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Morlais Project Environmental Statement

Chapter 15: Shipping and Navigation

Volume I

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MarineSpace
Making Sense of the Marine Environment™



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TABLE OF CONTENTS

TABLE OF FIGURES (VOLUME II)	II
TABLE OF APPENDICES (VOLUME III)	II
GLOSSARY OF ABBREVIATIONS	III
15. SHIPPING AND NAVIGATION	1
15.1. INTRODUCTION	1
15.2. POLICY, LEGISLATION AND GUIDANCE	1
15.3. CONSULTATION	3
15.4. METHODOLOGY	37
15.5. EXISTING ENVIRONMENT	44
15.6. IMPACT ASSESSMENT	51
15.7. SUMMARY	80
15.8. REFERENCES	108



TABLE OF TABLES

Table 15-1 NPS EN-3 Assessment Requirements Relevant to Shipping and Navigation	2
Table 15-2 Consultation Responses	4
Table 15-3 Project-Specific Marine Traffic Data Collection.....	38
Table 15-4 Frequency Criteria	40
Table 15-5 Consequence Categories and Criteria	40
Table 15-6 Risk Factor Matrix Used for Hazard Assessment	43
Table 15-7 RNLI Stations near to the MDZ	44
Table 15-8 Nearby Anchorages	44
Table 15-9 Vessel Categories.....	45
Table 15-10 Consultation Feedback in Relation to Poor Weather Routing.....	46
Table 15-11 Potential Impacts of the Project Phases on Shipping and Navigation.....	51
Table 15-12 NRA Assumptions.....	52
Table 15-13 Other Developments Considered in Cumulative Impact Assessment.....	79
Table 15-14 Assessed Scenario	79
Table 15-15 Cumulative Risk Assessment.....	80
Table 15-16 Summary of Potential Impacts on Shipping and Navigation Associated with the Development of the Project.....	86

TABLE OF FIGURES (VOLUME II)

Figure 15-1 Morlais NRA Vessel Transits - All Vessel Types (Summer 2017 and Winter 2019)
Figure 15-2 Morlais NRA Vessel Transit Density - All Vessels (26th August - 9th September 2017 and 5th April - 19th April 2019) RADAR and AIS.
Figure 15-3 Morlais NRA Density - All Vessels (1st October 2017 to 31 March 2018) AIS Only
Figure 15-4 Morlais NRA Commercial Vessel Tracks (Summer 2017 and Winter 2019)
Figure 15-5 Morlais NRA Passenger Vessel Transits (Winter 2017 and Summer 2019)
Figure 15-6 Morlais NRA Ferry Transits - 1st October 2017 to 31 March 2018
Figure 15-7 Morlais NRA Military Vessel Transits (Summer 2017 and Winter 2019)
Figure 15-8 Morlais NRA Other Vessel Transits (Summer 2017 and Winter 2019)
Figure 15-9 Morlais NRA Fishing Vessel Tracks (Summer 2017 and Winter 2019)
Figure 15-10 UK Fishing Intensity (kWh) from VMS data - 2016
Figure 15-11 Morlais NRA Recreational Vessel Transits (Summer 2017 and Winter 2019)
Figure 15-12 Morlais NRA Vessel transits by Length Over All (LOA) AIS Only (1st October 2017 to 31 March 2018)
Figure 15-13 Morlais NRA Marine Accident Investigation Branch (MAIB) Incidents 1997 to 2017
Figure 15-14 RNLI Callouts

TABLE OF APPENDICES (VOLUME III)

Appendix 15.1 Navigation Risk Assessment – Morlais Tidal Demonstration Zone

GLOSSARY OF ABBREVIATIONS

AIS	Automatic Identification System
ALARP	As Low as Reasonably Practicable
ASD	Admiralty Sailing Directions
ATBA	Area To Be Avoided
CA	RYA Coastal Atlas of Recreational Boating
CD	Chart Datum
CGOC	Coast Guard Operation Centre
CHA	Competent Harbour Authority
COLREGS	International Regulations for Preventing Collisions at Sea
CPMR	Coastal Processes Modelling Report (HR Wallingford)
DfT	Department for Transport
DP	Dynamic Positioning
ERCoP	Emergency Response Co-operation Plan
ES	Environmental Statement
FLO	Fisheries Liaison Officer
FSA	Formal Safety Assessment
GIS	Geographic Information System
HA	Harbour Authority
HMCG	Her Majesty's Coast Guard
HSC	High Speed Craft
HSE	Health & Safety Executive
HW	High Water
IALA ASM	International Association of Marine Aids to Navigation and Lighthouse Authorities
ICW	In Collision With
IMO	International Maritime Organisation
IMM	International Maritime Management
ISM	International Safety Management
kt	Knot (unit of speed equal to nautical mile per hour, approximately 1.15 mph)
kWh	Kilowatt-hour
LAT	Lowest Astronomical Tide
LOA	Length-Over All
LW	Low Water
m	Metre
MAIB	Maritime Accident Investigation Branch
Marico Marine	Marine and Risk Consultants Ltd
MCA	Maritime and Coastguard Agency
MDZ	Morlais Demonstration Zone
MGN	Marine Guidance Note

ML	Most Likely
MMO	Marine Management Organisation
MSI	Maritime Safety Information
MW	Megawatts
nm	Nautical Mile
NRA	Navigation Risk Assessment
NSMS	Navigational Safety Management System
NTM	Notice To Mariners
OREI	Offshore Renewable Energy Infrastructure
PA	Precautionary Area
PDE	Project Design Envelope
PEXA	Practise and Exercise Area
PHA	Preliminary Hazard Analysis
PPE	Personal Protective Equipment
RHIB	Rigid Hull Inflatable Boat
RNLI	Royal National Lifeboat Institution
RYA	Royal Yachting Association
SAR	Search and Rescue
SHA	Statutory Harbour Authority
SMS	Safety Management System
SOG	Speed Over Ground
SOLAS	Safety Of Life At Sea
SRR	Search and Rescue Region
SWAN	Simulating Waves Nearshore
TEC	Tidal Energy Converter
THLS	Trinity House Lighthouse Service
TSS	Traffic Separation Schemes
UKC	Under Keel Clearance
UXO	Unexploded Ordnance
VHF	Very High Frequency (radio communication)
VMS	Vessel Monitoring System
WC	Worst Credible

15. SHIPPING AND NAVIGATION

15.1. INTRODUCTION

1. Menter Môn Morlais Limited (Menter Môn) proposes the development of 240 MW of tidal generating capacity within the Morlais Demonstration Zone (MDZ). The development of the Morlais Project (the Project) will support the development of renewable energy technology objectives of the Anglesey and Gwynedd Joint Local Development Plan (JLDP), providing a consented tidal technology demonstration zone which supports installation, testing and commercial demonstrations of tidal energy devices. The Project will also provide opportunities for the local communities via direct employment and support of the local supply chain.
2. The Project will include permanent communal infrastructure for tidal technology developers which provides a shared route to a local grid connection via nine export cable tails, an onshore landfall substation, and an onshore electrical cable route to a grid connection via a grid connection substation.
3. This chapter of the Environmental Statement (ES) describes the current shipping and navigation activity in the vicinity of the MDZ. The impact of the potential interaction between the Project and vessel activity is assessed for the construction, operation and maintenance (including repowering) and decommissioning phases of the Project. Where appropriate, mitigation measures are proposed to ensure the identified effects are avoided, removed, or minimised, where possible. Potential cumulative impacts are also considered.
4. More details of the baseline data collected and the assessment undertaken are provided in **Appendix 15.1, Volume III**.
5. This chapter has links with **Chapter 2, Policy and Legislation, Chapter 14, Commercial Fisheries, Chapter 16, Marine Infrastructure and Other Users** and **Chapter 25, Socio-Economics, Tourism and Recreation**.
6. This chapter has been prepared by MarineSpace Ltd on behalf of Menter Môn.

15.2. POLICY, LEGISLATION AND GUIDANCE

7. The assessment within this chapter has been guided and informed by the following key relevant legislation, guidance and policy. Further detail on legislation and policy in relation to the wider Project is provided in **Chapter 2, Policy and Legislation**.

15.2.1. National Policy Statements

8. Although this Project is not seeking a Development Consent Order (DCO), its size (up to 240 MW) means it is representative of a Nationally Significant Infrastructure Project (NSIP). Guidance that is relevant to assessing impacts on shipping and navigation for NSIPs are set out within National Policy Statements (NPSs) which are the principal decision-making documents for NSIPs. Those relevant to shipping and navigation include:
 - NPS for Renewable Energy Infrastructure (EN-3), July 2011.

9. Details of specific policies within EN-3 used to inform this assessment are provided in **Table 15-1** below. The specific assessment requirements for shipping and navigation are detailed, together with an indication of the paragraph numbers of the chapter where each is addressed.

Table 15-1 NPS EN-3 Assessment Requirements Relevant to Shipping and Navigation

NPS Requirement	NPS Reference	ES Reference
“Site selection should have been made with a view to avoiding or minimising disruption or economic loss to the shipping and navigation industries”	NPS EN-3 Para 2.6.162	Chapter 3, Site Selection and Consideration of Alternatives and Appendix 15.1 (Volume III)
“Negative impacts on less strategically important shipping routes should be reduced to As Low as Reasonably Practicable (ALARP)”	NPS EN-3 Para 2.6.163	Impact assessment is provided in Section 15.6 and a Navigation Risk Assessment is provided in Appendix 15.1 (Volume III) .
“A detailed Search and Rescue (SAR) Response Assessment should be undertaken prior to the commencement of construction”	NPS EN-3 Para 2.6.164	See Sections 15.6.3 and 15.6.4 . The Project will adhere to the MCA Guidance on Offshore Renewable Energy Installation: Requirements, Advice and Guidance for Search and Rescue and Emergency Response.
“The scheme must be designed to minimise the effects on recreational craft: The extent and nature of any obstruction of or danger to navigation which is likely to be caused by the development will be considered”.	NPS EN-3 Para 2.6.166	Impact assessment is provided in Section 15.6 and a Navigation Risk Assessment is provided in Appendix 15.1 (Volume III) .

15.2.2. Marine Policy Statement

10. The Marine Policy Statement (MPS) adopted by all UK administrations in March 2011 provides the policy framework for the preparation of marine plans and establishes how decisions affecting the marine area should be made in order to enable sustainable development. The MPS sets out a vision of having ‘clean, healthy, safe, productive and biologically diverse oceans and seas’ by supporting the development of Marine Plans. It also sets out the framework for environmental, social and economic considerations that need to be considered in marine planning.

15.2.3. Wales National Marine Plan

11. By adopting the MPS, the Welsh Government committed to the requirement to introduce Marine Plans for Wales.
12. The Welsh Government is currently developing the first marine plan for Welsh inshore and offshore waters, the Welsh National Marine Plan (WNMP). The Plan is being developed in accordance with the Marine and Coastal Access Act (MCAA) 2009, the MPS and the Maritime Spatial Planning Directive, a draft version has been issued for consultation (discussed further in **Chapter 2, Policy and Legislation**).
13. Objective 10 of the WNMP, “to maintain and enhance the resilience of marine ecosystems and the benefits they provide in order to meet the needs of present and future generations”, is of relevance to this chapter as this covers policies and commitments on the wider ecosystem, as set out in the MPS including those to do with the Marine Strategy Framework Objective Directive

and the Water Framework Directive, as well as other environmental, social and economic considerations.

15.2.4. Relevant Guidance

14. The Environmental Impact Assessment (EIA) Regulations (see **Chapter 2, Policy and Legislation**) is the only legislation directly relevant to this assessment. However, there are a number of guidance documents available which provide further detail on the aspects of the shipping and navigation environment that should be assessed and how the assessment should be undertaken.
15. Guidance on the assessment requirement was primarily sought from the Maritime and Coastguard Agency (MCA) Marine Guidance Note (MGN) 543 (M+F) which replaces MGN 371. MGN 543 advises the correct methodology to evaluate navigation safety around Offshore Renewable Energy Installations (OREIs). The full list of guidance used is as follows:
 - MGN 543 Guidance on UK Navigational Practice, Safety and Emergency Response Issues;
 - MGN 372 Guidance to Mariners Operating in the Vicinity of UK OREIs;
 - MGN 166 Guidelines for Voyage Planning;
 - Maritime and Coastguard Agency (MCA)- Offshore Renewable Energy Installation: Requirements, Advice and Guidance for Search and Rescue and Emergency Response.
 - International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA AISM) 0-139 the Marking of Man-Made Offshore Structures;
 - International Maritime Organisation (IMO) Formal Safety Assessment. Revised Guidelines for Formal Safety Assessment (FSA) MSC-MEPC.2/Circ.12/Rev.2;
 - Royal Yachting Association (RYA) Position on Offshore Energy Developments;
 - Regulatory expectations on moorings for floating wind and marine devices – HSE and MCA 2017;
 - Cumulative Impact Assessment Guidelines issued by RenewableUK in June 2013; and
 - International Regulations for Preventing Collisions at Sea 1972 (as amended) (COLREGS).

15.3. CONSULTATION

16. Stakeholder consultation has been undertaken via the EIA scoping process undertaken in April 2018 as well as targeted consultation with local and national consultees, as part of the Preliminary Hazard Analysis (PHA) (Phase 1 - National) and the Navigational Risk Assessment (NRA) (Phase 2 – Local and National) and the NRA Addendum (local and national). The PHA, NRA and NRA Addendum consultations were undertaken in accordance with guidance set out in MGN 543.

17. **Table 15-2** presents a summary of the key issues raised in the 2018 Scoping Opinion and in the consultation carried out as part of the PHA, NRA and NRA Addendum, with reference to the ES sections relevant to the specific comment.

Table 15-2 Consultation Responses

Date/Document	Comment	Response
Planning Inspectorate		
Scoping Report 2018	"Vessel movements: The ES should detail the anticipated vessel movements during all phases of the Proposed Works. These should be presented on a worst-case basis."	Noted and assessed in Chapter 15, Shipping and Navigation, Sections 15.6.3, 15.6.4 and Appendix 15.1 (Volume III)
	"Search and rescue: The ES should also assess the implications of the Proposed Works on search and rescue operations."	Noted and assessed in Chapter 15, Shipping and Navigation, Section 15.6.3 and Appendix 15.1 (Volume III) . The Project will adhere to the MCA Guidance on Offshore Renewable Energy Installation: Requirements, Advice and Guidance for Search and Rescue and Emergency Response.
Trinity House Lighthouse Service		
Scoping Report 2018	Within section 9.4 Shipping, Navigation and Marine Infrastructure, I advise that the navigation risk assessment should be undertaken in accordance with MGN 543 (which supersedes MGN 371).	The NRA has been completed in accordance with MGN 543 as specified.
	The applicant should also note that separate risk assessments are likely to be required for each deployment of TEC/arrays, in due course, as this project progresses.	Noted.
NRW		
Scoping Report 2018	There is concern about the impact the proposed Array may have on the safety of navigation. In particular, the changes to vessel routing with the reduction in navigable depth, the constriction placed on recreational, commercial and fishing vessels operating in or transiting the area and accessing ports and harbours, and the resulting increase in the frequency of encounters. The Environmental Statement must provide details of the possible impact on navigational issues for both commercial and recreational craft, specifically: <ul style="list-style-type: none"> • Collision Risk, • Navigational Safety, • Visual intrusion and noise, • Risk Management and Emergency response, • Marking and lighting of site and information to mariners, 	Noted and assessed in Chapter 15, Shipping and Navigation and Appendix 15.1 (Volume III) .

Date/Document	Comment	Response
	<ul style="list-style-type: none"> • 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 	
Scoping Report 2018	The EIA must assess the safety of navigational channels and obstacles to navigation from Tidal Energy Converters (TEC's)/supporting infrastructure and support vessels. Avoiding any potential for collision during any stage of the project is of absolute importance.	Noted and assessed in Chapter 15, Shipping and Navigation, Sections 15.6.3, 15.6.4 and Appendix 15.1 (Volume III) .
Scoping Report 2018	A Navigational Risk Assessment (NRA) will need to be submitted in accordance with MGN 543 (and MGN 372) and the MCA Methodology for Assessing the Marine Navigation Safety & Emergency Response Risks of Offshore Renewable Energy Installations (OREI). This NRA should be accompanied by a detailed MGN 543 Checklist which can be downloaded from the MCA website. We note that the Scoping currently refers to MGN 371 which has been superseded by MGN 543.	The NRA has been completed in accordance with MGN 543 as specified. The MGN 543 checklist is included as an Annex to Appendix 15.1 (Volume III) . Please note, however, some of the listed requirements are to be covered at the device specific NRA stage given the lack of available information (such as a device specific layout) at this stage.
Scoping Report 2018	It should be noted that separate risk assessments are likely to be required for each deployment of TEC/arrays, in due course, as this project progresses.	Noted. Final mitigation plans will be agreed prior to the construction once the final details are known.
Scoping Report 2018	The shipping and navigation study should include radar and manual observations in addition to AIS data to ensure vessels of less than 300gt are captured and should be completed within 24 months prior to the Environmental Statement submission. Casualty information from the MAIB and RNLi would also be good data sources, in establishing the risk profile for the area. We note that the Scoping report currently states 'existing AIS and vessel data collected previously in the study area will be undertaken, utilising existing data sets where available'.	<p>See Chapter 15, Shipping and Navigation, Section 15.4.3.</p> <p>AIS data were collected over a two week period in the summer during 2017 and two week period in the winter during 2019 to better understand the traffic profile of vessels transiting the project area and any potential impacts the Project may have upon navigation.</p> <p>Six months of AIS data from between October 2017 and March 2018 were additionally sourced to account for any seasonal variances in ferry activity and usage of the poor weather routes.</p> <p>To overcome the limitations posed by utilisation of AIS alone and in line with MGN 543 requirements, winter and summer radar surveys were undertaken for representative summer and winter periods.</p> <p>On the advice of the MCA, an additional project-specific marine traffic survey (winter #2) was undertaken in April 2019. This was to remove the risk of the original</p>

Date/Document	Comment	Response
		winter #1 data being invalidated due it being collected greater than two years from the date of ES submission. Casualty information from the MAIB was obtained and is reviewed in Section 15.5.3.1 and Appendix 15.1 (Volume III) .
Scoping Report 2018	AIS data should not be used as an absolute measure of recreational traffic, as the substantial volume of yachts without AIS are not accounted for. The UK Coastal Atlas of Recreational Boating, available on licence from the RYA, or via the Marine Management Organisation's Marine Information System, provides relative AIS intensity data, general boating areas, and locations of clubs and training centres.	See Chapter 15, Shipping and Navigation, Section 15.4.3 Noted. Boating density within the Coastal Atlas is based on AIS data only and, therefore, includes primarily large racing yachts and does not reflect the activity of small, non-AIS carrying coastal recreational vessels that represent a considerable proportion of recreational traffic. The combination of AIS and radar collected for the NRA is therefore, considered to provide greater accuracy and therefore, the data provided within the Coastal Atlas was not deemed necessary.
Scoping Report 2018	The NRA should address safe Under Keel Clearance (UKC) for the maximum drafts of vessel both observed and anticipated, from which a realistic UKC assessment should be undertaken. The MCA's Under Keel Clearance Policy paper can be found on their website.	Under Keel Clearance is assessed in the Appendix 15.1 (Volume III) in accordance with MCA - Guidance to Developers in Assessing Minimum Water Depth over Tidal Devices (2014)
Scoping Report 2018	The marking of offshore wave and tidal energy installations should be based on recommendations of the IALA, and the offshore structures marking can be found on the IALA website.	All marking and lighting will be in accordance with International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA AISM) 0-139 the Marking of Man-Made Offshore Structures and will be determined through consultation with Trinity House.
Scoping Report 2018	Consideration will need to be given to the implications of the site size and location on SAR resources and Emergency Response Co-operation Plans (ERCOP) for both construction and operation phases. Any additional Search and Rescue requirements, as per MGN 543 Annex 5, will be discussed and agreed at the approval stage and recorded in a SAR checklist.	See Chapter 15, Shipping and Navigation, Sections 15.6.3 and 15.6.4 . The Project will adhere to the MCA Guidance on Offshore Renewable Energy Installation: Requirements, Advice and Guidance for Search and Rescue and Emergency Response.
Scoping Report 2018	Particular 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 is required e.g. rock bags, concrete mattresses, a 5 % reduction in surrounding depths referenced to Chart Datum is acceptable. This will be particularly relevant where depths are	Cable burial and changes to charted depth arising from tidal turbines and the burial depth of cabling, where applicable, should be surveyed and marked on navigational charts.

Date/Document	Comment	Response
	decreasing towards shore and potential impacts on navigable water increase.	
Scoping Report 2018	Cable Corridor 4 runs to the south of the major shipping route of the Holyhead to Dublin ferry route by 5 km. The ES will need to appropriately assess this in relation to maintaining safe navigation and provide reassurance that this can be undertaken with suitable protection and the absolute minimal level of disruption.	Please refer to Chapter 4, Project Description for details of the proposed cable route and landfall in Abraham's Bosom which succeed the Scoping Report. Final mitigation plans will be agreed prior to the construction once the final details are known. This will include a Communications and Liaison Plan, Aids to Navigation Plan, Emergency response Co-operation Plan and array specific Navigation Risk Assessment Plan which will be submitted prior to construction and device deployments.
Scoping Report 2018	All cable laying should be charted with the data freely available to marine users and suitable protection in the form of burial or rock placement must be implemented to prevent cable snag which through abrasion will damage the cable and potentially cause damage to the vessel or crew and potentially vessel obstruction.	Noted. Final mitigation plans will be agreed prior to the construction once the final details are known. This will include a Communications and Liaison Plan, Aids to Navigation Plan, Emergency Response Co-operation Plan and array specific Navigation Risk Assessment Plan which will be submitted prior to construction and device deployments.
Scoping Report 2018	The assessment in the ES should incorporate the effects of tidal arrays, associated infrastructure, and any proposed exclusion zones on recreational routes, general sailing areas, racing areas, and access to boating facilities and anchorages.	Noted and assessed in Chapter 15, Shipping and Navigation Section 15.6 and Appendix 15.1 (Volume III) .
Scoping Report 2018	MCA, UKHO, and GLAs guidance on charting, marking, and lighting of tidal infrastructure should be followed.	All marking and lighting will be in accordance with International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA AISM) 0-139 the Marking of Man-Made Offshore Structures and will be determined through consultation with Trinity House.
Scoping Report 2018	MGN 543 Annex 2 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 reports 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.	Noted.
Scoping Report 2018	Any application for safety zones will need to be carefully assessed and additionally supported by experience from the development and construction stages	Noted. Safety Zones are assessed in Chapter 15, Shipping and Navigation Section 15.6 . Safety Zones would be monitored and enforced through active monitoring arrangements such as guard vessels and control centre. Final mitigation plans will

Date/Document	Comment	Response
		be agreed prior to the construction once the final details are known.
MCA		
October 2018 (PHA)	Concerns on: 1. Size of the project area – a Safety Zone would result in a large area that will be unavailable for navigation;	Noted. Safety Zones are assessed in Chapter 15, Shipping and Navigation Section 15.6. Safety Zones would be monitored and enforced through active monitoring arrangements such as guard vessels and control centre. Final mitigation plans will be agreed prior to the construction once the final details are known.
	2. Cutting an established inshore navigation route;	The Project does not “cut” any established inshore navigation route although the NRA does consider the impact of narrowing the available sea space within the inshore route and pinch points. See Chapter 15, Shipping and Navigation Sections 15.6.3.6 and 15.6.4.6 and Appendix 15.1 (Volume III).
	3. Access through site;	Noted. Passage through the area is assessed in Chapter 15, Shipping and Navigation Section 15.6 and Appendix 15.1 (Volume III).
	4. Impacts on SAR activities; and	See Chapter 15, Shipping and Navigation, Sections 15.6.3, 15.6.4. The Project will adhere to the MCA Guidance on Offshore Renewable Energy Installation: Requirements, Advice and Guidance for Search and Rescue and Emergency Response.
	5. Need to collect site-specific radar data to inform EIA	See Chapter 15, Shipping and Navigation, Section 15.4.3 AIS data were collected over a two week period in the summer during 2017 and two week period in the winter during 2019 to better understand the traffic profile of vessels transiting the project area and any potential impacts the Project may have upon navigation. Six months of AIS data from between October 2017 and March 2018 were additionally sourced to account for any seasonal variances in ferry activity and usage of the poor weather routes. To overcome the limitations posed by utilisation of AIS alone and in line with MGN 543 requirements, winter and summer radar surveys were undertaken for representative summer and winter periods.

Date/Document	Comment	Response
Chamber of Shipping		
October 2018 (PHA)	Primary Concerns: 1. Proximity to the Dublin/ Holyhead ferry route and the impact it may have upon adverse weather routing.	Noted. The northern boundary of the Project has been designed to minimise impact to the ferry routes and adverse weather routes and ferry routes and adverse weather routing are assessed in Chapter 15, Shipping and Navigation Sections 15.6.3.3, 15.6.3.4, 15.6.4.1 and 15.6.4.2.
	2. Under Keel Clearances (UKC) particularly in the northern most zones.	Under Keel Clearance is assessed in the Appendix 15.1 (Volume III) in accordance with MCA - Guidance to Developers in Assessing Minimum Water Depth over Tidal Devices (2014).
	3. Site layout uncertainty (distribution of devices of varying depth).	Noted. Final mitigation plans will be agreed prior to the construction once the final details are known. This will include a Communications and Liaison Plan, Aids to Navigation Plan, Emergency Response Co-operation Plan and array specific Navigation Risk Assessment Plan which will be submitted prior to construction and device deployments.
	4. Potential for the adoption of a full site Exclusion Zone.	Noted. Final mitigation plans will be agreed prior to the construction once the final details are known. This will include a Communications and Liaison Plan, Aids to Navigation Plan, Emergency Response Co-operation Plan and array specific Navigation Risk Assessment Plan which will be submitted prior to construction and device deployments.
	5. Need for NRA to consider cruise ships in this region	Noted. Cruise Ships are assessed in Chapter 15, Shipping and Navigation Sections 15.6.3.2 and 15.6.4.1.
	6. Impact on local anchorages.	Local anchorages are assessed in Appendix 15.1 (Volume III).
	7. Noted that the eastern boundary is highly utilised and there needs to be adequate clearance for the inshore route. Pointed out that no-one will sail at the site boundary rather, sailing will occur at a safe distance from the eastern boundary, resulting in a very narrow navigable channel.	The NRA does consider the impact of narrowing the available sea space within the inshore passage and pinch points. See Chapter 15, Shipping and Navigation Sections 15.6.3.6 and 15.6.4.6 and Appendix 15.1 (Volume III).
	8. If cables are not to be buried then sufficient protection needs to be in place e.g. gabions.	Noted. The impacts of the export cables are assessed in Chapter 15, Shipping and Navigation Sections 15.6.3.9 and 15.6.4.9.
	9. Questioned whether the top zone could be re-located to the south of the current extent. Minimum 20m UKC should be maintained in Northern extent of the site.	Due to the availability of the tidal resource re-locating the northern most zone to the south of the Project has not been considered. However, the proposed site layout now outlines no devices with an

Date/Document	Comment	Response
		UKC of less than 20m will be deployed in the northern most zone.
	10. Concern that level of activity attributed to installation and major maintenance may be far greater than that of a normal offshore renewable project and hence may cause increased activity and safety zone necessity in the area.	Noted. Safety Zones are assessed in Chapter 15, Shipping and Navigation Section 15.6 . Safety Zones would be monitored and enforced through active monitoring arrangements such as guard vessels and control centre. Final mitigation plans will be agreed prior to the construction once the final details are known.
Trinity House		
October 2018 (PHA)	Marking and lighting will be fundamental to the project.	All marking and lighting will be in accordance with International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA AISM) 0-139 the Marking of Man-Made Offshore Structures and will be determined through consultation with Trinity House.
	As much of the area should be left open for navigation as possible.	Noted.
	Would not like to see a site wide Safety Zone. Commented that at Minesto, a 12m UKC was proposed which is unacceptable. A 20m minimum UKC has been agreed at Minesto.	Noted. Safety Zones are assessed in Chapter 15, Shipping and Navigation Section 15.6 . Under Keel Clearance is assessed in the Appendix 15.1 (Volume III) in accordance with MCA - Guidance to Developers in Assessing Minimum Water Depth over Tidal Devices (2014).
	Restricted areas could be put in place but as much of the area should remain open for navigation as possible.	Noted.
	Policed Safety Zones should only be in place during construction and maintenance.	Safety Zones would be monitored and enforced through active monitoring arrangements such as guard vessels and control centre. Final mitigation plans will be agreed prior to the construction once the final details are known.
	Considered that all devices should be charted, even seabed devices – either as individual devices or as whole areas.	Devices will be charted and marked in accordance with MCA guidelines and following review of the final design layout with the MCA, Trinity House and Chamber of Shipping.
	The operator is to ensure that the devices remain at the stated depths and in the state agreed.	Noted. It is anticipated that devices will be fitted with depth monitoring systems and be subject to periodic maintenance surveys.
	Buoyage should be monitored by the control centre (and guard vessel) and defects reported by the operators to TH.	All marking and lighting will be in accordance with International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA AISM) 0-139

Date/Document	Comment	Response
		the Marking of Man-Made Offshore Structures and will be determined through consultation with Trinity House. Buoyage will be maintained and defects reported.
Welsh Fishermen's Association		
November 2018 (NRA)	<p>Fishing vessel traffic on plot appears to be light. There is a plethora of under 10s that operate within the area.</p> <p>Abrahams Bosom should be more populated. Pot buoys – head ropes inshore within 10m contour.</p> <p>July is a very active month and therefore, there should be more traffic than demonstrated on the plot. There is very little traffic at the end of February / start of March.</p> <p>The MDZ is not very fishing friendly due to the tidal conditions, except for at slack water.</p> <p>If the project were to go ahead fishing in the area would be sterilised due to snagging and gear loss issues – may get some fishermen attempting to set pots as lobsters will hide within devices which will create a new habitat.</p> <p>Vessels will not be able to anchor in the zone if they run into difficulties.</p> <p>At maximum capacity, a fishing boat would not attempt to navigate through the zones, even if they were lit.</p> <p>There is a risk of loss of power and drifting in to the devices</p> <p>It appears that vessels will have to navigate around the outside of the Zone.</p> <p>Inshore passage is a manageable gap, however, the current makes it difficult to navigate.</p> <p>The inshore passage would not be navigable for a coaster.</p> <p>Normal passage planning would allow 1-2 miles offing from a steep-to danger.</p> <p>Collision risk will likely increase, however, WFA does not consider increase will be</p>	<p>Noted. There are limitations with AIS in that many fishing vessels under 10m are not equipped with AIS which is why radar surveys were also undertaken and this supplemented by fishing intensity data as recorded by the MMO using the Vessel Monitoring System (VMS).</p> <p>Fishing vessel activity and the impact of the Project on fishing vessels is discussed in Chapter 15, Shipping and Navigation Sections 15.5.3.1.1, 15.6.3.5 and 15.6.4.5.</p> <p>Noted.</p> <p>Fishing vessel activity and the impact of the Project on fishing vessels is discussed in Chapter 15, Shipping and Navigation Sections 15.5.3.1.1, 15.6.3.5 and 15.6.4.5.</p> <p>Noted.</p> <p>Noted.</p> <p>There will still be an inshore passage route available and the NRA does consider the impact of narrowing the available sea space and pinch points particularly for recreational and smaller fishing vessels.</p> <p>See Chapter 15, Shipping and Navigation Sections 15.6.3, 15.6.4 and Appendix 15.1 (Volume III).</p> <p>The NRA does consider the impact of narrowing the available sea space and pinch points.</p> <p>See Chapter 15, Shipping and Navigation Sections 15.6.3, 15.6.4 and Appendix 15.1 (Volume III).</p> <p>Collision and allision for fishing vessels are assessed in Chapter 15, Shipping</p>

Date/Document	Comment	Response
	appreciable. However, may be of concern for yachts/ powerboats in summer.	and Navigation Sections 15.6.3, 15.6.4 and Appendix 15.1 (Volume III).
	Required UKC should allow for worst case wave height and vessel draught. 8m minimum UKC required for fishing vessels to navigate over devices.	An UKC of 8m has been used for fishing vessel impact assessment. Under Keel Clearance is assessed in the Appendix 15.1 (Volume III) in accordance with MCA - Guidance to Developers in Assessing Minimum Water Depth over Tidal Devices (2014).
	The separation between / spread of devices will be of highest concern.	Noted. Final mitigation plans will be agreed prior to the construction once the final details are known. This will include a Communications and Liaison Plan, Aids to Navigation Plan, Emergency Response Co-operation Plan and array specific Navigation Risk Assessment Plan which will be submitted prior to construction and device deployments.
	To navigate through windfarms a skipper requires parallel index lines on the radar to navigate safely through the devices. This would be more difficult with tidal devices.	Noted. Final mitigation plans will be agreed prior to the construction once the final details are known. This will include a Communications and Liaison Plan, Aids to Navigation Plan, Emergency Response Co-operation Plan and array specific Navigation Risk Assessment Plan which will be submitted prior to construction and device deployments.
	Cardinal mark the whole zone.	All marking and lighting will be in accordance with International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA AISM) 0-139 the Marking of Man-Made Offshore Structures and will be determined through consultation with Trinity House.
	One of the rights of navigation is that you should be able to run to a safe haven if you get caught. Holyhead is the only close safe-haven. If this option were to be lost, then vessels would be very stuck.	Noted. Final mitigation plans will be agreed prior to the construction once the final details are known. This will include a Communications and Liaison Plan, Aids to Navigation Plan, Emergency Response Co-operation Plan and array specific Navigation Risk Assessment Plan which will be submitted prior to construction and device deployments.
Harbour Master		
November 2018 (NRA)	Confirmed that the traffic plots were similar to what he would have anticipated other than the fishing vessel activity shown in the inshore area was less than he would have expected.	Noted. There are limitations with AIS in that many fishing vessels under 10m are not equipped with AIS which is why radar surveys were also undertaken and this supplemented by fishing intensity data as recorded by the MMO using the Vessel Monitoring System (VMS).

Date/Document	Comment	Response
	<p>Considered that the width of the inshore passage between Holy Island and the zone is too narrow for small vessel navigation except during clement weather conditions.</p>	<p>The NRA does consider the impact of narrowing of the inshore route, the available sea space and pinch points for recreational vessels.</p> <p>See Chapter 15, Shipping and Navigation Sections 15.6.3.6 and 15.6.4.6 and Appendix 15.1 (Volume III).</p>
	<p>Suggested an additional hazard to be considered of a vessel losing power and then being swept/blown down on to the devices.</p>	<p>This has been considered and would result in allision of a vessel with a tidal device which is considered in the Hazard Risk Assessment in the NRA and the impacts to all vessel types. See Chapter 15, Shipping and Navigation Sections 15.6.3 and 15.6.4 and Appendix 15.1 (Volume III).</p>
	<p>Considered that the current Stena and Irish Ferries vessels require approximately 20m to safely navigate at all states of tide and in all weather conditions.</p>	<p>The proposed site layout now outlines no devices with an UKC of less than 20m will be deployed in the northern most zone.</p>
<p>Local Recreation and RYA</p>		
<p>November 2018 (NRA)</p>	<p>Recreational traffic under-represented within plot. Last weekend of July to bank holiday weekend of August represents busiest period.</p>	<p>Noted. There are limitations with AIS in that many vessels under 10m are not equipped with AIS which is why radar surveys were also undertaken.</p> <p>Vessel traffic surveys have been conducted in accordance with MCA guidelines. See Appendix 15.1 (Volume III).</p> <p>It is acknowledged that the vessel traffic data may not show peak periods of activity but it is still felt to be representative and suitable for impact assessment.</p>
	<p>The inshore passage is widely used by recreational vessels, particularly areas around Abrahams Bosom, South Stack and North Stack.</p>	<p>Noted.</p>
	<p>There are many kayakers active in the area that follow the coastline around Holyhead and utilise the inshore passage.</p>	<p>Noted.</p>
	<p>Holyhead Sailing Club participates in racing around Anglesey. They race out of Holyhead harbour and will cross the northern portion of the site.</p>	<p>Noted.</p>
	<p>TBSC races around the stacks and can travel around 1 km off the South Stack when racing to and from Holyhead.</p>	<p>Noted.</p>
	<p>The proposed zone has the potential to have a long-term impact on the recreational use around the island.</p>	<p>The impacts on recreational users is assessed in Chapter 15, Shipping and Navigation Sections 15.6.3.6 15.6.4.6 and Appendix 15.1 (Volume III).</p>

Date/Document	Comment	Response
	<p>The primary concern is the restriction of the inshore passage which is essential to recreational vessels.</p>	<p>The NRA does consider the impact of narrowing of the inshore route, the available sea space and pinch points for recreational vessels.</p> <p>See Chapter 15, Shipping and Navigation Sections 15.6.3.6 and 15.6.4.6 and Appendix 15.1 (Volume III).</p>
	<p>Concerned about the visual impact surface devices may have on tourism.</p>	<p>Visual impacts discussed in Chapter 24, Seascape, Landscape and Visual Impact Assessment.</p>
	<p>If vessels transit too close to the shore, then there is a risk of wash deflecting off of the shore which is hazardous to small vessels.</p> <p>At least a 2-mile offing would be required to clear the over-falls.</p> <p>It is considered that there is an increased risk of collision due to navigating within a reduced area.</p> <p>Questioned whether the increase in survey vessels will increase traffic density in the inshore passage</p>	<p>With regard to wash deflecting off a shore this was noted as a concern but not felt to be changed by the addition of the MDZ and the devices within it. The sea area already has a challenging wave climate in which the danger of swamping and reflected wave energy is already a consideration to the prudent mariner. The addition of tidal devices is not felt likely to make this any worse. This is reflected in the scoring of the NRA.</p> <p>The NRA does consider the impact of narrowing of the inshore route, the available sea space and pinch points for recreational vessels.</p> <p>See Chapter 15, Shipping and Navigation Sections 15.6.3.6 and 15.6.4.6 and Appendix 15.1 (Volume III).</p>
	<p>Large racing yachts have a draught of <2.5m. Therefore, in good weather if devices are >3m below CD then most would be able to transit above them.</p> <p>In poor weather safe UKC will increase to allow for wave heights. In this case a minimum of 6-7m is recommended.</p>	<p>Under Keel Clearance is assessed in the Appendix 15.1 (Volume III) in accordance with MCA - Guidance to Developers in Assessing Minimum Water Depth over Tidal Devices (2014).</p>
	<p>Holyhead is the only nearby safe-haven for running for shelter. Caernarvon is not accessible during poor weather.</p>	<p>Noted.</p>
	<p>Surface mounted devices would represent a considerable hazard to a yacht making for Holyhead in a gale and it is, therefore, the preference of TBSC, not to have surface mounted devices within the project.</p> <p>Recreational vessels would be taking a severe risk attempting to transit through the site at night should it be populated with surface and near surface devices.</p>	<p>The impacts on recreational users is assessed in Chapter 15, Shipping and Navigation Sections 15.6.3.6 15.6.4.6 and Appendix 15.1 (Volume III).</p>
	<p>If the devices are under water with a sufficient UKC preference would be that there is no buoy at the surface to maintain navigation. Anything at the surface with the potential to break free should be avoided.</p>	<p>Under Keel Clearance is assessed in the Appendix 15.1 (Volume III) in accordance with MCA - Guidance to Developers in Assessing Minimum Water Depth over Tidal Devices (2014).</p>

Date/Document	Comment	Response
	It was commented that buoys are hazardous in themselves and are difficult to maintain.	All marking and lighting will be in accordance with International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA AISM) 0-139 the Marking of Man-Made Offshore Structures and will be determined through consultation with Trinity House.
	Swept depth should be given on chart.	Noted. Changes to charted depth arising from tidal turbines and the burial depth of cabling should be surveyed and marked on navigational charts. Devices will be monitored during operations.
RNLI		
November 2018 (NRA)	AIS/Radar plots showed less fishing activity in the area than they would have expected though the other plots appeared representative.	Noted. There are limitations with AIS in that many fishing vessels under 10m are not equipped with AIS which is why radar surveys were also undertaken and this supplemented by fishing intensity data as recorded by the MMO using the Vessel Monitoring System (VMS). Fishing vessel activity and the impact of the Project on fishing vessels is discussed in Chapter 15, Shipping and Navigation Sections 15.5.3.1.1, 15.6.3.5 and 15.6.4.5.
	Whelkers attempt to fish in the deep -water area however the tidal race makes it difficult except at neap tides.	Noted.
	SS Waverley comes close to shore when it visits.	Noted. Cruise Ships are assessed in Chapter 15, Shipping and Navigation Sections 15.6.3.2 and 15.6.4.1.
	If blowing hard from the north, some of the larger vessels shelter at Caernarvon Bay/ behind Anglesey.	Noted.
	Stated that if he were making a passage through inshore passage, he does not believe that there would be sufficient spacing between the devices and the cliffs to navigate safely except in benign conditions. 3-4 cables off South Stack should normally be required with windage around the stack as, if engine was to fail during a westerly, then the vessel would be too close to shore. Fishing vessels would struggle in an inshore passage of this size.	The NRA does consider the impact of narrowing of the inshore route, the available sea space and pinch points for recreational vessels. See Chapter 15, Shipping and Navigation Sections 15.6.3.6 and 15.6.4.6 and Appendix 15.1 (Volume III).
	RNLI considers 6-8m under keel clearance is necessary for small vessels (<2.5m draught) to navigate safely over submerged devices in all states of tide and weather conditions.	

Date/Document	Comment	Response
	<p>Vessels from south – west Ireland will definitely transit through the zone when running for shelter. Vessels will no longer be able to do this if the area is fully populated with surface devices and instead will have to go around the site. In which case it should be properly marked.</p> <p>South Stack is the beacon used as a waypoint for vessels coming in (vessels from Ireland etc).</p>	<p>Traffic surveys did not indicate significant transits through the development site but collision and allision for all vessel types is assessed in Chapter 15, Shipping and Navigation Sections 15.6.3 and 15.6.4 and Appendix 15.1 (Volume III).</p> <p>All marking and lighting will be in accordance with International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA AISM) 0-139 the Marking of Man-Made Offshore Structures and will be determined through consultation with Trinity House.</p>
	<p>RNLI questioned what the spacing of the devices will be. RNLI believe having them close may be a good thing as they will be clearly visible and vessels are not left wondering where the other devices are and it will encourage vessels to go around the entire site rather than attempting to get through.</p>	<p>Noted. Final design and layout is yet to be finalised. This will include a Communications and Liaison Plan, Aids to Navigation Plan, Emergency Response Co-operation Plan and array specific Navigation Risk Assessment Plan which will be submitted prior to construction and device deployments.</p>
	<p>Radar reflectors / RACONS on all four corners.</p> <p>Consider AIS on all four corners.</p>	<p>All marking and lighting will be in accordance with International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA AISM) 0-139 the Marking of Man-Made Offshore Structures and will be determined through consultation with Trinity House.</p> <p>In consultation with Trinity House they advised “It is Trinity House’s preference that devices and buoys not be marked with AIS as the over proliferation of AIS can cause confusion on ships’ radar and ECDIS displays.”</p>
	<p>The RNLI has already responded to an incident involving a recreational vessel colliding with a Minesto Buoy. The radar reflector on the buoy was lost and the mast of the yacht broke.</p> <p>Vessels commonly break-down to the south of the proposed zone close to Careg Hen and drift northwards into the proposed project zone.</p> <p>Searches have been undertaken within the project area. For example, a multivessel search line approach was undertaken for a missing fisherman within the area.</p>	<p>Noted.</p>
Stena Line		
<p>November 2018 (NRA)</p>	<p>The presence of surface devices at the northern boundary may impact ferry operations.</p>	<p>Noted. Ferry Routes and adverse weather routing are assessed in Chapter 15, Shipping and Navigation Sections 15.6.3.3, 15.6.3.4, 15.6.4.1 and 15.6.4.2.</p>

Date/Document	Comment	Response
	<p>Device breakout and stated device depth not being maintained would be of concern.</p>	<p>Noted. Changes to charted depth arising from tidal turbines and the burial depth of cabling should be surveyed and marked on navigational charts. Devices will be monitored during operations.</p>
	<p>Visibility of surface devices due to low height above water surface is a concern. Mark project zone on charts and ensure ECDIS is up to date. Ensure surface devices are clearly visible – however, if the zone is densely populated with surface devices which are all lit, run the risk of the whole zone being lit.</p>	<p>All marking and lighting will be in accordance with International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA AISM) 0-139 the Marking of Man-Made Offshore Structures and will be determined through consultation with Trinity House.</p>
	<p>Consider devices >15m below CD in the northern most sub-zones</p>	<p>The final design layout is yet to be determined but suitable mitigations measures will be implemented. Under Keel Clearance is assessed in the Appendix 15.1 (Volume III) in accordance with MCA - Guidance to Developers in Assessing Minimum Water Depth over Tidal Devices (2014).</p>
Irish Ferries		
<p>November 2018 (NRA)</p>	<p>The northern most two sub-zones and the top of the western sub-zone would clip the SW poor weather route. Normal weather route would be restricted. Adequate space must be left to allow Irish Ferries and Stena to cross.</p>	<p>Noted. Ferry Routes and adverse weather routing are assessed in Chapter 15, Shipping and Navigation Sections 15.6.3.3, 15.6.3.4, 15.6.4.1 and 15.6.4.2.</p>
	<p>The route south to the “waiting area” passes directly through the MDZs. An adequate UKC to allow continued navigation would be 2 x draughts below the keel (total 3 draughts). This would result in a 20m minimum clearance as with Minesto. Devices with >20m clearance only in northern most zones.</p>	<p>Suitable UKC for Ferries has been set at 20m for the purpose of Impact Assessment. Under Keel Clearance is assessed in the Appendix 15.1 (Volume III) in accordance with MCA - Guidance to Developers in Assessing Minimum Water Depth over Tidal Devices (2014).</p>
	<p>Consideration should be given to virtual buoys – they do not require a physical object to be present within the water, however, are detectable by vessel’s AIS. If surface devices were to be deployed then the northern most zone boundary should be clearly marked.</p>	<p>All marking and lighting will be in accordance with International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA AISM) 0-139 the Marking of Man-Made Offshore Structures and will be determined through consultation with Trinity House. In consultation with Trinity House they advised “It is Trinity House’s preference that devices and buoys not be marked with AIS as the over proliferation of AIS can cause confusion on ships’ radar and ECDIS displays.”</p>
	<p>Ensure that for all seabed devices that all supporting equipment (e.g.: cables and hubs) are on the seabed to maintain navigability.</p>	<p>Noted. All devices will be surveyed and monitored to ensure they maintain their specified depth.</p>

Date/Document	Comment	Response
	Also that they believe that the impact of the project to ferries will be less than to other vessel types such as recreational vessels.	Changes to charted depth arising from tidal turbines and the burial depth of cabling should be surveyed and marked on navigational charts. Devices will be monitored during operations.
	The presence of the Morlais Project will prevent vessels approaching the ferry route from the south.	Noted.
	Noted that in terms of diversions - a Traffic Separation Scheme (TSS) may be implemented in a day and would likely cause much greater diversions than those that would result from the Morlais Project.	Noted.
RYA		
December 2018 (NRA)	<p>Considered the inshore route to be too narrow and that navigation in the inshore route will be restricted.</p> <p>Small recreational vessels rely on this route and there is a risk of these vessels being forced into the over-falls.</p> <p>During fine weather and in the daytime this route may be navigable, however, it would be difficult /unsafe to navigate in poor weather and at night.</p>	<p>The NRA does consider the impact of narrowing of the inshore route, the available sea space and pinch points for recreational vessels.</p> <p>See Chapter 15, Shipping and Navigation Sections 15.6.3.6 and 15.6.4.6 and Appendix 15.1 (Volume III).</p>
	Deploying a mixture of device types will be a concern as this would cause confusion. In this case at full capacity it would likely have to be an Area To Be Avoided (ATBA) forcing vessels to take the inshore or offshore route.	Noted. Final mitigation plans will be agreed prior to the construction once the final details are known.
	<p>90 % of recreational vessels have a draught of 3m or less.</p> <p>A recreational vessel should not go through a swell greater than 3m. At all states of weather / tide 8m (from CD) of UKC would be required as a minimum to maintain navigation.</p> <p>Recommends that the MCA UKC methodology is utilised for the assessment of UKC.</p>	<p>Suitable UKC for Recreational users has generally been set at 8m for the purpose of Impact Assessment.</p> <p>Under Keel Clearance is assessed in the Appendix 15.1 (Volume III) in accordance with MCA - Guidance to Developers in Assessing Minimum Water Depth over Tidal Devices (2014).</p>
	<p>Devices to be appropriately marked and lit - Trinity House to advise on this.</p> <p>Zone boundary to be marked on navigation charts and lit.</p> <p>Sub-surface devices not to be marked with buoys to maintain navigation.</p>	All marking and lighting will be in accordance with International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA AISM) 0-139 the Marking of Man-Made Offshore Structures and will be determined through consultation with Trinity House.
	Locate surface devices / devices <8m below CD away from the eastern boundary.	Noted. This has been proposed as an additional mitigation measure. Final mitigation plans will be agreed prior to the construction once the final details are known.

Date/Document	Comment	Response
	Relocate the eastern boundary to allow 4 cables of space for the inshore passage/ to accommodate the spread of the existing tracks.	Noted. This could be an additional mitigation measure. Final mitigation plans will be agreed prior to the construction once the final details are known.
	Explained that the RYA holds recreational vessel density data.	Noted. Similarly to the data held within the coastal atlas, this density data is based on AIS data and as such provides a less accurate picture than the combined radar and AIS data utilised within the assessment as a large proportion of recreational users do not carry AIS. The combination of summer and winter RADAR surveys and AIS data utilised within the NRA meets the requirements of MGN 543 and as such the use of RYA density data was not deemed necessary.
	Pointed out that wind farms are more visible and require around 1 km spacing between turbines.	Noted.
Chamber of Shipping		
December 2018 (NRA)	<p>Commented that the two weeks' summer and two weeks' winter ferry data did not cover any period when the ferries were using their "Foul Weather Route" in SW gales.</p> <p>Additionally commented that March/April did not reflect what was understood to be winter.</p> <p>The standard ferry tracks overlap the northern two E/W zones;</p> <p>The "Foul Weather Route" passes through the northern two E/W zones plus through the northern half of the N/S zone;</p> <p>Commented that the northern E/W was more of a hazard to inbound (east going) ferries as, if having to alter course to starboard IAW the ColReg, it will force them close or into the northern E/W zone.</p>	<p>The data acquired is in accordance with the requirements MGN 543 but a further six-months of winter AIS data has also been included for analysis within the NRA.</p> <p>Noted. Ferry Routes and adverse weather routing are assessed in Chapter 15, Shipping and Navigation Sections 15.6.3.3, 15.6.3.4, 15.6.4.1 and 15.6.4.2.</p> <p>The proposed site layout now outlines no devices with an UKC of less than 20m will be deployed in the northern most zone.</p>
	Requested that a mitigation measure of only devices below 20m CD are deployed in the northern two E/W zones and the northern half of the N/S zone be considered.	UKC of 20m has been considered for Ferries and additional mitigation measures of excluding devices to deployed less than 20m below CD have been considered.
	Considered that Cruise ship routing was discretionary and could navigate to the west of the zones. The draught of larger cruise ships can be greater than for ferries.	Noted. Cruise Ships are assessed in Chapter 15, Shipping and Navigation Sections 15.6.3.2 and 15.6.4.1.
	Surprised about how few fishing vessels were contained in the radar/AIS data and expected to see more inshore activity.	Noted. There are limitations with AIS in that many fishing vessels under 10m are not equipped with AIS which is why radar surveys were also undertaken and this supplemented by fishing intensity data as

Date/Document	Comment	Response
		recorded by the MMO using the Vessel Monitoring System (VMS). Fishing vessel activity and the impact of the Project on fishing vessels is discussed in Chapter 15, Shipping and Navigation Sections 15.5.3.1.1, 15.6.3.5 and 15.6.4.5.
	Considered that inshore route is not practical for coastal shipping and they would navigate to the West of the MDZs. Commented that the inshore route appeared to be narrow for recreational and fishing vessels which may cause them to deviate onto other routes should surface devices be used. Should submerged devices be used, small vessels could safely navigate over.	The NRA does consider the impact of narrowing of the inshore route, the available sea space and pinch points for recreational and fishing vessels. See Chapter 15, Shipping and Navigation Sections 15.6.3.1, 15.6.4 and Appendix 15.1 (Volume III).
	Understood the need for the Rochdale approach but would prefer to have more detail on the device deployment plan.	Device deployment plans are not known at this stage but will be provided as they are finalised.
	Considered that the proposed Morlais site would increase Navigation Risk of: Collision – squeezing traffic into a smaller area. Contact (Allision) – The devices introduce new surface and submerged objects in the area.	Collision and allision for all vessel types is assessed in Chapter 15, Shipping and Navigation Sections 15.6.3, 15.6.4 and Appendix 15.1 (Volume III).
	SAR restrictions / access difficulties if surface devices are utilised and a sufficient distance for navigation is not maintained between devices.	See Chapter 15, Shipping and Navigation, Sections 15.6.3, 15.6.4. The Project will adhere to the MCA Guidance on Offshore Renewable Energy Installation: Requirements, Advice and Guidance for Search and Rescue and Emergency Response.
	Stated that the CoS supported the proposed Morlais site in principle provided that suitable navigational safety compromises and mitigation measures are agreed.	Noted.

Public Information Days

Four Public Information Days were held in 2019, which included coastal communities (two in Holyhead and one Trearddur Bay). A drop in event was also held at Trearddur Bay Sailing Club on 30th of July.

The below organisations were invited and provided with project information. In addition, the events were widely publicised on local media.

Anglesey Adventures, Anglesey Divers, Anglesey School of Yachting, Anglesey Water Sports, Anglesey Charter Fishing, Around Anglesey Race Organisers, Holyhead Lifeboat Station, Holyhead Marina, Holyhead Sailing Club, Canoe Wales, North Wales Cruising Club, Red Wharf Bay Sailing and Watersports Club, Rhosneigr Sub-Aqua Club, Rib Ride, RNLI Holyhead, Royal Anglesey Yacht Club, Round Anglesey Race Organisers, RYA Cymru Wales, Sea Kayaking Wales, The Cruising Association, Traeth Coch Sailing Club, Trearddur Bay Lifeboat Station, Trearddur Bay Sailing Club, Anglesey Sea Kayaking (provided with information), Anglesey Tourism Association (provided with information)

Date/Document	Comment	Response
2019	<p>Some local maritime users raised concerns about navigational safety and visual impact. Other expressed support for the development [MOR-ATEB-DOC-0066]</p> <p>In the consultation responses, there was no reference to the potential for an effect on the recreational boating economy at these events, or in the subsequent representations to the TWAO application, with the exception of those about sea kayaking. For this reason, and the lack of expected effect, the impact on the recreational boating economy was not specifically included in the Supplementary Tourism and Recreation Assessment.</p>	<p>Feedback from these meetings was generally of widespread support for such a development.</p> <p>Navigational concerns have been considered in the NRA and assessment.</p> <p>In light of concerns raised by RYA, and to reflect the responsible nature of the Developer, a Supplementary Kayaking And Sailing Activities Assessment has been provided which specifically commits to monitoring and mitigating negative impacts should they occur.</p>
MCA and Trinity House		
<p>January 2019 (NRA consultation on the PHA and approach to NRA document)</p>	<p>The initial concern is the size of the project area.</p> <p>Reiterated that the layout once agreed will need to ensure clear lines of sight and navigational channels between devices to maintain search and rescue access especially at night, in poor visibility and high sea states.</p> <p>Reiterated that while the MCA is supportive of Offshore Renewable Energy development, its remit is to ensure that the safety of navigation is preserved, and Search and Rescue capability is maintained.</p> <p>Surface and surface breaking devices should, therefore, be aligned in straight rows that allow RNLI vessels to have continued access.</p>	<p>Noted.</p> <p>See Chapter 15, Shipping and Navigation, Sections 15.6.3, 15.6.4.</p> <p>The Project will adhere to the MCA Guidance on Offshore Renewable Energy Installation: Requirements, Advice and Guidance for Search and Rescue and Emergency Response.</p> <p>Final mitigation plans will be agreed prior to the construction once the final details are known.</p>
	<p>Concerns over restricting the inshore route.</p>	<p>The NRA does consider the impact of narrowing of the inshore route, the available sea space and pinch points for recreational and fishing vessels.</p> <p>See Chapter 15, Shipping and Navigation Sections 15.6.3.1, 15.6.4 and Appendix 15.1 (Volume III).</p>
	<p>Explained that Trinity House often has a vessel with a heli-pad working off South Stack lighthouse which typically would be located at a distance of up to 1.5 miles off of South Stack. Should Trinity House's access to South Stack lighthouse be restricted, this would be of significant operational concern.</p>	<p>During consultation it was noted by Trinity House that once per year it has a vessel with a heli-pad located up to 1.5 nm off of South Stack in order to carry out routine maintenance. Additionally, approximately every 7 years the vessel would be present for an extended time to support major maintenance activities such as; painting, battery change or modernisation. This information has been included in the NRA.</p>

Date/Document	Comment	Response
	Pointed out that there are no adequate examples of the alternative poor weather ferry routes within the passenger vessel plot.	An additional six months of winter AIS data has been purchased which contained examples of poor weather routes including a ferry anchoring at Abraham's Bosom.
	Pointed out that the fishing vessel traffic looked light with only examples of vessels en-transit passing through the MDZ.	Noted. There are limitations with AIS in that many fishing vessels under 10m are not equipped with AIS which is why radar surveys were also undertaken and this supplemented by fishing intensity data as recorded by the MMO using the Vessel Monitoring System (VMS).
	Questioned why the hazard 'Impact to Fishing' was scored as high for both the baseline and residual risk score.	This was due to the risk of gear catching on the devices causing both a hazard to the fishing gear and the project. It is considered, therefore, that this hazard cannot be mitigated to a level that would reduce the risk of fishing to acceptable levels and as such it is recommended that fishing be excluded within the MDZ.
	Pointed out that Safety Zones are only really effective if there are monitoring arrangements i.e. a guard vessel on site.	Noted. Safety Zones are assessed in Chapter 15, Shipping and Navigation Section 15.6 . Safety Zones would be monitored and enforced through active monitoring arrangements such as guard vessels and control centre. Final mitigation plans will be agreed prior to the construction once the final details are known.
	Questioned where the requirement for an ERCoP will be addressed.	This had been included as an embedded mitigation measure and is included within the NRA. See Appendix 15.1 (Volume III) .
	Questioned how C&I impacts had been addressed within the PHA.	A high-level assessment had been undertaken and that Cumulative impacts are addressed. See Chapter 15, Shipping and Navigation Section 15.6.6 and Appendix 15.1 (Volume III) .
	Enquired after the feedback received from local stakeholder consultation, particularly fishing and recreational users.	See Consultation Meeting Notes in Appendix 15.1 (Volume III) .
	Pointed out that there had been some updates to existing legislation / guidance: Annex 5 of MGN 543 – Revised ERCoP / SAR guidance IMO circular in relation to updated FSA Guidance (with reference to MGN 543)	Noted. The NRA was undertaken in accordance with this updated guidance/legislation.
Canoe Wales / Snowdonia Canoe Club		

Date/Document	Comment	Response
<p>February 2020 ML and TWAO Application and supporting documentation</p>	<p>Regarding the placement of devices, why change the zone from the original area.</p>	<p>The application to move the zone from the original area was down to the tidal resource. This area would provide significantly greater power out per device and therefore would make the project more economically viable. There was a defined process to follow to enable the zone to be moved and this did include a period of consultation.</p>
	<p>How much control will the project have over installation of the devices.</p>	<p>It was explained that the project would have full control over this as it would be Menter Môn that owns the consent and would have to manage the zone in accordance with the regulators consent conditions.</p>
	<p>It was noted that the canoe clubs are not against the idea of the project but want to ensure that it is developed appropriately.</p>	<p>Noted</p>
	<p>Sea Kayaking is a very important industry in this part of Anglesey. Many top class, skilled sea kayaking coaches come to this area and a lot of income is made from this particular stretch of coast. 85% of the clients come from outside the area.</p>	<p>Noted The Canoe Clubs were invited to collate data with regard to the socio economics and feed this back to the Morlais such that this could be included in the Supplementary Socio-economic Assessment Document reference MOR-BAU-DOC-0002</p>
	<p>Kayaks are very different to any other small vessel as they are solely human powered. This means that there are huge safety issues – and these have not been addressed in the current NRA.</p>	<p>The NRA (Appendix 15.1 (Volume III)) has separated hazards to un-powered and powered recreational vessels.</p>
	<p>It has been noted that underwater devices are required to have 8m under keel clearing. What is the impact of having such a device underwater have on the surface? How will these devices effect and change the tidal flow, the eddies and back eddies etc?</p>	<p>Please refer to the HR Wallingford Coastal Process Report which has also been referenced in the production of the NRA (Appendix 15.1 (Volume III)). Changes in tidal stream rates and wave heights resulting from the presence of the MDZ were assessed within the HR Wallingford report and identified to have little additional impact over the existing sea conditions.</p>
	<p>Collision of human powered vessels is not considered as part of the assessment. There could be potential dangers of collision with floating devices and marker buoys. A capsized in the array could be very hazardous and a rescue could be very difficult. Significant risk and safety hazards. And this is not only to sea kayakers, but this area is also used by paddle boarders and sit on top fishing etc.</p>	<p>The NRA (Appendix 15.1 (Volume III)) has separated hazards to un-powered and powered recreational vessels.</p>

Date/Document	Comment	Response
	<p>Discussions were had around exclusion zones. Some concerns around impact on businesses etc. Some courses are booked well in advance. And it was noted that there are a few events to take into consideration e.g. circumnavigational races around the island, crossing to Ireland etc.</p> <p>It was noted that there are three important emergency exit points in this area:</p> <ul style="list-style-type: none"> • Abrahams Bosom • Penrhyn Mawr Point • Breakwater Park. <p>In the summer there could be 100-200 people out in the waters.</p> <p>It is noted that there are many concerns over the exclusion zones and the collision risks.</p>	<p>The project is not seeking formal exclusion zones. Safety zones are expected during construction and deployment. This could be up to 500m zone during construction, but would consider the requirements of other sea users especially in the inshore route. Construction is planned to be phased and in blocks. There will be various restrictions as to what time of year work can take place.</p> <p>Noted, please see previous responses. Engagement with the Canoe Clubs has continued with exchange of data and information.</p>
MCA and Trinity House		
<p>February 2020 ML and TWA0 Application and supporting documentation</p>	<p>Restriction of Navigation and exclusion of fishing: Trinity House enquired on the reason for the restriction as they noted that other projects have maintained vessel navigation</p> <p>MCA and Trinity House highlighted that under present legislation there is no facility to exclude navigation from an area. The area can be highlighted as an Area To Be Avoided (ATBA) but the right of navigation remains. Approval for an ATBA will need to be provided through the MCA and UK Safety of Navigation Committee (UKSON).</p> <p>Trinity House advised that Morlais could look at being designated as a Restricted Area but this would need changes to National Policy and agreement with DEFRA and DFT plus then approval through the MCA and UKSON.</p> <p>With regards to fishing, the present position is that fishing will be excluded but given the phased nature of the project this will also be phased.</p>	<p>It was clarified that the restriction would be on all navigation. However, navigation may be possible between groups of devices and arrays will be designed with due consideration for Search and Rescue (SAR) operations.</p> <p>Noted Additional mitigation measure 'Restrict Navigation through the Gold and Green MDZ Zones' suggested as it is an effective mitigating measure against contact and snagging hazards, however, its adoption will need to be balanced against loss of freedom of navigation by the regulator.</p> <p>Noted Additional mitigation measure 'Restrict Navigation through the Gold and Green MDZ Zones' suggested as it is an effective mitigating measure against contact and snagging hazards, however, its adoption will need to be balanced against loss of freedom of navigation by the regulator.</p> <p>Designation of MDZ as a no fishing zone has been suggested as it is an effective mitigating measure against contact and snagging hazards, however, its adoption will need to be balanced against loss of freedom of navigation by the regulator.</p>

Date/Document	Comment	Response
	Additional Mitigation Measures	Additional Mitigation Measures proposed are listed in Chapter 15, Shipping and Navigation Section 15.7.1.
	The MCA asked whether the additional mitigation measures included a Guard Vessel for the Operations as well as Construction phase of the project.	Mitigation measure of guard vessel to monitor passing traffic suggested in the construction phase (including repowering) only.
	Separate NRA for each site	Morlais confirmed that separate NRAs will be undertaken for the initial deployments.
	Lighting and marking Trinity House stated that they could consider alternative solutions upon receiving supplementary materials from Morlais.	Morlais are keen to work with the MCA & Trinity House to look at sympathetic lighting and marking of devices whilst being cognisant of the IALA recommendations and the need to ensure safety of navigation.
	MCA highlighted that enhanced cable protection for areas of unburied cable and construction of vessels to be marked in accordance with COLREG should be embedded mitigation measures.	'Enhanced cable protection' has been considered within the NRA Addendum as a suggested mitigation measure. Construction vessels to be marked in accordance with COLREGs has been included as an embedded mitigation measure.
	MCA requested an Interactive Boundary Assessment be completed for the Northern and eastern Boundaries.	Please see document Ref: 20UK1619_RN_MM_VTS02-02
	The MCA welcomed the introduction of the 8m UKC zone along the eastern boundary of the site as a good mitigation measure. However, they commented that it may need further review to consider the possible passage of inshore craft.	The >8m UKZ zone was reviewed following further stakeholder engagement and the Interactive Boundary Assessment and the western edge straightened and the zone widened overall.
	The NRA details the methodology for determining UKC but it is unclear why an UKC of 20m was selected for Commercial and Passenger Vessels.	Detailed explanation of the UKC calculations is provided in the NRA Appendix 15.1 (Volume III) Section 10.2.
	Discussion regarding devices greater than 20m only in Zone 1 MCA recommended further dialogue with the passenger ferry operators.	Dialogue with the ferry companies and Chamber of Shipping and their responses to the NRA Addendum are detailed in this consultation summary.
	Redesign Eastern Boundary MCA welcomed the introduction of the >8m UKC zone which showed that stakeholders were being listened to. MCA suggested that there may need to be some slight alterations to the alignment of this zone to take into	The >8m UKZ zone was reviewed following further stakeholder engagement and the Interactive Boundary Assessment and the western edge straightened and the zone widened overall.

Date/Document	Comment	Response
	consideration the likely course recreational users would take along the inshore route.	
	<p>Sea Room issues</p> <p>MCA and Trinity House suggested that this seemed to provide enough searoom but that the interactive boundary assessment may help to confirm this.</p>	<p>Please see the Interactive Boundary Assessment document Ref: 20UK1619_RN_MM_VTS02-02</p>
	<p>Risk Matrix</p> <p>In their representation the MCA noted inconsistencies between the risk matrices in the NRA and ES. The NRA lists each hazard, scores them and lists possible risk control measures. The ES however, does not use the NRA hazard list, instead some of the NRA hazards have been included along with combined hazards which are described as 'Impacts' e.g. "Potential Impacts to Commercial Vessels". These have then been scored.</p>	<p>To assist in making the connection between the NRA and the ES Morlais a risk control matrix has been included Chapter 15, Shipping and Navigation Table 15-16.</p>
	<p>The MCA highlighted that stakeholders raised a concern about access to Holyhead as a safe haven however it is not clear where this has been addressed in the NRA and ES.</p>	<p>We believe this is in reference to the NRA consultation meeting held in November 2018 with the Welsh Fishermen's Association.</p> <p>The comment was "One of the rights of navigation is that you should be able to run to a safe haven if you get caught. Holyhead is the only close safe-haven."</p> <p>The response as detailed in the ES was "Noted. Final mitigation plans will be agreed prior to the construction once the final details are known. This will include a Communications and Liaison Plan, Aids to Navigation Plan, Emergency Response Co-operation Plan and array specific Navigation Risk Assessment Plan which will be submitted prior to construction and device deployments."</p> <p>As discussed at the meeting, there will be restrictions on navigation within the Proposed Development Zone but the ERCOP will address issues such as access to Safe Haven and so we believe that we have responded to this comment in full.</p>

Date/Document	Comment	Response
	MCA confirmed that the vessel traffic data acquired for the project and presented in the NRA and ES is fully compliant with their requirements and those of MGN 543. Should Morlais wish to also consider the RYA Atlas data then that may be helpful but is not specifically required.	Noted
	In closing, Trinity House and MCA emphasised that they have not raised any objections to the development at this time and have only supplied representations. They are generally very supportive of renewable energy developments and are keen to work with the Morlais team to find proactive solutions to issues raised.	Noted
24 th June 2020 ML and TWAO Application and supporting documentation	Mitigation Measures MCA advised they would expect to see a site wide ERCOP which would then be added to with device and location specific ERCOPs as the site is developed.	Noted
	NS advised that “Exclusion of Fishing” be removed as an Additional Mitigation Measure. This is likely to be a result of the development rather than an implemented mitigation measure.	Designation of MDZ as a no fishing zone has been suggested as it is an effective mitigating measure against contact and snagging hazards, however, its adoption will need to be balanced against loss of freedom of navigation by the regulator.
	MCA asked for clarification on the Embedded mitigation measure “Enhanced cable burial protection where burial is not possible and where there is a requirement to do so”.	‘Enhanced cable protection’ has been included within the NRA as a suggested mitigation measure as it is an effective mitigation against snagging hazards.
	With regard to Restricting Navigation through the MDZ NS advised again that there is a process to have an area marked as an “Area to be Avoided”. If the development is properly charted and marked then it should not be necessary to go down this potentially protracted process and so this could be removed.	Noted
	With regard to “Establishing no anchoring zones” similarly there is a process to be followed to achieve this but if this relates to cables then it is already captured in good practice guidelines and so can be removed.	‘Establishing no anchoring zones’ has been included within the NRA as a suggested mitigation measure as it is an effective mitigation against snagging hazards.
	MCA and TH requested that the list of Embedded and Additional Mitigation Measures be issued as a formal document. This could be included in the Statement of common Ground (SOCG).	Additional Mitigation Measures proposed are listed in Chapter 15, Shipping and Navigation Section 15.7.1 . They will also be included in the SoCG with the MCA and TH.

Date/Document	Comment	Response
	<p>TH advised that with regard to off station alarms note be taken of their request to reduce where possible the proliferation of AIS systems and that other technologies are available as an alternative to AIS.</p>	<p>Noted</p>
	<p>Interactive boundary Assessment. MCA welcomed the IBA and noted that it supplied evidence and support to the decision made with regard to redesign of the <8M UKC along the eastern boundary in response to issues raised by recreational stakeholders. NS requested an additional section be included in the IBA detailing the draught of the vessels using the inshore route.</p>	<p>Please see the Interactive Boundary Assessment document Ref: 20UK1619_RN_MM_VTS02-02</p>
	<p>UKC Clarification MCA and TH were happy with the clarification provided on this point which provided a good a solid argument as to why key UKC figures have been used in the NRA. MCA requested that the UKC clarification be included in a formal document for future reference.</p>	<p>Detailed explanation of the UKC calculations is provided in the NRA Appendix 15.1 (Volume III) Section 10.2.</p>
	<p>Eastern Boundary The revisions to the <8m UKC zone along the eastern boundary, including straightening the weather boundary and widening the zone overall, were discussed and generally welcome by the MCA and TH.</p>	<p>Noted</p>
	<p>Morlais to engage with RYA on searoom issues</p>	<p>Morlais continue to engage with the RYA to address concerns raised and will continue to provide updated information to the RYA as the applications processes continue.</p>
	<p>Risk Matrix MCA and TH were very pleased with the risk matrix provided which confirmed that Morlais continue to engage with the RYA to address concerns raised and will continue to provide updated information to the RYA as the applications processes continue.</p>	<p>Noted</p>
	<p>Mitigation measures referenced in the Risk Matrix will need to be reviewed in light of earlier comments.</p>	<p>Mitigation Measures and the risk matrix have been updated and are included in Chapter 15, Shipping and Navigation Table 15-16 and Appendix 15.1 (Volume III).</p>

Date/Document	Comment	Response
	<p>Safe Haven Consultation</p> <p>Morlais supplied a response to this item demonstrating that a response has been supplied and the MCA confirmed their acceptance of that response provided.</p>	Noted
	<p>The MCA raised the issue of Hydrographic survey requirements highlighting the pre and post installation surveys will be required.</p>	<p>Morlais confirmed their understanding of the requirements and advised that the geophysical surveys completed to date would be supplied to the MCA in due course.</p>
	<p>The MCA suggested that a good way to incorporate the range of items that have been covered in recent meetings would be to issue an Addendum to the NRA. Morlais agreed that this would be an option and asked MCA to confirm that such an Addendum would not trigger any requirements for additional vessel traffic surveys. NS confirmed no additional traffic surveys would be required and will confirm this in writing.</p>	Noted
TH Operations		
<p>June 2020 Access to South Stack</p>	<p>TH felt that whilst they could possibly operate with an UKC of 8m the issue was really about sea room and vessel safety in the event of breakdown or in drift/blow on conditions.</p> <p>TH therefore felt that it would actually be more appropriate to access South Stack by either locating completely outside the Morlais Development Zone or operating in the northern zone where devices of <20m UKC will be deployed.</p> <p>This would be acceptable to TH but would increase helicopter time and thereby operational costs.</p>	<p>All parties expressed a willingness to find a mutually acceptable solution and TH advised that they would look at the operational costs and revert.</p>
RYA		
<p>July 2020 Morlais to present project update and discuss RYA concerns</p>	<p>Please note the meetings of this meeting are still to be agreed between both parties.</p>	
Chamber of Shipping		
<p>August 2020 (NRA Addendum)</p>	<p>The new layout appears to be a positive step forward. Introduction of the 20m UKC zone to be an adequate compromise and safety provision.</p>	Noted.
	<p>The 20m UKC zone does still see a fair amount of traffic and ferries are still noted</p>	Noted.

Date/Document	Comment	Response
	crossing the 'gold zone', however, the introduction of the zone of 20m UKC should now allow vessels to safely pass to the north of the 'gold' zone.	
	Diverting around the edge [of the MDZ] should not be an issue for cruise ships which are required to keep an adequate distance from the coastline.	Noted.
	Coaster traffic frequency through the MDZ is low. Their diversion to the west of the site would be relatively minor.	Noted. Impact upon shipping and navigation risk to coasters assessed within the baseline NRA risk assessment.
	In terms of poor weather routeing; the changes introduced represent a pretty good compromise in terms of navigation safety.	Noted. Effectiveness of introduction of 20m UKC embedded mitigation measure assessed within the baseline NRA risk assessment.
	The boundary between the purple and gold zones will need to be clearly marked, particularly if sub-surface devices are installed in the gold zone that are not surface piercing and which do not allow 20m UKC for ferry navigation. Marking of the and NE and NW corners will be the most important.	Mitigation measure 'Marked in accordance with Trinity House' embedded into project. Additional mitigation measure 'Minimise use of marker buoys in zones of minimum UKC' suggested. Additional mitigation measure 'Undertake device / array specific Risk assessments to include NavAids and marker buoys' suggested.
	Freedom of navigation supported by adequate information and marking would be preferred [to restriction of navigation].	Noted. The requirement for the MDZ to be marked in accordance with Trinity House has been embedded into project as has the requirement for the site to be Surveyed and charted as required by UKHO. Additional mitigation measure 'Restrict Navigation through the Gold and Green MDZ Zones' suggested as it is an effective mitigating measure against contact and snagging hazards, however, its adoption will need to be balanced against loss of freedom of navigation by the regulator.
	No increase in risk of collision identified for the western route around the MDZ.	Noted.
	The risk of collision [for the inshore route] would likely be reduced in comparison to the previously assessed NRA design following implementation of mitigation.	Collision was assessed as a primary hazard across all vessel types within the NRA.
	The presence of structures in the water will increase contact risk.	Contact was assessed as a primary hazard across all vessel and device types within the NRA.

Date/Document	Comment	Response
	<p>Suitable usage of lights and marks should mitigate against contact risk.</p>	<p>The requirement for the MDZ to be marked in accordance with Trinity House has been embedded into project as has the requirement for the site to be Surveyed and charted as required by UKHO. These embossed mitigations apply to all contact hazards.</p>
	<p>SAR is primarily a concern of smaller vessels, however, lines and squares are typically preferable over an 'organic' design for SAR.</p>	<p>Noted. The appropriate alignment and spacing of arrays and devices has been suggested as a mitigation measure within the NRA. Along with the requirement to undertake device / array specific risk assessments to include ensuring layouts are designed to allow safe transit through by SAR.</p>
Trinity House		
<p>August 2020 (NRA Addendum)</p>	<p>Surface and surface breaking devices would be expected to be aligned in straight rows ensuring clear lines of sight and to maximise marking and visibility.</p>	<p>Noted. The requirement for the MDZ to be marked in accordance with Trinity House has been embedded into project. The appropriate alignment and spacing of arrays and devices has been suggested as a mitigation measure within along with the requirement to undertake device / array specific risk assessments to include ensuring layouts are designed to allow safe transit through by SAR.</p>
	<p>Isolated surface breaking devices requiring marking should not be separated from the primary arrays. Individual structures remote from the development would need to be further risk assessed and considered separately.</p>	<p>Noted. Mitigation measure to undertake device / array specific risk assessments to include ensuring layouts are designed to allow safe transit through by SAR.</p>
	<p>TH would not be able to comment on marking at this stage. Marking will need to be determined once a device specific layout is agreed. Sign off on layouts should be carried out in consultation with TH and the MCA.</p>	<p>Noted.</p>
	<p>In cases of areas where devices are not surface piercing there would be a requirement for a surface mark. It may be the case that marking broad areas is more appropriate than the marking of individual devices, however, more information on the device types and layout is required to determine if / where marking would be required.</p>	<p>Mitigation measure to undertake device / array specific risk assessments to include NavAids and marker buoys suggested, Mitigation measure 'Minimise use of marker buoys suggested in zones of minimum UKC.</p>
	<p>TH stated that the preference would be for the site to remain as open for use as possible.</p>	<p>Noted. The requirement for the MDZ to be marked in accordance with Trinity House has been embedded into project as has the requirement for the site to be</p>

Date/Document	Comment	Response
		Surveyed and charted as required by UKHO. Additional mitigation measure 'Restrict Navigation through the Gold and Green MDZ Zones' suggested as it is an effective mitigating measure against contact and snagging hazards, however, its adoption will need to be balanced against loss of freedom of navigation by the regulator.
Maritime and Coastguard Agency (MCA)		
August 2020 (NRA Addendum)	The updated design of the zone of minimum 8m UKC, now following a straighter line, is considered to be an improvement on the previously proposed design.	Noted.
	Exclusion of fishing has not been requested at other similar OREI sites. This will likely occur by default. As long as up-to-date information is correctly promulgated to stakeholders and the MDZ is marked on navigational charts, fishermen should be aware of the MDZ	Designation of MDZ as a no fishing zone has been suggested as it is an effective mitigating measure against contact and snagging hazards, however, its adoption will need to be balanced against loss of freedom of navigation by the regulator.
	[With reference to the restriction of navigation] proper charting and marking allowing a prudent mariner to make their own judgement would allow freedom of navigation.	The requirement for the MDZ to be marked in accordance with Trinity House has been embedded into project as has the requirement for the site to be Surveyed and charted as required by UKHO. Additional mitigation measure 'Restrict Navigation through the Gold and Green MDZ Zones' suggested as it is an effective mitigating measure against contact and snagging hazards, however, its adoption will need to be balanced against loss of freedom of navigation by the regulator.
	Proper notifications should be given when installations are taking place. Local notifications including local Notices to Mariners and other appropriate Maritime Safety Information should be issued. International notifications may include; Notice to Mariners, T&Ps, NavArea1, Hydrolants etc.	Requirement form the promulgation of information to all mariners through appropriate dissemination methods has been embedded.
	Clarification was given that mitigation measure [for a guard vessel] is recommended for use in the construction phase only.	Noted. Mitigation measure of guard vessel to monitor passing traffic suggested in the construction phase (including repowering) only.
Port of Holyhead Harbour Master		
July 2020	Overall port traffic is expected to increase as new port infrastructure is constructed.	Noted. Future developments and traffic levels are considered within the assessment of navigation risk.

Date/Document	Comment	Response
(NRA Addendum)	Seas in the vicinity of the Holyhead Deep can be particularly rough and the area is avoided by the ferries.	Noted. Inherent and resultant metocean conditions are considered in the assessment of navigation risk.
	Fishing vessel activity [from winter 2017 and summer 2017 surveys] shown in the inshore area is less than expected.	Noted. Fishing data from AIS and RADAR supplemented with fishing intensity VMS data and an additional AIS and RADAR survey in April 2019.
	Unaware of commercial vessels anchoring in Abrahams Bosom.	Noted. Snagging / Obstruction identified as a primary hazard for assessment across all vessel and device types. Additional Mitigation measure 'Establish no anchoring areas' suggested.
	Hazard of loss of power and being swept/blown on to device should be considered.	Equipment and mechanical failure identified as causal factors and assessed within the NRA against all relevant hazards.
Trearddur Bay Sailing Club		
(August 2020) (NRA Addendum)	We can see little material improvement over the previous scheme and still have grave concerns over the impact on yachting.	Impacts to powered and un-powered recreational vessels assessed across all identified hazard types.
	We still feel that any surface mounted or surface piercing devices present an unacceptable risk to shipping and yachting at this point on the coast. In broad terms we would support the whole scheme, were the Developer to commit to a purely under water array.	Impacts to powered and un-powered recreational vessels assessed across all identified hazard types for both submerged and surface piercing devices.
	We still feel that the navigable corridor between the proposed area and South Stack is far too narrow.	The introduction of the zone of 8m minimum UKC adjacent to the inshore route has been embedded in project design and has been risk assessed within the NRA for all vessel types, including powered and un-powered recreational vessels.
	[The navigable corridor] presents a very dangerous 'lee-shore' risk, with the prevailing south westerlies to the treacherous shoreline of South Stack, Abrahams Bosom and it should be remembered that there is a complex series of back-eddies (the 'seven tides') that make sailing by Abrahams Bosom very tricky.	Inherent met-ocean conditions have been identified and assessed as a causal factor across all assessed hazards.
	We really fear a risk to life if this whole stretch becomes only a narrow navigable corridor.	The potential risk of loss of life as a consequence of navigational hazards has been assessed within the NRA across all hazard and vessel types. The introduction of the zone of 8m minimum UKC adjacent to the inshore route has been embedded in project

Date/Document	Comment	Response
		design and has been risk assessed within the NRA for all vessel types, including powered and un-powered recreational vessels.
	We support the RYA position that it is unacceptable to define the scheme as a test area, where no pre-approval of technology is necessary and whereby any impact assessments are rendered theoretical by the lack of commitment to turbine type.	The NRA assesses the installation of any of the proposed device types in any location (worst credible) in adherence with the zones of minimum UKC embedded into the project design. The requirement to undertake device / array specific risk assessments prior to deployment has been suggested within the NRA.
Irish Ferries and Stena Line		
August / September 2020 (NRA Addendum)	The 20m UKC is of great benefit and assuages most of our concerns.	Noted.
	The proposed development will prevent the use of certain routes that are only used rarely in particular circumstances, and we can accept this.	Noted.
	The proposed development will still restrict options for ferries that cannot enter the Port of Holyhead in inclement weather – i.e. it limits areas in which to shelter.	The presence of devices within the gold and green MDZ zones will impact on vessels running for shelter from the south west. This has been considered as a causal factor within the risk assessment and assessed. Prior to the deployment of any devices an Emergency Response Co-operation Plan (ERCOP) will need to be agreed with the MCA and Trinity House. This will include details of access to a safe havens and places of refuge in the event of an emergency or stress of weather.
	The proposed development leads to less sea room for traffic going in and out of Holyhead to safely pass each other. Inbound/Eastbound traffic may tend to navigate further north than it does presently, with the result that outbound/westbound traffic will be pushed further north, with the risk of impinging on the Traffic Separation Scheme.	Collision has been assessed as a primary hazard for assessment within the NRA across all vessel types.
	Northbound Traffic bound for the TSS may be less inclined to alter to starboard (towards the development) to give way to outbound/westbound traffic from Holyhead.	Collision has been assessed as a primary hazard for assessment within the NRA across all vessel types.
Snowdonia Canoe Club and Canoe Wales		
August 2020 (NRA Addendum)	The zonation of the MDZ should not itself impede passage around the Stacks by kayak.	Noted.
	We are concerned that changes to the hydrodynamics of the inshore passage may render it unsafe for existing use.	Changes to met-ocean conditions and hydrodynamics assessed by HR Wallingford within the Coastal Processes

Date/Document	Comment	Response
		Modelling Report and identified and assessed as a causal factor for powered and un-powered recreational vessels.
	We are concerned that floating and emergent structures within the MDZ are a significant hazard and pose a risk to life.	<p>Navigational risk arising from the presence of surface piercing devices within the gold and green MDZ zones have been assessed within the NRA for all vessel types.</p> <p>The potential risk of loss of life has been considered as a consequence within the NRA and assessed across all vessel and device types.</p>
	We are concerned that exclusion zones during construction may restrict passage.	Implementation of Safety Zones of appropriate configuration and extent suggested. Configuration and extent of to be balanced against loss of freedom of navigation by the regulator.
	The navigation risk for kayaks between the coast and MDZ are likely to be intolerable.	The NRA assessed the navigation risk to un-powered recreational vessels assessed for all identified hazard and device types.
	The changes indicated in the Wallingford model suggest increases in flow speed of up to 0.8 m/sec and up to 0.5 m to wave heights. This alone would prevent passage by a significant proportion of paddlers.	The increased flow speeds of up to 0.8 m/sec and wave heights up to 0.5 m are modelled on Force 6 or greater conditions.
	Navigational risk will be significantly increased in the whole of the area within and landward of the MDZ and perhaps further afield e.g. Carmel Head and the Skerries.	Navigational risks resulting from the presence of MDZ have been assessed for all vessel types within the NRA.
	Once we stop paddling, say for example, to put someone back in their boat after a capsize we are at the mercy of the tide and will be rapidly swept into the MDZ.	<p>Risk to life as a result of person in water has been considered within NRA.</p> <p>Set on to device by tidal stream/ pinning identified as a causal factor for un-powered recreational vessels within the NRA. Inherent metocean conditions, including tidal stream dynamics identified and considered within the NRA.</p>
	[In the case of being swept into the MDZ] we would be very vulnerable to collision and/or entanglement as in a rescue situation we are unable to manoeuvre, will be trailing tow ropes and may have swimmers in the water.	<p>Contact (allision) assessed as a primary hazard for assessment across all vessel and device types.</p> <p>Risk to life as a result of person in water has been considered within NRA. Set on to device by tidal stream/ pinning identified as a causal factor for un-powered recreational vessels within the NRA.</p>
	Ideally risk control measures would take the form of a safe runout of, say, ten minutes at peak flow 'downstream' of features such as Penrhyn Mawr on the flood and North Stack on the ebb.	Inherent and resultant met-ocean conditions identified and assessed as a cause across all assessed hazards. Zone of 8m minimum UKC embedded in project design and risk assessment. The maximum rate tidal stream runs parallel to

Date/Document	Comment	Response
		<p>the major axis of the proposed MDZ and eastern inshore channel. In the event of an equipment or mechanical failure, vessels in the eastern passage are unlikely to be set onto the devices within the MDZ, however, vessels navigating within the MDZ could be set onto devices in the vicinity.</p>
	<p>Grab chains and ladders will render the structures more hazardous because of entanglement, the inability of a swimmer to hold on against the tide and likely extreme difficulty of undertaking a rescue close to the floating structure.</p>	<p>The effectiveness of suggested additional mitigation measure 'Provision of life saving equipment on fixed structures and floating devices' assessed in residual NRA assessment and was assessed as effective at reducing the risk scores of contact and swamping /capsize hazards for small vessels.</p>
	<p>We are concerned about the risks posed to kayaks of sharing the inshore passage with construction and other recreational vessels as at present we encounter few other vessels at most a handful of low speed small commercial and recreational fishing boats and occasional dive boats.</p>	<p>Noted. Existing baseline vessel traffic profile assessed within the NRA and identified to be low. Construction phase impacts assessed independently of operational phase for all vessel types to reflect increase in traffic as a result of the presence of construction vessels. Collision assessed as a primary hazard type for all project phases and for all vessel types.</p>
<p>Royal Yachting Association (RYA)</p>		
<p>September 2020 (NRA Addendum)</p>	<p>Given the consultation responses to you from our members, our previous meetings with Morlais/ Menter Môn in 2018 and 2020, our objections to the project – together with the recently supplied RYA Coastal Atlas: the RYA has now provided all relevant information.</p>	<p>Noted.</p>
	<p>The changes made to the Eastern boundary do not substantially alter our view on navigational risk, as these changes do not meet the safety requirements identified in our previous meetings with the Morlais project.</p>	<p>The introduction of the zone of 8m minimum UKC adjacent to the inshore route embedded in project design and has been risk assessed within the NRA for all vessel types.</p>
<p>Royal National Lifeboat Institution (RNLI)</p>		
<p>(NRA Addendum)</p>	<p>No response received</p>	<p>-</p>
<p>Welsh Fisherman's Association</p>		
<p>(NRA Addendum)</p>	<p>No response received</p>	<p>-</p>
<p>Anglesey Watersport</p>		
<p>(NRA Addendum)</p>	<p>No response received</p>	<p>-</p>
<p>Anglesey School of Yachting</p>		

Date/Document	Comment	Response
(NRA Addendum)	No response received	-

15.4. METHODOLOGY

15.4.1. Study Area

18. The location of the MDZ is given within **Figure 4-1 Chapter 4 Project Description (Volume II)**. The MDZ is located to the west of Holy Island, Anglesey, 500 m off South Stack and occupies a total area of 35 km² and has been sub-divided in to four separate zones with a zone for surface emergent devices, a zone for sub surface devices and two zones based on minimum Under Keel Clearance (UKC) (see **Figure 4-5, Chapter 4 Project Description Volume II**).

15.4.2. Data Sources – Desk Study

19. The main data sources used to identify the baseline navigational features and activity in the vicinity of the Project were:
- Automatic Identification System (AIS) data;
 - Radar data;
 - GIS shapefiles;
 - RYA Coastal Atlas of Recreational Boating;
 - Maritime Incident Data (Maritime Accident Investigation Branch (MAIB) 1997-2017 and RNLI Callouts 2008 to 2016;
 - Admiralty Sailing Directions – West Coast of England and Wales Pilot, NP37, 19th Edition, 2014; and
 - UK Admiralty Charts: 1970, 1413 (All cartography in this report, unless otherwise stated, is to WGS84 UTM Zone 30N standard. All marine charts are in a Mercator projection. Charts are not suitable for navigational purposes).

15.4.3. Data Sources – Site-Specific Surveys and Reports

20. Project-specific marine traffic surveys which collected AIS, radar and visual data were undertaken as per **Table 15-3**. These surveys collected data over two-week periods in the summer and winter, in line with MGN543 recommendations.
21. The following were assessed through the analysis of these marine traffic data:
- Location of the MDZ relative to areas used by any type of marine craft;
 - Numbers, types and sizes of vessels presently using the MDZ including; course, name, IMO Number and nationality where possible;
 - Non-transit uses of the areas, e.g. fishing, recreation, racing or military purposes;

- Presence of transit routes used by coastal or deep-draught vessel on passage; and
 - Alignment and proximity of the development site relative to adjacent shipping lanes.
22. Further information was gathered through consultation with key stakeholders including representatives of recreational and fishing organisations, and the local harbour master.
 23. Six months of AIS data from between October 2017 and March 2018 were additionally sourced to account for any seasonal variances in ferry activity and usage of the poor weather routes.
 24. To overcome the limitations posed by utilisation of AIS alone and in line with MGN 543 requirements, winter and summer RADAR surveys were undertaken for representative summer and winter periods.
 25. The data collected for utilisation within the NRA is summarised within **Table 15-3**.

Table 15-3 Project-Specific Marine Traffic Data Collection

Data Type	Season	Duration	Time Period
AIS	Summer	2 weeks	26th August to 9th September 2017
RADAR	Summer	2 weeks	26th August to 9th September 2017
AIS	Winter	2 weeks	05th April to 19th April 2019
RADAR	Winter	2 weeks	05th April to 19th April 2019
AIS	Winter*	6 Months	1st October 2017 to 31st March 2018

* AIS data purchased from Marine Traffic, not from survey.

15.4.4. Impact Assessment Methodology

26. **Chapter 5, EIA Methodology** outlines the Impact Assessment Methodology used for other Chapters. The Navigation Risk Assessment Methodology for the impact assessment in this chapter is detailed within **Appendix 15.1 (Volume III)**.
27. The approach is similar to that outlined in **Chapter 5, EIA Methodology** in that it seeks to make a balanced assessment and is based on the ‘source-pathway-receptor’ conceptual model process used to provide a systematic and auditable approach to understanding the potential for effects to arise, the spatial extents of the effect-receptor interactions, impact pathways, and potential impact significance.
28. The difference is that for the impact assessment methodology used in this chapter the outcomes are expressed as a Hazard Risk Score which is then translated into different terminology to that used in **Chapter 5, EIA Methodology** such as Negligible, Low Risk, As Low as Reasonably Practical (ALARP), Significant or High.
29. The objective is to use embedded mitigation and additional mitigations measures to reduce the risk to ALARP or better. This would be equivalent in the EIA Methodology outlined in **Chapter 5, EIA Methodology** to introducing mitigation measure to reduce Major and Moderate impacts to Minor or better.

15.4.5. Formal Risk Assessment Methodology

30. A shipping and navigation receptor can only be sensitive if there is a pathway through which an impact can be transmitted between the source activity and the receptor. This risk assessment was conducted in accordance with the International Maritime Organisation (IMO) Formal Safety Assessment (FSA) methodology for risk assessments.
31. Hazard identification is the first fundamental step in the risk assessment process and was informed by analysis and feedback from stakeholders. Key navigation hazards were identified and grouped with the identified vessel types operational in the vicinity of the MDZ to form the list of potential impacts for assessment. The hazards were then assessed as a factor of likelihood (frequency) and consequence. This approach considered two scenarios; “most likely” and the “worst credible”. The quantified values of frequency and consequence were then combined using the Marico HAZMAN II software to produce a risk score for each hazard and collated into a “Ranked Hazard List”. Risk control measures were then suggested that may reduce the hazard to ALARP.
32. Risk is the product of a combination of consequence of an event and the frequency with which it might be expected to occur. In order to determine navigation risk a Formal Safety Assessment (FSA) approach to risk management is used. International Maritime Organisation (IMO) Guidelines define a hazard as “something with the potential to cause harm, loss or injury”, the realisation of which results in an accident. The potential for a hazard to be realised can be combined with an estimated or known consequence of outcome. This combination is termed “risk”. Risk is therefore a measure of the frequency and consequence of a particular hazard.

15.4.5.1.1. General Risk Matrix

33. The combination of consequence and frequency of occurrence of a hazard is combined using a risk matrix which enables hazards to be ranked and a risk score assigned. The resulting scale can be divided into three general categories:
 1. Acceptable;
 2. As Low as Reasonably Practicable (ALARP); and
 3. Intolerable.
34. At the low end of the scale, frequency is extremely remote and consequence minor, and as such the risk can be said to be “acceptable”, whilst at the high end of the matrix, where hazards are defined as frequent and the consequence catastrophic, then risk is termed “intolerable”. Every effort should be made to mitigate all risks such that they lie in the “acceptable” range.
35. Where this is not possible, they should be reduced to the level where further reduction is not practicable. This region, at the centre of the matrix is described as the ALARP region. It is possible that some risks will lie in the “intolerable” region, but can be mitigated by measures, which reduce their risk score and move them into the ALARP region, where they can be tolerated, albeit efforts should continue to be made when opportunity presents itself to further reduce their risk score.
36. The FSA methodology used determines where to prioritise risk control options for the navigational aspects of a project site. The outcome of this risk assessment process should then act as the basis for a Navigation Safety Management System, which can be used to manage navigational risk.

15.4.5.1.2. Hazard Identification

37. Hazard identification is the first and fundamental step in the risk assessment process and was undertaken using the results of the analysis and feedback from local stakeholders.
38. The project phases were assessed individually due to their different navigational risk exposure and magnitude, i.e. the different nature of the operations, the vessels involved, and the potential cost of any consequences.

15.4.5.1.3. Risk Matrix Criteria

39. Frequency of occurrence and likely consequence are both to be assessed for the “most likely” and “worst case” scenario. It should be noted that within the NRA (**Appendix 15.1, Volume III**) reference is made to “worst credible scenarios” which is equivalent to “worst case scenario”. Frequencies were assessed according to the levels set out in **Table 15-4** below.

Table 15-4 Frequency Criteria

Scale	Description	Definition	Operational Interpretation
F5	Frequent	An event occurring in the range once a week to once an operating year.	One or more times in 1 year
F4	Likely	An event occurring in the range once a year to once every 10 operating years.	One or more times in 10 years 1 - 9 years
F3	Possible	An event occurring in the range once every 10 operating years to once in 100 operating years.	One or more times in 100 years 10 – 99 years
F2	Unlikely	An event occurring in the range less than once in 100 operating years.	One or more times in 1,000 years 100 – 999 years
F1	Remote	Considered to occur less than once in 1,000 operating years (e.g. it may have occurred at a similar site, elsewhere in the world).	Less than once in 1,000 years >1,000 years

40. Using the assessed notional frequency for the “most likely” and “worst case” scenarios for each hazard, the probable consequence associated with each hazard was assessed in terms of damage to:
- People - Personal injury, fatality etc.;
 - Property – Project and third party;
 - Environment - Oil pollution etc.; and
 - Business - Reputation, financial loss, public relations etc.

41. Consequences were assessed according to the levels set out in **Table 15-5**.

Table 15-5 Consequence Categories and Criteria

Category	People	Property	Environment	Business
C1	Negligible	Negligible	Negligible	Negligible

Category	People	Property	Environment	Business
	Possible very minor injury (e.g. bruising)	Costs <£10k	No effect of note. Tier1 may be declared but criteria not necessarily met. Costs <£10k	Costs <£10k
C2	Minor (single minor injury)	Minor Minor damage Costs £10k – £100k	Minor Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity. Costs £10K–£100k	Minor Bad local publicity and/or short-term loss of revenue Costs £10k – £100k
C3	Moderate Multiple minor or single major injury	Moderate Moderate damage Costs £100k - £1M	Moderate Tier 2 spill criteria reached but capable of being limited to immediate area within site Costs £100k -£1M	Moderate Bad widespread publicity Temporary suspension of operations or prolonged restrictions to project Costs £100k - £1M
C4	Major Multiple major injuries or single fatality	Major Major damage Costs £1M -£10M	Major Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release Costs £1M - £10M	Major National publicity, Temporary closure or prolonged restrictions on project operations Costs £1M -£10M
C5	Catastrophic Multiple fatalities	Catastrophic Catastrophic damage Costs >£10M	Catastrophic Tier 3 oil spill criteria reached. International support required. Widespread shoreline contamination. Serious chemical or gas release. Significant threat to environmental amenity. Costs >£10M	Catastrophic International media publicity. Project site closes. Operations and revenue seriously disrupted for more than two days. Ensuing loss of revenue. Costs >£10M

15.4.5.1.4. Hazard Data Review Process

42. Frequency and consequence data were assessed for each hazard. This was subsequently influenced by the views and experience of the many stakeholders, whose contribution was greatly appreciated, as well as historic incidents where available.



43. It should be noted that the hazards were scored on the basis of the “status quo” i.e. with all existing embedded mitigation measures taken into consideration. The outcome of this process was then checked for consistency against the assessments made in previous and similar risk assessments.

44. Having assessed each hazard for frequency and consequence in both the “most likely” and “worst case” scenarios, risk scores are obtained using the following matrix **Table 15-6**.

Table 15-6 Risk Factor Matrix Used for Hazard Assessment

Consequences	C5 (catastrophic)	5	6	7	8	10
	C4 (major)	4	5	6	7	9
	C3 (moderate)	3	3	4	6	8
	C2 (minor)	1	2	2	3	6
	C1 (negligible)	0	0	0	0	0
	Frequency	F1: Remote (>1,000 years)	F2: Unlikely (100-1,000 years)	F3: Possible (10-100 years)	F4: Likely (1 to 10 years)	F5: Frequent (Yearly)

45. Where:

Risk Number	Risk
0 to 1.9	Negligible
2 to 3.9	Low Risk
4 to 6.9	As Low as Reasonably Practical (ALARP)
7 to 8.9	Significant Risk
9 to 10.0	High Risk

46. It should be noted that occasionally, a “most likely” scenario will generate a higher risk score than the equivalent “worst case” scenario; this is due to the increased frequency often associated with a “most likely” event. For example, in the case of a large number of small contact events, the total damage might be of greater significance than a single heavy contact at a much lesser frequency.

15.4.5.1.5. Hazard Ranking

47. The risk scores obtained from the above process were then analysed further to obtain four indices for each hazard as follows:

- The average risk score of the four categories in the “most likely” set;
- The average risk score of the four categories in the “worst case” set;
- The maximum risk score of the four categories in the “most likely” set; and
- The maximum risk score of the four categories in the “worst case” set.

48. These scores were then be combined in Marico Marine’s hazard management software “HAZMAN” to produce a single numeric value representing each of the four indices. The hazard list was then sorted in order of the aggregate of the four indices to produce a “Ranked Hazard List” with the highest risk hazards prioritised at the top.

49. Mitigation measures that could be employed to reduce the likelihood or consequence of the hazards occurring were then identified. Risk controls were reviewed and discussed, and recommendations made as to which would be suitable for the Project. Risk controls were

proposed that show the greatest reduction in risk to the highest scoring identified hazards and following feedback from consultees.

15.5. EXISTING ENVIRONMENT

50. The following sections present a description of the existing baseline features and shipping activity recorded in the vicinity of the MDZ.

15.5.1. Regional Context

51. The largest ports in the area are Liverpool located on mainland UK, Dublin located on mainland Republic of Ireland (ROI) and Holyhead, situated on Anglesey. Shelter is listed within the Admiralty Sailing Directions (ASD) as available at all times in Holyhead Outer Harbour. In bad weather or at the request of the vessel, Liverpool Pilots will board vessels off Point Lynas at 53°25'000 N; 4°17'39 W.
52. South Stack Lighthouse is located at 53°18'41 N; 4°41' 98 W. The light is shown throughout 24 hours.
53. The closest Traffic Separation Scheme (TSS) is the Off Skerries TSS (53°22'.88 N; 4°52'27 W to 53°32'18 N; 4°31' 78 W). Off Skerries was established for vessels rounding the northwest coast of Anglesey. Rule 10 of The International Regulations for Preventing Collisions at Sea (COLREGS) applies. Laden tankers are to avoid the area between the southeast boundary of the TSS and the coast.
54. An un-adopted TSS is located at the entrance to Holyhead Harbour. The RNLI provides all-weather and inshore lifeboats around the coast for saving life at sea. The RNLI stations near to the MDZ are given within **Table 15-7**. At each of these stations crew and lifeboats are available on a 24-hour basis throughout the year.
55. The closest HM Coastguard SAR station to the MDZ is situated at Caernarfon Airport. The base has been operated by Bristow Helicopters Ltd on behalf of HMCG since it opened in 2015.
56. Anchorages in vicinity of the proposed MDZ are given within **Table 15-8**.

Table 15-7 RNLI Stations near to the MDZ

Station	Location	Lifeboats
Holyhead New Harbour	53°19'.17N 4°38'.56W	Christopher Pearce – Severn Class Mary and Archie Hooper – D Class
Trearddur Bay	53°16'.57"N 4°37'.49"W	Hereford Endeavour- B Class Clive and Imelda Rawlins – D Class

Table 15-8 Nearby Anchorages

Anchorage	Description
Abraham's Bosom	53°17'.81N 4°40'.97W - Anchorage in offshore winds. A below water rock lies below the water surface (Pen – las rock) close to the northern entrance to the bay with foul ground extending 1 cable southwest from the rock.
Trearddur Bay	53°16'.63N 4°37'.28W Temporary anchorage in offshore winds.

57. For details regarding other Infrastructure and Marine Users within the area please refer to **Chapter 16, Infrastructure and Other Users**.

15.5.2. Physical Environment

58. Wind, wave and tidal data for the area were used as input to the NRA process. This is presented in **Chapter 7, Metocean Conditions and Coastal Processes** of the ES and in **Section 4 Appendix 15.1 (Volume III)** and **Section 9 Appendix 15.1 (Volume III)** of the NRA which discusses met-ocean impacts based on the Coastal Process Modelling Report completed by HR Wallingford in March 2020.

15.5.3. Marine Traffic Survey

59. This section presents analysis of the maritime traffic survey data within the study area and intersecting the development site. Data have been collected using AIS and radar and cover 2 x two-week periods from 2017 through to 2019; one winter periods and one summer period. Further analysis of historical AIS data from a 6-month period covering from October 2017 to March 2018 was also included.
60. All vessel tracks recorded by AIS and RADAR between 26th August and 19th September 2018 and 5th April and 19th April 2019 are shown in **Figure 15-1 (Volume II)**. Immediately evident is the inshore passage utilised by smaller low-draught vessels such as; recreational craft, workboats and small fishing vessels and the ferry route to the north of the MDZ utilised by Irish Ferries and Stena Line (see **Figure 15-5, Volume II**).

15.5.3.1. Density Analysis

61. Density analysis was undertaken using a fixed Cartesian grid system to count the number of vessel transits through each given 100 m² cell.
62. Vessel transit density from the summer 2017 and winter 2019 radar and AIS surveys is represented within **Figure 15-2 (Volume II)**. The inshore passage and ferry route to the north of the MDZ are clearly evident, demonstrating the highest traffic densities.
63. Vessel transit density per month across the MDZ for the winter 2017 / 2018 period (from AIS only) is depicted in **Figure 15-3 (Volume II)**. It is evident that traffic density of larger vessels carrying AIS is low within the MDZ during winter with <4 transits per month across all sub-zones, with up to 12 transits per month occurring in the northern most 200 m of the MDZ, reflecting the presence of the ferry route there.

15.5.3.1.1. Analysis by Vessel Type

64. Analysis according to vessel type has been undertaken to establish existing traffic patterns within the proposed MDZ. Following assessment of the primary vessel types present within the area, vessel types were grouped in to the categories outlined in **Table 15-9** for analysis.

Table 15-9 Vessel Categories

Ref	Vessel Type Category	Draught	Including
1	Commercial Ship	>3m	Cargo vessels, tankers, dredgers, survey vessels (draught >3m), buoy laying vessels, commercial fishing vessels/ fish carriers.
2	Passenger Vessel	>3m	Ferries, cruise ships
3	Project Vessels	>3m	Cable laying vessels, barges and heavy lift vessels.
4	Fishing Vessel	<3m	Fishing Vessels
5	Recreational Vessel	<3m	Yachts, power boats, kayaks, canoes
6	Other Vessel	<3m	Tugs and tows, survey vessels, RNLI, construction and maintenance vessels, cable laying vessels.

Commercial Ships

65. The tracks of commercial vessels >3 m draught (including cargo, tankers and dredgers) recorded during two-weeks of winter 2019 and two weeks of summer 2017 are shown in **Figure 5-4 (Volume II)**.
66. There was one vessel of this category within the winter dataset; the general cargo vessel *Halenic* (unladen draught 3.2 m, laden draught 5.5 m). This vessel transited 0.2 nm from the western boundary of the MDZ. There were two vessels of this category within the summer dataset; the buoy laying vessel *Patricia* (draught 4.5 m) and the dredger *DEO Gloria* (draught 3.3 m). No tankers were recorded within either dataset.

Passenger Ferries

67. Irish Ferries and Stena Line operate to the north of the proposed MDZ as shown in **Figure 15-6 (Volume II)** and **Figure 15-5 (Volume II)**. Typically, the ferries transit clear of the northern zone boundary, however, occasionally pass within the northern two sub-zones and the western sub-zone during poor weather conditions. A summary of poor weather routing from consultation is given within **Table 15-10**.

Table 15-10 Consultation Feedback in Relation to Poor Weather Routing

Consultee	Feedback
2019 NRA Feedback	
Stena Line	<ul style="list-style-type: none"> ▪ During a SW gale (rare but considered to be the most difficult) 046° line is utilised, which takes the vessel through the MDZ. ▪ Alternative weather routing plus 100 % cargo lashing must be taken with a forecast of >4m waves. ▪ Ferries do not transit near to the tidal race.
Irish Ferries	<ul style="list-style-type: none"> ▪ The ferries will not normally operate in 5m waves. Irish Ferries has a 2.5m sea state limit. ▪ 7° Poor weather route is utilised in SW gales and when sea state is building up to 3.5m significant waves. ▪ Holyhead Deep is considered to be an Area to Be Avoided (ATBA) during high seas as this is the main area of wave build up. ▪ Irish Ferries avoid navigating too close to shore due to wave build up. Irish Ferries never transit closer than half a mile to shore.

	<ul style="list-style-type: none"> Usage of the alternative poor weather routes varies. For example: they were utilised for approximately 3 weeks in 2017 (mainly within November) and 3 days in 2018. Waiting area to the south of the MDZs rarely utilised (2 times in 13 years by the Ulysses and similar usage by Epsilon).
Holyhead Harbour Master	<ul style="list-style-type: none"> Seas in the vicinity of the Holyhead Deep can be particularly rough and the area is avoided by the ferries.
NRA Addendum Stakeholder Feedback	
Chamber of Shipping	<ul style="list-style-type: none"> In terms of poor weather routeing; the changes introduced represent a pretty good compromise in terms of navigation safety.
Irish Ferries and Stena Line	<ul style="list-style-type: none"> The proposed development will prevent the use of certain routes that are only used rarely in particular circumstances, and we can accept this.

68. Six months of AIS data from between October 2017 and March 2018 was sourced to account for any seasonal variances in ferry activity and usage of the poor weather routes. The data includes Class A and Class B vessels.
69. The ferry *Epsilon* is noted in **Figure 15-6 (Volume II)** transiting through the proposed MDZ to anchor at Abrahams Bosom on 03rd March 2018 during ‘the beast from the east’ storm. Although this is considered a rare event (**Table 15-10**), alternative poor weather/emergency anchor routes would likely need to be established, should devices with an UKC of <20 m be deployed within the proposed MDZ.
70. In addition to ferries, five transits were made by four unique cruise ship vessels; *Hebridean Sky* (draught 4.2 m), *Corinthian* (draught 4 m), *Variety Voyager* (draught 3.4 m) and *Balmoral* (draught 2.1 m) within the two-week summer 2017 dataset. The cruise ships, while infrequent, are noted occupying a larger portion of the proposed MDZ and are present within all eight sub-zones. Cruise ships undertake thorough passage planning and, in contrast to ferries, cruise ships may more easily alter passage plans to accommodate offshore infrastructure.

Naval Vessels

71. Naval vessels may not broadcast AIS given the sensitive nature of their operations and, as such, may be under-represented within the datasets. **Figure 15-7 (Volume II)** shows the tracks naval vessels recorded within the summer and winter 2017 surveys.
72. Two transits by one unique vessel, the military training vessel *Smit Don*, were recorded within the proposed MDZ within the winter dataset. One transit by *Smit Don* was recorded within the northern most sub-zone of the proposed MDZ within summer. *Smit Don* has a recorded draught of <3 m.

Other Vessels

73. **Figure 15-8 (Volume II)** shows an assortment of other vessel types which are active near the Project, including; tugs and tows, survey vessels, RNLI vessels, construction and maintenance vessels and cable laying vessels. This vessel category is active across the entirety of the proposed MDZ and is primarily comprised of vessels with draught <3 m. *MV Seekat C* is noted

undertaking Project related surveys within the summer dataset with other category vessels more prolific in summer than in winter.

Fishing Vessels

74. This section analyses the fishing vessel activity in the study area, based on the maritime traffic survey. Further information is provided in **Chapter 14, Commercial Fisheries**.
75. Holyhead is one of three main commercial fishing ports in Wales. The tracks of fishing vessels during summer and winter from radar and AIS are given in **Figure 15-9 (Volume II)**. The Admiralty Sailing Directions (ASD)¹ details that within this region, inshore trawlers *'may be encountered at any time in depths of 25 m to 35 m' and that pots may be found up to 10 miles offshore*. The tracks within the inshore passage and those actively fishing within the eastern portion of the proposed MDZ are comprised of smaller fishing vessels that do not carry AIS while the majority of fishing vessels on transit are larger vessels carrying AIS. It is noted that vessels engaged in fishing are more prevalent within summer than winter where the majority of vessels are on transit through the proposed MDZ.
76. Fishing data from AIS and radar has been supplemented by fishing intensity data as recorded by the MMO using the Vessel Monitoring System (VMS). VMS is required on vessels greater than 15 m Length Over-All LOA and effort is presented in kW hours (kWh) (calculated by multiplying the time associated with each VMS report in hours by the engine power of the vessel concerned at the time of the activity).
77. Fishing intensity from VMS in the vicinity of the MDZ is shown within **Figure 15-10 (Volume II)**. Intensity is determined to be low at less than 20,000 kWh per year, particularly to the west of the MDZ where the intensity falls to <5,000 kWh per year.

Recreational Vessels

78. The tracks of recreational vessels are given within **Figure 15-11 (Volume II)**. Most tracks are concentrated close to shore with small recreational craft, including yachts, primarily utilising the inshore passage to the east of the MDZ. The density of recreational vessels increases substantially in summer where the area occupied by these vessels is much greater, overlapping the eastern portion of the proposed MDZ, particularly in the vicinity of South Stack. In consultation with the recreational users and RYA in November 2018, August was described as the busiest month as a result of favourable weather conditions and the school holidays. The increase in activities in August were reported to be mainly confined to the inshore waters between Holyhead and Trearddur Bay/Penrhos Bay. This additional activity has been taken into account within the scoring of navigational risk. In light of this feedback, the RYA Coastal Atlas of Recreational Boating (CA) which depicts mean recreational vessel transits in summer 2014

¹ United Kingdom Hydrographic Office - Admiralty Sailing Directions : West Coast of England Pilot (2014) , NP37, 19th Edition, Chapter 7 – North-West Coast of Wales Including The Island of Anglesey and the Menai Strait.

and 2017 was obtained to supplement the summer recreational AIS and RADAR data **Figure 15-15 (Volume II)** and is further discussed below.

79. The presence of a western route was noted by local recreational stakeholders and the RYA in consultation. It was reported by local recreational stakeholders that ‘tracks transiting SW / NE through site are from Bardsey Island and Cork’ and by the RYA that ‘members indicate that the Western Offshore route is normally used as part of passage planning from Liverpool and Holyhead to Bardsey Bay² Recreational vessels are noted in **(Appendix 15.1 (Volume III) Error! Reference source not found.)** transiting NE/SW through the MDZ, however, by comparison to the inshore route, vessel transit density in the western route is noted to be low. This is in-keeping with the feedback obtained during consultation with local recreational representatives that ‘usage of this route is limited in comparison to the inshore route. The primary concern is the restriction of the inshore passage which is essential to recreational vessels’.
80. Activities of small un-powered recreational craft such as kayaks, canoes and small dinghies, similarly to sailing vessels, were reported in consultation to operate primarily close inshore within the inshore passage; ‘the zonation of the MDZ as indicated in **(Appendix 15.1 (Volume III) Error! Reference source not found.)** should not itself impede passage around the Stacks by kayak’. This is further corroborated by **(Appendix 15.1 (Volume III) Error! Reference source not found.)** which demonstrates kayak transits within the inshore route and close to shore.
81. The RYA UK Coastal Atlas of Recreational Boating (CA) provides relative AIS intensity data, general boating areas, and locations of clubs and training centres. The CA utilises AIS data from the summers of 2014 and 2017, to indicate the intensity of boating activity per 0.25 km x 0.25 km unit area in coastal waters around the UK³ The mean values of the total count of AIS intersections over the two summer periods are utilised with zero values eliminated. A log10 is then taken of the relative density counts to give an ‘intensity of use’ to prevent high-use areas, such as the Solent, from masking the density outputs of other regions and to accurately portray the routes utilised by recreational vessels.
82. It is noted that the CA dataset is limited in that it only represents vessels that carry AIS transponders, which may exclude a large proportion of small un-powered recreational craft; ‘*it is assumed that areas close inshore and in many estuaries are frequented by vessels that are small⁴*’. General boating polygon areas are provided to compliment the AIS data. These polygons were generated utilising racing information from the RYA’s previous dataset and information acquired from clubs and other sources in 2015 (see **Appendix 15.1 (Volume III) Error! Reference source not found.)** replacing the 2012 dataset that ‘*cover large expanses of the coastline, and give less information than the AIS data as they indicate no intensity of use⁵*’ **Figure 15-15 (Volume II)**.

² FEI - OBJ013 (2020) Transport and Works Act (TWA) order application TWA/3234121

³ RYA UK Coastal Atlas of Recreational Boating 2.1 User Guide

⁴ RYA UK Coastal Atlas of Recreational Boating 2.1 User Guide

⁵ RYA UK Coastal Atlas of Recreational Boating 2.1 User Guide

83. By comparison to the general boating areas indicated in (**Appendix 15.1 (Volume III)** Error! Reference source not found.) those shown in (**Appendix 15.1 (Volume III)** Error! Reference source not found.) coincide with the views expressed during stakeholder consultation and corroborates the determination from AIS, RADAR and local stakeholder consultation and the CA AIS data that utilisation of the western route is limited in comparison to that of the inshore areas.

Analysis by Vessel Length

84. Vessel transits by LOA from AIS between 1st October 2017 and 31st March 2018 are shown in **Figure 15-12 (Volume II)**. The majority of vessels transiting through the MDZ are <21 m LOA corresponding to; recreational, fishing and other vessel categories. All vessels transiting through the proposed MDZ with a LOA >167 m transited within the northern most two sub-zones and the western-most sub-zone with the exception of *Epsilon* (see **Figure 15-6, Volume II**) which transited through the proposed MDZ to anchor at Abrahams Bosom on 3rd March 2018.

Maritime Incidents

85. **Figure 15-13 (Volume II)** shows marine accidents investigated by the MAIB in proximity to the MDZ between 1997 and 2017. There were 14 separate MAIB incidents recorded within 1 nm, of which, one is considered navigationally significant; a collision between a fishing boat and a recreational dive boat on 31st August 2015. The incident was described by the MAIB as follows:
*'Collision between a dive RHIB and fishing vessel - A diving boat had divers in the water and was stationary displaying the appropriate flag, when a fishing vessel came towards them at speed and despite seeing the diving vessel did not slow down.'*⁶
86. It was noted during consultation with the RNLI Holyhead in November 2018 that an incident had occurred at the adjacent Minesto operated Holyhead Deep tidal energy site, whereby a yacht made contact with a project buoy resulting in loss of the radar reflector on the buoy and the mast of the yacht.
87. RNLI Callouts are shown within **Figure 15-14 (Volume II)**. A total of 125 callouts occurred within 1 nm of the proposed MDZ, or approximately 16 per year. Of these, 56 callouts (45 %) involved recreational vessels, and 10 or 8 % involved fishing vessels. 9 % of callouts were in response to a person in the water and 25 % were in response to persons stranded on the adjacent beach cliffs. One callout was in response to a military vessel that experienced a machinery failure. 23 % of callouts reported machinery failure as the cause for assistance. 50 % of callouts were answered by Holyhead Lifeboat station and 50 % by Trearddur Bay Lifeboat station.
88. A total of 21 callouts occurred within the MDZ, of which, 12 or 57 % were in response to recreational vessels. 50 % of callouts within the MDZ occurred in 2008 and 2012, the busiest years for callouts. There were two callouts per year between 2014 and 2016 within the MDZ.

⁶ Marine Accident Investigation Branch (2015)

15.6. IMPACT ASSESSMENT

15.6.1. Overview of Potential Impacts

89. The main navigation effects of the MDZ are assessed as:

- Restriction of vessel navigation; and
- Increased risk of vessel allision, between vessels and the tidal devices (surface piercing superstructures and subsea elements), and collision between vessels and other vessels due to reduced sea room.

90. **Table 15-11** provides a list of the potential impacts on Shipping and Navigation that may arise during activities undertaken during each phase of the Project.

Table 15-11 Potential Impacts of the Project Phases on Shipping and Navigation

Phase	Potential Impact
Construction (including Repowering)	Impact 1: Potential Impacts on commercial vessels (safe operations) Impact 2: Potential Impacts on commercial vessel routing Impact 3: Potential impacts on passenger vessels (safe operations) Impact 4: Potential impacts on passenger vessel routing Impact 5: Potential impacts on commercial fishing vessels Impact 6: Potential impacts on recreational craft (Including powered and un-powered recreational vessels. Impact 7: Potential impacts on other vessels Impact 8: Potential impacts on emergency response operations Impact 9: Subsea export cables Impact 10: Potential impacts on project vessels
Operation and Maintenance	Impact 1: Potential impacts on commercial vessels (safe operations) Impact 2: Potential impacts on commercial vessel routing Impact 3: Potential impacts on passenger vessels (safe operations) Impact 4: Potential impacts on passenger vessel routing Impact 5: Potential impacts on commercial fishing vessels Impact 6: Potential impacts on recreational craft (Including powered and un-powered recreational vessels. Impact 7: Potential Impacts on other vessels Impact 8: Potential impacts on emergency response operations Impact 9: Subsea export cable
Decommissioning	Impact 1: Potential Impacts on commercial vessels (safe operations) Impact 2: Potential Impacts on commercial vessel routing Impact 3: Potential impacts on passenger vessels (safe operations) Impact 4: Potential impacts on passenger vessel routing Impact 5: Potential impacts on commercial fishing vessels Impact 6: Potential impacts on recreational craft (Including powered and un-powered recreational vessels. Impact 7: Potential impacts on other vessels

	Impact 8: Potential impacts on emergency response operations Impact 9: Subsea export cables
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15.6.2. Worst Case Parameters

91. In order to assess the potential impact of the MDZ on shipping and navigation, a worst-case layout (including both surface and sub-surface) has been assumed throughout the Navigation Risk Assessment. As a finalised layout was not available for the assessment, the NRA assumes any combination of device types may be deployed up to a maximum 240 MW (worst-case capacity).

Table 15-12 NRA Assumptions

Assumption	Description
Utilisation of worst-case maximum capacity (240 MW)	A Project Design Envelope (PDE) approach to consent is sought for an array of up to 240MW installed capacity. Therefore, a device specific layout has not been provided prior to undertaking the NRA. Full deployment to a worst-case of 240 MW could comprise up to a maximum of 6,201 tidal devices, supporting up to 1,648 TECs and up to 740 inter-array cables within the MDZ.
Any device type may be deployed within any zone in accordance with embedded required minimum UKC.	The Project will install multiple technology types; therefore, the consent application will be based on the Project Design Envelope (Rochdale Envelope) approach. Device types will be determined through consideration of the direction of future developments and technology. The deployment of any device within any zone of the MDZ in line with embedded minimum UKC requirements has been considered to represent the worst case.
Each single array will be comprised of the same type of tidal device / technology.	Each array will consist of uniform device/ technology types of approximately 30 MW installed capacity per array.
Maximum 9 x 33 kV export cables	A series of seabed installed cables will be laid between individual offshore electrical hubs and the landfall location. The cable routes have not yet been determined, however, they will make landfall at Abrahams Bosom.
Embedded mitigation measures are in place prior to construction	Embedded mitigation listed within Appendix 15.1 (Volume III) are assumed to be in place and as such are reflected in the scores.
Displaced traffic due to MDZ.	Hazard assessment informed by traffic analysis assumes the worst-case displacement of traffic into the areas around the MDZ.

15.6.2.1. Construction Programme

92. The construction of offshore works (for installation of tidal devices and associated cabling and infrastructure) would be phased over a period of several years, taking up to 15 days per device or hub and up to 1.5 days for each inter-array cable, up to 20 days for each offshore cable, and up to 12 days for each phase of cable protection. Up to nine separate cable laying and protection campaigns are possible. The HDD at the landfall would be completed over a four- to six-month period with two months for offshore cable tail installation.

15.6.2.2. Repowering

93. For the purpose of defining impact assessment parameters for the repowering phase, an assumption has been made that 50 % of the tenants will undertake repowering, i.e. for 50 % of the tenants, their infrastructure will be removed and replaced (potentially with different

infrastructure by a different tenant). For the other 50 % of tenants, their infrastructure will remain over the lifetime of the Project.

15.6.2.3. Embedded Mitigation

94. Mitigation and safety measures will be applied to the development appropriate to the level and type of risk determined during the EIA. Possible specific additional mitigation measures to be employed will be selected in consultation with the MCA navigation safety branch and other relevant statutory stakeholders where required, dependent on the final design.
95. Embedded mitigation measures are described further in the NRA (**Appendix 15.1, Volume III**) and will be in place throughout the relevant phases of the Project. Possible additional mitigation measures are described further in the NRA (**Appendix 15.1, Volume III**).
96. These embedded mitigation measures are (see **Appendix 15.1, Volume III** for further information):
- Compliance with applicable guidance and regulations (including COLREGs and SOLAS);
 - Promulgation of information to local stakeholders (including via Notice to Mariners (NTM) and other appropriate Maritime Safety Information (MSI) dissemination methods.
 - Selection of appropriate construction/decommissioning and maintenance vessels;
 - Incidents and near misses are reported and investigated by developer and operators;
 - Ensuring devices marked as per International Association of Lighthouse Authorities (IALA) Guidance and Aids to Navigation and in accordance with Trinity House;
 - Global Positioning System off station alarm / Supervisory Control and Data Acquisition (SCADA) monitoring system;
 - Surveyed and charted as required by United Kingdom Hydrographic Office;
 - Formulation and implementation of an Emergency Response Co-operation Plan (ERCoP);
 - Passage plans for construction/decommissioning and maintenance craft; and
 - Consideration of weather and sea state during construction/decommissioning planning;
 - Devices >8m minimum UKC below CD to be deployed within the blue zone;
 - Devices >20m minimum UKC below CD deployed within the purple zone.

15.6.3. Potential Impacts During Construction

15.6.3.1. Construction Impact 1: Potential Impacts on Commercial Vessels (Safe Operations)

97. The winter marine traffic survey only identified one commercial vessel >3 m draft and the summer marine traffic surveys only two commercial vessels >3 m draft within the study area at the time of the studies; one of which (the *MZV Equator*) was transiting within the Off Skerries TSS well clear of the MDZ.
98. Traffic is most dense offshore across the most northern part of the MDZ. The main flow of commercial vessels was southwest / northeast and vice versa transiting through all zones of the MDZ. One of the commercial vessels intersecting the MDZ was a dredger. This vessel was transiting northwest, destination Garston.
99. The impacts potentially associated with commercial vessels were raised at the consultation meetings with the Chamber of Shipping, see **Appendix 15.1 (Volume III)**.
100. Potential impacts may also affect ports or harbours utilised / in the vicinity of MDZ traffic, dependent on where staging areas are to be located.
101. During the construction phases there would be an increase in marine traffic associated with the vessels required to carry out these operations. This could increase the risk to other vessels operating within proximity of the offshore site or those vessels engaged in the construction phase. It is also possible that there could be an increased risk of vessels colliding with the tidal devices, due to the fact that either the devices are part constructed/decommissioned or navigational aids (e.g. lights and markings) may not all be present.
102. Close consultation and co-operation with ports where construction vessels or operations are to be based will reduce the potential for impacts.
103. Potential impacts identified as part of the assessment include:
 - Contact: Commercial Ship with Surface Device;
 - Contact: Commercial Ship with Mid-Water Device (<8 m below CD);
 - Contact: Commercial Ship with Mid-Water Device (>8 m below CD);
 - Contact: Commercial Ship with Sea-Bed Device >20 m UKC;
 - Contact Commercial Ship with Electrical Hubs;
 - Collision: Commercial Ship ICW Commercial Ship;
 - Collision: Commercial Ship ICW Passenger Vessels;
 - Collision: Commercial Ship ICW Project Vessels;
 - Collision: Commercial Ship ICW Fishing Vessel;

- Collision: Commercial Ship ICW Powered Recreational Vessel;
- Collision: Commercial Vessel ICW Un-Powered Recreational Vessel;
- Collision: Commercial Ship ICW Other Vessel;
- Snagging/ Obstruction: Commercial Ship; and
- Breakout of device / device not at stated depth

104. The overall severity of consequences for the construction phase are considered to be moderate (C3) due to the potential for notable damage to infrastructure / vessel(s) and interruption to construction (including impacts on businesses). The frequency of occurrence is considered remote (F1) due to low vessel density and the presence of embedded mitigations.

105. This indicates an overall risk ranking of (C3 x F1) = **Low Risk**. An exception is Breakout of device / device not at stated depth (C2 X F4) = **ALARP**.

15.6.3.1.1. Additional Mitigation

106. Associated possible additional mitigation measures that could be utilised, as identified in the NRA, include:

- Continuous Monitoring by Marine Co-ordination Centre;
- Restrict Navigation through the gold and green MDZ zones;
- Appropriate alignment and spacing of arrays and devices;
- Use of guard vessel(s) to monitor passing traffic;
- Implementation of Safety Zones;
- Temporary navigation aids as required by Trinity House;
- Undertake device specific NRA's to include NavAids prior to deployments, i.e. once exact locations and scale/type of device deployment is known; and
- Check device surveys.

15.6.3.1.2. Residual Impact

107. If all the mitigations measures as detailed are utilised then the overall impact would be reduced but would still remain as **Low Risk**.

15.6.3.2. Impact 2: Potential Impacts on Commercial Vessel Routing

108. Very few commercial vessels intersected the development site (**Appendix 15.1, Volume III**).

109. As already noted, there would be increased activity associated with these phases at the offshore site. There would also be deviations for transiting traffic associated with the avoidance of any

rolling navigational safety zones in use. However, the early notification of the works through the promulgation of information will ensure that all receptors, including regular operators, are kept informed, enabling them to safely passage plan and anticipate the works taking place.

110. Potential impacts identified as part of the assessment include:

- Impact on Commercial Vessel Routing – Commercial vessel forced to take alternative route due to presence of the site.

111. The overall severity of consequences for the construction phases are considered to be minor (C2). The frequency of occurrence is considered Remote (F1) due to the presence of embedded mitigations. This indicates an overall risk ranking of (C2 x F1) = **Low Risk**.

15.6.3.2.1. Additional Mitigation

112. Associated additional embedded mitigation measures that could be utilised would be as shown for Impact 1 (**Section 15.6.3.1**).

15.6.3.2.2. Residual Impact

113. If all the mitigations measures as detailed are utilised then the overall impact would be reduced but would still remain as **Low Risk**.

15.6.3.3. Impact 3: Potential Impacts on Passenger Vessels (Safe Operations)

114. Irish Ferries and Stena Line ferries operate to the north of the proposed MDZ as shown in **Appendix 15.1 (Volume III)**. Typically, the ferries transit clear of the northern zone boundary; however, occasionally pass within the northern two sub-zones and the western sub-zone during poor weather conditions. A summary of poor weather routing from consultation is given within **Appendix 15.1 (Volume III)**.

115. Traffic is most dense offshore across the most northern part of the MDZ. The main flow of passenger vessels was east / west and vice versa, as expected given the ferries routes in this area. In addition to ferries, five transits were made by four unique cruise ship vessels; Hebridean Sky (draught 4.2m), Corinthian (draught 4m), Variety Voyager (draught 3.4m) and Balmoral (draught 2.1m) within the two-week summer 2017 dataset. The cruise ships, while infrequent, are noted occupying a larger portion of the proposed MDZ. *Epsilon* is noted in **Appendix 15.1 (Volume III)** transiting through the proposed MDZ to anchor at Abrahams Bosom on 03rd March 2018 although this is considered a rare event.

116. The impacts potentially associated with passenger vessels were raised at the consultation meetings with the Ferry Companies, Holyhead Harbour Master and the Chamber of Shipping, see **Appendix 15.1 (Volume III)**.

117. Potential impacts may also affect ports or harbours utilised / in the vicinity of MDZ traffic, dependent on where staging areas are to be located.

118. During the construction phases there would be an increase in marine traffic associated with the vessels required to carry out these operations. This could increase the risk to other vessels

operating within proximity of the offshore site or those vessels engaged in the construction phase. It is also possible that there could be an increased risk of vessels alliding with the tidal devices, due to the fact that either the devices are part constructed/ or navigational aids (e.g. lights and markings) may not all be present.

119. Close consultation and co-operation with ports where construction vessels or operations are to be based will reduce the potential for impacts within port limits.

120. Potential impacts identified as part of the assessment include:

- Contact: Passenger Vessels with Surface Device;
- Contact: Passenger Vessels with Mid-Water Device (<8m below CD);
- Contact: Passenger Vessels with Mid-Water Device (>8m below CD);
- Contact: Passenger vessel with Electrical Hubs;
- Collision: Passenger Vessels ICW Commercial Ship;
- Collision: Passenger Vessels ICW Passenger Vessels;
- Collision Passenger Ship ICW Project Vessel;
- Collision: Passenger Vessels ICW Fishing Vessel;
- Collision: Passenger Vessels ICW Powered Recreational Vessel;
- Collision: Passenger Vessels ICW Un-Powered Recreational Vessels;
- Collision: Passenger Vessels ICW Other Vessel;
- Snagging / Obstruction: Passenger Vessels; and
- Breakout of device / device not at stated depth.

121. The overall severity of consequences for the construction phases are considered to be moderate (C3) due to the potential for notable damage to infrastructure / vessel(s), possible pollution and interruption to construction (including impacts on businesses). The frequency of occurrence is considered unlikely (F2) due to the presence of embedded mitigations. This indicates an overall risk ranking of (C3 x F2) = **Low Risk**. Exceptions are Contact Passenger Vessels with Mid-Water Device (<8m below CD) where the increased (F3) frequency gives a risk ranking (C3 X F3) = **ALARP**; Collision Passenger Vessel ICW Passenger Vessel (C4 X F1) = **ALARP** and Breakout of device / device not at stated depth (C2 X F4) = **ALARP**.

15.6.3.3.1. Additional Mitigation

122. Associated possible additional mitigation measures that could be utilised, as identified in the NRA, include:

- Continuous Monitoring by Marine Co-ordination Centre;

- Restrict Navigation through the gold and green MDZ zones;
- Appropriate alignment and spacing of arrays and devices;
- Check device surveys;
- Redesign the Northern Boundary;
- Use of guard vessel(s) to monitor passing traffic;
- Implementation of Safety Zones;
- Temporary navigation aids as required by Trinity House;
- Undertake device specific NRA's including NavAids prior to deployments, i.e. once exact locations and scale/type of device deployment is known; and
- Minimise use of marker buoys in zones of minimum UKC.

15.6.3.3.2. Residual Impact

123. If all the mitigations measures as detailed are utilised then the overall impact would be reduced but would still remain as **Low Risk**. Similarly, if the mitigation measures as detailed are utilised Contact Passenger Vessels with Mid-Water Device (<8m below CD) and Breakout of device / device note at stated depth would be reduced to **Low Risk**. An exception is Collision: Passenger Vessel ICW Passenger Vessel which remains as **ALARP** driven by major (C4) Consequences.

15.6.3.4. Impact 4: Potential Impacts on Passenger Vessel Routing

124. Whilst cruise ships are seen to intersect the development site (**Appendix 15.1, Volume III**); they undertake thorough passage planning and, in contrast to ferries, cruise ships may more easily alter passage plans to accommodate offshore infrastructure.
125. Ferries frequently intersected the development site (**Appendix 15.1, Volume III**) to the north of the MDZ and, during poor weather, ferries were seen transiting right across the MDZ.
126. The introduced zone of 20m minimum UKC (purple zone **Appendix 15.1, Volume III**) to the north of the MDZ has increased the area for safe navigation of vessels, particularly of >3m draught including for ferries during both fair and poor weather routeing and reduced the impacts to passenger vessel routeing.
127. As already noted, there would be increased activity associated with these phases at the offshore site. There would also be deviations for transiting traffic associated with the avoidance of any rolling navigational safety zones in use. However, the early notification of the works through the promulgation of information will ensure that all receptors, including regular operators, are kept informed, enabling them to safely passage plan and anticipate the works taking place. This would potentially require discussions with the ferry companies to look at alternate poor weather routing if possible, or staging the construction works to the north and west of the MDZ during the summer period, as is likely, to avoid the increase in poor weather routing during the winter.

128. Potential impacts identified as part of the assessment include:
129. Impact on Passenger Vessel Routing – Passenger vessel forced to take alternative route due to presence of the site. The overall severity of consequences for the construction phase are considered to be moderate (C2). The frequency of occurrence is considered Possible (F3) due to the proximity of the MDZ with ferry standard operational routeing and interaction with poor weather routing. This indicates an overall risk ranking of (C2 x F3) = Low Risk.

15.6.3.4.1. Additional Mitigation

130. Associated additional embedded mitigation measures that could be utilised would be as shown for Impact 3 (**Section 15.6.3.3.1**) with the addition of:
- Provisions made for continued use of ferry poor weather routing or alternative routes to be established.

15.6.3.4.2. Residual Impact

131. If all the mitigation measures as detailed are utilised then the residual impact would be reduced but would remain **Low Risk**.

15.6.3.5. Impact 5: Potential Impacts on Fishing Vessels

132. Holyhead is one of three main commercial fishing ports in Wales. Catch types within the vicinity of the MDZ include; velvet crab, lobster, green shore crab, whelks, scallops and skate. Fishing activity in the MDZ, as indicated by local fishermen, is dominated by static gear, which are used to target shellfish species. Prawns also feature highly in the MMO landings data (MMO, 2018), as well as bass. Skate were also highlighted as a key species during consultation. There is generally no pelagic fishing due to no quotas being available to fish species here.
133. Three receptor groups were used in the Commercial Fisheries Assessment, A) $\leq 10\text{m}$ nearshore static gear vessels targeting crab/lobster in the nearshore region; B) $\leq 10\text{m}$ and $>10\text{m}$ static gear vessels targeting whelk/crab/lobster in the MDZ; and C) $>10\text{m}$ mobile gear vessels targeting whitefish and/or scallops in the MDZ and surrounding area (see **Chapter 14, Commercial Fisheries**).
134. The tracks of fishing vessels during summer and winter from radar and AIS are given in **Appendix 15.1 (Volume III)** and show that tracks within the inshore passage and those actively fishing within the eastern portion of the proposed MDZ are comprised of smaller fishing vessels that do not carry AIS while the majority of fishing vessels on transit are larger vessels carrying AIS.
135. Fishing intensity from VMS in the vicinity of the MDZ is shown within **Appendix 15.1 (Volume III)**. Intensity is determined to be low at less than 20,000 kWh per year, particularly to the west of the zone where the intensity falls to $<5,000$ kWh per year.
136. Both the MMO data and observations during the marine traffic surveys indicated that the fishing vessels engaged in potting (static gear) were the most common vessels in proximity to the

development site. Larger vessels carrying AIS with other gear types do not seem to operate in the area and were only observed on transit through the MDZ.

137. Static gear fishing vessels are regular users of the area in general, weather and conditions dependent, and operate with no notable impact on the other receptors transiting the area. These static gear vessels were densest between the development site boundary and the shore, in keeping with the gear being used.
138. The impacts potentially associated with fishing vessels were raised at the consultation meetings with the Welsh Fishing Association and Holyhead Harbour Master, see **Appendix 15.1 (Volume III)**.
139. Potential impacts identified as part of the assessment include:
- Contact: Fishing Vessels with Surface Device;
 - Contact: Fishing Vessel with Mid-Water Device (<8m below CD);
 - Contact: Fishing Vessel with Electrical Hubs;
 - Collision: Fishing Vessel ICW Commercial Vessel;
 - Collision: Fishing Vessel ICW Passenger Vessel;
 - Collision: Fishing Vessel ICW Project Vessel;
 - Collision: Fishing Vessel ICW Fishing Vessel;
 - Collision: Fishing Vessel ICW Powered Recreational Vessel;
 - Collision: Fishing Vessel ICW Un-Powered Recreational Vessel;
 - Collision: Fishing Vessel ICW Other Vessel;
 - Grounding / Forced Ashore: Fishing Vessel;
 - Swamping / Capsize: Fishing Vessel;
 - Snagging/ Obstruction: Fishing Vessel; and
 - Breakout of device / device not at stated depth.
140. Due to the gear type and activity of fishing vessels operating in proximity to the development site, the subsea structures present a risk with regard to interaction between devices and fishing gear. There is also risk posed by works traffic transiting to / from the development site.
141. The overall severity of consequences for the construction phase are considered to be minor (C2) due to the potential for notable damage to infrastructure / vessel(s) and interruption to construction (including impacts on businesses). The frequency of occurrence is considered Likely(F4). This indicates an overall risk ranking of (C2 x F4) = **ALARP**.

15.6.3.5.1. Additional Mitigation

142. Associated possible additional mitigation measures that could be utilised, as identified in the NRA, include:

- Continuous Monitoring by Marine Co-ordination Centre;
- Restrict Navigation through the gold and green MDZ zones;
- MDZ designation as a No Fishing Zone;
- Only deploy devices that allow at least 8 m UKC along eastern boundary;
- Re-design eastern boundary of the MDZ;
- Appropriate alignment and spacing of arrays and devices;
- Check Device Surveys;
- Use of Guard vessel(s) to monitor passing traffic;
- Enhanced cable protection;
- Establish no anchoring zones;
- Implementation of Safety Zones;
- Temporary navigation aids as required by Trinity House;
- Undertake device specific NRA's including NavAids prior to deployments, i.e. once exact locations and scale/type of device deployment is known;
- Provision of life saving equipment on fixed structures and floating devices; and
- Minimise use of marker buoys in zones of minimum UKC.

15.6.3.5.2. Residual Impact

143. Mid Water Devices <8m below CD present a great risk to commercial fishing vessels due to the potential for snagging/obstruction. This is best reduced by considering restricting fishing within the MDZ. The frequency of occurrence could then be reduced to unlikely (F2) and an overall risk ranking of (C2 x F2) = **Low Risk**.

15.6.3.6. Impact 6: Potential Impacts on Recreational Craft

144. Recreational craft includes a variety of vessels, all generally have similar characteristics; small in size with relatively shallow keels (<3m) including yachts, powerboats, kayaks and canoes.

145. Recreational craft are highly influenced by season, daylight, fair weather and tidal conditions. This insight is consistent with the observations of the marine traffic survey, where during the summer, gate analysis (**Appendix 15.1, Volume III**) identified 52 % of all transits were by

recreational craft making them the most prolific receptor, both in proximity to the development site and intersecting the development site.

146. Most tracks for recreational vessels are concentrated close to shore with craft, including yachts, primarily utilising the inshore passage to the east of the MDZ. The density of recreational vessels increases substantially in summer where the area occupied by these vessels is much greater, overlapping the eastern portion of the proposed MDZ. In consultation, August was described as the busiest month as a result of favourable weather conditions and the school holidays. It is likely therefore that the vessel track analysis underrepresents the recreational vessel activity in the summer months and vessel traffic may be more numerous around late July and August during the days with planned events taking place such as Holyhead and Trearddur Bay Sailing Club Races events during the summer. In light of this, the RYA Coastal Atlas of Recreational Boating which depicts mean recreational vessel transits in summer 2014 and 2017 was obtained to supplement the summer recreational AIS and RADAR data (**Appendix 15.1 (Volume III) Figure 13**) and was considered withing the assessment of navigation risk.
147. The impacts potentially associated with recreational vessels were raised at the consultation meetings with the Recreational Users, the RYA and the RNLI see **Appendix 15.1 (Volume III)**.
148. As noted for other receptors, recreational craft are also susceptible to the impacts associated with construction activities. Although, less so to partially constructed / installed devices, as long as there is sufficient UKC.
149. Potential impacts identified as part of the assessment include:
- Contact Powered Recreational Vessel with Surface Device;
 - Contact Un-Powered Recreational Vessel with Surface Device;
 - Contact Powered Recreational Vessel with Mid-Water Device (<8m below CD);
 - Contact Un-Powered Recreational Vessel with Mid-Water Device (<8m below CD);
 - Contact: Powered Recreational Vessel with Electrical Hub;
 - Contact: Un-Powered Recreational Vessel with Electrical Hub;
 - Collision: Powered Recreational Vessel ICW Commercial Vessel;
 - Collision: Un- Powered Recreational Vessel ICW Commercial Vessel;
 - Collision: Powered Recreational Vessel ICW Passenger Vessel;
 - Collision: Un-Powered Recreational Vessel ICW Passenger Vessel;
 - Collision: Powered Recreational Vessel ICW Project Vessel;
 - Collision: Un-Powered Recreational Vessel ICW Project Vessel;
 - Collision: Powered Recreational Vessel ICW Fishing Vessel;

- Collision: Un-Powered Recreational Vessel ICW Fishing Vessel;
- Collision Powered Recreational Vessel ICW Powered Recreational Vessel;
- Collision Powered Recreational Vessel ICW Un-Powered Recreational Vessel;
- Collision Powered Recreational Vessel ICW Other Vessel;
- Collision Un-Powered Recreational Vessel ICW Other Vessel;
- Grounding/Forced Ashore: Powered Recreational Vessel;
- Grounding/ Forced Ashore: Un-Powered Recreational Vessel;
- Swamping / capsize: Powered Recreational Vessel;
- Swamping / capsize: Un-Powered Recreational Vessel;
- Snagging/ Obstruction Powered Recreational Vessel; and
- Breakout of device / device not at stated depth

150. The overall severity of consequences for the construction phase are considered to be minor (C2). The frequency of occurrence is considered possible (F3). This indicates an overall risk ranking of (C2 x F3) = Low with the exception of; , Grounding / Forced Ashore: Powered Recreational Vessel (C3 x F4), Collision: Powered Recreational Vessel ICW Other Vessel (C2 x F4), Contact Powered Recreational Vessel with Mid-Water Device (<8m below CD) (C2 x F4), Swamping / Capsize Un-Powered Recreational Vessel (C2 x F4), Collision Powered Recreational Vessel ICW Powered Recreational Vessel (C2 x F4) and Breakout of device / device not at stated depth (C2 x F4) which was scored as ALARP. Additional mitigation measures should be considered to further reduce these hazards scoring as ALARP.

15.6.3.6.1. Additional Mitigation

151. Associated possible additional mitigation measures that could be utilised, as identified in the NRA, include:
- Continuous Monitoring by Marine Co-ordination Centre;
 - Restrict Navigation through the Gold and Green MDZ Zones;
 - Appropriate alignment and spacing of arrays and devices;
 - Ensure regular programme of device condition surveys;
 - Use of guard vessel(s) to monitor passing traffic;
 - Establish no anchoring areas;
 - Enhanced cable protection;

- Implementation of Safety Zones;
- Temporary navigation aids as required by Trinity House;
- Undertake device / array specific NRA's including NavAids prior to deployments, i.e. once exact locations and scale/type of device deployment is known; and
- Provision of life saving equipment on fixed structures and floating devices;
- Minimise use of marker buoys in zones of minimum UKC.

15.6.3.6.2. Residual Impact

152. Re-designing the eastern boundary of the MDZ was considered as a possible additional mitigation measure but was excluded as it was considered an unacceptable measure effecting the viability of the development. Therefore, this additional mitigation measure has not been included when assessing the residual impact.
153. If all the mitigation measures as detailed are utilised, with the exception of redesigning the eastern boundary, then the overall impact would be reduced to **Low Risk**.

15.6.3.7. Impact 7: Potential Impacts on Other Vessels

154. The professional nature of the vessels engaged in the operations associated with these phases will ensure this risk is as low as possible. The types of small vessels which may be used in the project construction phase would be SOLAS (and other relevant conventions / codes) compliant. They would be operating in line with their safety management system (SMS) and using the appropriate Personal Protective Equipment (PPE).
155. Potential impacts identified as part of the assessment include:
- Contact Other Vessel with Surface Device;
 - Contact Other Vessel with Mid-Water Device (<8m below CD);
 - Collision: Other Vessel ICW Commercial Vessel;
 - Collision: Other Vessel ICW Passenger Vessel;
 - Collision: Other ICW Project Vessel;
 - Collision: Other Vessel ICW Fishing Vessel;
 - Collision: Other Vessel ICW Powered Recreational Vessel;
 - Collision: Other Vessel ICW Un-Powered Recreational Vessel;
 - Collision: Other Vessel ICW Other Vessel;
 - Grounding / Forced Ashore: Other Vessel;

- Swamping / Capsize / Other Vessel;
- Snagging/ Obstruction Recreational Vessel; and
- Breakout of device / device not at stated depth.

156. The overall severity of consequences for the construction phases are considered to be minor (C2) due to the potential for loss of life and notable damage to vessel(s). The frequency of occurrence is considered likely (F4) due to the presence of embedded mitigations. This indicates an overall risk ranking of $(C2 \times F4) = \text{ALARP}$.

15.6.3.7.1. Additional Mitigation

157. Associated additional mitigation measures that could be utilised, as identified in the NRA, include:

- Continuous Monitoring by Marine Co-ordination Centre;
- Restrict Navigation through the gold and green MDZ zones;
- Check device surveys;
- Establish no anchoring areas;
- Use of guard vessel(s) to monitor passing traffic; and
- Temporary navigation aids as required by Trinity House.

15.6.3.7.2. Residual Impact

158. If all the mitigation measures as detailed are utilised then the overall impact would be reduced to **Low Risk**.

15.6.3.8. Impact 8: Potential Impacts on Emergency Response Operations

159. The device types and tidal technologies covered within the Project Design Envelope, as noted within **Chapter 4, Project Description** are such that they present less of an obstruction to aerial SAR activities than other renewable technologies (OWF's). However, as highlighted in consultation with the MCA appropriate alignment and spacing of devices is key to SAR operations and clear lines of sight and navigational channels between devices to maintain SAR access especially at night.

160. The impacts potentially associated with Emergency Response vessels were raised at the consultation meetings with the RNLI and MCA see **Appendix 15.1 (Volume III)**.

161. Depending on the tidal device types installed, the recovery and evacuation of persons from the water in the development site would potentially be impacted due to surface piercing superstructure which could complicate recovery operations.

162. An ERCoP will be in place for all phases of the MDZ development. In addition, the vessels undertaking work at the development site will have some level of self-rescue capability, as required by SOLAS or their Flag State regulations.
163. The capability of those vessels engaged in work at the development site will also lend extra resilience to any response required. As will the guard vessel(s) during the phases where this is engaged.
164. Potential impacts identified as part of the assessment are the same for SAR as for other vessels e.g. Contact RNLI vessel with mid water device etc. as well as:
- Restricted SAR in the MDZ during an emergency.
165. The overall severity of consequences for all phases are considered to be moderate (C2). The overall frequency of occurrence is considered to be unlikely (C2). This indicates an overall risk ranking of (C2 x F2) = **Low**.

15.6.3.8.1. Additional Mitigation

166. Associated possible additional mitigation measures that could be utilised, as identified in the NRA, include:
- Continuous Monitoring by Marine Co-ordination Centre;
 - Restrict Navigation through the gold and green MDZ zones;
 - Re-design eastern boundary of the MDZ;
 - Appropriate alignment and spacing of arrays and devices;
 - Check device surveys;
 - Use of guard vessel(s) to monitor passing traffic;
 - Implementation of Safety Zones;
 - Temporary navigation aids as required by Trinity House;
 - Minimise use of marker buoys in zones of minimum UKC, and
 - Provision of life saving equipment on fixed structures and floating devices."

15.6.3.8.2. Residual Impact

167. If all the mitigations measures as detailed are utilised, then the overall impact would be reduced but would still remain as **Low Risk**.

15.6.3.9. Impact 9: Subsea Infrastructure – Potential Impacts on all Receptors

168. The construction phase will involve a large specialist vessel(s) to undertake the work within the offshore site. This activity would be protected by the use of a rolling navigational safety zone and guard vessels. The cable would be protected by the most suitable method, as detailed within **Chapter 4, Project Description**; this could include cable burial or alternative protection (rock bags, mattresses or split-pipe).
169. Potential impacts identified as part of the assessment include:
- Vessel anchoring on or dragging anchor over subsea equipment; and
 - Fishing gear interaction with subsea export cable.
170. The overall severity of consequences are considered to be minor (C2). The frequency of occurrence is considered possible (F2). This indicates an overall risk ranking of (C2 x F2) = **Low Risk**. Exceptions are Snagging / Obstruction: Fishing Vessel (C2 x F4), Snagging / Obstruction Project Vessel (C2 x F4), and Breakout of device/ device not at stated depth (C2 x F4) which scored as **ALARP**.

15.6.3.9.1. Additional Mitigation

171. Associated additional embedded mitigation measures that could be utilised, as identified in the NRA, include:
- Continuous Monitoring by Marine Co-ordination Centre;
 - MDZ designation as a No Fishing Zone ;Restrict Navigation through the gold and green MDZ zones;
 - Check device surveys;
 - Use of guard vessel(s) to monitor passing traffic;
 - Temporary navigation aids as required by Trinity House;
 - Establish no anchoring areas; and
 - Enhanced cable Protection.

15.6.3.9.2. Residual Impact

172. If all the mitigation measures as detailed are utilised then the overall impact would be reduced but would still remain as **Low Risk**. The hazards scoring as ALARP would also be reduced to **Low Risk**.

15.6.3.10. Impact 10: Potential Impacts on Project Vessels

173. The professional nature of the vessels engaged in the operations associated with these phases will ensure this risk is as low as possible. The types of small vessels which may be used in the project construction phase would be SOLAS (and other relevant conventions / codes) compliant. They would be operating in line with their safety management system (SMS) and using the appropriate Personal Protective Equipment (PPE).

174. Potential impacts identified as part of the assessment include:

- Contact Project Vessel with Surface Device
- Contact Project Vessel with Mid-Water Device (<8m below CD)
- Contact Project Vessel with Mid-Water Device (>8m below CD)
- Contact Project Vessel with Electrical Hubs
- Collision Commercial Ship ICW Project Vessel
- Collision Passenger Ship ICW Project Vessel
- Collision Project Vessel ICW Project Vessel
- Collision Project Vessel ICW Fishing Vessel
- Collision Project Vessel ICW Powered Recreational Vessel
- Collision Project Vessel ICW Un-Powered Recreational Vessel
- Collision Project Vessel ICW Other Vessel
- Grounding / Forced Ashore Project Vessels
- Snagging / Obstruction Project Vessels
- Breakout of device / device not at stated depth

175. The overall severity of consequences for all phases are considered to be moderate (C3). The overall frequency of occurrence is considered to be possible (F3). This indicates an overall risk ranking of (C3 x F3) = **ALARP**

15.6.3.10.1. Additional Mitigation

176. Associated possible additional mitigation measures that could be utilised, as identified in the NRA, include:

- Continuous Monitoring by Marine Co-ordination Centre;
- Restrict Navigation through the gold and green MDZ zones;
- Appropriate alignment and spacing of arrays and devices;

- Use of guard vessel(s) to monitor passing traffic;
- Implementation of Safety Zones;
- Temporary navigation aids as required by Trinity House; and
- Minimise use of marker buoys in zones of minimum UKC;
- Undertake device / array specific risk assessments to include NavAids;

15.6.3.10.2. Residual Impact

177. If all the mitigations measures as detailed are utilised, then the overall impact would be reduced to **Low Risk**.

15.6.4. Potential Impacts During the Operation and Maintenance (including Repowering) Phases

15.6.4.1. Impact 1: Potential Impacts on Commercial Vessels (Safe Operations)

178. The operation and maintenance phases will see a reduced level of project related traffic activity and is expected to decline over the lifetime of this phase as technologies bed in and tidal devices require less attention. Developers are expected to visit each TEC up to 15 times annually for both planned and unplanned maintenance activities. Many developers plan to undertake at least monthly routine inspection / maintenance using small vessels. A worst-case scenario of one five-hour visit to each device on site per month may be foreseeable. Conversely, the operational phase will see increased utilisation of the MDZ.

179. Potential impacts identified as part of the assessment include:

- Contact: Commercial Ship with Surface Device;
- Contact: Commercial Ship with Mid-Water Device (<8m below CD);
- Contact: Commercial Ship with Mid-Water Device (>8m below CD);
- Contact: Commercial Ship with Electrical Hub;
- Collision: Commercial Ship ICW Commercial Ship;
- Collision: Commercial Ship ICW Passenger Vessels;
- Collision: Commercial Ship ICW Fishing Vessel;
- Collision: Commercial Ship ICW Powered Recreational Vessel;
- Collision: Commercial Ship ICW Un-Powered Recreational Vessel;
- Collision: Commercial Ship ICW Other Vessel;
- Snagging/ Obstruction: Commercial Ship; and

- Breakout of device / device not at stated depth.

180. The overall severity of consequences for commercial vessels during the operation and maintenance (including repowering) phases are considered to be moderate (C3) due to the potential for notable damage to infrastructure / vessel(s). The frequency of occurrence is considered remote (F1) due to the low commercial traffic density and presence of embedded mitigations. This indicates an overall risk ranking of (C3 x F1) = **Low**.

15.6.4.1.1. Additional Mitigation

181. Associated possible additional mitigation measures that could be utilised, as identified in the NRA, include:

- Continuous Monitoring by Marine Co-ordination Centre;
- Restrict Navigation through the gold and green MDZ zones;
- Check devices surveys; and
- Minimise use of marker buoys in zones of minimum UKC."

15.6.4.1.2. Residual Impact

182. If all the mitigations measures as detailed are utilised then the overall impact would be reduced but would still remain as **Low Risk**.

15.6.4.2. Impact 2: Potential Impacts on Commercial Vessel Routing

183. Potential impacts remain the same as the construction phase with a reduction in project vessels.

184. The overall severity of consequences for the operation and maintenance (including repowering) phases are considered to be minor (C2). The frequency of occurrence is considered possible (F3). This indicates an overall risk ranking (C2 x F3) = **Low**.

15.6.4.2.1. Additional Mitigation

185. Associated possible additional mitigation measures that could be utilised, as identified in the NRA, include:

- Check device surveys;
-
- Minimise use of marker buoys in zones of minimum UKC;
- Establish no anchoring areas (Breakout of device / device not at stated depth); and
- Enhanced cable protection (Breakout of device / device not at stated depth).

15.6.4.2.2. Residual Impact

186. If all the mitigations measures as detailed are utilised then the overall impact would be reduced but would still remain as **Low Risk**.

15.6.4.3. Impact 3: Potential Impacts on Passenger Vessels (Safe Operations)

187. Once again it is anticipated that there will be a decrease in project related marine traffic as compared to the construction phases of the project.

188. Potential impacts identified as part of the assessment include:

- Contact: Passenger Vessels with Surface Device;
- Contact: Passenger Vessels with Mid-Water Device (<8m below CD);
- Contact: Passenger Vessels with Mid-Water Device (>8m below CD);
- Contact: Passenger vessel with Electrical Hubs;
- Collision: Passenger Vessels ICW Commercial Ship;
- Collision: Passenger Vessels ICW Passenger Vessels;
- Collision: Passenger Vessels ICW Fishing Vessel;
- Collision: Passenger Vessels ICW Powered Recreational Vessel;
- Collision: Passenger Vessels ICW Un-Powered Recreational Vessels;
- Collision: Passenger Vessels ICW Other Vessel;
- Snagging / Obstruction: Passenger Vessels; and
- Breakout of device / device not at stated depth.

189. The overall severity of consequences for the operational and maintenance (including repowering) phases are considered to be moderate (C3) due to the potential for notable damage to infrastructure / vessel(s) and possible pollution. The frequency of occurrence is considered unlikely (F2) due to the presence of embedded mitigations. This indicates an overall risk ranking of (C3 x F2) = **Low**. The exception is Collision: Passenger Vessel ICW Passenger Vessel (C4 x F21= **ALARP**).

15.6.4.3.1. Additional Mitigation

190. Associated possible additional mitigation measures that could be utilised, as identified in the NRA, include:

- Continuous Monitoring by Marine Co-ordination Centre;

- Restrict Navigation through the gold and green MDZ zones;
- Check device surveys;
- Minimise use of marker buoys in zones of minimum UKC.
- Establish no anchoring areas (Breakout of device / device not at stated depth); and
- Enhanced cable protection (Breakout of device / device not at stated depth).

15.6.4.3.2. Residual Impact

191. If all the mitigation measures as detailed are utilised then the overall impact would be reduced but would still remain as **Low Risk**. Collision: Passenger Vessel ICW Passenger Vessel remains as **ALARP** driven by major (C4) Consequences.

15.6.4.4. Impact 4: Potential Impacts on Passenger Vessel Routing

192. As previously stated, ferries frequently intersected the development site (**Appendix 15.1, Volume III**) to the north of the MDZ and during poor weather ferries were seen transiting right across the MDZ.

193. The introduced zone of 20m minimum UKC (purple zone **Appendix 15.1, Volume III**) to the north of the MDZ has increased the area for safe navigation of vessels, particularly of >3m draught including for ferries during both fair and poor weather routing and reduced the impacts to passenger vessel routing.

194. Potential impacts identified as part of the assessment include:

- Impact on Passenger Vessel Routing: Passenger vessel forced to take alternative route due to presence of site.

195. The overall severity of consequences for the operational and maintenance phase are considered to be minor (C2). The frequency of occurrence is considered possible (F3). This indicates an overall risk ranking of (C2 x F3) = **Low Risk**.

15.6.4.4.1. Additional Mitigation

196. Associated possible additional mitigation measures that could be utilised, as identified in the NRA, include:

- Continuous Monitoring by Marine Co-ordination Centre;
- Check device surveys;
- Minimise use of marker buoys in zones of minimum UKC; and
- Provisions made for continued use of ferry company poor weather routing or alternative routes to be provided.

15.6.4.4.2. Residual Impact

197. If all the mitigation measures as detailed are utilised then the overall impact would be reduced to **Low Risk**.

15.6.4.5. Impact 5: Potential Impacts on Fishing Vessels

198. Potential impacts identified as part of the assessment include:

- Contact: Fishing Vessels with Surface Device;
- Contact: Fishing Vessel with Mid-Water Device (<8m below CD);
- Contact: Fishing Vessel with Electrical Hubs;
- Collision: Fishing Vessel ICW Commercial Vessel;
- Collision: Fishing Vessel ICW Passenger Vessel;
- Collision: Fishing Vessel ICW Fishing Vessel;
- Collision: Fishing Vessel ICW Powered Recreational Vessel;
- Collision: Fishing Vessel ICW Un-Powered Recreational Vessel;
- Collision: Fishing Vessel ICW Other Vessel;
- Grounding / Forced Ashore: Fishing Vessel;
- Swamping / Capsize: Fishing Vessel;
- Snagging/ Obstruction: Fishing Vessel; and
- Breakout of device / device not at stated depth.

199. The overall severity of consequences for the operation and maintenance (including repowering) phases are considered to be minor (C2). The frequency of occurrence is considered possible (F3) due to the presence of embedded mitigations. This indicates an overall risk ranking of (C2 x F3) = **Low Risk**. Exceptions are Contact Fishing Vessel with Mid-Water Device <8 below CD (C2 x F4) **ALARP** and Snagging / Obstruction Fishing Vessel (C2 x F4) **ALARP**.

15.6.4.5.1. Additional Mitigation

200. Associated possible additional mitigation measures that could be utilised, as identified in the NRA, include:

- Continuous Monitoring by Marine Co-ordination Centre;
- MDZ designation as a no fishing zone;
- Appropriate alignment and spacing of devices; and

- Check device surveys;
- Minimise use of marker buoys in zones of minimum UKC;
- Provision of life saving equipment on fixed structures and floating devices;
- Establish no anchoring areas (Breakout of device / device not at stated depth); and
- Enhanced cable protection (Breakout of device / device not at stated depth).

15.6.4.5.2. Residual Impact

201. If all the mitigation measures as detailed are utilised, with the exception of redesigning the eastern boundary, then the overall impact would be reduced but would still remain as **Low Risk**.

15.6.4.6. Impact 6: Potential Impacts on Recreational Craft

202. In the same manner as the other noted receptors, the reduction in project traffic levels will further reduce the impact of collision with project related vessels.

203. Potential impacts identified as part of the assessment include:

- Contact Powered Recreational Vessel with Surface Device;
- Contact Un-Powered Recreational Vessel with Surface Device;
- Contact Powered Recreational Vessel with Mid-Water Device (<8m below CD);
- Contact Un-Powered Recreational Vessel with Mid-Water Device (<8m below CD);
- Contact: Powered Recreational Vessel with Electrical Hub;
- Contact: Un-Powered Recreational Vessel with Electrical Hub;
- Collision: Powered Recreational Vessel ICW Commercial Vessel;
- Collision: Un- Powered Recreational Vessel ICW Commercial Vessel;
- Collision: Powered Recreational Vessel ICW Passenger Vessel;
- Collision: Un-Powered Recreational Vessel ICW Passenger Vessel;
- Collision: Powered Recreational Vessel ICW Fishing Vessel;
- Collision: Un-Powered Recreational Vessel ICW Fishing Vessel;
- Collision Powered Recreational Vessel ICW Powered Recreational Vessel;
- Collision Powered Recreational Vessel ICW Un-Powered Recreational Vessel;

- Collision Powered Recreational Vessel ICW Other Vessel;
- Collision Un-Powered Recreational Vessel ICW Other Vessel;
- Grounding/Forced Ashore: Powered Recreational Vessel;
- Grounding/ Forced Ashore: Un-Powered Recreational Vessel;
- Swamping / capsizes: Powered Recreational Vessel;
- Swamping / capsizes: Un-Powered Recreational Vessel;
- Snagging/ Obstruction Powered Recreational Vessel; and
- Breakout of device / device not at stated depth.

204. The overall severity of consequences for the operation and maintenance phases are considered to be minor (C2). The frequency of occurrence is considered possible (F3) due to the presence of embedded mitigations. This indicates an overall risk ranking (C2 x F3) = **Low Risk**. Exceptions scored as ALARP include; Contact: Powered Recreational Vessel with Mid-Water Device (<8m below CD) (C2 x F4), Grounding / Forced Ashore Powered Recreational Vessel (C3 x F3), and Swamping / Capsizes Un-Powered Recreational Vessel (C2 x F4) which were scored as ALARP. and

15.6.4.6.1. Additional Mitigation

205. Associated additional mitigation measures that could be utilised, as identified in the NRA, include:

206.

- Restrict navigation through the gold and green MDZ zones;
- Continuous Monitoring by Marine Co-ordination Centre;
- Only deploy devices that allow at least 8 m UKC along eastern boundary;
- Re-design eastern boundary of the MDZ;
- Check device surveys
- Appropriate alignment and spacing of arrays and devices;
- Minimise use of marker buoys in zones of minimum UKC;
- Provision of life saving equipment on fixed structures and floating devices;
- Establish no anchoring areas (Breakout of device / device not at stated depth); and

15.6.4.6.2. Enhanced cable protection (Breakout of device / device not at stated depth).Residual Impact

207. If all the mitigation measures as detailed are utilised then the risk would be reduced but hazards would still remain as **Low Risk** with the exception of Grounding / Forced Ashore Powered Recreational Vessel and Swamping / Capsize Un-Powered Recreational Vessel which would remain as ALARP.

15.6.4.7. Impact 7: Potential Impacts on Other Vessels

208. While project specific traffic would be reduced, the same high levels of operational planning would take place. The vessels engaged in this phase would likely be different from those in the other phases, especially those concerned solely with personnel transfers, etc. They would still be compliant with the relevant shipping safety codes and have a suitable SMS and correct PPE for the tasks taking place. Potential impacts remain the same as the construction phase. Associated possible mitigation measures remain similar to the construction phase with the exception of guard vessels and temporary navigation aids which are not applicable for the operational phase.

209. Potential impacts identified as part of the assessment include:

- Contact Other Vessel with Surface Device;
- Contact Other Vessel with Mid-Water Device (<8m below CD);
- Collision: Other Vessel ICW Commercial Vessel;
- Collision: Other Vessel ICW Passenger Vessel;
- Collision: Other Vessel ICW Fishing Vessel;
- Collision: Other Vessel ICW Powered Recreational Vessel;
- Collision: Other Vessel ICW Un-Powered Recreational Vessel;
- Collision: Other Vessel ICW Other Vessel;
- Grounding / Forced Ashore: Other Vessel;
- Swamping / Capsize / Other Vessel;
- Snagging/ Obstruction Recreational Vessel; and
- Breakout of device / device not at stated depth.

210. The overall severity of consequences for the operation and maintenance phases are considered to be minor (C2. The frequency of occurrence is considered Unlikely (F2) due to the reduction of project related traffic and presence of embedded mitigations. This indicates an overall risk ranking of (C2 x F2) = **Low Risk**.

15.6.4.7.1. Residual Impact

211. Associated additional mitigation measures that could be utilised, as identified in the NRA, include:

- Continuous Monitoring by Marine Co-ordination Centre;
- Restrict navigation through gold and green MDZ zones;
- Appropriate alignment and spacing of arrays and devices;
- Check Device Surveys;
- Minimise use of marker buoys in zones of minimum UKC, and
- Provision of life saving equipment on fixed structures and floating devices
- Establish no anchoring areas (Breakout of device / device not at stated depth); and
- Enhanced cable protection (Breakout of device / device not at stated depth).

212. If all mitigation measures as detailed are utilised then the overall impact would be reduced but would remain **Low Risk**.

15.6.4.8. Impact 8: Potential Impacts on Emergency Response Operations

213. As with construction, an ERCoP will be in place for all phases of the Morlais development. In addition, the vessels undertaking maintenance at the development site will have some level of self-rescue capability, as required by SOLAS or their Flag State regulations. However, as highlighted in consultation with the MCA appropriate alignment and spacing of devices is key to SAR operations and clear lines of sight and navigational channels between devices to maintain SAR access especially at night.

214. The capability of those vessels engaged in work at the development site will also lend extra resilience to any response required. Potential impacts remain the same as the construction phase.

215. The overall severity of consequences for all phases are considered to be minor (C2). The frequency of occurrence is considered unlikely (F2). This indicates an overall risk ranking of $(C2 \times F2) = \text{Low}$.

216. Associated possible additional mitigation measures that could be utilised, as identified in the NRA, include:

- Continuous Monitoring by Marine Co-ordination Centre;
- Restrict Navigation through the gold and green MDZ zones;

- Appropriate alignment and spacing of arrays and devices;
- Check device surveys;
- Minimise use of marker buoys in zones of minimum UKC,
- Provision of life saving equipment on fixed structures and floating devices.

15.6.4.8.1. Residual Impact

217. If all the mitigation measures as detailed are utilised, , then the overall impact would be reduced but would remain **Low Risk**.

15.6.4.9. Impact 9: Subsea Infrastructure – Potential Impacts on all Receptors

218. The subsea cable will be protected and the risk mitigated to ALARP.

219. Potential impacts remain the same as the construction phase.

220. Associated mitigation measures remain the same as the construction phase.

221. The overall severity of consequences for all phases are considered to be minor (C2). The frequency of occurrence is considered unlikely (F2) due to the presence of embedded mitigations. This indicates an overall risk ranking of $(C2 \times F2) = \text{Low Risk}$. An exception is Snagging / Obstruction: Fishing Vessel which scored as $(C2 \times F4) \text{ ALARP}$.

15.6.4.9.1. Residual Impact

222. If all the mitigations measures as detailed are utilised then the overall impact would be reduced but would remain **Low Risk**. The hazard Snagging / Obstruction: Fishing Vessel which scored as $(C2 \times F4)$ would be reduced to **Low Risk**.

15.6.5. Potential Impacts During Decommissioning

223. It is likely that decommissioning of individual structures will be the responsibility of the individual developers, as overseen by Mentor Môn. Decommissioning of the site comprises the complete removal of all infrastructure associated with the tidal energy project. Offshore decommissioning methodologies would vary considerably between devices but would be expected to be similar to the construction phase in reverse. For the purpose of this chapter, it is assumed that cables are required to be removed as this represents the worst-case scenario in terms of impacts. Therefore, it can be assumed that all impacts identified as having the potential to arise during the construction phase (**Section 15.6.3**) may also occur during the decommissioning phase.

224. As the methodologies for decommissioning are expected to be similar to construction it can be assumed that the same impacts arise and can be applied to the decommissioning phase. It should be noted that this is a highly precautionary assessment as it is likely that the impacts from decommissioning will be less than those from construction (PTEC, 2014).

15.6.6. Cumulative Impacts

225. Cumulative impacts refer to the impact upon receptors, proposed developments and activities and any other foreseeable project proposals arising from the presence of the MDZ.
226. The approach to cumulative assessment considers the Cumulative Impact Assessment Guidelines issued by RenewableUK in June 2013.
227. In assessing the potential cumulative impacts, it is important to bear in mind that proposed and in development projects may or may not actually be taken forward. Relevant projects/ plans that are already under construction are likely to contribute to cumulative impact, whereas projects/ plans not yet approved or not yet submitted are less certain to contribute to such an impact, as some may not achieve approval or may not ultimately be built.
228. Projects that were identified and informed this approach are outlined within **Table 15-13**.

Table 15-13 Other Developments Considered in Cumulative Impact Assessment

Development Type	Project	Distance from Morlais (km)	Status
Tidal	Holyhead Deep	1	In Development
Oil and Gas	P2292	61	Operational
Wind Farm	Rhyl Flats	66	Operational
Wind Farm	Gwynt y Mor	67.5	Operational
Wind Farm Extension	Gwynt y Mor	67.5	Proposed
Wind Farm	North Hoyle	81.5	Operational
Aggregate Extraction	Area 457	70	Operational
Aggregate Extraction	Area 392 / 393	73	Operational

229. For the purposes of the cumulative assessment, the Holyhead Deep Tidal project with an aspirational maximum total installed capacity of 80 MW, is the only project currently considered to fall within the assessment study area, and as such the impact assessment has been driven by the cumulative impacts arising from this site. The assessed scenario is, therefore, outlined in **Table 15-14**.

Table 15-14 Assessed Scenario

Impact	Scenario	Justification
Cumulative Impact due to Increased Vessel Activity	Multiple offshore developments require construction and maintenance vessel activity as they transit to and from their bases of operation.	Potential increases in collision risk.
Cumulative Impact on Vessel Routing	Commercial shipping, fishing boats and recreational craft must all operate to avoid these developments and any works taking place. This reduces the available sea room available, concentrating them in smaller areas, potentially bringing them into conflict.	Change in vessel routing across multiple sites due to multiple developments.

Cumulative Impact from Cable Routes	Multiple cable routes that cross over one another may reduce the navigable depth of water.	Reduction in depth and increased maintenance works vessels.
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230. The results of the cumulative risk assessment are given in **Table 15-15**. The determination of risk was assessed to be a factor of the likelihood of the impact occurring and the consequence, should it occur. The criteria of frequency and consequence and risk score definitions are outlined within the risk assessment methodology (**Appendix 15.1, Volume III**).

Table 15-15 Cumulative Risk Assessment

Impact	Description	Likelihood	Consequence	Risk Score	Impact
Impact from increased vessel Activity	Vessels associated with the Morlais and Holyhead Deep projects may interact with one another. The level of additional vessel activity from each project will be higher during construction and decommissioning. This has the potential to increase collision risk.	Unlikely	Minor	2	Low Risk
Impact on Vessel Routing	The cumulative impact of these developments will result in a loss of navigable sea room which may require vessels to be rerouted which has the potential to increase the risk elsewhere. Primary cumulative impacts to routing are the inshore passage and impact upon vessels such as ferries utilising the northern ferry route, search and rescue and Holyhead Deep maintenance vessels.	Unlikely	Minor	2	Low Risk
Impact from Cable Route	The cables are to be unburied with cable protection. Multiple cable routes are required for the project, which may result in a decrease in the charted depth in some areas and an increase in vessel activity during the construction and decommissioning phases.	Unlikely	Minor	2	Low Risk

15.7. SUMMARY

231. This chapter has provided an overview on the potential impacts on shipping and navigation that may occur within the construction, repowering, operation and maintenance, and decommissioning phases of the Morlais project.

232. The impacts presented in this chapter were identified and quantified via a formal NRA process (see **Appendix 15.1, Volume III**). The assessment included allision / collision risk assessment (including UKC) in accordance with formal safety assessment criteria as adopted by the IMO for all phases of the development, as well as an assessment of cumulative and in-combination effects.

233. **Table 15-16** collates the determinations of each of the impacts assessed and is presented as a summary of the determinations. In line with the terminology adopted by the NRA and presented in this chapter, severity of consequence and frequency of occurrence are used rather than magnitude of effect and sensitivity of receptor. All the risks/impacts presented below also assume that embedded mitigation defined in preceding sections are successfully implemented. Where additional mitigation measures are proposed, these are listed.
234. It's is evident from the Impact Assessment for Navigation and Shipping that the Morlais Development Zone will impact navigation and that a range of additional mitigation measures will be required to reduce the potential impacts and risk during the construction (including repowering), operations and maintenance and decommissioning phases. Some of these additional mitigation measures will be relevant to specific vessel types but otherwise will apply for all marine traffic in the area.
235. For the construction phase there will be a need to restrict navigation and fishing activity (see **Chapter 14, Commercial Fisheries**) within the MDZ and the export cable corridor which will be achieved through implementation of Safety Zones of up to 500 m around all offshore works during construction.
236. For the operation and maintenance phase restriction of navigation within the gold and green MDZ zones and restriction of fishing within all zones of the MDZ have been suggested as it is an effective mitigating measure against contact and snagging hazards, however, their adoption will need to be balanced against loss of freedom of navigation by the regulator. For the decommissioning phase there will be a need to restrict navigation and fishing activity (see **Chapter 14, Commercial Fisheries**) within the MDZ and the export cable corridor which will be achieved through implementation of Safety Zones of up to 500 m around all offshore works during construction.



15.7.1. Summary of proposed Additional Mitigation Measures

ID	Risk Control	Description	Phase
1	Continuous Monitoring by Marine Co-ordination Centre	Monitoring by radar, AIS, Closed Circuit Television (CCTV) or other agreed means. Appropriate means for OREI operators to notify, and provide evidence of, the infringement of safety zones or ATBA.	All Phases
2	Restrict Navigation through the Gold and Green MDZ Zones.	<p>For example; via designation of site as an Area To Be Avoided (ATBA) or Precautionary Area (PA).</p> <p>In the UK, all vessels have freedom to transit through OREIs, subject to any applied safety zones, and their own risk assessments and passage plans, which should take account of factors such as vessel size, maneuverability, environmental factors and competency of the Master and crew. MGN 372⁷ (or subsequent update) provides further guidance on navigation in and around OREIs.</p> <p>An ATBA is an area within defined limits that should be avoided by all ships or certain classes of ship, in which navigation is particularly hazardous or in which it is exceptionally important to avoid casualties. In general, ATBAs should be established only in places where: inadequate survey or insufficient provision of aids to navigation may lead to danger of stranding; where local knowledge is considered essential for safe passage; where there is the possibility that unacceptable damage to the environment could result from a casualty; or where there may be hazards to a vital aid to navigation⁸.</p> <p>PA's are defined as areas within defined limits where ships must navigate with particular caution and within which the direction of flow of traffic may be recommended.⁹</p>	All Phases
3	MDZ designation as No Fishing Zone	To prevent fishing gear snagging on underwater devices and their associated infrastructure.	All Phases

⁷ Maritime and Coastguard Agency (2008) MGN372 (M+F) Offshore Renewable Energy Installations (OREIs): Guidance to Mariners Operating in the Vicinity of UK OREIs.

⁸ International Maritime Organisation (1985) General Provisions on Ships' Routeing, adopted Nov. 20, 1985, IMO Resolution A.572(14).

⁹ International Maritime Organisation (1985) General Provisions on Ships' Routeing, adopted Nov. 20, 1985, IMO Resolution A.572(14).



ID	Risk Control	Description	Phase
4	Appropriate alignment and spacing of devices	<p>The MCA has statutory obligations to provide Search and Rescue services in and around OREIs in UK waters. Device layout designs must be designed to ensure clear lines of sight and navigation allow safe transit by rescue craft and those vessels that decide to transit through them including during poor visibility, high sea states and at night.[3]</p> <p>In order to minimise risks to surface vessels transiting through an OREI, structures (turbines, substations etc) should be aligned and in straight rows or columns. Multiple lines of orientation provide alternative options for passage planning and for vessels to counter the environmental effects on handling i.e. sea state, tides, currents, weather, visibility etc. Developers should plan for at least two lines of orientation unless they can clearly demonstrate that fewer is acceptable.</p> <p>The MCA document 'Offshore Renewable Energy Installation: Requirements, Advice and Guidance for Search and Rescue and Emergency Response' outlines the SAR requirements.</p> <p>See also 15:'Undertake Device / Array Specific Risk Assessments'</p> <p>It was noted during consultation with recreational stakeholders that 'if surface devices are spaced adequately then sailing could occur between them, although this would not be recommended at night'.</p>	All Phases
5	Check device surveys	To ensure devices remain at the stated charted depth. Changes to charted depth arising from tidal turbines should be surveyed and marked on navigational charts.	All Phases
6	Guard vessel to monitor passing traffic	To prevent a vessel contacting a device / partially constructed device during construction / installation. To keep watch and warn vessels that may be in danger, for example, to prevent a collision as a result of third-party avoidance.	Construction
7	Establish no anchoring areas	No anchoring areas to be established around nearshore cable route.	All Phases
8	Enhanced cable protection	If burial is not possible, for example due to underwater features and/or seabed ground conditions export cables should be suitably protected such as by rocks or other such suitable mattress placements to mitigate the risks to the cable and vessels. The MCA would be willing to accept up to 5% reduction in surrounding charted depths referenced to Chart	All Phases



ID	Risk Control	Description	Phase
		Datum, unless developers are able to demonstrate evidence that any identified risks to any vessel type are satisfactorily mitigated. ¹⁰	
9	Implementation of Safety Zones	Safety zones of appropriate configuration, extent and application; typically: 500m during construction, extension, maintenance or decommissioning and 50m during operation.	Construction
10	Temporary navigation aids as required by Trinity House	Temporary marking, lighting and buoyage should be utilised during construction phase in accordance with Trinity House requirements.	Construction
11	Undertake Device / Array Specific Risk Assessments to include NavAids and Marker Buoys.	<p>Further site-specific assessments should be undertaken to build on previous assessments and assess the proposed locations of individual turbine devices, substations, platforms and any other structure within the tidal array. This assessment should include the potential impacts the proposed location may have on navigation and SAR activities and should be undertaken in liaison with the MCA. Additionally, this assessment should consider the tow / delivery of devices to and from the site.</p> <p>MCA has statutory obligations to provide Search and Rescue (SAR) services in and around OREIs in UK waters. Turbine layout designs must be designed to allow safe transit through OREIs by SAR helicopters operating at low altitude in bad weather, and those vessels (including rescue craft) that decide to transit through them. Developers should therefore carry out further site-specific assessment to build on previous assessments to assess the proposed locations of individual turbine devices, substations, platforms and any other structure within the wind farm or tidal/wave array. This assessment should include the potential impacts the proposed location may have on navigation and SAR activities.</p> <p>Risk assessments for proposed layouts should build on earlier work conducted as part of the Navigation Risk Assessment and the mitigations identified as part of that process. Where possible, this original assessment should be referenced to confirm where information or the assessment remains the same or can be further refined due to the later stages of project development</p>	Construction

¹⁰ MGN 543



ID	Risk Control	Description	Phase
12	Provision of life saving equipment on fixed structures and floating devices.	Provide a refuge for people in the water for example; grab chains and ladders.	All Phases
13	Minimise use of marker buoys in zones of minimum UKC.	To reduce the risk of contact with buoys by vessels navigating in the zones of minimum UKC. It was reported by recreational stakeholders in consultation that <i>'if the devices are under water with a sufficient UKC preference would be that there is no buoy at the surface to maintain navigation'</i> .	All Phases



Table 15-16 Summary of Potential Impacts on Shipping and Navigation Associated with the Development of the Project

NRA Hazard ID's	Hazard Title	Risk Score	Potential Impact	Baseline Severity of Consequence	Baseline Frequency of Occurrence	Baseline Impact	Additional Mitigation Measures	Residual Impact (Risk)
Construction Phase								
1	Contact Commercial Ship with Surface Device	2.58	1. Potential impacts on commercial vessels (safe operations)	C3 (Moderate)	F1 (Remote)	(C3 x F1)	Restrict Navigation through the gold and green MDZ zones; Continuous Monitoring by Marine Co-ordination Centre; Appropriate alignment and spacing of arrays and devices; Check Device Surveys; Implementation of Safety Zones; Guard vessel to monitor passing traffic; Construction vessels to be marked in accordance with COLREGS; Temporary navigation aids as required by Trinity House; Undertake device / array specific risk assessments to include NavAids.	(C3 x F1)
8	Contact Commercial Ship with Mid-Water Device (<8m below CD)	3.20						
15	Contact Commercial Ship with Mid-Water Device (>8m below CD)	2.88						
22	Contact Commercial Ship with Sea-Bed Device >20m UKC	2.88						
29	Contact Commercial Ship with Electrical Hubs	2.45						
36	Collision Commercial Ship ICW Commercial Ship	2.54						
37	Collision Commercial Ship ICW Passenger Vessels	3.45						
38	Collision Commercial Ship ICW Project Vessel	3.13						
39	Collision Commercial Ship ICW Fishing Vessel	2.27						
40	Collision Commercial Ship ICW Powered Recreational Vessel	2.72						



NRA Hazard ID's	Hazard Title	Risk Score	Potential Impact	Baseline Severity of Consequence	Baseline Frequency of Occurrence	Baseline Impact	Additional Mitigation Measures	Residual Impact (Risk)
41	Collision Commercial Ship ICW Un-Powered Recreational Vessel	2.72						
42	Collision Commercial Ship ICW Other Vessel	2.43						
78	Snagging/ Obstruction Commercial Ship	1.85						
85	Breakout of device / device not at stated depth	4.72	1(a) Breakout of device / device not at stated depth	C2 (Minor)	F4 (Frequent)	(C2 x F4) = ALARP	Restrict Navigation through gold and green MDZ zones; Continuous Monitoring by Marine Co-ordination Centre; Check device surveys; Establish no anchoring areas; Implementation of safety zones; Temporary navigation aids as required by Trinity House.	(C2 x F2) = Low Risk
N/A	Impact on Commercial Vessel Routing – Commercial vessel forced to take alternative route due to presence of the site.	1.79	2. Potential impacts on commercial vessel routing	C2 (Minor)	(F1) Remote	(C2 x F1) = Negligible	Check Device Surveys; Minimise use of marker buoys in zones of minimum UKC.	(C2 x F1) = Negligible
2	Contact Passenger Vessels with Surface Device	2.49	3. Potential impacts on Passenger Vessels (safe operations)	C3 (Moderate)	F2 (Unlikely)	(C3 x F2) = Low Risk	Restrict Navigation through the gold and green MDZ zones; Continuous Monitoring by Marine Co-ordination Centre; Appropriate alignment and spacing of arrays and devices; Check Device Surveys; Implementation of Safety Zones; Guard vessel to monitor passing traffic; Construction vessels to be marked in accordance with COLREGS;	(C3 x F2) = Low Risk
16	Contact Passenger Vessels with Mid-Water Device (>8m below CD)	3.11						



NRA Hazard ID's	Hazard Title	Risk Score	Potential Impact	Baseline Severity of Consequence	Baseline Frequency of Occurrence	Baseline Impact	Additional Mitigation Measures	Residual Impact (Risk)
30	Contact Passenger Vessels with Electrical Hubs	2.94					Temporary navigation aids as required by Trinity House; Undertake device / array specific risk assessments to include NavAids; Minimise use of marker buoys in zones of minimum UKC.	
37	Collision Commercial Ship ICW Passenger Vessels	3.45						
44	Collision Passenger Ship ICW Project Vessel	3.71						
45	Collision Passenger Vessels ICW Fishing Vessel	2.43						
46	Collision Passenger Vessels ICW Powered Recreational Vessel	2.96						
47	Collision Passenger Vessels ICW Un-Powered Recreational Vessel	2.96						
48	Collision Passenger Vessels ICW Other Vessels	3.00						
79	Snagging/ Obstruction Passenger Vessels	2.09						
9	Contact Passenger Vessels with Mid-Water Device (<8m below CD)	4.06	3(a) Contact Passenger Vessels with Mid-Water Device (<8m below CD)	C3 (Moderate)	F3 (Possible)	C3 x F3 = ALARP	Restrict Navigation through the gold and green MDZ zones; Continuous Monitoring by Marine Co-ordination Centre; Appropriate alignment and spacing of arrays and devices; Check Device Surveys; Implementation of Safety Zones; Guard vessel to monitor passing traffic; Construction vessels to be marked in accordance with COLREGS; Temporary navigation aids as required by Trinity House;	C3 x F2 = Low Risk



NRA Hazard ID's	Hazard Title	Risk Score	Potential Impact	Baseline Severity of Consequence	Baseline Frequency of Occurrence	Baseline Impact	Additional Mitigation Measures	Residual Impact (Risk)
							Undertake device / array specific risk assessments to include NavAids.	
43	Collision Passenger Vessels ICW Passenger Vessel	4.00	3(b) Collision Passenger Vessels ICW Passenger Vessel	C4 (Major)	F1 (Remote)	(C4 x F1) = ALARP	Continuous Monitoring by Marine Co-ordination Centre; Guard vessel to monitor passing traffic; Construction vessels to be marked in accordance with COLREGS; Temporary navigation aids as required by Trinity House; Minimise use of marker buoys in zones of minimum UKC.	(C4 x F1) = ALARP
85	Breakout of device / device not at stated depth	4.72	3(c) Breakout of device / device not at stated depth	C2 (Minor)	F4 (Frequent)	(C2 x F4) = ALARP	Restrict Navigation through gold and green MDZ zones; Continuous Monitoring by Marine Co-ordination Centre; Check device surveys; Establish no anchoring areas; Implementation of safety zones; Temporary navigation aids as required by Trinity House.	(C2 x F2) = Low Risk
N/A	Impact on Passenger Vessel Routing Passenger vessel forced to take alternative route due to presence of site.	3.64	4. Potential impacts on passenger vessel routing	C2 (Minor)	(F3) Possible	(C2 x F3) = Low Risk	Check Device Surveys; Minimise use of marker buoys in zones of minimum UKC.	(C2 x F3) = Low Risk
4	Contact Fishing Vessel with Surface Device	3.47	5. Potential impacts on fishing vessels	C2 (Minor)	F3 (Possible)	(C2 x F3) = Low Risk	Continuous Monitoring by Marine Co-ordination Centre; Restrict Navigation through the Gold and Green MDZ Zones; MDZ designation as No Fishing Zone; Appropriate alignment and spacing of arrays and devices; Guard vessel to monitor passing traffic; Implementation of safety zones; Establish no anchoring zones; Enhanced cable protection; Temporary navigation aids as required by Trinity House; Construction vessels to be marked in accordance with COLREGS; Undertake device / array specific risk assessments to include	(C2 x F2) = Low Risk
32	Contact Fishing Vessel with Electrical Hubs	2.93						
39	Collision Commercial Ship ICW Fishing Vessel	2.27						



NRA Hazard ID's	Hazard Title	Risk Score	Potential Impact	Baseline Severity of Consequence	Baseline Frequency of Occurrence	Baseline Impact	Additional Mitigation Measures	Residual Impact (Risk)
45	Collision Passenger Vessels ICW Fishing Vessel	2.43					NavAids; Provision of life saving equipment on fixed structures and floating devices; Minimise use of marker buoys in zones of minimum UKC.	
50	Collision Project Vessel ICW Fishing Vessel	3.00						
54	Collision Fishing Vessel ICW Fishing Vessel	2.38						
55	Collision Fishing Vessel ICW Powered Recreational Vessel	3.31						
56	Collision Fishing Vessel ICW Un-Powered Recreational Vessel	3.67						
57	Collision Fishing Vessel ICW Other Vessels	3.59						
67	Grounding / Forced Ashore Fishing Vessel	3.74						
74	Swamping / Capsize Fishing Vessel	3.13						
81	Snagging/ Obstruction Fishing Vessel	4.50	5(a) Snagging/ Obstruction Fishing Vessel	C2 (Minor)	F5 (Frequent)	(C2 x F5) = ALARP	Continuous Monitoring by Marine Co-ordination Centre; Restrict navigation through gold and green MDZ zones; MDZ designation as no fishing zone; Establish no anchoring areas; Enhanced cable protection.	(C2 x F3) = Low Risk



NRA Hazard ID's	Hazard Title	Risk Score	Potential Impact	Baseline Severity of Consequence	Baseline Frequency of Occurrence	Baseline Impact	Additional Mitigation Measures	Residual Impact (Risk)
11	Contact Fishing Vessel with Mid-Water Device <8m below CD)	5.00	5(b) Contact Fishing Vessel with Mid-Water Device <8m below CD)	C2 (Minor)	F4 (Frequent)	(C2 x F4) = ALARP	Restrict navigation through the gold and green MDZ zones; Continuous Monitoring by Marine Co-ordination Centre; MDZ designation as No Fishing Zone; Check Device Surveys; Appropriate alignment and spacing of arrays and devices; Implementation of Safety Zones; Guard vessel to monitor passing traffic; Construction vessels to be marked in accordance with COLREGS; Undertake device / array specific risk assessments to include NavAids; Temporary navigation aids as required by Trinity House; Provision of life saving equipment on fixed structures and floating devices.	(C2 x F3) = Low Risk
85	Breakout of device / device not at stated depth	4.72	5(c) Breakout of device / device not at stated depth	C2 (Minor)	F4 (Frequent)	(C2 x F4) = ALARP	Restrict Navigation through gold and green MDZ zones; Continuous Monitoring by Marine Co-ordination Centre; Check device surveys; Establish no anchoring areas; Implementation of safety zones; Temporary navigation aids as required by Trinity House.	(C2 x F2) = Low Risk
5	Contact Powered Recreational Vessel with Surface Device	3.94	6. Potential impacts on recreational craft	C2 (Minor)	F3 (Possible)	(C2 x F3) = Low Risk	Continuous Monitoring by Marine Co-ordination Centre; Restrict Navigation through the Gold and Green MDZ Zones; Appropriate alignment and spacing of arrays and devices; Guard vessel to monitor passing traffic; Implementation of safety zones; Construction vessels to be marked in accordance with COLREGS; Temporary navigation aids as required by Trinity House; Construction vessels to be marked in accordance with COLREGS; Undertake device / array specific risk assessments to include NavAids; Provision of life saving equipment on fixed structures and	(C2 x F2) = Low Risk
6	Contact Un-Powered Recreational Vessel with Surface Device	3.59						
13	Contact Un- Powered Recreational Vessel with Mid-Water Device (<8m below CD)	3.18						



NRA Hazard ID's	Hazard Title	Risk Score	Potential Impact	Baseline Severity of Consequence	Baseline Frequency of Occurrence	Baseline Impact	Additional Mitigation Measures	Residual Impact (Risk)
33	Contact Powered Recreational Vessel with Electrical Hubs	2.93					floating devices; Minimise use of marker buoys in zones of minimum UKC.	
34	Contact Un-Powered Recreational Vessel with Electrical Hubs	1.94						
40	Collision Commercial Ship ICW Powered Recreational Vessel	2.72						
41	Collision Commercial Ship ICW Un-Powered Recreational Vessel	2.72						
46	Collision Passenger Vessels ICW Powered Recreational Vessel	2.96						
47	Collision Passenger Vessels ICW Un-Powered Recreational Vessel	2.96						
51	Collision Project Vessel ICW Powered Recreational Vessel	3.02						
52	Collision Project Vessel ICW Un-Powered Recreational Vessel	2.66						
55	Collision Fishing Vessel ICW Powered Recreational Vessel	3.31						
56	Collision Fishing Vessel ICW Un-Powered Recreational Vessel	3.67						



NRA Hazard ID's	Hazard Title	Risk Score	Potential Impact	Baseline Severity of Consequence	Baseline Frequency of Occurrence	Baseline Impact	Additional Mitigation Measures	Residual Impact (Risk)
59	Collision Powered Recreational Vessel ICW Un-Powered Recreational Vessel	3.18						
61	Collision Un-Powered Recreational Vessel ICW Un-Powered Recreational Vessel	2.13						
62	Collision Un-Powered Recreational Vessel ICW Other Vessel	3.24						
69	Grounding / Forced Ashore Un-Powered Recreational Vessel	3.67						
75	Swamping / Capsize Powered Recreational Vessel	3.55						
82	Snagging/ Obstruction Powered Recreational Vessel	0.56						
68	Grounding / Forced Ashore Powered Recreational Vessel	5.27	6(a)Grounding / Forced Ashore Powered Recreational Vessel	C3 (Moderate)	F4 (Frequent)	(C3 x F4) = ALARP	Continuous Monitoring by Marine Co-ordination Centre; Appropriate alignment and spacing of arrays and devices; Guard vessel to monitor passing traffic; Construction vessels to be marked in accordance with COLREGS; Temporary navigation aids as required by Trinity House; Undertake device/ array specific risk assessment to include NavAids and marker buoys; Minimise use of marker buoys in zones of minimum UKC.	(C3 x F3) = ALARP



NRA Hazard ID's	Hazard Title	Risk Score	Potential Impact	Baseline Severity of Consequence	Baseline Frequency of Occurrence	Baseline Impact	Additional Mitigation Measures	Residual Impact (Risk)
60	Collision Powered Recreational Vessel ICW Other Vessel	4.47	6(b)Collision Powered Recreational Vessel ICW Other Vessel	C2 (Minor)	F4 (Frequent)	(C2 x F4) = ALARP	Continuous Monitoring by Marine Co-ordination Centre; Appropriate alignment and spacing of arrays and devices; Guard vessel to monitor passing traffic; Implementation of safety zones; Construction vessels to be marked in accordance with COLREGS; Temporary navigation aids as required by Trinity House; Minimise use of marker buoys in zones of minimum UKC.	(C2 x F3) = Low Risk
12	Contact Powered Recreational Vessel with Mid-Water Device (<8m below CD)	4.47	6(c)Contact Powered Recreational Vessel with Mid-Water Device (<8m below CD)	C2 (Minor)	F4 (Frequent)	(C2 x F4) = ALARP	Restrict navigation through the gold and green MDZ zones; Continuous Monitoring by Marine Co-ordination Centre; Check Device Surveys; Appropriate alignment and spacing of arrays and devices; Implementation of Safety Zones; Guard vessel to monitor passing traffic; Construction vessels to be marked in accordance with COLREGS; Temporary navigation aids as required by Trinity House; Undertake device / array specific risk assessments to include NavAids; Provision of life saving equipment on fixed structures and floating devices.	(C2 x F3) = Low Risk
76	Swamping / Capsize Un-Powered Recreational Vessel	4.13	6(d)Swamping / Capsize Un-Powered Recreational Vessel	C2 (Minor)	F4 (Frequent)	(C2 x F4) = ALARP	Continuous monitoring by marine coordination centre; Appropriate alignment and spacing of arrays and devices; Guard vessel to monitor passing traffic; Construction vessels to be marked in accordance with COLREGS, Provision of life saving equipment on fixed structures and floating devices; Minimise use of marker buoys in zones of minimum UKC.	(C2 x F4) = ALARP
58	Collision Powered Recreational Vessel ICW Powered Recreational Vessel	4.35	6(e)Collision Powered Recreational Vessel ICW Powered Recreational Vessel	C2 (Minor)	F4 (Likely)	(C2 x F4) = ALARP	Continuous Monitoring by Marine Co-ordination Centre; Appropriate alignment and spacing of arrays and devices; Guard vessel to monitor passing traffic; Construction vessels to be marked in accordance with COLREGS; Temporary navigation aids as required by Trinity House; Minimise use of marker buoys in zones of minimum UKC.	(C2 x F3) = Low Risk



NRA Hazard ID's	Hazard Title	Risk Score	Potential Impact	Baseline Severity of Consequence	Baseline Frequency of Occurrence	Baseline Impact	Additional Mitigation Measures	Residual Impact (Risk)
85	Breakout of device / device not at stated depth	4.72	6(f) Breakout of device / device not at stated depth	C2 (Minor)	F4 (Frequent)	(C2 x F4) = ALARP	Restrict Navigation through gold and green MDZ zones; Continuous Monitoring by Marine Co-ordination Centre; Check device surveys; Establish no anchoring areas; Implementation of safety zones; Temporary navigation aids as required by Trinity House.	(C2 x C2) = Low Risk
7	Contact Other Vessels with Surface Device	4.72	7. Potential Impacts on other vessels	C2 (Minor)	F4 (Frequent)	(C2 x F4) = ALARP	Restrict Navigation through gold and green MDZ zones; Continuous Monitoring by Marine Co-ordination Centre; Check device surveys; Establish no anchoring areas; Implementation of safety zones; Temporary navigation aids as required by Trinity House.	(C2 x F3) = Low Risk
14	Contact Other Vessels with Mid-Water Device (<8m below CD)	4.72						
35	Contact Other Vessels with Electrical Hubs	4.07						
42	Collision Commercial Ship ICW Other Vessel	2.43						
48	Collision Passenger Vessels ICW Other Vessels	3.00						
53	Collision Project Vessel ICW Other Vessel	4.63						
57	Collision Fishing Vessel ICW Other Vessels	3.59						
60	Collision Powered Recreational Vessel ICW Other Vessel	4.47						
63	Collision Other Vessels ICW Other Vessels	5.13						



NRA Hazard ID's	Hazard Title	Risk Score	Potential Impact	Baseline Severity of Consequence	Baseline Frequency of Occurrence	Baseline Impact	Additional Mitigation Measures	Residual Impact (Risk)
70	Grounding / Forced Ashore Other Vessel	3.74						
77	Swamping / Capsize Other Vessel	3.62						
84	Snagging/ Obstruction Other Vessel	3.59						
85	Breakout of device / device not at stated depth	4.72						
N/A	8 Potential impacts on emergency response operations	2.99	8 Potential impacts on emergency response operations	Minor (C2)	(F2) Unlikely	(C2 x F2) = Low Risk	Continuous Monitoring by Marine Co-ordination Centre; Restrict navigation through gold and green MDZ zones; Appropriate alignment and spacing of arrays and devices; Check Device Surveys; Minimise use of marker buoys in zones of minimum UKC, Provision of life saving equipment on fixed structures and floating devices.	(C2 x F2) = Low Risk
78	Snagging/ Obstruction Commercial Ship	1.85	9. Subsea Infrastructure – potential impacts on all receptors	C2 (Minor)	F2 (Unlikely)	(C2 x F2) = Low Risk	Restrict Navigation through gold and green MDZ zones; MDZ designation as a No Fishing Zone; Continuous Monitoring by Marine Co-ordination Centre; Check device surveys; Establish no anchoring areas; Implementation of safety zones; Use of guard vessels to monitor passing traffic; Temporary navigation aids as required by Trinity House; Enhanced cable protection.	(C2 x F2) = Low Risk
79	Snagging/ Obstruction Passenger Vessels	2.09						
82	Snagging/ Obstruction Powered Recreational Vessel	0.56						
84	Snagging/ Obstruction Other Vessel	3.59						
80	Snagging / Obstruction Project Vessels	4.13	9(a) Snagging/ Obstruction Project Vessel	C2 (Minor)	F4 (Frequent)	(C2 x F4) = ALARP	Continuous Monitoring by Marine Co-ordination Centre; Establish no anchoring areas; Enhanced cable protection.	(C2 x F4) = LOW



NRA Hazard ID's	Hazard Title	Risk Score	Potential Impact	Baseline Severity of Consequence	Baseline Frequency of Occurrence	Baseline Impact	Additional Mitigation Measures	Residual Impact (Risk)
81	Snagging/ Obstruction Fishing Vessel	4.50	9(b)Snagging Obstruction Fishing Vessel	C2 (Minor)	F4 (Frequent)	(C2 x F4) = ALARP	Continuous Monitoring by Marine Co-ordination Centre; Restrict navigation through gold and green MDZ zones; MDZ designation as no fishing zone; Establish no anchoring areas; Enhanced cable protection.	(C2 x F3) = Low Risk
85	Breakout of device / device not at stated depth	4.72	9(c) Breakout of device/ device not at stated depth	C2 (Minor)	F4 (Frequent)	(C2 x F4) = ALARP	Restrict Navigation through gold and green MDZ zones; Continuous Monitoring by Marine Co-ordination Centre; Check device surveys; Establish no anchoring areas; Implementation of safety zones; Temporary navigation aids as required by Trinity House.	(C2 x C2) = Low Risk
3	Contact Project Vessel with Surface Device	4.38	10. Potential Impacts on project vessels	C3 (Moderate)	F3 (Possible)	(C3 x F3) = ALARP	Continuous Monitoring by Marine Co-ordination Centre; Restrict navigation through the gold and green MDZ zones; Appropriate alignment and spacing of devices; Guard vessel to monitor passing traffic; Implementation of safety zones; Construction vessels to be marked in accordance with COLREGS; Temporary navigation aids as required by Trinity House; Undertake device / array specific risk assessments to include NavAids; Minimise use of marker buoys in zones of minimum UKC.	(C3 x F2) = Low Risk
10	Contact Project Vessel with Mid-Water Device (<8m below CD)	5.28						
17	Contact Project Vessel with Mid-Water Device (>8m below CD)	3.11						
31	Contact Project Vessel with Electrical Hubs	3.77						
38	Collision Commercial Ship ICW Project Vessel	3.13						
44	Collision Passenger Ship ICW Project Vessel	3.71						
49	Collision Project Vessel ICW Project Vessel	4.53						
50	Collision Project Vessel ICW Fishing Vessel	3.00						



NRA Hazard ID's	Hazard Title	Risk Score	Potential Impact	Baseline Severity of Consequence	Baseline Frequency of Occurrence	Baseline Impact	Additional Mitigation Measures	Residual Impact (Risk)
51	Collision Project Vessel ICW Powered Recreational Vessel	3.02						
52	Collision Project Vessel ICW Un-Powered Recreational Vessel	2.66						
53	Collision Project Vessel ICW Other Vessel	4.63						
66	Grounding / Forced Ashore Project Vessels	2.57						
80	Snagging / Obstruction Project Vessels	4.13						
85	Breakout of device / device not at stated depth	4.72						
Operational Phase								
1	Contact Commercial Ship with Surface Device	2.58	1. Potential impacts on commercial vessels (safe operations)	C3 (Minor)	(F1) Remote	(C3 x F1) = Low Risk	Continuous Monitoring by Marine Co-ordination Centre; Restrict navigation through gold and green MDZ zones; Appropriate alignment and spacing of arrays and devices; Check Device Surveys; Establish no anchoring areas; Enhanced cable protection; Minimise use of marker buoys in zones of minimum UKC.	(C3 x F1) = Low Risk
7	Contact Commercial Ship with Mid-Water Device (<8m below CD)	3.20						
13	Contact Commercial Ship with Mid-Water Device (>8m below CD)	2.88						
25	Contact Commercial Vessel with Electrical Hubs	2.45						
31	Collision Commercial Ship ICW Commercial Ship	2.54						



NRA Hazard ID's	Hazard Title	Risk Score	Potential Impact	Baseline Severity of Consequence	Baseline Frequency of Occurrence	Baseline Impact	Additional Mitigation Measures	Residual Impact (Risk)
32	Collision Commercial Ship ICW Passenger Vessels	3.45						
33	Collision Commercial Ship ICW Fishing Vessel	2.27						
34	Collision Commercial Ship ICW Powered Recreational Vessel	2.72						
35	Collision Commercial Ship ICW Un-Powered Recreational Vessel	2.72						
36	Collision Commercial Ship ICW Other Vessel	2.27						
64	Snagging/ Obstruction Commercial Ship	1.85						
70	Breakout of device / device not at stated depth	2.95						
N/A	Impact on Commercial Vessel Routing – Commercial vessel forced to take alternative route due to presence of the site.	1.79	2. Potential impacts on commercial vessel routing	C2 (Minor)	(F1) Remote	(C2 x F1) = Negligible	Check Device Surveys; Minimise use of marker buoys in zones of minimum UKC.	(C2 x F1) = Negligible
2	Contact Passenger Vessels with Surface Device	2.49	3. Potential impacts on	C3 (Moderate)	(F2) Unlikely	(C3 x F2) = Low Risk	Continuous Monitoring by Marine Co-ordination Centre; Restrict navigation through gold and green MDZ zones; Appropriate alignment and spacing of arrays and devices;	(C3 x F1) = Low Risk



NRA Hazard ID's	Hazard Title	Risk Score	Potential Impact	Baseline Severity of Consequence	Baseline Frequency of Occurrence	Baseline Impact	Additional Mitigation Measures	Residual Impact (Risk)
8	Contact Passenger Vessels with Mid-Water Device (<8m below CD)	3.82	Passenger Vessels (safe operations)				Check Device Surveys; Establish no anchoring areas; Enhanced cable protection; Minimise use of marker buoys in zones of minimum UKC.	
14	Contact Passenger Vessels with Mid-Water Device (>8m below CD)	3.11						
26	Contact Passenger Vessels with Electrical Hubs	2.68						
32	Collision Commercial Ship ICW Passenger Vessels	3.45						
38	Collision Passenger Vessels ICW Fishing Vessel	2.43						
39	Collision Passenger Vessels ICW Powered Recreational Vessel	2.96						
40	Collision Passenger Vessels ICW Un-Powered Recreational Vessel	2.96						
41	Collision Passenger Vessels ICW Other Vessels	2.43						
65	Snagging/ Obstruction Passenger Vessels	2.09						
70	Breakout of device / device not at stated depth	2.95						
37	Collision Passenger Vessels ICW Passenger Vessel	4.00	3(a) Collision Passenger Vessels ICW Passenger Vessel	C4 (Major)	F1 (Remote)	(C4 x F1) = ALARP	Minimise use of marker buoys in zones of minimum UKC.	(C4 x F1) = ALARP



NRA Hazard ID's	Hazard Title	Risk Score	Potential Impact	Baseline Severity of Consequence	Baseline Frequency of Occurrence	Baseline Impact	Additional Mitigation Measures	Residual Impact (Risk)
N/A	Impact on Passenger Vessel Routing Passenger vessel forced to take alternative route due to presence of site.	3.64	2. Potential impacts on passenger vessel routing	C2 (Minor)	(F3) Possible	(C2 x F3) = Low Risk	Check Device Surveys; Minimise use of marker buoys in zones of minimum UKC.	(C2 x F3) = Low Risk
3	Contact Fishing Vessel with Surface Device	3.47	5. Potential impacts on fishing vessels	C2 (Minor)	F3 (Possible)	(C2 x F3) = Low Risk	Continuous Monitoring by Marine Co-ordination Centre; Restrict navigation through gold and green MDZ zones; MDZ designation as no fishing zone; Appropriate alignment and spacing of arrays and devices; Check Device Surveys; Establish no anchoring areas; Enhanced cable protection; Minimise use of marker buoys in zones of minimum UKC; Provision of life saving equipment on fixed structures and floating devices.	(C2 x F2) = Low Risk
27	Contact Fishing Vessel with Electrical Hubs	2.86						
33	Collision Commercial Ship ICW Fishing Vessel	2.27						
38	Collision Passenger Vessels ICW Fishing Vessel	2.43						
42	Collision Fishing Vessel ICW Fishing Vessel	2.38						
43	Collision Fishing Vessel ICW Powered Recreational Vessel	3.31						
44	Collision Fishing Vessel ICW Un-Powered Recreational Vessel	3.67						
45	Collision Fishing Vessel ICW Other Vessels	2.76						
54	Grounding / Forced Ashore Fishing Vessel	2.88						
60	Swamping / Capsize Fishing Vessel	3.13						



NRA Hazard ID's	Hazard Title	Risk Score	Potential Impact	Baseline Severity of Consequence	Baseline Frequency of Occurrence	Baseline Impact	Additional Mitigation Measures	Residual Impact (Risk)
70	Breakout of device / device not at stated depth	2.95						
66	Snagging/ Obstruction Fishing Vessel	4.50	5(a) Snagging/ Obstruction Fishing Vessel	C2 (Minor)	F4 (Likely)	(C2 x F4) = ALARP	Continuous Monitoring by Marine Co-ordination Centre; Restrict navigation through gold and green MDZ zones; MDZ designation as no fishing zone; Appropriate alignment and spacing of arrays and devices; Check Device Surveys; Establish no anchoring areas; Enhanced cable protection; Minimise use of marker buoys in zones of minimum UKC.	(C2 x F3) = Low Risk
9	Contact Fishing Vessel with Mid-Water Device <8m below CD)	4.23	5(b)Contact Fishing Vessel with Mid-Water Device <8m below CD)	C2 (Minor)	F4 (Likely)	(C2 x F4) = ALARP	Continuous Monitoring by Marine Co-ordination Centre; Restrict Navigation through the Gold and Green MDZ Zones; MDZ designation as No Fishing Zone; Appropriate alignment and spacing of arrays and devices; Check device surveys; Provision of life saving equipment on fixed structures and floating devices.	(C2 x F3) = Low Risk
4	Contact Powered Recreational Vessel with Surface Device	3.59	6. Potential impacts on recreational craft	C2 (Minor)	F3 (Possible)	(C2 x F3) = Low Risk	Continuous Monitoring by Marine Co-ordination Centre; Restrict navigation through gold and green MDZ zones; Appropriate alignment and spacing of arrays and devices; Check Device Surveys; Establish no anchoring areas; Enhanced cable protection; Minimise use of marker buoys in zones of minimum UKC; Provision of life saving equipment on fixed structures and floating devices.	(C2 x F3) = Low Risk
5	Contact Un-Powered Recreational Vessel with Surface Device	3.59						
11	Contact Un-Powered Recreational Vessel with Mid-Water Device (<8m below CD).	3.04						
28	Contact Powered Recreational Vessel with Electrical Hubs	2.76						
29	Contact Un-Powered Recreational Vessel with Electrical Hubs	1.94						



NRA Hazard ID's	Hazard Title	Risk Score	Potential Impact	Baseline Severity of Consequence	Baseline Frequency of Occurrence	Baseline Impact	Additional Mitigation Measures	Residual Impact (Risk)
34	Collision Commercial Ship ICW Powered Recreational Vessel	2.72						
35	Collision Commercial Ship ICW Un-Powered Recreational Vessel	2.72						
39	Collision Passenger Vessels ICW Powered Recreational Vessel	2.96						
40	Collision Passenger Vessels ICW Un-Powered Recreational Vessel	2.96						
43	Collision Fishing Vessel ICW Powered Recreational Vessel	3.31						
44	Collision Fishing Vessel ICW Un-Powered Recreational Vessel	3.67						
46	Collision Powered Recreational Vessel ICW Powered Recreational Vessel	3.64						
47	Collision Powered Recreational Vessel ICW Un-Powered Recreational Vessel	2.94						
48	Collision Powered Recreational Vessel ICW Other Vessel	3.51						
49	Collision Un-Powered Recreational Vessel ICW Un-Powered Recreational Vessel	2.13						



NRA Hazard ID's	Hazard Title	Risk Score	Potential Impact	Baseline Severity of Consequence	Baseline Frequency of Occurrence	Baseline Impact	Additional Mitigation Measures	Residual Impact (Risk)
50	Collision Un-Powered Recreational Vessel ICW Other Vessel	2.94						
56	Grounding / Forced Ashore Un-Powered Recreational Vessel	3.37						
61	Swamping / Capsize Powered Recreational Vessel	3.55						
67	Snagging/ Obstruction Powered Recreational Vessel	0.56						
70	Breakout of device / device not at stated depth	2.95						
10	Contact Powered Recreational Vessel with Mid-Water Device (<8m below CD)	4.01	6(a)Contact Powered Recreational Vessel with Mid-Water Device (<8m below CD)	C2 (Minor)	F4 (Likely)	(C2 x F4) = ALARP	Continuous Monitoring by Marine Co-ordination Centre; Restrict Navigation through the Gold and Green MDZ Zones; Appropriate alignment and spacing of arrays and devices; Check device surveys; Provision of life saving equipment on fixed structures and floating devices.	(C2 x F3) = Low Risk
55	Grounding / Forced Ashore Powered Recreational Vessel	4.67	6(b)Grounding / Forced Ashore Powered Recreational Vessel	C3 (Moderate)	F3 (Likely)	(C3 x F3) = ALARP	Appropriate alignment and spacing of arrays and devices; Minimise use of marker buoys in zones of minimum UKC.	(C3 x F3) = ALARP
62	Swamping / Capsize Un-Powered Recreational Vessel	4.13	6(c)Swamping / Capsize Un-Powered Recreational Vessel	C2 (Minor)	F4 (Possible)	(C2 x F4) = ALARP	Continuous monitoring by marine coordination centre; Provision of life saving equipment on fixed structures and floating devices.	(C2 x F4) = ALARP
6	Contact Other Vessels with Surface Device	3.56	7. Potential Impacts on other vessels	C2 (Minor)	(F2) Unlikely	(C2 x F2) = Low Risk	Continuous Monitoring by Marine Co-ordination Centre; Restrict navigation through gold and green MDZ zones; Appropriate alignment and spacing of arrays and devices;	(C2 x F2) = Low Risk



NRA Hazard ID's	Hazard Title	Risk Score	Potential Impact	Baseline Severity of Consequence	Baseline Frequency of Occurrence	Baseline Impact	Additional Mitigation Measures	Residual Impact (Risk)
12	Contact Other Vessels with Mid-Water Device (<8m below CD)	3.57					Check Device Surveys; Establish no anchoring areas; Enhanced cable protection; Minimise use of marker buoys in zones of minimum UKC, Provision of life saving equipment on fixed structures and floating devices.	
30	Contact Other Vessels with Electrical Hubs	3.72						
36	Collision Commercial Ship ICW Other Vessel	2.27						
41	Collision Passenger Vessels ICW Other Vessels	2.43						
45	Collision Fishing Vessel ICW Other Vessels	2.76						
48	Collision Powered Recreational Vessel ICW Other Vessel	3.51						
50	Collision Un-Powered Recreational Vessel ICW Other Vessel	2.94						
51	Collision Other Vessels ICW Other Vessels	2.64						
57	Grounding / Forced Ashore Other Vessel	2.88						
63	Swamping / Capsize Other Vessel	3.13						
69	Snagging/ Obstruction Other Vessel	2.54						
70	Breakout of device / device not at stated depth	2.95						
N/A	Potential impacts on emergency response operations	2.99	8 Potential impacts on emergency response operations	Minor (C2)	Unlikely (F2)	(C2 x F2) = Low Risk		Continuous Monitoring by Marine Co-ordination Centre; Restrict navigation through gold and green MDZ zones; Appropriate alignment and spacing of arrays and devices; Check Device Surveys; Minimise use of marker buoys in zones of minimum UKC,



NRA Hazard ID's	Hazard Title	Risk Score	Potential Impact	Baseline Severity of Consequence	Baseline Frequency of Occurrence	Baseline Impact	Additional Mitigation Measures	Residual Impact (Risk)
							Provision of life saving equipment on fixed structures and floating devices.	
64	Snagging/ Obstruction Commercial Ship	1.85	9. Subsea Infrastructure – potential impacts on all receptors	C2 (Minor)	(F2) Unlikely	(C2 x F2) = Low Risk	Restrict Navigation through gold and green MDZ zones; Continuous Monitoring by Marine Co-ordination Centre; Check device surveys; MDZ designation as no fishing zone; Establish no anchoring areas; Enhanced cable protection; Implementation of safety zones; Temporary navigation aids as required by Trinity House.	(C2 x F2) = Low Risk
65	Snagging/ Obstruction Passenger Vessels	2.09						
67	Snagging/ Obstruction Powered Recreational Vessel	0.56						
69	Snagging/ Obstruction Other Vessel	2.54						
70	Breakout of device / device not at stated depth	2.95						
66	Snagging/ Obstruction Fishing Vessel	4.50	9(a) Snagging/ Obstruction Fishing Vessel	C2 (Minor)	F4 (Likely)	(C2 x F4) = ALARP	Continuous Monitoring by Marine Co-ordination Centre; Restrict navigation through gold and green MDZ zones; MDZ designation as no fishing zone; Appropriate alignment and spacing of arrays and devices; Check Device Surveys; Establish no anchoring areas; Enhanced cable protection; Minimise use of marker buoys in zones of minimum UKC.	(C2 x F3) = Low Risk
Decommissioning Phase								
			It is likely that decommissioning of individual structures will be the responsibility of the individual developers, as overseen by Mentor Môn. Decommissioning of the site comprises the complete removal of all infrastructure associated with the tidal energy project. Offshore decommissioning methodologies would vary considerably between devices but would be expected to be similar to the construction phase in reverse. As the methodologies for decommissioning are expected to be similar to construction it can be assumed that the same impacts arise and can be applied to the decommissioning phase. It should be noted that this is a highly precautionary assessment as it is likely that the impacts from decommissioning will be less than those from construction.					
Cumulative Impacts								



NRA Hazard ID's	Hazard Title	Risk Score	Potential Impact	Baseline Severity of Consequence	Baseline Frequency of Occurrence	Baseline Impact	Additional Mitigation Measures	Residual Impact (Risk)
C1	Impact from increased vessel activity			Minor (C2)	Unlikely (F2)		Continuous Monitoring by Marine Co-ordination Centre; Restrict navigation through gold and green MDZ zones; Check Device Surveys; Appropriate alignment and spacing of arrays and devices.	(C2 x F2) = Low Risk
C2	Impact on vessel routing			Minor (C2)	Unlikely (F2)		Continuous Monitoring by Marine Co-ordination Centre; Restrict navigation through gold and green MDZ zones; Check Device Surveys; Appropriate alignment and spacing of arrays and devices.	(C2 x F2) = Low Risk
C3	Impact from subsea cables			Minor (C2)	Unlikely (F2)		Continuous Monitoring by Marine Co-ordination Centre; Restrict navigation through gold and green MDZ zones; Check Device Surveys; Appropriate alignment and spacing of arrays and devices.	(C2 x F2) = Low Risk

15.8. REFERENCES

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