoring activity is evident within the windfarm site.

14.5.3 Incidents

14.108 MAIB and RNLI incident data was analysed as outlined in **Table 14.7**. Incident rates across the windfarm site and study area are low. Four navigationally significant incidents were recorded within the windfarm site between 1992 and 2022 (**Appendix 14.1**, Figure 40):

- Two related to mechanical failures (one fishing and one recreational craft)
- One minor personal injury incident related to the roll of a passenger ship in heavy weather which resulted in injury to a passenger
- One contact incident was recorded to the north of the windfarm site related to the loss of control of a service ship and subsequent rig contact at the South Morecambe gas field. The MAIB recorded this as a 'Less Serious' incident, with minor damage reported

14.109 Using the MAIB and RNLI databases, between 1 and 6 navigationally significant incidents occur in the study area per year (**Appendix 14.1**, Figure 41). This incident frequency is low, and mainly relates to mechanical failure aboard recreational vessels.

14.110 Further analysis including detail on background incident rates within offshore windfarms is contained in the NRA (**Appendix 14.1**, Section 6.5).

14.6 Future case scenario

14.111 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations) require that "an outline of the likely evolution thereof without implementation of the development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge" is included within the ES (EIA Regulations, Schedule 4, Paragraph 3).

14.112 From the point of assessment, over the course of the development and operational lifetime of the Project, long-term trends mean that the condition of the baseline environment is expected to evolve.

14.113 This section provides a qualitative description of the evolution of the baseline environment, on the assumption that the Project is not constructed, using available information and scientific knowledge of shipping and navigation.

14.6.1 Commercial vessels

14.114 Analysis of the future case traffic profile has been undertaken within the NRA (**Appendix 14.1**). The Department for Transport (DfT) publishes historical and projected port statistics, including annual freight quantities and transits which can be used as an indicator of long-term trends. Projected freight traffic into UK major ports, produced by the DfT in 2019 is shown in **Plate 14.1**. Nationally, port traffic is forecast to remain relatively flat in the short term but grow in the long term, with tonnage 39% higher in 2050 compared to 2016. This equates to approximately a 15% increase in national freight tonnage by 2035.

14.115 Liquid bulk traffic (principally crude oil) has the largest forecast decreases, continuing a historical trend. Similarly, general cargo is forecast to decrease driven by increased containerisation of goods. Dry bulk traffic is forecast to have a relatively large decrease in the short term, driven primarily by demand for coal being projected to fall. In the long term, the decrease associated with coal will be offset primarily by biomass resulting in an overall increase. Unitised freight (motor vehicles, Twenty-foot Equivalent Units (TEUs) Lift-on/Lift-off (Lo-Lo) and Roll-on/Roll-off (Ro-Ro)) are all forecast to grow strongly, driven by economic growth.

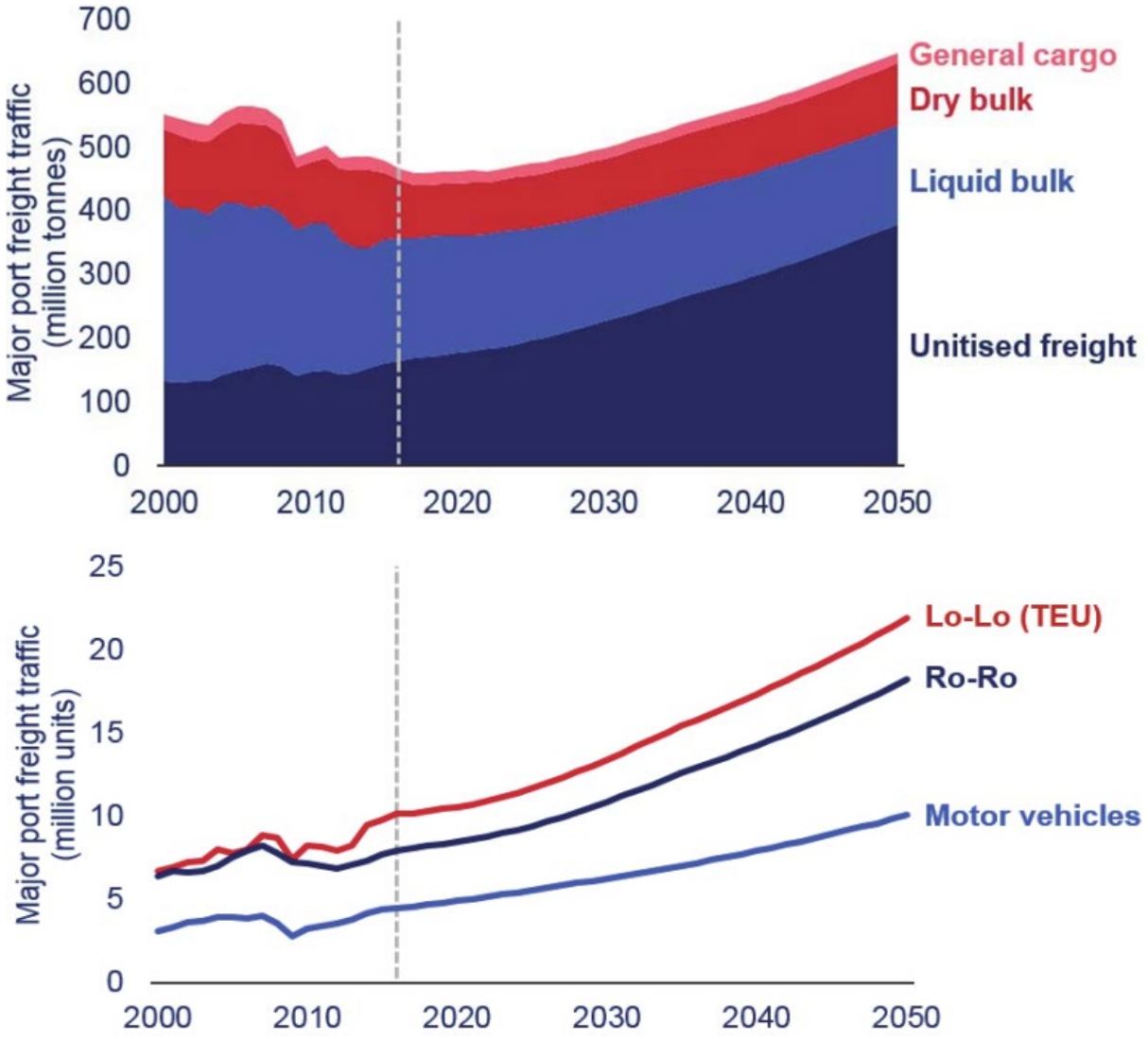

Plate 14.1 UK port freight projections (DfT, 2019)

14.116 Locally, port freight activity at the Port of Liverpool steadily increased between 2014 and 2019, before undergoing a significant reduction in 2020, likely due to pandemic related restrictions. It should be noted that an increase in tonnage does not necessarily correlate with an increase in vessels. New build vessels are often larger, capable of carrying more cargo, and ports such as Liverpool have invested in shoreside infrastructure to better handle these larger vessels.

14.6.2 Ferries

14.117 Freight and passenger ferries account for a large proportion of vessel movements within the study area. These routes are subject to change both in terms of schedule and via the addition of new routes in order to meet market demand. For example, between the AIS data for 2019 and the data for 2022 shows that Stena replaced several of their ferries with the new E-flex class.

14.118 Seatruck has seen significant growth in demand reporting a 30% increase in volumes since 2015, with a 10% increase in 2017 alone. The increase in unaccompanied trailer volumes between 2007 and 2018 was reportedly 250%. A €100 million investment by Seatruck in 2018 was announced to increase capacity on the Warrenpoint to Heysham route by 30%.

14.119 Both of the IoMSPC vessels are twenty years old and will require replacement before 2035. The Ben My Chree will be replaced by the Manxman, which entered service in 2023. Consultation with IoMSPC determined that it is reasonable to assume that the Ben My Chree and Manxsman will have similar handling and endurance capabilities. The Manannan is due for replacement before 31st December 2026. This may be replaced by either a new fast craft or a fast conventional ferry.

14.120 Trends for passenger numbers (**Appendix 14.1**, Figure 45) show a gradual increase in passenger numbers across most routes with the exception of the Liverpool-Dublin route which has had a steady decline. Meanwhile Liverpool-Belfast has experienced an increase and was the least affected route during COVID-19. Predicting how these trends may influence vessel schedules and routes is uncertain. Therefore, an assumption is made that vessel routes will be similar in 2035 as to the existing base case but with a likely increase in services.

14.6.3 Fishing

14.121 Fishing within the Irish Sea is important for both the UK and Isle of Man. There is limited information available for future fishing vessel activity. Within the study area, UK fisheries primarily target non-quota shellfish species, namely queen scallop *Aequipecten opercularis*, whelk *Buccinum undatum*, king scallop *Pecten maximus* (hereon referred to as scallop), and lobster *Homarus gammarus*. Therefore, fishing fleets are unlikely to be impacted by quota transfers following the UK's withdrawal from the European Union. Market changes have the potential to impact fishing activity in the study area, however, fishing activity in the area is not anticipated to change significantly, with both local and foreign vessels continuing fishing activity in the area. Further information is located in **Chapter 13 Commercial Fisheries**.

14.6.4 Recreational

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

influenced by COVID-19 with a significant variation between 2021 and 2022 due to national/local lockdowns. It is assumed therefore, that a significant change in the number of recreational users due to macro trends is unlikely.

14.6.5 Oil and gas vessels

14.123 Irish Sea oil and gas platforms are reaching the end of their life and approaching decommissioning. Full details of which platforms and timelines are not yet known. The Project overlaps with the Morecambe South and Calder gas fields.

14.124 The South Morecambe gas field includes the platforms DP6, DP8 and the Central Processing Complex (CPC) and associated cable, pipeline and umbilical infrastructure. DP3 (chartered within the windfarm site) and DP4 were decommissioned and removed in 2023 meaning there are no further obstructions to navigation present. The CPC is located 0.9nm north of the windfarm site and is a hub complex made up of three platforms on jacket substructures (CPP1, AP1 and DP1). The Calder gas field includes platform CA1 which is a small production platform with a single topside located 0.5nm to the mid-west of the windfarm site boundary.

14.125 A 500m exclusion zone would be necessary around all oil & gas platforms in order to ensure ongoing legislative compliance (it is noted that the Project has committed to 1.5nm of separation from surface piercing Project infrastructure (i.e. wind turbine generator and offshore substation platforms) for platforms with an active helideck). These are considered throughout the Project design process and in consideration of the developing layout scenarios. Oil and gas operators have also noted access requirements for Platform Supply Vessels (PSV) and Emergency Rescue and Recovery Vessel (ERRV).

14.126 The International Guidance for Offshore Marine Operations (IGOMO) state that vessels should plan for vessel passing distances of at least 1nm (1.8km) from each platform and operations which might be in progress in its immediate vicinity.

14.127 Future decommissioning of oil and gas platforms would require a jack-up barge or heavy lift vessel followed by a drilling rig, estimated to be on site for over six months per platform and supported by service vessels. Within the South Morecambe gas field, a platform supply vessel currently operates three days a week and an ERRV operates 365 days/year. Future vessel movements would continue for ERRVs during decommissioning during which time platform supply vessel transits may also increase.

14.128 The Project is located within and surrounding areas designated for gas storage and carbon capture storage (CCS). An Agreement for Lease (AfL) with The Crown Estate was awarded for the Gateway Gas Storage Facility in

2018, which covers offshore rights in the east of the Irish Sea. No development activities have taken place to date and the storage facility is located 4km to the northeast of the windfarm site, with no direct overlap.

14.129 In 2020 ENI UK Limited were awarded a carbon dioxide appraisal and storage licence covering an area located within the Liverpool Bay area. Under the licence, Eni plans to reuse and repurpose depleted hydrocarbon reservoirs (the Hamilton, Hamilton North and Lennox fields) and associated infrastructure to permanently store carbon dioxide captured in northwest England and north Wales. These fields are located 10km to the south of the windfarm site and there is no direct overlap.

14.130 Rights for the exploration and appraisal of potential carbon dioxide storage sites were granted by the North Sea Transition Authority in 2023 for an area overlapping with the windfarm site (East Irish Sea Area 1). This area contains the Spirit Energy proposed Morecambe Net Zero Cluster Project which would provide a carbon storage and hydrogen production cluster if a permit is sought and granted, however detailed plans for this potential project are not currently available.

14.131 Further information on oil and gas activities is contained in **Chapter 17 Infrastructure and Other Users**.

14.7 Assessment of effects

14.132 The principal receptors with respect to shipping and navigation are outlined in **Section 14.5.2** and include vessel operators such as ferries and commercial vessels, and other users of the sea, including oil and gas operators and associated support vessels and recreational vessels. Potential impacts on shipping and navigation receptors, and realistic worst-case scenarios arising from the Project, are introduced in **Table 14.2**.

14.7.1 Potential effects during construction

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

14.7.1.1 Impact 1: Impact on ferry routeing

14.134 Existing ferry traffic could be displaced during construction due to the presence of buoyed construction areas, active safety zones, construction vessels and partially completed or pre-commissioned structures. Detailed construction schedules and areas would be defined post-consent, but it is assumed that construction areas could extend 500m beyond the windfarm site boundary. Displacement would be greatest when the windfarm site is fully

constructed (maximum footprint) which is assessed in the operation and maintenance **Section 14.7.2.1**.

14.135 For regular runners such as ferries, the obstruction and subsequent re-routeing presented by windfarm construction activities has the potential to result in increased costs or to make schedules unviable. Impacts on routeing may in turn lead to increased contact or collision risks (**Section 14.7.1.3** and **Section 14.7.1.4**).

14.136 Hours of rest and berth constraints were raised as a concern during consultation. The Maritime Labour Convention requires 10 hours of rest in any 24-hour period, in a maximum of two separate periods, of which at least six hours must be uninterrupted. Existing ferry schedules enable this requirement to be met. Increased transit durations could impact their ability to comply with the convention.

14.137 An increase in transit distance as a result of the Project windfarm location is identified for one route; the Stena Line Liverpool to Belfast east of Isle of Man (east of Calder) route, which would experience a 1.6nm increase in journey distance in normal metocean conditions (**Table 14.19**). Vessels using this route are primarily northbound exiting the Liverpool Bay TSS. Approximately one vessel every two days (153 – 196 vessel transits per year) was recorded on this route with vessels instead favouring the use of the west of Isle of Man routes that pass outside of the windfarm site through the south of the study area (**Appendix 14.1**, Figure 48).

14.138 The IoMSPC route between Liverpool and Douglas would be constrained by the presence of the Project windfarm site. The basecase passage plan is 2.3nm clear of the southwestern corner of the windfarm site and would be unaffected, however, a small proportion of westward transiting vessels (12.8% of vessels in 2022) navigate to the north of Hamilton North Gas Field structure (110/13). The presence of the windfarm site would require all IoMSPC Liverpool/Douglas services to follow their existing standard passage plan and navigate south of the Hamilton North structure.

14.139 In order to manage displacement impacts throughout the construction phase, the requirement to ensure third party vessels are aware of construction activities and display information on charts is embedded in the Project design. This includes an AtoN Management Plan covering the construction period which would be agreed prior to construction.

Frequency of occurrence

14.140 As outlined above and detailed in **Section 14.5.2.3**, Stena Line currently has one route (the Liverpool to Belfast east of Isle of Man (east of Calder) route) that transits through the windfarm site. Vessels navigating to the east of Calder (CA1) are on westbound transits. In total, 153 transits utilised the passage

plan in 2019 and 196 transits were recorded in 2022. The development of the windfarm site would necessitate a re-routeing of this route around the windfarm site.

14.141 Stena Line and IoMSPC also each have one route that transits in close proximity to the windfarm site (the IoMSPC Liverpool to Douglas route and the Stena Liverpool to Belfast east of Isle of Man (west of Calder) route). While re-routeing would not be required, the development of the windfarm site may limit routeing options, with ferries required to keep a safe distance from the Project.

14.142 The frequency of IoMSPC and Stena Line transits passing through the study area are detailed in **Table 14.17**. No increase in journey distance is recorded for the IoMSPC Liverpool to Douglas route or the Stena Liverpool to Belfast east of Isle of Man (west of Calder) route, however the following is noted:

- The Stena Liverpool to Belfast east of IoM (west of Calder) passage plan is clear of the southwest corner of windfarm site by 2.5nm. In 2019, one transit on this route intersected the windfarm site and three intersected in 2022. The presence of the windfarm site would require all Stena Line Liverpool/Belfast (east of IoM) services to navigate south of Calder CA1, along the existing operator passage plan. This results in no additional transit distance between the basecase and futurecase passage plans for the vessels passing to the west of Calder CA1, and an additional 1.6nm (5.1 minutes) for vessels passing to the east of Calder CA1
- The IoMSPC Liverpool to Douglas basecase passage plan is 2.3nm clear of the southwestern corner of the windfarm site and would be unaffected, however, a small proportion of westward transiting vessels (12.8% of vessels in 2022) navigate north of Hamilton North Gas Field structure (110/13), with 14 and 8 vessels on this route passing through the windfarm site in 2019 and 2022 respectively. The presence of windfarm site would require all IoMSPC Liverpool/Douglas services to navigate south of 110/13 on the existing standard passage plan

14.143 Overall, the frequency of occurrence has been assessed as **frequent**, with deviations experienced on greater than an annual basis.

Severity of consequence

14.144 Analysis suggests (**Appendix 14.1**, Section 8.2) that in normal conditions the additional transit distance for the Stena Line Liverpool to Belfast east of Isle of Man (east of Calder) route (an increase of 1.6nm on a 114nm passage) would increase journey time by approximately five minutes (an increase of 1% to the baseline journey time of 480 minutes). As set out above this route is used approximately once every two days and this small increase in journey

time is not likely to significantly adversely impact upon operations (noting there would be some associated operational costs).

14.145 No increase in journey distance is recorded for the IoMSPC Liverpool to Douglas route or the Stena Line Liverpool to Belfast east of IoM (west of Calder) route.

14.146 In adverse weather, ferry operators tend to transit to the southwest of the study area towards the prevailing conditions. As such, IoMSPC, Seatruck and P&O adverse weather routes, and the Stena Liverpool to Belfast west of IoM route, are largely unaffected by the windfarm site (**Appendix 14.1**, Section 8.2). Stena Line vessels on the Liverpool to Belfast east of IoM (east of Calder) route typically follow normal weather routeing during adverse weather, although there is infrequent use of the Stena Liverpool to Belfast east of IoM (east of Calder) route during adverse weather with no vessels recorded in 2019 and two in 2022. These vessels would be deviated to the southwest of the windfarm site, to follow a similar adverse weather route to that of the Liverpool to Belfast west of IoM. This deviation would increase the basecase Liverpool to Belfast (east of IoM) adverse weather route by 1.5nm, adding approximately 5.2 minutes to the 8 hour baseline journey time. This increases total delays from 0 – 30 minutes in the basecase to 5.2 - 35.2 minutes for the futurecase (**Appendix 14.1**, Table 28). However as noted above the route is not typically used in adverse weather conditions.

14.147 The severity of consequence has been assessed as **negligible**.

Significance of effect

14.148 The effect has been assessed as **minor adverse** and is not significant in EIA terms.

Additional mitigation

14.149 The measures included in the embedded mitigation for the Project (**Table 14.3**), particularly the realignment of the western boundary of the windfarm site, and the Project's commitment to continued engagement with navigation stakeholders, ensures the potential effects on ferry routeing during construction of the Project are not significant in EIA terms. Additional mitigation measures are not considered necessary.

Residual effect

14.150 The residual effect has been assessed as **minor adverse**, which is not significant in EIA terms.

14.7.1.2 Impact 2: Impact on commercial vessel routeing

14.151 Offshore windfarms can impact commercial vessel routeing or loitering by creating an obstruction in otherwise navigable waters that requires deviation

of vessel routes. For commercial vessels, this has the potential to result in increased operational costs (such as fuel) and transit times. Impacts on routeing may in turn lead to increased contact or collision risks (**Section 14.7.1.3** and **Section 14.7.1.4**).

14.152 During the construction phase, commercial traffic could be displaced due to the presence of buoyed construction areas, active safety zones, construction vessels and partially completed or pre-commissioned structures. Construction areas could extend up to 500m beyond the windfarm site boundary.

Frequency of occurrence

14.153 Three commercial routes have been identified with the potential to be impacted by the Project; the Liverpool/East of IoM route, the Heysham/Off Skerries TSS route, and the Barrow/Off Skerries TSS route. The frequency of transits along each of these routes is detailed in **Table 14.18**. Each of these routes are considered to be low frequency use with <1 vessel every nine days on the busiest route (Liverpool/East of Isle of Man) in 2019 and <1 vessel every 13 days in 2022.

14.154 All three routes have been considered to determine the deviations that would be experienced to avoid the windfarm site (**Appendix 14.1**, Section 8.3). The routes would experience increased journey distances as a result of the presence of the Project of up to 2.4nm, although in a westward direction, the Barrow/Off Skerries TSS route is expected to experience a reduction in journey times.

14.155 Overall, the frequency of occurrence has been assessed as **frequent**, with diversions experienced on a greater than annual basis.

Severity of consequence

14.156 The Liverpool/East of Isle of Man route (27 transits in 2022) would experience the largest diversion as the route east of the Calder platform currently passes through the centre of the windfarm site. The diversion would be up to 2.4nm to the southwest of the windfarm site for the north bound route (**Appendix 14.1**, Figure 50). The route west of the Calder platform (13 transits in 2022) intersects the southwest corner of the windfarm site which would result in a minor (0.1nm) increase in transit distance.

14.157 The Heysham/Off Skerries TSS route had only 17 transits in 2022 and passes to the south of Calder and South Morecambe gas fields, through the centre of the windfarm site. Any deviations during Project construction would result in an additional transit distance of up to 2.4nm for the eastward route and 1.4nm for the westward route (**Appendix 14.1**, Figure 51).

14.158 The route between the Barrow/Off Skerries TSS is also a low-use route with 17 transits in 2022. The route is split between vessels transiting through the

windfarm site south of the Calder and South Morecambe gas fields (westward route – four vessels per year; eastward route - 13 vessels per year). During construction, the Project could result in an additional distance of up to 1.7nm for the eastward passage plan and reduction in transit distance of 0.4nm for the westward passage plan (**Appendix 14.1**, Figure 52).

14.159 Analysis of adverse weather routeing (**Appendix 14.1**, Section 8.3.3) did not reveal any changes to typical routes as a result of the Project. Similarly, the Project did not inhibit access to anchorages in the event of a commercial vessel seeking shelter in adverse weather. There is sufficient clear sea room to the west of the Project to continue loitering while awaiting adequate conditions for berthing.

14.160 Embedded mitigation measures would ensure third party vessels would be aware of construction activities and that required information is displayed on charts. An AtoN Management Plan covering the construction period would also be agreed.

14.161 Given the very low traffic intensity of the affected commercial routes and the minimal extent and impact of the route deviations (and therefore operational costs), it is considered unlikely to make such operations unviable. The severity of consequence has been assessed as **negligible**.

Significance of effect

14.162 The effect has been assessed as **minor adverse** which is not significant in EIA terms.

Additional mitigation

14.163 While the impact is assessed to be minor adverse, as with Impact 1, the embedded mitigation for the Project (**Table 14.3**), including the realignment of the western boundary of the windfarm site, ensures the potential effects on commercial routeing during construction of the Project are not significant in EIA terms. Additional mitigation measures are not considered necessary.

Residual effect

14.164 The residual effect has been assessed as **minor adverse**, which is not significant in EIA terms.

14.7.1.3 Impact 3: Impact on risk of allision

14.165 The construction of any windfarm where obstructions are not currently present would increase allision likelihood.

14.166 A vessel is most likely to contact a windfarm structure during construction due to human error or mechanical failure, which could be exacerbated by other factors such as a failure of an AtoN, for example. The presence of new

infrastructure, or partially constructed infrastructure, in an area can increase the risk that a vessel may be involved in an allision with it.

14.167 Impacts associated with allision were modelled to establish the likelihood of an allision. The methodology for allision modelling is outlined in the NRA (**Appendix 14.1**, Section 8.4). Allision impacts are considered to be greatest during the operational phase when full build out is achieved, and modelling was conducted on this basis. The full results of the modelling are therefore presented in the operational phase assessment (**Section 14.7.2.3**).

Frequency of occurrence

14.168 Analysis of historic allision incidents at existing offshore windfarms have primarily involved project vessels at low speed (**Appendix 14.1**). Project vessels, although more likely to allide with a turbine due to their working in close proximity, are also more likely to have crew who are experienced in safely transiting offshore windfarm construction areas.

14.169 The east Irish Sea already has various offshore infrastructure present, including offshore windfarms and oil and gas installations, and as such vessels traversing this area are familiar with navigating around and between various types of infrastructure.

14.170 There is potential for fishing to take place within the windfarm site. As such, there is potential for a fishing vessel to be involved in an allision with a WTG (including in construction), however, given the embedded mitigations and available searoom, a glancing blow with minor damage is considered the most credible outcome, especially as potting rather than trawling is the dominant fishery in the windfarm site.

14.171 Modelling of commercial vessel allisions for full build out of the windfarm (operational phase) shows the frequency of allision events are low, with 1 in 9,549 years for commercial vessels and 1 in 2,118 years for ferries (**Section 14.7.2.3**). During construction safety zones of up to 500m from the outer extremity of structures above or below water would be marked and 50m safety zones would be applied around partially completed Project structures or complete Project structures undergoing commissioning. All vessels would avoid these buoyed construction areas through standard practice. Further the greater manoeuvrability and familiarity of ferry bridge teams reduces the likelihood of an allision increasing the ability of the vessel to take avoiding action.

14.172 It is therefore expected that during the construction phase that these return periods would be lower with allision risk considered less likely up to the point of the final installation. Overall, the frequency of occurrence has been assessed as **remote - extremely unlikely**. This reflects the occurrence of different vessels within and operating in vicinity of the windfarm site, for

example; oil and gas vessels and construction vessels which would have experience navigating close to static structures, recreational vessels which although very low numbers would be less experiences operating within the windfarm site and commercial vessels which maintain a wide berth from windfarm sires, reducing the likelihood of allision.

Severity of consequence

14.173 Multiple factors (vessel speed, angle and the engineering of the WTG and vessel characteristics) influence the severity of consequence should an allision occur.

14.174 Where incidents have occurred at existing offshore windfarms, they have primarily involved project vessels at low speed and occur due to equipment failure (**Appendix 14.1**). The most likely outcome is, therefore, minor damage and/or minor injuries. However, it is feasible that a worst-case allision involving a larger vessel might result in turbine collapse, holing and eventual flooding of a vessel and potential loss of life, though this is considered unlikely.

14.175 Various studies have sought to quantify severity of consequence (Biehl and Lehmann (2006), Besöksadress et al. (2008), Dai et al. (2013), Moulas et al. (2017) and Presencia and Shafiee (2017)). These studies indicate that:

- Ship allisions, even at low speeds, can cause significant damage to WTGs including deformation and buckling
- Some studies of in-field project vessels (up to 4,000 tons), with allisions at high speeds, did not result in WTG collapse
- Modelling of allisions with large commercial ships could result in holing of the vessels hull and cargo release
- Larger vessels (30,000 deadweight tonnes (DWT)) alliding with the turbine might typically result in the tower collapsing away from the vessel
- Some studies however suggested that large commercial ships could result in the tower collapsing towards the vessel, with the damage likely to penetrate the deck

14.176 The windfarm site would be well marked and there is sufficient searoom to safely pass around the site rather than through it, therefore, it is unlikely that a small vessel, such as a recreational vessel would choose to transit through the site. Were a contact with a turbine to occur, a glancing blow with minor damage is the most credible outcome. Given the minimum distance between turbines (1,060m) and 500m construction safety zones, fishing may take place, however, given the available searoom a glancing blow with minor damage is also considered the most likely outcome.

14.177 Overall, the severity of consequence has been assessed as **negligible - serious** (although this is feasible, it is considered unlikely).

Significance of effect

14.178 During the construction phase, vessels would be less familiar with avoiding a new obstruction. Communication of construction activities and progress would be required and is embedded in the Project design through use of Notice to Mariners, a Fisheries Liaison Officer and the continuation of the MNEF.

14.179 The effect has been assessed as **negligible - moderate adverse**.

Additional mitigation

14.180 The measures included in the embedded mitigation for the Project (**Table 14.3**), particularly the realignment of the western boundary of the windfarm site, ensures the potential effects on allision during construction of the Project are ALARP. Additional mitigation measures are not considered necessary. Consensus was reached during the hazard workshop that no additional risk controls were identified as being required for the Project and consequently, where effects on allision during construction of the Project are assessed to be moderate, they can be considered to be ALARP and therefore not significant in EIA terms.

Residual effect

14.181 The residual effect has been assessed as **negligible - moderate adverse (but ALARP)** (not significant in EIA terms).

14.7.1.4 Impact 4: Impact on risk of collision

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

14.183 The addition of construction vessels associated with the Project may also increase potential encounter and collision scenarios. These vessels may cross-cut established routeing to access the windfarm site. The worst-case total additional movements during construction of the Project are up to 2,583 return vessel movements/year, with a maximum of 37 vessels on site at any one time (**Table 14.2**).

14.184 Blind spots may result from WTGs or the presence of large construction vessels blocking or hindering the view of other navigating vessels which could increase the risk of collision by reducing the capability for early and effective collision avoidance. The presence of a new obstruction may also result in reduced area for a vessel to take action to avoid collision or reduce the options available to do so.

14.185 Modelling was undertaken to establish the likelihood of a vessel collision occurring. The methodology is outlined in the NRA (**Appendix 14.1**, Section 8.5). It is noted that modelling assumes maximum build out of the windfarm. It is therefore expected that during the construction phase these return periods would initially be lower with collision risk considered less likely up to the point of full build-out.

Frequency of occurrence

14.186 Modelling results are detailed in **Table 14.23**, **Section 14.7.2.4** and indicate the frequency of collision events are low, with 1 in every 2,190,308 years for commercial vs commercial collisions, 1 in every 16,226 years for commercial vessels vs ferries and 1 in every 1,139 years for ferries vs ferries. The modelled likelihood of a collision is greatest on routes with higher vessel traffic density. An increase in the future case (with the windfarm present) collision potential is concentrated to the north of the study area, associated with the concentration of vessels bound to and from the ports of Heysham and Barrow passing to the south of the West of Duddon Sands and Walney offshore windfarms. The increase in ferry-ferry collision potential is driven by the concentration of Stena Line ferries on the Liverpool/Belfast east of Isle of Man (east of Calder) route onto the west of Calder route which increases the likelihood of meeting situations. However, the increase over the base-case is minor.

14.187 Given the spacing between WTGs and density of traffic passing adjacent to the Project, a significant increase in risk to visual navigation and collision avoidance is not assumed. The risks of collision associated with construction vessels emerging from the windfarm site would be managed through a robust VTMP which would define aspects of vessel management during the construction phase to set out the measures required to mitigate marine traffic and transport-related effects resulting from the construction of the Project (**Table 14.3**).

14.188 Project construction vessel movements may interact with existing traffic, for example, when crossing shipping routes increasing encounter potential and therefore collision risk. Risk controls would be established (as set out in the embedded mitigation listed in **Table 14.3**) to deconflict CTV movements with other passing traffic. Coordinated passage plans for CTVs would be developed to minimise the potential impact on other traffic (**Table 14.3**).

14.189 Based on the analysis, the change in collision risk over the existing baseline as a result of the Project for commercial and passenger vessels is very low. Based on modelling (**Table 14.23**) the overall likelihood of a collision post construction of the Project is 1 in 933 years.

14.190 Recreational collision risk is considered low due to the low levels of these vessel types in the study area. The vessel traffic surveys identified no

recreational vessels during the 2022 and 2023 winter surveys and 12 during the summer 2022 survey, therefore, the increase in risk of collision would be small.

14.191 Analysis of historic incidents associated with UK operational windfarms identified 69 incidents between 2010 and 2019. This includes six collisions, 29 allisions, 21 groundings and 13 near misses. Of these incidents 82% involved project craft (such as CTVs or construction vessels). There are currently no recorded accidents involving large commercial shipping and offshore windfarms in the UK, during construction. Nor did any of the recorded navigational incidents across the UK sector result in loss of life.

14.192 Overall, considering the collision risk modelling the frequency of occurrence has been assessed as **remote - extremely unlikely**.

Severity of consequence

14.193 International studies have explored the consequences of collision between large vessels. The European Maritime Safety Agency (EMSA) (2015) collision risk model developed for their FSA based on historical incidents estimated that 33% of struck roll-on/roll-off passenger (RoPax) vessels would result in water ingress and additionally 14% of those vessels would result in sinking (resulting in a joint probability of 4.6% for a struck RoPax to sink). The MSC 85-17-2 FSA gives probabilities of 16% of collisions being a serious casualty of which 50% of struck vessels would flood, 22% would sink with a further 50% split between gradual sinking or rapid capsize (joint probability of the latter being 0.8%).

14.194 Analysis of MAIB data suggests that approximately 1% of collisions would result in loss of life and as such, the severity of consequence has been assessed as **moderate - serious** (although this is feasible, it is considered unlikely).

Significance of effect

14.195 Given the embedded mitigation and likelihood of occurrence the effect has been assessed as **negligible - moderate adverse**.

Additional mitigation

14.196 The mitigation measures included in the embedded mitigation for the Project (**Table 14.3**), particularly the realignment of the western boundary of the windfarm site, the commitment to producing a VTMP and CTV passage planning and undertaking continued engagement with stakeholders, were reviewed and agreed with stakeholders at the hazard workshops (**Appendix 14.1**) to ensure the potential effects on collision during construction of the Project are ALARP. Consensus was reached that no additional risk controls were identified as being required for the Project and consequently, where

effects on collision during construction of the Project are assessed to be moderate, they can be considered to be ALARP and therefore not significant in EIA terms.

Residual effect

14.197 The residual effect has been assessed as **negligible - moderate adverse (but ALARP)** (not significant in EIA terms).

14.7.1.5 Impact 5: Impact on search and rescue

14.198 Construction traffic would lead to an increased number of vessels and personnel in the study area, and as such there may be an increase in the number of incidents requiring emergency response or impacts to emergency response procedures.

14.199 Existing incident rates are considered low in the study area based on the data studied within the NRA (**Appendix 14.1**, Section 6.5). An assessment of the impacts of the Project on the likelihood of collision and allision for vessels (**Sections 14.7.1.3** and **Section 14.7.1.4**) showed remote return periods, which is due to the generally low levels of vessel traffic in the study area. It is not therefore anticipated that the Project would notably increase the observed existing incident rates.

14.200 Further, it should be considered that the on-site presence of Project construction vessels would form additional resource to respond to any incidents in the area in liaison with the MCA, both in terms of incidents associated with the Project (i.e. self-help resources), but also incidents occurring to third party vessels outside of the Project site. As required under MGN654, an ERCoP would be produced and submitted to the MCA detailing how Project construction vessels would cooperate and assist in the event of an incident. The principals of SAR access for OWFs are contained in MGN654, Annex 5.

Frequency of occurrence

14.201 Given the embedded mitigation and likelihood of incidents, a frequency of occurrence (noting low baseline incident rates) of **remote - extremely unlikely** has been assigned.

Severity of occurrence

14.202 The severity of occurrence has been assessed as **minor** given the embedded mitigation and available searoom to undertake emergency manoeuvres if required.

Significance of effect

14.203 The effect has been assessed as **negligible**, which is not significant in EIA terms.

Additional mitigation

14.204 No additional mitigation above that embedded (**Section 14.3.3**) is proposed. A commitment to two lines of orientation is included within the embedded mitigation for the Project.

Residual effect

14.205 The residual effect has been assessed as **negligible** adverse, which is not significant in EIA terms.

14.7.1.6 Impact 6: Impact on snagging

14.206 Cabling (within the windfarm site) would comprise both inter-array and platform link cables. These can pose a risk to navigating vessels through a reduction in under-keel clearance (UKC) and/or by presenting a snagging risk to vessel anchors or fishing gear.

14.207 During the construction phase, the presence of partially protected cables during installation and the lack of awareness of the cable's presence may increase anchor and fishing gear snagging risk. Impacts resulting from snagging and reduction in UKC may in turn lead to displacement of vessels.

14.208 Snagging risks are considered greatest from fishing vessels when gear is deployed, particularly mobile gear types. The area is used primarily by vessels using static gear from ports in Wales and Fleetwood, with very little trawling or mobile gear activity. South and south western sections of the study area have been recorded as having over 10,000 hours of fishing time in 2020 from VMS data. Fishing activity present within the study area is detailed in **Section 14.5.2.6** and further information is located in **Chapter 13 Commercial Fisheries**.

Frequency of occurrence

14.209 During construction it is required in the Project embedded mitigation that safety zones would be established of an appropriate configuration and extent to mitigate for potential snagging hazards. Cable burial and adequate protection would mitigate the risk of snagging once burial is complete. The requirement for a cable burial risk assessment is embedded mitigation for the Project to ensure these risks are adequately addressed for the types of gear used within the study area. As such the frequency of snagging has been assessed as **extremely unlikely** with embedded mitigation measures in place.

Severity of consequence

14.210 Were a fishing vessel to snag a cable, the most likely outcome is loss of gear and minor damage to the cable. A more severe credible outcome is the loss of the fishing vessel and potential fatalities however, this is considered

unlikely. The severity of consequence has been assessed as **moderate** given embedded mitigation.

Significance of effect

14.211 The effect has been assessed as **minor adverse**, which is not significant in EIA terms.

Additional mitigation

14.212 No additional mitigation above that embedded (**Section 14.3.3**) is proposed.

Residual effect

14.213 The residual effect has been assessed as **minor adverse** and not significant in EIA terms.

14.7.2 Potential effects during operation and maintenance

14.7.2.1 Impact 1: Impact on ferry routeing

14.214 Offshore windfarms can impact vessel routeing by creating an obstruction in otherwise navigable waters that requires deviation of vessel routes. Impacts on routeing are considered greatest during the operational phase when the windfarm is fully built-out (maximum footprint). For regular runners such as ferries, this has the potential to result in increased costs or to make schedules unviable, noting an increase in journey time/distance may impact on schedules and lead to increased fuel burn. Impacts on routeing may in turn lead to increased contact or collision risks (see **Section 14.7.2.3** and **Section 14.7.2.4**).

14.215 Hours of rest were also raised as a consideration during consultation with ferry operators. The Maritime Labour Convention requires 10 hours of rest in any 24-hour period, in a maximum of two separate periods, of which at least six hours must be uninterrupted. Existing ferry schedules enable this requirement to be met. Increased transit durations could impact their ability to comply with the convention.

14.216 Berth constraints within ports are an additional consideration. Delays may result in missing arrival windows or impacted turn-around-times. Local berth and port constraints include:

- Heysham: Has a tight entrance, which in combination with strong tides and wind conditions, makes approaching the harbour and berthing challenging. The harbour is also dredged but occasionally arrival at spring low tides is not achievable with sufficient under keel clearance, requiring amendments to timetables
- Douglas: Berthing in certain wind conditions is challenging and may result in cancellations

- Warrenpoint: Is tidally constrained
- Belfast: There is a limitation on berths given the number of vessels operating on a route
- Liverpool: Constrained by lock timings and other vessel movements
- Dublin: Relocation of freight terminals further from the seaward entrance in 2022 would increase transit duration

Frequency of occurrence

14.217 As detailed in **Section 14.5.2.3**, IoMSPC and Stena Line currently route through or in close proximity to the windfarm site. As such, the development of the windfarm site would necessitate their re-routeing to the southwest to avoid passing in close proximity to the windfarm. The frequency of IoMSPC and Stena Line transits passing through the study area are detailed in **Table 14.17**.

14.218 One route has been identified as experiencing an increase in transit distance as a result of the Project; the Stena Liverpool to Belfast east of Isle of Man (east of Calder) route, which would experience a 1.6nm increase in journey distance (**Table 14.19** and **Appendix 4.1**, Section 8.2). Vessels using this route are primarily northbound exiting the Liverpool Bay TSS and less than one vessel every two days (153 vessel transits in 2019 and 196 in 2022) were recorded on this route. The basecase passage plan for the east of IoM (west of Calder) route, is clear of the southwest corner of windfarm site by 2.5nm.

14.219 Although no increase in journey distance is recorded for the IoMSPC Liverpool to Douglas route or the Stena Line Liverpool to Belfast east of Isle of Man (west of Calder) route, the following is noted:

- The Stena Liverpool to Belfast east of IoM (west of Calder) passage plan is clear of the southwest corner of windfarm site by 2.5nm. In 2019, one transit on this route intersected the windfarm site and three intersected in 2022. The presence of the windfarm site would require all Stena Line Liverpool/Belfast (east of IoM) services to navigate south of Calder CA1, along the existing operator passage plan. This results in no additional transit distance between the basecase and futurecase passage plan for the vessels passing to the west of Calder
- The IoMSPC Liverpool to Douglas basecase passage plan is 2.3nm clear of the southwestern corner of the windfarm site and would be unaffected, however, a small proportion of westward transiting vessels (12.8% of vessels in 2022) navigate north of Hamilton North Gas Field structure (110/13) with 14 and 8 vessels on this route passing through the windfarm site in 2019 and 2022 respectively. The presence of windfarm site would require all IoMSPC Liverpool/Douglas services to navigate south of 110/13 on the existing standard passage plan

14.220 The frequency of occurrence has been assessed as **frequent** with deviations occurring annually.

Severity of consequence

14.221 Analysis suggests (**Appendix 14.1**, Section 8.2) that in normal conditions the additional transit distance for the Stena Line Liverpool to Belfast east of Isle of Man (east of Calder) route (an increase of 1.6nm on a 114nm passage) would increase journey time by approximately five minutes (an increase of 1% to the baseline journey time of 480 minutes). As set out above this route is used approximately once every two days and this small increase in journey time is not likely to significantly adversely impact upon operations (noting there would be some associated operational costs).

14.222 No increase in journey distance is recorded for the IoMSPC Liverpool to Douglas route or the Stena Line Liverpool to Belfast east of IoM (west of Calder) route or the Stena Line Liverpool to Belfast west of IoM route.

14.223 In adverse weather, ferry operators tend to transit to the southwest of the study area towards the prevailing conditions. As such, IoMSPC, Seatruck and P&O adverse weather routes, and the Stena Liverpool to Belfast west of IoM route, are unaffected by the windfarm site (**Section 14.5.2.3** and **Appendix 14.1**, Section 8.2).

14.224 There is infrequent use of the Stena Line Liverpool to Belfast east of IoM (east of Calder) route during adverse weather with no vessels in 2019 and two in 2022. With the Project in place, these vessels may use the unaffected east of IoM (west of Calder) route however, they are more likely to follow the Liverpool to Belfast west of IoM adverse weather route which is not deviated by the Project. If the vessels deviate to use the east of IoM (west of Calder) route, there would be an increased distance of 1.5nm, adding approximately 5.2 minutes to the 8 hour baseline journey time. This increases total delays from 0 – 30 minutes in the basecase to 5.2 - 35.2 minutes for the futurecase (**Appendix 14.1**, Table 28). However as noted above the route is not typically used in adverse weather conditions.

14.225 During the operational phase, up to 500m safety zones would be enforced for major maintenance only. Commercial vessels including ferries are likely to keep well clear of any active safety zones through normal operational procedures.

14.226 The severity of consequence has been assessed as **negligible**.

Significance of effect

14.227 The effect has been assessed as **minor adverse** and not significant in EIA terms.

Additional mitigation

14.228 The measures included in the embedded mitigation for the Project (**Table 14.3**), particularly the realignment of the western boundary of the windfarm site, and the Projects commitment to continued engagement with navigation stakeholders, ensures the potential effects on ferry routeing during operation and maintenance of the Project are not significant in EIA terms. Additional mitigation measures are not considered necessary.

Residual effect

14.229 The residual effect has been assessed as **minor adverse**, which is not significant in EIA terms.

Table 14.19 Impact on ferry routeing in normal met-ocean conditions

Ferry operator	Passage plan route	Approximate Annual Crossings (2019)	Approximate Annual Crossings (2022)	Basecase route distance (nm)	Future route distance (nm)	Additional route distance (nm)	Additional time (minutes)
Stena Line	LIV-BEL East of IOM (West of Calder)	200	194	114.9	114.9	0	0
	LIV-BEL East of IOM (East of Calder)	153	196	113.9	115.5	+1.6	5.1
	LIV-BEL West of IOM	1442	1098	113.3	113.3	0	0
IOMSPC	LIV-DOUG	674	593	56.9	56.9	0	0
	HEY-DOUG	1,372	1,451	46.8	46.8	0	0

14.7.2.2 Impact 2: Impact on commercial vessel routeing

14.230 Offshore windfarms can impact commercial vessel routeing or loitering by creating an obstruction in otherwise navigable waters that requires deviation of vessel routes. For commercial vessels, this has the potential to result in increased operational costs (such as fuel) and transit times. Impacts on routeing may in turn lead to increased collision or contact risks (**Section 14.7.2.3** and **Section 14.7.2.4**). Impacts on routeing are considered greatest during the operational phase when the windfarm is fully built-out (maximum footprint).

14.231 During the operational and maintenance phase 500m safety zones would be enforced for major maintenance only. Commercial vessels are likely to keep well clear of any active safety zones through normal operational procedures.

Frequency of occurrence

14.232 Three commercial routes have been identified with the potential to be impacted by the windfarm site; the Liverpool/East of IOM route, the Heysham/Off Skerries TSS route and the Barrow/Off Skerries TSS route. The frequency of transits along each of these routes is detailed in **Table 14.18**. Each of these routes are considered to be low frequency with <1 vessel every nine days on the busiest route (Liverpool/East of Isle of Man) in 2019 and <1 vessel every 13 days in 2022.

14.233 Overall, the frequency of occurrence has been assessed as **frequent** with deviations experienced on a greater than annual basis.

Severity of consequence

14.234 All three routes have been considered to determine the deviations that would be experienced to avoid the windfarm site. The routes would experience increased journey distances as a result of the Project of up to 2.4nm, although in a westward direction, the Barrow/Off Skerries TSS route is expected to experience a reduction in journey times (**Appendix 14.1**, Section 8.3).

14.235 The Liverpool/East of Isle of Man route (27 transits in 2022) would experience the largest diversion (up to 2.4nm to the southwest of the windfarm site for the east of Calder route) as it currently passes through the centre of the windfarm site (**Table 14.20**).

14.236 The Heysham/Off Skerries TSS route had only 17 transits in 2022 and passes to the south of Calder and South Morecambe gas fields, through the centre of the windfarm site. The deviation results in an additional transit distance of 2.4nm for the eastward route and 1.4nm for the westward route (**Table 14.20**).

14.237 The route between Barrow/Off Skerries TSS is also a low-use route with 17 transits in 2022. The route is split between vessels transiting through the

windfarm site south of the Calder and South Morecambe gas fields (westward route - four vessels in 2022; eastward - 13 vessels in 2022). The existing passage plans deviate vessels north of the windfarm site to pass >1.8nm south of West of Duddon Sands windfarm, and >1.25nm north of DP8. The Project would result in an additional distance of 1.7nm for the eastward passage plan and reduction of 0.4nm for the westward passage plan (**Table 14.20**).

14.238 Analysis of poor weather routeing (**Appendix 14.1**) did not reveal any changes to typical routes as a result of the Project. Similarly, the Project did not inhibit access to anchorages in the event of a commercial vessel seeking shelter in adverse weather. There is sufficient clear sea room to the west of the Project to continue loitering while awaiting adequate conditions for berthing.

14.239 Given the very low traffic intensity of the affected commercial routes, the impacts of the route deviations are minimal and, therefore, are unlikely to make operations unviable. As such, the severity of consequence has been assessed as **negligible**.

Significance of effect

14.240 The effect has been assessed as **minor adverse** with embedded mitigation measures, which is not significant in EIA terms.

Additional mitigation

14.241 No additional mitigation above that embedded (**Section 14.3.3**) is proposed.

Residual effect

14.242 The residual effect has been assessed as **minor adverse**, which is not significant in EIA terms.

Table 14.20 Impact on commercial routeing in normal met-ocean conditions

Passage plan route	Route direction	Basecase route distance (nm)	Futurecase route distance (nm)	Additional ES route distance (nm)
LIV-East of IOM	East of Calder	70.1	72.5	+2.4
	West of Calder	72.4		+0.1
HEY-Off Skerries TSS	Eastward	68.6	71.0	+2.4
	Westward	72.5	73.9	+1.4
BAR-Off Skerries TSS	Eastward	67.4	69.0	+1.7
	Westward	71.8	71.4	-0.4

14.7.2.3 Impact 3: Impact on risk of allision

14.243 The presence of any offshore windfarm in areas where obstructions were not previously present would increase allision likelihood.

14.244 A vessel is most likely to contact a windfarm structure due to human error or mechanical failure, which could be exacerbated by other factors such as a failure of an AtoN, for example. This risk is present for both vessels transiting within the windfarm site (for example, Project vessels, fishing or recreational vessels) and adjacent to it.

14.245 Modelling (for commercial and passenger vessels) was undertaken to establish the likelihood of an allision with the Project in place. The modelling methodology and results are outlined in the NRA (**Appendix 14.1**, Section 8.4). Modelling was undertaken to test the potential allision risk of an indicative 35-turbine layout and the inclusion of two offshore substation platforms (**Table 14.2, Section 14.3.2**).

Table 14.21 Allision modelling results (commercial and passenger vessel)

Hazard	Vessel	Futurecase (yrs)	15% traffic uplift (yrs)
Allision	Commercial (Cargo/tanker)	1 in 10,982	1 in 9,549
	Ferries/passenger	1 in 2,436	1 in 2,118
	Total	1 in 1,587	1 in 1,380

Frequency of occurrence

14.246 Given future traffic projections for ferries and commercial vessels discussed in **Appendix 14.1**, Section 8.4.2, the allision rate with a 15% estimated increase in traffic is given (**Table 14.21**). The return period is derived from a 15% uplift of the future case probability value and converted to an updated return period.

14.247 The results for this 15% traffic uplift scenario are also considered to be low, with allision events occurring 1 in 9,549 years for commercial vessels, and 1 in 2,118 years for ferries.

14.248 The highest risk WTGs would be those situated at the westerly periphery due to their proximity to the highest density shipping routes. However, as commercial and passenger vessels maintain adequate passing distances as standard practice, the risk of allision between a commercial or passenger vessel and a WTG is considered to be unlikely. Additionally, the greater manoeuvrability and therefore ability to take avoiding action and familiarity of ferry bridge teams reduces the likelihood of a ferry allision.

14.249 The east Irish Sea already has various offshore infrastructure present, including offshore windfarms and oil and gas installations, and as such vessels navigating this area are familiar navigating around and between various types of infrastructure. Historical incident analysis at other offshore wind projects suggests that an allision between a CTV and a WTG occurs approximately once every ten years (**Appendix 14.1**, Section 6.5.1). If oil and gas decommissioning in the vicinity of the Project proceeds (**Section 14.6** and **Chapter 17 Infrastructure and Other Users**), then the likelihood of allision for tug and service vessels would be reduced.

14.250 Overall, analysis of historic incidents associated with UK operational windfarms identified 69 incidents between 2010 and 2019. This includes six collisions, 29 allisions, 21 groundings, and 13 near misses. Of these incidents 82% involved project craft (such as CTVs or construction vessels). There are currently no recorded accidents involving large commercial shipping and offshore windfarms in the UK. None of the recorded incidents across the UK sector resulted in loss of life.

14.251 Overall, the frequency of occurrence has been assessed as **remote - extremely unlikely**. This reflects the occurrence of different vessel types in and in vicinity of the windfarm site, for example oil and gas vessels which would have experience navigating close to static structures, the very low numbers of, but comparatively less experienced in navigating windfarms recreational vessels, and commercial vessels which would keep a wide berth from the windfarm site.

Severity of consequence

14.252 Multiple factors influence the severity of consequence should an allision occur. For example, vessel speed, angle and the engineering of the WTG and vessel characteristics.

14.253 Various studies have sought to quantify severity of consequence (Biehl and Lehmann (2006), Besöksadress at al. (2008), Dai et al. (2013), Moulas et al. (2017) and Presencia and Shafiee (2018)):

- Ship allisions, even at low speeds, can cause significant damage to WTGs including deformation and buckling
- Some studies of in-field Project vessels (up to 4,000 tons), with allisions at high speeds, did not result in WTG collapse
- Modelling of allisions with large commercial ships could result in holing of the vessels hull and cargo release
- Larger vessels (30,000 DWT) alliding with the turbine might typically result in the tower collapsing away from the vessel

- Some studies suggested that large commercial ships could result in the tower collapsing towards the vessel, with the damage likely to penetrate the deck

14.254 Analysis of allision incidents at existing offshore windfarms have primarily involved project vessels at low speed. **Table 14.22** presents some case studies of past incidents and the resulting impacts to people, property and the environment. It can be concluded that where incidents have occurred, they have been at low speed, involve in-field project vessels and typically result in only minor damage or injuries. However, it is feasible that a serious allision with an OWF might result in turbine collapse, holing and eventual flooding of a vessel, and has the potential for loss of life, though this is considered unlikely.

Table 14.22 Historical windfarm allisions

Date	Site	Vessel	Description
31st January 2022	Hollandse Kust Zuid	Julietta D – 190m 24,196 GT Bulk Carrier	Disabled vessel in a storm struck the foundation of a substation jacket that result in minor damage to both the vessel and jacket. There were no injuries or pollution.
23rd April 2020	Borkrum Riffgrund	Njord Forseti – 24m 137 GT	Vessel skipper not keeping proper lookout collided with wind turbine at speed. Vessel suffered significant structural damage.
23rd April 2020	Borkum Riffgrund 1 (Germany)	Njord Forseti – 26m CTV	CTV made heavy contact with WTG. Resulted in three injuries (one seriously) and significant flooding of CTV through 0.5m crack in bow.
10th April 2018	AOWF (Baltic)	Vos Stone – 80m 4,956 GT Offshore Supply Vessel	Construction vessel casting off from a WTG lost control and was forced against the WTG due to adverse weather. Resulted in 3 minor injuries, dry docking of the vessel and minor damage to platform. There was no pollution.
14th August 2014	Walney	OMS Pollux – Stand By Safety Vessel	Whilst conducting inspection work, the vessel collided with a turbine that resulted in no injuries, and minor leaking of marine gas oil.
21st November 2012	Sheringham Shoal	Island Panther – 17m 22 GT CTV	CTV made heavy contact with unlit transition piece. Resulted in 5 injuries and damage to the vessels bow.
6th October 2006	Scroby Sands	Jack-up	Large jack-up barge collided with turbine resulting in damage to a turbine blade.

14.255 The site would be well marked (in accordance with the requirements of IALA G-1162 for marking and agreed with TH) and there is sufficient searoom to safely pass around the site rather than through it, therefore, it is unlikely that a small vessel, such as a recreational vessel, would choose to transit through the site. Were a contact with a WTG to occur, a glancing blow with minor damage is the most credible outcome. The minimum distance between WTGs (1,062m) would enable fishing to take place, however, should allision occur, in the available searoom a glancing blow with minor damage is considered the most credible outcome.

14.256 As such, the severity of consequence has been assessed as **moderate - serious**.

Significance of effect

14.257 The effect has been assessed as **negligible - moderate adverse**.

Additional mitigation

14.258 The measures included in the embedded mitigation for the Project (**Table 14.3** and **Appendix 14.1**), particularly the realignment of the western boundary of the windfarm site, as well as the additional risk controls, were reviewed with stakeholders at the hazard workshop (September 2023). Consensus was reached with workshop stakeholders that no further additional risk controls were identified as being required for the Project. Consequently, where effects on allision during operation and maintenance of the Project are assessed to be moderate, they can be considered to be ALARP and therefore not significant in EIA terms.

Residual effect

14.259 The residual effect has been assessed as **negligible - moderate adverse (but ALARP)** (not significant in EIA terms).

14.7.2.4 Impact 4: Impact on risk of collision

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

14.261 The addition of Project operation and maintenance vessels may also increase potential encounter and collision scenarios. These vessels may cross-cut established routeing to access the windfarm site. The worst-case total additional vessel movements as a result of Project operational and maintenance phase is estimated to be a maximum of 384 return vessel trips during a standard year with up to three vessels on site at any one time. During a heavy maintenance year (anticipated to be every 5th year) a maximum of

832 return vessel trips may be required with up to ten vessels on site at any one time (**Table 14.2**).

14.262 The vessel traffic survey identified no recreational vessels during winter surveys and twelve recreational vessels during summer within the study area (six of which transited through the windfarm site). Given the low frequency of recreational transits, the increase in risk of collision would be small.

14.263 Blind spots may result from WTGs blocking or hindering the view of other navigating vessels or aids to navigation which could increase the risk of vessel collision by reducing the capability for early and effective collision avoidance. However, most passing vessels would transit with a sufficient safety buffer from the windfarm (c.1.5nm) such that an emerging vessel at 15 knots would be visible for approximately six minutes, providing some opportunity to avoid a collision.

14.264 It is noted that the geometries of offshore windfarms could reduce the visual appreciation of other vessels. Particularly where the routes converge on corners of sites. For example, vessels proceeding north to the east and west of the windfarm site may not have visual sight of one another until they meet at the north of the windfarm site. However, larger vessels would be identifiable from AIS (and tracked by radar/visual means) and, therefore, passing arrangements should be planned in accordance with COLREGs.

14.265 Modelling was undertaken to establish the likelihood of a commercial (cargo/tanker) and passenger vessel (ferry) collision occurring which is presented in **Table 14.23**. The methodology and results are outlined in the NRA (**Appendix 14.1**, Section 8.5).

Table 14.23 Collision modelling results (commercial and passenger vessel)

Hazard	Hazard	Basecase (yrs)	Futurecase (yrs)	15% Traffic uplift (yrs)
Collision	Commercial vs Commercial	1 in 3,631,510	1 in 2,518,855	1 in 2,190,308
	Commercial vs Ferries	1 in 19,949	1 in 18,659	1 in 16,226
	Ferries vs Ferries	1 in 1,442	1 in 1,310	1 in 1,139
	Total	1 in 1,176	1 in 1,073	1 in 933

Frequency of occurrence

14.266 The modelled likelihood of a collision involving a commercial vessel is greatest on routes with higher vessel traffic density. An increase in futurecase (windfarm present) collision potential is noted to the north-west of the windfarm site and to the south of the windfarm site where vessels are bound for Liverpool. This is due to the re- routeing of transits that would have

otherwise passed through the windfarm site (**Appendix 14.1**, Figure 57). However, overall, the increase in frequency of collision events over the base-case is low (**Table 14.23**).

14.267 Given the spacing between WTGs and density of traffic passing adjacent to the Project, a significant increase in risk to visual navigation and collision avoidance is not assumed. The risks of collision associated with operation and maintenance vessels emerging from the windfarm site would be managed through the development of coordinated passage plans for CTVs that would include:

- Specified passage plans
- Agreed passing protocols/CPA for interactions with commercial shipping (e.g. no crossing within 5nm ahead of commercial vessel underway)
- Reporting protocols to be established prior to crossing corridors
- Dissemination of passage plans and operations to regular runners and ferry services Restricted visibility protocols (**Table 14.3**)

14.268 Analysis of historic incidents associated with UK operational windfarms identified 69 incidents between 2010 and 2019. This includes six collisions, 29 allisions, 21 groundings and 13 near misses. Of these incidents 82% involved project craft (such as CTVs or construction vessels). There are currently no recorded accidents involving large commercial shipping and offshore windfarms in the UK. Of the recorded navigationally significant incidents across the UK sector, none resulted in loss of life.

14.269 Overall, the frequency of occurrence has been assessed as **remote - extremely unlikely**. This reflects the modelling and occurrence of different vessels in the windfarm site, for example very low numbers of recreational vessels are recorded in proximity to the windfarm site.

Severity of consequence

14.270 International studies have explored the consequences of collision between large vessels. The EMSA (2015) collision risk model developed for their FSA based on historical incidents estimated that 33% of struck RoPax vessels would result in water ingress and additionally 14% of those vessels would result in sinking (resulting in a joint probability of 4.6% for a struck RoPax to sink). The MSC 85-17-2 FSA gives probabilities of 16% of collisions being a serious casualty of which 50% of struck vessels would flood, 22% would sink with a further 50% split between gradual sinking or rapid capsize (joint probability of the latter being 0.8%).

14.271 Analysis of MAIB data suggests that approximately 1% of collisions would result in loss of life.

14.272 The severity of consequence has been assessed as **moderate - serious** (although this is feasible, it is considered unlikely).

Significance of effect

14.273 Based on the analysis, the change in collision risk over the existing baseline as a result of the Project for commercial and passenger vessels is very low. Based on modelling (**Table 14.23**) the likelihood of a collision post construction of the Project is 1 in 933 years. When the low frequency of high consequence events is taken into account, (assuming 1% of collisions leads to a fatality (**Appendix 14.1**)) the return period for a collision leading to a fatality would be even lower.

14.274 Given the likelihood of occurrence and severity of consequence the effect has been assessed as **negligible - moderate adverse**.

Additional mitigation

14.275 The measures included in the embedded mitigation for the Project (**Table 14.3** and **Appendix 14.1**), particularly the realignment of the western boundary of the windfarm site, the commitment to producing a CTV passage plan and undertaking continued engagement with stakeholders, as well as the additional risk controls, were reviewed with stakeholders at the hazard workshop (September 2023). Consensus was reached with workshop stakeholders that no further additional risk controls were identified as being required for the Project. Consequently, where effects on collision during operation and maintenance of the Project are assessed to be moderate, they can be considered to be ALARP and therefore and not significant in EIA terms.

Residual effect

14.276 The residual effect has been assessed as **negligible - moderate adverse (but ALARP)** (not significant in EIA terms).

14.7.2.5 Impact 5: Impact on search and rescue

14.277 The presence of operation and maintenance traffic would lead to an increased level of vessels and personnel in the study area. As a result, there may be an increase in the number of incidents requiring emergency response or impacts to search and rescue procedures.

14.278 The final layout of the windfarm would be agreed with the MMO in consultation with the MCA and Trinity House post-consent and these discussions would include SAR considerations. The design of the windfarm should be such to enable both helicopter and vessel access therefore safeguarding HM Coastguard obligations to SAR within the UK Search and Rescue Region. Impacts to SAR are mitigated through design (WTG spacing) and adherence to an ERCoP.

14.279 It is also noted that embedded mitigation (**Table 14.3**) makes provision for facilitating SAR access, facilitating periodic emergency management and response exercises in conjunction with the Coast Guard Operations Centre/SAR and includes the commitment to maintaining two lines of orientation for the windfarm layout.

14.280 Existing incident rates are considered low in the study area based on the data studied within the NRA (**Appendix 14.1**, Section 6.5). An assessment of the impacts of the Project on the likelihood of collision and allision for vessels (**Sections 14.7.2.3** and **Section 14.7.2.4**) showed remote return periods, which is due to the generally low levels of vessel traffic in the study area. It is not therefore anticipated that the Project would notably increase the observed existing incident rates. **Appendix 14.1** (Table 25) presents the base case accident frequency per vessel type and accident type for the study area which shows the incident frequencies across the windfarm site and study area are low and mostly involve mechanical failure aboard recreational vessels.

14.281 Given the above context it is assumed that impacts to SAR would be effectively mitigated by adherence to regulatory and MGN654 requirements. The principals of SAR access for OWFs are contained in MGN654, Annex 5. Further information on helicopter operations is contained in **Chapter 16 Civil and Military Aviation and Radar**.

Frequency of occurrence

14.282 Given the embedded mitigation, and likelihood of incidents a frequency of occurrence (noting low baseline incident rates) of **remote - extremely unlikely** has been assigned.

Severity of occurrence

14.283 The severity of occurrence has been assessed as **minor** given the embedded mitigation and available searoom to undertake emergency manoeuvres if required.

Significance of effect

14.284 The effect has been assessed as **negligible** and not significant in EIA terms.

Additional mitigation

14.285 No additional mitigation above that embedded in the Project design (**Section 14.3.3**) is proposed.

Residual effect

14.286 The residual effect has been assessed as **negligible**, which is not significant in EIA terms.

14.7.2.6 Impact 6: Impact on snagging

14.287 Cabling within the windfarm site, both inter-array and platform link cables, can pose a risk to navigating vessels through a reduction in UKC and/or by presenting a snagging risk to vessel anchors or fishing gear.

14.288 Snagging risks are considered greatest from fishing vessels when gear is deployed, particularly mobile gear types. The area is used by primarily by vessels using static gear from ports in Wales and Fleetwood, with very little trawling or mobile gear activity. Belgian beam trawlers were noted as making periodic visits to the area. South and south western sections of the study area have been recorded as having over 10,000 hours of fishing time in 2020 from VMS data. Fishing activity present within the study area is detailed in **Section 14.5.2.6** and further information is provided in **Chapter 13 Commercial Fisheries.**

14.289 During the operational and maintenance phase of the Project fishermen and vessel masters should be familiar with the location of cables, which would be charted, reducing the likelihood of a snagging incident. Any maintenance works required would be communicated with the fishing community in accordance with the embedded mitigation measures outlined in **Table 14.3**.

14.290 Cable burial and adequate protection would mitigate the risk of snagging. The requirement for a cable burial risk assessment is embedded mitigation for the Project to ensure these risks are adequately addressed for the types of gear used within the study area. Additionally, safety zones of up to 500m from the outer extremity of structures above or below water would be established during major maintenance works such as cable repair and burial. As such the impact of snagging is considered acceptable with existing proposed embedded mitigation measures in place.

Frequency of occurrence

14.291 Overall, the frequency of occurrence has been assessed as **extremely unlikely** given the embedded mitigation measures.

Severity of consequence

14.292 Were a fishing vessel to snag a cable, the most likely outcome is loss of gear and minor damage to the cable. A worst credible outcome is the loss of the fishing vessel, and potential fatalities, however, this is considered unlikely. The severity of consequence has been assessed as **moderate** given embedded mitigation.

Significance of effect

14.293 The effect has been assessed as **minor adverse** and not significant in EIA terms.

Additional mitigation

14.294 No additional mitigation above that embedded (**Section 14.3.3**) is proposed.

Residual effect

14.295 The residual effect has been assessed as **minor adverse**.

14.7.2.7 Impact 7: Impact on communications, radar and positioning systems

14.296 Windfarm sites may adversely impact equipment used for navigation, collision avoidance or communications. The sound generated by the WTGs could additionally mask navigational sound signals from vessels or aids to navigation.

14.297 It is noted that the Project windfarm site sits outside of all port limits, VTS and pilotage areas and therefore whilst shore-based radar may have partial coverage of the windfarm site, it would not be actively monitored. Therefore, the presence of the windfarm site would not compromise vessel traffic monitoring obligations.

14.298 Equipment that may be adversely impacted is discussed below:

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

14.299 A pre-application request has been made by the Project team to the DIO of the MOD for advice regarding the proposed development. The MOD initially raised concerns by regarding the potential impact to military vessels operating in the area, but has subsequently confirmed highly surveyed routes do not overlap the windfarm site (see **Section 14.1.1**).

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

- MCA and QinetiQ (2004). Results of the electromagnetic investigations and assessments of marine radar, communications and positioning systems undertaken at the North Hoyle offshore windfarm by QinetiQ and the Maritime and Coastguard Agency
- BWEA (2007). Investigation of Technical and Operational Effects on Marine Radar Close to Kentish Flats Offshore Windfarm
- National Academies of Sciences, Engineering and Medicine (2022). Wind Turbine Generator Impacts to Marine Vessel Radar

14.301 In each instance, the studies found no appreciable impact on navigation safety. More information is provided within the NRA (**Appendix 14.1**, Section 8.8).

14.302 These effects of spurious returns such as side lobes, echoes, reflections and blanketing of marine radar were studied extensively in both the QinetiQ (2004) and BWEA (2006) studies. Based on these studies, the MCA developed a shipping route template (MGN654) that placed the extent of these effects at 1.5nm, increasing as the vessels transit closer to the WTGs. The studies determined that intolerable impacts may be experienced up to 0.5nm from the offshore windfarm. Historical evidence suggests that most vessels pass more than 0.5nm from an offshore windfarm and therefore these effects are lessened by normal operating practices.

14.303 A study has been undertaken to assess the potential effect the Project may have on Radar Early Warning Systems (REWS) and Line of Sight (LoS) microwave communication links located on offshore oil and gas platforms during the operation and maintenance phase of the Project ("the REWS study") (**Appendix 17.2**).

14.304 The REWS study (**Appendix 17.2**) considered the effect the Project may have on the ability of the REWS to detect vessels within the vicinity of the Project and the effect of re-routed vessel traffic (due to the presence of the Project) on the REWS alarm rates. REWS uses the radar returns to monitor and track vessels within the detection region and alert the operator when a proximity violation or an allision threat to the platform is detected.

14.305 The REWS study concluded that due to the presence of the WTGs there would be small gaps in the detection map due to the elevated thresholds and shadowing effects from the WTGs. However, these effects would be largely resolved by the built-in advanced tracking techniques within the REWS. Additionally, the integration of the available AIS data with the REWS coverage will provide an alternative source of vessel information and location within the zones where the REWS may lose detection and can complement the data

when temporary radar losses are experienced. As such, the effect of the Project on the detection performance of nearby REWS installation is expected to be low and manageable without the need for further mitigation measures.

14.306 Time to Closest Point of Approach (TCPA) and Closest Point of Approach (CPA) alarm assessments were undertaken. The results show that there would be no increase in the number of CPA or TCPA alarms. The REWS operators may need to attend to the alarms more carefully during adverse weather conditions. However, it is anticipated that this measure would be implemented by operators under adverse weather conditions under their existing operational procedures.

14.307 No negative impacts to microwave communication links were determined, with the modelling results showing that the Project is located sufficiently far from the considered microwave communications links onboard ENI Energy and Spirit Energy platforms and based on the modelled parameters for the communications links and turbines.

Frequency of occurrence

14.308 Overall, the frequency of occurrence has been assessed as **frequent**.

Severity of consequence

14.309 The severity of consequence has been assessed as **negligible**.

Significance of effect

14.310 The effect has been assessed as **minor adverse** and not significant in EIA terms.

Additional mitigation

14.311 No additional mitigation above that embedded (**Section 14.3.3**) is proposed.

Residual effect

14.312 The residual effect has been assessed as **minor adverse** and not significant in EIA terms.

14.7.3 Potential effects during decommissioning

14.7.3.1 Impact 1: Impact on ferry routeing

14.313 Displacement of ferry vessels within the study area could arise from the presence of structures undergoing decommissioning and the vessels associated with decommissioning of WTGs, infield and offshore cables.

14.314 As for construction, buoyed areas would be established during decommissioning activities and Notice to Mariners (NtM) and other methods of information dissemination would ensure that vessels are able to effectively

plan to minimise deviations. Detailed mitigation measures would be identified within the Project Decommissioning Programme.

Frequency of occurrence

14.315 As for the construction phase, ferries may experience displacement to a varying degree, depending on activity frequency and geographical spread of decommissioning activities across the study area. However, at the point of decommissioning, routeing with consideration of the windfarm would already be well established, significantly reducing impacts to established ferry routeing. Further, ferries transit well clear of windfarm site under normal operating procedures and are, therefore, unlikely to be impacted by the 500m safety zones that may be enforced during decommissioning. Overall, the frequency of occurrence has been assessed as **frequent**.

Severity of consequence

14.316 The severity of consequence has been assessed as **negligible** considering the embedded mitigation that would be in place to monitor and communicate decommissioning activities and given the level of experience vessel masters possess through navigating the windfarm over the course of the operational phase.

Significance of effect

14.317 The effects in EIA terms are considered to be significantly reduced in comparison to construction, owing to the long-term implementation of alternative routeing and with detailed mitigation measures to be identified within the Project Decommissioning Programme. The effect has been assessed as **minor adverse** and not significant in EIA terms.

Additional mitigation

14.318 No additional mitigation above that embedded (**Section 14.3.3**) is proposed. Detailed mitigation measures would be set out within the Project Decommissioning Programme.

Residual effect

14.319 The residual effect has been assessed as **minor adverse** and not significant in EIA terms.

14.7.3.2 Impact 2: Impact on commercial vessel routeing

14.320 Displacement of commercial vessels within the study area could arise from the presence of structures undergoing decommissioning and the presence of vessels associated with decommissioning of WTGs, infield and offshore cables. As for construction, buoyed areas would be established during decommissioning activities and NtM and other methods of information

dissemination would ensure that vessels are able to effectively plan to minimise deviations.

14.321 As for the construction phase, commercial vessels may experience displacement depending on activity frequency and geographical spread of decommissioning activities across the study area. However, at the point of decommissioning, routeing with consideration of the windfarm would already be well established significantly reducing impacts to established commercial vessel routeing. Further, commercial vessels transit well clear of windfarm sites under normal operating procedures and are therefore unlikely to be impacted by the 500m safety zones that may be enforced during decommissioning. Detailed mitigation measures would be identified within the Project Decommissioning Programme.

Frequency of occurrence

14.322 As outlined in **Section 14.7.2.2**, commercial vessel routes are low frequency with <1 vessel every two days on the busiest route (Liverpool/East of Isle of Man).

14.323 Overall, the frequency of occurrence has been assessed as **frequent**.

Sensitivity of consequence

14.324 The severity of consequence has been assessed as **negligible** considering the embedded mitigation that would be in place to monitor and communicate decommissioning activities and given the level of experience vessel masters possess through navigating the windfarm over the course of the operational phase.

Significance of effect

14.325 The effects in EIA terms although considered similar to impacts experienced during construction, are considered to be significantly reduced owing to the long-term implementation of alternative routeing. The effect has been assessed as **minor adverse** and not significant in EIA terms.

Additional mitigation

14.326 No additional mitigation above that embedded (**Section 14.3.3**) is proposed. Detailed mitigation measures would be set out within the Project Decommissioning Programme.

Residual effects

14.327 The residual effect has been assessed as **minor adverse** and not significant in EIA terms.

14.7.3.3 Impact 3: Impact on risk of allision

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

14.329 The presence of partially decommissioned infrastructure can increase the risk that a vessel may be involved in an allision with it if its visibility is reduced.

14.330 Impacts associated with allisions were modelled to establish the likelihood of an allision, the methodology for which is outlined in the NRA (**Appendix 14.1**). Allision impacts are considered to be greatest during the operational phase when full build out is achieved, and modelling was conducted on this basis. The results of the modelling are therefore presented in the operational phase assessment (**Section 14.7.2.3**).

14.331 Analysis of historic allision incidents at existing offshore windfarms have primarily involved project vessels at low speed (**Table 14.22**). The chance of a project vessel alliding with a WTG may be increased during the decommissioning phase due to it working in close proximity to the WTGs. It is noted however, that project vessel crew are also more likely to be experienced in safely transiting offshore windfarms during decommissioning activities.

Frequency of occurrence

14.332 Modelling of commercial vessel allisions for full build out (operational phase) shows the predicted frequency of allision is low, 1 in 9,549 years for commercial vessels, and 1 in 2,118 years for ferries (**Section 14.7.2.3**). It is therefore expected that during the decommissioning phase that the frequency of allision events would be lower.

14.333 By the point of decommissioning, the windfarm would have been established and promulgated through charting and other communication means for a number of years. Vessels would be experienced navigating through the study area. Safety zones enforced during the decommissioning phase of the Project would help deconflict traffic (particularly small vessel traffic) with the windfarm structures reducing the likelihood of contact.

14.334 Commercial vessels would likely avoid buoyed areas/safety zones during decommissioning through standard practice reducing exposure to allision risks.

14.335 The site would be well marked and there is sufficient searoom to safely pass around the site rather than through it, therefore, it is unlikely that a small vessel, such as a recreational vessel would choose to transit through the site. Were a contact with a WTG to occur, a glancing blow with minor damage is the most credible outcome. Given the minimum distance between WTGs

(1,062m), fishing may take place, however, given the available searoom a glancing blow with minor damage is also considered the most credible outcome for fishing vessels.

14.336 Detailed mitigation measures would be identified within the Project Decommissioning Programme. The frequency of occurrence has been assessed as **remote - extremely unlikely**.

Severity of consequence

14.337 Multiple factors influence the severity of consequence should an allision occur. For example, vessel characteristics, vessel speed, angle and the engineering of the WTG. The greater manoeuvrability and familiarity of vessel bridge teams reduces the likelihood of an allision and ability of the vessel to take avoiding action.

14.338 Various studies have sought to quantify severity of consequence (Biehl and Lehmann (2006), Besöksadress *et al*. (2008), Dai et al. (2013), Moulas *et al*. (2017) and Presencia and Shafiee (2018)):

- Ship allisions, even at low speeds, can cause significant damage to WTGs including deformation and buckling
- Some studies of in-field project vessels (up to 4,000 tons), with allisions at high speeds, did not result in WTG collapse
- Modelling of allisions with large commercial ships could result in holing of the vessels hull and cargo release
- Larger vessels (30,000 DWT) alliding with the turbine might typically result in the tower collapsing away from the vessel
- Some studies suggested that large commercial ships could result in the tower collapsing towards the vessel, with the damage likely to penetrate the deck

14.339 Where incidents have occurred at existing offshore windfarms, they have primarily involved project vessels at low speed (**Appendix 14.1**). The most likely outcome is, therefore, minor damage and/or minor injuries. However, it is feasible that a worst-case allision might result in WTG collapse, holing and eventual flooding of a vessel and the potential for loss of life though this is considered unlikely.

14.340 Overall, the severity of consequence has been assessed as **moderate - serious**.

Significance of effect

14.341 The effects in EIA terms although considered similar to impacts experienced during construction, are considered to be reduced owing to the long-term

implementation of alternative routeing. The effect has been assessed as **negligible - moderate adverse**.

Additional mitigation

14.342 No additional mitigation above that embedded for the Project (**Table 14.3**) is required. Detailed mitigation measures would be set out within the Project Decommissioning Programme.

Residual effect

14.343 The residual effect has been assessed as **negligible - moderate adverse but ALARP** (not significant in EIA terms).

14.7.3.4 Impact 4: Impact on risk of collision

14.344 The worst-case total additional movements as a result of project vessels during the decommissioning phase is estimated to be similar to construction.

14.345 Most passing vessels would transit with a sufficient safety buffer from the windfarm (c.1.5nm) such that an emerging vessel (for example a vessel involved in decommissioning) at 15 knots would be visible for approximately six minutes providing some opportunity to avoid a collision.

14.346 It is noted that given the geometry of the windfarm site, vessels proceeding north to the east and west of the windfarm site may not have visual sight of one another until they meet at the north of the windfarm site. However, larger vessels would be identifiable from AIS (and tracked by radar/visual means) which would enable passing arrangements to be planned in accordance with COLREGs. As decommissioning progresses, visual navigation would increase towards the pre-construction baseline.

14.347 Modelling was undertaken to establish the likelihood of a collision occurring. The methodology is outlined in the NRA (**Appendix 14.1**, Section 8.5). It is noted that modelling assumes maximum build out of the windfarm. It is therefore expected that during the decommissioning phase that these return periods would be lower. The results of the modelling are outlined in **Section 14.7.2.4** and detailed in the NRA (**Appendix 14.1**, Section 8.5).

Frequency of occurrence

14.348 Decommissioning vessels may interact with existing traffic, for example, when crossing shipping routes increasing encounter potential and therefore collision risk. Additional risk controls should be identified to deconflict WFSV movements with other passing traffic, for example via passage planning for decommissioning vessels.

14.349 Recreational and fishing vessel collision risk is considered low due to the low levels of these vessel types in the study area. The vessel traffic survey

identified no recreational vessels during winter 2022 and 2023 surveys and twelve were identified during the summer survey, therefore, the increase in risk of collision would be small.

14.350 Based on the analysis, the change in collision risk over the existing baseline as a result of the Project for commercial and passenger vessels is very low. Based on modelling (**Table 14.23**) the likelihood of a collision with the Project in place is 1 collision event in 933 years. This would reduce further towards the base case as decommissioning progresses.

14.351 Overall, the frequency of occurrence has been assessed as **remote - extremely unlikely**.

Severity of consequence

14.352 International studies have explored the consequences of collision between large vessels. The EMSA (2015) collision risk model developed for their FSA based on historical incidents estimated that 33% of struck RoPax vessels would result in water ingress and additionally 14% of those vessels would result in sinking (resulting in a joint probability of 4.6% for a struck RoPax to sink). The MSC 85-17-2 FSA gives probabilities of 16% of collisions being a serious casualty of which 50% of struck vessels would flood, 22% would sink with a further 50% split between gradual sinking or rapid capsize (joint probability of the latter being 0.8%).

14.353 Analysis of MAIB data suggests that approximately 1% of collisions would result in loss of life. The severity of consequence has been assessed as **moderate - serious**.

Significance of effect

14.354 Given the severity of the potential consequence the effect has been assessed as **negligible - moderate adverse**.

Additional mitigation

14.355 No further additional risk controls were identified as being required for the Project above the measures included in the embedded mitigation for the Project (**Table 14.3** and **Appendix 14.1**). Consequently, where effects on collision of the Project are assessed to be moderate, they can be considered to be ALARP and therefore not significant in EIA terms.

14.356 Detailed mitigation measures would be set out within the Project Decommissioning Programme.

Residual effect

14.357 The residual effect has been assessed as **negligible - moderate adverse (but ALARP)** (not significant in EIA terms).

14.7.3.5 Impact 5: Impact on search and rescue

14.358 Decommissioning would lead to an increase in Project vessel activities and personnel in the area, and as such there may be an increase in the number of incidents requiring emergency response. The impact during decommissioning is considered to be the same as during the construction phase.

Frequency of occurrence

14.359 Given the embedded mitigation, and likelihood of incidents a frequency of occurrence (noting low baseline incident rates) of **remote - extremely unlikely** has been assigned.

Severity of occurrence

14.360 The severity of occurrence has been assessed as **minor** given the embedded mitigation and available sea room to undertake emergency manoeuvres if required.

Significance of effect

14.361 The effect has been assessed as **negligible adverse** and not significant in EIA terms.

Additional mitigation

14.362 No additional mitigation above the embedded mitigation (**Section 14.3.3**) is proposed. Detailed mitigation measures would be identified within the Project Decommissioning Programme.

Residual effect

14.363 The residual effect has been assessed as **negligible adverse**, which is not significant in EIA terms.

14.7.3.6 Impact 6: Impact on snagging

14.364 Snagging risks are considered greatest from fishing vessels when gear is deployed, particularly mobile gear types. The area is used by primarily by vessels using static gear from ports in Wales and Fleetwood, with very little trawling or mobile gear activity. Belgium beam trawlers were noted as making periodic visits to the area. South and southwestern sections of the study area have been recorded as having over 10,000 hours of fishing time in 2020 from VMS data. Fishing activity present within the study area is detailed in **Section 14.5.2.6** and further information is presented in **Chapter 13 Commercial Fisheries**. Fishing future case scenario is detailed in **Section 14.6.3**, which details that fishing activity in the area is not anticipated to change significantly.

14.365 Cables would either be removed or decommissioned in situ with their presence charted. When considering the impact where cables are

decommissioned in situ, impacts would be expected to be the same as during construction. During decommissioning it is required in the Project embedded mitigation that safety zones would be established of an appropriate configuration and extent to mitigate for potential snagging hazards. As such, snagging potential during and post decommissioning is considered the same as during the construction and the operation and maintenance phases.

Frequency of occurrence

14.366 Overall, the frequency of occurrence has been assessed as **extremely unlikely**.

Sensitivity of consequence

14.367 Were a fishing vessel to snag a cable, the most likely outcome is loss of gear and minor damage to the cable. A worst credible outcome is the loss of the fishing vessel, and potential fatalities, however, this is considered unlikely. The severity of consequence has been assessed as **moderate** given embedded mitigation.

Significance of effect

14.368 The effect has been assessed as **minor adverse** and not significant in EIA terms.

Additional mitigation

14.369 No additional mitigation above the embedded mitigation (**Section 14.3.3**) is proposed. Detailed mitigation measures would be set out within the Project Decommissioning Programme.

Residual effect

14.370 The residual effect has been assessed as **minor adverse** and not significant in EIA terms.

14.8 Cumulative effects

14.371 In order to undertake the CEA, and as per the PINS advice note (PINS, 2019), the potential for cumulative effects has been established considering each Project-alone effect (and the zone of impact (ZoI)) extent of each impact) alongside the list of other plans, projects and activities that could potentially interact. These stages are detailed below.

14.8.1 Identification of potential cumulative effects

14.372 Part of the cumulative assessment process is the identification of which individual impacts assessed for the Project have the potential for a cumulative effect on receptors (impact screening). This information is set out in **Table**

14.24. Screening considers the extent of the impacts and the plans and projects identified in **Table 14.25** (presented in **Figure 14.2**).

14.373 Impacts for which the significance of effect was assessed in the Project-alone assessment as 'negligible', or above, are considered in the CEA screening (i.e. only those assessed as 'no change' are not taken forward as there is no potential for them to contribute to a cumulative effect).

Table 14.24 Potential cumulative effects (screening)

Impact	'Project-alone' effect significance	Potential for cumulative effect	Rationale
All phases			
Impact 1: Impact on ferry routeing	Minor adverse	Yes	There is potential for interaction which may lead to cumulative displacement, re- routeing and disruption to normal and adverse weather routeing.
Impact 2: Impact on commercial vessel routeing	Minor adverse	Yes	There is potential for interaction which may lead to cumulative displacement, re-routeing and disruption to normal and adverse weather routeing.
Impact 3: Impact on risk of allision	Negligible - Moderate adverse but ALARP	Yes	There is potential for interaction which may lead to cumulative allision risk.
Impact 4: Impact on risk of collision	Negligible - moderate adverse but ALARP	Yes	There is potential for interaction which may lead to cumulative collision risk.
Impact 5: Impact on search and rescue	Negligible adverse	Yes	There is potential for interaction which may lead to cumulative effects to search and rescue access and emergency response.
Impact 6: Impact on snagging	Minor adverse	Yes	Where snagging incidents occur, they are specific to each individual project, however they are considered cumulatively in relation to additive effects. Snagging may be a causal factor leading to cumulative effects (displacement of fishing vessels, for example), however, in itself, it does not present a cumulative impact. Impacts associated with displacement of fishing vessels/activities are assessed in **Chapter 13 Commercial Fisheries**.

Impact	'Project-alone' effect significance	Potential for cumulative effect	Rationale
Impact 7: Impact on communications, radar and positioning	Minor adverse	Yes	There is potential for interaction which may lead to cumulative effects on communication systems.

14.8.2 Identification of other plans, projects and activities

14.374 The identification and review of other plans, projects and activities that may result in cumulative effects (described as 'project screening') is undertaken alongside an understanding of Project-alone effects. This project screening information is set out in **Table 14.25**. This includes consideration of the relevant details of each project, including current status (e.g. under construction), planned construction period, distance to the Project, status of available data and rationale for including or excluding from the CEA.

14.375 All projects considered for CEA across all topics have been identified within **Appendix 6.1 CEA Project Long List** (Document Reference 5.2.6.1), which forms an exhaustive list of plans, projects and activities relevant to the Project.

14.376 The CEA has been informed by the CRNRA contained in **Appendix 14.2**. The study area for the purposes of CEA is defined as defined as the region of the east Irish Sea bounded by the Isle of Man to the northwest and the Welsh and English coasts to the south and east respectively (**Appendix 14.2**).

14.377 Only projects which are reasonably well described and sufficiently advanced to provide information on which to base a meaningful and robust assessment have been included in the CEA. Projects, such as existing operational windfarms and oil and gas infrastructure, which are sufficiently established during the baseline characterisation for the Project have been considered as part of the baseline for the EIA for shipping and navigation and are therefore not listed here, but form part of the assessment.

Table 14.25 Summary of projects considered for the CEA in relation to shipping and navigation

Project	Status (at time of assessment)	Construction/ decommissioning period	Closest distance from the Project (km)	Screened in CEA (Y/N)	Rationale
Morgan and Morecambe Offshore Windfarms: Transmission Assests	Pre-application stage. PEIR published in October 2023.	2026 – 2029	0 (adjacent)	Y	There is the potential for temporal overlap of offshore activities and therefore cumulative effects.
Mona Offshore Wind Project	Pre-application stage. PEIR published in April 2023.	2026 – 2029	10.0	Y	There is the potential for temporal overlap of offshore activities and therefore cumulative effects.
Morgan Offshore Wind Project Generation Assets	Pre-application stage. PEIR published in April 2023.	2026 - 2029	16.7	Y	There is the potential for temporal overlap of offshore activities and therefore cumulative effects.
AyM Offshore Wind Farm	Consent granted 2023.	2027 - 2030	28.9	Y	There is the potential for temporal overlap of offshore activities and therefore cumulative effects. The AyM Offshore Wind Farm is located 28.9km to the south of the Project, and is separated from the Project by the Liverpool Bay TSS. For the purposes of the CRNRA, the AyM wind farm is considered within the baseline assessment of the Project. Given its location inland of this TSS, and hence not interacting with the majority of routeing in the area the ES for AyM concluded that construction, operation and decommissioning effects were Tolerable or Broadly Acceptable and not significant in EIA terms.

Project	Status (at time of assessment)	Construction/ decommissioning period	Closest distance from the Project (km)	Screened in CEA (Y/N)	Rationale
					The Project is located to the north of the Liverpool Bay TSS and its presence, either during construction/decommissioning or operation and maintenance, does not cause the re-routeing of ferries or commercial vessels south into the Liverpool Bay TSS. As such, it is unlikely that the cumulative effect of both projects on vessel routeing, allision or collision risk, SAR procedures and communications would be increased above the effects assessed for either project alone.
Mooir Vannin Offshore Wind Farm	Pre-application stage. Scoping report published October 2023.	2030 – 2032	43.7	Y	This project is within the CRNRA study area and there is potential cumulative effects. Due to the release of the Scoping Report for the Mooir Vannin OWF in October 2023, after the completion of many of the activities undertaken to inform the CRNRA, an addendum to the CRNRA was prepared to consider the additional cumulative risks that might result to vessel traffic identified within the CRNRA (**Appendix 14.2**)

14.8.3 Assessment of cumulative effects

14.378 Having established the residual effects from the Project with the potential for a cumulative effect, along with the other relevant plans, projects and activities, the following sections provide an assessment of the level of cumulative effect that may arise. These are detailed per impact where the potential for cumulative effects have been identified (in line with **Table 14.24**).

14.379 Given the interconnected nature of the Project and the Transmission Assets, a separate 'combined' assessment of these is provided within the CEA (**Section 14.8.3.1**). Thereafter, the cumulative assessment considers all plans, projects and activities screened into the CEA (**Section 14.8.3.2**).

14.8.3.1 Cumulative assessment – Generation and Transmission Assets (combined assessment)

14.380 While the Transmission Assets[12] are being considered in a separate ES as part of a separate DCO application, given the functional link, a 'combined' assessment is made considering both the Project and the Transmission Assets. This provides an assessment of impact interactions and additive effects and thus any change in the significance of effects is assessed separately.

14.381 The Transmission Assets PEIR (Morgan Offshore Wind Limited and Morecambe Offshore Windfarm Ltd, 2023a) informs the assessment.

14.382 Only the marine elements of the Transmission Assets would interact with the Project in relation to shipping and navigation, including:

- Export cables for the Morgan Offshore Wind Project Generation Assets and the Project, making landfall south of Blackpool
- Booster station required for the Morgan Offshore Wind Project Generation Assets
- OSP(s) (for the Project and Morgan Offshore Wind Project Generation Assets)

[12] As the Transmission Assets includes infrastructure associated with both the Project and the Morgan Offshore Wind Project Generation Assets, it should be noted that the combined assessment considers the transmission infrastructure for both the Project and the Morgan Offshore Wind Project Generation Assets.

14.383 The following (project-alone) impacts were concluded during the construction, operation and maintenance and decommissioning phases in the Transmission Assets PEIR (Morgan Offshore Wind Limited and Morecambe Offshore Windfarm Ltd, 2023a):

- Impact on recognised sea lanes essential to international navigation - **negligible adverse** effect (not significant in EIA terms)
- Impact to commercial operators including strategic routes and lifeline ferries – **minor/negligible** adverse effect (not significant in EIA terms)
- Impact to adverse weather routeing - **minor/negligible** adverse effect (not significant in EIA terms)
- Impact on access to ports and harbours - **minor** adverse effect (not significant in EIA terms)
- Impact on emergency response capability due to increased incident rates and reduced access for SAR responders - **negligible** adverse effect (not significant in EIA terms)
- Impact on vessel to vessel collision risk - **minor** adverse effect (not significant in EIA terms)
- Impact on allision (contact) risk to vessels - **minor/negligible** adverse effect (not significant in EIA terms)
- Impact on marine navigation, communications and position fixing equipment - **negligible** adverse effect (not significant in EIA terms)
- Impact on recreational craft passages and safety - **minor/negligible** adverse effect (not significant in EIA terms)
- Impact on snagging risk to vessel anchors and fishing gear - **minor/negligible** adverse effect (not significant in EIA terms)
- Impact on oil and gas navigation, operations and safety - **minor** adverse effect (not significant in EIA terms)
- Impact on underkeel clearance - **negligible** adverse effect (not significant in EIA terms)

14.384 During construction and decommissioning activities for the Transmission Assets up to a total of 70 construction vessels are expected on site at any one time and up to 385 return vessel trips are expected per year. Operation and maintenance activities would require up to 1,155 vessel movements (return trips) per year. This includes CTVs/workboats, jack-up vessels, cable repair vessels, service operation vessels or similar, and excavators/backhoe dredgers. This is in addition to vessels for the Project (**Table 14.2**), although it is noted that OPSs are considered in both design envelopes.

14.385 Once constructed, the Transmission Assets would provide limited surface obstructions outside of the Project and Morgan windfarm sites. As assessed in the CRNRA (**Appendix 14.2**), the potential Morgan booster station would not materially impact upon most of the routeing decisions made by Irish Sea ferries, given its proximity to both the Project windfarm site and existing oil and gas platforms. However, for Stena Line Liverpool-Belfast routes to the east of the Isle of Man, it could necessitate an additional minor deviation were it to be located within the most westerly portion of the search areas to maintain suitable clearances.

14.386 While the need for and location of the Morgan booster station had not been finalised, the Transmission Assets PEIR (assessing at the worst-case position) does not identify any significant effects on shipping and navigation stakeholders but notes further consultation would be undertaken with oil and gas operators as the need for and location of the booster station is refined.

14.387 The shipping and navigation impacts assessed for the Transmission Assets align with those assessed for the Project (with small differences in wording). Given the largely spatially separate effects (as described in **Table 14.26**) and the embedded mitigation to be adopted by each project, while all effects are additive between the Project and the Transmission Assets, there is no material change in the significance of effects when considering the majority of impacts together. It is also noted there is further information in the CRNRA (**Appendix 14.2**) which includes the Transmission Assets in the assessment of regional effects.

Table 14.26 Summary of impacts from the Project and Transmission Assets alone and combined (note: wording of impacts has been summarised to encompass both projects)

Impact	Transmission Assets significance of effect	Project significance of effect	Combined assessment
Construction/decommissioning phases			
Impact on recognised sea lanes essential to international navigation	Negligible adverse	No impact	While there would be some small-scale additive effects, the cumulative effects of these impacts is not considered to be elevated beyond those individually assessed.
Impact to commercial operators including strategic routes and lifeline services	Minor adverse	Assessed as part of routeing effects	

Impact	Transmission Assets significance of effect	Project significance of effect	Combined assessment
Impact on access to ports and harbours	Minor adverse	Assessed as part of routeing effects	
Impact on recreational craft passages and safety	Minor adverse	Assessed as part of allision and collision risks	
Impact on ferry routeing including adverse weather	Minor adverse	Minor adverse	
Impact on commercial vessel routeing including adverse weather	Minor adverse	Minor adverse	
Impact on risk of allision	Minor adverse	Negligible - Moderate adverse (but ALARP)	
Impact on risk of collision	Minor adverse	Negligible - Moderate adverse (but ALARP)	
Impact on search and rescue	Negligible adverse	Negligible adverse	
Impact on snagging	Minor adverse	Minor adverse	
Impact on oil and gas navigation, operations and safety	Minor adverse	Assessed as part of allision and collision risks.	
Impact on underkeel clearance	Negligible adverse	Assessed as part of snagging given water depths at the windfarm site	

Impact	Transmission Assets significance of effect	Project significance of effect	Combined assessment
Operation and maintenance phase			
Impact on recognised sea lanes essential to international navigation	Negligible adverse	No impact	While there would be some small-scale additive effects, the cumulative effects of these impacts are not considered to be elevated beyond those individually assessed.
Impact to commercial operators including strategic routes and lifeline services	Negligible adverse	Assessed as part of routeing effects	
Impact on access to ports and harbours	Minor adverse	Assessed as part of routeing effects	
Impact on recreational craft passages and safety	Negligible adverse	Assessed as part of allision and collision risks	
Impact on ferry routeing including adverse weather	Negligible adverse	Minor adverse	
Impact on commercial vessel routeing including adverse weather	Negligible adverse	Minor adverse	
Impact on risk of allision	Negligible adverse	Negligible - Moderate adverse (but ALARP)	
Impact on risk of collision	Minor adverse	Negligible - Moderate adverse (but ALARP)	
Impact on search and rescue	Negligible adverse	Negligible adverse	
Impact on snagging	Negligible adverse	Minor adverse	

Impact	Transmission Assets significance of effect	Project significance of effect	Combined assessment
Impact on oil and gas navigation, operations and safety	Minor adverse	Assessed as part of allision and collision risks, and impacts on communications, radar and positioning	
Impact on communications, radar and positioning	Negligible adverse	Minor adverse	
Impact on underkeel clearance	Negligible adverse	Assessed as part of snagging given water depths at the windfarm site	

14.8.3.2 Cumulative Assessment – All plans and projects

14.388 Based on the impacts (**Table 14.24**) and plans and projects (**Table 14.25**) identified where there is the potential for cumulative effects, a detailed cumulative assessment has been undertaken considering all relevant information from the Project and other plans and projects (including the Transmission Assets). As set out in **Table 14.25**, due to insufficient information at the time of the assessment, the Mooir Vannin Offshore Wind Farm was not assessed in the main CRNRA, but has been assessed as an addendum to the CRNRA (**Appendix 14.2**, Appendix D), and is presented separately below, following the CRNRA assessment that covers the Irish Sea Round 4 projects.

14.389 During early consultation for the Project, stakeholders raised concerns regarding cumulative effects of the Mona Offshore Wind Project, the Morgan Offshore Wind Project Generation Assets and the Morecambe Offshore Windfarm Generation Assets (the Project). In particular, it was noted that the presence of all three projects would result in corridors between them that may result in greater impacts on navigation safety and commercial operations than each project in isolation. As such, the developers of Mona Offshore Wind Project, Morgan Offshore Wind Project Generation Assets and Morecambe Offshore Windfarm Generation Assets commissioned a joint CRNRA

(**Appendix 14.2**) to address these concerns and manage cumulative effects in a coordinated manner.

14.390 An initial CRNRA was conducted to inform the PEIRs of each project which were published for statutory consultation in 2023. A summary of the key conclusions is provided in **Section 14.1.1** and in **Appendix 14.2**, Section 1.2. In short, the initial CRNRA identified that there was insufficient searoom between the three windfarm sites for safe navigation which led to unacceptably high risks. As a result of this finding a number of commitments were made by the projects, including changes to the boundaries of each project to increase the available searoom between the projects. These commitments are summarised in **Appendix 14.2**, Table 2.

14.391 Given the significance of the boundary change commitments and other commitments, a full update of the CRNRA was undertaken to inform the ES assessments for the projects. This included updating the data analysis using 2022 datasets, repeating the navigation simulations with ferry companies and undertaking a second hazard workshop in September 2023, attended by representatives from ferry operators, regulators, commercial bodies, oil and gas operators, ports and fishing community. The cumulative effects assessment set out in this section is informed by this updated CRNRA and should be read in conjunction with **Appendix 14.2**. The Transmission Assets, including possible offshore booster station search areas associated with the Morgan export cable corridor, unknown at the time of the initial CRNRA, were also included as a further project as part of the updated CRNRA.

14.392 Embedded mitigation measures are presented in **Appendix 14.2**, Table 7 which describe industry standard risk controls that would be present for all four projects. These are considered embedded in the risk assessment process rather than additional requirements and are included within the embedded mitigations for the Project (**Table 14.3**).

14.393 The assessment below focusses on the operation and maintenance phases of the projects given the long-term nature of effects, noting that during construction and decommissioning these effects would also occur.

Impact 1: Impact on ferry routeing

14.394 The CRNRA noted additional cumulative effects on ferry routeing above those identified for the Project-alone scenario in **Section 14.7.2.1**. The potential impacts of the projects on ferry vessel routeing determined that there would be necessary deviation of Stena Line, IoMSPC and Seatruck routes around the windfarm sites in both normal and adverse weather conditions (**Appendix 14.2** and see **Plate 14.2** and **Plate 14.3**).

14.395 The cumulative deviation in normal conditions would be less than five minutes for most ferry routes, with the exception of Stena Line services between

Liverpool and Belfast, with increases of between 13 and 16 minutes. Existing passages are up to eight hours duration (dependent on route), with existing services having significant variation of greater than 25 minutes in turnaround times and transit times. The increase in passage distance and time duration associated with the projects is, therefore, unlikely to have significant schedule impacts but could increase pressures on operators. The presence of the projects may also necessitate additional watchkeeping requirements to ensure safe navigation within the routes and effective collision avoidance.

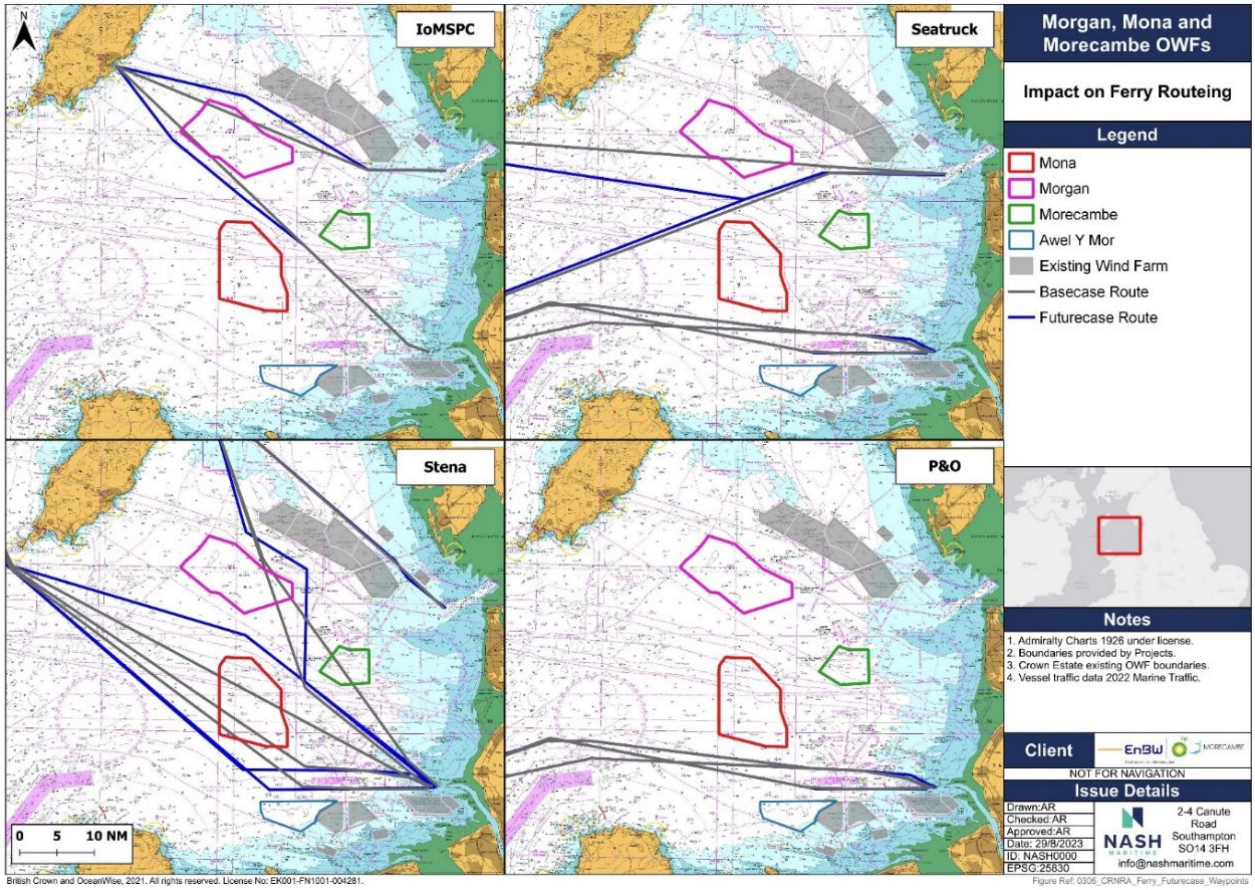

Plate 14.2 Impact on ferry routeing in normal weather conditions due to Morgan, Mona and Morecambe OWFs[13]

14.396 During adverse weather the following principal impacts are identified in the CRNRA (see **Plate 14.3**):

- **Stena Heysham to Belfast** route may choose not to transit between West of Duddon Sands and Barrow OWFs and pass to the west of West of Duddon Sands where there is greater sea room and weather routeing optionality. This was estimated during navigation simulations to occur with significant wave heights between 3m and 3.5m (occurring approximately

[13] Basecase represents current passage plans as provided by ferry operators. Futurecase represents the suggested deviated routes around the windfarm sites.

monthly on average during winter months). Within the 2022 data, vessels choosing to do so incurred approximately 40-70 minutes of transit time, albeit with significant variation in crossing duration. With the Array Areas (windfarm sites) in place, and were the route between Morgan and Walney OWFs is not deemed navigable in adverse weather, vessels may choose to pass to the west of Morgan Array Area before proceeding north (to the east of IoM). This is estimated to incur a further increase in transit times by 63 minutes of transit, a total delay of approximately +103 to +133 minutes to the normal route. Alternatively, vessels may elect to continue further west and pass to the east of IoM, with a reduced transit distance but more exposed to the elements.

- **Stena Line Liverpool to Belfast** ferries are susceptible to excessive roll motions with seas with significant wave heights in excess of 3m on the beam (occurring approximately monthly on average during winter months), posing a risk to passengers and crew. The existing practice in such conditions would be for vessels to alter course to the southwest to find a more comfortable heading. Within the 2022 data, this accounted for approximately an additional 20 to 60 minutes in additional distance and reduced speed, albeit with significant variation in crossing duration. The footprint of the Mona Array Area is clear of the existing key adverse weather routes taken by Stena Line, however, the presence of all of the projects together may require Stena Line to more frequently take an adverse weather route bypassing all project, increasing journey times. Routes to the east of the IoM are used in adverse weather and an updated passage plan is shown in **Plate 14.3** on this basis with the project array areas in place (passing between Morecambe/Mona and Morgan/Mona Array Areas). However, if the routes between the project array areas are not considered navigable in adverse weather then vessels may elect to navigate using the west of IoM route described above which would necessitate far greater journey times.
- **IoMSPC Heysham and Douglas**. The Ben-my-Chree is constrained in heavy seas on the beam, which can cause large roll motions. During navigation simulations, it was determined that with significant wave heights of approximately 3m on the beam, the roll exceeds 10 degrees and occasionally 30-degree motions which would be unsafe for passengers and cargo. Analysis of 2022 AIS data showed that in such conditions, the vessel tracked southwest of its usual course to minimise roll and this accounted for approximately an additional 10 to 23 minutes of journey time, albeit with significant variation in crossing duration. Given that the presence of Morgan Array prevents this action from being taken, the navigation simulations concluded that in conditions greater than approximately 2.5m Hs (equating to monthly summer and fortnightly winter conditions) the vessel would choose to pass south of Morgan. This

would necessitate a further increase in transit times by 24 minutes in journey times, a total delay of at least 34 minutes to the normal route.

- **IoMSPC Liverpool and Douglas**. The Manannan is most constrained with wind and sea on its bow, which can cause large pitch and roll motions. During the navigation simulations, it was concluded that the most effective mitigation was to reduce speed to half ahead, which would generally result in a reduction of 30% speed over ground. During navigation simulations, it was determined that with significant wave heights of approximately 2.5m on the beam, there was a need to take some action. However, by adverse weather routeing to the south, full speed could be maintained within lee of Anglesey for longer, noting that this action could take the Manannan clear of the development area of the Mona Array Area. Analysis of 2022 AIS data showed that in such conditions, the vessel tracked southwest of its usual course and this accounted for approximately an additional 10 to 33 minutes of journey time, albeit with significant variation in duration. In order to clear the Mona Array Area, a further increase in journey times by 13 minutes is required, a total delay of at least 23 minutes to the normal route.
- **Seatruck** adverse weather routeing was generally limited within the vicinity of the projects array areas and this was confirmed during the navigation simulations. Within the 2022 AIS data, tracks diverged approximately west of the Mona and Morgan Array Areas, accounting for approximately an additional 28 minutes of journey time for both routes, albeit with significant variation in duration. The additional deviation required to avoid the projects array areas was minor. However, it was noted that on rare occasions as a result of particular metocean conditions, adverse weather routes passed through the Morecambe Array Area and such transits would necessarily need to follow the more frequent route between Mona and Morgan.

14.397 The increase in delays during adverse weather has several implications for the vessel schedules that could increase the number of cancellations. This includes hours of rest requirements for the bridge teams and schedule/turn around constraints.

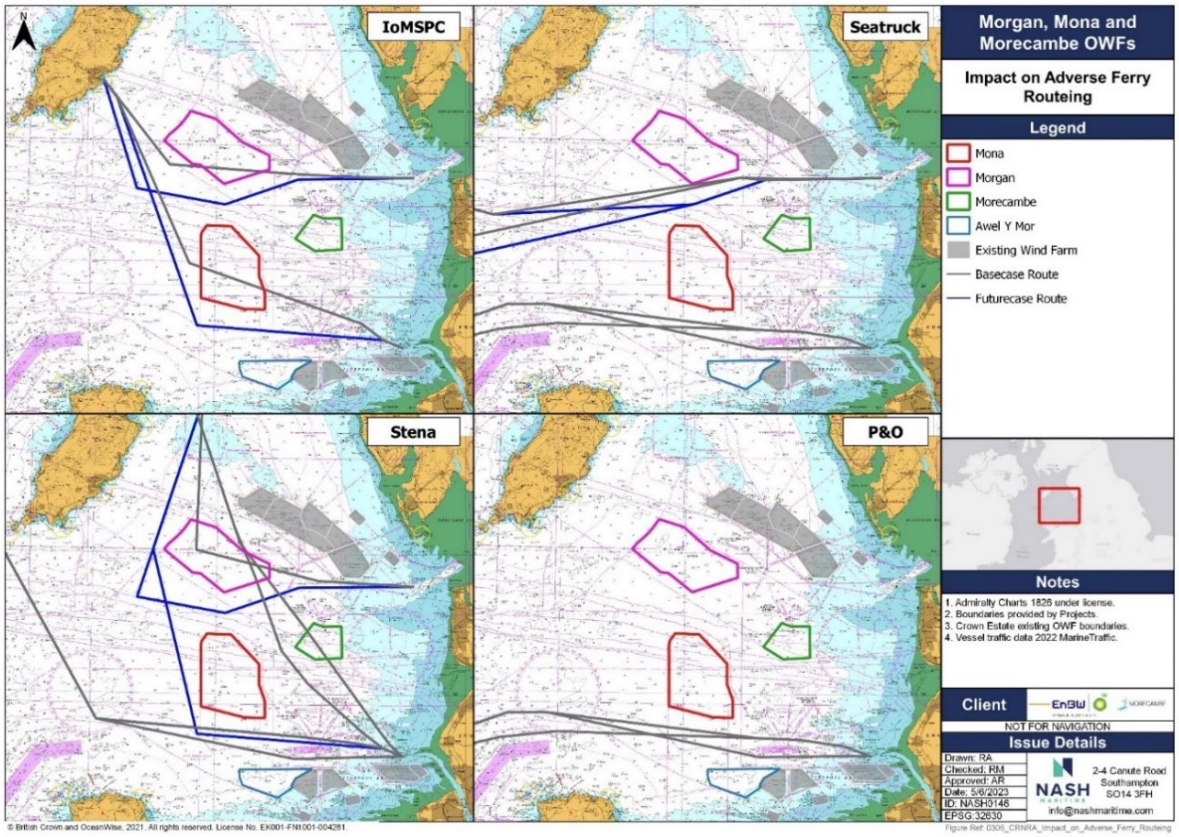

Plate 14.3 Impact on adverse weather ferry routeing

Significance of effect

14.398 Deviations due to the projects on ferry passage planning in normal weather conditions is minor (a maximum increase in transit time of 16 minutes on a baseline transit time of 480 minutes for the Stena Liverpool-Belfast east of Isle of Man (east of Calder) route). The existing variation in timetables and turnaround times in port was significantly greater than the additional time incurred for the necessary deviations around the projects. The CRNRA has described how the Projects might impact upon ferry operations. The CRNRA notes that whilst the impacts vary by operator, the results suggest that in normal conditions the additional transit duration is not likely to significantly impact upon ferry operations. However, in adverse weather the reduced sea room and increased duration of journey caused by the additional deviations around the combined projects, could necessitate additional operational constraints and could result in increased delays and cancellations to some services (**Appendix 14.2**).

14.399 Considering the impacts to adverse weather routeing when all three projects are considered, the frequency of occurrence is deemed to be **frequent**, and the severity of consequence has been assessed as **minor**. The effect, therefore, has been assessed as **moderate adverse** and significant in EIA terms. However, the contribution of the Project-alone is considered to be small given the Project has only a minor effect the Stena Line Liverpool-Belfast (east

of IoM (east of Calder)) route, with the remaining normal and adverse weather routes largely unaffected by the Project itself (**Section 14.7.2.1**). It is, therefore, considered that the Project is not materially contributing to the significance of this impact and no additional mitigations are required by the Project. However, engagement with ferry operators on residual operational impacts is planned to continue as the Project progresses.

Impact 2: Impact on commercial vessel routeing

14.400 The most significant commercial shipping routes in the CRNRA study area (more than one vessel per day) are between Off Skerries TSS and Liverpool Bay TSS (**Plate 14.4** and **Appendix 14.2**, Figure 46). These are relatively unaffected by the projects with no additional transit duration. The routes from the west of the Isle of Man and Liverpool Bay TSS would necessitate a minor deviation around the south west corner of Mona Array Area, however this would be less than 0.5nm.

14.401 Less trafficked routes are more dispersed within the CRNRA study area and therefore greater deviations are encountered. The most impacted routes are between Douglas and Liverpool TSS with an additional 6.5nm steaming and between Off Skerries TSS and Heysham with an additional 4.8nm of steaming. However, less than one vessel per week utilises these routes.

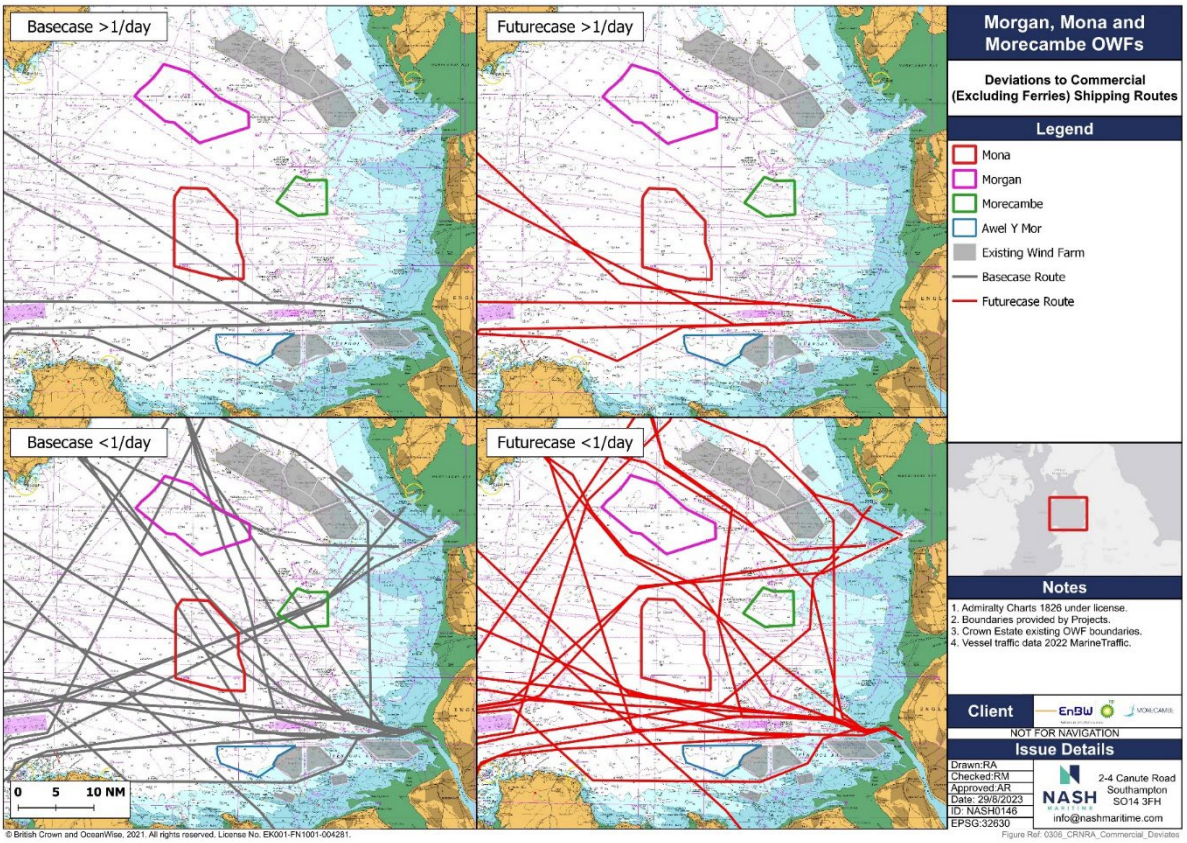

Plate 14.4 Change in commercial vessel shipping routes with project windfarm sites

14.402 The majority of other affected routes are of similarly low intensity and typically route through the corridor between the Mona and Morgan Array Areas or deviate to the southwest of the Mona Array Area. Some routes, such as Douglas to Liverpool, have minor reductions in distance where less direct routes routinely used to avoid traffic or weather are no longer possible (**Appendix 14.2**, Table 28). Furthermore, this necessitates greater course changes to pass between the project array areas, or as is the case for the Liverpool to the east of Isle of Man (west) route, necessitates not utilising the Liverpool TSS when they previous would have (**Appendix 14.2**).

14.403 Analysis of adverse weather routeing during 2019 and 2022 named storms did not identify any notable changes to typical routes. There was a greater demand for the anchorages along the Welsh coast and no discernible impacts of the projects are identified for the availability of anchorages for vessels to seek shelter in adverse weather. Some vessels were recorded loitering both to the west and within the project array areas, likely riding the conditions before they could berth. There is sufficient clear sea room to the west of the projects for this practice to continue.

Significance of effect

14.404 Commercial routes would be deviated through the corridors between the projects, but the increase in distance is minor when the length of the voyages

these vessels undertake is considered. Given the very low volumes of commercial vessel traffic utilising the affected commercial routes, the impacts of the route deviations during normal and adverse weather are considered to be infrequent, minimal and unlikely to make operations unviable.

14.405 While the cumulative effect on commercial vessel routeing is increased in comparison to the Project-alone scenario, driven largely by minor deviations around the Mona Array Area, overall, the significance is considered the same as the Project-alone scenario. The frequency of occurrence has been assessed as **frequent** as deviations will be required on a greater than annual basis.

14.406 Given the very low traffic intensity of the affected commercial routes and the minimal extent and impact of the route deviations) in relation to the length of the voyages, it is considered unlikely to make such operations unviable. As such, the severity of consequence is considered to be **negligible**. The effect has been assessed as **minor adverse** with embedded mitigation measures, which is not significant in EIA terms.

Additional mitigation and residual effect

14.407 No additional mitigation above the embedded mitigation measures (**Table 14.3,** and **Appendix 14.2**, Table 46) is proposed. The effect has been assessed as **minor adverse** which is not significant in EIA terms.

Impact 3: Impact on risk of allision

14.408 The presence of new infrastructure in an area can increase the risk that a vessel may be involved in an allision (contact) with it. In general, the greater the amount of infrastructure in an area (i.e. WTGs) the greater the risk of an allision. Historical incident analysis at other offshore wind projects suggests that an allision between a CTV and a WTG occurs approximately once every ten years (**Appendix 14.1**, Section 6.5.1).

14.409 The CRNRA (**Appendix 14.2**) subdivided the study area into corridors (**Plate 14.5**), reflecting the areas between project array areas:

- Corridor between Morgan and Mona Array Areas
- Corridor between Morgan Array Area and the existing Walney Offshore Windfarm
- Corridor between Mona and Morecambe Array Areas
- South Mona (i.e. between Mona Array Area and AyM Offshore Wind Farm)

- East Morecambe (i.e. east of Morecambe Array Area)

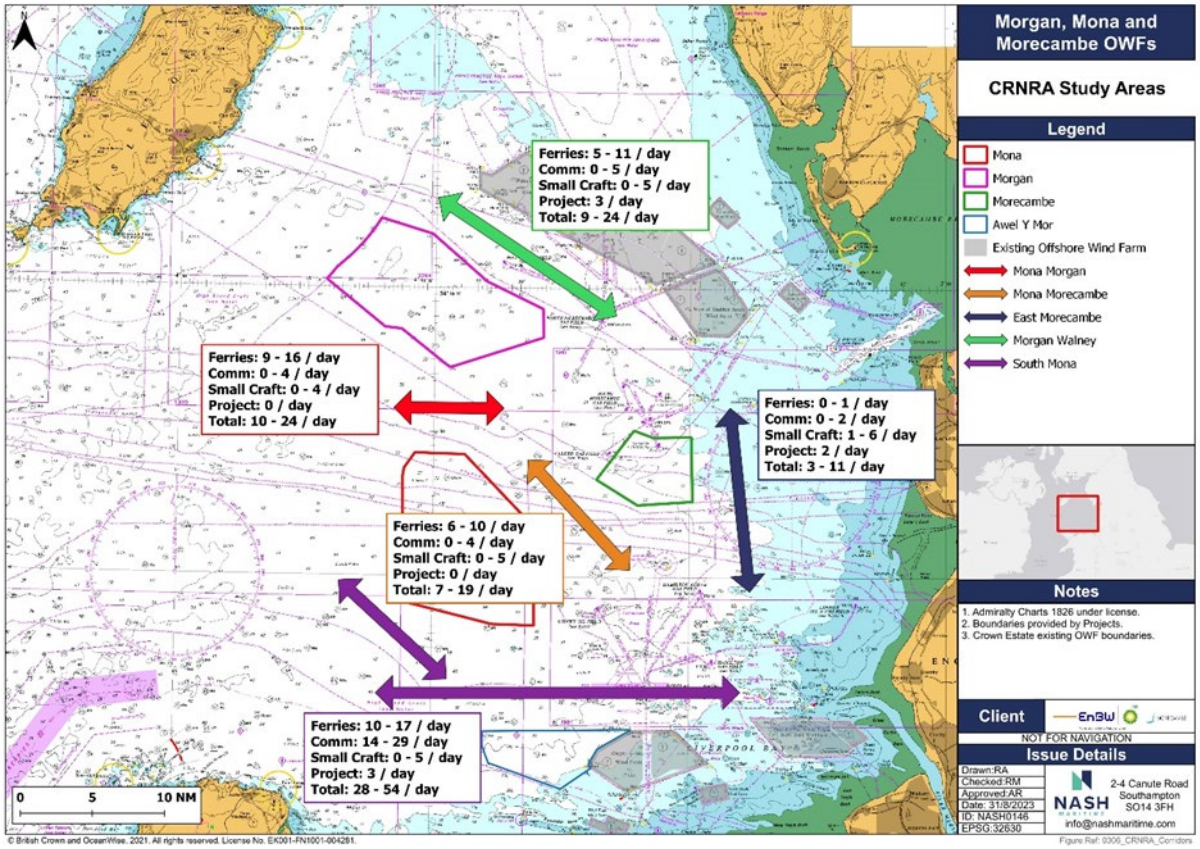

Plate 14.5 CRNRA corridors

14.410 Whilst the CRNRA determined that all corridors were safe to navigate in normal weather conditions in the absence of other traffic, by accounting for regular and foreseeable traffic conditions and adverse weather conditions, an increase in navigational risk was identified (**Appendix 14.2**, Section 7.8). This is described in relation to allision risk below.

Significance of effect

14.411 The modelling undertaken to inform the CRNRA suggests that the likelihood of allision could increase from 1 in 105 years to 1 in 72 years. With the future case foreseeable increase in traffic conditions of 15% this would increase again to 1 in 63 years. Whilst this increase is relatively large, this is principally due to approximately a 50% increase in the number of structures in the Irish Sea. Both ferries and cargo/tanker allision likelihoods increase by similar amounts.

14.412 The highest scoring hazards (medium risk) within the CRNRA relate to an allision by a ferry/passenger vessel within the Morgan-Walney and Mona-Morgan corridors, driven by the consequence should an allision occur (**Appendix 14.2**, Table 40). Allision would occur should a vessel experience failure of vessel steering, propulsion or positioning systems. Consequently, it

is considered that the likelihood of such failure would be low as ferries have high redundancy and reliability.

14.413 The third highest scoring allision hazard (medium risk) relates to allision of fishing vessels within any offshore windfarm site. Allision of fishing vessels within all corridors is considered to carry a medium risk. Smaller vessels such as tug, service, fishing and recreational vessels, typically operate in closer proximity to windfarms and are therefore more likely to make contact with WTGs than larger commercial vessels which typically maintain a suitable passing distance. However, should an allision occur the consequences to a vessel would be reduced as these vessels would generally be travelling at low speed, therefore, minor damage and/or minor injuries would be the most likely outcome. Analysis of historic incidents reveals that vessels most likely to come into contact with a WTGs are project vessels engaged in construction or maintenance activities as opposed to third-party vessels. Allisions involving recreational craft were scored as medium risk for Morgan-Walney, South Mona and East Morecambe corridors and low risk for all other corridors, as these corridors have a greater propensity for small craft as they are closer inshore than the other corridors.

14.414 Allision hazards for cargo/tankers were scored as low risk for all corridors with the exception of the South Mona corridor which scored medium risk due to the relatively high density of baseline traffic in this area.

14.415 Overall, the frequency of occurrence has been assessed as **unlikely** and the severity of consequence has been assessed as **moderate - serious** given the embedded mitigation. The effect has been assessed as **moderate adverse**.

Additional mitigation and residual effect

14.416 Consensus was reached with stakeholders at the hazard workshop that appropriate risk controls (**Appendix 14.2**, Table 46) were considered to be embedded in the design of the projects. Whilst additional risk control measures were discussed, it was agreed that these would be disproportionate to the reduction in risk they might achieve. Therefore, the CRNRA concluded where risks are scored as medium, they can be considered ALARP and therefore Tolerable (**Appendix 14.2**, Section 8.8). As such the residual effect has been assessed as **moderate adverse** (**but ALARP)**, and therefore are not significant in EIA terms.

Impact 4: Impact on risk of collision

14.417 As set out under Impact 3 above, the CRNRA (**Appendix 14.2**) subdivided the study area into corridors to assess collision risk. The Mona-Morgan, Morgan-Walney, and South Mona corridors were identified as those with greatest collision risk (**Appendix 14.2**, Table 40), due to the compressing of traffic within a corridor.

14.418 The amendments made by all three projects to their site boundaries since PEIR have increased the available searoom and the CRNRA determined that all corridors meet the minimum guidance requirements (MGN654 and PIANC WG161). For example, at 5.7nm in width, the Mona-Morecambe corridor meets guidance requirements and enables more than 1nm separation between passing vessels and the WTGs.

14.419 However, through the nature of compressing traffic within a corridor, an increase in collision risk in all corridors over the base case would still be expected. During adverse weather, with “seas” beam-on to transiting ferries when navigating the corridor, excessive and potentially dangerous vessel motions could be encountered, and may further compress traffic as they navigate adverse weather routes, such as to the south of Mona.

14.420 All hazard risk scores assessed in the CRNRA are set out in **Appendix 14.2**, Section 8.6.3.

Significance of effect

14.421 Of the top 10 hazards identified in the CRNRA (**Appendix 14.2,** Table 40), six were defined to be collision hazards and are presented in **Table 14.27**.

Table 14.27 Top 6 collision hazards

Area	Hazard title	Baseline risk	
		Score	Rating
Mona-Morgan	Collision -Ferry/Passenger ICW. Cargo/Tanker or Ferry/Passenger	9.2	Medium Risk - Tolerable (if ALARP)
South-Mona	Collision -Ferry/Passenger ICW. Cargo/Tanker or Ferry/Passenger	9.2	Medium Risk - Tolerable (if ALARP)
South-Mona	Collision - Cargo/Tanker ICW. Cargo/Tanker	8.9	Medium Risk - Tolerable (if ALARP)
Morgan-Walney	Collision -Ferry/Passenger or Cargo/Tanker ICW. Small Craft	8.8	Medium Risk - Tolerable (if ALARP)
South-Mona	Collision -Ferry/Passenger or Cargo/Tanker ICW. Small Craft	8.8	Medium Risk - Tolerable (if ALARP)
Mona-Morgan	Collision -Ferry/Passenger or Cargo/Tanker ICW. Small Craft	8.8	Medium Risk - Tolerable (if ALARP)

14.422 The two highest scoring collision hazards identified in **Table 14.27** involve a ferry/passenger vessel ICW a Cargo/Tanker vessel or Ferry/Passenger vessel. With the exception of a collision hazard between a cargo/tanker and another cargo/tanker in the South Mona corridor, all other collisions are between a ferry/passenger or cargo/tanker vessel with a small craft such as a fishing vessel, recreational craft or CTV.

14.423 Overall, the frequency of occurrence is deemed to be **unlikely**. Navigation simulations undertaken with the ferry operators concluded that there was sufficient searoom to take avoiding action. The severity of consequence is considered to be **moderate - serious**. The effect has therefore been assessed as **moderate adverse**.

Additional mitigation and residual effects

14.424 Consensus was reached with stakeholders at the hazard workshop that appropriate risk controls (**Appendix 14.2**, Table 46) were considered to be embedded in the design of the projects. Whilst additional risk control measures were discussed, it was agreed that these would be disproportionate to the reduction in risk they might achieve. Therefore, the CRNRA concluded where risks are scored as medium, they can be considered ALARP and therefore Tolerable (**Appendix 14.2**, Section 8.8). As such the residual effect has been assessed as **moderate adverse** (**but ALARP)**, and therefore are not significant in EIA terms. It is noted that none of the higher-ranking collision hazards relate to the corridors identified around the Project.

Impact 5: Impact on search and rescue

Significance of effect

14.425 Offshore windfarms can impact the effectiveness of SAR. Ensuring WTGs are arranged in straight lines, with multiple lines of orientation and WTG spacing can facilitate safe access. The principals of SAR access for OWFs are contained in MGN654, Annex 5.

14.426 A layout plan for each project that provides for continued SAR access would be agreed individually with the MMO in consultation with the MCA and TH prior to construction. Discussions with the MCA would include cumulative SAR considerations where applicable. Given the minimum WTG spacing proposed for the projects, it is considered that that vessel or helicopter access to the sites would not be compromised. The projects have also committed to providing two lines of orientation.

14.427 An increase in incident rates could arise as a result of the cumulative interaction of the projects, leading to an impact on emergency response resources. Analysis of historic incidents at other offshore windfarms identified 69 incidents between 2010 and 2019 (**Appendix 14.2**, Table 19). This includes six collisions, 29 allisions, 21 groundings and 13 near misses. Eighty-two percent of incidents involved project craft (such as CTVs or construction vessels).

14.428 The collision and allision assessments presented in the CRNRA indicate that, with the projects in place, the likelihood (or frequency of occurrence) of a collision or allision occurring is considered to be unlikely. Given the low level of incident rates in the study area and that the projects would be required to

comply with layout guidance (MGN654 and PIANC WG161), it is therefore considered unlikely that the projects would adversely affect SAR activities.

14.429 Further details on SAR are contained in the CRNRA (**Appendix 14.2**), in addition to the impacts on vessel emergency response.

14.430 Overall, the frequency of occurrence has been assessed as **unlikely** and the severity of consequence has been assessed as **minor** given embedded mitigation. The effect has been assessed as **minor adverse** and not significant in EIA terms.

Additional mitigation and residual effect

14.431 No additional mitigation above the embedded mitigation measures (**Section 14.3.3**) is proposed. The effect has been assessed as **minor adverse**, which is not significant in EIA terms.

Impact 6: Impact on snagging

14.432 Cabling within the Project, along with cabling for the Mona and Morgan projects and the Transmission Assets presents a potential cumulative snagging risk to vessel anchors or fishing gear. Whilst snagging risks are localised to individual projects, the assessment of cumulative effects considers a greater extent of subsea infrastructure across the Irish Sea arising from the projects.

14.433 Each project has built in control measures that would limit snagging risks, such as a CBRA and Cable Specification and Installation Plan with periodic validation surveys and the charting of subsea cables (such as those listed in **Table 14.3**).

Significance of effect

14.434 Overall, the frequency of occurrence has been assessed as **extremely unlikely** given the embedded mitigation measures. Were a vessel to snag a cable, the most likely outcome is loss of gear and minor damage to the cable. A worst credible outcome is the loss of the vessel, and potential fatalities, however, this is considered unlikely. As such, the severity of consequence has been assessed as **moderate**

14.435 The effect has been assessed as **minor adverse**, which is not significant in EIA terms.

Additional mitigation and residual effect

14.436 No additional mitigation above the embedded mitigation measures (**Section 14.3.3** and **Appendix 14.2**, Table 46) is proposed.

14.437 The residual effect has been assessed as **minor adverse**, which is not significant in EIA terms.

Impact 7: Impact on communications, radar and positioning

14.438 The effects of windfarms on radar systems are the same as that experienced when in close proximity to other vessels or structures. Experience in UK waters has shown that mariners have become increasingly aware of radar effects in proximity to windfarms and how to correctly interpret the readings as more offshore windfarms have become operational. Careful manual adjustment of radar controls by mariners can mitigate impacts to radars.

14.439 Impacts resulting from radar interference are primarily localised (project specific) and cumulative effects are limited. However, a vessel may encounter radar interference from multiple projects along a given route.

Significance of effect

14.440 MGN654 notes that impacts to marine radars from interference from windfarms within 0.5nm may be intolerable. Historical evidence suggests that most vessels pass more than 0.5 nm from an OWF and therefore these effects are lessened. Echoes develop at approximately 1.5nm and where a route passes within this proximity of a windfarm, interference may be experienced. MGN372 recommends a 2nm passing distance from an offshore windfarm.

14.441 Evidence presented in **Appendix 14.2** (Section 7.12.2) indicates that there is sufficient sea room between the Projects for radar effects to be avoided should vessels navigate the centre of the routes (**Appendix 14.2**, Figure 58). Analysis shows that vessels routinely pass within 1nm of offshore windfarms, particularly West of Duddon Sands, Gwynt y Môr and Burbo Bank. Therefore, any effects on radar are already encountered and should be well understood by bridge teams.

14.442 The REWS study (**Appendix 17.2**) considered cumulative effects due to the presence of the turbines, identifying, as per Project-alone there will would be small gaps in the detection map due to the elevated thresholds and shadowing effects from the wind turbines. However, these effects will be largely mitigated resolved by the built-in advanced tracking techniques within the REWS. Additionally, the integration of the available AIS data with the REWS coverage will provide an alternative source of vessel information and location within the zones where the REWS may lose detection. The assessment for cumulative effects, as per Project-alone also identified no increase in CPA or TCPA alarms and no negative impacts to microwave communication links.

14.443 The frequency of occurrence has been assessed as **frequent**, and the severity of consequence has been assessed as **negligible** given embedded mitigation. The effect has been assessed as **minor adverse**, which is not significant in EIA terms.

Additional mitigation and residual effect

14.444 No additional mitigation above the embedded mitigation measures (**Section 14.3.3**) is proposed. The effect has been assessed as **minor adverse**, which is not significant in EIA terms.

14.8.3.3 Mooir Vannin Offshore Wind Farm

14.445 The Mooir Vannin Offshore Wind Farm is proposed within an AfL area in the Isle of Man territorial waters, located 43.7km to the northwest of the Project. A Scoping Report for Mooir Vannin was submitted to the IoM Government in October 2023.

14.446 The potential cumulative effects of Mooir Vannin OWF with Mona Offshore Wind Project, Morgan Offshore Wind Project Generation Assets, Morecambe Offshore Windfarm Generation Assets and the Morgan and Morecambe OWFs Transmission Assets have been considered in an addendum to the CRNRA (**Appendix 14.2**, Appendix D). As the Mooir Vannin OWF Scoping Report was issued after the completion of many of the activities undertaken to inform the CRNRA, the assessment within the Addendum is primarily desk based, applying the high-level information contained within the Mooir Vannin OWF Scoping Report to identify any changes to the earlier findings of the CRNRA.

14.447 As described in the Mooir Vannin OWF Scoping Report, it is expected that a cumulative assessment (which will include an assessment of the Round 4 projects as Tier 1) will be prepared by Mooir Vannin Offshore Wind Limited on the basis of their proposed development parameters which will accompany their development application to the IoM Government.

14.448 At its closest point, the Mooir Vannin OWF Scoping Boundary (which is the same as the AfL area), considering navigational distances, is 2.5nm from the Morgan Array Area and would create a much narrower passage in this area than was assessed within the CRNRA.

14.449 The Mooir Vannin Scoping Boundary, in combination with the Round 4 projects would require deviations to regular commercial vessel routes in typical and adverse conditions.

14.450 The assessment concluded that with the addition of Mooir Vannin OWF, there were likely to be impacts on ferry routes in typical and adverse conditions and unacceptable risk to navigation safety between the Morgan Array Area, Walney OWFs and the Mooir Vannin OWF. Given the location of Mooir Vannin OWF, the Project is not considered to contribute to these impacts.

14.8.3.4 Summary

14.451 The Applicant has undertaken detailed and collaborative cumulative assessments covering the projects across the region. Given their locations it was concluded there is limited interaction between the Project and the AyM and Mooir Vannin OWFs.

14.452 The CRNRA concluded that cumulative effects greater than those identified for the Project-alone, are identified for the Project together with the Mona Offshore Wind Project, Morgan Offshore Wind Project Generation Assets and the Morgan and Morecambe Transmission Assets. Appropriate risk controls were considered to be embedded in the projects' design and whilst additional risk control options were identified, it was agreed at the hazard workshop in September 2023 that these were disproportionate to the reduction in risk they might achieve. Therefore, the CRNRA concluded that all moderate impacts can be considered ALARP and therefore Tolerable and not significant in EIA terms, and no further risk controls are warranted (**Table 14.32**).

14.453 Operational impacts as a result of ferry routeing were identified, particularly for adverse weather routes, however the contribution of the Project is small. Engagement with ferry operators on residual operational impacts is planned to continue as the Project progresses.

14.454 An addendum to the CRNRA was prepared to consider the additional cumulative risks that might result on vessel traffic following the release of the Mooir Vannin Scoping Report in October 2023. It was concluded that with the addition of Mooir Vannin OWF, there were likely to be impacts on ferry routes in typical and adverse conditions and unacceptable risks to navigation safety between the Morgan Array Area, Walney OWFs and the Mooir Vannin OWF. Given the location of Mooir Vannin OWF, the Project is not considered to contribute to these impacts.

14.9 Transboundary effects

14.455 Given the international nature of shipping and navigation, transboundary impacts are possible. These are assessed in terms of impacts to international shipping routes. Impacts to vessel routeing were assessed within the impact assessment (**Section 14.7** and **Section 14.8**), including impacts to established ferry routes between the UK and Ireland (summarised in **Table 14.17**).

14.10 Inter-relationships

14.456 There are clear inter-relationships between shipping and navigation and several other topics that have been considered within this ES. **Table 14.28** provides a summary of the principal inter-relationships and signposts to where those issues have been addressed in the relevant chapters.

Table 14.28 Shipping and navigation inter-relationships

Topic and description	Related chapter	Where addressed in this chapter	Rationale
Impacts on fishing vessels (displacement)	**Chapter 13 Commercial Fisheries**	Impacts to fishing vessels that may lead to displacement are discussed in Impact 6 Impact on snagging risk, as assessed in **Section 14.7.1.6, Section 14.7.2.6** and **Section 14.7.3.6**.	Safety implications to fishing vessels, including snagging and a reduction in available UKC is assessed within the NRA (**Appendix 14.1**) and **Section 14.7.1.6, Section 14.7.2.6** and **Section 14.7.3.6**. Impacts resulting from snagging and reduction in UKC may lead to displacement. The commercial implications of displacement of fishing vessels are assessed in **Chapter 13 Commercial Fisheries**.
Impacts on tug and service vessels	**Chapter 17 Infrastructure and Other Users**	Impacts tug and service vessels are assessed in **Section 14.7**.	Allision or collision risks to tugs and service vessels are assessed within the NRA (**Appendix 14.1**). Potential allision risks are assessed in **Sections 14.7.1.3, 14.7.2.3 and 14.7.3.3**. Potential collision risks are assessed in **Sections 14.7.1.4, 14.7.2.4 and 14.7.3.4**. Impacts associated with loss of access are addressed in **Chapter 17 Infrastructure and Other Users**.
Impacts on recreational vessels (displacement)	**Chapter 17 Infrastructure and Other Users** **Chapter 19 Human Health** **Chapter 20 Socio-economics,**	Impacts to recreational vessels that may lead to displacement are assessed in **Section 14.7**.	Displacement may impact access to recreational routes which may lead to impacts on health and tourism. Impacts to recreational vessel safety and displacement are assessed within this chapter. Impacts associated with loss of access are addressed in **Chapter 17 Infrastructure and**

Topic and description	Related chapter	Where addressed in this chapter	Rationale
	Tourism and Recreation		**Other Users**. Impacts associated with health and tourism are assessed in **Chapter 20 Socio-economics, Tourism and Recreation** and **Chapter 19 Human Health**.
Impacts on communications and SAR	**Chapter 16 Civil and Military Aviation and Radar** **Chapter 17 Infrastructure and Other Users**	Impacts to communications, radar and positioning systems are assessed in **Section 14.7.2.7**. Impacts to SAR are assessed in **Sections 14.7.1.5, 14.7.2.5, 14.7.3.5**.	Impacts associated with SAR access, including SAR helicopter access, are assessed within this chapter. Aviation impacts associated with low flying operations are assessed in **Chapter 16 Civil and Military Aviation and Radar**. Impacts associated with potential interference with REWS on nearby oil and gas platforms are assessed in **Chapter 16 Civil and Military Aviation and Radar** and **Chapter 17 Infrastructure and Other Users**.

14.11 Interactions

14.457 The impacts identified and assessed in this chapter have the potential to interact with each other. The areas of potential interaction between impacts are presented in **Table 14.29, Table 14.30** and **Table 14.31** for construction, operation and maintenance, and decommissioning phases respectively. This provides a screening tool for which impacts have the potential to interact. The impacts have been assessed relative to each development phase (i.e. construction, operation and maintenance or decommissioning) to see if, for example, multiple construction impacts affecting the same receptor could increase the level of impact upon that receptor.

14.458 The worst-case impacts assessed within the chapter take these potential interactions and effects across phases into account, and therefore the impact assessments are considered conservative and robust and the levels of significance identified in **Sections 14.7** and **14.8** are not increased in any phase or over the lifetime of the Project.

Table 14.29 Interaction between impacts – screening (construction phase)

	Potential interaction between impacts					
	Impact 1: Impact on ferry routeing	Impact 2: Impact on commercial vessel routeing	Impact 3: Impact on risk of allision	Impact 4: Impact on risk of collision	Impact 5: Impact on search and rescue	Impact 6: Impact on snagging
Impact 1: Impact on ferry routeing		Yes	Yes	Yes	No	No
Impact 2: Impact on commercial vessel routeing	Yes		Yes	Yes	No	No
Impact 3: Impact on risk of allision	Yes	Yes		Yes	Yes	No
Impact 4: Impact on risk of collision	Yes	Yes	Yes		Yes	No
Impact 5: Impact on search and rescue	No	No	Yes	Yes		No
Impact 6: Impact on snagging	No	No	No	No	No	

Table 14.30 Interaction between impacts – screening (operational phase)

	Potential interaction between impacts						
	Impact 1: Impact on ferry routeing	Impact 2: Impact on commercial vessel routeing	Impact 3: Impact on risk of allision	Impact 4: Impact on risk of collision	Impact 5: Impact on search and rescue	Impact 6: Impact on snagging	Impact 7: Impact on communications, radar and positioning
Impact 1: Impact on ferry routeing		Yes	Yes	Yes	No	No	No
Impact 2: Impact on commercial vessel routeing	Yes		Yes	Yes	No	No	No
Impact 3: Impact on risk of allision	Yes	Yes		Yes	Yes	No	Yes
Impact 4: Impact on risk of collision	Yes	Yes	Yes		Yes	No	Yes
Impact 5: Impact on search and rescue	No	No	Yes	Yes		No	Yes
Impact 6: Impact on snagging	No	No	No	No	No		No
Impact 7: Impact on communications, radar and positioning	No	No	Yes	Yes	Yes	No	

Table 14.31 Interaction between impacts – screening – decommissioning phase

	Potential interaction between impacts					
	Impact 1: Impact on ferry routeing	Impact 2: Impact on commercial vessel routeing	Impact 3: Impact on risk of allision	Impact 4: Impact on risk of collision	Impact 5: Impact on search and rescue	Impact 6: Impact on snagging
Impact 1: Impact on ferry routeing		Yes	Yes	Yes	No	No
Impact 2: Impact on commercial vessel routeing	Yes		Yes	Yes	No	No
Impact 3: Impact on risk of allision	Yes	Yes		Yes	Yes	No
Impact 4: Impact on risk of collision	Yes	Yes	Yes		Yes	No
Impact 5: Impact on search and rescue	No	No	Yes	Yes		No
Impact 6: Impact on snagging	No	No	No	No	No	

14.12 Potential monitoring requirements

14.459 Monitoring requirements for shipping and navigation are included as embedded measures (**Table 14.3**). These include:

- Construction vessel traffic monitoring
- Aids to navigation plan
- A swathe bathymetric survey to International Hydrographic Organisation (IHO) Order 1a
- Periodic monitoring of cable burial/protection

14.460 Monitoring requirements are described in detail within the draft In Principle Monitoring Plan (IPMP) (Document Reference 6.4), submitted alongside the DCO Application, and would be further developed and agreed with stakeholders, prior to construction, based on the IPMP and taking account of the final detailed design of the Project.

14.13 Assessment summary

14.461 This chapter has investigated the potential effects on shipping and navigation receptors. The range of potential impacts and associated effects considered have been informed by the Scoping Opinion, PEIR findings, consultation and the Project NRA and CRNRA (**Appendix 14.1** and **14.2**) with reference to existing policy and guidance. The impacts considered include those brought about directly, as well as indirectly.

14.462 There are no internationally recognised sea lanes including IMO routeing/reporting measures or recommended channels in the study area, the closest being the Liverpool TSS 12.4nm to the south. The Project windfarm site and study area are outside of any VTS or LPS areas. The nearest HMCG helicopter base is located at Caernarfon Airport, Gwynedd and is 47nm southwest of the windfarm site. No anchoring activity is evident within the windfarm site.

14.463 The study area overlaps with the South Morecambe gas field, North Morecambe gas field and the Calder gas field. These fields are supported by offshore infrastructure (platforms, pipelines, cables and wells) and onshore facilities for extracting, transporting and processing reserves. There are no oil and gas platforms within the windfarm site, however, service vessels associated with oil and gas infrastructure and existing offshore windfarms account for a large proportion of vessel movements within the study area.

14.464 Analysis of historical vessel traffic data in the study area identified that large vessels (<200m) passing through the windfarm site are predominantly ferries and service vessels. Commercial cargo and tanker routes are low frequency

at less than one vessel per day and predominately pass southwest/northeast and northwest/southeast through the windfarm site into Heysham/Barrow and the Port of Liverpool.

14.465 Ferry routes intersecting the study area are between Liverpool-Belfast/Dublin and Liverpool-Douglas, or between Heysham-Douglas and Heysham-Dublin/Warrenpoint. Cruise ship transits also occur, to a lesser extent, between Douglas and Liverpool.

14.466 Recreational vessel traffic is concentrated along the coast, particularly along the entrance to Liverpool, and around Holyhead, Douglas and Rhyl. Cruising routes exist between Liverpool and Isle of Man and Heysham and the Welsh coast.

14.467 Fishing activity is primarily by vessels using static gear from ports in Wales and Fleetwood, with little trawling activity. Some fishing vessels are engaged in guard vessel duties or other survey works and account for some of the concentrations around oil and gas installations.

14.468 Analysis of adverse weather routeing demonstrates that passenger vessels deviate from their usual routes to west of the study area.

14.469 Future-case (windfarm present) passage plans indicate that the Stena Line route between Liverpool-Belfast passing east of Isle of Man (east of Calder) is the only route affected by the Project adding an additional distance of 1.6nm on a 114nm passage (**Section 14.7.2.1**).

14.470 Although no increase in journey distance is recorded for the Liverpool to Douglas IoMSPC route or the Stena Liverpool to Belfast east of IoM (west of Calder) route, a small number of vessels on these routes do pass through the southwestern corner of the windfarm site which would be diverted south to the main passage plan.

14.471 During adverse weather, the assessment determined that typical ferry transits are unaffected by the Project. Only the infrequently used Stena Line route between Liverpool-Belfast passing east of Isle of Man (east of Calder) would be affected by the Project adding an additional distance of 1.5nm (an additional 5.2 minutes to the 8 hour baseline journey time) (**Section 14.7.2.1**).

14.472 An assessment of the impacts on small craft routeing determined that there is sufficient spacing between WTGs to facilitate safe navigation for fishing and recreational craft. There may be some effect of offsetting these vessels into adjacent channels where vessels choose not to do so.

14.473 An assessment on the likelihood of collision and allision for all vessels identified a limited increase. However, mitigation has been identified to reduce the risk to as low as reasonably possible.

14.474 Impacts to radar are inherent when navigating adjacent to offshore windfarms and it is likely that these effects would be experienced in the vicinity of the windfarm site. An assessment of the impacts of the Project on communications, radar and positioning systems determined that effects are minor.

14.475 Overall, the potential effects of the Project on navigation safety within the Irish Sea are assessed to be negligible to moderate adverse but ALARP and not significant in EIA terms.

14.476 A joint CRNRA was undertaken to assess the impacts of the Morecambe Offshore Windfarm Generation Assets (the Project), the Mona Offshore Wind Project and the Morgan Offshore Wind Project Generation Assets on shipping and navigation, together with other cumulative projects in the region. The initial CRNRA assessment (at the PEIR stage) identified significant cumulative effects on ferry routeing and vessel safety due to the creation of narrow corridors between the Array Areas. These high-risk impacts were largely driven by the corridors between Mona and Morgan Array Areas and between Morgan and Walney Array Areas.

14.477 Additional mitigations were suggested and adopted as embedded mitigation by all three projects to reduce adverse effects, including changes to the boundaries of all three projects and a commitment to maintenance of two lines of orientation within the windfarm layouts. The CRNRA has been updated to account for the changes made by the projects through additional data collection, navigation simulations and a further hazard workshop attended by representatives from ferry operators, regulators, commercial bodies, oil and gas operators, ports and fishing community. The Morgan and Morecambe Offshore Wind Farms Transmission Assets project was also included as a further project within the updated CRNRA.

14.478 The updated CRNRA has concluded that following the changes to the boundaries, all hazards have been reduced to either Medium Risk or Broadly Acceptable. Appropriate risk controls were considered to be embedded in the design and whilst additional risk control options were discussed, it was agreed with stakeholders that these were disproportionate to the reduction in risk they might achieve. Therefore, the CRNRA concluded where risks are scored as medium, they can be considered ALARP and therefore Tolerable. As such the residual cumulative effect has been assessed as moderate adverse (but ALARP) and not significant in EIA terms.

14.479 Cumulative effects on adverse weather ferry routeing were determined to be moderate adverse and significant. However, the contribution of the Project-alone is considered to be small, with only a minor contribution of effects to the infrequently used Stena Line Liverpool-Belfast route, with the remaining normal and adverse weather routes largely unaffected by the Project itself.

14.480 Due to the release of the scoping report for the Mooir Vannin OWF in October 2023, after the completion of many of the activities undertaken to inform the CRNRA, an addendum was prepared to consider the additional cumulative impacts that might result. This is reported in Appendix D of the CRNRA (**Appendix 14.2**) and identifies likely impacts on ferry routes in typical and adverse conditions. An unacceptable risk to navigation safety between the Morgan Array Area, Walney OWFs and the Mooir Vannin OWF was identified. However, given the location of Mooir Vannin, the Project is not considered to contribute to the cumulative effects with the Mooir Vannin OWF.

Table 14.32 Summary of potential effects on shipping and navigation

Potential impact	Receptor	Frequency of occurrence	Severity of consequence	Significance of effect	Additional mitigation measures proposed	Residual effect
Construction phase						
Impact 1: Impact on ferry routeing	Ferries	Frequent	Negligible	Not significant (Minor adverse)	None	Not significant (Minor adverse)
Impact 2: Impact on commercial vessel routeing	Commercial vessels	Frequent	Negligible	Not significant (Minor adverse)	None	Not significant (Minor adverse)
Impact 3: Impact on risk of allision	All vessel types	Remote - extremely unlikely	Negligible - serious	Not significant (Negligible - Moderate adverse)	None	Not significant (Negligible - Moderate adverse (but ALARP))
Impact 4: Impact on risk of collision	All vessel types	Remote - extremely unlikely	Moderate - serious	Not significant (Negligible - Moderate adverse)	None	Not significant (Negligible - Moderate adverse (but ALARP))
Impact 5: Impact on search and rescue	Search and rescue vessels	Remote - extremely unlikely	Minor	Not significant (Negligible adverse)	None	Not significant (Negligible adverse)
Impact 6: Impact on snagging	All vessel types	Extremely unlikely	Moderate	Not significant (Minor adverse)	N/A	Not significant (Minor adverse)

Potential impact	Receptor	Frequency of occurrence	Severity of consequence	Significance of effect	Additional mitigation measures proposed	Residual effect
Operation and maintenance phase						
Impact 1: Impact on ferry routeing	Ferries	Frequent	Negligible	Not significant (Minor adverse)	None	Not significant (Minor adverse)
Impact 2: Impact on commercial vessel routeing	Commercial vessels	Frequent	Negligible	Not significant (Minor adverse)	None	Not significant (Minor adverse)
Impact 3: Impact on risk of allision	All vessel types	Remote - extremely unlikely	Moderate - serious	Not significant (Negligible - Moderate adverse)	None	Not significant (Negligible - Moderate adverse but ALARP)
Impact 4: Impact on risk of collision	All vessel types	Remote - extremely unlikely	Moderate - serious	Not significant (Negligible - Moderate adverse)	None	Not significant (Negligible - Moderate adverse but ALARP)
Impact 5: Impact on search and rescue	Search and rescue vessels	Remote - Extremely unlikely	Minor	Not significant (Negligible adverse)	None	Not significant (Negligible adverse)
Impact 6: Impact on snagging	All vessel types	Extremely unlikely	Moderate	Not significant (Minor adverse)	N/A	Not significant (Minor adverse)
Impact 7: Impact on communications, radar and positioning	All vessel types	Frequent	Negligible	Not significant (Minor adverse)	None	Not significant (Minor adverse)

Potential impact	Receptor	Frequency of occurrence	Severity of consequence	Significance of effect	Additional mitigation measures proposed	Residual effect
Decommissioning phase						
Impact 1: Impact on ferry routeing	Ferries	Frequent	Negligible	Not significant (Minor adverse)	None	Not significant (Minor adverse)
Impact 2: Impact on commercial vessel routeing	Commercial vessels	Frequent	Negligible	Not significant (Minor adverse)	N/A	Not significant (Minor adverse)
Impact 3: Impact on risk of allision	All vessel types	Remote - extremely unlikely	Moderate - serious	Not significant (Negligible - moderate adverse)	N/A	Not significant (Negligible - moderate adverse but ALARP)
Impact 4: Impact on risk of collision	All vessel types	Remote - extremely unlikely	Moderate - serious	Not significant (Negligible - moderate adverse)	N/A	Not significant (Negligible - moderate adverse but ALARP)
Impact 5: Impact on search and rescue	Search and rescue vessels	Remote - extremely unlikely	Minor	Not significant (Negligible adverse)	N/A	Not significant (Negligible adverse)
Impact 6: Impact on snagging	All vessel types	Extremely unlikely	Moderate	Not significant (Minor adverse)	N/A	Not significant (Minor adverse)

Potential impact	Receptor	Frequency of occurrence	Severity of consequence	Significance of effect	Additional mitigation measures proposed	Residual effect
Cumulative assessment						
Impact 1: Impact on ferry routeing	Ferries	Frequent	Minor	**Significant** (Moderate adverse) Continued engagement as the Project progresses		
Impact 2: Impact on commercial vessel routeing	Commercial vessels	Frequent	Negligible	Not significant (Minor adverse)	N/A	Not significant (Minor adverse)
Impact 3: Impact on risk of allision	All vessel types	Unlikely	Moderate - serious	Not significant (Moderate adverse)	N/A	Not significant (Moderate adverse but ALARP)
Impact 4: Impact on risk of collision	All vessel types	Unlikely	Moderate-serious	Not Significant (Moderate adverse)	N/A	Not significant (Moderate adverse but ALARP)
Impact 5: Impact on search and rescue	Search and rescue vessels	Unlikely	Minor	Not significant (Minor adverse)	N/A	Not significant (Minor adverse)
Impact 6: Impact on snagging	All vessel types	Extremely unlikely	Moderate	Not significant (Minor adverse)	N/A	Not significant (Minor adverse)
Impact 7: Impact on communications, radar and positioning	All vessel types	Frequent	Negligible	Not significant (Minor adverse)	N/A	Not significant (Minor adverse)

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