HORIZON NUCLEAR POWER

WYLFA NEWYDD

ENERGY WORKING FOR BRITAIN

Wylfa Newydd Project

6.4.99 ES Volume D - WNDA Development App D15-1 - Navigational Risk Assessment

PINS Reference Number: EN010007

Application Reference Number: 6.4.99

June 2018

Revision 1.0

Regulation Number: 5(2)(a)

Planning Act 2008
Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

Horizon Internal DCRM Number: WN0902-JAC-PAC-APP-00174

[This page is intentionally blank]

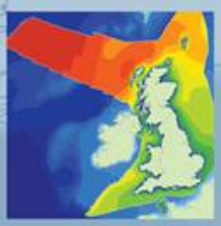
Wylfa Newydd Project

Navigational Risk Assessment

Jacobs

August 2017

Creating sustainable solutions for the marine environment


Page intentionally left blank

Wylfa Newydd Project

Navigational Risk Assessment

August 2017

Document Information

Document History and Authorisation		
Title	Wylfa Newydd Project	
	Navigational Risk Assessment	
Commissioned by	Jacobs	
Issue date	August 2017	
Document ref	R.2723 v2	
Project no	R/4521/1	
Date	**Version**	**Revision Details**
V2		
02/06/2017	1	Issued for client use
13/06/2017	2	Issued for client use – following client review
22/06/2017	3	Issued for client use – following client review
04//08/2017	4	Issued for client review – following client updates (unsigned)
09/08/2017	5	Issued for client use

Prepared (PM)	Approved (QM)	Authorised (PD)
Adam Fitzpatrick	Monty Smedley	Natalie Frost

Suggested Citation

ABPmer, (2017). Wylfa Newydd Project, Navigational Risk Assessment, ABPmer Report No. R.2723 v2.
A report produced by ABPmer for Jacobs, August 2017.

Contributing Authors

Adam Fitzpatrick and Monty Smedley

Notice

ABP Marine Environmental Research Ltd
Quayside Suite, Medina Chambers, Town Quay, Southampton, Hampshire SO14 2AQ
T: +44 (0) 2380 711844 W: http://www.abpmer.co.uk/

Executive Summary

ABPmer has been commissioned by Jacobs to undertake a Navigational Risk Assessment (NRA), which details the marine risk associated with the construction and operational phases of the marine works for the Wylfa Newydd Project.

A risk workshop was held to draw out expert opinion from the local stakeholders. Relevant guidance and information published by industry bodies and regulators has also been reviewed and incorporated into the NRA process. To inform the stakeholder group, information defining the baseline navigational environment was provided, which included a traffic assessment using Automatic Identification System data collected in 2015, augmented by published and anecdotal information on recreational vessel use.

In total, 43 hazard scenarios were identified and assessed. A total of 23 hazard scenarios were identified for the construction of the Marine Off-Loading Facility (MOLF), breakwaters, Cooling Water intake and Cooling Water outfall and 20 hazard scenarios for the operational phase.

From the NRA process, 42 mitigation measures were identified, split between the construction and operational phases of the marine works. Following implementation of appropriate mitigation, marine risk to navigational receptors can be maintained within a level that is 'As Low As Reasonably Practicable'.

Contents

Appendices

Images

Tables

Figures

1 Introduction

1.1 Background to the Wylfa Newydd Project

A Development Consent Order (DCO) will be applied for in respect of the Wylfa Newydd DCO Project. The Power Station would be located on a site identified by the UK Government through the National Policy Statement for Nuclear Power Generation (EN-6), referred to as the Wylfa National Policy Statement (NPS) Site. The Wylfa NPS Site is located on the north coast of Anglesey adjacent to the Existing Power Station. Marine facilities would be used during construction and operation of the Power Station. These marine facilities include the MOLF, breakwaters, Cooling Water intake and Cooling Water outfall for the Power Station. The marine development is referred to collectively as 'Wylfa Marine Development Area' throughout the report.

1.2 Study area overview

For the purposes of this NRA, the study area includes the Skerries traffic separation scheme (TSS) to the west and north of the Wylfa NPS Site, Dulas Bay to the east and the Holyhead North marine disposal site to the south. The marine works area extends to the Skerries lighthouse in the west, north to the Skerries TSS and east to the Middle Mouse rock. Figure 1 shows the full extent of the study area and marine works area.

1.3 Legislation and guidance

The following section identifies relevant legislation relating to navigational assessments for marine developments.

1.3.1 Primary legislation

International protocols and conventions relating to safety, laws of the sea and pollution apply to shipping and ports. The UK Government has a responsibility to ensure that measures are implemented in order to honour its commitments to these protocols, not least of these is the UK's responsibility under Article 60(7) of the United Nations Convention on the Law of the Sea (UNCLOS) relating to provisions for 'Artificial islands, installations and structures in the exclusive economic zone'. An NRA is one process by which the necessary considerations of developments can be evaluated.

Within UK territorial waters, the UK Government upholds the right of innocent passage, as defined in Article 17 of UNCLOS. Beyond the 12-nautical-mile limit of UK territorial waters, shipping has the freedom of navigation. The regulation of shipping should be carried out by the 'flag state control' operated by the country to which the ship is registered. As this has proved unsatisfactory, 'port state control' has become common in national jurisdictions. Under this regime, the UK Government represented by the inspection division of the Maritime and Coastguard Agency (MCA) exercises the rights of the port state to inspect and, if appropriate, detain sub-standard ships.

Sea ports and harbours provide the interface between the land, near shore and open sea. The UK Marine Policy Statement (UK Government, 2011) identifies in relation to port developments and marine safety that:

"*Marine plan authorities and decision makers should take into account and seek to minimise any negative impacts on shipping activity, freedom of navigation and navigational safety; and ensure that their decisions are in compliance with international maritime law"* (HM Government, 2011)

A Statutory Harbour Authority (SHA) is self-governed, with specific legislation (normally acts of Parliament) creating the SHA as an entity, with further powers and amendments made over time in response to the changing scope and remit of the SHA. Underpinning the powers of an SHA is a range of national legislation which places statutory responsibility on the SHA to ensure navigation and safety within the harbour limits; this includes the 'Harbours Act 1964', 'Harbours, Docks and Piers Clauses Act 1847' and the 'British Transport Docks Act 1972'. Under such legislation, the Harbour Master, as defined in the Harbours, Docks and Piers Clauses Act 1847, may issue general or specific directions to control movements of vessels within their SHA area in order to ensure safety.

The DCO in respect of the Wylfa Newydd DCO Project will establish Horizon Nuclear Power Wylfa as a SHA. The SHA area would include the extent of the marine works. .

1.3.2 Secondary guidance

In the absence of specific navigational guidance relating to the development and operation of marine works, including the creation of a MOLF, breakwaters, Cooling Water intake and Cooling Water outfall inside of an SHA area, the following secondary guidance documents have been used in preparation of the NRA tables. These documents provide information regarding the issues that should be considered when assessing the effect on navigational safety:

- International Maritime Organization (IMO) Revised Guidelines for Formal Safety Assessment (FSA) for use in the IMO rule making process (IMO, 2013);
- MCA, Marine Guidance Note 543 (MGN 543 Merchant + Fishing) Safety of Navigation: Offshore Renewable Energy Installations (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response (MCA, 2016);
- Department for Transport (DfT) and MCA; Methodology for Assessing the Marine Navigational Safety and Emergency Response Risks of Offshore Renewable Energy Installations (OREI) (DfT/MCA, 2013); and
- Port Marine Safety Code (PMSC) (DfT/MCA, 2016).

As the regulator for marine safety, the MCA has been consulted in the planning and creation of the supporting NRA. In addition, in its capacity as the General Lighthouse Authority, Trinity House has been consulted with respect to the lighting and marking of marine structures and marine works associated with the MOLF, breakwaters, Cooling Water intake and Cooling Water outfall.

1.3.3 ALARP principle

Within the PMSC, the term ALARP is defined; this stands for 'As Low As Reasonably Practicable'. It is an industry-wide concept applying to both health and safety and port marine safety. The core concept is that of 'reasonably practicable', which involves weighing up risk against the effort, time and money needed to control it. The PMSC specifically references ALARP in respect of the Marine Safety Management System (MSMS) and NRAs.

2 Data Sources

The following section details where the data required to inform the baseline information and NRAs have been compiled from.

2.1 Automatic identification system data

Automatic Identification System (AIS) data has been used for the 2015 period. The data has been provided through agreement with the Marine Management Organisation and decoded by ABPmer to create a geodatabase of anonymised vessel transits. The data was collected by the UK MCA using their network of AIS receivers. The data represent a composite of 84 days of AIS data collected in 2015. The following periods of time form the dataset:

- 1 to 7 from each of the following: January, February, March, April, May, June, July, August and November 2015;
- 8 to 14 of October 2015;
- 29 August to 4 September 2015; and
- 3 to 9 December 2015.

The minimum requirements for vessel traffic data from the OREI methodology (DfT/MCA, 2013) is 28 days split between peak and off-peak periods (typically 14 days in the winter and 14 days in the summer). The data used for this assessment consists of a sample of seven days for each month of the year. This provides for 84 days of AIS data from 2015, which is the most recent set of data available from the MCA. This approach ensures that seasonality is captured within the full 84-day dataset, with the NRA making use of the latest national AIS dataset. This provides greater confidence that the vessel traffic routeing has more fully taken into account transient vessel patterns. This approach was agreed with the MCA at the start-up meeting preceding the NRA (see Section 7.1.1).

AIS signals are broadly classified as 'Class A' and 'Class B', where AIS-A is carried by international voyaging ships with gross tonnage of 300 or more tonnes, and all passenger ships regardless of size. AIS-B is carried by smaller vessels and is aimed at smaller commercial vessels, the fishing sector and recreational vessel users; however, the use of AIS-B is non-compulsory. Both AIS-A and AIS-B data have been used within this study.

The AIS data has been broken down using the following vessel categories, which are taken directly from the AIS data transmissions:

- Non-port service craft;
- Port service craft;
- Vessels engaged in dredging or underwater operations;
- High speed craft;
- Military or law enforcement vessels;
- Passenger vessels;
- Cargo vessels;
- Tankers;
- Fishing; and
- Recreational.

2.2 Recreational activity

Data for recreational activity in the study area has been collated using a variety of methods. Quantitative data has been derived from AIS-B records. However, it is recognised that only a small percentage of recreational craft carry AIS transceivers, as use of AIS-B is non-mandatory. Therefore, patterns of activity by recreational craft from AIS sources alone were considered to significantly underplay their true frequency and routeing patterns. To provide a more comprehensive set of information to define recreational use, anecdotal and website information has been compiled; this included information from local yacht and sailing clubs, Royal Yachting Association (RYA) routeing information, race route maps, analysis of passage plans and yachting guides.

2.3 Navigational features

Navigational features have been considered in Section 3.1. These features have been identified using information from Admiralty Chart number 1977 titled 'Holyhead to Great Orme's Head'.

2.4 Maritime incidents

To characterise maritime incidents occurring within the study area, available data has been pooled from a number of sources. This includes call out data records held by the Royal National Lifeboat Institution (RNLI) and Marine Accident Investigation Branch (MAIB) incident records.

2.5 MetOcean

Information relating to the MetOcean environment, relevant to navigational interests with the study area has been drawn from surveys completed by Titan Environmental Surveys. Tidal information is published via Admiralty Total Tide; the current flows were measured at intervals on a neap and spring tide and presented in the Wylfa Oceanography Interpretive Report (Titan Environmental Surveys, 2012). Wind information has been taken from observations at RAF Valley since 1 January 1960 and has been summarised using a wind rose. Wave information was provided by the Wylfa Newydd Development Site Further wave modelling, Phase 1 (Amec, 2015).

3 Navigational Baseline

The following sections review the baseline conditions for commercial shipping and recreational navigation within the study area. Where relevant, factors relating to Wylfa Marine Development Area have been drawn out. The following elements are covered in the baseline:

- Navigational environment;
- Statutory responsibilities and management procedures;
- Recreational facilities;
- Fishing activities;
- Aids to navigation;
- Emergency response; and
- Marine incidents.

3.1 Navigational environment

This section presents a description of the navigational features in the study area (Figure 2). Cemlyn Bay in which the Wylfa Marine Development Area is situated is not currently used by commercial vessels, and due to the navigational features in the area, large vessels typically navigate around 4 Nautical Miles (nm) from the coastline. The largest port within the study area is Holyhead, which is operated by Stena Line Ports Ltd; the port has ferry services to Ireland operated by Stena Line and Irish ferries. The other harbours located within the study area are at Cemaes Bay and Amlwch. These harbours are mainly used by smaller recreational and fishing vessels. However, it should be noted that a pilot service for vessels navigating to and from Liverpool is located at Amlwch; the associated pilot boarding station is located 2 nm north of Point Lynas (see Figure 2).

A significant feature within the study area is the Skerries TSS. This TSS is regularly used by vessels transiting to and from ports on the north coast of Wales and the north-west coast of England, in particular Liverpool. The TSS is located 4.2 nm from the Wylfa Marine Development Area at its closest point, meaning that large commercial vessels are unlikely to transit close to the Wylfa Marine Development Area. There is a deep-water anchorage located 2 nm north-east of Moelfre, close to Dulas Bay. This anchorage is routinely used by commercial vessels before proceeding to the Port of Mostyn. For locations, see Figure 2.

3.2 Statutory responsibilities and management procedures

There are no SHAs that currently cover any part of the marine works area. Recreational vessels regularly report their departure and intentions to the coastguard station situated at Holyhead, and vessels navigating to or from Holyhead contact Holyhead Port Control which is operated by Stena Line Ports Ltd.

3.3 Recreational facilities

Within the study area there are recreational facilities available at Holyhead Marina. The marina has approximately 350 berths and a large number of swinging moorings. Holyhead Sailing Club operates out of Holyhead marina; the sailing club is RYA accredited and offers courses in the area (see Figure 3 for locations).

The bays and inlets along the north coast of Anglesey provide sheltered anchorages for recreational craft in the area when the wind is in a south-west, through to south-easterly direction. The bays do

not provide permanent mooring facilities and are mainly used for cruising as a stop-off point for overnight anchoring or a short break to wait for tide or wind during a transit.

3.4 Fishing activities

Recreational fishing regularly takes place in the area to the north of Anglesey with vessels based at Cemaes Harbour and Amlwch Harbour. These harbours are both home to vessels that regularly fish in Cemlyn Bay (the Wylfa Marine Development Area is located in the east of Cemlyn Bay). There are approximately seven vessels fishing within Cemlyn Bay, some of which currently lay pots and shoot lines within the Wylfa Marine Development Area. There are no commercial fishing activities taking place in the vicinity of the Wylfa Marine Development Area.

3.5 Aids to navigation

A range of Aids to Navigation are used within the study area; Figure 2 identifies their locations. There are a number of cardinal marker buoys to the east of the Wylfa Marine Development Area that mark areas where there are rocks close to the surface. The cardinal marker buoys are situated at the extremity of a navigational hazard with the buoy indicating which direction is safe for vessels to pass.

A Racon is in operation at the Skerries lighthouse. The Racon will be shown on a vessel's radar as the Morse Code for the corresponding letter shown on the nautical chart. The purpose of the Racon is to present a visual representation on the vessel's radar screen highlighting, in this case, the location of the lighthouse. This is widely used so that in periods of reduced visibility vessels can navigate safely in the area.

A differential global positioning system station is located at Point Lynas. This station transmits a correction to the global positioning system receivers within a maximum range of approximately 300 nm to increase the positional accuracy of the system.

The existing Magnox jetty located within the Wylfa Marine Development Area has port lateral marks to aid vessels navigating to berth at the jetty.

3.6 Emergency response

A range of emergency response is available within the study area. The following organisations provide resources to render assistance in the instance that a marine emergency occurs.

3.6.1 HM Coastguard

The MCA is responsible for the initiation and coordination of all civilian maritime search and rescue operations within the UK Maritime Search and Rescue Region. This includes the mobilisation, organisation and tasking of adequate resources to respond to persons in distress at sea, or to persons at risk of injury or death along the shoreline within the UK. HM Coastguard has access to a range of resources including aircraft and coastal search teams. The study area falls within the jurisdiction of the Holyhead Coastguard Operations Centre.

3.6.2 Local rescue organisations

There are two lifeboat stations in the vicinity of Wylfa Marine Development Area, located at Holyhead and Moelfre, shown on Figure 2. The coverage area for the two lifeboat stations is sufficient to cover the north coast of Anglesey. The following provides a brief overview:

- **Holyhead RNLI** is manned by a voluntary crew and the station operates both an all-weather Severn class lifeboat and an inshore D class lifeboat.
- **Moelfre RNLI** is manned by a voluntary crew operating a Tamar class lifeboat and an inshore D class lifeboat.

3.7 Marine incidents

This section reviews marine incidents that have occurred within the study area over the past 10 years (subject to the availability of data). The analysis is intended to provide a general indication as to whether the study area is in an area of low or high risk in terms of marine incidents. Data from the MAIB and the RNLI has been obtained, covering the following timescale:

- MAIB: information includes accidents to ships and personnel reports to the MAIB within the period of 2006 to 2015 inclusive.
- RNLI: complete dataset of all callouts from 2006 to 2015 inclusive.

Given that the datasets cover slightly different time periods, and use different classifications for identifying accidents and incidents, the study team has amalgamated datasets to create the best available 10 years of information. Where possible, duplication of data has been removed (as the same incident may have been recorded by both organisations). The complete combined dataset has been presented spatially in Figure 4. Due to the size and complexity of the data record, the tabulated information has been included in Appendix A. Table 3.2 and Table 3.3 provide a compiled view of marine incidents within the study area and marine works area addressed by this document.

3.8 Holyhead North Disposal Site

Excess dredge material from the Wylfa Marine Development Area will be disposed at Holyhead North marine disposal site (IS043). This is a newly designated site to the north-west of Holyhead (see Figure 2) replacing Holyhead Deep Disposal Site (IS040). The Holyhead Deep site has been closed due to the tidal power project in the southern half of the disposal site planned by Minesto. This project involves deploying tidal turbines and was granted consent in April 2017. The northern half of the Holyhead Deep Disposal Site has been designated as Holyhead North.

As Holyhead North is a newly designated site, there is no historical information for disposal quantities. To indicate possible future levels of disposal at Holyhead North, Table 3.1 presents annual disposal quantities for Holyhead Deep from 2006 to 2015. The disposal quantities are used to determine the number of vessels that are likely to be navigating to/from Holyhead North over a period.

Table 3.1 Annual disposal quantities for Holyhead Deep Disposal Site

Year	Disposal Quantity (wet tonnes)
2006	12,750
2007	52,513
2008	44,937
2009	65,964
2010	0
2011	88,535
2012	87,568
2013	41,678
2014	0
2015	89,320

Table 3.2 Marine incident summary for the study area (2006 to 2015)

Incident Category	Year										Total	Annual Frequency
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015		
Capsize/sinking	3	4	2	3	2	1	4	4	4	3	30	3
Collision	3	2	0	0	0	0	0	0	4	2	11	1.1
Equipment failure (vessel)	22	18	14	23	17	12	14	15	20	18	173	17.3
Fire/explosion	3	1	0	0	0	1	1	2	0	0	8	0.8
Grounding	5	1	2	3	0	4	0	3	2	1	21	2.1
Impact with structure	0	1	1	1	3	1	0	1	1	2	11	1.1
Leaks/swamping	0	2	0	0	1	0	1	2	1	2	9	0.9
Other nautical safety	5	6	5	10	1	3	5	10	9	7	61	6.1
Person in distress	1	6	3	3	2	1	3	0	3	3	25	2.5
Person(s) in the water	4	1	2	3	1	1	2	1	1	1	17	1.7
Total	**46**	**42**	**29**	**46**	**27**	**24**	**30**	**38**	**45**	**39**	**366**	**36.6**

Table 3.3 Marine incident summary for the marine works area (2006 to 2015)

Incident Category	Year										Total	Annual Frequency
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015		
Capsize/sinking	1	0	1	0	0	0	0	0	0	1	3	0.3
Collision	0	2	0	0	0	0	0	0	0	0	2	0.2
Equipment failure (vessel)	1	0	0	3	1	1	2	1	0	2	11	1.1
Fire/explosion	0	0	0	0	0	0	0	1	0	0	1	0.1
Grounding	1	1	1	0	0	0	0	1	0	0	4	0.4
Leaks/swamping	0	0	0	0	0	0	0	0	1	0	1	0.1
Other nautical safety	0	0	0	1	0	0	0	0	1	0	2	0.2
Person(s) in the water	0	1	1	0	0	0	0	0	1	1	4	0.4
Total	**3**	**4**	**3**	**4**	**1**	**1**	**2**	**3**	**3**	**4**	**28**	**2.8**

From Table 3.2, it can be noted that the most commonly occurring incident within the study area is that of 'equipment failure (vessel)' followed by 'other nautical safety' and 'capsize/sinking'. When the location of these is examined on Figure 5, it can be seen that incidents generally occur in larger concentrations at Holyhead and Moelfre, then to a lesser extent along the coastline of Anglesey.

Incidents within the marine works area are shown in Table 3.3. The most common incident is again 'equipment failure (vessel)' with an average annual frequency of 1.1 occurrences per year. The next most frequent type of incident within the marine works area is 'grounding' with four occurrences within the 10-year period. Figure 5 shows that most of the groundings occur on the shallow rocks and reefs between the Skerries Lighthouse and the Anglesey coastline; there was one grounding on the north-western side of Cemlyn Bay.

The more serious marine incidents of ship-to-ship collision, fire/explosion and capsize/sinking occur very infrequently within the marine works area with five reported occurrences within the 10-year period. There were three reported 'capsize/sinking' incidents of which two were a canoe or kayak capsizing and one was the capsize of a dinghy which led to a fatality. There was one 'fire/explosion' incident which involved an engine fire on board a workboat whilst on passage and one collision, which was a near miss event between a small cargo vessel and a recreational yacht.

4 MetOcean

4.1 Tides

A study of the oceanography for the area surrounding the Wylfa Peninsula was commissioned by Horizon Nuclear Power Wylfa and carried out by Titan Environmental Surveys. The oceanographic study shows that the spring and neap tidal ranges at the Wylfa Peninsula are 7 m and 2.5 m respectively. In this area, the flood tide will flow in an easterly direction and the ebb tide in a westerly direction. The proposed location of the MOLF and breakwaters is partially sheltered in Cemlyn Bay within which the current forms rotational eddies. The maximum current speed and direction for spring and neap tides are shown in Table 4.1.

Table 4.1 Summary of current flow results

Site Number	Location	Spring Tide		Neap Tide	
		Maximum Current (ms^{-1})	Direction of Maximum Current (°N)	Maximum Current (ms^{-1})	Direction of Maximum Current (°N)
S2	Seabed	1.82	258	1.33	094
S2	Surface	2.12	263	1.85	086
S4	Seabed	1.95	269	1.33	097
S4	Surface	1.93	256	1.34	262
S9	Seabed	1.01	249	0.75	252
S9	Surface	1.03	256	0.71	248
1 m/s is 1.94 knots					

Source: Titan Environmental Surveys, 2012

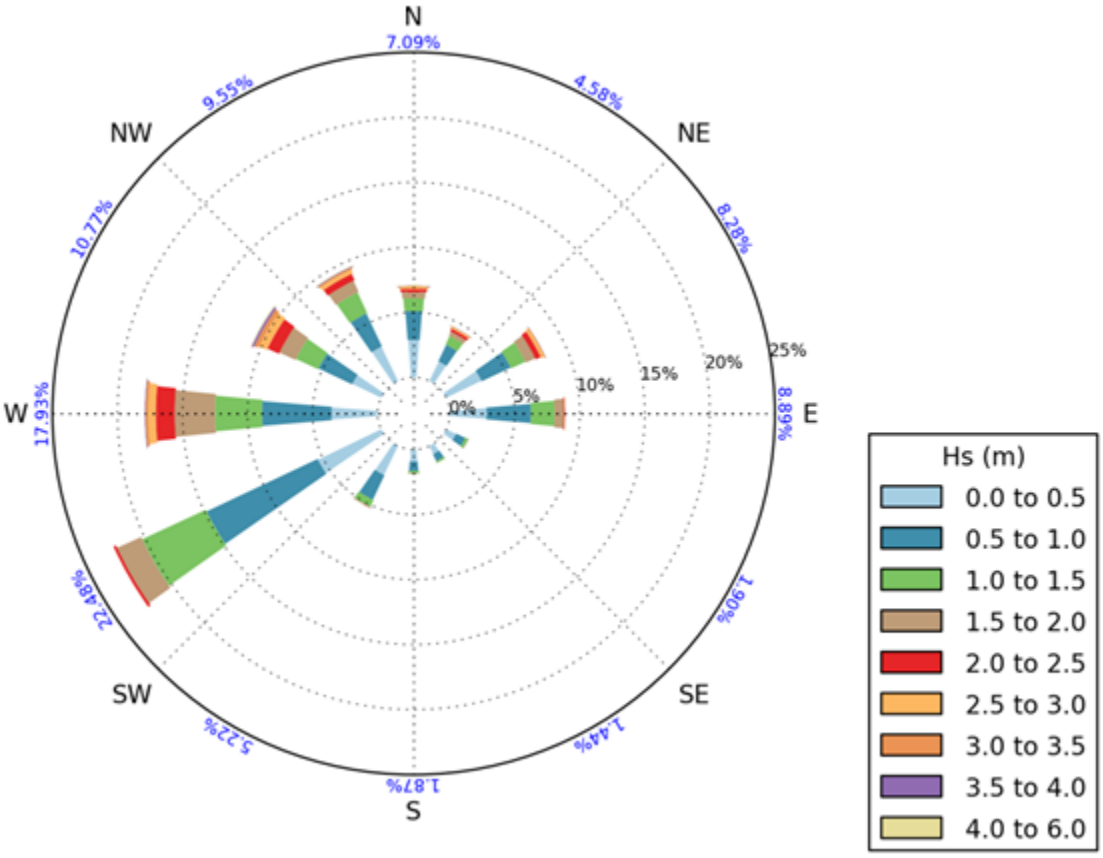
It can be seen from Table 4.1 that the strongest flow for the current occurs during a spring tide flowing in a westerly direction indicating that this is during an ebb tide.

MetOcean observations were taken from a set of locations in the vicinity of the Wylfa Marine Development Area (see Figure 5). The maximum surface current is similar for sites S4 and S9 but is marginally faster (0.3 ms^{-1}) at site S2. The location of site S2 means that the water will be much deeper in this area so the current at the seabed is unlikely to affect navigation. The maximum current for each part of the tidal cycle involves an approximate easterly or westerly direction, parallel to the shoreline.

Information gained through survey has been used to inform a hydrodynamic model created by RWE. The outputs from the Wylfa Hydrodynamic Model (RWE, 2016) have been used to create a tidal stream atlas showing current flow for hourly intervals from high water minus six hours to high water plus six hours for spring and neap tides. The tidal stream atlas is presented in Appendix B and identifies strong currents running east west to the north of Wylfa Head, with multiple eddies forming at various states of the tide within Cemlyn Bay.

4.2 Waves

Image 1 shows a wave rose diagram for a point approximately 1.1 nm north of the Wylfa Marine Development Area (see Figure 5). This provides an indication of wave activity for the area vessels would be transiting when proceeding to or from Wylfa Marine Development Area.



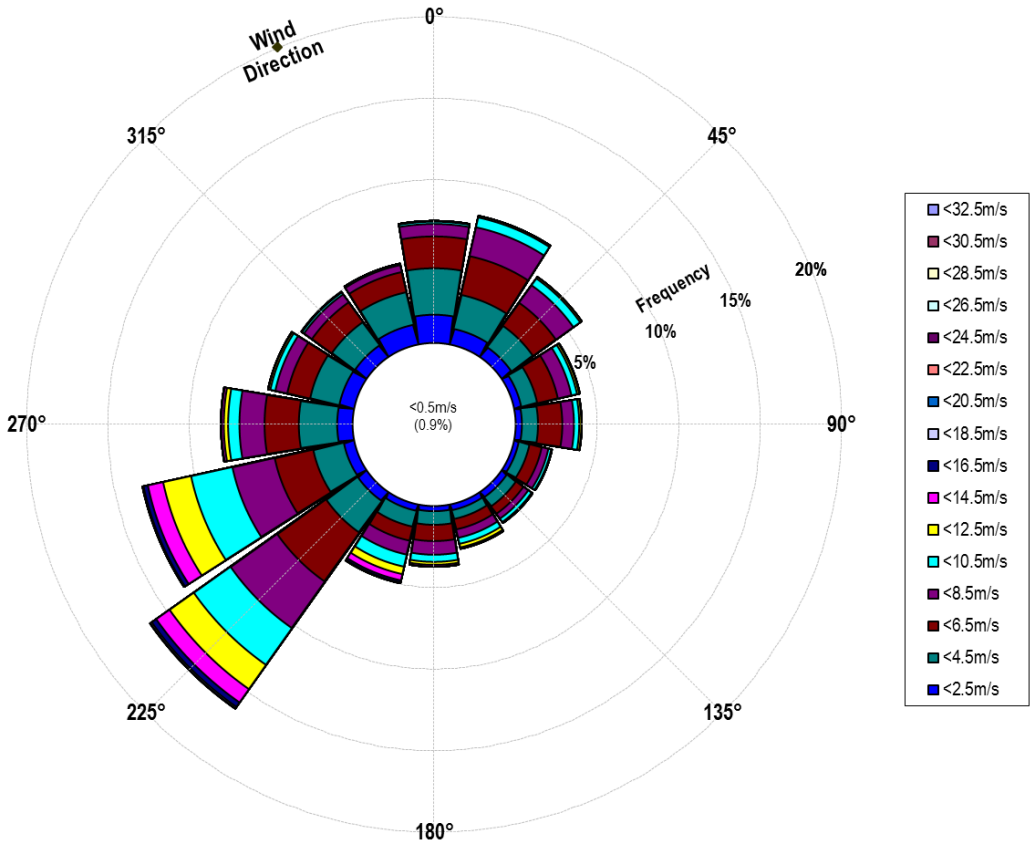
Source: Amec, 2015

Image 1 Rose plot of wave height against direction

It can be seen from Image 1 that a significant proportion of waves are from the south-west and west where the wave height is most frequently 0.5 m to 1.0 m. The highest frequency of larger waves (2.0 m to 3.5 m) comes from the south-west through to north-west direction. The waves from these sectors have the longest fetch distance and are therefore larger.

4.3 Wind conditions

Image 2 shows a wind rose comprising data from 2009 to 2014 inclusive recorded at RAF Valley on Anglesey. RAF Valley is located on the south-west side of Anglesey near the town of Rhosneigr (see Figure 5 for location). Image 2 provides indicative wind characteristics for the Anglesey area.



UK Met Office, 2015

Image 2 Wind rose for RAF Valley

Image 2 identifies that the wind is predominantly from the south-west and to a lesser extent westerly. The strongest winds of up to 16.5 m/s (Beaufort wind force 7) are also predominantly from the south-west and west. The Wylfa Marine Development Area is sheltered from these directions by the surrounding land and is likely to experience lighter wind from these directions.

5 Marine Traffic Analysis

This section presents both recreational navigation and commercial shipping traffic within the study area, using information collated from vessel traffic survey analysis, augmented by written information regarding recreational use and anecdotal information from the recreational and fishing community. Information on commercial shipping is presented in Figure 6 to Figure 15 and recreational boating is presented in Figure 3 and Figure 8.

5.1 Recreational vessel movements

5.1.1 Recreational vessel transits/cruising areas/racing areas

Through analysis of yacht club information and anecdotal discussions with recreational boaters, the recreational usage of the area has been determined. Transits of recreational craft using AIS-A or AIS-B are shown in Figure 8. In addition, Figure 3 provides a heat-map (density grid) of recreational vessel sea area published by the RYA. This heat-map has been created from AIS data collected over the summers of 2011 to 2013; the resulting heat-map is presented as a grid of 1 nm by 1 nm squares. Information denoting typical cruising routes, which are classified as medium and light use, is also shown. It should be noted that not all recreational craft will carry AIS and so anecdotal information has been obtained from users of the local area to determine inshore transit routes for recreational vessels (per comms. Kim Argyle, 2016) and these have been included on Figure 8.

5.1.2 Yachting

Yachting covers a variety of boating activities, which for the purposes of this assessment include motor boating, keelboat cruising and racing. In general, cruising takes place all year round with increased intensity in the summer months; any recreational sailing will also be heavily biased towards the weekend. The Holyhead Sailing Club organises yacht racing between April and October with several of their racing routes following the north coast of Anglesey. These events include a range of yacht sizes and types, all of which are large enough to navigate within coastal area. The marine works area is not used by any smaller (non-powered) dinghies or keelboats.

Figure 3 identifies indicative routes for recreational vessels and cruising areas using the RYA UK Coastal Atlas of Recreational Boating (RYA, 2016). The information in Figure 3 accompanied by analysis of yacht club information and anecdotal information received from stakeholders gives a representation of recreational yacht activity in the area. It can be seen from Figure 8 that during the period when the AIS data was recorded, recreational vessels generally transited approximately 1.0 nm to the north of the Wylfa Marine Development Area. A transit line can be seen entering Cemaes Bay before continuing out of the marine works area. This was likely to anchor to either gain shelter from weather conditions or as a rest stop.

Anecdotal information from Holyhead Sailing Club (per comms. Kim Argyle, 2016) suggests that vessels typically navigate between the mainland and Middle Mouse Rock on the eastern side of the marine works area. They would then remain close to the coastline, making use of back eddies and tidal currents to progress along track. Vessels may then navigate outside of Furlong Green Starboard hand marker buoy, and then inshore of Victoria Bank and West Mouse, before leaving the marine works area at the south-western corner. This route is shown on Figure 8 as a dark purple line.

5.1.3 Sea kayaking

The study area is a popular location for sea kayaking due to the quality of the scenery and challenges of navigating a small unpowered craft in the strong tidal flows and wave conditions. There is a range of training centres located on Anglesey that offer courses including the circumnavigation of Anglesey. Kayaks that navigate along the coast, past the Wylfa Marine Development Area, will keep close to the shoreline (within approximately 10 m) to gain protection from wind conditions under any steep-sided foreshore. If there are any waves at the time of the passage, sea kayaks will stand further out to sea, beyond any shore breaks. Nearly all transits by sea kayaks will be carried out in daylight hours.

5.2 Fishing vessel transits

Fishing vessel activity is provided on Figure 10, which depicts AIS fishing vessel transits, and on Figure 16 which shows Vessel Monitoring System (VMS) information obtained from the Marine Management Organisation. All UK commercial fishing vessels 12 m or more in overall length must have a UK government-approved satellite-tracking device. The device allows a vessel to be automatically located and identified through VMS by transmitting position data every two hours when at sea (Marine Management Organisation, 2014). This information is not representative of smaller fishing vessels under 12 m in length as they are unlikely to use either AIS or VMS systems. Anecdotal information has been used to provide information on fishing vessels under 12 m in length.

Figure 10 and Figure 16 show that there is no recorded fishing traffic currently using Cemlyn Bay. Anecdotal information (per comms, David Williams, 2016) suggests that up to seven local vessels under 12 m in length use the area. These vessels are trawling, potting and line fishing within Cemlyn Bay. The vessels are operated for either recreational fishing or for commercial purposes such as chartered fishing. Figure 10 identifies the typical navigational routes used by these fishing vessels, which are classified as 'Inshore Fishing Routes'.

5.3 Commercial transit routes

AIS data, representative of 84 days of AIS collected in 2015, have been used to create transit lines shown in Figure 6 to Figure 14 (see Section 2.1 for data description). The following text provides a description of commercial vessel routeing.

Vessel transits through the study area are shown in Figure 6 where it can be seen that the majority of vessels proceed offshore of Anglesey with routes that run through the Skerries TSS and do not cross into the marine works study area. Vessels that navigate closer inshore, transit to the north of the Skerries Lighthouse to avoid the shallow rocks and banks closer inshore. These vessels would proceed past the Wylfa Marine Development Area at a distance of approximately 1.7 nm. Vessels with shallower draughts such as high speed craft and port service craft regularly pass to the south of the Skerries and so would be approximately 0.5 nm offshore as they pass the Wylfa Marine Development Area. Table 5.1 shows the count of vessel transits entering the study area from the 84 days of recorded AIS data in 2015. This count is then uplifted to provide a representative yearly vessel count.

The majority of vessels navigating within the study area transit through the Skerries TSS meaning that they pass the Wylfa Marine Development Area at approximately 4 nm. To assess the vessels that navigate closer to the Wylfa Marine Development Area location, a count of the vessel transits entering the marine works area is given in Table 5.2. This number was then uplifted to give a representative yearly figure for vessel transits which will enter the marine works area.

Table 5.1 Vessel transits by ship type group in the study area

Vessel Category	Transit Line Count (84 days)	Uplifted (Yearly) Transit Count	Transit Count Percentage
Unknown*	202	878	1.1
Non-port service	266	1,156	1.5
Port service	252	1,095	1.4
Dredging/underwater	357	1,551	2
High speed craft	3,777	16,412	21.2
Military/law	524	2,277	2.9
Passenger	7,355	31,959	41.2
Cargo	2,955	12,840	16.5
Tanker	1,422	6,179	8
Fishing	280	1,217	1.6
Recreational	465	2,021	2.6
Grand Total	**17,855**	**77,585**	**100**

* Vessel type 'unknown' is an AIS record which is not correctly transmitting its vessel type at the time of data collection, and cannot therefore be assigned a vessel type. It is included in the dataset to ensure full representation of known vessel activity.

Data Source: Data is representative of 84 days of AIS-A and AIS-B data from MCA terrestrial AIS receivers:
- 1 to 7 from January, February, March, April, May, June, July, August, November 2015;
- 29 August to 04 September 2015;
- 08 to 14 October 2015; and
- 03 to 09 December 2015.

See Section 2.1 for more information.

Table 5.2 Vessel transits by ship type group in the marine works area

Vessel Category	Transit Line Count (84 days)	Uplifted (Yearly) Transit Count	Transit Count Percentage
Unknown*	34	148	5.6
Non-port service	41	178	6.7
Port service	45	196	7.4
Dredging/underwater	5	22	0.8
High speed craft	261	1,134	42.9
Military/law	11	48	1.8
Passenger	30	130	4.9
Cargo	33	143	5.4
Tanker	26	113	4.3
Fishing	55	239	9
Recreational	68	295	11.2
Grand Total	**609**	**2,646**	**100**

* Vessel type 'unknown' is an AIS record which is not correctly transmitting its vessel type at the time of data collection, and cannot therefore be assigned a vessel type. It is included in the dataset to ensure full representation of known vessel activity.

Data Source: Data is representative of 84 days of AIS-A and AIS-B data from MCA terrestrial AIS receivers:
- 1 to 7 from January, February, March, April, May, June, July, August, November 2015;
- 29 August to 04 September 2015;
- 08 to 14 October 2015; and
- 03 to 09 December 2015.

See Section 2.1 for more information.

It can be seen from Table 5.2 that there were 609 vessel transits through the marine works area during the 84-day period when the AIS data was recorded. This is represented by 121 individual vessels. A large proportion of vessels transiting through the marine works area are high speed craft (42.9%). These vessels are predominantly wind farm transfer vessels operating between Holyhead and the Irish Sea wind farms. These vessels have a shallow draught and are highly manoeuvrable, so can safely

navigate inshore of the TSS. The second highest proportion of vessels transiting the marine works area are recreational vessels (11.2%). The recreational vessel movements are detailed within Section 5.1. The next highest proportion of vessel traffic was fishing vessels (9%).

5.4 Traffic density

By combining AIS vessel transit data, a density grid with a cell size of 250 m by 250 m has been produced (Figure 15). This is an 'all up density' and includes all vessel type classifications. The peak density shown by the density grid is due to regular passenger services operating between Holyhead and Dublin. Other areas that show a large density of vessel traffic are the two lanes of the Skerries TSS and where vessels leave the TSS heading for the Liverpool pilot station to the north of Amlwch. It can be seen from Figure 15 that the area of vessel traffic with highest density within the marine works area is from vessels transiting between the Skerries Lighthouse and Anglesey. From analysis of the AIS vessel transits, these are fishing, recreational and high speed craft.

5.5 Future traffic

The future growth and development of ports and shipping on a macro level is intrinsically linked to world trade patterns and the economic climate, and is reactive to changing economic circumstances. Shipping volumes bear a direct relationship to the global economic market. As markets react to the changing financial situation, shipping lines respond with services to move goods and people. Economic growth and increasing world trade results in higher levels of shipping and growth of port operations; economic slowdown and recession results in lower levels of global trade and of shipping as a result.

To provide a local context, changes to the trends of shipping can be assessed by looking at the vessel trends of nearby ports and the potential for projects that might affect shipping traffic. To provide a comparison with historic data for the area, port arrival statistics from the DfT have been presented in Table 5.3. It should be noted that traffic for the port of Holyhead predominantly uses routes connecting north Wales with Ireland; therefore most of the traffic from Holyhead does not pass the Wylfa Marine Development Area. Traffic for the ports of Liverpool and Mostyn will predominantly pass Anglesey in an east-west direction. However, the route for larger ships will use the Skerries TSS located 5 nm to the north of the Wylfa frontage. Other Anglesey ports such as Amlwch do not provide DfT statistics due to their vessel use and port size. Hence comparison information for smaller ports is not available.

From Table 5.3 the main trades and vessel types for each port can be determined. The vessel counts have been collated in Table 5.4 to give an annual vessel traffic count for each port; this can then be brought forward to estimate future traffic levels.

When considering the period from 2009 to 2015, the minimum traffic total (all ports combined) was 9,226 in 2009 with a peak value of 11,749 in 2010; a range of 2,523. Between 2009 and 2015, the annual traffic total fluctuates within this range. Image 3 shows the fluctuating port data. From Image 3 it can be noted that ship calls at Liverpool rise by *circa* 1,000 between 2009 and 2010, then drop back over a two-year period, followed by another rise in 2014. It would be expected that the opening of Liverpool2 in 2016 will provide a change in ship calls as new berthing space has been created at the port. Holyhead demonstrates a slight increase in ship calls over the seven-year period, with a rise of around 500 calls over the period. The port of Mostyn shows an overall rise in vessel calls, with the peak in 2014 reflecting the change of use by P&O ferries.

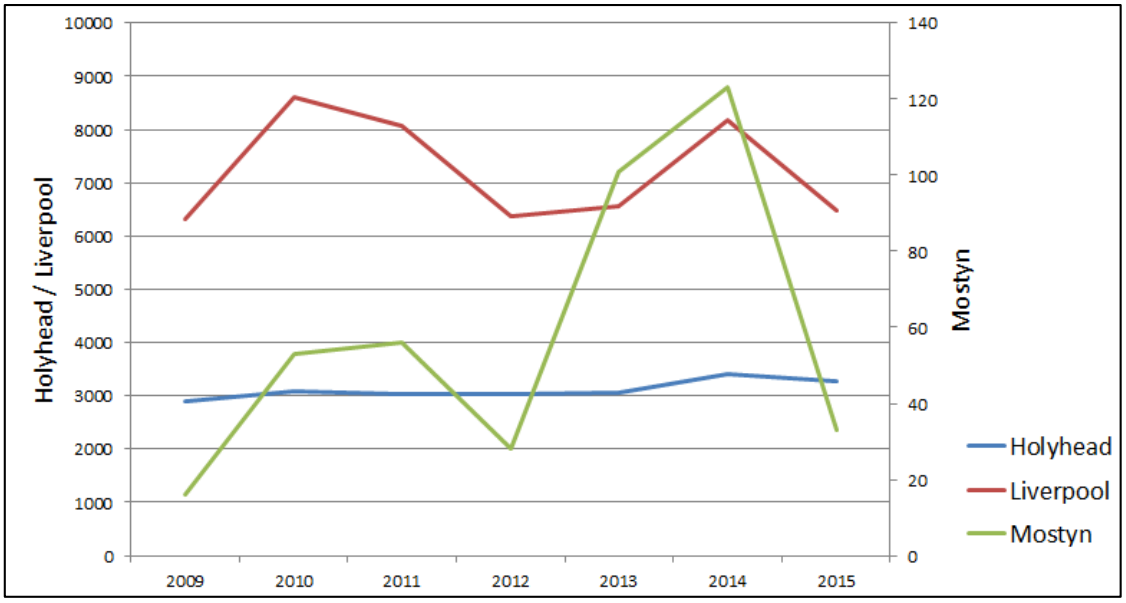


Image 3 Annual ship calls: Holyhead, Liverpool, Mostyn

Table 5.2 identifies the 2015 vessel traffic based on 84 days of AIS data, uplifted to present an annual value. It is not possible to directly compare the DfT information (Table 5.3 and Table 5.4) with vessel movements summarised from AIS information (Table 5.1). DfT information identifies ship calls, as a direct count; whereas the AIS data counts all vessel transit within the defined study area. The transit count will always be much greater as it includes a count of '1' for each vessel movement (for example, from anchorage to berth) plus transits from support craft, fishing vessels and the recreational community. The DfT values deal with commercial ship arrivals only. However, the DfT values provide the only government-published long-term trend information, and have therefore been interpreted to provide a correlation for the anticipated future baseline.

Table 5.3 Port statistics by vessel type

Port	Vessel Type	2009	2010	2011	2012	2013	2014	2015
Holyhead	Tankers	3	12	47	55	58	63	64
	Roll on Roll off (Ro-Ro) vessels	2,886	3,076	2,958	2,950	2,959	3,326	3,163
	Container vessels	0	0	0	1	0	0	0
	Cargo vessels	13	9	13	18	10	2	0
	Passenger vessels	0	2	12	17	16	13	24
	Other vessels	0	0	4	3	9	9	17
Liverpool	Tankers	1,171	1,643	1,638	1,211	1,219	1,523	1,216
	Ro-Ro vessels	3,212	4,149	3,372	2,624	2,627	3,474	2,848
	Container vessels	471	644	710	597	671	916	706
	Cargo vessels	1,359	2,053	2,035	1,667	1,689	1,873	1,391
	Passenger vessels	39	29	140	44	35	48	59
	Other vessels	56	79	185	225	307	346	248
Mostyn	Tankers	1	0	0	0	0	0	0
	Ro-Ro vessels	12	15	36	24	82	47	27
	Container vessels	0	0	0	0	0	0	0
	Cargo vessels	3	33	17	3	3	2	3
	Passenger vessels	0	0	0	0	0	0	1
	Other vessels	0	5	3	1	16	74	2

Data Source: (DfT, 2016)

Based on the values in Table 5.3, it can be summarised that a 360 ship call per year difference could be seen over a seven-year period (range of 2,523 over seven years). However, as demonstrated in the total values per year in Table 5.3, this range can occur year to year, without any increasing or decreasing trend. The guidance from the DfT/MCA Methodology for Assessing the Marine Navigational Safety and Emergency Response Risks of Offshore Renewable Energy Installations (OREI) (DfT/MCA, 2013) identifies that a future baseline should cover the development. Vessel traffic associated with the Wylfa Marine Development Area is possible up to the point the reactor becomes operational (although the intensity of traffic would occur over the 5-year build of the Power Station).

Table 5.4 Annual ship calls: Holyhead, Liverpool, Mostyn

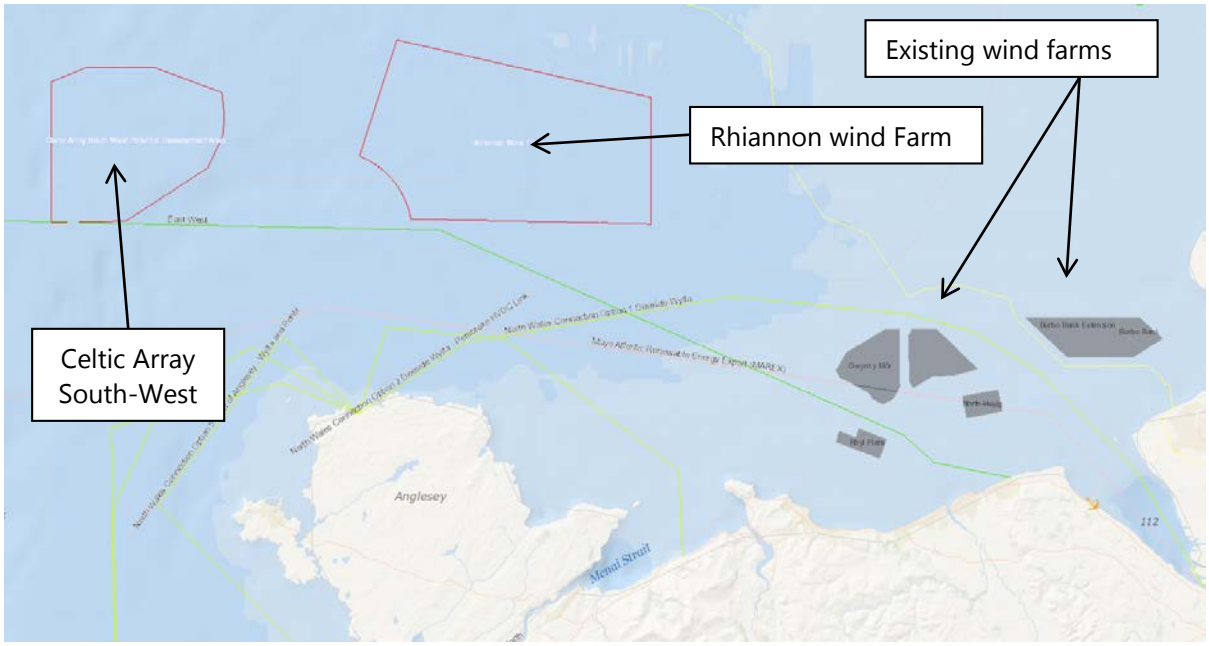
Port	2009	2010	2011	2012	2013	2014	2015
Holyhead	2,902	3,099	3,034	3,044	3,052	3,413	3,268
Liverpool	6,308	8,597	8,080	6,368	6,548	8,180	6,468
Mostyn	16	53	56	28	101	123	33
Total	**9,226**	**11,749**	**11,170**	**9,440**	**9,701**	**11,716**	**9,769**

The future prediction uses the rationale of an approximate 3% increase in vessel transits over the period of the Wylfa Newydd Project. The future prediction completes at the point the reactor becomes operational. Two scenarios are presented in Table 5.5, the first as a cumulative increase, the second as a fixed increase based on a 3% traffic increase value calculated from the baseline.

Table 5.5 Future traffic prediction

Year Count	Year	3% Vessel Uplift (cumulative)	3% Vessel Uplift (baseline)	Scheme Milestone
1	2015	77,585	77,585	Baseline – vessel transit
2	2016	79,965	79,965	
3	2017	82,418	82,345	
4	2018	84,947	84,798	MOLF build
5	2019	87,553	87,324	MOLF operational
6	2020	90,238	89,926	
7	2021	93,007	92,605	
8	2022	95,860	95,363	
9	2023	98,801	98,204	Last vessel use of MOLF
10	2024	101,832	101,130	
11	2025	104,956	104,142	Reactor operational

It should be noted however, as demonstrated by the fluctuation in ship calls in the DfT data, vessel use is highly dependent on national and international economic conditions. Not least of these is the effect of the UK withdrawing its membership of Europe, and any implications for border controls, with implications for Irish Sea ferry services running from Liverpool, Mostyn and Holyhead. Another controlling factor is the further development of offshore activity associated with wind farms. There are two potential offshore wind farm locations that would affect the high speed vessel traffic in the area indicated in Image 4. At the time of writing this NRA report, both the Celtic Array South-West and Rhiannon wind farms have been cancelled and so there will be no associated change in vessel traffic due to high speed craft. However, should this decision be revised, this could lead to an increase in high speed vessels. The best knowledge available at this time suggests that high speed vessel movements recorded in 2015, as part of the baseline, are indicative of the future level of vessel transits from the operations and maintenance phase of the established wind farms.



Source: Global Offshore Wind Farms Database

Image 4 Wind farm developments

6 Wylfa Newydd Project Details

The marine development aspects of the Power Station would create a MOLF, breakwaters, Cooling Water intake and Cooling Water outfall for the Power Station. The marine development is considered in this report in terms of construction and operation of these facilities.
There are four phases to the scheme, namely construction of the marine works, operation of the MOLF, operation of the Power Station and decommissioning. The following outlines the phases as applied within the NRA.

Construction of the marine works

- Marine works deliveries and use of marine construction plant during construction of the marine works.
- Deliveries for Power Station construction (in conjunction with marine works deliveries, and marine construction plant).

Operational phase of the MOLF

- Deliveries for Power Station construction (with the marine works fully complete).

Operational phase of the Power Station

- Operation of the Power Station, with approximately one vessel every year for replacement of plant and equipment.

Decommissioning phase

- This phase is not considered within the scope of the NRA.

The assessments carried out in this NRA have considered the operational phase of the MOLF and the operational phase of the Power Station together. These have been referred to in following sections as the operational phase.

6.1 Construction

The MOLF would provide two purpose-built quays: a bulk quay (with two berths); and a Ro-Ro quay to allow delivery by sea of bulk materials, such as aggregates, cement and reinforcing steel, and the large pre-fabricated elements required for the construction of the Power Station, including Abnormal Indivisible Loads (AILs).

The MOLF's use would offset the need for the delivery of a considerable quantity of construction materials by road and, therefore, would reduce the volume of road traffic and the associated environmental effects.

The bulk quay would extend between the eastern breakwater and the Ro-Ro quay and comprise two berthing platforms, each with four mooring dolphins (i.e. eight on total). It would provide berthing facilities for bulk vessels and unloading facilities for bulk materials. The two berthing platforms would have approximate surface area dimensions of 65 m by 30 m. The area behind the platforms and dolphins would be filled to a platform level of between +5 m AOD or +6 m AOD, and would be protected by a rock armour revetment.

The Ro-Ro quay would extend eastwards from the southern end of the bulk quay (i.e. towards the shoreline) and comprise a quayside used primarily for Ro-Ro vessels and Lift-on Lift-off (Lo-Lo) vessels, incorporating a ramp for ship to shore transfer of AILs, and Lo-Lo of equipment and materials by cranes. Its quay wall would be approximately 100 m in length and its quay surface would be set at a platform level of between +5 m AOD or +6 m AOD. The quay wall for the Ro-Ro ramp would be set at the same level as the bulk berth quay surface level with the toe of the sloping ramp used to receive AILs being at approximately +3.5 m AOD, thereby providing a shallow gradient up to the general quay level. The quay wall would continue towards the Cooling Water System intake and the base of the wall would match the level required for the Cooling Water System intake.

In addition to the bulk and Ro-Ro quays, the MOLF would include a temporary layby berth that vessels could be moored against for short-term waiting until the destination bulk or Ro-Ro berth is available. The berth would be located at the southern end of the western breakwater and consist of a series of berthing and mooring dolphin structures. The berth is remote from the land and would be accessed by small boats.

6.1.1 Dredging

Dredging would be required to form the inner harbour and access channel for vessel navigation, along with the required depth for the Cooling Water channel and intake facility. For the purposes of the NRA, it has been assumed that the dredging works could generate up to 242,000 m^3 of soft sediment which may be removed by cutter suction dredge methods and up to approximately 368,000 m^3 of fractured bedrock removed through drill and blast methods, with backhoe excavation to barges. It is anticipated that the majority of rock could be used within the breakwater, cofferdam and backfill for the berthing areas. However, for the purposes of assessment, the worst case is assessed, which assumes that all dredged material (i.e. 610,000 m^3) is disposed of at sea at Holyhead North marine disposal site (IS043). In either scenario, material would be transported via barge from the site and generate vessel moves. For further details on the dredge and disposal considerations, refer to the Horizon Nuclear Power Wylfa "Marine Works Volumes" memo (HNP-S4-SDE-MEM-00005) (Horizon, 2016) for assumptions on the volume of marine excavated materials requiring disposal for different scenarios.

For the purposes of this assessment, it is assumed that all of the 242,000 m^3 of superficial material would be transported by dredger, and all of the rock (368,000 m^3) would transported by barge away from the site. Table 6.1 estimates the number of vessel movements associated with the disposal of dredged material, assuming the below vessel capacities.

Table 6.1 Dredge disposal assumed number of loads

Vessel Type	Assumed Hopper Capacity	Volume (*in situ*) m^3	Assumed Number of Loads	Number of Movements
Inshore Cutter Suction Dredger	3,600 m^3	100,000	28	56
Offshore Cutter Suction Dredger	9,000 m^3	142,000	16	32
Barge	900 m^3	368,000	409	818

6.1.2 Disposal at sea

Dredge arising that cannot be used within the marine works would be taken to the Holyhead North marine disposal site either within the onboard hopper of the dredger or on a hopper barge. A number of routeing options are possible for dredge vessels moving between the Wylfa Newydd Project construction area and the disposal site. To provide a basis to carry out this NRA, an assumed

transit route has been identified on Figure 17. There are other routes that could be used to complete the passage, based on vessel size, tidal state, weather conditions and sea state. The route shown on Figure 17 has a journey distance of 13.4 nm which would take approximately 2.5 hours to complete. The hazard scenarios associated with this passage have been included in Appendix C.

6.1.3 MOLF

For the purposes of this assessment, it is assumed that the MOLF would be constructed in the wet, and therefore require construction plant, platforms with spud moorings, a variety of cranes and barges for transporting works material. Tugs and workboats would also be required to move non-powered barges and platforms into location, along with safety boats and crew transfer vessels. This marine plant would arrive on-site at predetermined points in the construction programme, and remain on-site until discharged to other operations. Therefore, movements into, and out of, the site are limited to occasional transits. Where possible, construction material would be delivered to site via tug and tow (until the MOLF is constructed).

A section of the MOLF would be completed early in the marine construction programme. The intent of completing this section early is to allow for access to vessels, and for delivery of materials required for marine construction (e.g. pre-cast concrete elements for the MOLF, and pre-cast concrete armour units for the breakwater).

6.1.4 Breakwaters

There would be two breakwaters extending out into Porth-y-pistyll that would provide protection and create acceptable wave conditions for operation of the cooling water intake equipment; hereafter referred to as the western breakwater and the eastern breakwater. The breakwaters would also provide sheltered conditions for vessels accessing and berthing at the MOLF.

Construction of the breakwater structures in principle, introduces permanent new hard surfaces, which could potentially have the capacity to function as an artificial rocky reef providing a new colonisation surface for species dependent on hard substrate. The development of habitats and species on the breakwater structures could also potentially provide habitat, food and refuge resources for seabirds. They also provide intertidal areas for grey seals to haul out.

The western breakwater would not be connected to the shore. From its landward end it would be aligned approximately south-west to north-east and then kinked approximately south to north. The eastern breakwater would be connected to the shore. From its landward end, it would be aligned approximately south-east to north-west.

6.1.5 Cooling Water intake and outfall

The Cooling Water intake is located on the southern side of the MOLF whereas the Cooling Water outfall is located to the north in a small embayment surrounded by rocky outcroppings. The Cooling Water intake and outfall would be constructed during the marine works and become operational whilst the MOLF is in use and continues to operate through the operational phase of the Power Station.

6.2 Operational phase of the MOLF

Construction of the marine facilities would be complete by 2020 to support the main site construction. It is anticipated that up to 60-80% of construction materials for the Power Station would be delivered via sea. The anticipated number of vessel arrivals at the MOLF is summarised in Table 6.2.

Table 6.2 MOLF operational use

MOLF	Total Number of Movements
Bulk materials	3,142
Abnormal Indivisible Loads barges	660

6.2.1 Vessel simulation study

To support the development of the MOLF and breakwater design, a navigation simulation study has been carried out by BMT Argoss (BMT Argoss, 2016) to investigate the feasibility and risks when using the proposed harbour and MOLF facilities during the operational phase. This study used models of a bulk vessel, Ro-Ro barge and Lift on-Lift off vessel to determine whether they could safely operate within the harbour area. There were two harbour layouts considered:

- Layout A – 400 m breakwater; and
- Layout B – 500 m breakwater.

The study had 15 objectives detailed within Table 6.3.

Table 6.3 Vessel simulation objectives

Vessel Type	No.	Objective
Tug power requirement	1	Determine tug power required to hold large Ro-Ro barge in position, at pilot station, in worst expected MetOcean conditions
	2	Determine tug power required to hold bulk vessel in position in worst expected MetOcean conditions
Bulk vessel operations – Layout A	3	Determine limiting MetOcean conditions in which the bulk vessel can enter the port and berth at the bulk berth starboard side alongside
	4	Determine limiting MetOcean conditions in which the bulk vessel can depart the port from starboard side alongside
	5	Determine limiting MetOcean conditions in which the bulk vessel can enter the port and berth port side alongside
	6	Determine limiting MetOcean conditions in which the bulk vessel can depart the port from the bulk berth port side alongside
Large Ro-Ro barge – Layout A	7	Determine limiting MetOcean conditions in which the large Ro-Ro barge can enter the port. Within the limits two hours before high water to two hours after high water and berth at the Ro-Ro berth
	8	Determine limiting MetOcean conditions in which the large Ro-Ro barge can depart the port
Lo-Lo vessel operations – Layout A	9	Determine limiting MetOcean conditions in which the Lo-Lo vessel can enter the port and berth at the Ro-Ro berth starboard side alongside
	10	Determine limiting MetOcean conditions in which the Lo-Lo vessel can depart the port from the Ro-Ro berth starboard side alongside
	11	Determine limiting MetOcean conditions in which the Lo-Lo vessel can enter the port and berth at the bulk berth starboard side alongside
	12	Determine limiting MetOcean conditions in which the Lo-Lo vessel can depart the port from the bulk berth starboard side alongside
	13	Determine limiting MetOcean conditions in which the Lo-Lo vessel can enter the port and berth at the bulk berth port side alongside
	14	Determine limiting MetOcean conditions in which the Lo-Lo vessel can depart the port from the bulk berth port side alongside
All vessels – Layout B	15	Determine by repeating previous failed runs, if layout B is an improvement over layout A

A total of 77 vessel simulation runs were completed and were used to inform key recommendations and conclusions for navigation at the project location. These conclusions are summarised below:

- All vessels can be safely berthed in wind conditions up to 30 knots from any direction.
- The most challenging approach is during the ebb tide.
- A set of lateral buoys marking an approach channel would limit the sea room available for manoeuvring and would not provide benefit to a vessel navigating to berth.
- A set of leading lights would provide the most useful indication of distance off track.
- A number of approach runs required the aid of a harbour tug to aid with passing the breakwaters and berthing.
- To maintain a vessels position at pilot station, a full sea going tug would be required.

These recommendations have been used to inform the NRA in respect of control measures applied as mitigation.

6.2.2 Maintenance dredging

The requirement for maintenance dredging will be informed by hydrographic survey to determine rates of sedimentation. Currently a low rate of sediment accretion is expected at the Wylfa Marine Development Area.

6.2.3 Operational phase of the Wylfa Newydd Power Station

Once the construction phase of the Power Station is complete, there is no planned usage of the MOLF. The MOLF would be maintained to allow usage should this be required during the operational phase of the Power Station.

6.3 Decommissioning

Decommissioning the Power Station has been assessed at a qualitative level. The decommissioning process is not anticipated to occur for approximately 60(+) years and would require a further Environmental Impact Assessment under the Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999 (as amended).

Whilst the potential use of the MOLF during the decommissioning phase is currently unknown, it is likely that a proportion of demolished materials may be transported to/from the Wylfa Newydd Project site during this phase. Vessel volumes are likely to be enveloped by those of the main site construction phase and activity would occur over a significantly longer period of time. It should be noted that vessel movements can only be assumed at this stage.

This NRA does not further consider the decommissioning phase, due to the large timescale of operation and the requirement for a further Environmental Impact Assessment to be completed for decommissioning of the facilities. This approach was agreed with the MCA during the meeting held on 30 September 2016 (see Section 7.1.1). However, further consideration is given to the decommissioning phase in chapter D15 (Shipping and navigation) (Application Reference Number: 6.4.15). of this Environmental Statement.

7 Navigational Risk Assessment Process

This section presents the methodology and lists consultation for the NRA.

7.1 Regulator meetings

7.1.1 Maritime and Coastguard Agency

A meeting with the MCA was held on 30 September 2016. The aim of this meeting was to present the Wylfa Newydd Project and agree a methodology for completing the NRA. Table 7.1 lists the attendees of the meeting.

Table 7.1 MCA meeting attendees

Attendee	Organisation
Nick Salter	MCA
Heloise Warner	MCA
Emma Beagley	Horizon Nuclear Power
Rob Bromley	Jacobs
Jane Templeton	Jacobs
Colin Trigg	Jacobs
Natalie Frost	ABPmer
Monty Smedley	ABPmer
Adam Fitzpatrick	ABPmer

During this meeting, the approach to collection of baseline data and the methodology for carrying out the NRA was confirmed as appropriate by the MCA.

7.1.2 Trinity House

A meeting with Trinity House was held on 22 May 2017. The aim of this meeting was to discuss and agree aids to navigation that would be required for the Wylfa Marine Development Area. Table 7.2 lists the attendees of the meeting.

Table 7.2 Trinity House meeting attendees

Attendee	Organisation
Trevor Harris	Trinity House
Steve Vanstone	Trinity House
Martin Thomas	Trinity House
Richard Potter	Royal Haskoning DHV
Bas Wijdeven	Royal Haskoning DHV
Jane Templeton	Jacobs
Adam Fitzpatrick	ABPmer

7.2 Hazard observation workshop

In order to provide an assessment of navigational risk during the construction and operational phases of the proposed MOLF, breakwaters, Cooling Water intake and Cooling Water outflow, a hazard

workshop with maritime community stakeholders was undertaken. The hazard identification workshop was held on 24 October 2016 at Horizon Nuclear Power Wylfa's offices at Wylfa. During the workshop, a presentation was given of the available baseline data and exercises were carried out to identify potential hazards associated with the Wylfa Newydd Project.

The aim of the workshop was to identify navigational safety concerns relative to the study's scope. In addition, attendees at the workshop provided anecdotal information regarding marine use of the study area, which enhanced the level of detail collected through the navigation baseline activities.

The output from the workshop was documented and shared with attendees. A total of 23 hazard scenarios were identified for the construction phase and 20 hazard scenarios for the operational phase.

7.2.1 Attendance

The attendees at the hazard workshops are shown in Table 7.3. This list was drawn from known stakeholders and from those identified through local consultation. This list is not exhaustive, but is representative of those with interests in the area.

Table 7.3 Hazard risk workshop attendees

Attendee	Organisation
Kevin Riley - Harbour Master	Stena Line Ports Ltd
Wyn Parry - Port Manager	Stena Line Ports Ltd
Neil Humphreys - Pilot	Stena Line Ports Ltd
Trever Harris - Aids to Navigation Manager	Trinity House
Tony Hilliard - Marine Surveyor	MCA
Geoff Price - Harbour Master	Amlwch Harbour
David Williams	Cemaes Harbour Committee
Sue James	Holyhead Sailing Club
Kim Argyle	Holyhead Sailing Club
Mike Butterfield	RYA
Emma Beagley	Horizon Nuclear Power Wylfa
Ifer Gwyn	Horizon Nuclear Power Wylfa
Jane Templeton	Jacobs
Monty Smedley	ABPmer
Adam Fitzpatrick	ABPmer

7.3 Hazard workshop process

As part of the workshops, key marine hazards associated with the construction and operation were discussed and noted (see Section 6 for details of the build and operation of the facility). Where appropriate, vessel types were considered separately to ensure the risk levels were assessed accurately and so that the control options could be identified on a type-specific basis, for example, risk control measures for construction craft which may be floating platforms with spud legs used as anchors present different risks to operating recreational vessels. Other general hazards associated with the construction and operational phases, such as dropped objects, man overboard, pollution incidents and search and rescue operations were also discussed. Table 7.4 details definitions of specific hazard types taken from DfT/MCA (2013); Methodology for Assessing the Marine Navigational Safety and Emergency Response Risks of Offshore Renewable Energy Installations (OREI).

Table 7.4 Hazard definitions

Category	Description
Foundering	To sink below the surface of the water.
Collision	Collision is defined as a vessel striking, or being struck by, another vessel, regardless of whether either vessel is under way, anchored or moored; but excludes hitting underwater wrecks.
Allision	Defined as a violent contact between a vessel and a fixed structure.
Contact	Contact is defined as a vessel striking, or being struck by, an external object that is not another vessel or the sea bottom.
Fire	Fire is defined as the uncontrolled process of combustion characterised by heat or smoke or flame or any combination of these.
Explosion	An explosion is defined as an uncontrolled release of energy which causes a pressure discontinuity or blast wave.
Loss of hull integrity	Loss of hull integrity is defined as the consequence of certain initiating events that result in damage to the external hull, or to internal structure and sub-division, such that any compartment or space within the hull is opened to the sea or to any other compartment or space.
Flooding	Flooding is defined as sea water, or water ballast, entering a space, from which it should be excluded, in such a quantity that there is a possibility of loss of stability leading to capsizing or sinking of the vessel.
Grounding	Grounding is defined as the ship coming to rest on, or riding across underwater features or objects, but where the vessel can be freed from the obstruction by lightening and/or assistance from another vessel (e.g. tug) or by floating off on the next tide.
Stranding	Stranding is defined as being a greater hazard than grounding and is defined as the ship becoming fixed on an underwater feature or object such that the vessel cannot readily be moved by lightening, floating off or with assistance from other vessels (e.g. tugs).
Machinery related accidents	Machinery related accidents are defined as any failure of equipment, plant and associated systems which prevent, or could prevent if circumstances dictate, the ship from manoeuvring or being propelled or controlling its stability.
Payload related accidents	Payload related accidents include loss of stability due to cargo shifting and damage to the vessel's structure resulting from the method employed for loading or discharging the cargo. This category does not include incidents which can be categorised as hazardous substance, fires, explosions, loss of hull integrity, flooding accidents etc.
Hazardous substance accidents	Hazardous substance accidents are defined as any substance which, if generated as a result of a fire, accidental release, human error, failure of process equipment, loss of containment, or overheating of electrical equipment, can cause impairment of the health and/or functioning of people or damage to the vessel. These materials may be toxic or flammable gases, vapours, liquids, dusts or solid substances.
Accidents to personnel	Accidents to personnel are defined as those accidents which cause harm to any person on-board the vessel e.g. crew, passengers, stevedores, which do not arise as a result of one of the other accident categories. Essentially, it refers to accidents to individuals, though this does not preclude multiple human casualties as a result of the same hazard, and typically includes harm caused by the movement of the vessel when underway, slips, trips, falls, electrocution and confined space accidents, food poisoning incidents, etc.

Category	Description
Accidents to the general public	Accidents to the general public are defined as those accidents which lead to injury, death or loss of property amongst the population ashore resulting from one of the other ship accident categories.
Capsizing	The overturning of a vessel after attaining negative stability.

After the workshop, the risks associated with the hazards were ranked based on the discussions held during the workshop and mitigation measures were identified. A combined total of 43 hazard scenarios were identified during the workshop; these are shown alphabetically in Table 7.5 and Table 7.6

Table 7.5 Hazard log for the construction of breakwaters, MOLF, Cooling Water intake and Cooling Water outflow

Assessment Number	Hazard Category	Hazard Scenario
1	Accidents to personnel	Diving operations associated with the marine works
2	Accidents to personnel	Man overboard during dredge/construction works
3	Allision	Dredge/construction plant impact with marine works during construction phase
4	Collision	Dredge/construction plant collision with recreational vessel
5	Collision	Dredge/construction plant collision with commercial vessel
6	Collision	Dredger or barge on passage to Holyhead North disposal site with another vessel
7	Collision	Dredger or barge depositing load at Holyhead North with vessel transiting
8	Collision	Tug and tow collision with commercial vessel
9	Fire/explosion	Dredge/construction plant on-board fire
10	Fire/explosion	Ordnance found during dredge/construction
11	Fire/explosion	Pressure waves caused by explosives during dredging operations
12	Flooding	Dredger flooding whilst engaged in operations
13	Grounding	Dredge/construction plant grounding due to marine works
14	Grounding	Dredger/barge on passage to Holyhead North disposal site
15	Grounding	Tug and tow grounding due to steering/propulsion failure
16	Hazardous substance accidents	Accidental spill
17	Machinery related accidents	Heavy lift failure or failure of lifting gear
18	Other	Malicious actions by third parties
19	Other	Vessel damage due to weather conditions
20	Other	Ranging of construction craft on temporary moorings
21	Other	Displacement of vessels
22	Payload related accidents	Incorrect loading or unloading of barge transporting rock affects vessel stability
23	Stranding	Small recreational vessel on breakwater

Table 7.6 Hazard log MOLF operational phase

Assessment Number	Hazard Category	Hazard Scenario
1	Accidents to personnel	Man overboard
2	Allision	Vessel with breakwaters
3	Allision	Vessel with the MOLF
4	Collision	With moored vessel
5	Collision	Recreation/fishing/high speed/harbour vessel with vessel transiting to or from the Wylfa Marine Development Area
6	Collision	Tanker with vessel transiting to or from the Wylfa Marine Development Area
7	Collision	Cargo vessel with vessel transiting to or from Wylfa Newydd
8	Fire/explosion	Vessel alongside the MOLF
9	Flooding	Vessel within the harbour
10	Grounding	Vessel within the harbour
11	Hazardous substance accidents	Accidental spill within the harbour
12	Machinery related accidents	Steering/propulsion failure entering or leaving the harbour
13	Machinery related accidents	Lifting equipment failure alongside the MOLF
14	Other	Towage operations within the harbour
15	Other	Malicious actions by third party
16	Other	Displacement of vessels
17	Payload related accidents	Vessel unloaded incorrectly alongside the MOLF
18	Ranging	Vessel on bulk quay ranging due to interaction
19	Ranging	Adverse weather conditions affecting moored vessels
20	Stranding	Small recreational vessel on breakwater

From the 43 hazard scenarios identified in Table 7.5 and Table 7.6 , the attendees considered the possible outcome for each hazard scenario according to the 'most likely' and 'worst credible' outcome. Theses outcomes included the consequences to the receptors of people, property, environment and the port business. A likely frequency of occurrence was assigned to the 'Most Likely' and 'Worst Credible' outcome for each hazard scenario, as informed by the accident/incident records identified in Section 3.7 along with knowledge gained from working on projects of similar scale and complexity. These frequency and consequence descriptors from the 'Most Likely' and 'Worst Credible' outcomes were used on a 5-by-5 matrix to determine the summative risk.

7.3.1 Hazard scenario causes

Each hazard scenario was considered to determine the possible causes both individually or in combination. Table 7.7 and Table 7.8 give a frequency of the causes identified during the hazard scenario process for the construction and MOLF operational phases of the Wylfa Newydd Project.

Table 7.7 Cause frequency for the construction phase

Cause	Frequency
Human error/fatigue - Ship personnel	19
Inadequate procedures in place onboard vessel	17
Adverse weather conditions	17

Cause	Frequency
Competence	17
Human error	16
Inadequate bridge resource management	14
Vessel breakdown or malfunction	13
Communication failure - Personnel	13
Risk assessment, incomplete/not reviewed	11
Inadequate training/competence - Others	11
Restricted visibility	10
Failure to comply with Vessel Traffic Services/Local Port Services/Standard Operating Procedures	8
Inadequate procedures shore side	8
Failure to follow passage plan	8
Excessive vessel speed	8
Vessel has unreported defect	7
Communication failure - Operational/procedural	7
Communication failure - Equipment	7
Failure to observe standing notices	7
Failure to comply with safe systems of work	7
Incorrect assessment of tidal flow	7
Inadequate maintenance/inspection	7
Human error/fatigue - Port/marine personnel	6
Fire/explosion	6
High traffic density	6
Incapacitated master (drugs/alcohol)	6
Ship/tug/launch failure	6
Unplanned interaction with recreational/fishing craft	5
Malicious action by external parties	5
COLREGS failure to comply	5
AIS failure	5
Language problems	5
Tug failure towing equipment	4
Protest by external parties	4
Navigation equipment failure	4
Failure to observe byelaws/local regulations	3
Non-attendance of boatmen	3
Interaction	3
Loss of watertight integrity	2
Failure to comply with towage guidelines	2
Failure of aid to navigation (out of position/unlit)	2
Shore side light backscatter	2
Loss of vessel's stability (due to other than loss of watertight integrity)	2
Port equipment (inc. craft) mechanical breakdown/system malfunction	2
Weather and hydro failure - equipment	2
Tugs - Inadequate/unavailable	2
Notice to mariners failure to observe	2
Inadequate surveying at planning stage	2
Vessel fails to notify hazardous cargo	1
Unexpected shoaling	1

Cause	Frequency
Failure of berth mooring systems	1
Vessel ramps or hatches not secure	1
Illegal discharges into the water	1
Breach of security at berth/terminal/ship	1
Port infrastructure failure	1
Inadequate Personal Protective Equipment	1

The top identified cause for the construction phase is 'human error/fatigue - ship personnel' with a frequency of 19, the second highest selected cause is 'inadequate procedures in place onboard vessel' with a frequency of 17 and the third highest cause is 'adverse weather conditions' with a frequency of 17.

Table 7.8 Cause frequency for the MOLF operational phase

Cause	Frequency
Inadequate procedures in place onboard vessel	18
Human error	18
Human error/fatigue - Ship personnel	17
Adverse weather conditions	15
Communication failure - Personnel	13
Inadequate bridge resource management	12
Vessel breakdown or malfunction	11
Inadequate training/competence - Others	9
Competence	9
Restricted visibility	9
Excessive vessel speed	9
Incorrect assessment of tidal flow	8
Communication failure - Operational/procedural	7
Failure to comply with safe systems of work	7
Vessel has unreported defect	7
Ship/tug/launch failure	7
Inadequate maintenance/inspection	6
Failure to observe standing notices	6
Incapacitated master (drinks/drugs)	6
Inadequate procedures shore side	5
Human error/fatigue - Port/marine personnel	5
Failure to follow passage plan	4
Language problems	4
Communication failure - equipment	4
COLREGS failure to comply	4
Fire/explosion	4
Port equipment (inc. craft) mechanical breakdown/system malfunction	4
Shore side light backscatter	4
Malicious action by external parties	4
Risk assessment, incomplete/not reviewed	3
Failure to observe byelaws/local regulations	3
Loss of watertight integrity	3
Inadequate number/type tugs	2

Cause	Frequency
Failure to comply with VTS/LPS/SOPs instructions	2
Notice to mariners failure to observe	2
Failure of Aid to Navigation (out of position/unlit)	2
Failure of berth mooring systems	2
Unplanned interaction with recreational/fishing craft	2
Incorrect draught advised/promulgated	1
Failure to comply with towage guidelines	1
High traffic density	1
Tug failure towing equipment	1
Loss of vessel's stability (due to other than loss of watertight integrity)	1
Vessel ramps or hatches not secure	1
Protest by external parties	1
Illegal discharges into the water	1
Breach of security at berth/terminal/ship	1
Incorrect ballasting	1

The top selected causes for the operational phase are 'inadequate procedures in place onboard vessel' and 'human error' jointly with a frequency of 18, and the third highest selected cause is 'human error/fatigue - Ship personnel' with a frequency of 17. As with the causes for the construction phase, the top selected causes can be described as human factors relating to errors of judgement or competence. As these causes are created from expert judgement of marine professionals, it would be prudent to consider the controls that reduced these potential causes through the application of suitable mitigation.

7.3.2 Risk controls

Each of the 43 hazard scenarios were then considered in light of embedded risk controls (these include mandatory measures such as compliance with international regulations and good practice such as review of weather forecasts). These controls are available at, or can be deployed by, the Wylfa Newydd Project in response to a marine emergency. It should be noted that embedded mitigation, in the context of marine safety, relates to processes, practices and available safety resources that are in existence irrespective of the Wylfa Newydd Project. These might include (for example) international regulations (such as the International Regulations for Preventing Collisions at Sea 1972) or training of personnel (such as the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW)) or search and rescue provision (such as the UK Coastguard service.

Table 7.9 and Table 7.10 detail the embedded risk controls that identified in the risk assessments.

Table 7.9 Embedded risk controls for the construction phase

Control	Frequency
Standing orders/SOPs	14
Emergency services equipment - shore side	13
International COLREGS 1972 (as amended)	9
Standards of Training, Certification and Watchkeeping for Seafarers (STCW)	8
Passage planning	7
Communications equipment	7
Safe systems of work (H&S)	7

Control	Frequency
Notices to mariners	5
Vessel maintenance	5
Vessel inspection/survey	5
International Convention for the Safety of Life at Sea (SOLAS) 1974	5
Visual observation (clear line of sight)	3
Weather forecasting	3
Communications - Traffic broadcast	2
AIS coverage	2
Training of pollution response personnel	2
Vessel secured for sea	2
Draught, accurate, declared and within max limits	1
Hydrographic surveying program	1
Oil spill contingency plans	1
Contingency plan exercises	1
Availability of latest hydrographic information	1
Availability of pollution response equipment	1
Aids to navigation, provision and maintenance of	1
Signage	1
Ramps/hatches closed when underway	1
Unexploded ordnance investigation and reported risk levels	1
Loading/unloading plan	1
Vessel safety management system (ISM code)	1
Personal Protective Equipment	1
Marine warranty survey	1

Table 7.10 Embedded risk controls for the MOLF operational phase

Control	Frequency
Emergency services equipment - shore side	11
Passage planning	11
Standing orders/SOPs	9
Standards of Training, Certification and Watchkeeping for Seafarers (STCW)	8
Communications equipment	8
Weather forecasting	8
International COLREGS 1972 (as amended)	5
Visual observation (clear line of sight)	5
Communications - Traffic broadcast	4
Vessel secured for sea	2
Vessel safety management system (ISM code)	2
Dangerous Goods in Harbour Areas Regulations 2016	2
Notices to mariners	1
Vessel maintenance	1
Vessel inspection/survey	1
Draught, accurate, declared and within max limits	1
Contingency plan exercises	1
Loading/unloading plan	1
Marine warranty survey	1
Arrival/departure, advance notice of	1

Control	Frequency
Accurate tidal measurements	1
Tug/workboat certification	1

After determining which controls are applicable to each hazard scenario, an embedded risk score was calculated by determining the reduction in likelihood and consequence for each risk control should it be implemented; these reductions were then applied to the frequency and consequence of the scenario to give the overall risk score. Table 7.11 and Table 7.12 show the hazard scenarios ranked by current risk after embedded risk controls have been considered.

Table 7.11 Ranked hazard scenarios for the construction phase

Hazard Category	Hazard Scenario	Baseline Risk	Current Risk
Collision	Dredge/construction craft collision with commercial vessel	7.59	6.77
Other	Mooring failure on temporary moorings	6.66	6.60
Grounding	Tug and tow grounding due to steering/propulsion failure	7.22	6.51
Other	Vessel damage due to weather conditions.	6.59	6.48
Grounding	Dredge/construction craft grounding due to marine works	7.13	6.28
Collision	Tug and tow collision with commercial vessel	7.59	6.11
Stranding	Small recreational vessel on breakwater	6.47	5.67
Other	Displacement of vessels	6.31	5.66
Collision	Dredge/construction plant collision with recreational vessel	6.59	5.56
Fire/explosion	Dredge/construction plant on-board fire	6.09	5.43
Fire/explosion	Ordnance found during dredge/construction	6.16	5.20
Grounding	Dredger/barge on passage to Holyhead North disposal site	7.22	4.85
Accidents to personnel	Commercial diving operations associated with the marine works	5.09	4.81
Collision	Dredger or barge on passage to Holyhead North disposal site and other vessel	7.13	4.73
Machinery related accidents	Heavy lift failure or failure of lifting gear	5.94	4.65
Flooding	Dredger flooding whilst engaged in operations	6.81	4.64
Payload related accidents	Incorrect loading or unloading of vessel transporting rock affects vessel stability	6.81	4.64
Hazardous substance accidents	Accidental spill	5.91	4.63
Other	Malicious actions by third parties	4.91	4.62
Allision	Dredge/construction plant impact with marine works during construction phase	5.66	4.35
Collision	Dredger or barge depositing load at Holyhead North with vessel transiting	6.19	3.89
Fire/explosion	Pressure waves caused by explosives during dredging operations.	4.41	3.87
Accidents to personnel	Man overboard during dredge/construction works	4.69	2.93

Table 7.12 Ranked hazard scenarios for the MOLF operational phase

Hazard Category	Hazard Scenario	Baseline Risk	Current Risk
Grounding	Vessel within the harbour	7.78	7.63
Allision	Vessel with breakwaters	7.59	6.62
Collision	Recreation/fishing/high speed/harbour vessel with vessel transiting to or from the Wylfa Marine Development Area	7.25	6.52
Other	Displacement of vessels	6.59	5.92
Stranding	Small recreational vessel on breakwater	6.47	5.67
Machinery related accidents	Steering/propulsion failure entering or leaving the harbour	5.88	5.44
Payload related accidents	Vessel unloaded incorrectly alongside the MOLF	5.97	5.12
Allision	Vessel with the MOLF	5.91	5.10
Flooding	Vessel within the harbour	6.41	4.98
Other	Towage operations within the harbour	5.88	4.96
Collision	With moored vessel	6.19	4.85
Ranging	Adverse weather conditions affecting moored vessels	4.97	4.84
Collision	Tanker with vessel transiting to or from the Wylfa Marine Development Area	7.44	4.70
Collision	Cargo vessel with vessel transiting to or from the Wylfa Marine Development Area	6.94	4.44
Machinery related accidents	Lifting equipment failure alongside the MOLF	5.41	4.44
Ranging	Vessel on bulk quay ranging due to interaction with other vessel	4.53	3.91
Hazardous substance accidents	Accidental spill within the harbour	3.81	3.81
Fire/explosion	Vessel alongside the MOLF	4.27	3.53
Other	Malicious actions by third party	4.28	3.50
Accidents to personnel	Man overboard	4.69	3.11

The risk scores associated with each of the 43 hazard scenarios has been set on a scale of zero to 10. The classification of each score is given in Table 7.13.

Table 7.13 Risk score rating

Classification	Risk score
Very high risk	9.00 – 10.00
High risk	6.00 – 8.99
Significant risk	5.00 – 5.99
Moderate risk	4.00 – 4.99
Low risk	1.00 – 3.99
Negligible risk	0.01 – 0.99

Additional controls identified by the stakeholders were documented to ensure that risk levels were maintained to ALARP. These additional controls are safety recommendations which were then

assigned a likelihood and consequence reduction to allow the calculation of a final risk score. The full set of NRAs is shown in Appendix C and Appendix D. Chapter D15 (Application Reference Number 6.4.15) of this Environmental Statement lists those additional controls (mitigations) that are secured. Additionally, the Marine Works sub-Code of Construction Practice includes details of the secured mitigations for shipping and navigation.

Table 7.14 details the additional controls which were identified as recommendations for potential mitigation for the Wylfa Newydd Project construction phase along with the frequency in which they were applied to the hazard scenarios.

Table 7.14 Additional controls for the construction phase

Control	Frequency
LPS Harbour control office	17
PMSC compliance	16
MSMS	15
Contingency plan exercises	14
Port facility emergency plan	11
Oil spill contingency plans	10
LPS broadcast (navigation and safety information)	10
Contractor risk assessment method statement (RAMS)	10
Availability of pollution response equipment	9
AIS coverage	8
Direction (Special) - Powers of Harbour/Pier Master	8
Training of pollution response personnel	7
Dedicated Very High Frequency (VHF) channel	5
Notices to mariners	4
CCTV coverage	4
Training of port marine/operations personnel	4
Requirement for notification of vessel defects	3
Directions (General) - issued by SHA	3
Weather forecasting	2
International Convention for the Safety of Life at Sea (SOLAS) 1974	2
Aids to navigation, provision and maintenance of	2
Safety zone	2
Communications equipment	1
Communications - Traffic broadcast	1
Arrival/departure, advance notice of	1
Accurate tidal measurements	1
Safe allocation of berths (depth, available, suitable)	1
Port waste management plan	1
Guidance for small craft	1
Protective fendering	1
ISPS compliance	1
Shore side facility maintenance programme	1
Afloat deterrent	1
Mooring studies and plans	1
Vessel master simulation training	1
Tidal flow atlas	1

Permit to work	1

Table 7.15 details the additional controls which were identified as recommendations for potential mitigation for the Wylfa Newydd Project operational phase along with the frequency in which they were applied to the hazard scenarios.

Table 7.15 Additional controls for the MOLF operational phase

Control	Frequency
LPS - Harbour control office	20
PMSC compliance	16
MSMS	16
Contingency plan exercises	11
Port facility emergency plan	11
Oil spill contingency plans	10
LPS broadcast (navigation and safety information)	10
Pilotage service	10
Training of port marine/operations personnel	9
AIS coverage	8
Availability of pollution response equipment	7
Safe systems of work (H&S)	6
CCTV coverage	5
Requirement for notification of vessel defects	5
Directions (General) - issued by SHA	5
Direction (Special) - Powers of Harbour/Pier Master	4
Aids to navigation, provision and maintenance of	4
Arrival/departure, advance notice of	4
Accurate tidal measurements	4
Vessel master simulation training	4
Availability of latest hydrographic information	4
Hazardous cargoes, advance notice of	4
Safe allocation of berths (depth, available, suitable)	3
Tidal flow atlas	3
Towage, available and appropriate	3
Large-scale navigational charts	3
Protective fendering	2
Mooring studies and plans	2
Byelaws	2
Training of pollution response personnel	1
International Convention for the Safety of Life at Sea (SOLAS) 1974	1
Port waste management plan	1
ISPS compliance	1
Shore side facility maintenance programme	1
Afloat deterrent	1
International COLREGS 1972 (as amended)	1
Hydrographic surveying program	1

The additional controls have been assessed and assigned a likelihood reduction and consequence reduction if they will be implemented. These reductions have been used to calculate the final risk for each hazard scenario. Table 7.16 and Table 7.17 present the final risk for the hazard scenarios after the additional controls have been applied.

Table 7.16 Final risk for the construction phase

Hazard Category	Hazard Scenario	Baseline Risk	Current Risk	Final Risk
Collision	Dredge/construction craft collision with commercial vessel	7.59	6.77	5.77
Grounding	Dredger/barge on passage to Holyhead North disposal site	7.22	4.85	5.58
Other	Displacement of vessels	6.31	5.66	5.57
Other	Vessel damage due to weather conditions	6.59	6.48	5.50
Grounding	Tug and tow grounding due to steering/propulsion failure	7.22	6.51	5.35
Collision	Tug and tow collision with commercial vessel	7.59	6.11	5.12
Other	Mooring failure on temporary moorings	6.66	6.60	4.99
Stranding	Small recreational vessel on breakwater	6.47	5.67	4.68
Collision	Dredger or barge depositing load at Holyhead North with vessel transiting	6.19	3.89	3.82
Machinery related accidents	Heavy lift failure or failure of lifting gear	5.94	4.65	3.68
Fire/explosion	Dredge/construction craft on-board fire	6.09	5.43	3.59
Collision	Dredger or barge on passage to Holyhead North disposal site and other vessel	7.13	4.73	3.56
Accidents to personnel	Commercial diving operations associated with the marine works	5.09	4.81	3.54
Collision	Dredge/construction craft collision with recreational vessel	6.59	5.56	3.44
Other	Malicious actions by third parties	4.91	4.62	3.42
Fire/explosion	Pressure waves caused by explosives during dredging operations	4.41	3.87	3.19
Fire/explosion	Ordnance found during dredge/construction	6.16	5.20	2.99
Grounding	Dredge/construction craft grounding due to marine works	7.13	6.28	2.83
Allision	Dredge/construction craft impact with marine works during construction phase	5.66	4.35	2.43
Flooding	Dredger flooding whilst engaged in operations	6.81	4.64	1.68
Hazardous substance accidents	Accidental spill	5.91	4.63	1.46
Payload related accidents	Incorrect loading or unloading of vessel transporting rock affects vessel stability	6.81	4.64	0.98
Accidents to personnel	Man overboard during dredge/construction works	4.69	2.93	0.73

Table 7.17 Final risk for the MOLF operational phase

Hazard Category	Hazard Scenario	Baseline Risk	Current Risk	Final Risk
Other	Displacement of vessels	6.59	5.92	5.80
Collision	Recreation/fishing/high speed/harbour vessel with vessel transiting to or from the Wylfa Marine Development Area	7.25	6.52	5.80
Stranding	Small recreational vessel on breakwater	6.47	5.67	4.68
Collision	Tanker with vessel transiting to or from the Wylfa Marine Development Area	7.44	4.70	4.55
Other	Towage operations within the harbour	5.88	4.96	3.87
Grounding	Vessel within the harbour	7.78	7.63	3.85
Ranging	Adverse weather conditions affecting moored vessels	4.97	4.84	3.48
Collision	Cargo vessel with vessel transiting to or from the Wylfa Marine Development Area	6.94	4.44	3.48
Machinery related accidents	Lifting equipment failure alongside the MOLF	5.41	4.44	3.33
Flooding	Vessel within the harbour	6.41	4.98	3.21
Machinery related accidents	Steering/propulsion failure entering or leaving the harbour	5.88	5.44	3.10
Hazardous substance accidents	Accidental spill within the harbour	3.81	3.81	2.56
Collision	With moored vessel	6.19	4.85	2.26
Fire/explosion	Vessel alongside the MOLF	4.27	3.53	2.04
Payload related accidents	Vessel unloaded incorrectly alongside the MOLF	5.97	5.12	1.92
Allision	Vessel with the MOLF	5.91	5.10	1.61
Allision	Vessel with breakwaters	7.59	6.62	1.60
Other	Malicious actions by third party	4.28	3.50	1.33
Accidents to personnel	Man overboard	4.69	3.11	0.98
Ranging	Vessel on bulk quay ranging due to interaction with other vessel	4.53	3.91	0.18

8 Formal Safety Assessment

This section documents the formal safety assessment relating to the construction and the MOLF operational phases of the Wylfa Newydd Project. Hazard scenarios that have been scored as significant risk or higher (see Table 7.13) have been brought forward into the impact assessment.

8.1 Significance criteria

Impacts on shipping and navigation receptors, which were formulated based on hazard scenarios identified at the workshop, were assessed using a consistent scale of sensitivity and magnitude, as described in the following sections.

8.1.1 Sensitivity

A vessel or navigation receptor can be sensitive only if there is a pathway through which an effect can be transmitted between the source activity and the receptor. When a receptor is exposed to an effect, the overall sensitivity of the receptor is determined and that process incorporates a degree of subjectivity. Within the NRA process, expert opinion is used to define the sensitivity of a receptor. This expert judgement is based on professional judgement stemming from experience of the effects to navigation from other similar projects and baseline understanding of the study area. Table 8.1 identifies each definition.

Table 8.1 Receptor sensitivity

Sensitivity	Definition
Very high	Very high level of safety impact for vessels and navigation receptors Very limited ability to adapt to impact
High	High level of safety impact for vessels and navigation receptors Limited ability to adapt to impact
Medium	Medium level of safety impact for vessels and navigation receptors Some ability to adapt to impact
Low	Low level of safety impact for vessels and navigation receptors Ability to adapt to majority of impact
Negligible	Negligible level of safety impact for vessels and navigation receptors Ability to adapt to all of impact
Neutral	No impact for vessels and navigation receptors

For the purposes of assessing the impact to marine receptors, sensitivity must be judged. The criteria ranges from neutral (sensitivity) to very high. The greater the safety effect, and/or the lower the ability to adapt to the effect, the greater the sensitivity. A safety impact is classified as any impact that may influence the navigational safety of the marine receptor.

8.1.2 Magnitude

When assessing the magnitude of an effect, the geographical extent, the duration and the frequency are considered. Determining the overall magnitude of navigational effects also incorporates a degree of subjectivity, as decisions are based on expert opinion, in combination with baseline data. The potential 'effects' of the Wylfa Newydd Project from a navigational perspective, as identified through the hazard workshop and stakeholder feedback, are identified in Table 8.2.

Table 8.2 Effect magnitude

Magnitude	Definition
Large Negative	Impact geographical area beyond the extent of marine works/operational area Impact present on a permanent basis throughout the operational phase Impact occurs very frequently to constantly/permanently
Medium Negative	Impact localised to geographical extent of marine works operational area Impact present on a permanent basis throughout the operational phase Impact occurs frequently
Small Negative	Impact localised to geographical extent of marine works/operational area Impact present on a temporary basis Impact relatively infrequent
Neutral	No impact on vessels or navigational receptors
Positive	Navigation receptors benefit as a result of the impact

8.1.3 Significance

Applying the sensitivity of the receptor and the magnitude of the potential effect, the significance is determined according to the matrix shown in Table 8.3.

Table 8.3 Significance classification

Criteria		Magnitude				
		Large Negative	Medium Negative	Small Negative	Neutral	Positive
Sensitivity	Very high	Major adverse	Major adverse	Moderate to minor adverse	No effect	Major to minor beneficial
	High	Major adverse	Major to moderate adverse	Minor adverse	No effect	Major to minor beneficial
	Medium	Moderate adverse	Moderate to minor adverse	Minor adverse	No effect	Moderate beneficial
	Low	Minor adverse	Minor adverse	Insignificant	No effect	Minor beneficial
	Negligible	Minor/ insignificant	Insignificant	Insignificant	No effect	Insignificant
	Neutral	No effect	No effect	No effect	No effect	No effect

The assessment of significance assumes that the embedded risk controls detailed in Table 7.9 and Table 7.10 are in place. In accordance with the requirements of the PMSC, which references the 'ALARP' concept, each hazard scenario is considered in isolation, with further controls added to lower the risk to a point which is 'as low as reasonably practicable'. The following assessment presents the risks that are scored above a 'medium' threshold (see Table 7.13). The assessments then outline

specific mitigation (termed 'Additional controls') identified through stakeholder/workshop engagement and based on expert opinion. However, it should be noted that a control that may be introduced to manage a higher scoring risk (for example, aids to navigation such as lights or buoys) may also apply to reduce risk in lower scoring hazard scenarios. To view the full output of the NRA, Appendices C and D should be viewed.

A number of the identified 'Additional controls' relate to powers available to a SHA for the safe management of a port or harbour. In order to reduce repetition within this assessment, these powers have been summarised in Section 8.1.4 and are referred to as 'Harbour Authority Powers' throughout the rest of the assessment.

8.1.4 Harbour Authority Powers

At the time of producing the NRAs, the intention is to apply for Harbour Authority Powers via the DCO process. Should this decision be revised, the NRA would require modification to update the mitigation measures to match the operation of a port facility outside of an SHA. Within the NRA tables (Appendix C and D) individual SHA controls are individually identified; within this chapter they are collectively referred to, and include (but are not limited to) the following:

- Contingency plan exercises – testing of the SHA's (marine-facing) emergency plan.
- Directions (General) – issued by the SHA as a set of instructions and general rules that all users of the harbour area must follow. This power would be set out within the establishing DCO.
- Directions (Special) – issued by the SHA (or equivalent). This power provides a key control for directing traffic and controlling marine situations within the harbour.
- LPS – application of an LPS provides a harbour control and coordination centre, configured to an agreed standard following guidance in the MCA's Marine Guidance Note (MCA, 2009). An LPS will be staffed by trained operatives using a range of sensor equipment to inform and update vessel masters of the prevalent conditions.
- LPS broadcast (navigation and safety information) – the broadcast of detailed movement information within the harbour, along with local weather conditions and any safety related issues. Information is normally disseminated via VHF radio.
- Notices to mariners – publication of SHA information, detailing ongoing safety and awareness information to harbour users and to local vessels navigation within area.
- Pilotage service – if a SHA is granted competent harbour authority status , under the Pilotage Act 1987, it will have the power to provide a pilotage service. This is a key control for managing the safe transit of vessels within the harbour and its approaches.
- Port emergency plan – a SHA would create or provide detailed plans and procedures to follow in the event of an emergency. A similar plan may be provided by the project/development in the absence of a defined SHA.
- Safety zone – determined and set by the SHA within its harbour area, allows it to restrict or manage access to parts of the harbour for safety reasons.

Within the following Chapter, these controls are referred to collectively as 'Harbour Authority Powers'.

8.2 Construction impacts

The NRAs from Table 7.11 for construction of the MOLF, breakwaters, Cooling Water intake and Cooling Water outfall which have an assessed outcome of significant risk (or above) have been taken forward into this impact assessment. These are summarised in Table 8.4.

Table 8.4 NRAs brought forward into the impact assessment

Hazard Category	Hazard Scenario	Current Risk
Collision	Dredge/construction craft collision with commercial vessel	6.77
Collision	Dredge/construction craft collision with recreational vessel	5.56
Collision	Tug and tow collision with commercial vessel	6.11
Fire/explosion	Dredge/construction craft on-board fire	5.43
Fire/explosion	Ordnance found during dredge/construction	5.20
Grounding	Tug and tow grounding due to steering/propulsion failure	6.51
Grounding	Dredge/construction craft grounding due to marine works	6.28
Other	Mooring failure on temporary moorings	6.60
Other	Vessel damage due to weather conditions	6.48
Other	Displacement of vessels	5.66
Stranding	Small recreational vessel on breakwater	5.67

8.2.1 Collision – Dredge/construction craft with commercial vessel

During the dredge and marine works activity, there would be increased vessel movements to and from the area of the Wylfa Marine Development Area. Dredged material would be taken from the site and transported to Holyhead North marine disposal site. The number of projected loads for disposal of the superficial material totals a maximum of 88 movements (44 loads). This dredge commitment would be completed by a trailing suction hopper dredger, working in combination with split bottom barges. In addition, the transport of excavated and dredge rock to Holyhead North marine disposal site is projected to take 818 movements (409 loads).

There would likely be in the order of 364 vessel movements (182 loads) as a result of transporting the pre-cast concrete elements to the site. These additional transits increase the risk of vessel collision between dredge/construction plant and marine commercial traffic; this risk relates to interaction with other vessels transiting near the shore, or those leaving and entering the traffic routeing measures established further offshore (the TSS). Some of the construction vessels would be restricted in their ability to manoeuvre (e.g. less manoeuvrable construction plant, platforms with spud mooring, barges on tow etc.).

Vessels approaching the Wylfa Marine Development Area or those working on-site are very unlikely to interact with other passing commercial vessels due to the distance between the site and the main east-west shipping routes. AIS analysis shows that there were 541 commercial vessels transiting near the marine works area for the 84 days of AIS data collected in 2015 (see Table 5.2). The vessel transits can be uplifted to give an annual figure of 2,351 commercial vessel transits through the marine works area. Therefore, the scheme's 906 dredge/barge movements and 364 movements associated with transhipment of breakwater pre-cast concrete represents an increase of 50% over the baseline situation.

This potential effect would have a medium level of sensitivity due to the ability of vessels to react to the situation by manoeuvring to avoid a collision situation. This type of incident has the potential to occur throughout the vessel's passage, and, therefore, the volume of additional vessel movements occurs frequently above the baseline volume, and therefore presents a magnitude which is assessed as medium negative. This leads to an overall ranking of **moderate to minor adverse**.

The following further mitigation measures would reduce the risk to ALARP:

- Harbour Authority Powers (see Section 8.1.4).
- AIS coverage – All dredge/construction vessels, including barges to carry AIS (A or B).
- Arrival/departure, advance notice of – To allow LPS to advise vessels operating at the marine works of traffic movements.
- RAMS – Provided to the SHA and agreed prior to commencement of operations.
- Dedicated VHF channel – Licence obtained from OFCOM, information updated in the Admiralty List of Radio Signals (ALRS).
- LPS broadcast (navigation and safety information) – Including weather conditions within the harbour.

Following the implementation of mitigation measures, specifically the use of AIS by all vessels engaged in the construction phase of the works providing greater opportunity for collision avoidance, the sensitivity is reduced to negligible and the residual effect would therefore be **insignificant.**

8.2.2 Collision – Tug and tow collision with commercial vessel

During the dredge and marine works activity, tug and tow operations would operate into, and out of, the Wylfa Marine Development Area. These operations are associated with dredge disposal and/or relocation of dredged material and the transport of build materials (metalwork, rock armour, aggregate, heavy plant and equipment etc.). An increase in the number of vessel movements means that there is an increased likelihood that steering/propulsion failure may occur to tugs and tows as they arrive or depart from the Wylfa Marine Development Area. Should this occur, a drifting tug and tow could be involved in a collision if the steering/propulsion failure occurs in an area used by other vessels.

This potential effect would have a medium level of sensitivity as any vessel subject to steering/propulsion failure would show the appropriate lights and shapes, along with a VHF broadcast to the coastguards and all vessels. This would allow for the reaction of other vessel traffic to the situation. This incident could happen throughout the vessel passage; however, it would be an isolated occurrence. The potential impact would be present for the construction phase only and would occur infrequently throughout the period of the marine works. This leads to an assessed magnitude of small negative and an overall ranking of **minor adverse**.

The following further mitigation measures would reduce the risk to ALARP:

- Harbour Authority Powers (see Section 8.1.4).
- AIS coverage – All dredge/construction vessels, including barges to carry AIS (A or B).
- RAMS – Provided to the SHA and agreed prior to commencement of operations.
- LPS – Harbour control office – Point of contact for Harbour operations.

Following the implementation of mitigation measures, specifically the use of AIS by all vessels engaged in the construction phase of the works providing greater opportunity for collision avoidance, the sensitivity is reduced to negligible and the residual effect would therefore be **insignificant.**

8.2.3 Collision – Dredge/construction craft with recreational vessel

During the dredging and marine works activity, there would be increased dredger movements which have been assessed as a maximum of 906 movements for dredge craft and 364 movements associated with transhipment of breakwater pre-cast concrete material. These additional transits increase the risk of vessel collision between dredge/construction plant and recreational vessel traffic.

This is more likely to occur closer to the coastline, as smaller vessels more typically transit closer to the shore to avoid routes used by commercial vessels and vessels with deeper draughts. Some of the dredge/construction vessels will be restricted in their ability to manoeuvre (e.g. less manoeuvrable construction plant, platforms with spud mooring, dredger or dredge barges).

This potential effect would have a medium level of sensitivity due to the ability of vessels to react to the situation by manoeuvring to avoid a collision situation. This type of incident has the potential to occur throughout the vessel's passage, and therefore the volume of additional vessel movements occurs frequently above the baseline volume, and therefore presents a magnitude which is assessed as medium negative. This leads to an overall ranking of **moderate to minor adverse**.

The following further mitigation measures would reduce the risk to ALARP:

- Harbour Authority Powers (see Section 8.1.4).
- AIS coverage – All dredge/construction vessels, including barges to carry AIS (A or B).
- Availability of pollution response equipment – Harbour and contractors to have equipment available.
- RAMS – Provided to SHA and agreed prior to commencement of operations.
- Dedicated VHF channel – Licence obtained from OFCOM, information updated in ALRS.
- Guidance for small craft – Passive (informative) management of leisure traffic by Development Liaison Team, written information to the RYA and local yacht clubs, and available as a web-based resource.
- MSMS – Established prior to operations based on risk assessment and containing procedures to allow for safe operations within the harbour.
- Oil spill contingency plans – The MCA require an OPRC plan to be in place and approved by them prior to the commencement of marine works at the site.
- PMSC compliance – SHA MSMS applies, which recognises the need for contractor RAMS to be agreed with the SHA in advance of marine works.

Following the implementation of mitigation measures, specifically information dissemination to local recreational users, the sensitivity is reduced to negligible and the residual effect would therefore be **insignificant.**

8.2.4 Fire/explosion – Dredge/construction craft on-board fire

During the construction phase, vessel fire is possible (if uncontained and therefore potentially leading to an explosion). Vessel fires within a marine works site can have onward consequences for other vessels, infrastructure and shore side buildings or equipment in the vicinity. However, given the proximity of shore-side emergency response, uncontrolled situations are rare and will be contained relatively quickly. Immediate action by the crew in response to a fire is the most effective measure to prevent a larger marine emergency. Any response to a fire on board a vessel can lead to pollutants entering the water through the use of various fire suppression methods.

This potential effect would have a medium level of sensitivity due to the type of work being carried out by construction craft (such as hot works) and the range of vessels engaged with the marine works. The potential effects would be localised to the extent of the marine construction area and would be present for the construction phase only. A fire or explosion has the potential to occur throughout the construction phase, but is an infrequent risk, which leads to an assessed magnitude of small negative and an overall ranking of **minor adverse**.

The following further mitigation measures would reduce the risk to ALARP:

- Harbour Authority Powers (see Section 8.1.4).
- Availability of pollution response equipment – Harbour and contractors to have equipment available.
- MSMS – Prior to commencement of marine operations, MSMS established by the SHA.
- Oil spill contingency plan – The MCA require an OPRC plan to be in place and approved by them prior to the commencement of marine works at the site
- PMSC compliance – SHA MSMS applies, which recognises the need for contractors RAMS to be agreed with the SHA in advance of marine works.
- Training of port marine/operations personnel – This should include the use of equipment and implementation of the plans.

Following the implementation of mitigation measures, specifically the MSMS and equipment to clean up any potential spill or pollutant, the sensitivity is reduced to low and the residual effect is therefore assessed as **insignificant.**

8.2.5 Fire/explosion – Ordnance found during dredge/construction

During the dredge/construction phase, unexploded ordnance could be discovered and inadvertently detonated by dredgers or construction plant. The resulting explosion is likely to cause severe damage to the vessel and fatalities to the crew. However, considering the geographic location of the Wylfa Newydd Project and previous military activities, the presence of unexploded ordnance is highly unlikely. The NRA considered these circumstances, but could not rule out the possibility without further investigation.

In the instance that unexploded ordnance was discovered, the potential effect would have a high level of safety impact for vessel safety. The potential outcomes would be limited to the extent of the marine construction area and/or location of the dredge/construction plant. The effect has the potential to occur throughout the construction phase, but would impact infrequently which leads to an assessed magnitude of small negative and an overall ranking of **minor adverse**.

The following further mitigation measures would reduce the risk to ALARP:

- Harbour Authority Powers (see Section 8.1.4).
- Availability of pollution response equipment – Harbour and contractors to have equipment available.
- MSMS – Prior to commencement of marine operations, MSMS established by the SHA.
- Oil spill contingency plan – The MCA require an OPRC plan to be in place and approved by them prior to the commencement of marine works at the site.
- PMSC compliance – SHA MSMS applies, which recognises the need for contractors RAMS to be agreed with the SHA in advance of marine works.

Following the implementation of mitigation measures, specifically the unexploded ordnance desk-based investigation (followed by magnetometer survey if relevant) the magnitude can be quantified. It is expected that this can be reduced to a level which is small negative, or neutral; leading to a residual effect which is **minor/insignificant.**

8.2.6 Grounding – Tug and tow due to steering/propulsion failure

During the dredge and marine works activity, tug and tow operations would operate into, and out of, the Wylfa Marine Development Area. These operations are associated with dredge disposal and/or relocation of dredged material and the transport of build materials (metalwork, rock armour,

aggregate, heavy plant and equipment etc.). An increase in the number of vessel movements means that there is an increased likelihood that steering/propulsion failure may occur to tugs and tows as they arrive or depart from the Wylfa Marine Development Area. Should this occur whilst the tug and tow are close to shore, then they may drift and ground on rocky outcrops in shallow water. The coastline and seabed near the Wylfa Marine Development Area is predominantly rocky, meaning that grounding would lead to major damage to the tug and tow. This damage could lead to loss of life and marine pollution from vessel bunkers and cargo.

The potential effect would have a high level of sensitivity due to the limited time and ability for the vessel crew to react to the situation. There is scope for the vessel crew to anchor the tug and tow; however, there are particularly strong currents in the area off the Wylfa Marine Development Area (see Section 4.1) contributing to a sensitivity which is assessed as high. The potential impact would be localised to the coastline of the local area to the Wylfa Marine Development Area and would be present for the construction phase only. The effect has the potential to occur throughout the construction phase, but would impact infrequently which leads to an assessed magnitude of small negative and an overall ranking of **minor adverse.**

The following further mitigation measures would reduce the risk to ALARP:

- Harbour Authority Powers (see Section 8.1.4).
- Availability of pollution response equipment – Shore side equipment provided by the SHA.
- Oil spill contingency plans – The MCA require an OPRC plan to be in place and approved by them prior to the commencement of marine works at the site.
- Training of pollution response personnel – Response by the SHA.

Following the implementation of mitigation measures, the use of Harbour Authority Powers and coordination, the sensitivity can be reduced to medium; however, the residual effect remains at **minor adverse.**

8.2.7 Grounding – Dredge/construction plant due to marine works

During the dredge and marine works activity which constitutes the construction phase for the marine aspects of the Wylfa Newydd Project, there would be an increased risk of dredge/construction vessels grounding in the vicinity of the marine works due to working close inshore, in complex tidal conditions with limited room to manoeuvre. In addition, the available water depth and nature of the coastline (mainly rocky outcrops with sand embayments) plus the changing morphology of the marine works (breakwater, movement of dredge material etc.) means that there is reduced room to manoeuvre and uncharted topography.

The potential effect would have a high level of sensitivity due to the limited time and ability for the vessel crew to react to the situation. The potential impact would be localised to the extent of the marine construction area and would be present for the construction phase only. The effect has the potential to occur throughout the construction phase, and has the potential to occur frequently which leads to an assessed magnitude of medium negative and an overall ranking of **major to moderate adverse**.

The following further mitigation measures would reduce the risk to ALARP:

- Harbour Authority Powers (see Section 8.1.4).
- Accurate tidal measurements – Tide level observed on-site and made available to vessels.
- Aids to navigation, provision and maintenance of – All marine works are required to be lit.
- Availability of pollution response equipment – Shore side equipment provided by the SHA.

- Oil spill contingency plans – The MCA require an OPRC plan to be in place and approved by them prior to the commencement of marine works at the site.
- PMSC compliance – SHA MSMS applies, which recognises the need for contractors RAMS to be agreed with the SHA in advance of marine works.
- Tidal flow atlas – Covering each hour for spring and neap, scaled for the harbour area, including the combined effect of Cooling Water intake and outflow.
- Requirement for notification of vessel defects – Defects will be reported to the SHA.
- Vessel master simulation training – Ability for vessel masters to practice on a ship simulator prior to navigating on-site.

Following the implementation of mitigation measures, specifically the ability of vessel masters to practice in a simulated environment prior to navigating at the site, and the availability of tidal flow atlases which would provide an ability to adapt to the situation, leading to a sensitivity which is low with a residual effect which is **minor adverse.**

8.2.8 Other – Mooring failure on temporary moorings

The initial moorings available during the construction phase of the MOLF, breakwaters, Cooling Water intake and Cooling Water outfall would be exposed to the prevailing environmental conditions in the area. Large waves from the west and strong winds from the east will place extra strain on mooring systems. This can result in the moorings parting, setting the vessel adrift or damage to the temporary moorings and vessel due to movement and contact.

Weather forecasting services for the area present adequate time for a vessel to leave moorings and anchor in sheltered waters or proceed to local ports. This means that the sensitivity will be low. This impact will be localised to the marine works area and be present on a temporary basis until either the permanent berths are completed or the breakwater reaches a sufficient level of development to provide shelter giving a magnitude of medium negative. This leads to an overall ranking of **minor adverse.**

The following further mitigation measures would reduce the risk to ALARP:

- Harbour Authority Powers (see Section 8.1.4).
- LPS broadcast (navigation and safety information) – Local weather conditions promulgated by LPS.
- RAMS – Method statement identifies practices for establishing temporary moorings.
- MSMS – Prior to commencement of marine operations, MSMS established by the SHA.
- Mooring studies and plans – Berths designed for the prevailing MetOcean conditions and mooring arrangements suitable for vessel size.
- PMSC compliance – SHA MSMS applies, which recognises the need for contractor RAMS to be agreed with the Harbour Authority in advance of marine works.

- Protective fendering – In place on jetties/quays and suitable for vessels being used.
- Safe allocation of berths (depth, available, suitable) – Berths located to minimise ranging due to weather.

Following the implementation of mitigation measures, specifically the procedures in place as part of the contractor RAMS and the harbour MSMS following this incident. would reduce the magnitude to small negative, leading to a sensitivity which is low with a residual effect which is **insignificant**

8.2.9 Other – Vessel damage due to weather conditions

High wind speeds and swell developing from the Irish Sea would affect dredge and construction craft operating at the marine works. The vessels would be operating close to shore in confined locations with shallow water. Any adverse weather conditions can increase the risk of allision with marine works, grounding or collision with other vessels within the dredge/construction area.

This potential impact would have a medium sensitivity due to the ability to react to building swell condition and the time available to move to a more sheltered location. The potential effect would be localised to the extent of the study area and would be present for the construction phase only. However, the impact has the potential to occur frequently throughout the period of the construction, which leads to an assessed magnitude of medium negative and an overall ranking of **moderate to minor adverse**.

The following further mitigation measures would reduce the risk to ALARP:

- Harbour Authority Powers (see Section 8.1.4).
- Availability of pollution response equipment – Shore side equipment provided by the SHA.
- MSMS – Prior to commencement of marine operations, MSMS established by the SHA.
- Oil spill contingency plan – The MCA require an OPRC plan to be in place and approved by them prior to the commencement of marine works at the site.
- PMSC compliance – SHA MSMS applies, which recognises the need for contractors to risk assess marine operations and agree plans with the SHA in advance of marine works.
- Training of pollution response personnel – Response by the SHA.
- Weather forecasting – Sea state model used throughout the build phase of the MOLF to predict weather conditions and downtime.

Following the implementation of mitigation measures, specifically weather predictions, the magnitude would be reduced to small negative with the residual effect being assessed as **minor adverse.**

8.2.10 Other – Displacement of vessels

The dredge and construction operations carried out as part of the marine works and resultant transit routes to and from the Wylfa Marine Development Area would result in recreational and fishing vessels, which currently navigate within that area, being displaced into areas where larger vessels navigate. These vessels would be temporarily displaced either further offshore, or more likely a timing delay would occur to vessel transits to avoid crossing situations (and therefore avoid potential collision situations).

This potential effect would have a medium level of sensitivity due to the potential for safety impacts and vessels with limited ability to manoeuvre and therefore react to the traffic situation. The potential effect would be localised to the extent of the study area and would be present on a permanent basis. This leads to an assessed magnitude of medium negative and an overall ranking of **moderate to minor adverse**.

The following further mitigation measures would reduce the risk to ALARP:

- Harbour Authority Powers (see Section 8.1.4).
- AIS coverage – All dredge/construction vessels, including barges to carry AIS (A or B).

Following the implementation of mitigation measures, specifically the use of AIS, would reduce the magnitude to small negative, and therefore the residual effect will be **minor adverse.**

8.2.11 Stranding –Small recreational vessel on breakwater

The surrounding areas of the Wylfa Marine Development Area are regularly navigated by recreational kayakers and other small craft. These craft can navigate in the embayments and close to the coastline to gain shelter from weather conditions due to the profile of the coastline. During periods of adverse weather conditions, it is possible that these craft will strand on the sloped faces of the breakwaters. The resulting damage would mean it would be unlikely for the vessel to be refloated safely.

The small vessel is likely to have communications equipment available; however, this may not be operational in the conditions that would cause this incident giving a sensitivity of medium. The potential incident would be localised to the footprint of the breakwaters and would be present on a permanent basis giving a magnitude of medium negative. This leads to an overall ranking of **moderate to minor adverse**.

The following further mitigation measures would reduce the risk to ALARP:

- Harbour Authority Powers (see Section 8.1.4).
- CCTV coverage – Monitoring of the harbour area.
- MSMS – Prior to commencement of marine operations, MSMS established by the SHA.
- Safety boat – On call to be available in the event of an emergency.
- PMSC compliance – SHA MSMS applies, which recognises the need for contractor RAMS to be agreed with the SHA in advance of marine works.

Following the implementation of mitigation measures, specifically the use of CCTV to monitor the harbour and operation of an MSMS which will take this risk into account and provide guidance, the magnitude would be reduced to small negative giving an overall ranking of **minor adverse**

8.3 Operational impacts

The NRAs from Table 7.12 for MOLF operational phase of the project that have an outcome of significant risk (or above) have been taken forward into this impact assessment. These are summarised in Table 8.5.

Table 8.5 NRAs brought forward into the impact assessment

Hazard Category	Hazard Scenario	Current Risk
Allision	Vessel with breakwaters	6.62
Allision	Vessel with the MOLF	5.10
Collision	Recreation/fishing/high speed/harbour vessel with vessel transiting to or from the Wylfa Marine Development Area	6.52
Grounding	Vessel within the harbour	7.56
Machinery related accidents	Steering/propulsion failure entering or leaving the harbour	5.44
Other	Displacement of vessels	5.92
Payload related accidents	Vessel unloaded incorrectly alongside the MOLF	5.12
Stranding	Small recreational vessel on breakwater	5.67

8.3.1 Allision – Vessel with breakwaters

Manoeuvring of vessels in close proximity to the breakwaters has the potential for contact with the structure (allision), especially during periods of adverse weather conditions when wind activity and wave action has the potential to adversely affect vessel manoeuvring. In addition, tidal flow conditions require additional consideration depending on the time the vessel is expected to enter or leave the harbour and the tidal conditions during the vessel's transit. Any allision has the potential to cause damage to a vessel, which may lead to a pollution event and injuries to personnel. This risk will diminish with time as crew become familiar with the new berthing locations and the effects of wind and tidal flow at this location. Indicative manoeuvres of vessels passing the breakwaters and berthing are given in Appendix E.

The confined area within the breakwaters means that a vessel has reduced ability to make corrective actions. The slow speed at which an approach to the harbour is made means that there would be sufficient time to make alterations of course through application of engines, rudder and bow thrusters. These factors lead to a medium level of sensitivity. In addition, the potential impact is localised to the area of the marine facilities and would occur throughout the operational phase, leading to a magnitude of medium negative and an overall ranking of **moderate to minor adverse**.

The following further mitigation measures will reduce the risk to ALARP:

- Harbour Authority Powers (see Section 8.1.4).
- Availability of latest hydrographic information – Results of hydrographic survey provided to UK Hydrographic Office (UKHO) for update of navigation charts for the area.
- Accurate tidal measurements – Tide level observed on-site and made available to vessels.
- Arrival/departure, advance notice of – Notification sent to LPS.
- Aids to navigation, provision and maintenance of – Provided after consultation with Trinity House Lighthouse Authority.
- AIS coverage – Monitored by LPS marine personnel.
- Availability of pollution response equipment – Harbour to have equipment to deal with Tier 1 spills.
- MSMS – Provides guidance and procedures based on risk assessments.
- Oil spill contingency plans – Details actions to be taken in the event of oil spill.
- Protective fendering – Along breakwaters to stop vessels making contact with the rock armour.
- PMSC compliance – Ensures all risk is reduced to ALARP.
- Production of large-scale navigational charts – the UKHO can provide large-scale Electronic Navigational Charts (ENCs) for vessels using the Harbour Area.
- Requirement for notification of vessel defects – Details of vessel defects sent to LPS.
- Tidal flow atlas – Covering each hour for spring and neap, scaled for the Harbour Area, including the combined effect of Cooling Water intake and discharge.
- Towage, available and appropriate – Harbour tugs employed to escort vessel through the breakwaters to the berth.
- Training of port marine/operations personnel – This should include the use of equipment and implementation of the plans.
- Large-scale navigational charts – The UKHO production of large-scale ENCs and paper charts for vessels using the Wylfa Marine Development Area.
- Vessel master simulation training – Prior to operations, masters to practice berthing/unberthing using the vessels that will be entering the harbour and representative tidal flow at different states of tide and weather.

Following the implementation of mitigation measures, specifically the training of vessel Masters, availability of the latest hydrographic information and the creation of a tidal flow atlas, the sensitivity is reduced to low and so the residual effect will be **minor adverse**.

8.3.2 Allision – Vessel with the MOLF

The confined area within the harbour created by the breakwaters increases the risk that a vessel will make contact (allision) with the MOLF whilst manoeuvring to berth, especially in periods of adverse weather conditions when wind activity has the potential to adversely affect vessel manoeuvring. Any allision has the potential to cause damage to a vessel, which may lead to a pollution event and injuries to personnel. This risk will diminish with time as crew become familiar with the new berthing locations and the effects of wind and tidal flow at this location. Indicative manoeuvres of vessels passing the breakwaters and berthing are given in Appendix E.

This potential effect would have a moderate level of sensitivity due to the confined area within the breakwaters giving the vessel less space to manoeuvre. However, the low speed at which an approach to the berth is made means that there is adequate time to react to an allision situation by use of the vessel's engines, rudder and bow thruster. In addition, the potential impact is localised to the area of the marine facilities and would occur throughout the operational phase, leading to a magnitude of medium negative and an overall ranking of **moderate adverse**.

The following further mitigation measures will reduce the risk to ALARP:

- Harbour Authority Powers (see Section 8.1.4).
- Availability of latest hydrographic information – Results of hydrographic survey provided to UKHO for update of navigation charts for the area.
- Availability of pollution response equipment – Harbour to have equipment to deal with Tier 1 spills
- Aids to navigation, provision and maintenance of – Provided after consultation with Trinity House Lighthouse Authority.
- Accurate tidal measurements – Tide level observed on-site and made available to vessels.
- AIS coverage - Monitored by LPS marine personnel.
- Arrival/departure, advance notice of – Notification sent to LPS.
- MSMS – Provides guidance and procedures based on risk assessments.
- Oil spill contingency plans – Details actions to be taken in the event of oil spill
- Protective fendering - Along breakwaters to stop vessels making contact structure.
- Production of large-scale navigational charts – the UKHO can provide large-scale ENCs for vessels using the Harbour Area.
- PMSC compliance – Ensures all risk is reduced to ALARP.
- Requirement for notification of vessel defects – Details of vessel defects sent to LPS.
- Large-scale navigational charts – The UKHO production of large-scale ENCs for vessels using the Wylfa Marine Development Area.
- Towage, available and appropriate – Harbour tugs employed to escort vessel through the breakwaters to the berth.
- Training of port marine/operations personnel.
- Tidal flow atlas – Covering each hour for spring and neap, scaled for the harbour area, including the combined effect of Cooling Water intake and discharge.
- Vessel master simulation training – Prior to operations, masters to practice berthing/unberthing using the vessels that will be entering the harbour and representative tidal flow at different states of tide and weather.

Following the implementation of mitigation measures, specifically the training of vessel Masters, availability of the latest hydrographic information and the creation of a tidal flow atlas, the sensitivity is reduced to low, and so the residual effect will be **minor adverse**.

8.3.3 Collision – Recreation/fishing/high speed/harbour vessel with vessel transiting to or from the Wylfa Marine Development Area

Consultation with local stakeholders indicates that recreational fishing and leisure vessels use the bays in the vicinity of the Wylfa Marine Development Area for shelter from the weather, anchoring locations whilst on a passage and for potting. These vessels will generally be navigating close to the shore to avoid traffic in deeper water further to the north of the area. There is potential for one of these vessels to be involved in a collision with a vessel navigating to or from the Wylfa Marine Development Area.

In addition, high speed vessels navigate in the area between the Skerries TSS and the Wylfa Marine Development Area. Analysis of AIS has shown that these vessels are generally crew transfer vessels operating between the wind farms in the area and Holyhead Port. These vessels are generally very manoeuvrable and able to take avoiding action as required.

This potential effect would have a medium level of sensitivity due to the ability of vessels to react to the situation by manoeuvring to avoid a collision situation. This type of incident has the potential to occur throughout the operational phase, and therefore presents a magnitude which is assessed as medium negative. This leads to an overall ranking of **moderate to minor adverse**.

The following further mitigation measures will reduce the risk to ALARP:

- Harbour Authority Powers (see Section 8.1.4).
- AIS coverage – Monitored by LPS marine personnel.
- LPS broadcast (navigation and safety information) – Promulgate conditions and movements within the harbour to approaching vessels on request.

Following the implementation of mitigation measures, specifically the provision of LPS which will act as a central contact point for the Harbour that will be able to supply information on vessel movements to any vessels navigating through the area, the sensitivity is reduced to low and so the residual effect will be **minor adverse**.

8.3.4 Grounding – Vessel within the harbour

Vessels using the harbour area have the potential to ground in the shallower areas towards the south-eastern area, near the Cooling Water intake, especially when manoeuvring to the Ro-Ro berth. The Ro-Ro vessel is likely to enter this area bow first when swinging, before going astern to the berth. Any grounding in this location is likely to involve puncturing of the hull or major damage which could lead to a pollution event and debris entering the Cooling Water intake.

The potential effect would have a high level of sensitivity due to the limited time and ability for the vessel crew to react to the situation and the confined area within the breakwaters limiting possible manoeuvring. The potential impact will be localised to the extent of the harbour area and will be present on a permanent basis. The impact is likely to occur frequently but will diminish with time as vessel crews become more experienced with the harbour conditions leading, to an assessed magnitude of medium negative and an overall ranking of **major to moderate adverse**.

The following further mitigation measures will reduce the risk to ALARP:

- Harbour Authority Powers (see Section 8.1.4).
- Availability of latest hydrographic information – Results of hydrographic survey provided to UKHO for update of navigation charts for the area.
- Availability of pollution response equipment – Harbour and contractors to have equipment available
- Aids to navigation – Buoys and light to identify navigable water.
- Dredging programme – Informed by the results of hydrographic survey.
- Hydrographic surveying program – Regular scheduled surveys in line with PMSC requirements.
- MSMS – Provides guidance and procedures based on risk assessments.
- PMSC compliance – Ensures all risk is reduced to ALARP.
- Requirement for notification of vessel defects – Details of vessel defects sent to LPS.
- Safe allocation of berths (depth, available, suitable) – Should take into account the dimensions of the vessel transiting to the berth.
- Training of port marine/operations personnel – This should include the use of equipment and implementation of the plans
- Oil spill contingency plans – Details actions to be taken in the event of oil spill
- Vessel master simulation training – The strong currents present in the area and reduced sea room for manoeuvre means that masters will need training in order to safely navigate in the area.

Following the implementation of mitigation measures, specifically the training of vessel masters and tidal flow atlas, the sensitivity will be reduced to low and so the residual effect will be **minor adverse.**

8.3.5 Machinery related accidents – Steering/propulsion failure entering or leaving the harbour

There is the potential for engine, thruster or rudder failure whilst a vessel is manoeuvring from the berth and proceeding out of the harbour. The increased use of these systems during these manoeuvres increases the likelihood that these systems may fail. The restricted water available within the harbour means that, should the vessel lose steering or propulsion, there is the possibility the vessel can make contact with the quay or breakwaters.

The potential effect would have a high level of sensitivity due to the limited time and ability for the vessel crew to react to the situation and the confined area within the breakwaters, limiting possible manoeuvring. The potential impact will be localised to the extent of the harbour area and will be present on a permanent basis leading to an assessed magnitude of medium negative and an overall ranking of **major to moderate adverse**.

The following further mitigation measures will reduce the risk to ALARP:

- Harbour Authority Powers (see Section 8.1.4).
- MSMS – Provides guidance and procedures based on risk assessments.
- Oil spill contingency plans – Details actions to be taken in the event of oil spill.
- PMSC compliance – Ensures all risk is reduced to ALARP
- Port Facility Emergency Plan – To include actions in the event of a man overboard.
- Requirement for notification of vessel defects – Details of vessel defects sent to LPS.
- Training of port marine/operations personnel – This should include the use of equipment and implementation of the plans.

Following the implementation of mitigation measures, specifically the use of contingency plans should this event occur and the associated training of marine personnel, the magnitude will be reduced to small negative and so the residual effect will be **minor adverse.**

8.3.6 Other – Displacement of vessels

Transit routes to and from the Wylfa Marine Development Area will result in recreational and fishing vessels that currently navigate within that area being displaced into areas where larger vessels navigate. These vessels will be temporarily displaced either further offshore, or more likely a timing delay will occur to vessel transits to avoid crossing situations (and therefore avoid potential collision situations). Anecdotal information suggests that approximately seven fishing vessels use Cemlyn Bay for potting and line fishing, these vessels will continue to use the bay but may need to time their transits to avoid interaction with vessels leaving or entering the Wylfa Marine Development Area.

This potential effect would have a low level of sensitivity, as there is sufficient sea room to the north of the Wylfa Marine Development Area for vessels to transit safely and perform actions to avoid close quarters situations in accordance with the COLREGS. The potential effect will be localised to the extent of the study area and will be present on a permanent basis. This leads to an assessed magnitude of medium negative and an overall ranking of **minor adverse**.

The following further mitigation measures will reduce the risk to ALARP:

- Harbour Authority Powers (see Section 8.1.4).
- AIS coverage – All dredge/construction vessels, including barges to carry AIS (A or B).

Following the implementation of mitigation measures, the residual effect will be **insignificant.**

8.3.7 Payload related accidents – Vessel unloaded incorrectly alongside the MOLF

When unloading vessels, it is possible that the stability will be compromised due to the distribution of weight. This can have several effects including, list, loll, excessive sheer forces or bending moments. These have the potential to cause either severe damage to the vessel or lead it to capsize.

There is sufficient time before unloading operations commence to perform unloading calculations to ensure that stability limits are not exceeded, giving a sensitivity of low. The potential impact will be localised to the extent of the harbour area and will be present on a permanent basis leading to an assessed magnitude of medium negative and an overall ranking of **minor adverse.**
The following further mitigation measures will reduce the risk to ALARP:

- Harbour Authority Powers (see Section 8.1.4).
- Availability of pollution response equipment – Harbour and contractors to have equipment available.
- Hazardous cargoes, advance notice of – Vessels required to notify SHA of any hazardous cargoes in advance.
- MSMS – Provides guidance and procedures based on risk assessments.
- Oil spill contingency plans – Details actions to be taken in the event of oil spill
- PMSC compliance – Provides guidance and procedures based on risk assessments.
- Requirement for notification of vessel defects – Details of vessel defects sent to LPS.
- Safe systems of work (H&S) – Based on risk assessment and industry best practice.
- Safe allocation of berths (depth, available, suitable) – Should take into account the dimensions of the vessel transiting to the berth

- Training of port marine/operations personnel – This should include the use of equipment and implementation of the plans.

Following the implementation of mitigation measures, specifically the use of contingency plans should this event occur and the associated training of marine personnel, the magnitude will be reduced to small negative and so the residual effect will be **insignificant.**

8.3.8 Stranding – Small recreational vessel on breakwater

Recreational kayakers and other small craft regularly navigated in the embayments surrounding the Wylfa Marine Development Area. These craft, due to their size and propulsion, stay close to the coastline to gain shelter from tidal and prevailing weather conditions. During periods of adverse weather, it is possible that these craft will strand on the sloped faces of the breakwaters. The resulting damage would mean it would be unlikely for the vessel to be refloated safely.

The small vessel is likely to have communications equipment available; however, this may not be operational in the conditions that would cause this incident, giving a sensitivity of medium. The potential incident will be localised to the footprint of the breakwaters and will be present on a permanent basis, giving a magnitude of medium negative. This leads to an overall ranking of **moderate to minor adverse**.

The following further mitigation measures will reduce the risk to ALARP:

- Harbour Authority Powers (see Section 8.1.4).
- CCTV coverage – Monitoring harbour area.
- International Convention for the Safety of Life at Sea (SOLAS) 1974 – On call to be available in the event of emergency.
- MSMS – Provides guidance and procedures based on risk assessments.
- PMSC compliance – Ensures all risk is reduced to ALARP.

Following the implementation of mitigation measures, specifically the use of CCTV to monitor the harbour and operation of an MSMS which will take this risk into account and provide guidance, the magnitude will be reduced to small negative, giving an overall ranking of **minor adverse**.

9 Cumulative Impacts

Based on the projects identified for cumulative/in-combination consideration, the following activities and projects shown in Table 9.1 are considered relevant in relation to commercial shipping and recreational navigation. The assessed changes to likelihood and consequence associated with these projects have been used when determining the frequency and consequence levels in the NRA tables detailed in Appendix C and Appendix D.

Table 9.1 In-combination activities and projects

Project Developer and Description	Assessment
Magnox Limited - Decommissioning of the Existing Power Station (Wylfa) including care and maintenance of the existing facilities decommissioning and final site clearance.	**Not Considered**. There are currently no plans for the decommissioning of the Existing Power Station to involve marine operations.
Lateral Power (Orthios Group) - Anglesey Eco Park, including 299 MWe biomass power station within the existing consented scheme, prawn growing facility (aquaculture), large soilless indoor vegetable growing facility (hydroponics), home compostable food packaging facility, the CFP Centre of Excellence, research and development, and a deep-water jetty for bulk import.	The Anglesey Eco Park is expected to use a vessel berth in Holyhead for the import of biomass. This will increase the level of vessel traffic in the area and so **increase the likelihood** of marine incidents. The vessels using this facility are unlikely to transit close to the Wylfa Marine Development Area, so the project is unlikely to have an in-combination effect on vessels navigating in the area.
Conygar / Stena Line Ltd - Holyhead Waterfront Redevelopment A comprehensive mixed-use development on 1.2 km of Holyhead waterfront at Newry Beach and Porth y Felin.	The planned redevelopment of the Holyhead Waterfront includes the development of a 500-berth marina. This increase in recreational capacity is likely to increase the recreational vessel transits near to the Wylfa Marine Development Area. This will **increase the likelihood** of a marine incident. This is most likely to occur at the points where the vessels on passage to or from the Wylfa Marine Development Area cross recreational vessels navigating close to shore.
Amlwch LNG - Tankers would import liquid gas to a mooring 3 km from the Amlwch coast. The gas would then be transferred by an undersea pipeline from the mooring platform to the site near the town of Amlwch, where it would be converted back to natural gas and sent into the UK gas network.	The Amlwch LNG project will increase the number of vessels regularly navigating within the study area. Tankers on passage to or from Amlwch are likely to use the Skerries TSS, which means that they will not interact with traffic associated with the Wylfa Marine Development Area in the confined waters closer to shore. This means that there will be a **minimal increase in likelihood** of a marine incident. Due to the nature of LNG and the low flashpoint, any marine incident causing damage to the hull has the potential to cause fire and explosions. This means that there would be an **increase in consequence** associated with **people** and **property**.

Project Developer and Description	Assessment
Stena Line Ports (Harbour Revision Order) application - An application has also been made to Natural Resources Wales for a marine licence screening and scoping opinion for a three stage development of Holyhead Harbour. The scheme will see **Area A:** reclamation forming approximately 68,230 m^2 of new port land for a deep water multi-purpose berth for larger vessels and cruise vessels. **Area B:** reclaimed forming approximately 25,540 m^2 of new port land, providing an additional multi-purpose berth. **Area C:** reclamation forming approximately 16,830 m^2 of new port land, providing a multi-purpose berth for smaller vessels. The scheme also includes an approach channel dredge to achieve -9 m below Chart Datum resulting in approx. 1 M metres cubed of dredge material. It is anticipated that most of the material will be used in the scheme; a proportion may be taken to Holyhead Deep (IS040) disposal site.	The Stena Line Ports harbour development project has the potential to increase the number of vessels regularly navigating within the study area. Large vessels, including cruise vessels on passage along the Anglesey Coast may pass the Wylfa Marine Development Area , however they will be offshore and not directly affect the harbour area or scheme during construction or operation. Larger vessels will use the Skerries TSS, which means that they will not interact with traffic associated with the in the confined waters closer to shore. Dredging vessels working on the Stena Line Ports harbour development project may interact with dredging vessels on passage between the Wylfa Marine Development Area and the disposal site. This traffic however, will fit into the normal pattern of vessel movement within open sea; hence, the potential for interaction is minimal. Therefore, increased vessel activity from the Stena Line Port harbour development means that there will be a **minimal increase in likelihood** of a marine incident.
Minesto - Holyhead Deep 10 MW Tidal Kite installation off the coast of Holyhead, plus on-land elements and grid connection.	The Tidal Kite project will use a large area of the Holyhead Deep Disposal Site currently being considered for disposal of dredge material associated with the Wylfa Newydd Project. The inter-project effects would cause an **increase in likelihood** of a dredger making contact with a fixed structure when using Holyhead Deep.
Atlantis - Tidal array of up to nine tidal generators at the Skerries off the north-west coast of Anglesey.	**Not Considered**. The Atlantis Tidal Array at the Skerries is currently cancelled.
Dublin Port Company - Alexandra Basin Redevelopment Project. Extension of infrastructure to open up Dublin Port to larger cruise and cargo ships. The port will dredge the River Liffey to increase the depth of its berths and the entrance channel from 7 m to at least 10 m. This will eliminate access issues caused by tides and enable large cruise and cargo ships to turn in Alexandra Basin and dock at East Link Bridge, rather than reversing up the Liffey to their berth as they do now.	**Not Considered.** There will be no interaction between vessels involved with the Dublin Port Company and those associated with the Wylfa Newydd Project.
Dun Laoghaire Harbour Company (Ireland) - Proposed New Cruise Berth For Large Cruise Ships at Dun Laoghaire Harbour Dun Laoghaire Harbour Company is seeking permission for an €18 m cruise berth facility to cater for jumbo cruise ships.	**Not Considered.** There will be no interaction between vessels involved with the Dun Laoghaire Harbour Company and those associated with the Wylfa Newydd Project.

10 Mitigation Measures Summary

The following section summarises existing industry standard risk controls and project-specific mitigation measures identified in Section 8. The NRA process has recognised both existing industry standard risk controls and project-specific mitigation; to view mitigation and controls assigned to individual NRAs, see Appendix C and Appendix D. Existing risk controls are listed in Table 7.9.

10.1 Project-specific mitigation measures

Project-specific mitigation has been summarised against the two phases of the proposed development. The mitigation measures identified that rely on Horizon Nuclear Power Wylfa becoming a SHA have been detailed in 8.1.4. These Harbour Authority Powers have been considered in addition to the mitigation detailed in the following sections for the construction and operational phases.

10.1.1 Construction of the MOLF, breakwaters, Cooling Water intake and Cooling Water outfall

The following 18 project-specific mitigation measures were identified through the NRA process as appropriate risk management controls during the during the construction phase:

- Accurate tidal measurements – Tide level observed on-site by tidal gauges that can be remotely monitored by harbour personnel and made available to vessels
- AIS coverage – All dredge/construction vessels, including barges, to carry AIS (A or B) which will assist in other commercial vessels identifying traffic associated with the Wylfa Newydd Project and therefore taking avoiding action.
- Arrival/Departure, advance notice of – To allow marine personnel to supply accurate and up-to-date traffic movement information to vessels operating at the marine works.
- Availability of pollution response equipment – Harbour and contractors to have equipment available up to Tier 1. A Tier 2 contractor should be available.
- CCTV coverage – passive monitoring of marine operations via cameras covering the marine works will highlight adverse conditions to those monitoring operations.
- RAMS – reviewed and agreed prior to use.
- Dedicated VHF channel – for use by dredge/construction vessels working on the project. This will require a licence from OFCOM.
- Guidance for small craft – passive (informative) management of leisure traffic by Development Liaison Team, written information to the RYA and local yacht clubs, and available as a web based resource.
- MSMS – prior to commencement of marine operations, consideration and creation of a MSMS which details the marine side operations and how these will be managed. Detailed SOPs may also be established to compliment the MSMS.
- Mooring plans and studies – moorings should be designed for the prevailing MetOcean conditions and mooring arrangements suitable for vessel size.
- Oil Spill Contingency Plan – the MCA require an oil spill contingency plan to be in place before the commencement of marine works. Contractor to have spill gear up to Tier 1 which could be used in the event of an incident (if appropriate to the situation).
- PMSC compliance – MSMS applies, which recognises the need for contractor's RAMS to be agreed with the SHA in advance of marine works.
- Protective fendering – In place on jetties/quays and suitable for vessels being used.
- Safe allocation of berths (depth, available, suitable) – Berths located to minimise ranging due to environmental conditions.

- Tidal flow atlas – Provision of a tidal atlas for use on board dredge and construction vessels, which provides tidal flow speed and direction through each hour of the tidal cycle. The information needs to cover flow with the Cooling Water intake/outfall in operation, to provide clarity on expected water velocity and direction.
- Training of port marine/operations personnel – This should include the use of equipment and implementation of the emergency contingency plans
- Vessel master simulation training – Due to the complex currents and confined waters, larger vessel masters will require practice on a ship simulator prior to navigating on-site. This will be a requirement for new vessel masters who do not have experience using the MOLF.
- Weather forecasting – Sea state model can be used throughout the construction phase of the MOLF to predict weather conditions and downtime.
- Safety Boat – On call to be available in the event of emergency.

10.1.2 Operational phase

The following 24 project-specific mitigation measures were identified through the NRA process as appropriate risk management controls during the operational phase:

- Accurate tidal measurements – Tide level observed on-site and made available to vessels.
- Aids to navigation – Provision of lateral marks and leading lights would give visual indication of whether a vessel is likely to proceed clear of the breakwaters and markers to show where vessels should begin their swing and berth lighting to give visual indicators.
- AIS coverage – Monitored by marine personnel with vessel movements promulgated to port users.
- Arrival/departure, advance notice of – To allow marine personnel to supply accurate and up-to-date traffic movement information vessels operating at the marine works.
- Availability of latest hydrographic information – Results of hydrographic survey provided to UKHO for update of navigation charts for the area. This provides required information on the area for a master to plan entry to the harbour.
- Availability of pollution response equipment – Harbour and contractors to have equipment available. A Tier 2 contractor should be available.
- CCTV coverage – Monitoring the harbour area.
- Dredging programme – Informed by the results of hydrographic survey.
- Hazardous cargoes, advance notice of – Vessels required to notify the harbour of any hazardous cargoes in advance.
- Hydrographic surveying program – Regular scheduled surveys in line with PMSC requirements.
- MSMS – Would detail procedures in response to accidents/incidents.
- Oil spill contingency plans – Details actions to be taken in the event of oil spill.
- PMSC compliance – Ensures all risk is reduced to ALARP through risk assessment and subsequent mitigation measures.
- Port Facility Emergency Plan – To include actions in the event of an emergency situation in the harbour.
- Production of large-scale navigational charts – The UKHO can provide large-scale ENCs for vessels using the Harbour Area.
- Protective fendering – Protective measures to reduce the consequence of a vessel making contact with the breakwaters. Protective piles could be installed at key locations around the foot of the breakwaters to prevent vessels making contact with the sloping breakwater sides.
- Requirement for notification of vessel defects – Details of vessel defects sent to harbour.
- Safe allocation of berths (depth, available, suitable) – Should take into account the dimensions of the vessel transiting to the berth.
- Safe systems of work (H&S) – Based on risk assessment and industry best practice.

- Safety Boat – On call to be available in the event of emergency.
- Tidal flow atlas – Detailing current speed and direction for different states of the tide for both spring tides and neap tides. This information will be used at the passage planning stage to inform the master's manoeuvring plans.
- Towage, available and appropriate – Harbour tugs employed to escort vessel through the breakwaters to the berth.
- Training of port marine/operations personnel – This should include the use of equipment and implementation of the plans.
- Vessel Master simulation training – Due to the complex currents and confined waters, masters of larger vessel will require practice on a ship simulator prior to navigating on-site. This will be a requirement for new vessel masters who do not have experience using the MOLF.

11 Summary

These NRAs tables detail the risk generated by the construction (marine works and dredging) and operational phases of the proposed development. In total, 43 hazard scenarios were identified and assessed. A total of 23 hazard scenarios were identified for the construction phase and 20 hazard scenarios for the operational phase.

Through analysis of the causes and embedded mitigation, the hazard scenarios were scored and the 19 assessments that were classified as significant risk or above were brought forward into the formal safety assessment.

From the formal assessment process, 42 mitigation measures were identified, split between the construction and operational phases of the proposed development. Following implementation of appropriate mitigation, the marine risk to navigational receptors can be maintained within a level that is ALARP.

This NRA forms the basis of the assessment to be made as part of chapter D15 (Application Reference Number: 6.4.15) of this Environmental Statement..

12 References

Amec Foster Wheeler, 2015. Wylfa Newydd Further wave modelling, Phase 1, December 2015.

BMT Argoss, 2016. Wylfa Navigation Study, December 2016.

David Williams, 2016. Personal Communications (per Coms), 26 October 2016, David Williams – Cemaes Harbour Committee.

DfT/MCA, 2016. Port Marine Safety Code (PMSC), Department for Transport / Maritime and Coastguard Agency, November 2016.

DfT/MCA, 2013. Methodology for Assessing the Marine Navigational Safety and Emergency Response Risks of Offshore Renewable Energy Installations (OREI). Department for Transport / Maritime and Coastguard Agency.

DfT, 2016. Maritime and Shipping Statistics, published 21 September 2016. Department for Transport Accessed from website: https://www.gov.uk/government/statistical-data-sets/port06-uk-ship-arrivals

HM Government, 2011. UK Marine Policy Statement, March 2011.

Horizon Nuclear Power Wylfa. 2016. Marine Works Volumes 'HNP-S4-SDE-MEM-00005'.

International Maritime Organization (IMO) 2013. Revised Guidelines for Formal Safety Assessment (FSA) for use in the IMO rule making process

IMO, 1972. The International regulations for Preventing Collisions at Sea. International Maritime Organization.

Kim Argyle, 2016. Personal Communications (per Coms), 26 October 2016, Kim Argyle – Holyhead Sailing Club.

MCA, 2016. Marine Guidance Note 543 (MGN 543 Merchant + Fishing) Safety of Navigation: Offshore Renewable Energy Installations (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response. Maritime and Coastguard Agency.

MCA, 2009. MGN 401 (M+F) Navigation: Vessel Traffic Services (VTS) and Local Port Services (LPS) in the United Kingdom, September 2009

Marine Management Organisation, 2014. Vessel Monitoring System Information [online] Available at: https://www.gov.uk/guidance/apply-for-and-register-your-vessel-monitoring-system-device [Accessed 7 November 2016]

RWE, 2016. Wylfa Hydrodynamic Model Outputs, October 2016

RYA, 2016. UK Coastal Atlas of Recreational Boating, September 2016

Titan Environmental Surveys, 2012. Wylfa Oceanography Interpretive Report, July 2012

UK Government, 1999. Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999 (as amended).

UK Government, 2011 The UK Marine Policy Statement, March 2011.

UK Met Office, 2015. Wind data from RAF Valley.

13 Abbreviations/Acronyms

AIL	Abnormal Indivisible Loads
AIS	Automatic Identification System
ALARP	As Low As Reasonably Practicable
ALRS	Admiralty List of Radio Signals
AOD	Above Ordnance Datum
CCTV	Closed-Circuit Television
CGOC	Coastguard Operations Centre
COLREGS	International Regulations for Preventing Collisions at Sea 1972 (as amended)
DCO	Development Consent Order
DfT	Department for Transport
ENC	Electronic Navigational Chart
FSA	Formal Safety Assessment
HM	Her Majesty's
Hs	Significant Height
H&S	Health and Safety
HSE	Health and Safety Executive
IALA	International Association of Lighthouse Authorities
ID	Identity
IMO	International Maritime Organisation
ISPS	International Ship and Port Facility Security
Lo-Lo	Lift-on/Lift-off
LNG	Liquefied natural gas
LPS	Local Port Service
M+F	Merchant and Fishing
MAIB	Marine Accident Investigation Branch
MCA	Maritime and Coastguard Agency
MGN	Marine Guidance Notes
MoB	Man-overboard
MOLF	Marine Off-Loading Facility
MSMS	Marine Safety Management System
MW	Megawatt
MWe	Megawatt Electrical
NCP	National Contingency Plan
NPS	National Policy Statement
NRA	Navigational Risk Assessment
NtM	Notice to Mariners
OPRC	International Convention on Oil Pollution Preparedness
OREI	Offshore Renewable Energy Installations
PMSC	Port Marine Safety Code
Q	Quarter (of year - e.g. Q1, Q2 of 2016)
RAF	Royal Air Force
RAMS	Risk Assessment Method Statement
RNLI	Royal National Lifeboat Institution
Ro-Ro	Roll-on Roll-off
RYA	Royal Yachting Association
SAR	Search and Rescue
SHA	Statutory Harbour Authority
SLPL	Stena Line Ports Ltd

SMS	Safety Management System
SOLAS	Safety of Life at Sea
SOP	Standard Operating Procedures
SSOW	Safe System of Work
STCW	Standards of Training, Certification and Watchkeeping
Stbd	Starboard
TSS	Traffic Separation Scheme
UK	United Kingdom
UKHO	United Kingdom Hydrographic Office
UNCLOS	United Nations Convention on the Law of the Sea
VHF	Very High Frequency
VMS	Vessel Monitoring System
VTS	Vessel Traffic Service

Cardinal points/directions are used unless otherwise stated.

SI units are used unless otherwise stated.

14 Glossary

AIS	Automatic Identification System. Used for identifying and locating vessels by electronically exchanging data with other nearby ships, AIS base stations, and satellites.
AIS-A	Class A AIS is a carriage requirement for commercial ships of 300 gross tonnage and upwards engaged on international voyages, cargo ships of 500 gross tonnage and upwards not engaged on international voyages and all passenger ships irrespective of size.
AIS-B	Class B AIS is a more simple and lower cost version developed for use on smaller vessels.
ALRS	Admiralty List of Radio Signals. The publication provides comprehensive information on all aspects of Maritime Radio Communications.
Beaufort	A system of estimating and reporting wind speeds using a numerical scale ranging from 0 (calm) to 12 (hurricane).
Bulk Vessel	All vessels designed to carry bulk cargo such as grain, fertilisers, ore and oil.
Bunkers	Fuel used aboard ships.
COLREGS	International Regulations for Preventing Collisions at Sea 1972 (as amended). A set of navigation rules to be followed by ships and other vessels at sea to prevent collisions between two or more vessels.
Girded	A dangerous condition whereby a tow-line becomes near to, or at right angles to a vessel, causing a transverse pulling moment and the potential for loss of stability and capsize.
Hold	A ship's interior storage compartment.
HSE	Health and Safety Executive. The body responsible for the regulation and enforcement of workplace health, safety and welfare, and for research into occupational risks in England and Wales and Scotland.
LPS	Local Port Services. Provision of LPS is designed to improve port safety and coordination of port services within the port community by dissemination of port information to vessels and berth or terminal operators. It is mainly concerned with the management of the port, by the supply of information on berth and port conditions. Provision of LPS can also act as a medium for liaison between vessels and stevedores or allied services, as well as providing a basis for implementing port emergency plans.
MCA	Maritime and Coastguard Agency. The agency responsible for the regulation of the UK maritime industry, prevention of the loss of life on the coast and at sea. They produce legislation and guidance on maritime matters, and provide certification to seafarers.

Marine-SMS	Marine Safety Management System. Manages hazards and risks for a port or marine facility. It should document any practices which are the standard approach to port marine operations.
MOLF	Marine Off-Loading Facility. used as service port and transit point of equipment and materials used during the construction phase of the Wylfa Newydd Project.
OFCOM	The independent regulator and competition authority for the UK communications industries.
OPRC	Convention stating the requirements for a facility's oil spill contingency plan.
Ro-Ro	Roll on-Roll off. A method of ocean cargo service using a vessel with ramps that allow wheeled vehicles to be loaded and discharged without cranes.
SOPs	Standard Operating Procedures. A detailed set of instructions for a vessels crew to perform tasks.
SSOW	Safe Systems of Work. A procedure that results from a systematic examination of a working process. It identifies hazards and specifies work methods designed either to eliminate the hazards or controls and minimise the relevant risks.
Stem the Tide	When a vessel faces the strongest out of wind or current in order to remain in position more effectively.
VMS	Vessel Monitoring System. Allows a vessel to be automatically located and identified through the system by transmitting position data every 2 hours when at sea.

Figures

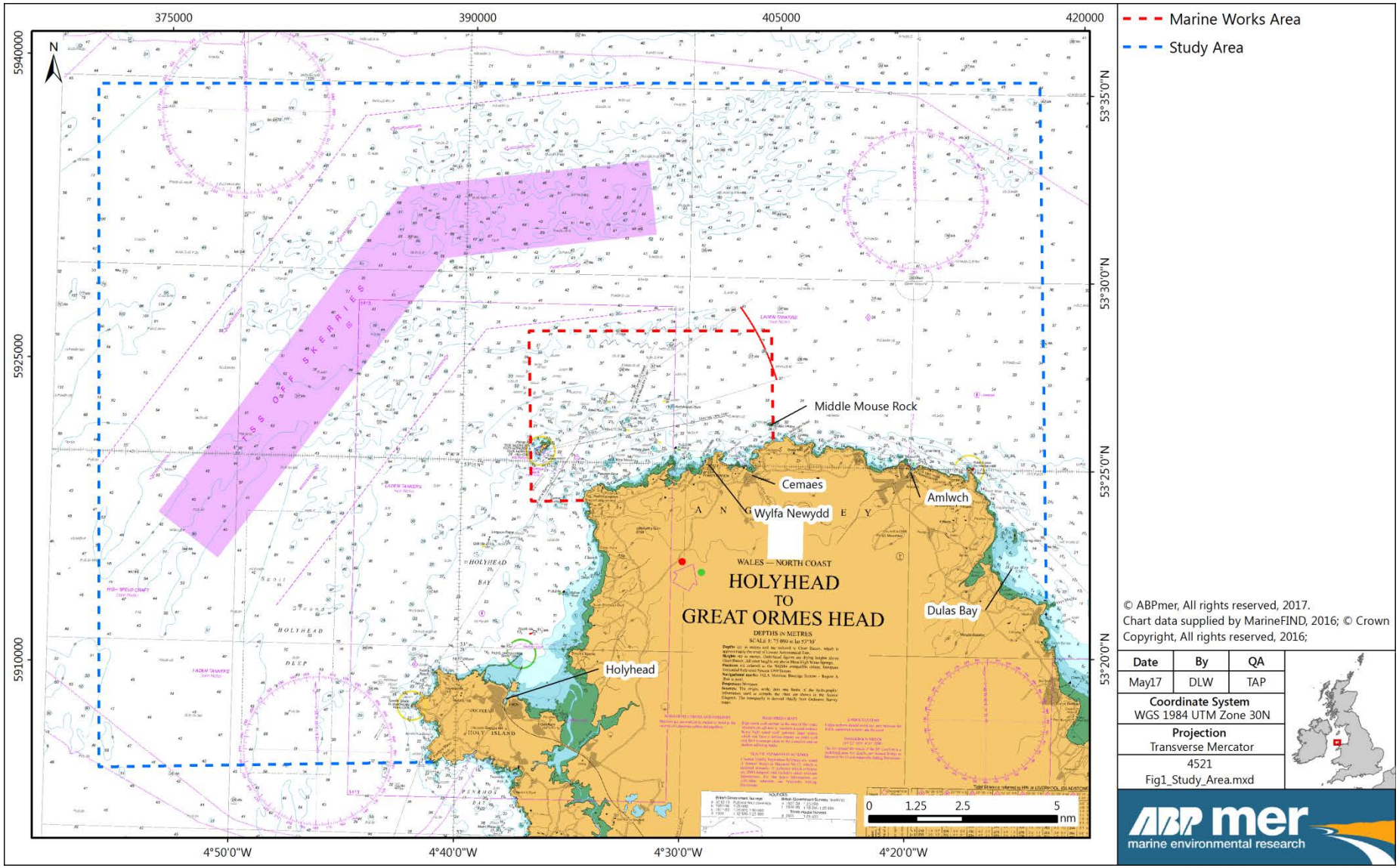


Figure 1. Study Area

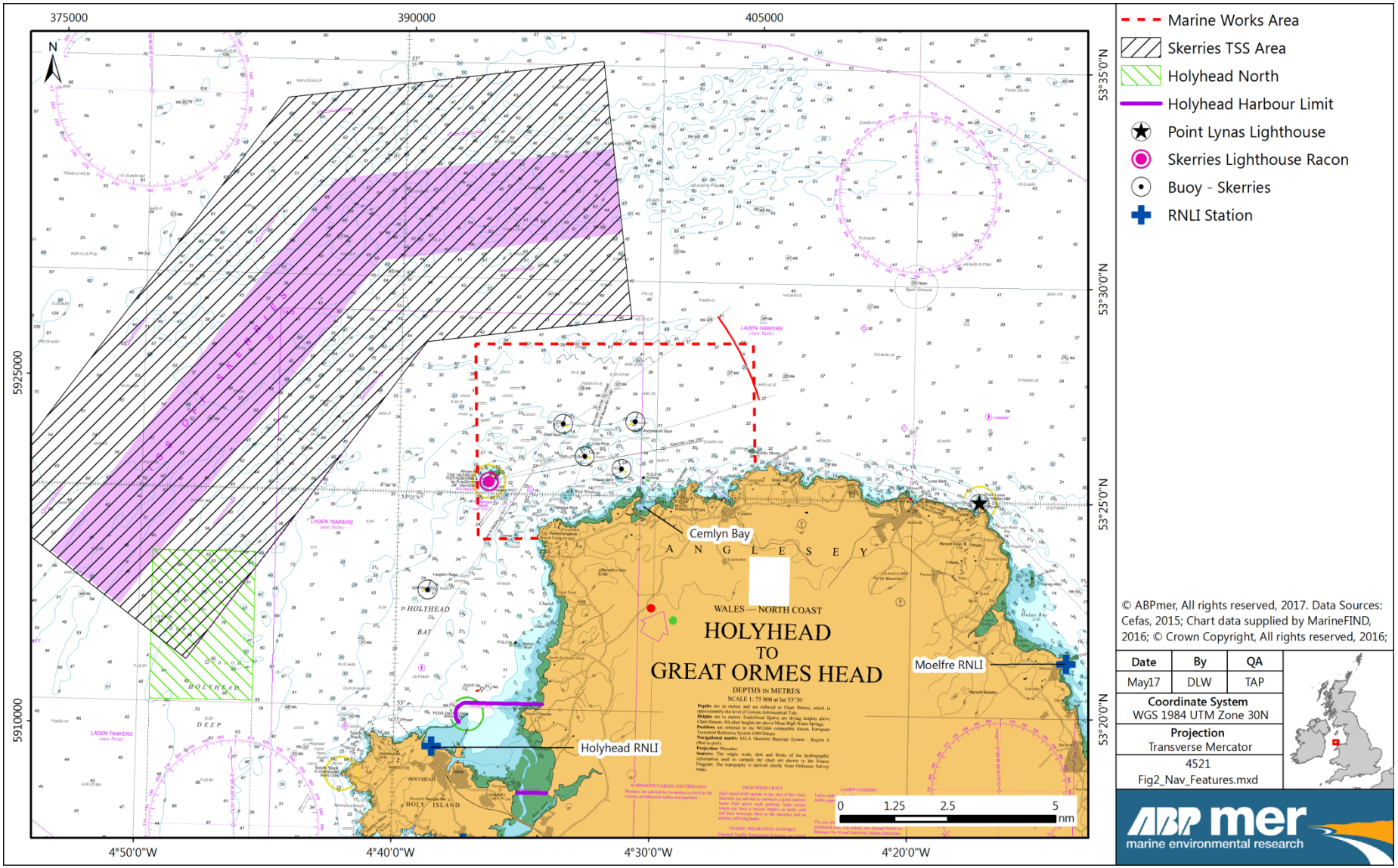


Figure 2. Navigational Features

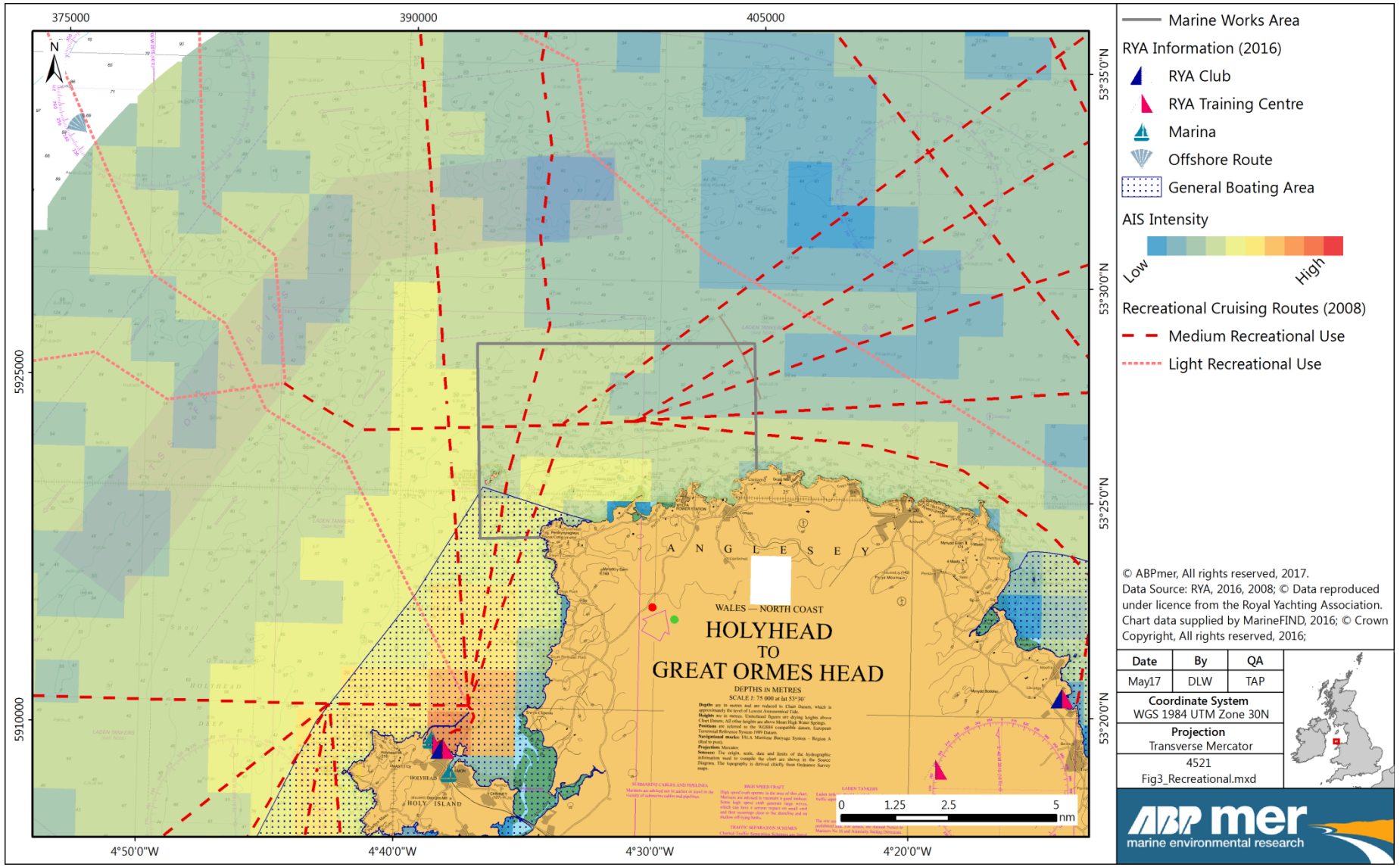


Figure 3. RYA Recreational Boating

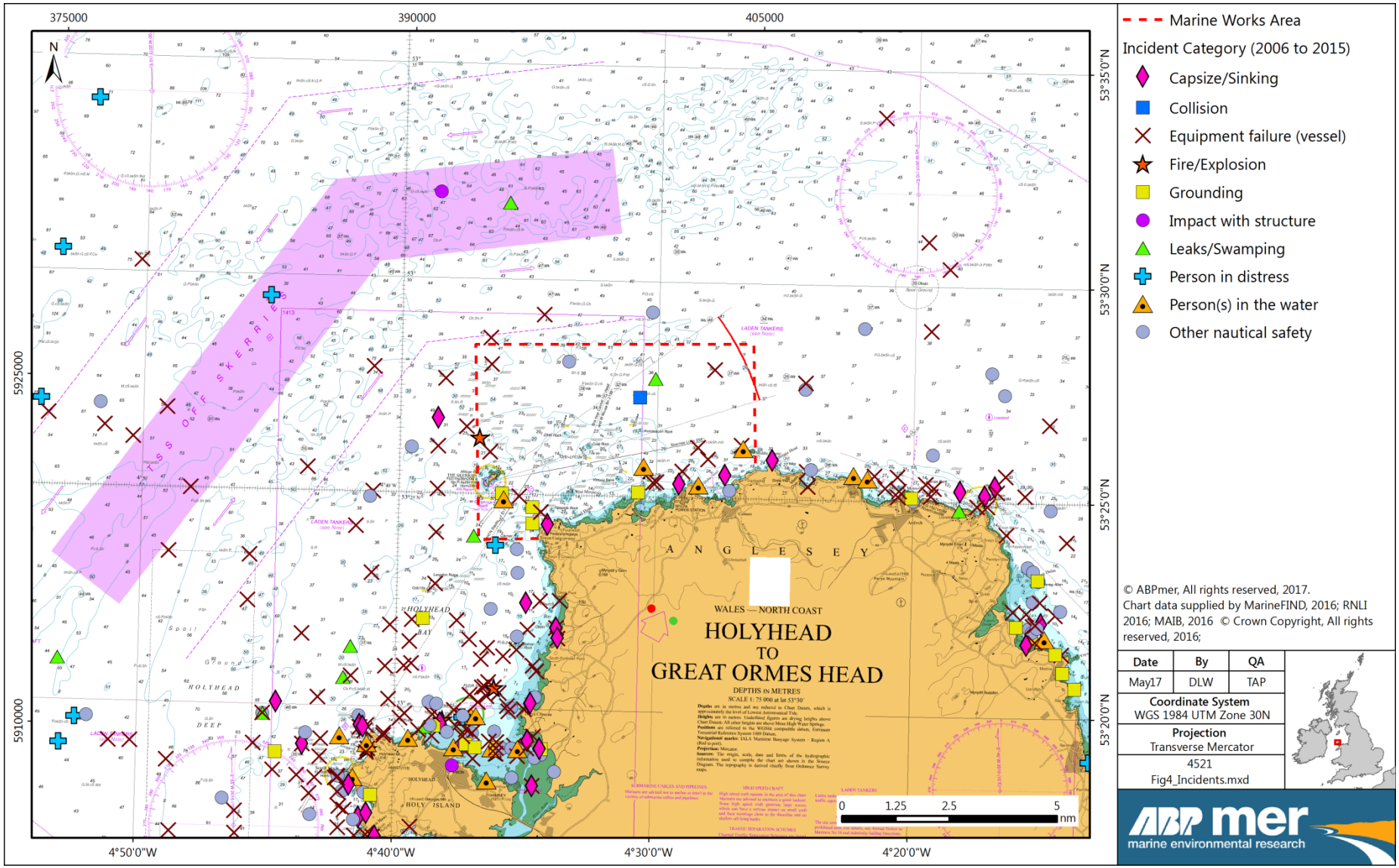


Figure 4. Navigational Accidents/Incidents

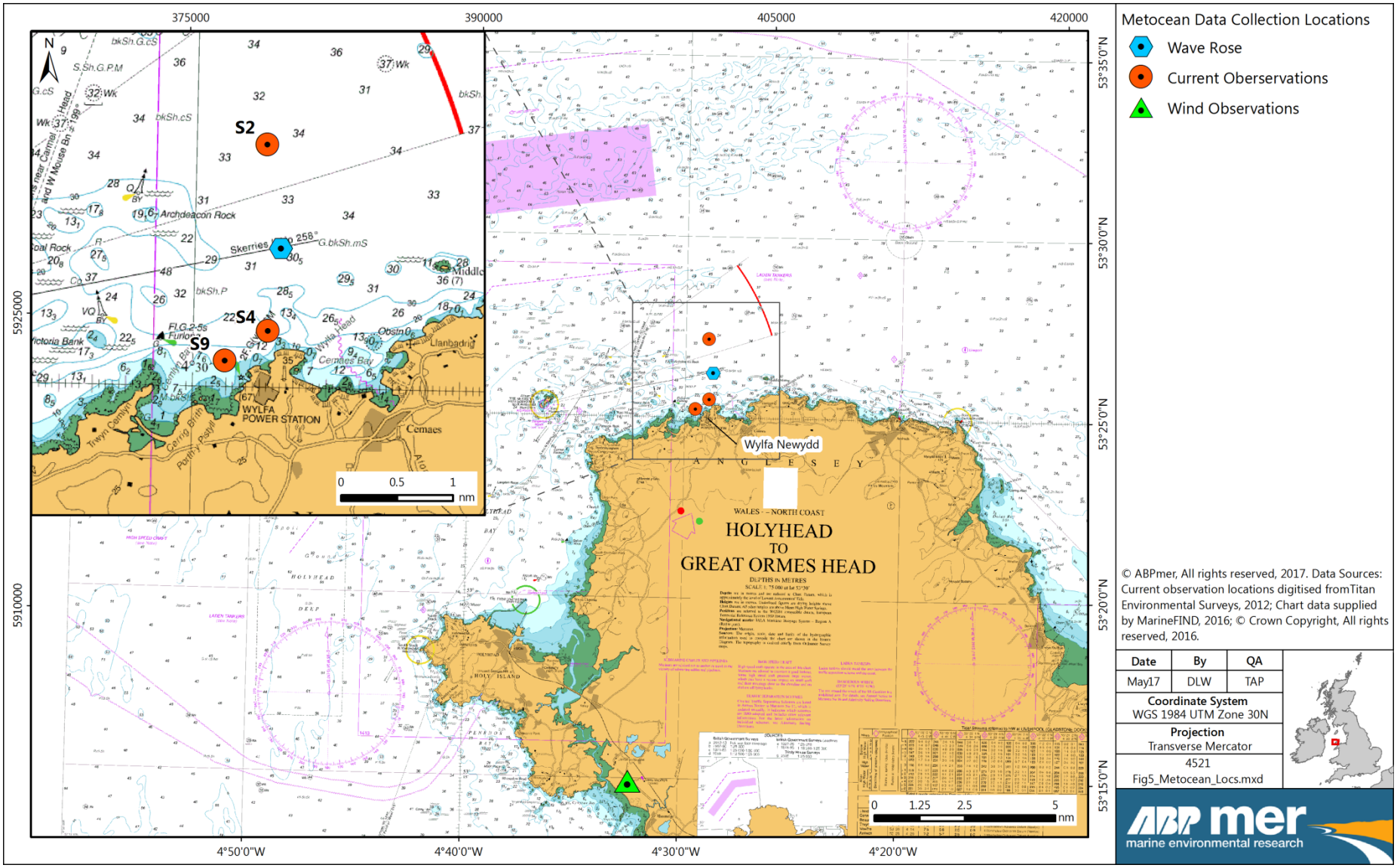


Figure 5. MetOcean Observation Locations

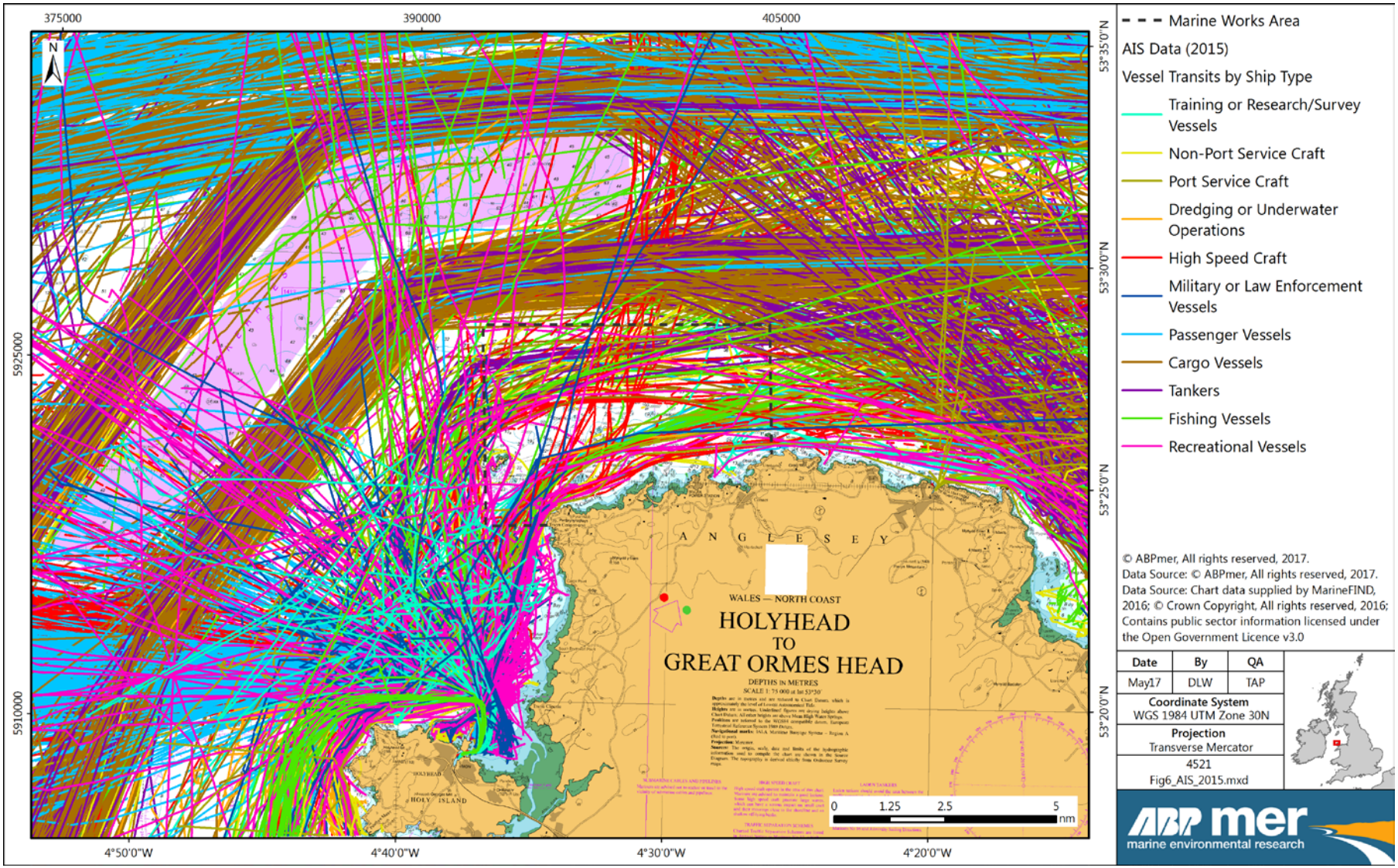


Figure 6. Vessel Transits through the Study Area

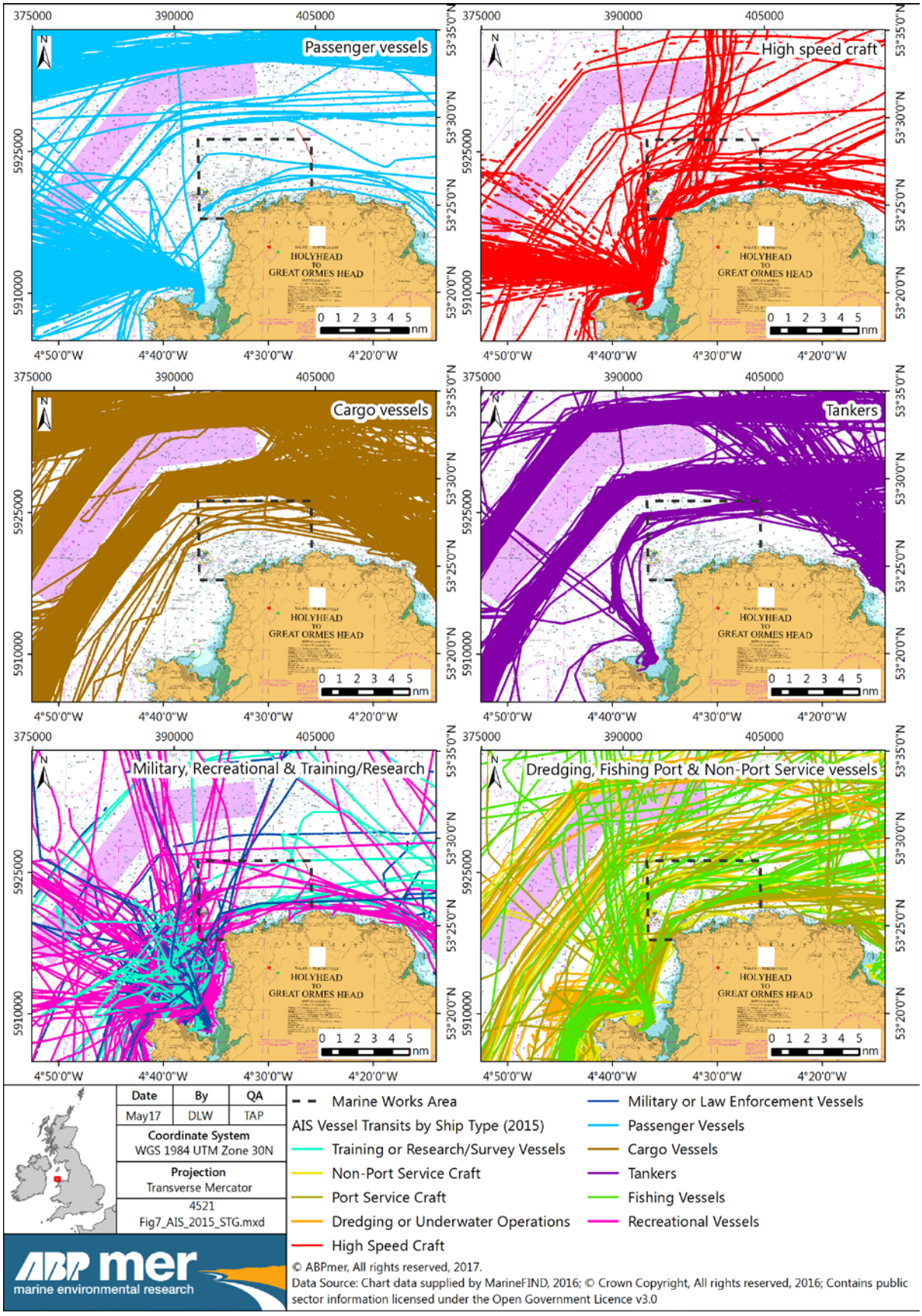


Figure 7. Vessel Transits through the Study Area by Ship Type

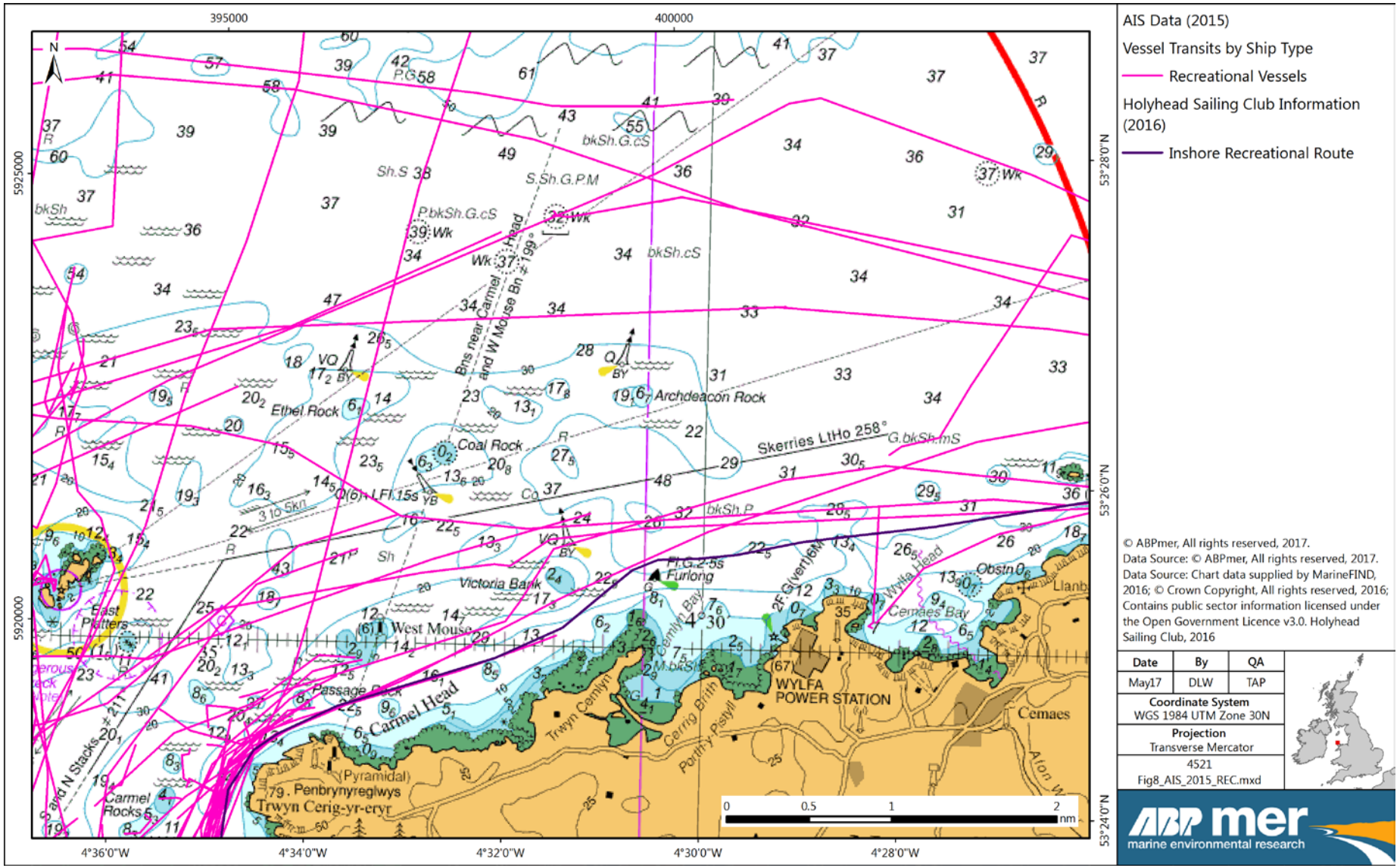


Figure 8. Recreational Transits through the Marine Works Area

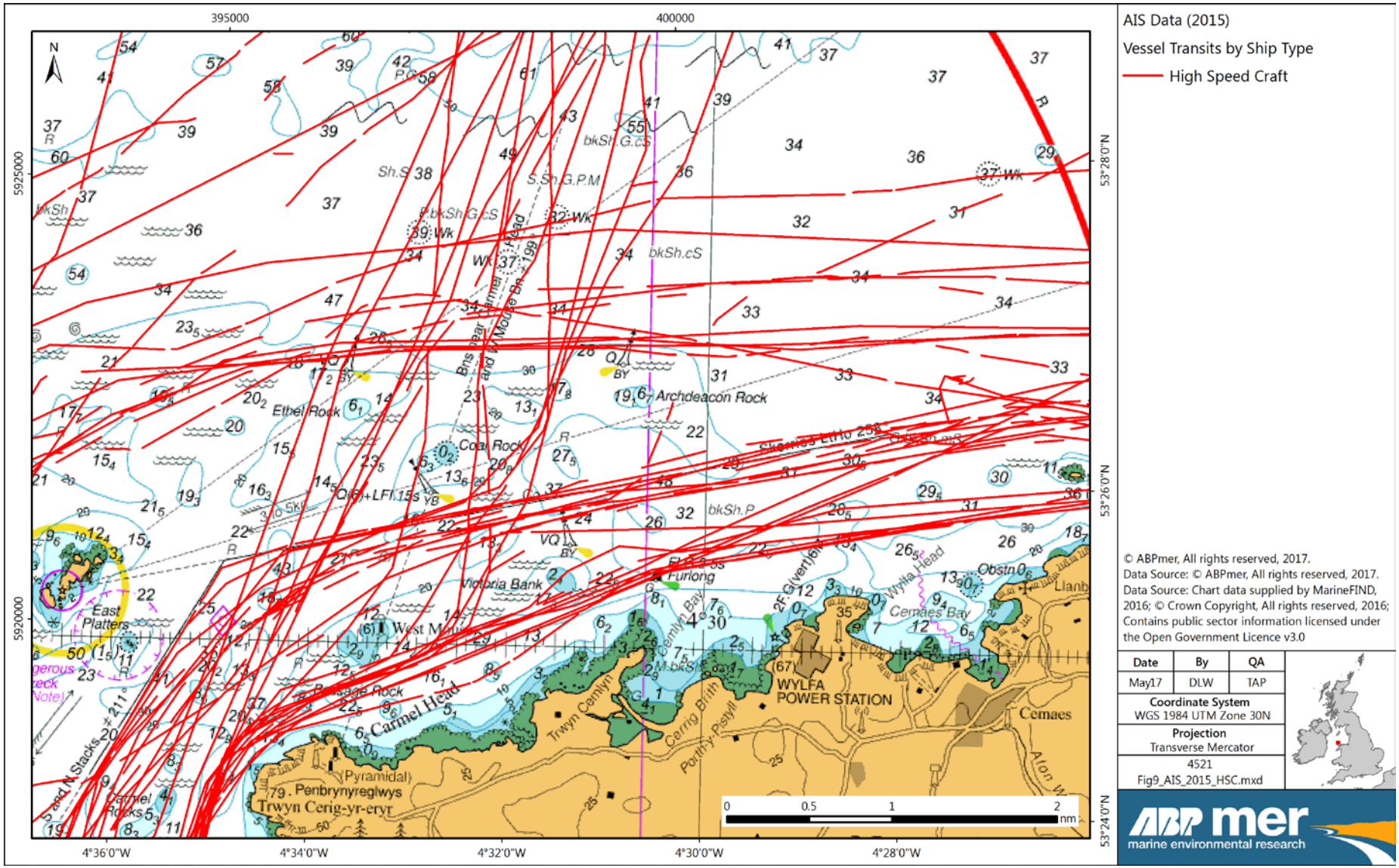


Figure 9. High Speed Craft Transits through the Marine Works Area

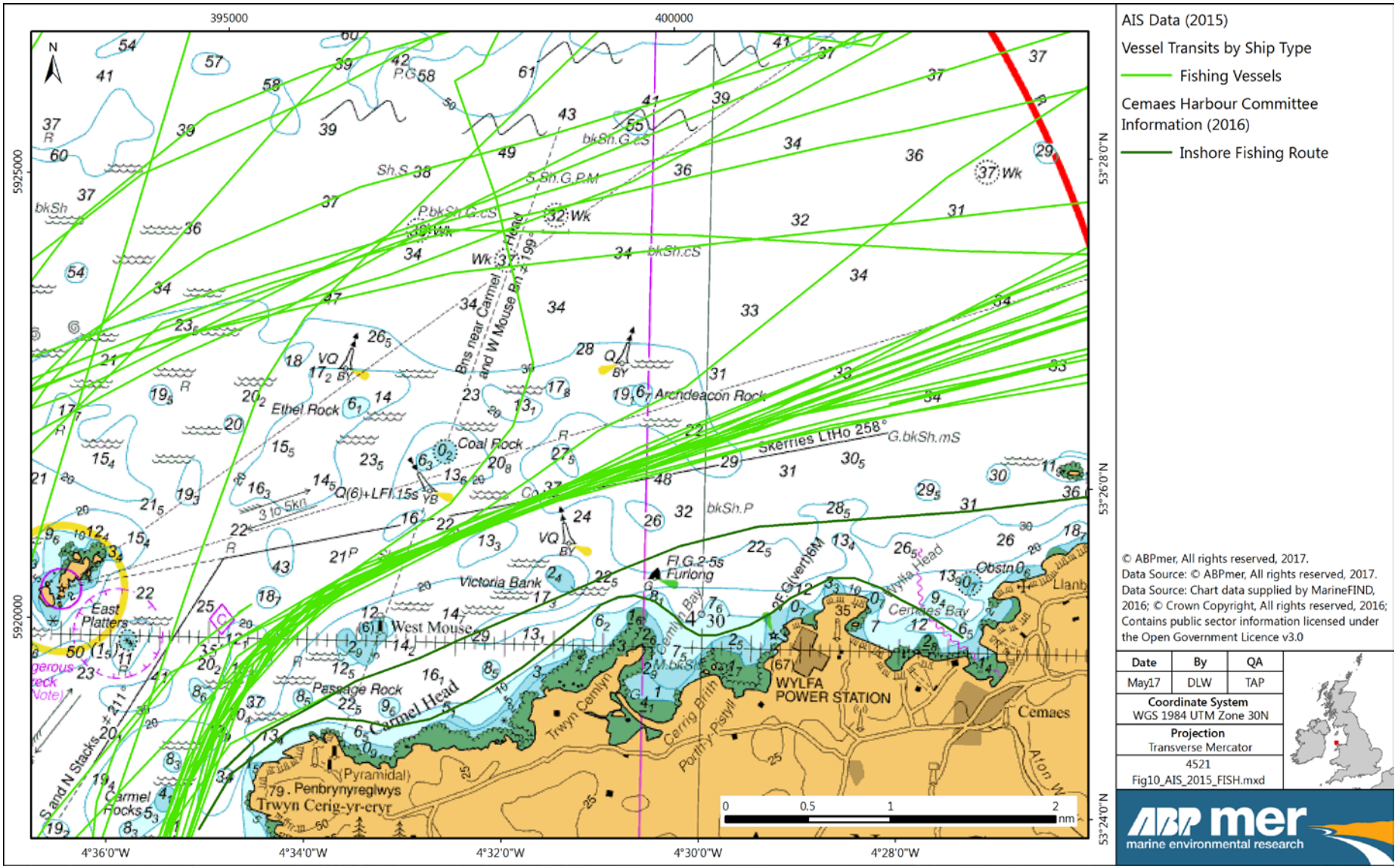


Figure 10. Fishing Vessel Transits through the Marine Works Area

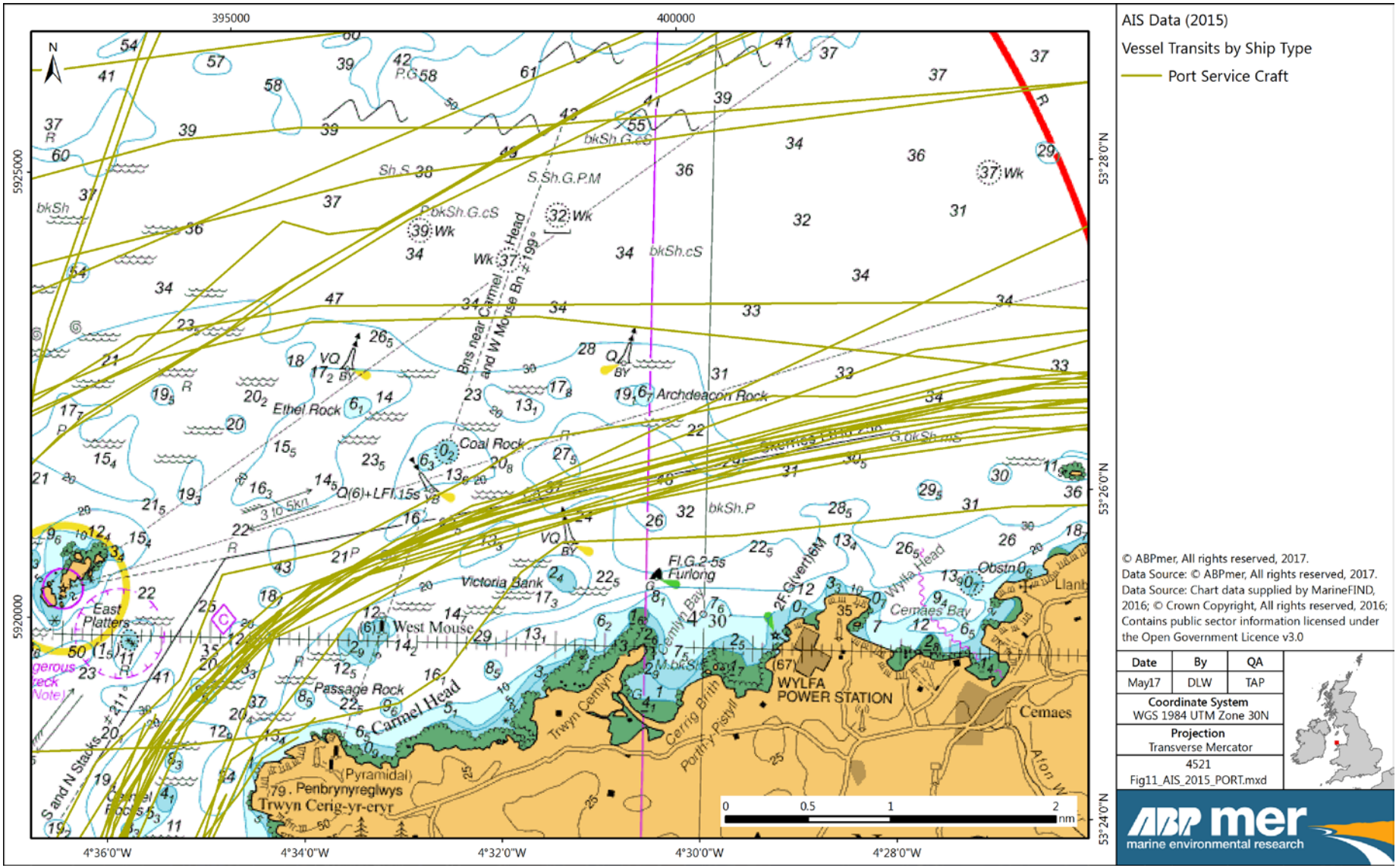


Figure 11. Port Service Craft Transits through the Marine Works Area

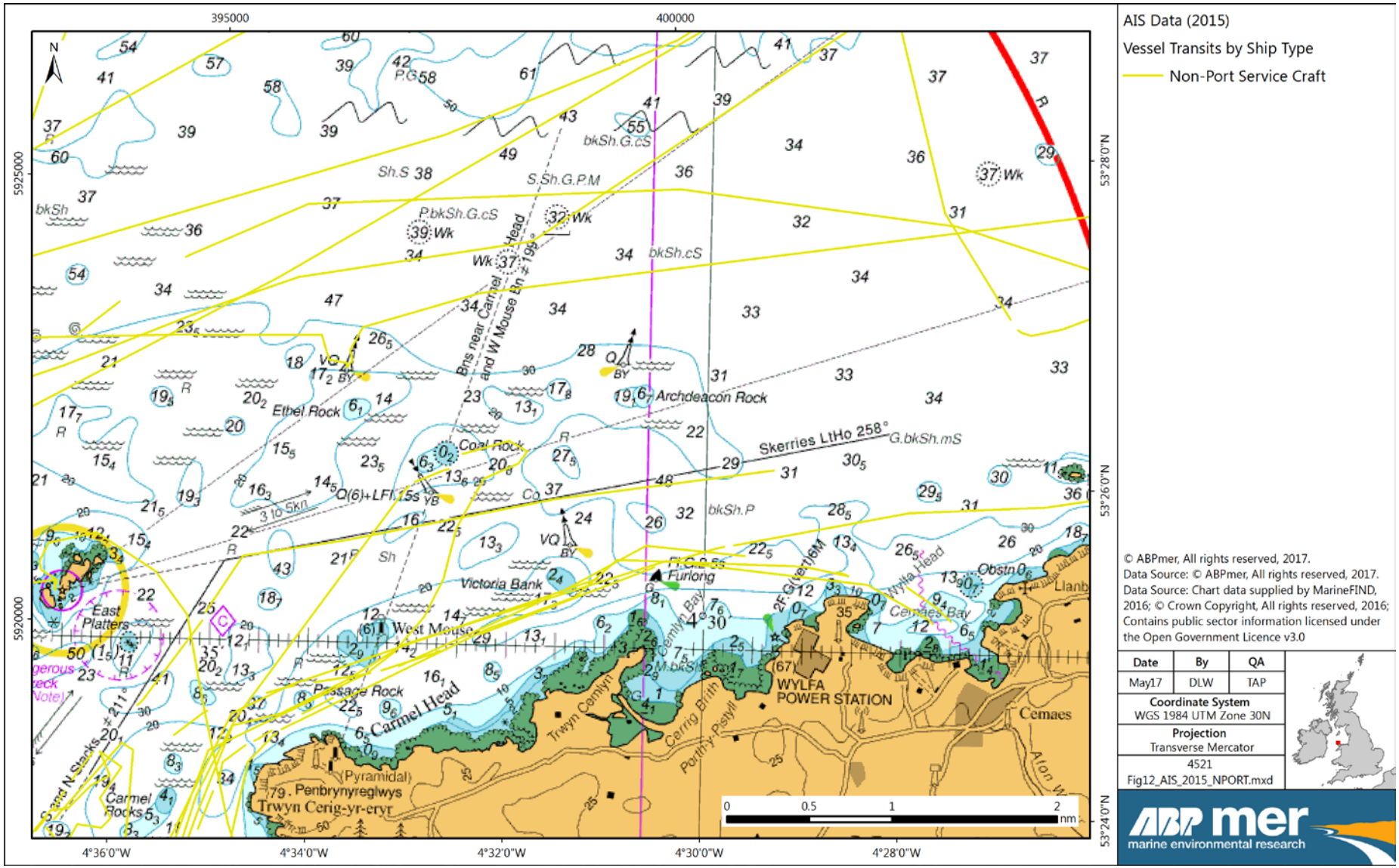


Figure 12. Non-Port Service Craft Transits through the Marine Works Area

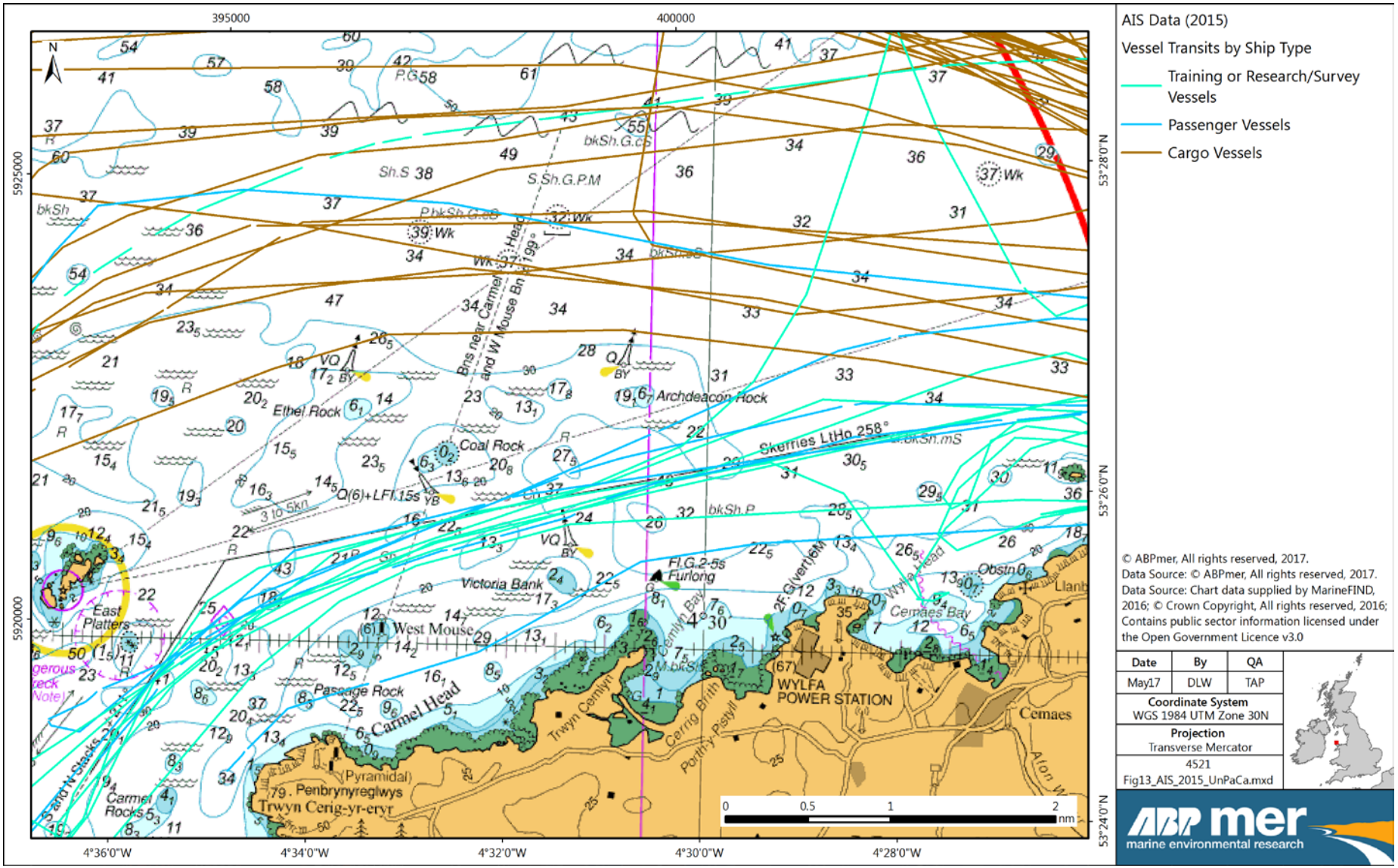


Figure 13. Training, Research, Passenger and Cargo Vessel Transits through the Marine Works Area

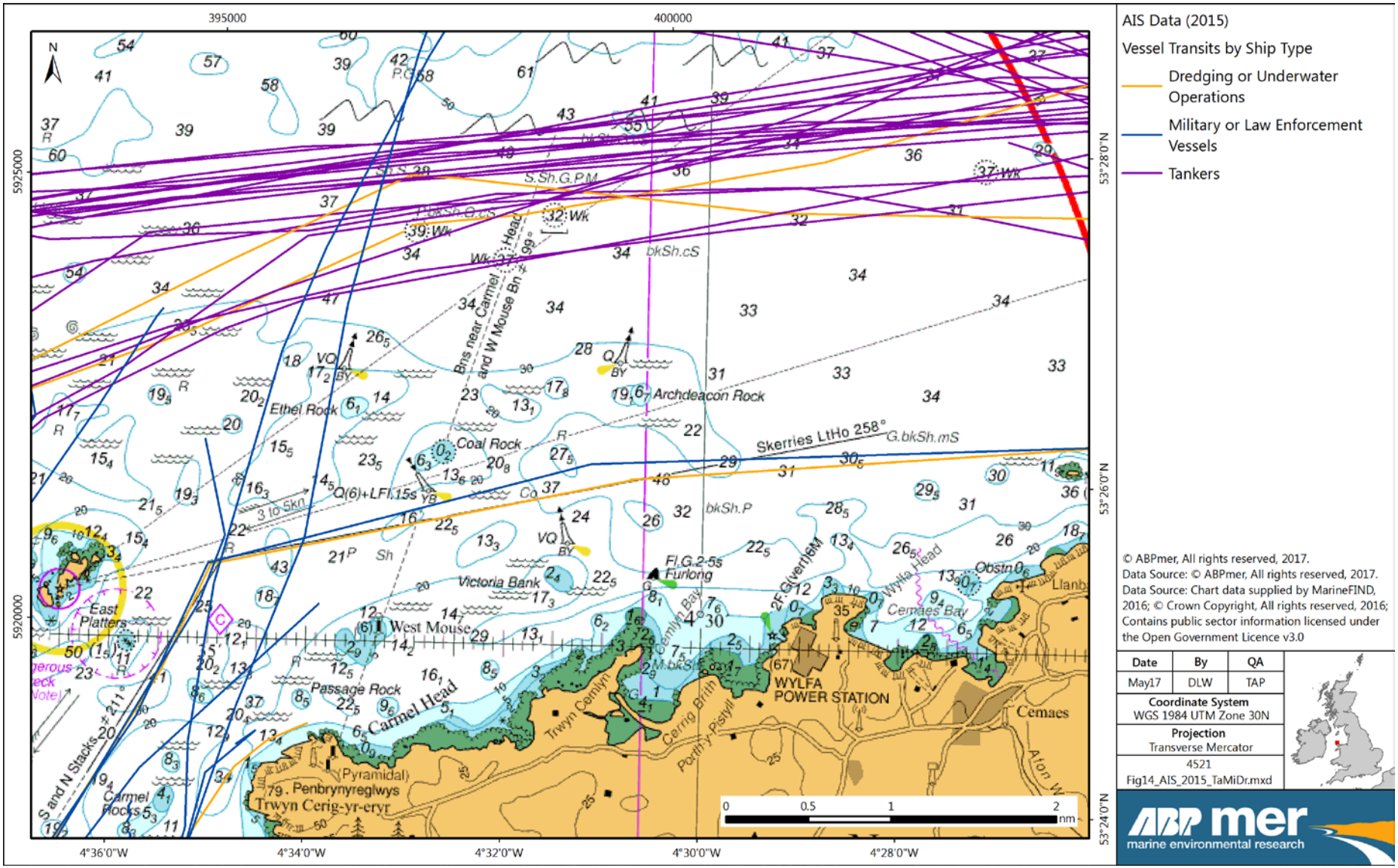


Figure 14. Dredging, Underwater Operations, Military, Law Enforcement and Tanker Transits through the Marine Works Area

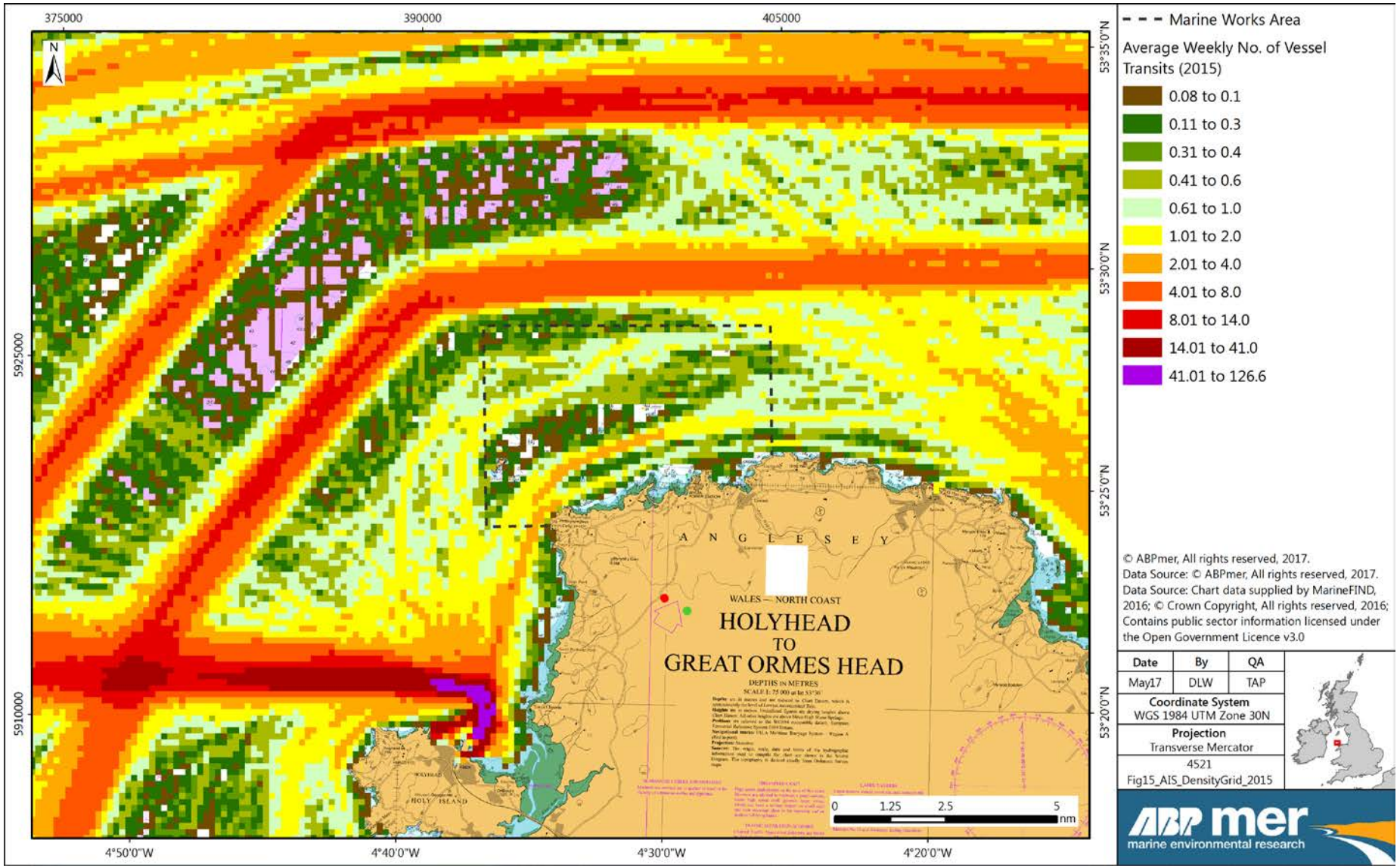


Figure 15. Vessel Transit Density Grid

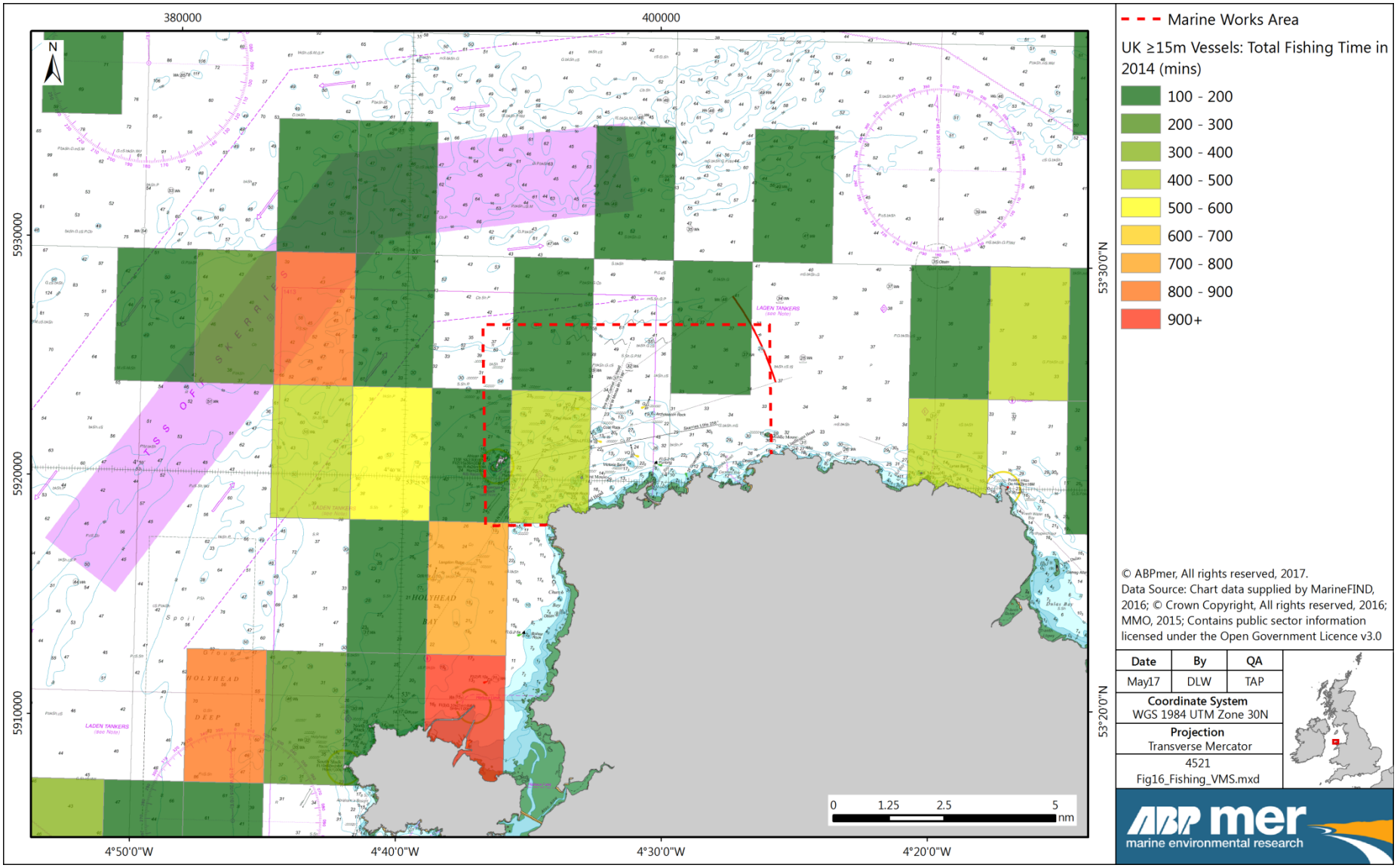


Figure 16. Vessel Monitoring System Information

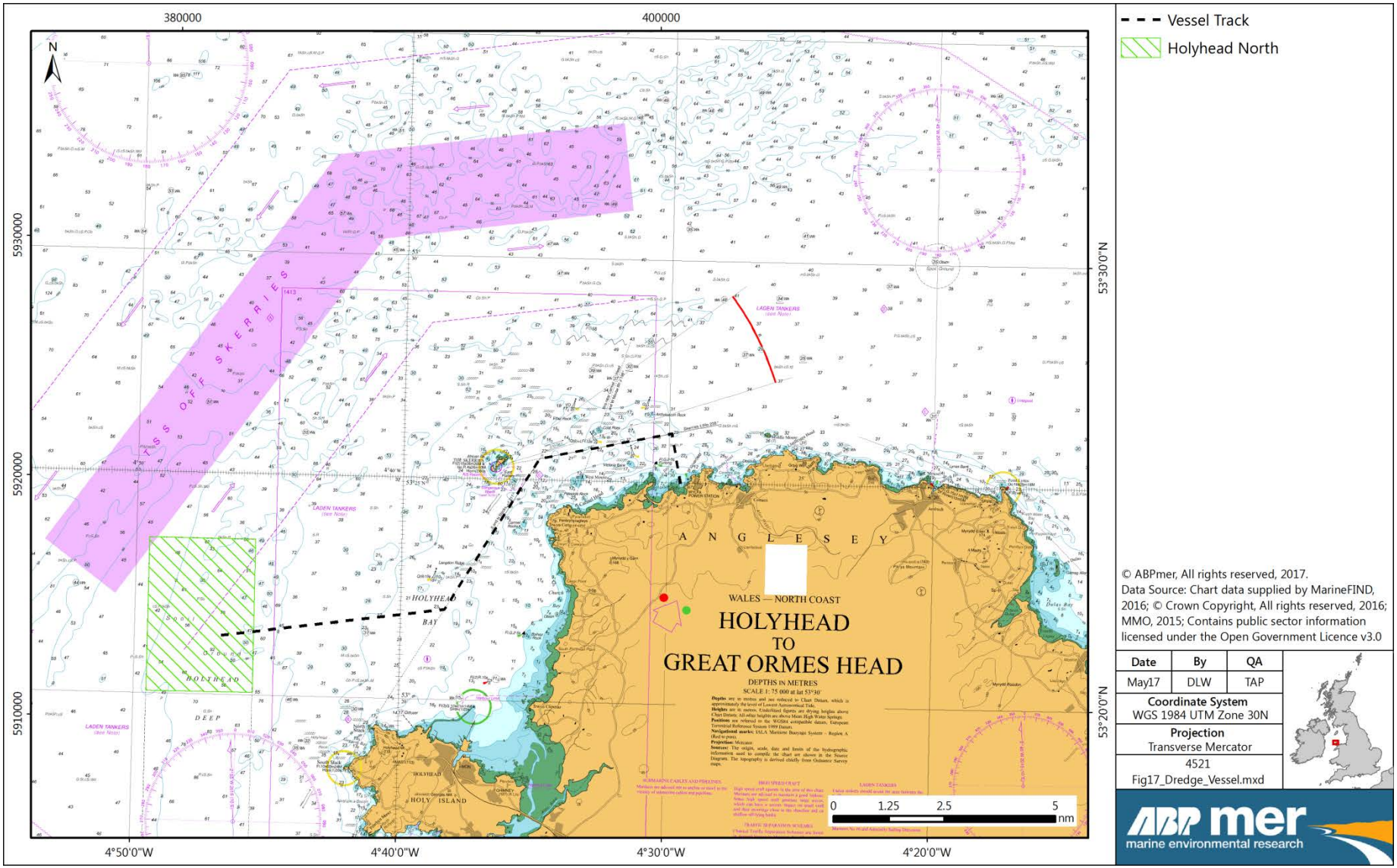


Figure 17. Passage between the Wylfa Marine Development Area and Holyhead North Disposal Site

Appendices

A Accident Incident Table

Record Origin	Incident Date	Vessel type	Incident Type	Latitude	Longitude
MAIB	12/01/2006	General Cargo	Collision	53.30	-4.63
MAIB	12/01/2006	Solid Cargo	Collision	53.30	-4.63
RNLI	27/01/2006	Canoe	Person(s) in the water	53.32	-4.60
RNLI	28/01/2006	Fishing vessel (large)	Grounding	53.32	-4.60
MAIB	29/01/2006	Service ship | Other	Fire/Explosion	53.30	-4.63
MAIB	01/02/2006	Passenger and Ro-Ro cargo	Grounding	53.42	-4.60
MAIB	06/02/2006	Fishing vessel	Equipment failure (vessel)	53.34	-4.61
RNLI	10/02/2006	Large powered boat with cabin	Equipment failure (vessel)	53.31	-4.81
MAIB	15/02/2006	Fishing vessel	Grounding	53.30	-4.63
MAIB	22/02/2006	Fishing vessel	Other nautical safety	53.47	-4.28
RNLI	09/03/2006	Rowing boat	Other nautical safety	53.30	-4.69
MAIB	30/03/2006	Recreational craft	Capsize/Sinking	53.41	-4.57
RNLI	16/04/2006	Large powered boat with cabin	Equipment failure (vessel)	53.32	-4.69
RNLI	20/04/2006	Large open powered boat	Equipment failure (vessel)	53.28	-4.68
RNLI	28/04/2006	Sail yacht with aux engine	Equipment failure (vessel)	53.36	-4.66
RNLI	29/04/2006	Large powered boat with cabin	Equipment failure (vessel)	53.40	-4.64
RNLI	17/05/2006	Large powered boat with cabin	Fire/Explosion	53.33	-4.64
RNLI	25/05/2006	Large powered boat with cabin	Equipment failure (vessel)	53.33	-4.66
MAIB	27/05/2006	Fishing vessel	Equipment failure (vessel)	53.39	-4.68
MAIB	29/05/2006	Fishing vessel	Collision	53.30	-4.63
RNLI	01/06/2006	Large powered boat with cabin	Equipment failure (vessel)	53.30	-4.72
RNLI	03/06/2006	Person in water	Person(s) in the water	53.32	-4.68
RNLI	03/06/2006	Sail yacht with aux engine	Equipment failure (vessel)	53.33	-4.64
RNLI	10/06/2006	Sail yacht with aux engine	Equipment failure (vessel)	53.48	-4.32
RNLI	11/06/2006	Sail yacht with aux engine	Equipment failure (vessel)	53.45	-4.82
RNLI	13/06/2006	Large powered boat with cabin	Equipment failure (vessel)	53.32	-4.71
RNLI	19/06/2006	Sail yacht with aux engine	Equipment failure (vessel)	53.32	-4.64
RNLI	19/06/2006	Sail yacht with aux engine	Equipment failure (vessel)	53.47	-4.46

Record Origin	Incident Date	Vessel type	Incident Type	Latitude	Longitude
MAIB	21/06/2006	Passenger and general cargo	Person(s) in the water	53.33	-4.62
RNLI	13/07/2006	Sail yacht with aux engine	Equipment failure (vessel)	53.43	-4.73
RNLI	15/07/2006	Sail yacht with aux engine	Equipment failure (vessel)	53.44	-4.84
RNLI	17/07/2006	Rowing boat	Other nautical safety	53.46	-4.40
RNLI	20/07/2006	Sailing dinghy	Capsize/Sinking	53.45	-4.64
RNLI	22/07/2006	Sail yacht with aux engine	Grounding	53.31	-4.74
RNLI	25/07/2006	Sail yacht with aux engine	Equipment failure (vessel)	53.43	-4.64
RNLI	09/08/2006	Small open powered boat	Grounding	53.36	-4.26
RNLI	12/08/2006	Jet ski	Other nautical safety	53.33	-4.59
RNLI	12/08/2006	Sail yacht with aux engine	Other nautical safety	53.45	-4.86
RNLI	18/08/2006	Large open powered boat	Equipment failure (vessel)	53.37	-4.27
RNLI	27/08/2006	Canoe	Capsize/Sinking	53.29	-4.69
MAIB	04/09/2006	Fishing vessel	Equipment failure (vessel)	53.30	-4.63
RNLI	09/09/2006	Large powered boat with cabin	Equipment failure (vessel)	53.32	-4.73
MAIB	14/09/2006	Fishing vessel	Fire/Explosion	53.30	-4.63
RNLI	15/10/2006	Sail yacht with aux engine	Equipment failure (vessel)	53.42	-4.33
RNLI	31/10/2006	Motor vehicle	Person in distress	53.33	-4.62
RNLI	04/11/2006	Canoe	Person(s) in the water	53.32	-4.70
RNLI	11/02/2007	Fishing vessel (large)	Equipment failure (vessel)	53.52	-4.33
MAIB	15/02/2007	Passenger and Ro-Ro cargo	Impact with Structure	53.30	-4.63
MAIB	07/03/2007	Cargo ship | Solid Cargo | Barge	Equipment failure (vessel)	53.44	-4.86
MAIB	27/04/2007	Cargo ship | Solid Cargo	Person in distress	53.30	-4.63
RNLI	30/04/2007	Sail yacht (no engine)	Other nautical safety	53.33	-4.69
RNLI	05/05/2007	Canoe	Person(s) in the water	53.41	-4.60
MAIB	14/05/2007	Fishing vessel	Equipment failure (vessel)	53.32	-4.68
RNLI	17/05/2007	Sail yacht with aux engine	Equipment failure (vessel)	53.46	-4.64
RNLI	19/05/2007	Large open powered boat	Equipment failure (vessel)	53.33	-4.62
RNLI	22/05/2007	Small open powered boat	Equipment failure (vessel)	53.32	-4.60
RNLI	12/06/2007	Sail yacht with aux engine	Other nautical safety	53.32	-4.60
MAIB	18/06/2007	Fishing vessel	Equipment failure (vessel)	53.30	-4.63
MAIB	29/06/2007	Fishing vessel | Potter	Person in distress	53.30	-4.63

Record Origin	Incident Date	Vessel type	Incident Type	Latitude	Longitude
MAIB	05/07/2007	Passenger and Ro-Ro cargo	Person in distress	53.28	-4.62
RNLI	10/07/2007	Sail yacht with aux engine	Equipment failure (vessel)	53.32	-4.59
RNLI	12/07/2007	Canoe	Capsize/Sinking	53.42	-4.29
RNLI	14/07/2007	Sail yacht with aux engine	Equipment failure (vessel)	53.33	-4.62
RNLI	15/07/2007	Small open powered boat	Capsize/Sinking	53.29	-4.68
RNLI	16/07/2007	Small open powered boat	Equipment failure (vessel)	53.34	-4.67
RNLI	18/07/2007	Small open powered boat	Equipment failure (vessel)	53.34	-4.60
RNLI	21/07/2007	Small open powered boat	Equipment failure (vessel)	53.34	-4.61
MAIB	28/07/2007	General Cargo	Collision	53.46	-4.51
MAIB	28/07/2007	Cargo ship | Solid Cargo	Collision	53.46	-4.51
RNLI	28/07/2007	Hovercraft	Equipment failure (vessel)	53.33	-4.64
RNLI	31/07/2007	Inflatable dinghy	Other nautical safety	53.37	-4.26
RNLI	02/08/2007	Small open powered boat	Capsize/Sinking	53.33	-4.64
RNLI	03/08/2007	Sail multihull with aux engine	Leaks/Swamping	53.34	-4.70
RNLI	05/08/2007	Sail multihull (no engine)	Capsize/Sinking	53.33	-4.74
RNLI	05/08/2007	Sail yacht with aux engine	Equipment failure (vessel)	53.34	-4.60
RNLI	15/08/2007	Sailing dinghy	Other nautical safety	53.46	-4.40
RNLI	15/08/2007	Sailing dinghy	Other nautical safety	53.46	-4.40
MAIB	20/08/2007	Recreational craft | Sailboat (sail only)	Grounding	53.41	-4.58
RNLI	26/08/2007	Small powered boat with cabin	Equipment failure (vessel)	53.37	-4.56
RNLI	31/08/2007	Sail yacht with aux engine	Equipment failure (vessel)	53.30	-4.58
RNLI	03/09/2007	Sail yacht with aux engine	Equipment failure (vessel)	53.36	-4.59
MAIB	16/11/2007	Service ship | Special purpose ship	Person in distress	53.30	-4.63
RNLI	23/11/2007	Sail yacht with aux engine	Leaks/Swamping	53.40	-4.62
MAIB	25/11/2007	Fishing vessel | Trawler | Beam	Person in distress	53.51	-4.89
RNLI	29/11/2007	Sail yacht with aux engine	Equipment failure (vessel)	53.33	-4.62
MAIB	03/12/2007	Fishing vessel | Trawler	Fire/Explosion	53.30	-4.63
MAIB	07/12/2007	Passenger and Ro-Ro cargo	Person in distress	53.30	-4.63
RNLI	22/12/2007	Tender (pleasure craft)	Other nautical safety	53.32	-4.59
RNLI	02/01/2008	Rowing Boat	Other nautical safety	53.32	-4.59
MAIB	23/03/2008	Passenger and Ro-Ro cargo	Person in distress	53.30	-4.63

Record Origin	Incident Date	Vessel type	Incident Type	Latitude	Longitude
RNLI	26/04/2008	Canoe/Kayak	Capsize/Sinking	53.43	-4.46
MAIB	30/04/2008	Passenger and Ro-Ro cargo	Person in distress	53.30	-4.63
RNLI	05/05/2008	Yacht with engine	Equipment failure (vessel)	53.40	-4.23
RNLI	17/05/2008	Yacht with engine	Equipment failure (vessel)	53.31	-4.72
RNLI	24/05/2008	Person in water	Person(s) in the water	53.42	-4.47
RNLI	31/05/2008	Yacht with engine	Equipment failure (vessel)	53.38	-4.64
RNLI	04/06/2008	Tender to a pleasure craft	Other nautical safety	53.32	-4.62
RNLI	06/06/2008	Yacht with engine	Grounding	53.42	-4.33
RNLI	07/06/2008	Canoe/Kayak	Grounding	53.41	-4.58
RNLI	21/06/2008	Yacht with engine	Equipment failure (vessel)	53.37	-4.63
RNLI	28/06/2008	Powered boat	Equipment failure (vessel)	53.37	-4.26
RNLI	12/07/2008	Powered boat	Equipment failure (vessel)	53.32	-4.62
RNLI	23/07/2008	Canoe/Kayak	Other nautical safety	53.34	-4.64
RNLI	24/07/2008	Powered boat	Equipment failure (vessel)	53.36	-4.58
RNLI	27/07/2008	Powered boat	Other nautical safety	53.40	-4.59
RNLI	01/08/2008	Multihull, no engine	Capsize/Sinking	53.37	-4.58
RNLI	04/08/2008	Yacht with engine	Equipment failure (vessel)	53.44	-4.90
RNLI	08/08/2008	Powered boat	Equipment failure (vessel)	53.31	-4.73
MAIB	15/08/2008	Passenger and Ro-Ro cargo	Equipment failure (vessel)	53.37	-4.76
RNLI	25/08/2008	Person in water	Person(s) in the water	53.32	-4.66
RNLI	20/09/2008	Yacht with engine	Equipment failure (vessel)	53.33	-4.63
RNLI	20/09/2008	Powered boat	Equipment failure (vessel)	53.34	-4.61
RNLI	29/09/2008	Yacht with engine	Other nautical safety	53.33	-4.87
MAIB	06/10/2008	Passenger and Ro-Ro cargo	Person in distress	53.33	-4.87
MAIB	23/12/2008	Fishing vessel	Equipment failure (vessel)	53.57	-4.36
MAIB	27/12/2008	Fishing vessel	Impact with Structure	53.30	-4.63
RNLI	29/12/2008	Powered boat	Equipment failure (vessel)	53.37	-4.66
MAIB	12/02/2009	Passenger and Ro-Ro cargo	Person in distress	53.30	-4.63
MAIB	19/02/2009	Passenger and Ro-Ro cargo	Person in distress	53.30	-4.63
RNLI	18/03/2009	Powered boat	Equipment failure (vessel)	53.42	-4.34
RNLI	21/03/2009	Yacht with engine	Equipment failure (vessel)	53.32	-4.60

Record Origin	Incident Date	Vessel type	Incident Type	Latitude	Longitude
MAIB	27/03/2009	Passenger and Ro-Ro cargo	Impact with Structure	53.30	-4.63
MAIB	08/04/2009	Fishing vessel | Trawler | Beam	Grounding	53.35	-4.23
RNLI	17/04/2009	Yacht with engine	Other nautical safety	53.42	-4.45
MAIB	29/04/2009	Fishing vessel | Trawler	Person in distress	53.32	-4.22
RNLI	29/04/2009	Yacht with engine	Other nautical safety	53.41	-4.69
RNLI	25/05/2009	Yacht with engine	Equipment failure (vessel)	53.48	-4.61
RNLI	31/05/2009	Powered boat	Equipment failure (vessel)	53.32	-4.60
RNLI	31/05/2009	Jet Ski	Equipment failure (vessel)	53.32	-4.58
RNLI	14/06/2009	Powered boat	Other nautical safety	53.37	-4.26
RNLI	27/06/2009	Motor Vehicle	Other nautical safety	53.30	-4.78
RNLI	29/06/2009	Powered boat	Equipment failure (vessel)	53.32	-4.69
RNLI	13/07/2009	Person in water	Person(s) in the water	53.31	-4.61
RNLI	19/07/2009	Powered boat	Equipment failure (vessel)	53.43	-4.34
RNLI	24/07/2009	Powered boat	Equipment failure (vessel)	53.37	-4.56
RNLI	24/07/2009	Powered boat	Equipment failure (vessel)	53.44	-4.45
RNLI	27/07/2009	Powered boat	Equipment failure (vessel)	53.37	-4.25
RNLI	27/07/2009	Yacht with engine	Other nautical safety	53.41	-4.24
RNLI	02/08/2009	Powered boat	Equipment failure (vessel)	53.40	-4.27
RNLI	08/08/2009	Multihull, no engine	Capsize/Sinking	53.32	-4.58
RNLI	11/08/2009	Sailing Dinghy	Other nautical safety	53.32	-4.57
RNLI	11/08/2009	Canoe/Kayak	Other nautical safety	53.39	-4.26
RNLI	11/08/2009	Sailing Dinghy	Capsize/Sinking	53.42	-4.28
RNLI	11/08/2009	Powered boat	Equipment failure (vessel)	53.43	-4.48
RNLI	15/08/2009	Yacht with engine	Equipment failure (vessel)	53.36	-4.62
MAIB	16/08/2009	Recreational craft | Sailboat (sail only)	Equipment failure (vessel)	53.42	-4.68
RNLI	17/08/2009	Sailing Dinghy	Equipment failure (vessel)	53.36	-4.24
RNLI	17/08/2009	Fishing Vessel	Equipment failure (vessel)	53.40	-4.69
RNLI	18/08/2009	Canoe/Kayak	Capsize/Sinking	53.37	-4.25
RNLI	19/08/2009	Yacht with engine	Equipment failure (vessel)	53.42	-4.50
RNLI	20/08/2009	Inflatables (airbed/toy/dinghy)	Person(s) in the water	53.36	-4.25
RNLI	22/08/2009	Yacht with engine	Equipment failure (vessel)	53.42	-4.26

Record Origin	Incident Date	Vessel type	Incident Type	Latitude	Longitude
RNLI	25/08/2009	Powered boat	Equipment failure (vessel)	53.44	-4.62
RNLI	28/08/2009	Bodyboard	Other nautical safety	53.34	-4.58
RNLI	30/08/2009	Canoe/Kayak	Other nautical safety	53.39	-4.25
RNLI	30/08/2009	Canoe/Kayak	Other nautical safety	53.39	-4.25
RNLI	07/09/2009	Powered boat	Person(s) in the water	53.43	-4.37
RNLI	12/09/2009	Powered boat	Equipment failure (vessel)	53.34	-4.62
RNLI	18/10/2009	Powered boat	Grounding	53.33	-4.64
RNLI	18/10/2009	Powered boat	Grounding	53.33	-4.64
RNLI	14/12/2009	Fishing Vessel	Equipment failure (vessel)	53.42	-4.80
RNLI	21/12/2009	Fishing Vessel	Equipment failure (vessel)	53.31	-4.62
RNLI	30/12/2009	Powered boat	Equipment failure (vessel)	53.33	-4.66
MAIB	29/01/2010	Fishing vessel | Potter	Impact with Structure	53.30	-4.63
MAIB	17/02/2010	Passenger and general cargo	Impact with Structure	53.30	-4.63
RNLI	21/03/2010	Yacht with engine	Equipment failure (vessel)	53.32	-4.84
MAIB	01/04/2010	Passenger and Ro-Ro cargo	Person in distress	53.30	-4.63
RNLI	17/04/2010	Yacht with engine	Equipment failure (vessel)	53.43	-4.27
MAIB	22/04/2010	Passenger and Ro-Ro cargo	Person in distress	53.30	-4.63
RNLI	07/05/2010	Fishing Vessel	Leaks/Swamping	53.36	-4.70
RNLI	29/05/2010	Yacht with engine	Equipment failure (vessel)	53.32	-4.76
RNLI	01/07/2010	Yacht with engine	Capsize/Sinking	53.33	-4.69
RNLI	07/07/2010	Yacht with engine	Equipment failure (vessel)	53.42	-4.28
RNLI	12/07/2010	Powered boat	Equipment failure (vessel)	53.42	-4.32
MAIB	13/07/2010	Passenger and Ro-Ro cargo	Equipment failure (vessel)	53.28	-4.68
RNLI	13/07/2010	Fishing Vessel	Equipment failure (vessel)	53.29	-4.70
MAIB	16/07/2010	Fishing vessel | Potter	Impact with Structure	53.30	-4.63
RNLI	16/07/2010	Charter angling vessel	Equipment failure (vessel)	53.34	-4.61
RNLI	17/07/2010	Powered boat	Equipment failure (vessel)	53.34	-4.60
RNLI	26/07/2010	Yacht with engine	Equipment failure (vessel)	53.35	-4.61
RNLI	02/08/2010	Yacht with engine	Equipment failure (vessel)	53.45	-4.25
RNLI	12/08/2010	Yacht with engine	Equipment failure (vessel)	53.33	-4.58
RNLI	13/08/2010	Canoe/Kayak	Other nautical safety	53.38	-4.25

Record Origin	Incident Date	Vessel type	Incident Type	Latitude	Longitude
RNLI	29/08/2010	Yacht with engine	Equipment failure (vessel)	53.29	-4.77
RNLI	02/09/2010	Yacht with engine	Equipment failure (vessel)	53.33	-4.59
RNLI	25/09/2010	Multihull, no engine	Capsize/Sinking	53.32	-4.57
RNLI	13/10/2010	Person in water	Person(s) in the water	53.32	-4.63
RNLI	25/10/2010	Fishing Vessel	Equipment failure (vessel)	53.37	-4.24
RNLI	25/10/2010	Powered boat	Equipment failure (vessel)	53.42	-4.59
RNLI	19/11/2010	Military vessel	Equipment failure (vessel)	53.32	-4.85
RNLI	25/03/2011	Powered boat	Grounding	53.37	-4.65
RNLI	31/03/2011	Kite Board	Other nautical safety	53.31	-4.59
RNLI	29/04/2011	Powered boat	Equipment failure (vessel)	53.33	-4.68
RNLI	29/04/2011	Multihull, no engine	Capsize/Sinking	53.37	-4.56
RNLI	04/06/2011	Powered boat	Equipment failure (vessel)	53.28	-4.69
RNLI	26/06/2011	Yacht with engine	Equipment failure (vessel)	53.35	-4.67
RNLI	30/06/2011	Yacht with engine	Grounding	53.32	-4.57
RNLI	02/07/2011	Powered boat	Equipment failure (vessel)	53.31	-4.70
MAIB	03/07/2011	Passenger and Ro-Ro cargo	Grounding	53.35	-4.23
RNLI	03/07/2011	Powered boat	Equipment failure (vessel)	53.31	-4.70
RNLI	03/07/2011	Fishing Vessel	Grounding	53.36	-4.24
RNLI	30/07/2011	Powered boat	Equipment failure (vessel)	53.29	-4.70
RNLI	31/07/2011	Yacht with engine	Equipment failure (vessel)	53.43	-4.61
RNLI	03/08/2011	Yacht with engine	Other nautical safety	53.37	-4.61
RNLI	06/08/2011	Powered boat	Equipment failure (vessel)	53.35	-4.60
RNLI	20/08/2011	Powered boat	Other nautical safety	53.31	-4.58
RNLI	21/08/2011	Powered boat	Equipment failure (vessel)	53.32	-4.59
RNLI	29/08/2011	Powered boat	Equipment failure (vessel)	53.32	-4.62
RNLI	02/09/2011	Sub aqua diver	Person(s) in the water	53.43	-4.36
MAIB	05/09/2011	Passenger and Ro-Ro cargo	Person in distress	53.30	-4.63
RNLI	27/09/2011	Yacht with engine	Equipment failure (vessel)	53.28	-4.81
RNLI	02/10/2011	Yacht with engine	Equipment failure (vessel)	53.36	-4.73
MAIB	28/10/2011	Passenger and Ro-Ro cargo	Fire/Explosion	53.32	-4.68
MAIB	29/11/2011	Passenger and Ro-Ro cargo	Impact with Structure	53.30	-4.63

Record Origin	Incident Date	Vessel type	Incident Type	Latitude	Longitude
MAIB	13/01/2012	Passenger and Ro-Ro cargo	Other nautical safety	53.25	-4.74
MAIB	01/02/2012	Fishing vessel | Trawler | Stern	Equipment failure (vessel)	53.30	-4.63
MAIB	17/02/2012	Passenger and Ro-Ro cargo	Person in distress	53.45	-4.90
RNLI	25/04/2012	Yacht with engine	Leaks/Swamping	53.33	-4.65
RNLI	05/05/2012	Canoe/Kayak	Capsize/Sinking	53.43	-4.43
MAIB	10/05/2012	Passenger and Ro-Ro cargo | Class B	Person in distress	53.30	-4.63
RNLI	22/05/2012	Fishing Vessel (Leisure)	Fire/Explosion	53.34	-4.60
RNLI	25/05/2012	Sailboard	Capsize/Sinking	53.34	-4.58
RNLI	26/05/2012	Yacht with engine	Equipment failure (vessel)	53.49	-4.57
RNLI	02/06/2012	Powered boat	Equipment failure (vessel)	53.42	-4.29
RNLI	03/06/2012	Yacht with engine	Other nautical safety	53.31	-4.70
RNLI	10/06/2012	Yacht with engine	Equipment failure (vessel)	53.47	-4.61
RNLI	23/06/2012	Powered boat	Equipment failure (vessel)	53.38	-4.25
RNLI	06/07/2012	Yacht with engine	Equipment failure (vessel)	53.43	-4.47
RNLI	07/07/2012	Canoe/Kayak	Capsize/Sinking	53.32	-4.73
RNLI	14/07/2012	Person in water	Person(s) in the water	53.31	-4.69
RNLI	21/07/2012	Canoe/Kayak	Capsize/Sinking	53.30	-4.67
RNLI	22/07/2012	Jet Ski	Person(s) in the water	53.33	-4.61
RNLI	10/08/2012	Powered boat	Equipment failure (vessel)	53.35	-4.66
RNLI	10/08/2012	Powered boat	Equipment failure (vessel)	53.36	-4.67
RNLI	10/08/2012	Yacht with engine	Equipment failure (vessel)	53.37	-4.55
RNLI	18/08/2012	Yacht with engine	Equipment failure (vessel)	53.31	-4.74
RNLI	19/08/2012	Fishing Vessel (Leisure)	Equipment failure (vessel)	53.30	-4.65
RNLI	20/08/2012	Yacht with engine	Other nautical safety	53.46	-4.28
RNLI	01/09/2012	Fishing Vessel (Leisure)	Equipment failure (vessel)	53.46	-4.40
RNLI	08/09/2012	Powered boat	Equipment failure (vessel)	53.29	-4.66
RNLI	10/09/2012	Canoe/Kayak	Other nautical safety	53.43	-4.66
RNLI	25/10/2012	Yacht with engine	Other nautical safety	53.32	-4.63
MAIB	14/11/2012	Passenger and Ro-Ro cargo	Person in distress	53.40	-4.60
MAIB	24/12/2012	Recreational craft | Motorboat	Equipment failure (vessel)	53.39	-4.76
MAIB	16/02/2013	Passenger and Ro-Ro cargo	Impact with Structure	53.32	-4.62

Record Origin	Incident Date	Vessel type	Incident Type	Latitude	Longitude
MAIB	19/04/2013	Recreational craft | Canoe/Kayak	Capsize/Sinking	53.30	-4.50
RNLI	21/04/2013	Powered boat	Other nautical safety	53.32	-4.60
RNLI	23/04/2013	Sailing Dinghy	Capsize/Sinking	53.42	-4.30
MAIB	16/05/2013	Service ship | Tug (Towing/Pushing)	Fire/Explosion	53.44	-4.62
RNLI	18/05/2013	Fishing Vessel (Leisure)	Equipment failure (vessel)	53.43	-4.40
MAIB	23/05/2013	Service ship | Special purpose ship	Equipment failure (vessel)	53.30	-4.63
RNLI	23/05/2013	Fishing Vessel (Leisure)	Other nautical safety	53.33	-4.64
RNLI	25/05/2013	Fishing Vessel (Leisure)	Equipment failure (vessel)	53.32	-4.67
RNLI	08/06/2013	Powered boat	Leaks/Swamping	53.41	-4.30
RNLI	09/06/2013	Jet Ski	Other nautical safety	53.29	-4.90
RNLI	09/06/2013	Powered boat	Equipment failure (vessel)	53.42	-4.29
RNLI	07/07/2013	Powered boat	Equipment failure (vessel)	53.42	-4.40
RNLI	09/07/2013	Powered boat	Other nautical safety	53.29	-4.69
RNLI	13/07/2013	Powered boat	Equipment failure (vessel)	53.32	-4.68
RNLI	14/07/2013	Powered boat	Grounding	53.30	-4.68
RNLI	16/07/2013	Fishing Vessel (Leisure)	Other nautical safety	53.33	-4.75
RNLI	17/07/2013	Powered boat	Equipment failure (vessel)	53.31	-4.70
RNLI	21/07/2013	Fishing Vessel (Leisure)	Equipment failure (vessel)	53.32	-4.67
RNLI	27/07/2013	Powered boat	Leaks/Swamping	53.33	-4.75
RNLI	28/07/2013	Fishing Vessel (Leisure)	Equipment failure (vessel)	53.34	-4.61
RNLI	29/07/2013	Inflatables (airbed/toy/dinghy)	Capsize/Sinking	53.36	-4.26
RNLI	07/08/2013	Fishing Vessel (Leisure)	Equipment failure (vessel)	53.36	-4.56
RNLI	08/08/2013	Yacht with engine	Grounding	53.42	-4.51
RNLI	12/08/2013	Canoe/Kayak	Capsize/Sinking	53.30	-4.58
RNLI	12/08/2013	Military vessel	Equipment failure (vessel)	53.34	-4.72
RNLI	20/08/2013	Inflatables (airbed/toy/dinghy)	Other nautical safety	53.37	-4.25
MAIB	23/08/2013	Passenger and Ro-Ro cargo	Other nautical safety	53.30	-4.63
RNLI	23/08/2013	Sailing Dinghy	Other nautical safety	53.48	-4.37
RNLI	26/08/2013	Fishing Vessel (Leisure)	Equipment failure (vessel)	53.34	-4.61
RNLI	28/08/2013	Yacht with engine	Equipment failure (vessel)	53.47	-4.68
RNLI	06/09/2013	Yacht with engine	Grounding	53.32	-4.62

Record Origin	Incident Date	Vessel type	Incident Type	Latitude	Longitude
RNLI	20/09/2013	Rowing Boat	Other nautical safety	53.40	-4.54
MAIB	22/09/2013	Passenger and Ro-Ro cargo	Equipment failure (vessel)	53.39	-4.82
RNLI	28/10/2013	Person in water	Person(s) in the water	53.32	-4.59
RNLI	06/11/2013	Fishing Vessel	Equipment failure (vessel)	53.44	-4.47
MAIB	20/11/2013	Service ship | Special purpose ship	Other nautical safety	53.42	-4.33
MAIB	29/11/2013	Service ship | Research ship	Fire/Explosion	53.32	-4.60
MAIB	14/03/2014	Service ship | Special purpose ship	Other nautical safety	53.42	-4.33
MAIB	15/03/2014	Fishing vessel | Dredger	Other nautical safety	53.31	-4.70
RNLI	15/03/2014	Fishing Vessel	Other nautical safety	53.30	-4.70
MAIB	03/04/2014	Cargo ship | Liquid Cargo | Oil tanker	Collision	53.30	-4.63
MAIB	03/04/2014	Cargo ship | Liquid Cargo	Collision	53.30	-4.63
RNLI	05/04/2014	Rowing Boat	Other nautical safety	53.43	-4.32
RNLI	11/04/2014	Yacht with engine	Equipment failure (vessel)	53.42	-4.35
RNLI	13/04/2014	Jet Ski	Equipment failure (vessel)	53.32	-4.53
RNLI	13/04/2014	Powered boat	Equipment failure (vessel)	53.37	-4.25
RNLI	25/04/2014	Fishing Vessel (Leisure)	Equipment failure (vessel)	53.36	-4.25
RNLI	27/04/2014	Yacht no engine	Grounding	53.32	-4.61
RNLI	28/04/2014	Powered boat	Equipment failure (vessel)	53.33	-4.75
MAIB	15/05/2014	Fishing vessel | Trawler | Other	Person in distress	53.57	-4.87
RNLI	15/05/2014	Fishing Vessel	Person in distress	53.49	-4.75
RNLI	31/05/2014	Canoe/Kayak	Capsize/Sinking	53.33	-4.69
RNLI	01/06/2014	Canoe/Kayak	Other nautical safety	53.39	-4.25
RNLI	01/06/2014	Powered boat	Equipment failure (vessel)	53.40	-4.42
RNLI	03/06/2014	Sailing Dinghy	Capsize/Sinking	53.36	-4.56
RNLI	05/06/2014	Fishing Vessel (Leisure)	Equipment failure (vessel)	53.38	-4.57
RNLI	07/06/2014	Powered boat	Equipment failure (vessel)	53.51	-4.31
RNLI	14/06/2014	Powered boat	Equipment failure (vessel)	53.35	-4.58
RNLI	15/06/2014	Powered boat	Equipment failure (vessel)	53.40	-4.40
MAIB	19/06/2014	Passenger and Ro-Ro cargo	Person in distress	53.30	-4.63
RNLI	28/06/2014	Jet Ski	Equipment failure (vessel)	53.42	-4.34
MAIB	30/06/2014	Passenger and Ro-Ro cargo	Impact with Structure	53.53	-4.64

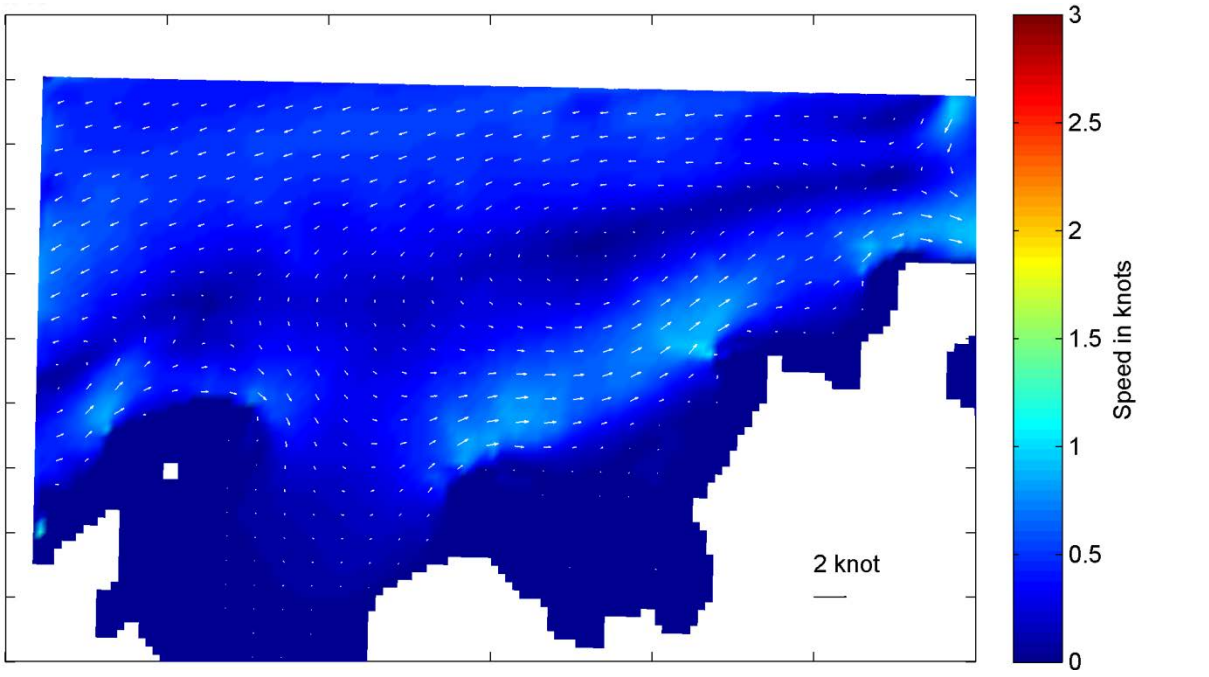
Record Origin	Incident Date	Vessel type	Incident Type	Latitude	Longitude
RNLI	15/07/2014	Yacht with engine	Equipment failure (vessel)	53.42	-4.64
RNLI	16/07/2014	Yacht with engine	Other nautical safety	53.47	-4.56
RNLI	22/07/2014	Powered boat	Equipment failure (vessel)	53.31	-4.70
RNLI	23/07/2014	Powered boat	Leaks/Swamping	53.46	-4.50
MAIB	24/07/2014	Liquid Cargo | Oil tanker | Product carrier	Collision	53.30	-4.63
RNLI	27/07/2014	Tender to a pleasure craft	Equipment failure (vessel)	53.33	-4.64
RNLI	02/08/2014	Inflatables (airbed/toy/dinghy)	Other nautical safety	53.31	-4.56
RNLI	05/08/2014	Yacht with engine	Grounding	53.39	-4.25
RNLI	17/08/2014	Powered boat	Person(s) in the water	53.44	-4.44
RNLI	22/08/2014	Powered boat	Equipment failure (vessel)	53.32	-4.58
RNLI	24/08/2014	Sailing Dinghy	Capsize/Sinking	53.34	-4.58
RNLI	04/09/2014	Powered boat	Equipment failure (vessel)	53.34	-4.70
RNLI	06/09/2014	Canoe/Kayak	Capsize/Sinking	53.29	-4.68
RNLI	12/09/2014	Yacht with engine	Equipment failure (vessel)	53.50	-4.84
RNLI	13/09/2014	Powered boat	Equipment failure (vessel)	53.28	-4.77
RNLI	01/10/2014	Multihull with engine	Equipment failure (vessel)	53.31	-4.71
RNLI	10/10/2014	Yacht with engine	Equipment failure (vessel)	53.41	-4.33
RNLI	14/11/2014	Yacht with engine	Other nautical safety	53.33	-4.64
RNLI	21/12/2014	Fishing Vessel	Other nautical safety	53.32	-4.72
MAIB	28/12/2014	Cargo ship | Liquid Cargo | Oil tanker	Collision	53.30	-4.63
MAIB	02/01/2015	Passenger and Ro-Ro cargo	Impact with Structure	53.32	-4.62
RNLI	10/01/2015	Work vessel	Equipment failure (vessel)	53.42	-4.32
MAIB	01/02/2015	Cargo ship | Liquid Cargo | Oil tanker	Collision	53.31	-4.62
MAIB	22/03/2015	Passenger and Ro-Ro cargo	Equipment failure (vessel)	53.31	-4.62
RNLI	24/03/2015	Powered boat	Equipment failure (vessel)	53.32	-4.60
MAIB	26/03/2015	Passenger and Ro-Ro cargo	Person in distress	53.30	-4.63
RNLI	24/04/2015	Fishing Vessel (Leisure)	Leaks/Swamping	53.35	-4.89
RNLI	29/04/2015	Yacht with engine	Equipment failure (vessel)	53.32	-4.65
RNLI	21/05/2015	Yacht with engine	Other nautical safety	53.49	-4.50
RNLI	25/05/2015	Powered boat	Equipment failure (vessel)	53.43	-4.36
RNLI	30/05/2015	Work vessel	Equipment failure (vessel)	53.42	-4.50

Record Origin	Incident Date	Vessel type	Incident Type	Latitude	Longitude
RNLI	08/06/2015	Yacht with engine	Grounding	53.37	-4.27
RNLI	10/06/2015	Yacht with engine	Equipment failure (vessel)	53.29	-4.70
RNLI	13/06/2015	Jet Ski	Equipment failure (vessel)	53.33	-4.59
RNLI	13/06/2015	Fishing Vessel (Leisure)	Leaks/Swamping	53.53	-4.60
RNLI	20/06/2015	Yacht with engine	Equipment failure (vessel)	53.32	-4.60
RNLI	20/06/2015	Yacht with engine	Equipment failure (vessel)	53.32	-4.60
RNLI	04/07/2015	Powered boat	Equipment failure (vessel)	53.32	-4.62
RNLI	09/07/2015	Powered boat	Equipment failure (vessel)	53.38	-4.56
RNLI	18/07/2015	Sailing Dinghy	Capsize/Sinking	53.32	-4.57
RNLI	18/07/2015	Powered boat	Equipment failure (vessel)	53.35	-4.58
RNLI	21/07/2015	Canoe/Kayak	Person(s) in the water	53.43	-4.51
RNLI	25/07/2015	Powered boat	Equipment failure (vessel)	53.35	-4.66
RNLI	01/08/2015	Powered boat	Capsize/Sinking	53.30	-4.69
RNLI	01/08/2015	Powered boat	Other nautical safety	53.38	-4.24
RNLI	02/08/2015	Powered boat	Equipment failure (vessel)	53.33	-4.63
MAIB	04/08/2015	Passenger and Ro-Ro cargo	Impact with Structure	53.31	-4.63
MAIB	08/08/2015	Passenger and Ro-Ro cargo	Person in distress	53.30	-4.63
RNLI	08/08/2015	Yacht with engine	Other nautical safety	53.39	-4.59
RNLI	16/08/2015	Yacht with engine	Equipment failure (vessel)	53.30	-4.70
RNLI	30/08/2015	Canoe/Kayak	Other nautical safety	53.29	-4.72
MAIB	31/08/2015	Passenger and Ro-Ro cargo	Collision	53.28	-4.68
RNLI	10/09/2015	Yacht with engine	Other nautical safety	53.43	-4.40
RNLI	26/09/2015	Powered boat	Equipment failure (vessel)	53.41	-4.57
MAIB	03/10/2015	Passenger and Ro-Ro cargo	Person in distress	53.32	-4.88
RNLI	23/10/2015	Powered boat	Other nautical safety	53.33	-4.62
RNLI	28/10/2015	Powered boat	Other nautical safety	53.36	-4.59
RNLI	01/11/2015	Powered boat	Equipment failure (vessel)	53.36	-4.61
RNLI	31/12/2015	Canoe/Kayak	Capsize/Sinking	53.42	-4.49

B Tidal Flow Atlas

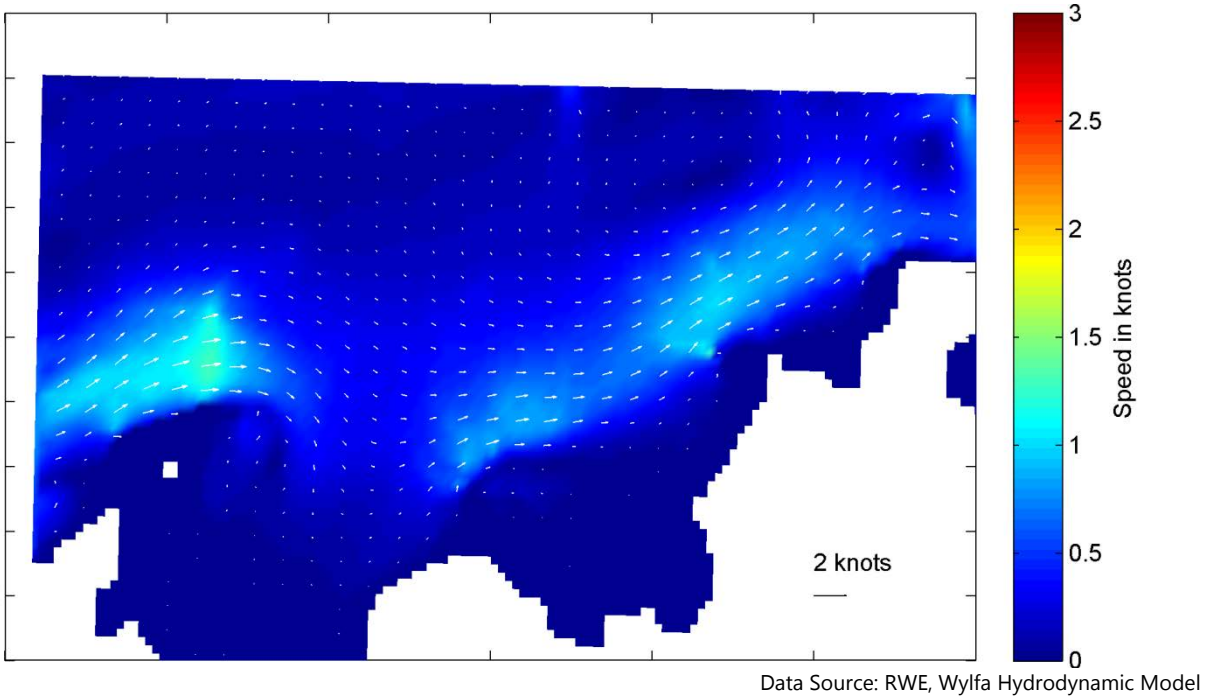
B.1 High Water Minus 6 Hours

Spring tide



Data Source: RWE, Wylfa Hydrodynamic Model

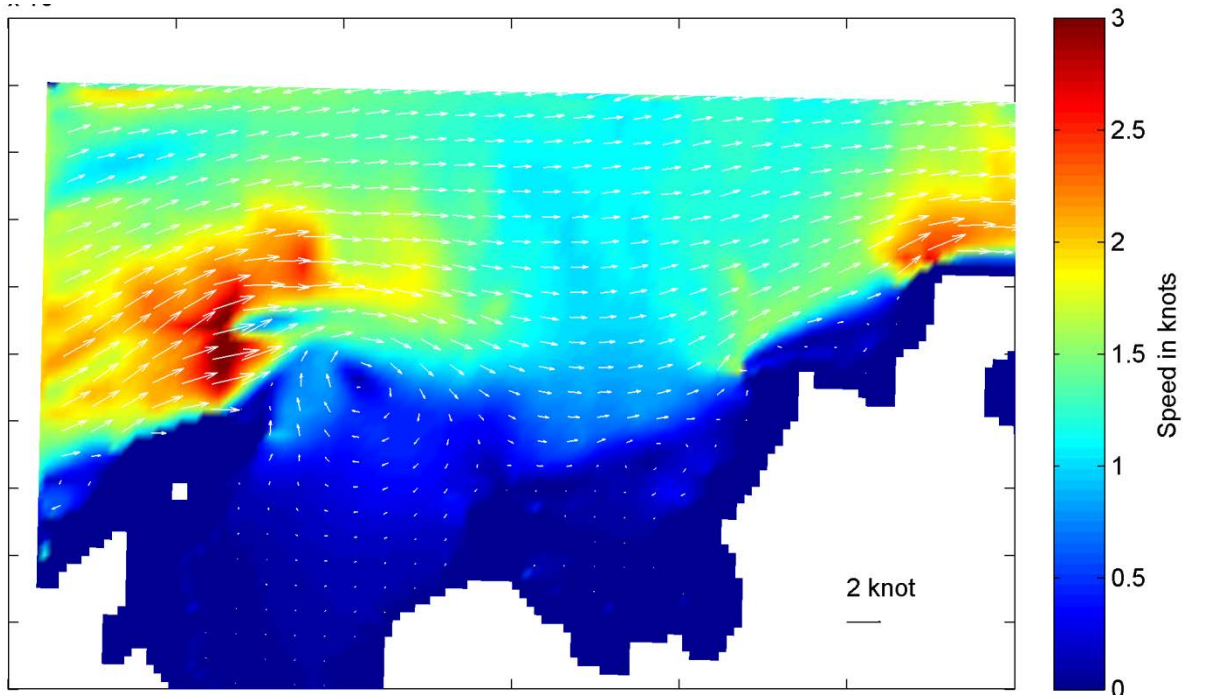
Neap tide



Data Source: RWE, Wylfa Hydrodynamic Model

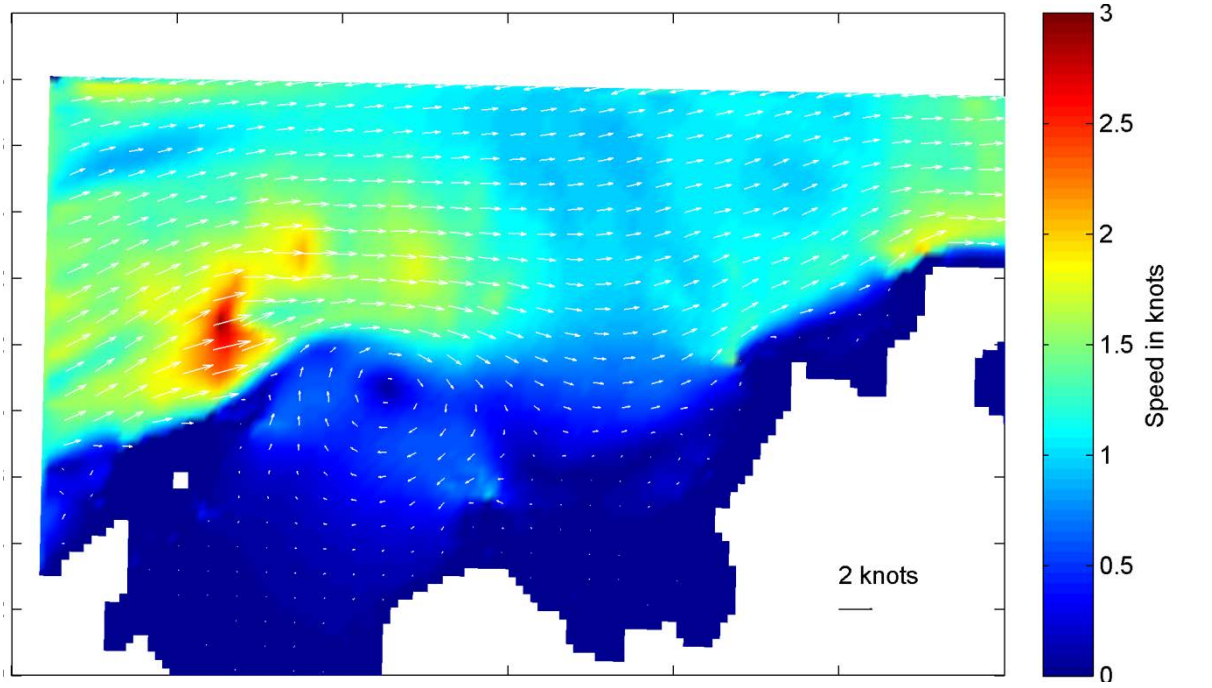
B.2 High Water Minus 5 Hours

Spring tide



Data Source: RWE, Wylfa Hydrodynamic Model

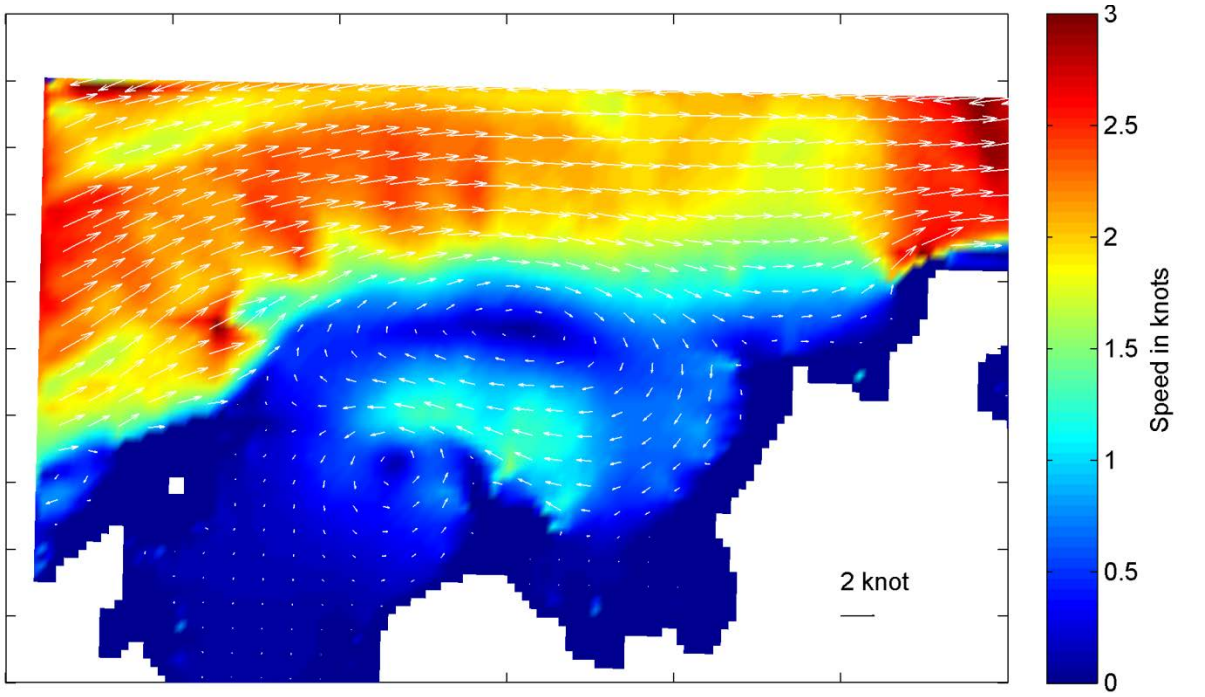
Neap tide



Data Source: RWE, Wylfa Hydrodynamic Model

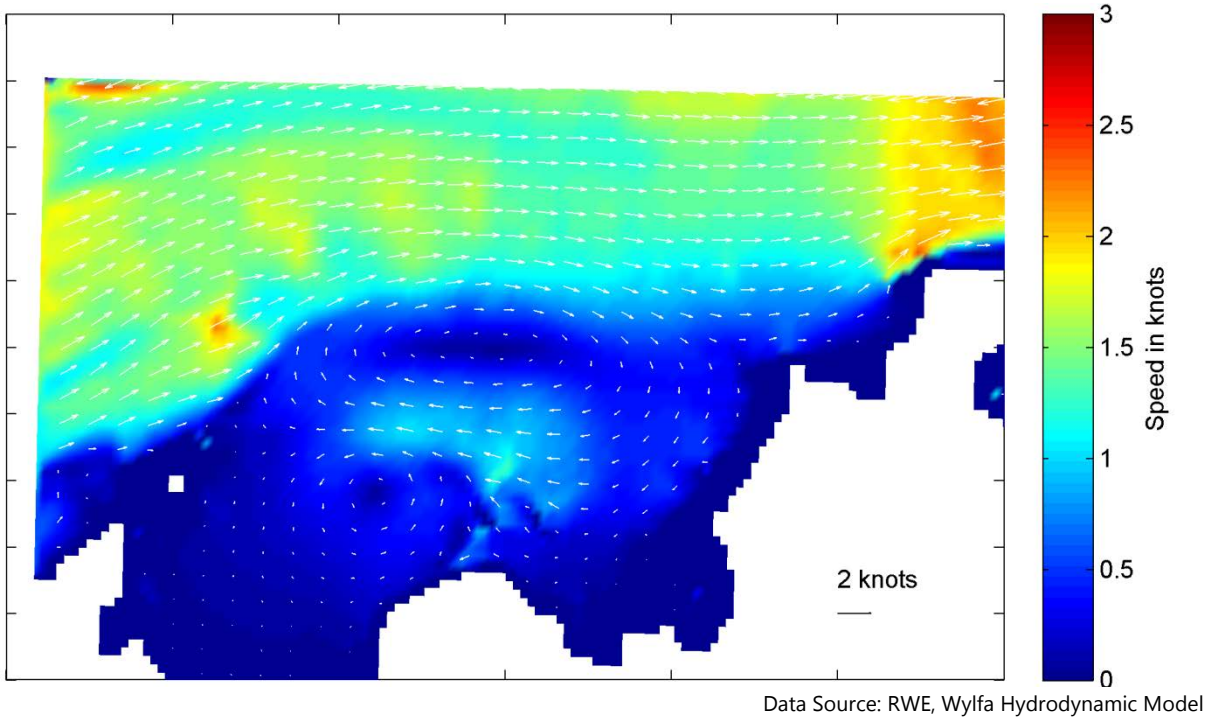
B.3 High Water Minus 4 Hours

Spring tide



Data Source: RWE, Wylfa Hydrodynamic Model

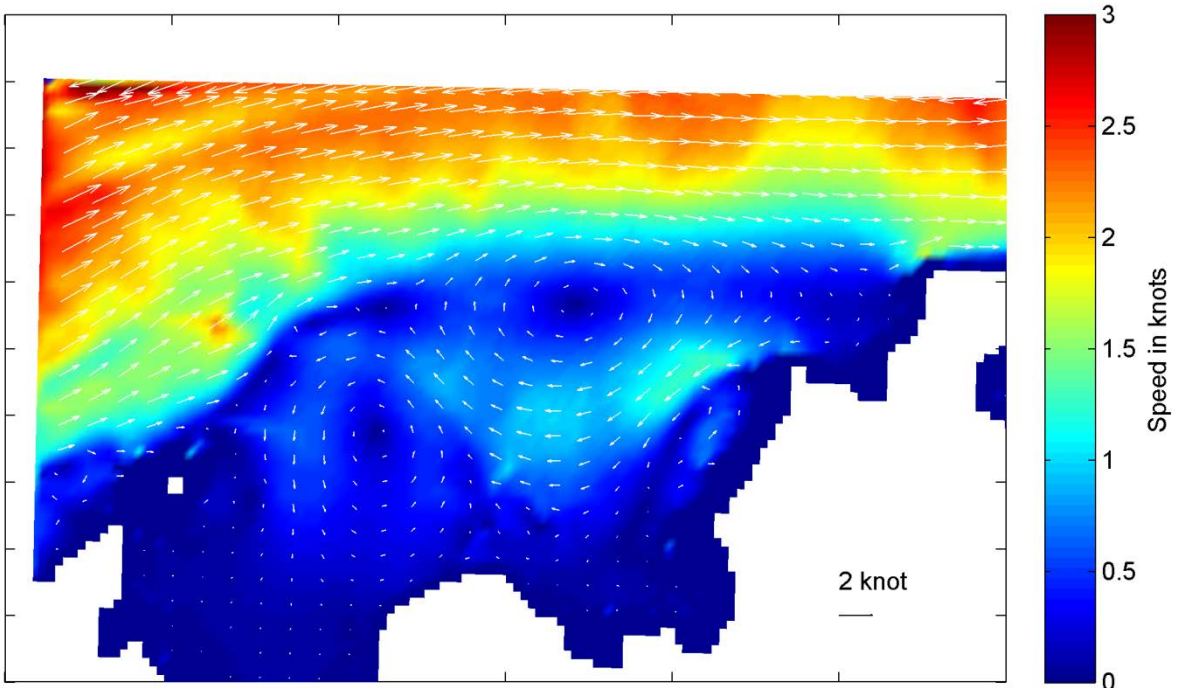
Neap tide



Data Source: RWE, Wylfa Hydrodynamic Model

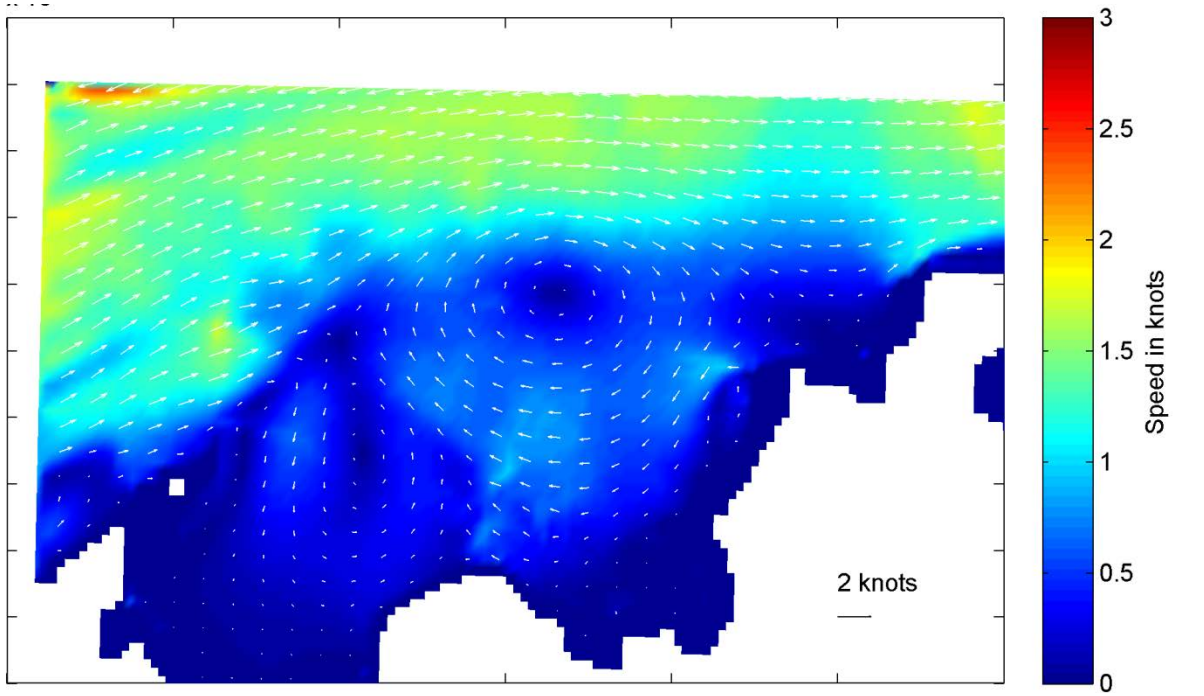
B.4 High Water Minus 3 Hours

Spring tide



Data Source: RWE, Wylfa Hydrodynamic Model

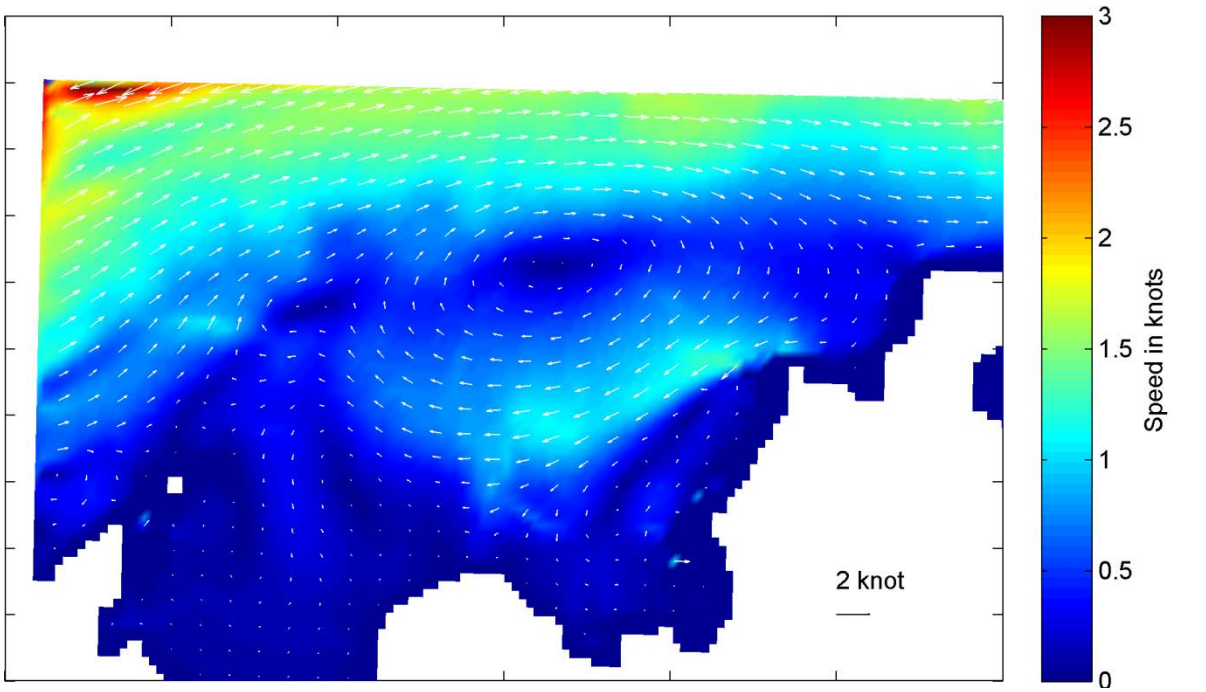
Neap tide



Data Source: RWE, Wylfa Hydrodynamic Model

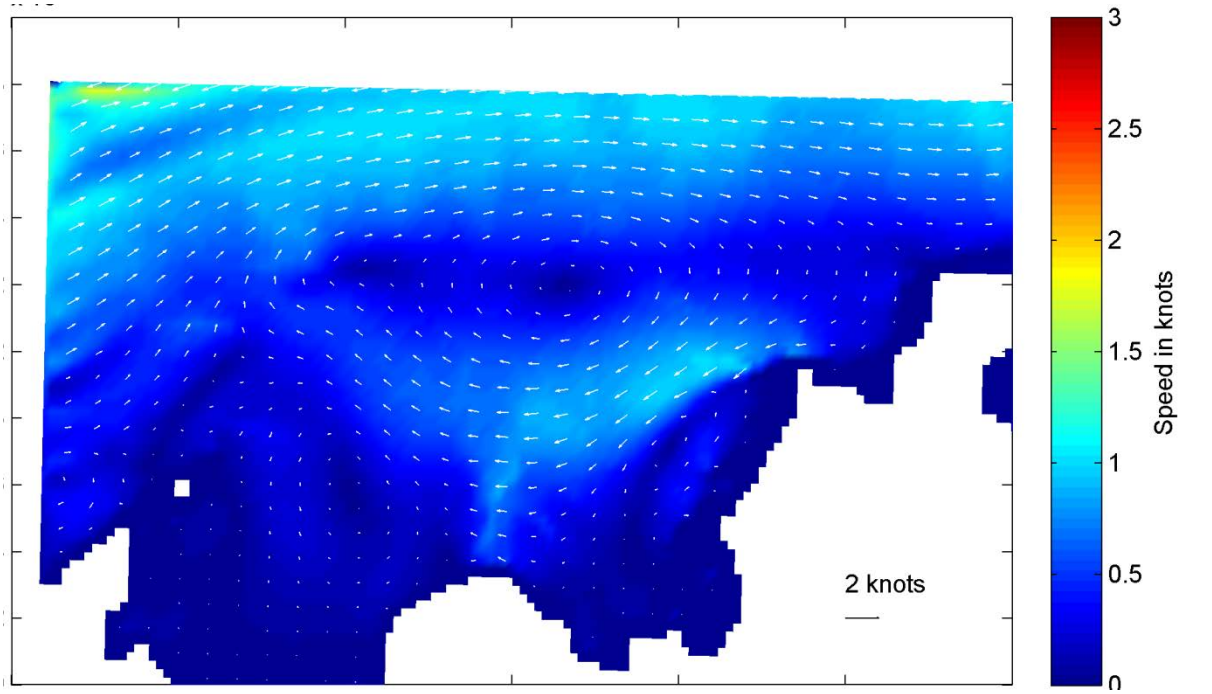
B.5 High Water Minus 2 Hours

Spring tide



Data Source: RWE, Wylfa Hydrodynamic Model

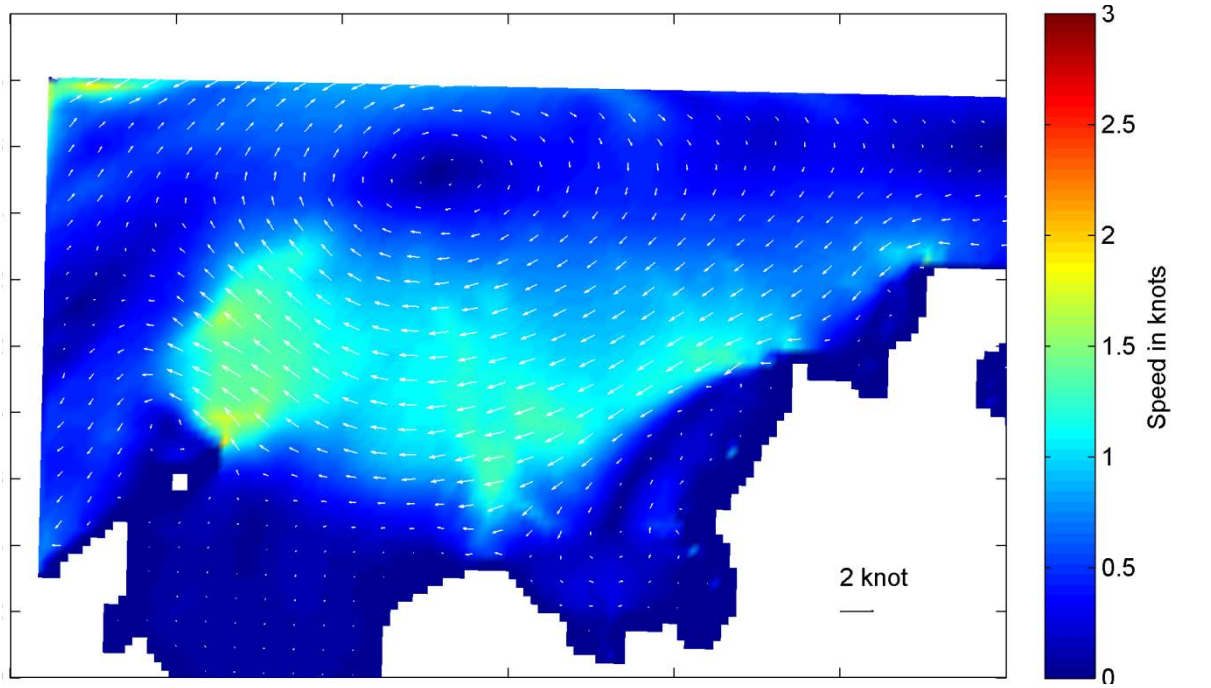
Neap tide



Data Source: RWE, Wylfa Hydrodynamic Model

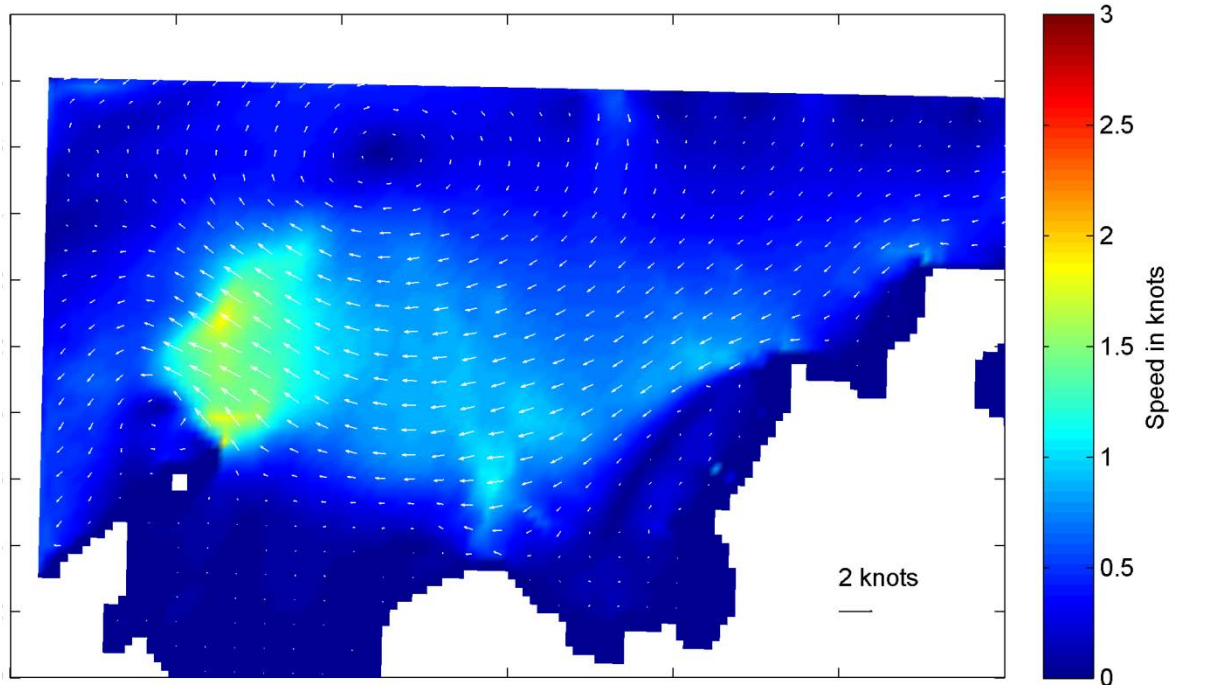
B.6 High Water Minus 1 Hour

Spring tide



Data Source: RWE, Wylfa Hydrodynamic Model

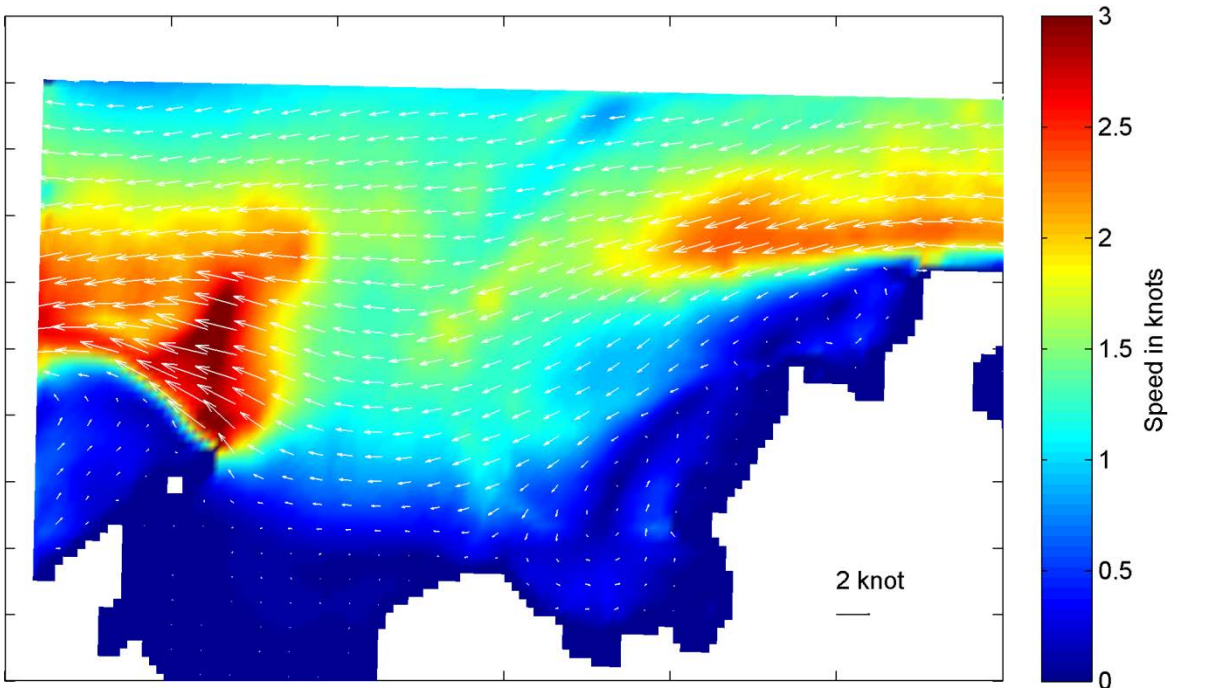
Neap tide



Data Source: RWE, Wylfa Hydrodynamic Model

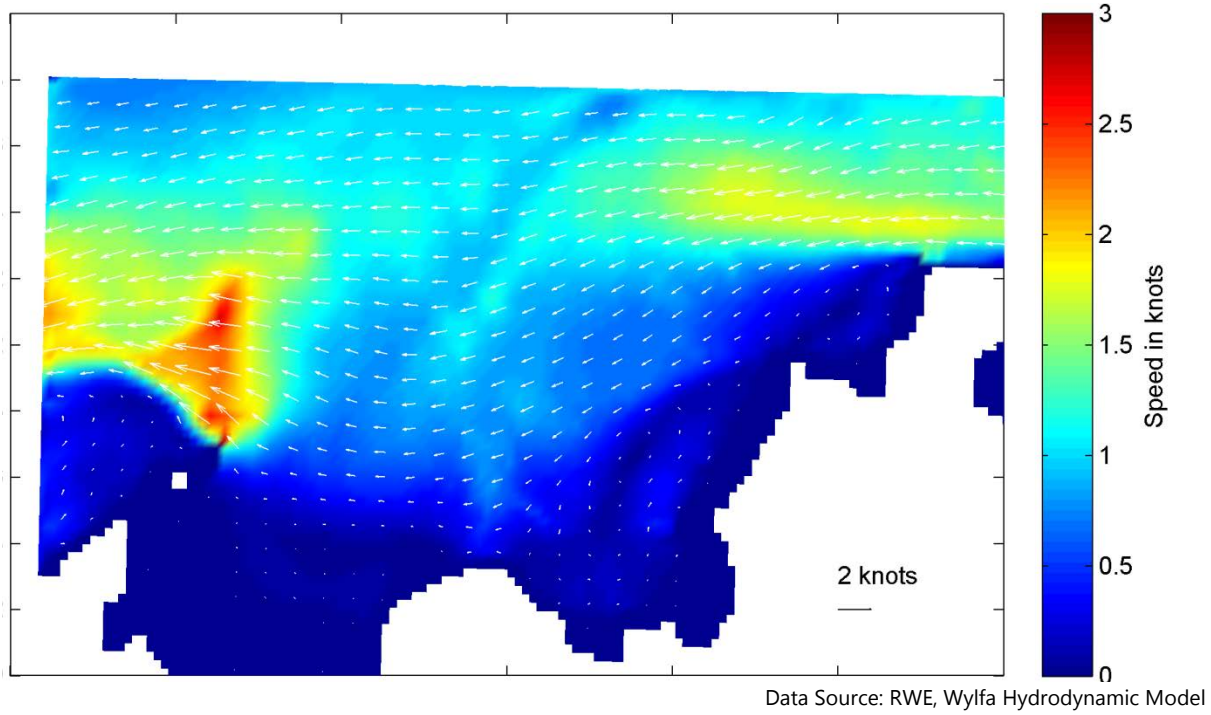
B.7 High Water

Spring tide



Data Source: RWE, Wylfa Hydrodynamic Model

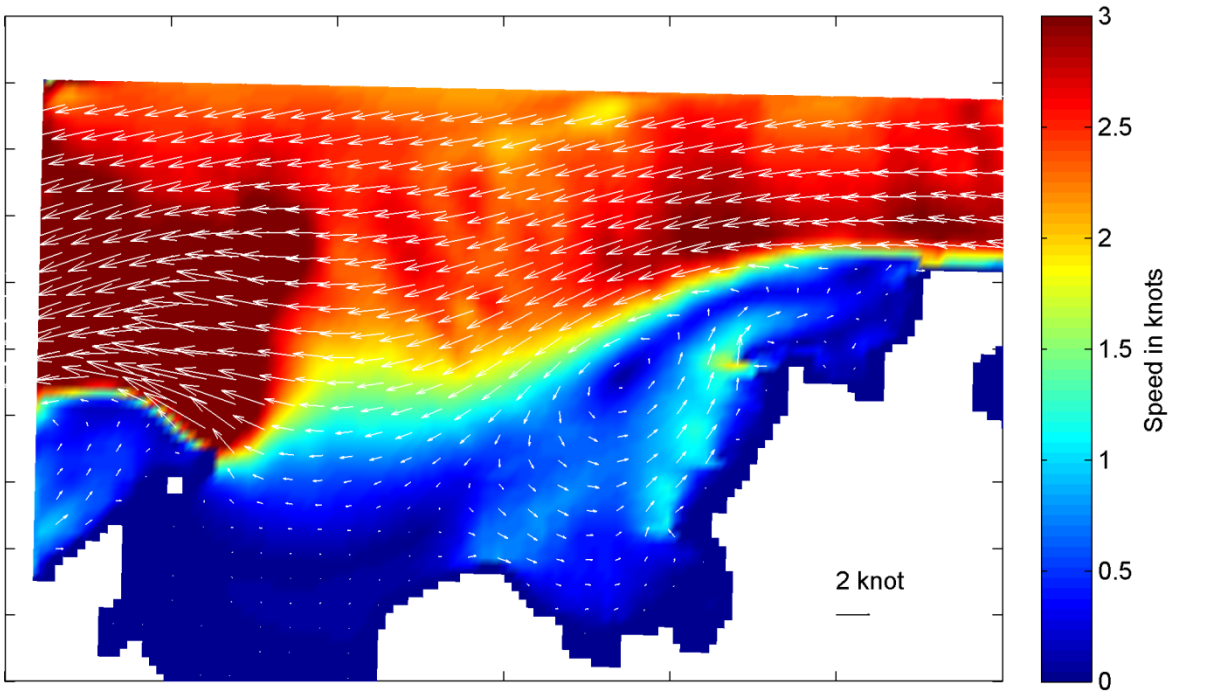
Neap tide



Data Source: RWE, Wylfa Hydrodynamic Model

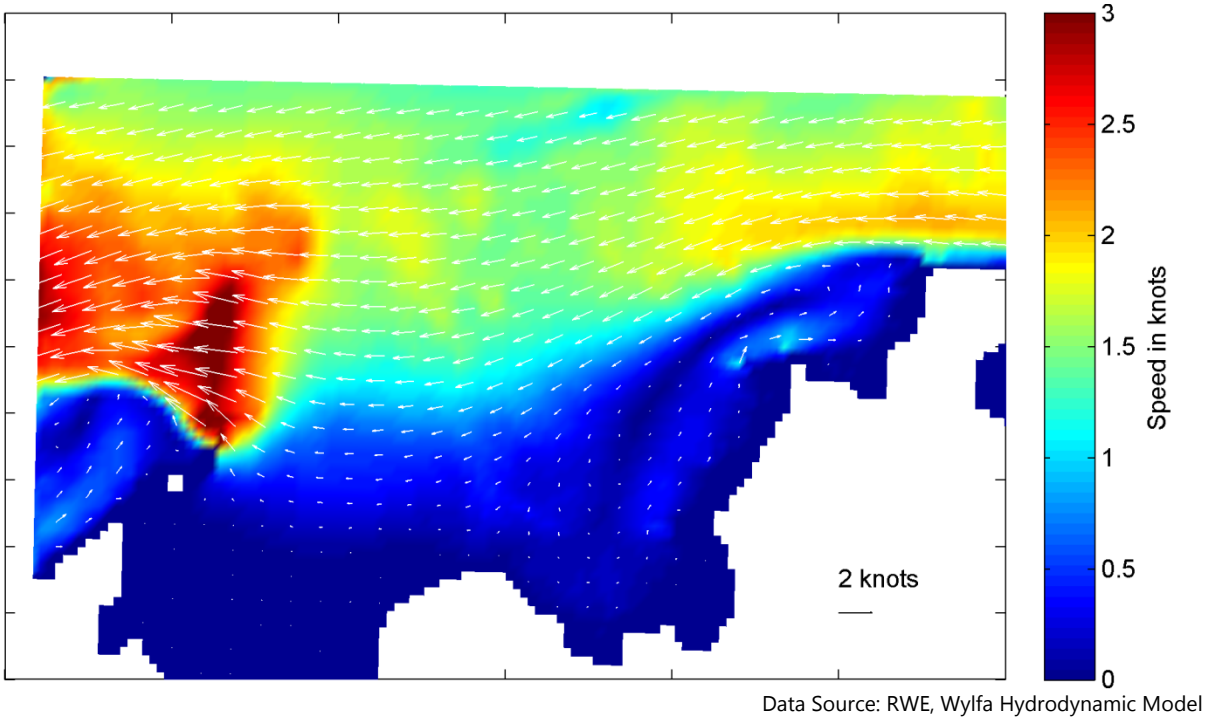
B.8 High Water Plus 1 Hour

Spring tide



Data Source: RWE, Wylfa Hydrodynamic Model

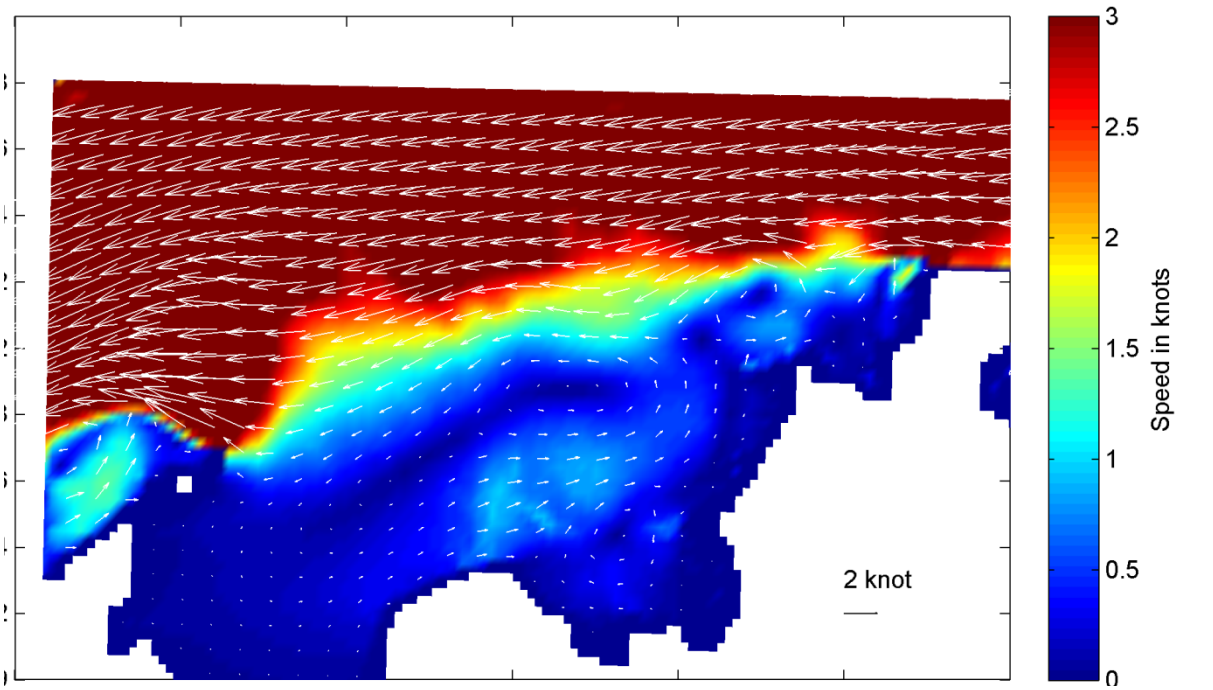
Neap tide



Data Source: RWE, Wylfa Hydrodynamic Model

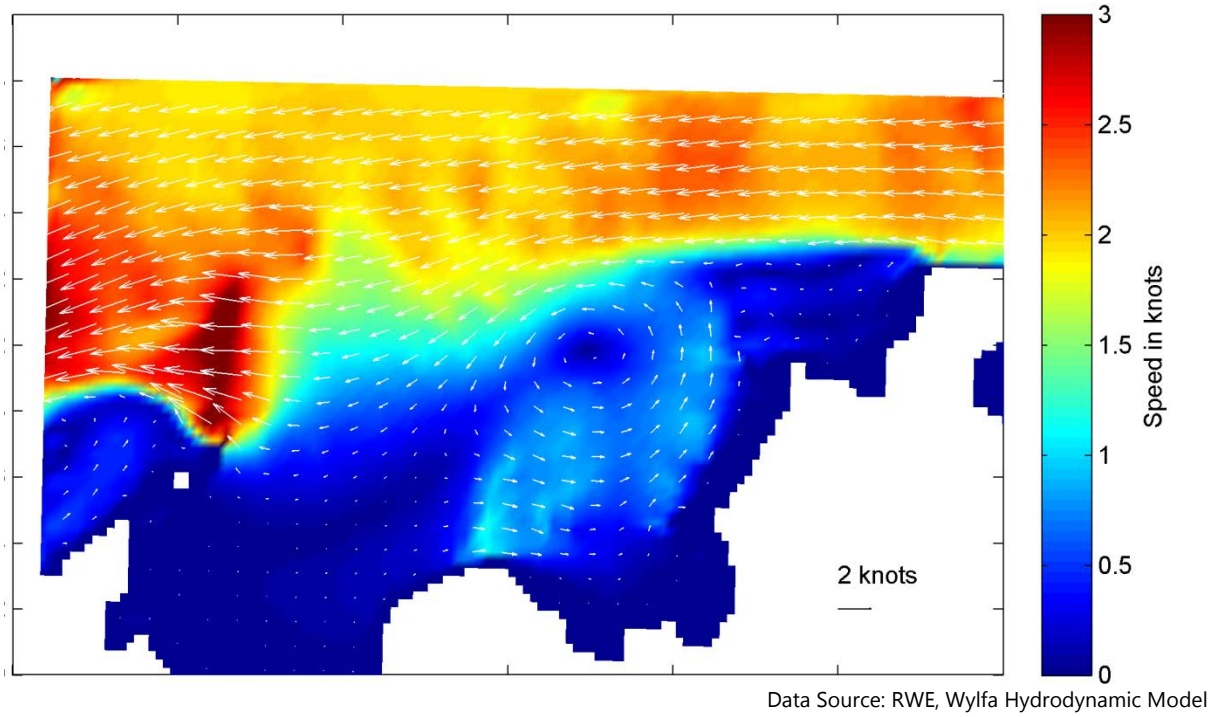
B.9 High Water Plus 2 Hours

Spring tide



Data Source: RWE, Wylfa Hydrodynamic Model

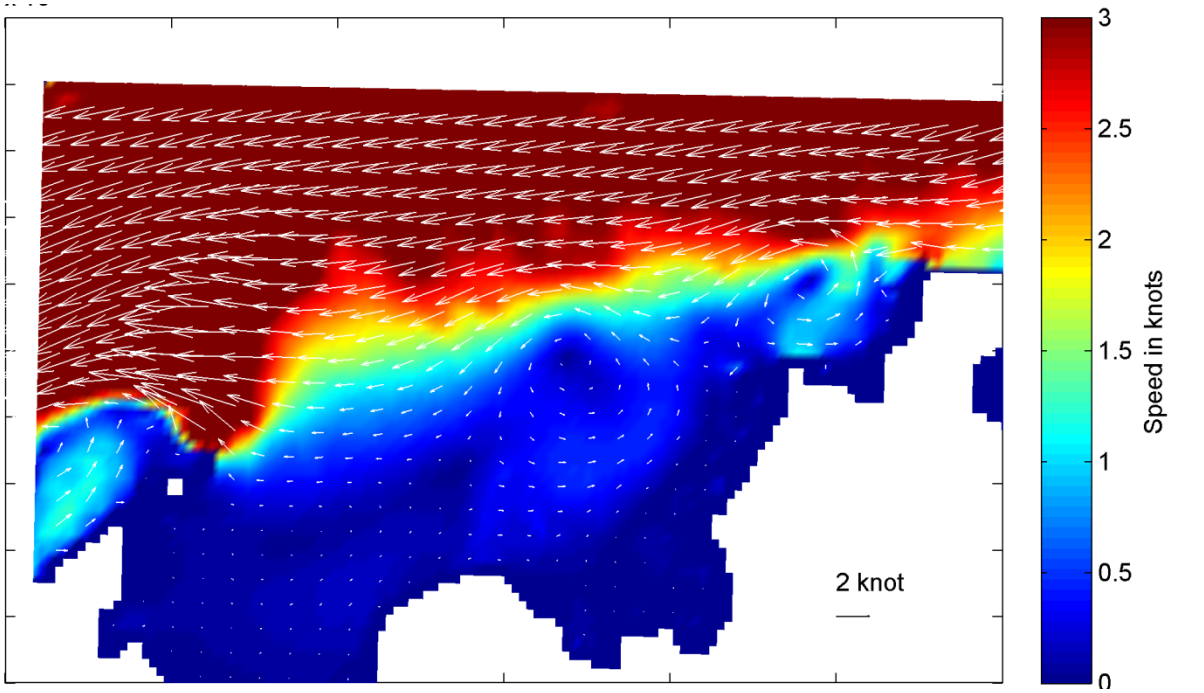
Neap tide



Data Source: RWE, Wylfa Hydrodynamic Model

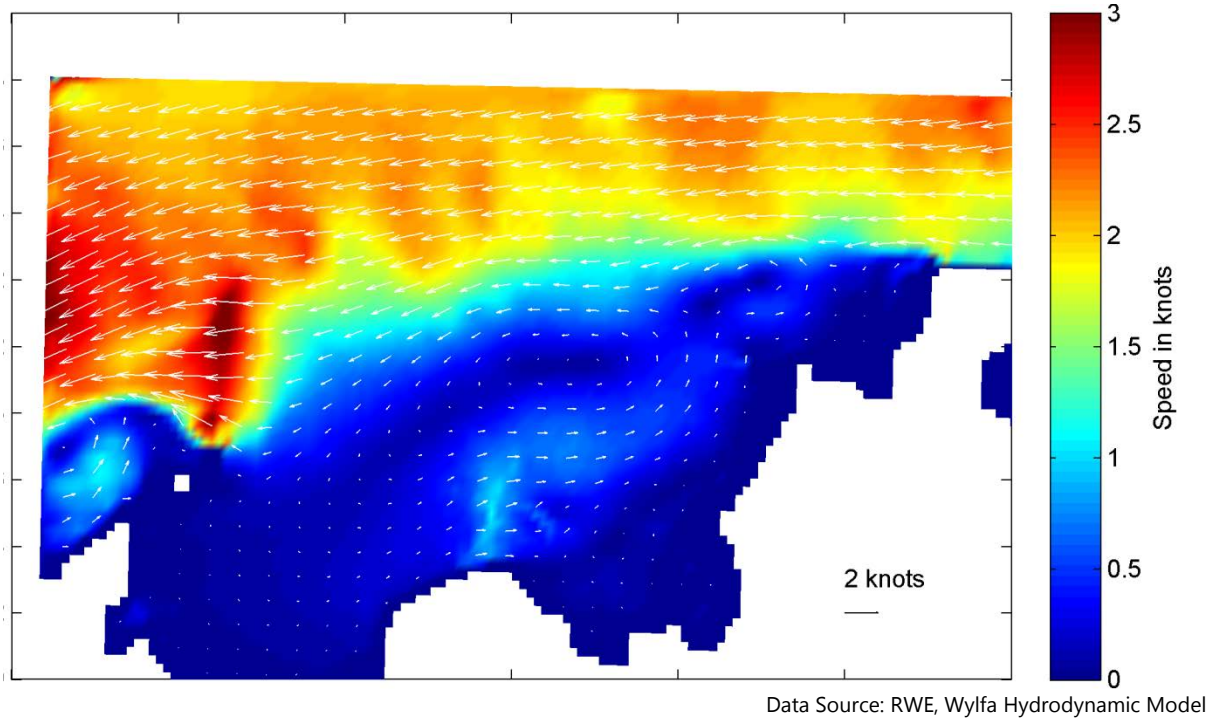
B.10 High Water Plus 3 Hours

Spring tide



Data Source: RWE, Wylfa Hydrodynamic Model

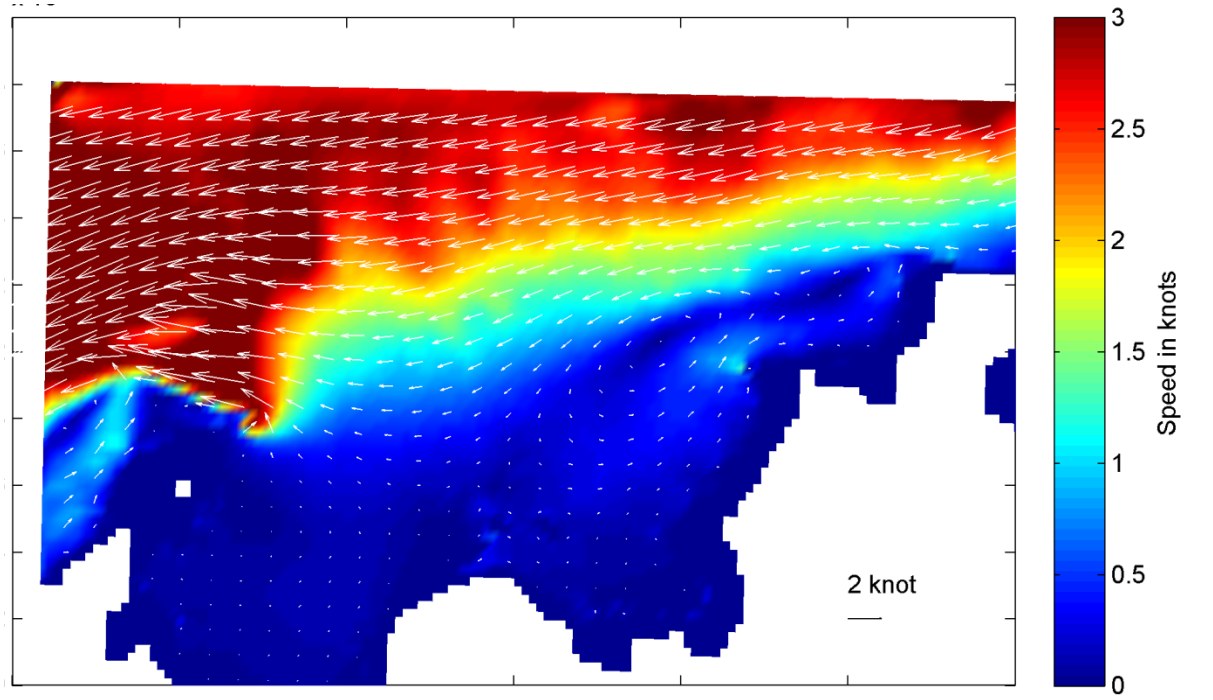
Neap tide



Data Source: RWE, Wylfa Hydrodynamic Model

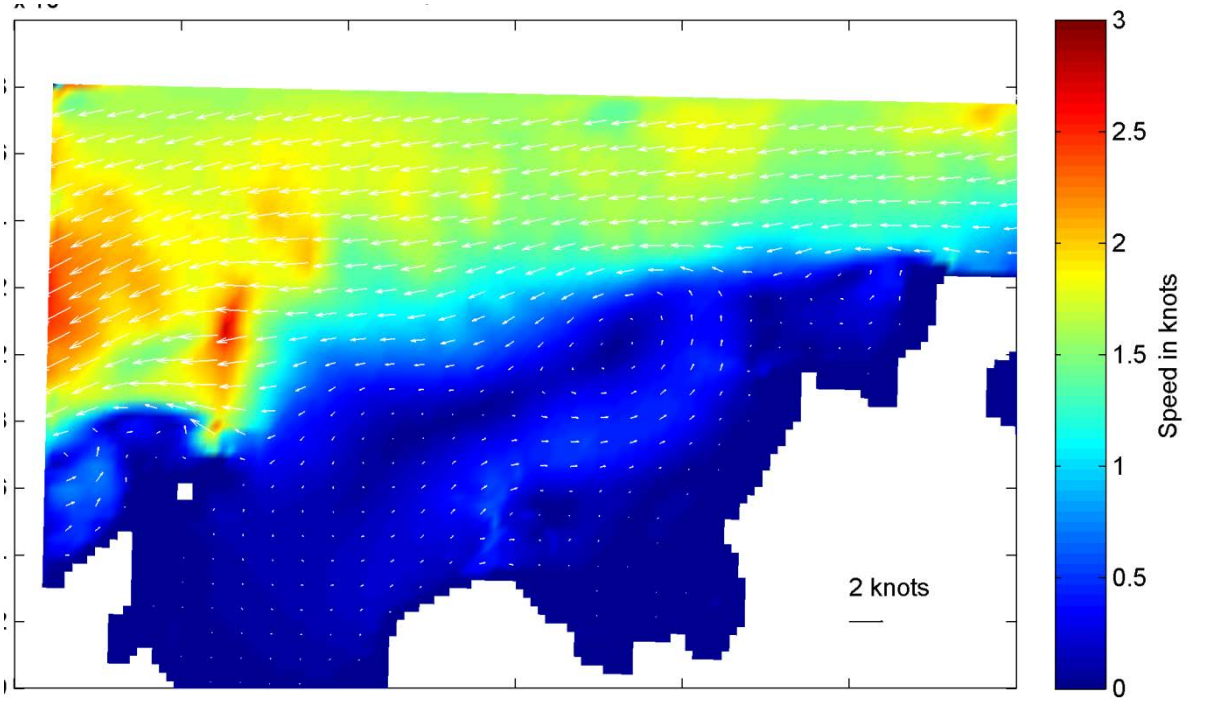
B.11 High Water Plus 4 Hours

Spring tide



Data Source: RWE, Wylfa Hydrodynamic Model

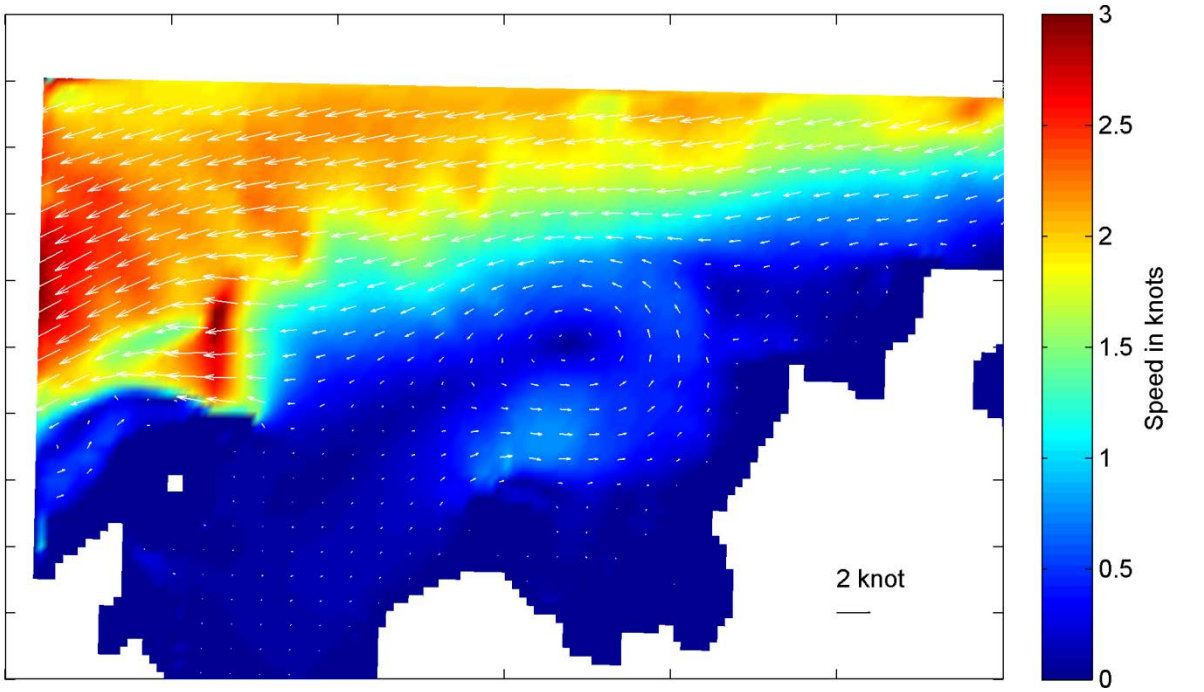
Neap tide



Data Source: RWE, Wylfa Hydrodynamic Model

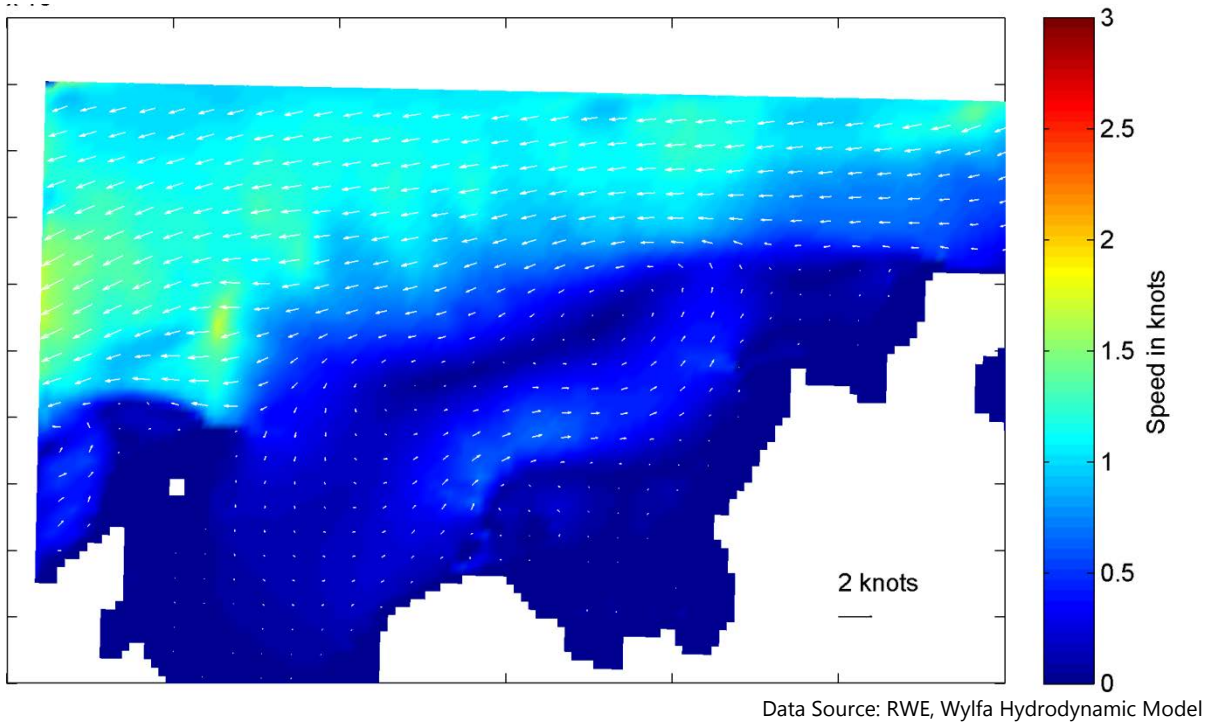
B.12 High Water Plus 5 Hours

Spring tide



Data Source: RWE, Wylfa Hydrodynamic Model

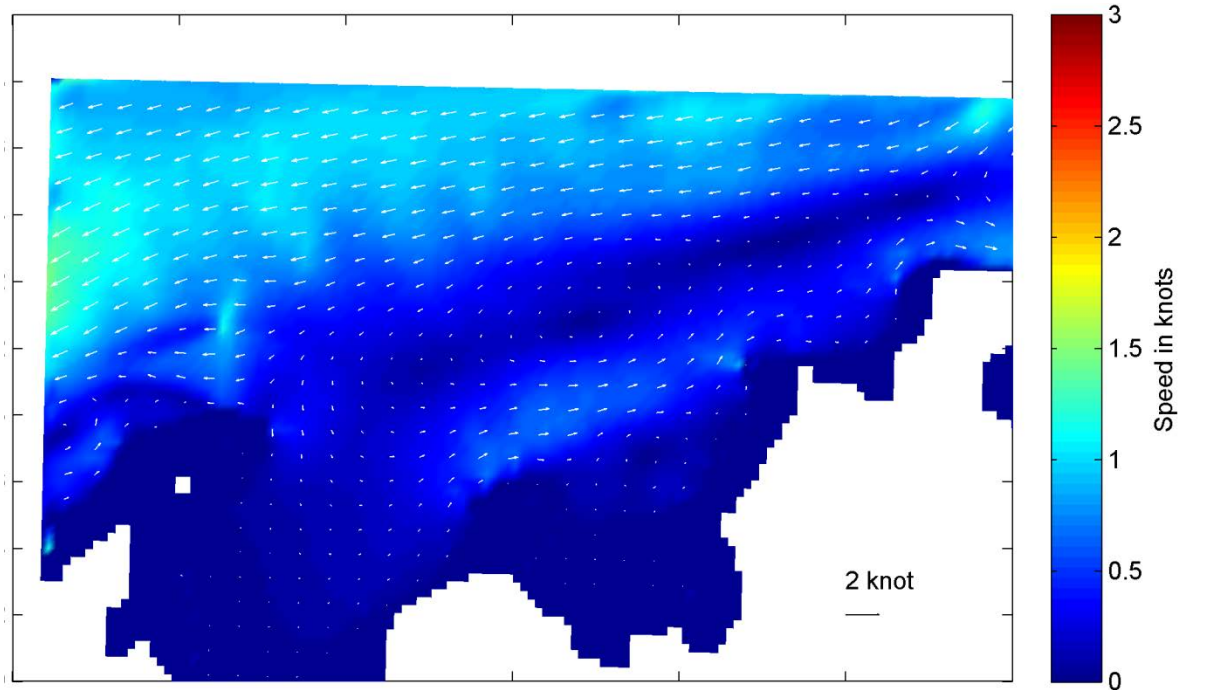
Neap tide



Data Source: RWE, Wylfa Hydrodynamic Model

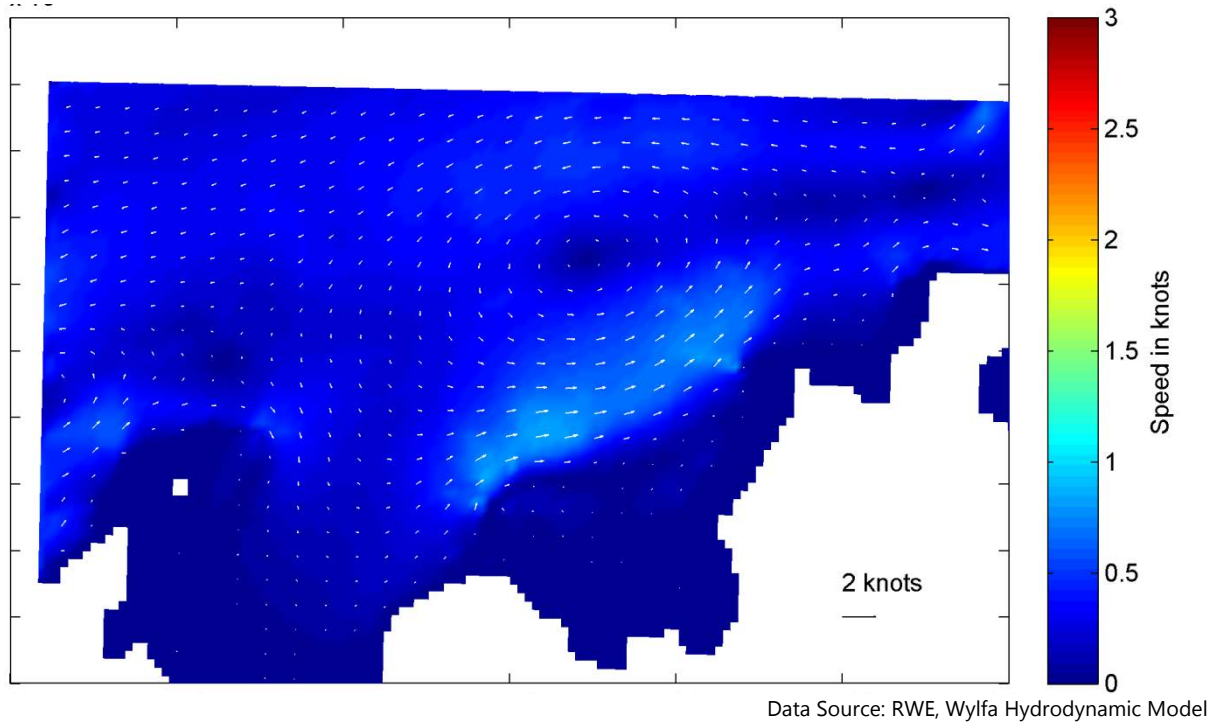
B.13 High Water Plus 6 Hours

Spring tide



Data Source: RWE, Wylfa Hydrodynamic Model

Neap tide



Data Source: RWE, Wylfa Hydrodynamic Model

C Construction Phase Navigational Risk Assessments

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
	Accidents to personnel	Commercial diving operations associated with the marine works	Dredge/construction vessel is unaware of divers in the water. Diver caught in propellers or umbilical severed, loss of life, operations cease during investigation, national adverse publicity.						Dredge/construction vessel approaches diving area and does not see 'A' flag. Vessel is warned of underwater operations and alters course. Divers taken out of water, disruption to activities.							1	Human error/fatigue - Ship Personnel
																5	Human error/fatigue - Port/Marine Personnel
																6	Inadequate bridge resource management
																7	Inadequate procedures in place on-board vessel
																23	Communication failure - Operational/procedural
																24	Communication failure - Equipment
																25	Communication failure - Personnel
																26	Adverse weather conditions
																28	Restricted visibility
																30	Failure to comply with VTS/LPS/SOPs
																31	Failure to observe standing notices
																33	High traffic density
1				5	3	1	0	4		1	0	0	0	1	5.09	37	Failure to comply with safe systems of work
																42	Non-attendance of boatmen
																43	Malicious action by external parties
																48	Risk Assessment, Incomplete/not reviewed
																55	Incapacitated master (drugs/alcohol)
																59	Inadequate procedures shore side
																61	Incorrect assessment of tidal flow
																78	Ship/Tug/Launch failure
																79	Weather & hydro failure - equipment
																80	Human error
																86	Competence
																87	Notice to Mariners failure to observe
																102	Language problems
																103	Excessive vessel speed

Control ID	Embedded Controls				Residual Risk	Current Risk	Control ID	Additional Controls				Residual Risk	Final Risk	Date	Assessors
	Control	Comment	Likelihood Reduction	Consequence Reduction				Control	Comment	Likelihood Reduction	Consequence Reduction				
26	Communications equipment	VHF radios used by diving team	10%	0%	5.04	4.81	9	Local Port Services - Harbour control office	Point of contact for Harbour operations and provided safety information to vessels	5%	5%	4.31	3.54	24-Oct-2016 Revised 02-Jun-2017	Anthony Hilliard - MCA Trevor Harris - Trinity House Wyn Parry - Stena Line Ports Ltd David Williams - Cemaes Harbour Committee Kim Argyle - Holyhead Sailing Club Monty Smedley - ABPmer Emma Beagley - Horizon
41	Notices to mariners	Issued weekly by the Admiralty	5%	0%	5.02		16	LPS broadcast (navigation and safety information)	VHF broadcast on commencement of diving operations	10%	0%	4.28			
44	Safe systems of work (H&S)	No diving operations to commence until reviewed and approved.	15%	0%	4.94		19	Port Facility Emergency Plan	Incorporating responsibility's as CAT 2 responder	0%	5%	4.10			
60	International COLREGS 1972 (as amended)		10%	0%	4.89		28	AIS coverage	All dredge/construction vessels, including barges to carry AIS (A or B).	5%	0%	4.08			
62	Emergency services equipment - shore side	Mayday or Pan-Pan call to Coastguards, local ambulance service.	0%	0%	4.89		41	Notices to mariners	Issued by the SHA or Local NtM	5%	0%	4.06			
95	Standing Orders/SOPs	In place on-board vessels	5%	0%	4.86		70	Marine Safety Management System	Prior to commencement of marine operations, MSMS established by the SHA, including SOPs	5%	0%	4.04			
97	Visual observation (clear line of sight)		5%	0%	4.84		112	PMSC compliance	SHA MSMS applies, which recognises the need for contractors RAMS to be agreed with the SHA in advance of marine works.	5%	0%	4.02			
102	Signage	A' flag displayed during diving operations	5%	0%	4.81		114	Directions (General) - issued by SHA	Allows HA to regulate vessel speed	5%	0%	4.00			
							132	Safety zone	Construction safety zone around the marine site, marked with buoyage.	10%	0%	3.92			
							140	RAMS	Provided to the HA and agreed prior to commencement of operations	10%	0%	3.91			
							141	Dedicated VHF channel	Licence obtained from OFCOM, information updated in ALRS	5%	0%	3.90			
							22	Contingency plan exercises		0%	5%	3.73			
							33	Training of port marine/operations personnel		0%	5%	3.55			
							137	Permit to work	Checklist to ensure all safety measures are in place prior to commencement of operations	10%	0%	3.54			

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
2	Accidents to personnel	Man overboard during dredge/construction works	Person falls into water during the dredge/construction works and hits head on the vessel leading to drowning. No pollution, delay to construction works during investigation. National adverse publicity.	5	3	0	0	3	Person falls into water during the dredge/construction works, person is recovered to shore and treated for cold water immersion. No pollution, minor delay to construction works.	1	1	0	0	1	4.69	1	Human error/fatigue - Ship Personnel
																7	Inadequate procedures in place on-board vessel
																8	Fire/Explosion
																16	Unplanned interaction with recreational/fishing craft
																20	Tug failure towing equipment
																23	Communication failure - Operational/procedural
																25	Communication failure - Personnel
																26	Adverse weather conditions
																30	Failure to comply with VTS/LPS/SOPs
																37	Failure to comply with safe systems of work
																48	Risk Assessment, Incomplete/not reviewed
																49	Loss of vessels stability (due to other than loss of watertight integrity)
																59	Inadequate procedures shore side
																76	Inadequate training/competence - Others
																78	Ship/Tug/Launch failure
																80	Human error
																86	Competence
																106	Inadequate PPE

Embedded Controls					Residual Risk	Current Risk	Additional Controls					Residual Risk	Final Risk	Date	Assessors
Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction			Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction				
26	Communications equipment	VHF radio available to vessels/personnel	0%	10%	4.33		9	Local Port Services - Harbour control office	Point of contact for Harbour operations, liaison with authorities during emergency	5%	5%	2.72			
44	Safe systems of work (H&S)	Provided by contractors and reviewed prior to operations	10%	0%	3.96		19	Port Facility Emergency Plan	Procedures for coordination of emergency operations	0%	5%	2.53			
62	Emergency services equipment - shore side	Mayday or Pan-Pan call to Coastguards, local ambulance service.	0%	10%	3.64		22	Contingency plan exercises	MoB drills at regular intervals	0%	5%	2.34			
95	Standing Orders/SOPs	Vessel SOPs for operations	10%	5%	3.44		27	CCTV coverage	Covering marine works	0%	10%	1.97			
155	PPE	Lifejackets and hard hats provided by contractor	0%	10%	3.11		28	AIS coverage	All dredge/construction vessels, including barges to carry AIS (A or B).	0%	5%	1.46			
142	International Convention for the Safety of Life at Sea (SOLAS) 1974	Details requirements for emergency procedures	0%	5%	2.93	2.93	70	Marine Safety Management System	Prior to commencement of marine operations, MSMS established by the SHA, including SOPs	10%	0%	1.46	0.73	24-Oct-2016 Revised 02-Jun-2017	Anthony Hilliard - MCA Trevor Harris - Trinity House Wyn Parry - Stena Line Ports Ltd David Williams - Cemaes Harbour Committee Kim Argyle - Holyhead Sailing Club Monty Smedley - ABPmer Emma Beagley - Horizon
							112	PMSC compliance	SHA MSMS applies, which recognises the need for contractors RAMS to be agreed with the SHA in advance of marine works.	10%	0%	1.46			
							140	RAMS	Reviewed prior to commencement of construction	5%	0%	1.46			
							142	International Convention for the Safety of Life at Sea (SOLAS) 1974	Appropriate craft capable of recovering MoB on-site and capable of immediate use	0%	10%	0.98			
							141	Dedicated VHF channel	Licence obtained from OFCOM information updated in ALRS. Channel used for HA and marine works operations	0%	5%	0.73			

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
3	Allision	Dredge/construction plant impact with marine works during construction phase	Dredge/construction craft slow speed impact with structures during the marine works dredge/construction phase. Minor damage to vessel, serious injury to crew, minor pollution (Tier 1). Delay to marine works due to repairs.	5	2	3	2	2	Dredge/construction vessel slow speed impact with structure during the marine works dredge/construction phase. No damage to vessel hull, minor injuries to crew, no pollution. Minor delay to marine works.	1	1	1	0	1	5.66	1	Human error/fatigue - Ship Personnel
																6	Inadequate bridge resource management
																7	Inadequate procedures in place on-board vessel
																11	Vessel breakdown or malfunction
																16	Unplanned interaction with recreational/fishing craft
																20	Tug failure towing equipment
																22	Failure to comply with Towage guidelines
																25	Communication failure - Personnel
																26	Adverse weather conditions
																28	Restricted visibility
																38	Shore side light backscatter
																55	Incapacitated master (drugs/alcohol)
																60	Protest by external parties
																61	Incorrect assessment of tidal flow
																68	Interaction
																72	Failure to follow passage plan
																76	Inadequate training/competence - Others
																78	Ship/Tug/Launch failure
																80	Human error
																84	Tugs - Inadequate/unavailable
																86	Competence
																103	Excessive vessel speed

Embedded Controls							Additional Controls									
Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction	Residual Risk	Current Risk	Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction	Residual Risk	Final Risk	Date	Assessors
26	Communications equipment	VHF radio available for all craft and supervisory personnel	10%	5%	4.97	4.35	9	Local Port Services - Harbour control office	Point of contact for Harbour operations. Provides safety information to vessels in the HA	10%	5%	4.12	2.43	24-Oct-2016 Revised 02-Jun-2017	Anthony Hilliard - MCA Trevor Harris - Trinity House Wyn Parry - Stena Line Ports Ltd David Williams - Cemaes Harbour Committee Kim Argyle - Holyhead Sailing Club Monty Smedley - ABPmer Emma Beagley - Horizon
44	Safe systems of work (H&S)	Reviewed and updated prior to commencement of operations	10%	0%	4.92		16	LPS broadcast (navigation and safety information)	Including weather conditions within the harbour	10%	0%	4.11			
95	Standing Orders/SOPs	In place on-board vessels	10%	5%	4.68		19	Port Facility Emergency Plan	Detailing the HA responsible to emergency situations	0%	5%	3.91			
97	Visual observation (clear line of sight)		10%	0%	4.63		21	Oil spill contingency plans	The MCA require an OPRC plan to be in place and approved by them prior to the commencement of marine works at the site.	0%	5%	3.72			
125	Standards of Training, Certification and Watchkeeping for Seafarers (STCW)	Maintain training and competence levels for vessel crew	50%	0%	4.38		22	Contingency plan exercises		0%	5%	3.52			
60	International COLREGS 1972 (as amended)		5%	0%	4.35		28	AIS coverage	All dredge/construction vessels, including barges to carry AIS (A or B).	10%	0%	3.51			
							36	Availability of pollution response equipment	Harbour and contractors to have equipment available	0%	5%	3.30			
							39	Direction (Special) - Powers of Harbour/Pier Master	Issued to control traffic in the event of an incident or for safety reasons	5%	5%	3.08			
							57	Aids to navigation, provision and maintenance of	All marine works are required to be lit, showing navigational lights/shapes as appropriate	10%	0%	3.06			
							69	Training of pollution response personnel		0%	5%	2.84			
							70	Marine Safety Management System	Established prior to operations based on risk assessment and containing procedures to allow for safe operations within the harbour	5%	0%	2.83			
							112	PMSC compliance		5%	0%	2.82			
							140	RAMS	Provided to HA and agreed prior to commencement of operations	10%	5%	2.44			
							141	Dedicated VHF channel	Licence obtained from OFCOM, information updated in ALRS	5%	0%	2.43			

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
4	Collision	Dredge/construction plant collision with recreational vessel	Collision of a recreational vessel with dredge/construction craft. Collision occurs at night, recreational vessel misunderstands or does not recognise navigational lights and shapes displayed by the dredge/construction craft, or dredge/construction craft not showing lights/shapes. Recreational vessel hull damaged leading to ingress of water and sinking, loss of life, small-scale pollution (Tier 1). Disruption to marine works during investigation and adverse publicity.	5	4	3	2	4	Collision of a recreational vessel with dredge or construction craft. Collision occurs at night, recreational vessel misunderstands or does not recognise navigational lights and shapes displayed by the dredge/construction craft, or dredge/construction craft not showing lights/shapes. Recreational vessel receives contact damage, no damage to dredge or construction plant. Minor injury to recreational vessel crew, no local adverse publicity.	5	1	2	0	1	6.59	1	Human error/fatigue - Ship Personnel
																6	Inadequate bridge resource management
																7	Inadequate procedures in place on-board vessel
																11	Vessel breakdown or malfunction
																16	Unplanned interaction with recreational/fishing craft
																23	Communication failure - Operational/procedural
																24	Communication failure - Equipment
																25	Communication failure - Personnel
																26	Adverse weather conditions
																28	Restricted visibility
																30	Failure to comply with VTS/LPS/SOPs
																31	Failure to observe standing notices
																32	Failure to observe Byelaws/local regulations
																33	High traffic density
																38	Shore side light backscatter
																48	Risk Assessment, Incomplete/not reviewed
																55	Incapacitated master (drugs/alcohol)
																56	COLREGS failure to comply
																61	Incorrect assessment of tidal flow
																68	Interaction
																72	Failure to follow passage plan
																76	Inadequate training/competence - Others
																80	Human error
																82	AIS failure
																86	Competence
																87	Notice to Mariners failure to observe
																102	Language problems
																103	Excessive vessel speed

Embedded Controls						Additional Controls								
Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction	Residual Risk	Current Risk	Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction	Residual Risk	Final Risk	Date	Assessors
10	Passage planning	Vessels must complete a detailed plan for every voyage	10%	0%	6.50	5.56	9	Local Port Services - Harbour control office	Point of contact for Harbour operations. Provides safety information to vessels in the HA	5%	5%	5.30	3.44	24-Oct-2016 Revised 02-Jun-2017	Anthony Hilliard - MCA Trevor Harris - Trinity House Wyn Parry - Stena Line Ports Ltd David Williams - Cemaes Harbour Committee Kim Argyle - Holyhead Sailing Club Monty Smedley - ABPmer Emma Beagley - Horizon
41	Notices to mariners	Issued weekly by the Admiralty, provided safety information	5%	0%	6.45		16	LPS broadcast (navigation and safety information)	Including weather conditions within the harbour	10%	0%	5.22			
60	International COLREGS 1972 (as amended)		5%	0%	6.41		19	Port Facility Emergency Plan	Detailing the HA responsible to emergency situations	0%	5%	5.00			
62	Emergency services equipment - shore side	Mayday or Pan-Pan call to Coastguards	5%	5%	6.05		21	Oil spill contingency plans	The MCA require an OPRC plan to be in place and approved by them prior to the commencement of marine works at the site.	0%	5%	4.78			
95	Standing Orders/SOPs	In place on-board vessels	5%	5%	5.78		22	Contingency plan exercises		0%	5%	4.56			
142	International Convention for the Safety of Life at Sea (SOLAS) 1974	Details requirements for emergency procedures	0%	5%	5.56		28	AIS coverage	All dredge/construction vessels, including barges to carry AIS (A or B).	10%	0%	4.48			
							36	Availability of pollution response equipment	Harbour and contractors to have equipment available	0%	5%	4.25			
							39	Direction (Special) - Powers of Harbour/Pier Master	Issued to control traffic in the event of an incident	5%	0%	4.21			
							41	Notices to mariners	Local Notice to Mariners issued by the SHA	5%	0%	4.17			
							45	Guidance for small craft	Passive (informative) management of leisure traffic by Development Liaison Team, written information to the RYA and local yacht clubs, and available as a web based resource.	10%	0%	4.09			
							69	Training of pollution response personnel		0%	5%	3.87			
							70	Marine Safety Management System	Established prior to operations based on risk assessment and containing procedures to allow for safe operations within the harbour	5%	0%	3.83			
							112	PMSC compliance	SHA MSMS applies, which recognises the need for contractors RAMS to be agreed with the SHA in advance of marine works.	5%	0%	3.78			
							114	Directions (General) - issued by SHA	Allows HA to regulate vessel speed	5%	0%	3.74			
							140	RAMS	Provided to HA and agreed prior to commencement of operations	5%	5%	3.46			
							141	Dedicated VHF channel	Licence obtained from OFCOM, information updated in ALRS	5%	0%	3.44			

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
5	Collision	Dredge/construction craft collision with commercial vessel	Collision of dredge/construction craft with commercial vessel in transit to or from the MOLF. Collision occurs in deep water. At least one vessel receives major hull damage, ingress of water and sinks. Multiple fatalities, pollution (Tier 2). Disruption to marine works meaning temporary suspension of operations until investigation complete and wreck removed. National adverse publicity.	5	4	4	3	3	Collision of Dredge/construction craft with commercial vessel in transit to or from the MOLF. Collision occurs in deep water. Vessels make contact whilst taking avoiding action, glancing blow resulting in minor damage to both vessels. Vessels return to nearest suitable berth to assess damage. Minor injury to crew, no pollution, no disruption to operations. Vessel remains at berth until damage is surveyed and repaired.	1	1	3	0	1	7.59	1	Human error/fatigue - Ship Personnel
																6	Inadequate bridge resource management
																7	Inadequate procedures in place on-board vessel
																11	Vessel breakdown or malfunction
																16	Unplanned interaction with recreational/fishing craft
																20	Tug failure towing equipment
																23	Communication failure - Operational/procedural
																24	Communication failure - Equipment
																25	Communication failure - Personnel
																26	Adverse weather conditions
																28	Restricted visibility
																30	Failure to comply with VTS/LPS/SOPs
																55	Incapacitated master (drugs/alcohol)
																56	COLREGS failure to comply
																61	Incorrect assessment of tidal flow
																72	Failure to follow passage plan
																76	Inadequate training/competence - Others
																78	Ship/Tug/Launch failure
																80	Human error
																82	AIS failure
																86	Competence
																102	Language problems
																103	Excessive vessel speed

Embedded Controls							Additional Controls								
Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction	Residual Risk	Current Risk	Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction	Residual Risk	Final Risk	Date	Assessors
10	Passage planning	Vessels must complete a detailed plan for every voyage	10%	0%	7.53	6.77	3	Communications - Traffic broadcast	LPS informs approaching vessel of movements within the harbour	10%	0%	6.71	5.77	24-Oct-2016 Revised 02-Jun-2017	Anthony Hilliard - MCA Trevor Harris - Trinity House Wyn Parry - Stena Line Ports Ltd David Williams - Cemaes Harbour Committee Kim Argyle - Holyhead Sailing Club Monty Smedley - ABPmer Emma Beagley - Horizon
60	International COLREGS 1972 (as amended)		15%	0%	7.44		9	Local Port Services - Harbour control office	Point of contact to control Harbour operations	5%	5%	6.44			
62	Emergency services equipment - shore side	Mayday or Pan-Pan call to Coastguards	5%	5%	7.06		13	Arrival/departure, advance notice of	To allow LPS to advise vessels operating at the marine works of traffic movements	10%	0%	6.39			
125	Standards of Training, Certification and Watchkeeping for Seafarers (STCW)	Maintain training and competence levels for vessel crew	10%	5%	6.77		16	LPS broadcast (navigation and safety information)	Including weather conditions within the harbour	5%	0%	6.36			
							28	AIS coverage	All dredge/construction vessels, including barges to carry AIS (A or B).	10%	5%	6.06			
							140	RAMS	Provided to HA and agreed prior to commencement of operations	5%	5%	5.80			
							141	Dedicated VHF channel	Licence obtained from OFCOM, information updated in ALRS	5%	0%	5.77			

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
6	Collision	Dredger or barge on passage to Holyhead North disposal site and other vessel	Collision between loaded dredger/barge and vessel transiting inshore of TSS. Damage to hull of both vessels leading to ingress of water and sinking of at least one vessel. Multiple fatalities, pollution (Tier 2), national adverse publicity, dredge operations cease until investigation complete and another vessel can be chartered.	5	4	4	3	3	Avoiding action taken resulting in glancing blow. Minor damage to both vessels, minor injuries to crew, no pollution, operations cease during survey and repair.	1	1	2	0	1	7.13	1	Human error/fatigue - Ship Personnel
																6	Inadequate bridge resource management
																7	Inadequate procedures in place onboard vessel
																26	Adverse weather conditions
																28	Restricted visibility
																33	High traffic density
																56	COLREGS failure to comply
																72	Failure to follow passage plan
																82	AIS failure
																86	Competence
																103	Excessive vessel speed
																105	Navigation equipment failure

Control ID	Embedded Controls				Residual Risk	Current Risk	Control ID	Additional Controls				Residual Risk	Final Risk	Date	Assessors
	Control	Comment	Likelihood Reduction	Consequence Reduction				Control	Comment	Likelihood Reduction	Consequence Reduction				
3	Communications - Traffic broadcast	Security message broadcast to vessels in the area	10%	0%	7.06	4.73	9	Local Port Services - Harbour control office	Point of control for Harbour operations	0%	5%	4.49	3.56	24-Oct-2016 Revised 02-Jun-2017	Anthony Hilliard - MCA Trevor Harris - Trinity House Wyn Parry - Stena Line Ports Ltd David Williams - Cemaes Harbour Committee Kim Argyle - Holyhead Sailing Club Monty Smedley - ABPmer Emma Beagley - Horizon
10	Passage planning	Vessels must complete a detailed plan for every voyage	10%	0%	7.00		16	LPS broadcast (navigation and safety information)		5%	0%	4.46			
28	AIS coverage	All dredgers are required to carry AIS	15%	0%	6.91		28	AIS coverage	All dredge/construction vessels, including barges to carry AIS (A or B).	10%	5%	4.17			
60	International COLREGS 1972 (as amended)		20%	0%	6.79		140	RAMS	Provided to HA and agreed prior to commencement of operations	5%	5%	3.56			
95	Standing Orders/SOPs	In place on a vessel as part of their SMS	10%	10%	6.17										
125	Standards of Training, Certification and Watchkeeping for Seafarers (STCW)	Maintain training and competence levels for vessel crew	10%	15%	5.43										
142	International Convention for the Safety of Life at Sea (SOLAS) 1974	Details requirements for emergency drills	0%	15%	4.73										

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
7	Collision	Dredger or barge Depositing load at Holyhead North with vessel transiting	Collision whilst dredger/barge stationary results in hull damage to both vessels, ingress of water and sinking of at least one vessel. Multiple fatalities, pollution (Tier 2), national adverse publicity, dredge operations cease until investigation complete and another vessel can be chartered.	10	4	4	3	3	Avoiding action taken resulting in glancing blow. Minor damage to both vessels, minor injuries to crew, no pollution, operations cease during survey and repair.	5	1	2	0	1	6.19	1	Human error/fatigue - Ship Personnel
																6	Inadequate bridge resource management
																7	Inadequate procedures in place on-board vessel
																26	Adverse weather conditions
																28	Restricted visibility
																33	High traffic density
																56	COLREGS failure to comply
																72	Failure to follow passage plan
																82	AIS failure
																86	Competence
																103	Excessive vessel speed
																105	Navigation equipment failure

Embedded Controls							Additional Controls								
Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction	Residual Risk	Current Risk	Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction	Residual Risk	Final Risk	Date	Assessors
10	Passage planning	Vessels must complete a detailed plan for every voyage	10%	0%	6.11	3.89	41	Notices to mariners	Publicised to advise vessels of disposal operations at the site	10%	0%	3.82	3.82	24-Oct-2016 Revised 02-Jun-2017	Anthony Hilliard - MCA Trevor Harris - Trinity House Wyn Parry - Stena Line Ports Ltd David Williams - Cemaes Harbour Committee Kim Argyle - Holyhead Sailing Club Monty Smedley - ABPmer Emma Beagley - Horizon
28	AIS coverage	All dredgers are required to carry AIS	10%	0%	6.03										
60	International COLREGS 1972 (as amended)		20%	0%	5.88										
95	Standing Orders/SOPs	In place on a vessel as part of their SMS	10%	10%	5.30										
125	Standards of Training, Certification and Watchkeeping for Seafarers (STCW)	Maintain training and competence levels for vessel crew	10%	15%	4.57										
142	International Convention for the Safety of Life at Sea (SOLAS) 1974	Details requirements for emergency drills	0%	15%	3.89										

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
8	Collision	Tug and tow collision with commercial vessel	Steering/propulsion failure causes tug and tow to drift into the Skerries traffic separation scheme. Collision with commercial vessel occurs in deep water. At least one vessel receives major hull damage, ingress of water and sinks. Multiple fatalities, pollution (Tier 2). Disruption to marine works meaning temporary suspension of operations until investigation complete and wreck removed. National adverse publicity.	5	4	4	3	3	Steering/propulsion failure causes tug and tow to drift into the Skerries traffic separation scheme. Collision occurs in deep water. Vessels make contact whilst taking avoiding action, glancing blow resulting in minor damage to both vessels. Vessels return to nearest suitable berth to assess damage. Minor injury to crew, no pollution, no disruption to operations.	1	1	3	0	1	7.59	1	Human error/fatigue - Ship Personnel
																6	Inadequate bridge resource management
																7	Inadequate procedures in place on-board vessel
																8	Fire/Explosion
																11	Vessel breakdown or malfunction
																14	Vessel has unreported defect
																20	Tug failure towing equipment
																23	Communication failure - Operational/procedural
																24	Communication failure - Equipment
																26	Adverse weather conditions
																33	High traffic density
																55	Incapacitated master (drugs/alcohol)
																75	Inadequate maintenance/inspection
																78	Ship/Tug/Launch failure
																80	Human error
																82	AIS failure
																84	Tugs - Inadequate/unavailable
																105	Navigation equipment failure

Control ID	Embedded Controls				Residual Risk	Current Risk	Control ID	Additional Controls				Residual Risk	Final Risk	Date	Assessors
	Control	Comment	Likelihood Reduction	Consequence Reduction				Control	Comment	Likelihood Reduction	Consequence Reduction				
3	Communications - Traffic broadcast	Security message broadcast to vessels in the area	10%	0%	7.53		9	Local Port Services - Harbour control office	Point of contact for Harbour operations	0%	5%	5.63			
10	Passage planning	Vessels must complete a detailed plan for every voyage	10%	0%	6.55		16	LPS broadcast (navigation and safety information)		5%	0%	5.62			
41	Notices to mariners	Issued weekly by the Admiralty, provided safety information	10%	0%	6.53		28	AIS coverage	All dredge/construction vessels, including barges to carry AIS (A or B).	10%	5%	5.36			
60	International COLREGS 1972 (as amended)		15%	0%	6.49		140	RAMS	Provided to HA and agreed prior to commencement of operations	5%	5%	5.63			
62	Emergency services equipment - shore side	Mayday or Pan-Pan call to Coastguards	0%	5%	6.16	5.86							5.63	24-Oct-2016 Revised 02-Jun-2017	Anthony Hilliard - MCA Trevor Harris - Trinity House Wyn Parry - Stena Line Ports Ltd David Williams - Cemaes Harbour Committee Kim Argyle - Holyhead Sailing Club Monty Smedley - ABPmer Emma Beagley - Horizon
118	Vessel maintenance	Maintenance schedule part of the vessel SMS	10%	0%	6.13										
119	Vessel inspection/survey	Port and flag state inspections and surveys by classification society	10%	0%	6.11										
125	Standards of Training, Certification and Watchkeeping for Seafarers (STCW)	Maintain training and competence levels for vessel crew	10%	5%	5.86										

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
9	Fire/Explosion	Dredge/construction plant on-board fire	Fire on-board the dredge/construction craft during the marine works dredge/construction phase. Substantial damage leaving the vessel inoperative, multipole fatalities, minor pollution (Tier 1) from firefighting products and run off, craft removed from service until repairs can be completed. Disruption to the marine works.	10	4	4	2	3	Fire on-board the dredge/construction craft during the marine works dredge/construction phase. Fire is contained by crew, resulting in localised damage to on-board equipment. Minor injuries, no pollution, vessel operational capability unaffected. Minor disruption to the marine works.	5	1	1	0	2	6.09	1	Human error/fatigue - Ship Personnel
																6	Inadequate bridge resource management
																7	Inadequate procedures in place on-board vessel
																8	Fire/Explosion
																11	Vessel breakdown or malfunction
																14	Vessel has unreported defect
																19	Vessel fails to notify hazardous cargo
																48	Risk Assessment, Incomplete/not reviewed
																75	Inadequate maintenance/inspection
																76	Inadequate training/competence - Others
																80	Human error
																86	Competence

Embedded Controls							Additional Controls									
Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction	Residual Risk	Current Risk	Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction	Residual Risk	Final Risk	Date	Assessors
44	Safe systems of work (H&S)	Provided by contractors after risk assessment	10%	0%	6.02		19	Port Facility Emergency Plan		0%	10%	4.98			
95	Standing Orders/SOPs	In place on-board vessels	10%	0%	5.94		21	Oil spill contingency plans	The MCA require an OPRC plan to be in place and approved by them prior to the commencement of marine works at the site.	0%	5%	4.76			
118	Vessel maintenance	Maintenance schedule part of the vessel SMS	10%	5%	5.55		22	Contingency plan exercises		0%	5%	4.54			
119	Vessel inspection/survey	Port and flag state inspections and surveys by classification society	10%	0%	5.49		33	Training of port marine/operations personnel	This should include the use of equipment and implementation of the plans	0%	5%	4.32			Anthony Hilliard - MCA Trevor Harris - Trinity House Wyn Parry - Stena Line Ports Ltd David Williams - Cemaes Harbour Committee Kim Argyle - Holyhead Sailing Club Monty Smedley - ABPmer Emma Beagley - Horizon
125	Standards of Training, Certification and Watchkeeping for Seafarers (STCW)	Maintain training and competence levels for vessel crew	10%	0%	5.43	5.43	36	Availability of pollution response equipment	Harbour and contractors to have equipment available	0%	5%	4.10	3.59	24-Oct-2016 Revised 02-Jun-2017	
							39	Direction (Special) - Powers of Harbour/Pier Master	Issued to control traffic in the event of an incident	0%	5%	3.88			
							69	Training of pollution response personnel		0%	5%	3.65			
							70	Marine Safety Management System	Prior to commencement of marine operations, MSMS established by the SHA.	5%	0%	3.62			
							112	PMSC compliance	SHA MSMS applies, which recognises the need for contractors RAMS to be agreed with the SHA in advance of marine works.	5%	0%	3.59			

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
10	Fire/Explosion	Ordnance found during dredge/construction	Dredger makes contact with unexploded ordnance. Resulting explosion punctures hull leading to flooding and sinking. Multiple fatalities through explosion and/or vessel sinking. Pollution (Tier 2). Significant disruption to the marine works and national adverse publicity.	10	4	4	3	3	Dredger brings unexploded ordnance on-board, which is identified by the crew. LPS (Local Ports Services and/or site office) is informed and the area is evacuated, the EOD (bomb disposal) team attend the site. Disruption to the marine works. No injury or pollution.	5	0	0	0	3	6.16	8	Fire/Explosion
																48	Risk Assessment, Incomplete/not reviewed
																59	Inadequate procedures shore side
																104	Inadequate surveying at planning stage

Embedded Controls							Additional Controls								
Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction	Residual Risk	Current Risk	Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction	Residual Risk	Final Risk	Date	Assessors
62	Emergency services equipment - shore side		0%	10%	5.73	5.20	9	Local Port Services - Harbour control office	Point of contact to control Harbour operations	0%	5%	4.99	2.99	24-Oct-2016 Revised 02-Jun-2017	Anthony Hilliard - MCA Trevor Harris - Trinity House Wyn Parry - Stena Line Ports Ltd David Williams - Cemaes Harbour Committee Kim Argyle - Holyhead Sailing Club Monty Smedley - ABPmer Emma Beagley - Horizon
115	Unexploded ordnance investigation and reported risk levels		40%	0%	5.48		19	Port Facility Emergency Plan	Detailing the HA responsible to emergency situations	0%	5%	4.78			
130	Vessel safety management system (ISM code)		10%	5%	5.20		21	Oil spill contingency plans	The MCA require an OPRC plan to be in place and approved by them prior to the commencement of marine works at the site.	10%	5%	4.50			
							22	Contingency plan exercises		0%	5%	4.28			
							36	Availability of pollution response equipment	Harbour and contractors to have equipment available	10%	5%	3.97			
							39	Direction (Special) - Powers of Harbour/Pier Master	Issued to control traffic in the event of an incident	0%	5%	3.73			
							70	Marine Safety Management System	Prior to commencement of marine operations, MSMS established by the SHA.	10%	5%	3.42			
							112	PMSC compliance	SHA MSMS applies, which recognises the need for contractors RAMS to be agreed with the SHA in advance of marine works.	10%	5%	3.08			
							132	Safety zone	Construction safety zone around the marine site, marked with special marker buoyage.	15%	0%	2.99			

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
11	Fire/Explosion	Pressure waves caused by explosives during dredging operations.	Explosives detonated too close to a dredge/construction plant. Severe injuries, noise impacts on marine environment. No impact on construction works or program	10	2	1	3	0	Pressure waves from explosives cause disturbance to marine environment.	5	0	0	2	0	4.41	1	Human error/fatigue - Ship Personnel
																5	Human error/fatigue - Port/Marine Personnel
																6	Inadequate bridge resource management
																7	Inadequate procedures in place on-board vessel
																8	Fire/Explosion
																25	Communication failure - Personnel
																30	Failure to comply with VTS/LPS/SOPs
																31	Failure to observe standing notices
																32	Failure to observe Byelaws/local regulations
																37	Failure to comply with safe systems of work
																48	Risk Assessment, Incomplete/not reviewed
																59	Inadequate procedures shore side
																80	Human error
																86	Competence

Embedded Controls							Additional Controls								
Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction	Residual Risk	Current Risk	Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction	Residual Risk	Final Risk	Date	Assessors
26	Communications equipment	VHF radio available for all craft and supervisory personnel	10%	5%	4.14	3.87	9	Local Port Services - Harbour control office	Point of contact to control Harbour operations	5%	0%	3.84	3.19	24-Oct-2016 Revised 02-Jun-2017	Anthony Hilliard - MCA Trevor Harris - Trinity House Wyn Parry - Stena Line Ports Ltd David Williams - Cemaes Harbour Committee Kim Argyle - Holyhead Sailing Club Monty Smedley - ABPmer Emma Beagley - Horizon
44	Safe systems of work (H&S)	Provided by contractors after risk assessment	15%	0%	4.05		16	LPS broadcast (navigation and safety information)	Security message broadcast prior to explosive operations	10%	5%	3.64			
95	Standing Orders/SOPs	Provided by the vessels owners/operators	5%	5%	3.87		39	Direction (Special) - Powers of Harbour/Pier Master	Issued to control traffic in the event of an incident	5%	0%	3.61			
							70	Marine Safety Management System	Prior to commencement of marine operations, MSMS established by the SHA.	5%	5%	3.43			
							112	PMSC compliance	SHA MSMS applies, which recognises the need for contractors RAMS to be agreed with the SHA in advance of marine works.	5%	5%	3.25			
							140	RAMS	Provided to HA and agreed prior to commencement of operations	10%	0%	3.19			

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
12	Flooding	Dredger flooding whilst engaged in operations	Ingress of water due to weld failure, sea valve failure, hatches/ramps not secure, affects vessel stability leading to vessel sinking. Loss of life, pollution (Tier 2), multiple fatalities. Vessel wreck presents navigation hazard. Operations cease until wreck is removed and investigation complete. National adverse publicity	5	4	4	3	3	Ingress of water controlled before vessel stability affected. Operations delayed until investigation/repairs completed.	1	0	1	0	2	6.81	1	Human error/fatigue - Ship Personnel
																9	Loss of watertight integrity
																11	Vessel breakdown or malfunction
																14	Vessel has unreported defect
																25	Communication failure - Personnel
																26	Adverse weather conditions
																43	Malicious action by external parties
																57	Vessel Ramps or Hatches not secure
																75	Inadequate maintenance/inspection
																76	Inadequate training/competence - Others
																80	Human error
																86	Competence

Embedded Controls							Additional Controls									
Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction	Residual Risk	Current Risk	Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction	Residual Risk	Final Risk	Date	Assessors
26	Communications equipment	VHF radio available for all craft and supervisory personnel	5%	0%	6.78	4.64	19	Port Facility Emergency Plan	Detailing the HA responsible to emergency situations	0%	5%	4.41	1.68	24-Oct-2016 Revised 02-Jun-2017	Anthony Hilliard - MCA Trevor Harris - Trinity House Wyn Parry - Stena Line Ports Ltd David Williams - Cemaes Harbour Committee Kim Argyle - Holyhead Sailing Club Monty Smedley - ABPmer Emma Beagley - Horizon
62	Emergency services equipment - shore side	Mayday or Pan-Pan call to Coastguards	0%	10%	6.29		21	Oil spill contingency plans	The MCA require an OPRC plan to be in place and approved by them prior to the commencement of marine works at the site.	0%	5%	4.19			
95	Standing Orders/SOPs	Provided by the vessels owners/operators	5%	5%	6.05		22	Contingency plan exercises	MoB drills at regular intervals	0%	5%	3.60			
110	Ramps/hatches closed when underway	Watertight doors should remain closed during operations	15%	0%	5.96		33	Training of port marine/operations personnel	This should include the use of equipment and implementation of the plans	0%	5%	3.28			
118	Vessel maintenance	Maintenance schedule part of the vessel SMS	15%	10%	5.44		36	Availability of pollution response equipment	Harbour and contractors to have equipment available	0%	5%	2.95			
119	Vessel inspection/survey	Port and flag state inspections and surveys by classification society	15%	10%	4.92		39	Direction (Special) - Powers of Harbour/Pier Master	Issued to control traffic in the event of an incident	5%	0%	2.93			
120	Vessel secured for sea		10%	5%	4.64		69	Training of pollution response personnel		0%	5%	2.55			
							70	Marine Safety Management System	Prior to commencement of marine operations, MSMS established by the SHA.	5%	5%	2.19			
							108	Requirement for notification of vessel defects	Defects will be reported to the SHA	10%	0%	2.15			
							112	PMSC compliance	SHA MSMS applies, which recognises the need for contractors RAMS to be agreed with the SHA in advance of marine works.	5%	5%	1.68			

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
13	Grounding	Dredge/construction craft grounding due to marine works	Dredge/construction craft grounds marine works during the dredge/construction phase (this is a declining risk over time as works progress and depth increases). Hull damaged causing ingress of water and vessel sinking. Multiple fatalities, pollution (Tier 2), disruption to marine works until wreck is removed and investigation complete. National adverse publicity	5	4	4	3	3	Dredge/construction craft grounds on marine works during the dredge/construction phase (this is a declining risk over time as works progress and depth increases). Minor damage to the craft, minor injuries. Delay to marine works during repair to craft.	1	1	2	0	1	7.13	1	Human error/fatigue - Ship Personnel
																6	Inadequate bridge resource management
																7	Inadequate procedures in place on-board vessel
																11	Vessel breakdown or malfunction
																14	Vessel has unreported defect
																25	Communication failure - Personnel
																26	Adverse weather conditions
																27	Unexpected shoaling
																28	Restricted visibility
																30	Failure to comply with VTS/LPS/SOPs
																31	Failure to observe standing notices
																37	Failure to comply with safe systems of work
																43	Malicious action by external parties
																48	Risk Assessment, Incomplete/not reviewed
																60	Protest by external parties
																61	Incorrect assessment of tidal flow
																72	Failure to follow passage plan
																80	Human error
																86	Competence
																103	Excessive vessel speed
																104	Inadequate surveying at planning stage

Embedded Controls							Additional Controls									
Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction	Residual Risk	Current Risk	Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction	Residual Risk	Final Risk	Date	Assessors
12	Draught, Accurate, declared and within max limits	Necessary for determining minimum depth that can be safely navigated	5%	0%	7.09	6.28	9	Local Port Services - Harbour control office	Point of contact to control Harbour operations	5%	5%	6.03	2.83	24-Oct-2016 Revised 02-Jun-2017	Anthony Hilliard - MCA Trevor Harris - Trinity House Wyn Parry - Stena Line Ports Ltd David Williams - Cemaes Harbour Committee Kim Argyle - Holyhead Sailing Club Monty Smedley - ABPmer Emma Beagley - Horizon
17	Hydrographic surveying program	To monitor depths	10%	0%	7.03		16	LPS broadcast (navigation and safety information)		5%	0%	6.00			
26	Communications equipment	VHF radio all craft and supervisory personnel	5%	0%	7.00		19	Port Facility Emergency Plan		0%	5%	5.77			
31	Availability of latest hydrographic information	Accurate chart update following hydrographic survey	10%	0%	6.94		21	Oil spill contingency plans	The MCA require an OPRC plan to be in place and approved by them prior to the commencement of marine works at the site.	0%	5%	5.54			
41	Notices to mariners	Issued weekly by the Admiralty, provided safety information	5%	0%	6.91		22	Contingency plan exercises	MoB drills at regular intervals	0%	5%	5.31			
69	Training of pollution response personnel	Vessels crews trained in pollution response	0%	5%	6.57		30	Accurate tidal measurements	Tide level observed on-site and made available to vessels	5%	0%	5.28			
95	Standing Orders/SOPs	Provided by the vessels owners/operators	5%	5%	6.31		36	Availability of pollution response equipment	Shore side equipment provided by the SHA	5%	0%	5.26			
97	Visual observation (clear line of sight)		5%	0%	6.28		39	Direction (Special) - Powers of Harbour/Pier Master	Issued to control traffic in the event of an incident	0%	5%	5.02			
							41	Notices to mariners	Issued by the SHA	0%	5%	4.79			
							57	Aids to navigation, provision and maintenance of	All marine works are required to be lit	10%	0%	4.73			
							108	Requirement for notification of vessel defects	Defects will be reported to the HA	5%	0%	4.70			
							112	PMSC compliance	SHA MSMS applies, which recognises the need for contractors RAMS to be agreed with the SHA in advance of marine works.	5%	5%	4.43			
							114	Directions (General) - issued by SHA		5%	5%	3.93			
							129	Vessel master simulation training	Ability for vessel Masters to practice on a ship simulator prior to navigating on-site.	15%	15%	2.85			
							133	Tidal flow atlas	Covering each hour for spring and neap, scaled for the Harbour Area, including the combined effect of Cooling Water intake and discharge.	15%	0%	2.83			

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
14	Grounding	Dredger/barge on passage to Holyhead North disposal site	Dredger/barge grounds in restricted visibility on the rocks inshore of the Skerries lighthouse. Hull damaged leading to ingress of water and vessel sinking. Multiple fatalities, pollution (Tier 2), disruption to marine works until wreck is removed and investigation complete. National adverse publicity	5	4	4	3	4	Dredger/barge grounds in restricted visibility on the rocks inshore of the Skerries lighthouse. Hull damaged, vessel able to return safely to harbour. Vessel out of service during survey and repairs, minor injuries.	1	1	2	0	1	7.22	1	Human error/fatigue - Ship Personnel
																6	Inadequate bridge resource management
																7	Inadequate procedures in place on-board vessel
																11	Vessel breakdown or malfunction
																26	Adverse weather conditions
																28	Restricted visibility
																36	Failure of Aid to Navigation (out of position/unlit)
																72	Failure to follow passage plan
																86	Competence
																103	Excessive vessel speed
																105	Navigation equipment failure

Control ID	Embedded Controls				Residual Risk	Current Risk	Control ID	Additional Controls				Residual Risk	Final Risk	Date	Assessors
	Control	Comment	Likelihood Reduction	Consequence Reduction				Control	Comment	Likelihood Reduction	Consequence Reduction				
10	Passage planning	Vessels must complete a detailed plan for every voyage	15%	0%	7.13	4.63							4.63	24-Oct-2016 Revised 02-Jun-2017	Anthony Hilliard - MCA Trevor Harris - Trinity House Wyn Parry - Stena Line Ports Ltd David Williams - Cemaes Harbour Committee Kim Argyle - Holyhead Sailing Club Monty Smedley - ABPmer Emma Beagley - Horizon
57	Aids to navigation, provision and maintenance of	Available in the area to mark dangers to navigation	15%	0%	7.04										
60	International COLREGS 1972 (as amended)		10%	0%	6.98										
95	Standing Orders/SOPs	Provided by the vessels owners/operators	10%	10%	6.34										
125	Standards of Training, Certification and Watchkeeping for Seafarers (STCW)	Maintain training and competence levels for vessel crew	10%	15%	5.58										
142	International Convention for the Safety of Life at Sea (SOLAS) 1974	Details requirements for emergency drills	0%	15%	4.88										
69	Training of pollution response personnel	Crew of vessels are trained for oil spill response	0%	5%	4.63										

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
15	Grounding	Tug and tow grounding due to steering/propulsion failure	Steering/propulsion failure causes tug and tow to drift into the Skerries traffic separation scheme. Collision with commercial vessel occurs in deep water. At least one vessel receives major hull damage, ingress of water and sinks. Multiple fatalities, pollution (Tier 2). Disruption to marine works meaning temporary suspension of operations until investigation complete and wreck removed. National adverse publicity.	5	4	4	3	4	Tug and tow grounds on rocky seabed, hull is not punctured and vessel remains afloat. Minor damage to the vessel, minor injuries. Delay to marine works until repairs complete.	1	1	2	0	1	7.22	1	Human error/fatigue - Ship Personnel
																6	Inadequate bridge resource management
																7	Inadequate procedures in place on-board vessel
																9	Loss of watertight integrity
																11	Vessel breakdown or malfunction
																14	Vessel has unreported defect
																25	Communication failure - Personnel
																26	Adverse weather conditions
																37	Failure to comply with safe systems of work
																48	Risk Assessment, Incomplete/not reviewed
																75	Inadequate maintenance/inspection
																80	Human error
																86	Competence

Embedded Controls							Additional Controls								
Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction	Residual Risk	Current Risk	Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction	Residual Risk	Final Risk	Date	Assessors
62	Emergency services equipment - shore side	Mayday or Pan-Pan call to Coastguards	0%	10%	6.74	6.51	9	Local Port Services - Harbour control office	Point of contact to control Harbour operations	0%	5%	6.28	5.35	24-Oct-2016 Revised 02-Jun-2017	Anthony Hilliard - MCA Trevor Harris - Trinity House Wyn Parry - Stena Line Ports Ltd David Williams - Cemaes Harbour Committee Kim Argyle - Holyhead Sailing Club Monty Smedley - ABPmer Emma Beagley - Horizon
118	Vessel maintenance	Maintenance schedule part of the vessel SMS	10%	0%	6.57		21	Oil spill contingency plans	The MCA require an OPRC plan to be in place and approved by them prior to the commencement of marine works at the site.	0%	5%	6.05			
119	Vessel inspection/survey	Port and flag state inspections and surveys by classification society	10%	0%	6.51		22	Contingency plan exercises	MoB drills at regular intervals	0%	5%	5.81			
							36	Availability of pollution response equipment	Shore side equipment provided by the SHA	0%	5%	5.58			
							69	Training of pollution response personnel	Response by the SHA	0%	5%	5.35			

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
16	Hazardous substance accidents	Accidental spill	Marine incident, split hose or pipe causes pollution in water. Available equipment not sufficient to contain spill. Tier 2 contractor required. National adverse publicity	5	0	0	3	4	Refuelling machinery on marine plant such as generators, compressors or craneage. Pollution from leading to Tier 1 response. Available pollution response equipment deployed. No effect to other nearby vessels.	1	0	0	2	2	5.91	1	Human error/fatigue - Ship Personnel
																5	Human error/fatigue - Port/Marine Personnel
																7	Inadequate procedures in place on-board vessel
																11	Vessel breakdown or malfunction
																14	Vessel has unreported defect
																24	Communication failure - Equipment
																25	Communication failure - Personnel
																48	Risk Assessment, Incomplete/not reviewed
																59	Inadequate procedures shore side
																62	Illegal discharges into the water
																69	Port Equipment (inc craft) mechanical breakdown/system malfunction
																75	Inadequate maintenance/inspection
																76	Inadequate training/competence - Others

Embedded Controls							Additional Controls								
Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction	Residual Risk	Current Risk	Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction	Residual Risk	Final Risk	Date	Assessors
21	Oil spill contingency plans	Vessels will have oil spill contingency plans that are specific to that vessel	0%	10%	5.54	4.63	9	Local Port Services - Harbour control office	Emergency plan response coordination	0%	5%	4.44	1.46	24-Oct-2016 Revised 02-Jun-2017	Anthony Hilliard - MCA Trevor Harris - Trinity House Wyn Parry - Stena Line Ports Ltd David Williams - Cemaes Harbour Committee Kim Argyle - Holyhead Sailing Club Monty Smedley - ABPmer Emma Beagley - Horizon
22	Contingency plan exercises	Oil spill response drills run by vessels crew	0%	10%	5.18		20	Port waste management plan	Created by the SHA	5%	5%	4.23			
36	Availability of pollution response equipment	Vessels will have pollution response equipment	0%	10%	4.81		21	Oil spill contingency plans	The MCA require an OPRC plan to be in place and approved by them prior to the commencement of marine works at the site.	0%	10%	3.38			
69	Training of pollution response personnel	Crew of vessels are trained for oil spill response	0%	5%	4.63		22	Contingency plan exercises	MoB drills at regular intervals	0%	5%	3.08			
							27	CCTV coverage	Monitoring the HA area	10%	0%	3.04			
							36	Availability of pollution response equipment	Shore side equipment provided by the SHA	0%	5%	2.75			
							69	Training of pollution response personnel	Response by the SHA	0%	5%	2.40			
							70	Marine Safety Management System	Prior to commencement of marine operations, MSMS established by the SHA.	5%	5%	2.08			
							112	PMSC compliance	SHA MSMS applies, which recognises the need for contractors RAMS to be agreed with the SHA in advance of marine works.	5%	5%	1.46			

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
17	Machinery related accidents	Heavy lift failure, or failure of lifting gear	Failure during unloading of vessels with load slung. Load released and lands on vessel deck causing major damage to vessel or failure during transfer of heavy cargo from vessel to quay. Multiple fatalities, no pollution (Tier 1), operations cease pending recovery and investigation.	5	4	3	0	3	Failure of lifting equipment causes automatic shutoff. Delay to operations while repairs are made.	1	0	0	0	2	5.94	1	Human error/fatigue - Ship Personnel
																5	Human error/fatigue - Port/Marine Personnel
																7	Inadequate procedures in place on-board vessel
																8	Fire/Explosion
																11	Vessel breakdown or malfunction
																23	Communication failure - Operational/procedural
																31	Failure to observe standing notices
																37	Failure to comply with safe systems of work
																69	Port Equipment (inc craft) mechanical breakdown/system malfunction
																75	Inadequate maintenance/inspection
																76	Inadequate training/competence - Others
																80	Human error
																86	Competence

Control ID	Embedded Controls				Residual Risk	Current Risk	Control ID	Additional Controls				Residual Risk	Final Risk	Date	Assessors
	Control	Comment	Likelihood Reduction	Consequence Reduction				Control	Comment	Likelihood Reduction	Consequence Reduction				
26	Communications equipment	VHF radio all craft and supervisory personnel	5%	5%	5.73	4.65	9	Local Port Services - Harbour control office	Coordination of marine response and emergency plan enactment	0%	5%	4.46	3.68	24-Oct-2016 Revised 02-Jun-2017	Anthony Hilliard - MCA Trevor Harris - Trinity House Wyn Parry - Stena Line Ports Ltd David Williams - Cemaes Harbour Committee Kim Argyle - Holyhead Sailing Club Monty Smedley - ABPmer Emma Beagley - Horizon
44	Safe systems of work (H&S)	Provided by contractors after risk assessment	10%	10%	5.31		19	Port Facility Emergency Plan	Detailing the HA responsible to emergency situations	0%	5%	4.27			
62	Emergency services equipment - shore side	Mayday or Pan-Pan call to Coastguards	0%	5%	5.12		21	Oil spill contingency plans	The MCA require an OPRC plan to be in place and approved by them prior to the commencement of marine works at the site.	0%	5%	4.08			
95	Standing Orders/SOPs	Provided by the vessels owners/operators	10%	10%	4.70		22	Contingency plan exercises	MoB drills at regular intervals	0%	5%	3.88			
116	Weather forecasting	Advance warning gained from available met ocean forecasts.	10%	0%	4.65		70	Marine Safety Management System	Prior to commencement of marine operations, MSMS established by the SHA.	5%	0%	3.86			
							112	PMSC compliance	SHA MSMS applies, which recognises the need for contractors RAMS to be agreed with the SHA in advance of marine works.	5%	0%	3.83			
							116	Weather forecasting	Seastate model used throughout the build phase of the MOLF to predict weather conditions and downtime.	15%	0%	3.75			
							122	Shore side facility maintenance programme	Maintenance of craneage and all lifting equipment	15%	0%	3.68			

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
18	Other	Malicious actions by third parties	Deliberate boarding of dredge/construction vessel during the marine works. Persons board vessels causing damage, vessel set adrift by malicious actions. Significant delay to construction works. Significant media interest	5	0	2	0	3	Deliberate boarding of dredge/construction vessel during the marine works. Persons boarding vessels are stopped and/or turned away by crew/security or police presence. Minor delay to marine works.	1	0	0	0	2	4.91	23	Communication failure - Operational/procedural
																30	Failure to comply with VTS/LPS/SOPs
																31	Failure to observe standing notices
																32	Failure to observe Byelaws/local regulations
																43	Malicious action by external parties
																59	Inadequate procedures shore side
																60	Protest by external parties
																63	Breach of security at berth/terminal/ship
																77	Port infrastructure failure

Embedded Controls							Additional Controls									
Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction	Residual Risk	Current Risk	Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction	Residual Risk	Final Risk	Date	Assessors
62	Emergency services equipment - shore side	Police force consulted on plans to deter/prevent malicious actions	0%	10%	4.62	4.62	19	Port Facility Emergency Plan	Detailing the HA responsible to emergency situations	0%	10%	4.33	3.42	24-Oct-2016 Revised 02-Jun-2017	Anthony Hilliard - MCA Trevor Harris - Trinity House Wyn Parry - Stena Line Ports Ltd David Williams - Cemaes Harbour Committee Kim Argyle - Holyhead Sailing Club Monty Smedley - ABPmer Emma Beagley - Horizon
							22	Contingency plan exercises	MoB drills at regular intervals	0%	5%	4.18			
							27	CCTV coverage	Monitoring the HA area	20%	0%	4.09			
							70	Marine Safety Management System	The MSMS should detail relevant powers and procedures	5%	0%	4.07			
							112	PMSC compliance	SHA MSMS applies, which recognises the need for contractors RAMS to be agreed with the SHA in advance of marine works.	5%	0%	4.04			
							111	ISPS compliance	Requires plans to be implemented to maintain security at a harbour	20%	0%	3.95			
							123	Afloat deterrent	Patrol boat to provide visual security presence and deter entry as required	15%	15%	3.42			

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
19	Other	Vessel damage due to weather conditions.	Adverse weather conditions lead to construction vessel grounding/stranding/allision. Weather related effects include waves, high wind and reduced visibility. Vessel hull damaged, takes on water and sinks. Multiple fatalities, pollution (Tier 2), operations cease and adverse publicity.	5	4	4	3	4	Construction operations cease until weather conditions drop below the operating threshold(s). Disruption to operations.	1	0	0	0	2	6.59	26	Adverse weather conditions
																30	Failure to comply with VTS/LPS/SOPs
																48	Risk Assessment, Incomplete/not reviewed
																79	Weather & hydro failure - equipment

Embedded Controls							Additional Controls								
Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction	Residual Risk	Current Risk	Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction	Residual Risk	Final Risk	Date	Assessors
116	Weather forecasting	Advance warning gained from available internet resources and met ocean forecasts.	20%	0%	6.48	6.48	70	Marine Safety Management System	Prior to commencement of marine operations, MSMS established by the SHA.	5%	0%	6.45	5.50	24-Oct-2016 Revised 02-Jun-2017	Anthony Hilliard - MCA Trevor Harris - Trinity House Wyn Parry - Stena Line Ports Ltd David Williams - Cemaes Harbour Committee Kim Argyle - Holyhead Sailing Club Monty Smedley - ABPmer Emma Beagley - Horizon
							112	PMSC compliance	SHA MSMS applies, which recognises the need for contractors to risk assess marine operations and agree plans with the SHA in advance of marine works.	5%	0%	6.42			
							116	Weather forecasting	Seastate model used throughout the build phase of the MOLF to predict weather conditions and downtime.	15%	0%	6.33			
							21	Oil spill contingency plans	The MCA require an OPRC plan to be in place and approved by them prior to the commencement of marine works at the site.	0%	5%	6.13			
							22	Contingency plan exercises	MoB drills at regular intervals	0%	5%	5.92			
							36	Availability of pollution response equipment	Shore side equipment provided by the SHA	0%	5%	5.71			
							69	Training of pollution response personnel	Response by the SHA	0%	5%	5.50			

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
20	Other	Mooring failure on Temporary moorings	Moorings part causing vessel to drift from berth and allision with marine works. Major injuries to crew or shore staff due to line snap-back and sudden movement. Extensive damage to marine works and craft, pollution (Tier 1), delay to operations until repairs complete.	5	2	4	2	3	Not all moorings part, vessel kept alongside but has impact with jetty. Minor damage to vessel and jetty, delays whilst repairs complete.	1	0	2	0	2	6.66	1	Human error/fatigue - Ship Personnel
																5	Human error/fatigue - Port/Marine Personnel
																11	Vessel breakdown or malfunction
																25	Communication failure - Personnel
																26	Adverse weather conditions
																40	Failure of berth mooring systems
																42	Non-attendance of boatmen
																43	Malicious action by external parties
																59	Inadequate procedures shore side
																60	Protest by external parties
																68	Interaction
																75	Inadequate maintenance/inspection
																76	Inadequate training/competence - Others
																80	Human error
																86	Competence

Embedded Controls							Additional Controls									
Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction	Residual Risk	Current Risk	Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction	Residual Risk	Final Risk	Date	Assessors
95	Standing Orders/SOPs	Provided by the vessels owners/operators	10%	0%	6.60	6.60	9	Local Port Services - Harbour control office	Coordination of marine response and emergency plan enactment	5%	0%	6.57	4.99	24-Oct-2016 Revised 02-Jun-2017	Anthony Hilliard - MCA Trevor Harris - Trinity House Wyn Parry - Stena Line Ports Ltd David Williams - Cemaes Harbour Committee Kim Argyle - Holyhead Sailing Club Monty Smedley - ABPmer Emma Beagley - Horizon
							16	Communications - Traffic broadcast	LPS broadcast (navigation and safety information)	10%	0%	6.51			
							18	Safe allocation of berths (depth, available, suitable)	Berths located to minimise ranging due to weather	10%	0%	6.45			
							39	Direction (Special) - Powers of Harbour/Pier Master	Issued to control traffic in the event of an incident	0%	5%	6.24			
							59	Protective fendering	in place on jetties/quays and suitable for vessels being used	0%	5%	6.03			
							70	Marine Safety Management System	Prior to commencement of marine operations, MSMS established by the SHA.	5%	0%	6.00			
							112	PMSC compliance	SHA MSMS applies, which recognises the need for contractors RAMS to be agreed with the SHA in advance of marine works.	5%	0%	5.97			
							124	Mooring studies and plans	Berths designed for the prevailing Met ocean conditions and mooring arrangements suitable for vessel size	20%	20%	5.02			
							140	RAMS	Method Statement identifies practices for establishing temporary moorings.	5%	0%	4.99			

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
21	Other	Displacement of vessels	Recreational and fishing vessels that would normally transit inshore, displaced into areas with higher traffic density offshore, or closer to the shore through areas with rocky outcrops and reefs (for example, Harry Furlong Reef). Vessel involved in collision (offshore) or grounding (inshore). Vessel hull damaged, ingress of water and sinks, multiple fatalities, national adverse publicity.	5	4	3	3	2	Recreational and fishing vessels are displaced from the footprint of the MOLF, Breakwater and Outfall during the construction phase. Routes into, and out of the construction area are also affected with laying of pots, fishing and recreational use displaced, leading to loss of sea area use and negative local publicity.	1	0	0	0	2	6.31	1	Human error/fatigue - Ship Personnel
																6	Inadequate bridge resource management
																7	Inadequate procedures in place on-board vessel
																16	Unplanned interaction with recreational/fishing craft
																25	Communication failure - Personnel
																26	Adverse weather conditions
																28	Restricted visibility
																33	High traffic density
																56	COLREGS failure to comply
																61	Incorrect assessment of tidal flow
																72	Failure to follow passage plan
																76	Inadequate training/competence - Others
																80	Human error
																86	Competence
																102	Language problems

Embedded Controls							Additional Controls								
Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction	Residual Risk	Current Risk	Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction	Residual Risk	Final Risk	Date	Assessors
10	Passage planning	Vessels must complete a detailed plan for every voyage	10%	0%	6.25	5.66	9	Local Port Services - Harbour control office	Coordination of marine response and emergency plan enactment	5%	0%	5.63	5.57	24-Oct-2016 Revised 02-Jun-2017	Anthony Hilliard - MCA Trevor Harris - Trinity House Wyn Parry - Stena Line Ports Ltd David Williams - Cemaes Harbour Committee Kim Argyle - Holyhead Sailing Club Monty Smedley - ABPmer Emma Beagley - Horizon
41	Notices to mariners	Issued weekly by the Admiralty, provided safety information	10%	0%	6.20		16	LPS broadcast (navigation and safety information)	Provide to passing vessels by VHF on request	5%	0%	5.60			
60	International COLREGS 1972 (as amended)		15%	0%	6.11		28	AIS coverage	All dredge/construction vessels, including barges to carry AIS (A or B).	5%	0%	5.57			
62	Emergency services equipment - shore side	Mayday or Pan-Pan call to Coastguards	0%	5%	5.91										
125	Standards of Training, Certification and Watchkeeping for Seafarers (STCW)	Maintain training and competence levels for vessel crew	10%	5%	5.66										

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
22	Payload related accidents	Incorrect loading or unloading of vessel transporting rock affects vessel stability.	Vessel capsizes and sinks during unloading operations. Loss of vessel, multiple fatalities, pollution (Tier 2). Operations cease until wreck removed and investigation complete.	5	4	3	3	4	Vessel takes on list during unloading. Operations cease until vessel brought upright using ballast or cargo.	1	0	1	0	2	6.81	1	Human error/fatigue - Ship Personnel
																5	Human error/fatigue - Port/Marine Personnel
																6	Inadequate bridge resource management
																7	Inadequate procedures in place on-board vessel
																11	Vessel breakdown or malfunction
																14	Vessel has unreported defect
																22	Failure to comply with Towage guidelines
																24	Communication failure - Equipment
																25	Communication failure - Personnel
																26	Adverse weather conditions
																31	Failure to observe standing notices
																37	Failure to comply with safe systems of work
																42	Non-attendance of boatmen
																48	Risk Assessment, Incomplete/not reviewed
																49	Loss of vessels stability (due to other than loss of watertight integrity)
																55	Incapacitated master (drugs/alcohol)
																59	Inadequate procedures shore side
																76	Inadequate training/competence - Others
																78	Ship/Tug/Launch failure
																80	Human error
																86	Competence
																102	Language problems

Embedded Controls							Additional Controls								
Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction	Residual Risk	Current Risk	Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction	Residual Risk	Final Risk	Date	Assessors
44	Safe systems of work (H&S)	Provided by contractors after risk assessment	10%	10%	6.26	4.64	9	Local Port Services - Harbour control office	Emergency response coordination	0%	10%	4.19	0.98	24-Oct-2016 Revised 02-Jun-2017	Anthony Hilliard - MCA Trevor Harris - Trinity House Wyn Parry - Stena Line Ports Ltd David Williams - Cemaes Harbour Committee Kim Argyle - Holyhead Sailing Club Monty Smedley - ABPmer Emma Beagley - Horizon
62	Emergency services equipment - shore side	Mayday or Pan-Pan call to Coastguards	10%	10%	5.77		19	Port Facility Emergency Plan	Detailing the HA responsible to emergency situations	0%	5%	3.60			
95	Standing Orders/SOPs	Provided by the vessels owners/operators	10%	10%	5.28		22	Contingency plan exercises	MoB drills at regular intervals	0%	5%	3.28			
118	Vessel maintenance	Maintenance schedule part of the vessel SMS	10%	5%	5.01		26	Communications equipment	For port marine personnel	5%	5%	2.93			
119	Vessel inspection/survey	Port and flag state inspections and surveys by classification society	10%	0%	4.95		33	Training of port marine/operations personnel	Safety training for personnel including the procedures for safety unloading vessels	5%	10%	2.19			
120	Vessel secured for sea	Heavy items lashed to ensure they do not shift	0%	5%	4.72		70	Marine Safety Management System	Prior to commencement of marine operations, MSMS established by the SHA.	5%	5%	1.68			
121	Loading/unloading plan	Provided by the contractor taking into account vessel stability	15%	0%	4.64		108	Requirement for notification of vessel defects	Defects reported to HA when entering port	5%	0%	1.68			
							112	PMSC compliance	SHA MSMS applies, which recognises the need for contractors RAMS to be agreed with the SHA in advance of marine works.	5%	5%	1.26			
							140	RAMS	Method statement identifies unloading process for rock armour and heavy loads to minimise vessel instability	20%	0%	0.98			

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
23	Stranding	Small recreational vessel on breakwater	Small unpowered craft (for example, kayak or sailing boat) strands on marine works during adverse weather conditions and is unable to return to shore. Loss of life, no pollution, national adverse publicity.	5	3	2	0	4	Small unpowered craft (for example, kayak or sailing boat) strands on marine works but is able to make contact with local RNLI/emergency services. Minor injuries/hypothermia, canoe/kayak recovered but sustains major damage, no pollution, adverse publicity.	1	1	1	0	2	6.47	24	Communication failure - Equipment
																26	Adverse weather conditions
																28	Restricted visibility
																36	Failure of Aid to Navigation (out of position/unlit)
																61	Incorrect assessment of tidal flow
																80	Human error

Control ID	Embedded Controls				Residual Risk	Current Risk	Control ID	Additional Controls				Residual Risk	Final Risk	Date	Assessors
	Control	Comment	Likelihood Reduction	Consequence Reduction				Control	Comment	Likelihood Reduction	Consequence Reduction				
62	Emergency services equipment - shore side	Mayday or Pan-Pan call to Coastguards/RNLI	0%	15%	5.83	5.67	9	Local Port Services - Harbour control office	Coordination of emergency response from the HA	10%	10%	5.20	4.68	24-Oct-2016 Revised 02-Jun-2017	Anthony Hilliard - MCA Trevor Harris - Trinity House Wyn Parry - Stena Line Ports Ltd David Williams - Cemaes Harbour Committee Kim Argyle - Holyhead Sailing Club Monty Smedley - ABPmer Emma Beagley - Horizon
116	Weather forecasting	Advance warning gained from available internet resources and met ocean forecasts.	10%	0%	5.67		27	CCTV coverage	Monitoring	10%	0%	5.15			
							70	Marine Safety Management System	Prior to commencement of marine operations, MSMS established by the SHA.	5%	0%	5.12			
							112	PMSC compliance	SHA MSMS applies, which recognises the need for contractors RAMS to be agreed with the SHA in advance of marine works.	5%	0%	5.10			
							142	Safety boat	On call to be available in the event of emergency	0%	10%	4.68			

D Operation Phase Navigational Risk Assessments

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
1	Accidents to personnel	Man overboard	Person enters the water in the harbour during the operational phase, area hits head on the vessel leading to drowning. No pollution, minor delay to operations during investigation. National adverse publicity.	5	3	0	0	3	Person enters the water in the harbour during the operational phase, Person hits head on the vessel leading to drowning. No pollution, minor delay to operations.	1	1	0	0	1	4.69	1	Human error/fatigue - Ship Personnel
																5	Human error/fatigue - Port/Marine Personnel
																7	Inadequate procedures in place onboard vessel
																23	Communication failure - Operational/procedural
																24	Communication failure - Equipment
																25	Communication failure - Personnel
																26	Adverse weather conditions
																37	Failure to comply with safe systems of work
																59	Inadequate procedures shore side
																80	Human error

Control ID	Embedded Controls				Residual Risk	Current Risk	Control ID	Additional Controls				Residual Risk	Final Risk	Date	Assessors
	Control	Comment	Likelihood Reduction	Consequence Reduction				Control	Comment	Likelihood Reduction	Consequence Reduction				
26	Communications equipment	VHF radios available onboard vessels	0%	10%	4.33	3.11	9	Local Port Services - Harbour control office	Point of contact for harbour operation will coordinate emergency operations	5%	5%	2.91	0.98	24-Oct-2016 Revised 02-Jun-2017	Kevin Riley - Stena Line Ports Ltd Neil Humphreys - Stena Line Ports Ltd Geoff Price - Amlwch Port Sue James - Holyhead Sailing Club Mike Butterfield - RYA Jane Templeton - Jacobs Adam Fitzpatrick - ABPmer
30	Accurate tidal measurements	Tide level observed on-site and made available to vessels	0%	5%	4.15		19	Port Facility Emergency Plan	To include actions in the event of MoB	0%	5%	2.72			
62	Emergency services equipment - shore side	Mayday or Pan-Pan call to Coastguards	10%	5%	3.64		22	Contingency plan exercises		0%	5%	2.53			
95	Standing Orders/SOPs	Provided by the vessels owners/operators	0%	10%	3.32		27	CCTV coverage	Monitoring the harbour area	0%	10%	2.16			
130	Vessel safety management system (ISM code)	All vessels require procedures as part of its SMS in compliance with the ISM code	10%	5%	3.11		28	AIS coverage	All dredge/construction vessels, including barges to carry AIS (A or B).	0%	5%	1.97			
							44	Safe systems of work (H&S)	Based on risk assessment and industry best practice	10%	5%	1.46			
							70	Marine Safety Management System	Prior to commencement of marine operations, MSMS established by the SHA.	10%	5%	1.22			
							112	PMSC compliance	SHA MSMS applies, which recognises the need for contractors to risk assess marine operations and agree plans with the SHA in advance of marine works.	5%	5%	0.98			

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
2	Allision	Vessel with breakwaters	Vessel makes contact with breakwaters on approach. Hull damaged leading to extensive flooding and vessel sinking in the approaches to the breakwaters. Multiple fatalities, pollution (Tier 2), loss of cargo, national adverse publicity. Hazard to navigation until wreck cleared causing financial losses and delay to operations. Potential for debris/cargo to enter water intake.	5	4	4	3	3	Vessel makes light contact at slow speed causing damage to vessel hull. Minor injuries, no pollution, vessel out of service until survey and repairs made.	1	1	3	0	1	7.59	1	Human error/fatigue - Ship Personnel
																6	Inadequate bridge resource management
																7	Inadequate procedures in place onboard vessel
																11	Vessel breakdown or malfunction
																14	Vessel has unreported defect
																16	Unplanned interaction with recreational/fishing craft
																25	Communication failure - Personnel
																26	Adverse weather conditions
																28	Restricted visibility
																31	Failure to observe standing notices
																32	Failure to observe Byelaws/local regulations
																36	Failure of Aid to Navigation (out of position/unlit)
																38	Shore side light backscatter
																55	Incapacitated master (drugs/alcohol)
																59	Inadequate procedures shore side
																61	Incorrect assessment of tidal flow
																72	Failure to follow passage plan
																78	Ship/Tug/Launch failure
																80	Human error
																87	Notice to Mariners failure to observe
																103	Excessive vessel speed

Control ID	Embedded Controls				Residual Risk	Current Risk	Control ID	Additional Controls				Residual Risk	Final Risk	Date	Assessors
	Control	Comment	Likelihood Reduction	Consequence Reduction				Control	Comment	Likelihood Reduction	Consequence Reduction				
10	Passage planning	From berth to berth containing all relevant information on the area and contingency planning	5%	0%	7.56	6.62	7	Pilotage service		30%	5%	6.21	1.60	24-Oct-2016 Revised 02-Jun-2017	Kevin Riley - Stena Line Ports Ltd Neil Humphreys - Stena Line Ports Ltd Geoff Price - Amlwch Port Sue James - Holyhead Sailing Club Mike Butterfield - RYA Jane Templeton - Jacobs Adam Fitzpatrick - ABPmer
26	Communications equipment	VHF radios available on board vessels	5%	5%	7.18		9	Local Port Services - Harbour control office	Point of contact for harbour operation will coordinate emergency operations	5%	5%	5.94			
62	Emergency services equipment - shore side	Mayday or Pan-Pan call to Coastguards	0%	5%	6.94		13	Arrival/departure, advance notice of	Notification sent to LPS	5%	0%	5.91			
97	Visual observation (clear line of sight)		5%	0%	6.91		16	LPS broadcast (navigation and safety information)	Promulgate conditions and movements within the harbour to approaching vessels	5%	0%	5.88			
116	Weather forecasting	Advance warning gained from available internet resources and met ocean forecasts	5%	0%	6.88		19	Port Facility Emergency Plan	Details actions to be taken in the event of emergency	0%	5%	5.65			
125	Standards of Training, Certification and Watchkeeping for Seafarers (STCW)	Maintain training and competence levels for vessel crew	5%	5%	6.62		21	Oil spill contingency plans	Details actions to be taken in the event of oil spill	0%	5%	5.40			
							22	Contingency plan exercises		0%	5%	5.13			
							28	AIS coverage	Monitored by LPS marine personnel	5%	0%	5.10			
							30	Accurate tidal measurements	Tide level observed on-site and made available to vessels	5%	0%	5.08			
							31	Availability of latest hydrographic information	Results of hydrographic survey provided to UKHO for update of navigation charts for the area	5%	0%	5.05			
							32	Towage, available and appropriate	Harbour tugs employed to escort vessel through the breakwaters to the berth	30%	20%	3.77			
							33	Training of port marine/operations personnel	This should include the use of equipment and implementation of the plans	0%	5%	3.47			
							36	Availability of pollution response equipment	Harbour to have equipment to deal with Tier 1 spills	0%	5%	2.76			
							57	Aids to navigation, provision and maintenance of	Provided after consultation with Trinity House Lighthouse Authority	10%	0%	2.74			
							59	Protective fendering	Along breakwaters to stop vessels making contact with the rock armour	0%	10%	1.60			
							70	Marine Safety Management System	Provides guidance and procedures based on risk assessments	5%	0%	1.60			
							108	Requirement for notification of vessel defects	Details of vessel defects sent to LPS	5%	0%	1.60			
							112	PMSC compliance	Ensures all risk is reduced to as low as reasonably practicable (ALARP)	5%	0%	1.60			
							129	Vessel master simulation training	Prior to operations, masters to practice berthing/unberthing using the vessels that will be entering the harbour and representative tidal flow at different states of tide and weather.	20%	0%	1.60			
							133	Tidal flow atlas	Covering each hour for spring and neap, scaled for the Harbour Area, including the combined effect of Cooling Water intake and discharge	15%	0%	1.60			
							135	Safety boat	The UKHO production of large-scale ENCs and paper charts for vessels using the Wylfa Marine Development Area	5%	0%	1.60			

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
3	Allision	Vessel with the MOLF	Contact with the quay leading to damage to vessel and MOLF. Major injuries to crew and marine personnel on MOLF, no pollution, berth unavailable until repairs made.	5	2	3	0	2	Contact made at slow speed causing minor damage to vessel and quay. Minor injuries to vessel crew, operations delayed as inspections carried out.	1	1	2	0	1	5.91	1	Human error/fatigue - Ship Personnel
																6	Inadequate bridge resource management
																7	Inadequate procedures in place onboard vessel
																11	Vessel breakdown or malfunction
																14	Vessel has unreported defect
																25	Communication failure - Personnel
																26	Adverse weather conditions
																28	Restricted visibility
																31	Failure to observe standing notices
																32	Failure to observe Byelaws/local regulations
																38	Shore side light backscatter
																55	Incapacitated master (drugs/alcohol)
																59	Inadequate procedures shore side
																61	Incorrect assessment of tidal flow
																78	Ship/Tug/Launch failure
																80	Human error
																87	Notice to Mariners failure to observe
																103	Excessive vessel speed

Embedded Controls					Residual Risk	Current Risk	Additional Controls					Residual Risk	Final Risk	Date	Assessors
Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction			Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction				
10	Passage planning	From berth to berth containing all relevant information on the area and contingency planning	5%	0%	5.88	5.10	7	Pilotage service		30%	0%	4.95	1.61	24-Oct-2016 Revised 02-Jun-2017	Kevin Riley - Stena Line Ports Ltd Neil Humphreys - Stena Line Ports Ltd Geoff Price - Amlwch Port Sue James - Holyhead Sailing Club Mike Butterfield - RYA Jane Templeton - Jacobs Adam Fitzpatrick - ABPmer
26	Communications equipment		5%	5%	5.55		9	Local Port Services - Harbour control office	Point of contact for harbour operation will coordinate emergency operations	5%	0%	4.92			
62	Emergency services equipment - shore side	Mayday or Pan-Pan call to Coastguards	0%	5%	5.36		13	Arrival/departure, advance notice of	Notification sent to LPS	5%	0%	4.90			
97	Visual observation (clear line of sight)		5%	0%	5.34		16	LPS broadcast (navigation and safety information)	Promulgate conditions and movements within the harbour to approaching vessels	10%	0%	4.85			
116	Weather forecasting	Advance warning gained from available internet resources and met ocean forecasts.	5%	0%	5.31		19	Port Facility Emergency Plan	Details actions to be taken in the event of emergency	0%	5%	4.66			
125	Standards of Training, Certification and Watchkeeping for Seafarers (STCW)	Maintain training and competence levels for vessel crew	5%	5%	5.10		21	Oil spill contingency plans	Details actions to be taken in the event of oil spill	0%	5%	4.48			
							22	Contingency plan exercises		0%	5%	4.30			
							28	AIS coverage	Monitored by LPS marine personnel	5%	0%	4.27			
							30	Accurate tidal measurements	Tide level observed on-site and made available to vessels	5%	0%	4.25			
							31	Availability of latest hydrographic information	Results of hydrographic survey provided to UKHO for update of navigation charts for the area	5%	0%	4.22			
							32	Towage, available and appropriate	Harbour tugs employed to escort vessel through the breakwaters to the berth	30%	20%	3.10			
							33	Training of port marine/ perations personnel		0%	5%	2.71			
							36	Availability of pollution response equipment	Harbour to have equipment to deal with Tier 1 spills	0%	5%	2.44			
							57	Aids to navigation, provision and maintenance of	Provided after consultation with Trinity House Lighthouse Authority	10%	0%	2.43			
							59	Protective fendering	Along breakwaters to stop vessels making contact structure	0%	10%	1.61			
							70	Marine Safety Management System	Provides guidance and procedures based on risk assessments	5%	0%	1.61			
							108	Requirement for notification of vessel defects	Details of vessel defects sent to LPS	5%	0%	1.61			
							112	PMSC compliance	Ensures all risk is reduced to as low as reasonably practicable (ALARP)	5%	0%	1.61			
							129	Vessel master simulation training	Prior to operations, masters to practice berthing/unberthing using the vessels that will be entering the harbour and representative tidal flow at different states of tide and weather.	20%	0%	1.61			
							133	Tidal flow atlas	Covering each hour for spring and neap, scaled for the Harbour Area, including the combined effect of Cooling Water intake and discharge	15%	0%	1.61			
							135	Safety boat	The UKHO production of large-scale ENCs for vessels using the Wylfa Marine Development Area	5%	0%	1.61			

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
4	Collision	With moored vessel	Fully loaded Ro-Ro (underway) strikes fully loaded bulk vessel (berthed) with momentum due to unfavourable weather conditions. Ro-Ro hull damaged leading to ingress of water and vessel sinking with multiple fatalities, pollution (Tier 2), adverse publicity, loss of cargo. Operations cease until wreck removed and investigation complete	5	4	4	3	3	Fully loaded Ro-Ro (underway) strikes partially loaded bulk vessel (berthed) at low speed. Collision results in minor damage, no injuries, no pollution. Both vessels remain afloat and fully operational. Slight delays due to vessel damage survey	1	0	1	0	1	6.19	1	Human error/fatigue - Ship Personnel
																6	Inadequate bridge resource management
																7	Inadequate procedures in place onboard vessel
																11	Vessel breakdown or malfunction
																14	Vessel has unreported defect
																25	Communication failure - Personnel
																26	Adverse weather conditions
																28	Restricted visibility
																31	Failure to observe standing notices
																38	Shore side light backscatter
																55	Incapacitated master (drugs/alcohol)
																61	Incorrect assessment of tidal flow
																78	Ship/Tug/Launch failure
																80	Human error
																103	Excessive vessel speed

Control ID	Embedded Controls				Residual Risk	Current Risk	Control ID	Additional Controls				Residual Risk	Final Risk	Date	Assessors
	Control	Comment	Likelihood Reduction	Consequence Reduction				Control	Comment	Likelihood Reduction	Consequence Reduction				
10	Passage planning		5%	0%	6.16		7	Pilotage service		30%		4.70			
62	Emergency services equipment - shore side	Mayday or Pan-Pan call to Coastguards	0%	5%	5.57		9	Local Port Services - Harbour control office		5%	5%	4.46			
95	Standing Orders/SOPs	Provided by the vessels owners/operators	5%	5%	5.33		15	Hazardous cargoes, advance notice of	Vessels required to notify HA of any hazardous cargoes in advance	0%	5%	4.24			
116	Weather forecasting	Advance warning gained from available met ocean forecasts.	5%	0%	5.31		16	LPS broadcast (navigation and safety information)	Promulgate conditions and movements within the harbour to approaching vessels	5%	0%	4.22			
125	Standards of Training, Certification and Watchkeeping for Seafarers (STCW)	Maintain training and competence levels for vessel crew	5%	5%	5.07		19	Port Facility Emergency Plan		0%	5%	4.00			
126	Dangerous Goods in Harbour Areas Regulations 2016		0%	5%	4.85		21	Oil spill contingency plans		0%	5%	3.78			
							22	Contingency plan exercises		0%	5%	3.55			
							27	CCTV coverage	Covering harbour area	5%	0%	3.53			
							28	AIS coverage		5%	0%	3.50			
						4.85	39	Direction (Special) - Powers of Harbour/Pier Master		5%	5%	3.25	2.26	24-Oct-2016 Revised 02-Jun-2017	Kevin Riley - Stena Line Ports Ltd Neil Humphreys - Stena Line Ports Ltd Geoff Price - Amlwch Port Sue James - Holyhead Sailing Club Mike Butterfield - RYA Jane Templeton - Jacobs Adam Fitzpatrick - ABPmer
							40	Byelaws		5%	0%	3.23			
							69	Training of pollution response personnel		5%	5%	2.94			
							70	Marine Safety Management System	Provides guidance and procedures based on risk assessments	5%	5%	2.65			
							112	PMSC compliance	Ensures all risk is reduced to as low as reasonably practicable (ALARP)	5%	5%	2.36			
							114	Directions (General) - issued by SHA		10%	0%	2.33			
							129	Vessel master simulation training	Prior to operations, masters to practice berthing/unberthing using the vessels that will be entering the harbour and representative tidal flow at different states of tide and weather.	20%	0%	2.30			
							133	Tidal flow atlas	Covering each hour for spring and neap, scaled for the Harbour Area, including the combined effect of Cooling Water intake and discharge	15%	0%	2.27			
							135	Safety boat	The UKHO production of large-scale ENCs for vessels using the Wylfa Marine Development Area	5%	0%	2.26			

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
5	Collision	Recreation/fishing/high speed/harbour vessel with vessel transiting to or from the Wylfa Newydd Development Area.	Collision in adverse weather conditions (high winds or reduced visibility). Fully loaded vessel on transit to the Wylfa Newydd Development Area in collision with recreation/fishing/high speed/harbour vessel at manoeuvring speed. Both vessels are damaged, one sinks with multiple fatalities. Pollution (Tier 2), operations immediately affected, damage to cargo, national adverse publicity.	5	4	4	3	3	Vessels make slow speed contact, damage to smaller vessel, minor injuries, no pollution, local adverse publicity.	1	1	2	0	2	7.25	1	Human error/fatigue - Ship Personnel
																6	Inadequate bridge resource management
																7	Inadequate procedures in place onboard vessel
																23	Communication failure - Operational/procedural
																25	Communication failure - Personnel
																26	Adverse weather conditions
																28	Restricted visibility
																56	COLREGS failure to comply
																80	Human error
																103	Excessive vessel speed

Control ID	Embedded Controls				Residual Risk	Current Risk	Control ID	Additional Controls				Residual Risk	Final Risk	Date	Assessors
	Control	Comment	Likelihood Reduction	Consequence Reduction				Control	Comment	Likelihood Reduction	Consequence Reduction				
3	Communications - Traffic broadcast	Information promulgated by the Holyhead Coastguard Operations Centre (CGOC)	5%	0%	7.22	6.52	7	Pilotage service	Control only applies between pilot boarding point and the Wylfa Marine Development Area	30%	5%	6.12	5.80	24-Oct-2016 Revised 02-Jun-2017	Kevin Riley - Stena Line Ports Ltd Neil Humphreys - Stena Line Ports Ltd Geoff Price - Amlwch Port Sue James - Holyhead Sailing Club Mike Butterfield - RYA Jane Templeton - Jacobs Adam Fitzpatrick - ABPmer
10	Passage planning	From berth to berth containing all relevant information on the area and contingency planning	5%	0%	7.19		9	Local Port Services - Harbour control office	Point of contact for harbour operation will coordinate emergency operations	5%	5%	5.86			
26	Communications equipment	VHF radios available on-board vessels	5%	5%	6.87		16	LPS broadcast (navigation and safety information)	Promulgate conditions and movements within the harbour to approaching vessels on request	5%	0%	5.83			
60	International COLREGS 1972 (as amended)		10%	0%	6.81		28	AIS coverage	Monitored by LPS marine personnel	5%	0%	5.80			
97	Visual observation (clear line of sight)		5%	0%	6.78										
125	Standards of Training, Certification and Watchkeeping for Seafarers (STCW)	Maintain training and competence levels for vessel crew	5%	5%	6.52										

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
6	Collision	Tanker with vessel transiting to or from the Wylfa Newydd Development Area	Tanker is struck side on causing hull and cargo tanks to be damaged. Fire/explosion and tanker cargo outflow into water causing major pollution (Tier 3), major injuries, operations cease as NCP used. Major national adverse publicity.	5	4	4	4	4	Vessels take avoiding action resulting in a glancing blow. Minor damage to both vessels, minor injuries, no pollution, adverse publicity.	1	1	2	0	2	7.44	1	Human error/fatigue - Ship Personnel
																6	Inadequate bridge resource management
																7	Inadequate procedures in place onboard vessel
																23	Communication failure - Operational/procedural
																25	Communication failure - Personnel
																26	Adverse weather conditions
																28	Restricted visibility
																56	COLREGS failure to comply
																80	Human error
																103	Excessive vessel speed

Embedded Controls					Residual Risk	Current Risk	Additional Controls					Residual Risk	Final Risk	Date	Assessors
Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction			Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction				
3	Communications - Traffic broadcast	Information promulgated by the Holyhead Coastguard Operations Centre (CGOC)	10%	0%	7.38	4.70	7	Pilotage service	Control only applies between pilot boarding point and the Wylfa Marine Development Area	30%	0%	4.59	4.55	24-Oct-2016 Revised 02-Jun-2017	Kevin Riley - Stena Line Ports Ltd Neil Humphreys - Stena Line Ports Ltd Geoff Price - Amlwch Port Sue James - Holyhead Sailing Club Mike Butterfield - RYA Jane Templeton - Jacobs Adam Fitzpatrick - ABPmer
10	Passage planning	From berth to berth containing all relevant information on the area and contingency planning	15%	0%	7.29		9	Local Port Services - Harbour control office	Point of contact for harbour operation will coordinate emergency operations	5%	0%	4.58			
26	Communications equipment	VHF radios available onboard vessels	10%	10%	6.69		16	LPS broadcast (navigation and safety information)	Promulgate conditions and movements within the harbour to approaching vessels on request	5%	0%	4.57			
60	International COLREGS 1972 (as amended)		30%	0%	6.51		28	AIS coverage	Monitored by LPS marine personnel	5%	0%	4.55			
62	Emergency services equipment - shore side	Holyhead CGOC response following an incident in the area	0%	15%	5.80										
95	Standing Orders/SOPs	Vessel's procedures following an incident	0%	15%	5.09										
97	Visual observation (clear line of sight)		15%	0%	5.00										
125	Standards of Training, Certification and Watchkeeping for Seafarers (STCW)	Maintain training and competence levels for vessel crew	10%	5%	4.70										

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
7	Collision	Cargo vessel with vessel transiting to or from the Wylfa Newydd Development Area	Vessels make contact leading to hull being damaged, ingress of water and loss of cargo. Multiple fatalities, pollution (Tier 2), national adverse publicity. Cargo in navigational channel represents hazard to navigation delays to operations until cleared. Vessel out of service until repairs complete.	5	4	4	3	3	Vessels take avoiding action resulting in a glancing blow. Minor damage to both vessels, no injuries, no pollution, adverse publicity. Vessels out of service during survey and repair.	1	0	2	0	2	6.94	1	Human error/fatigue - Ship Personnel
																6	Inadequate bridge resource management
																7	Inadequate procedures in place onboard vessel
																23	Communication failure - Operational/procedural
																25	Communication failure - Personnel
																26	Adverse weather conditions
																28	Restricted visibility
																56	COLREGS failure to comply
																80	Human error
																103	Excessive vessel speed

Control ID	Embedded Controls				Residual Risk	Current Risk	Control ID	Additional Controls				Residual Risk	Final Risk	Date	Assessors
	Control	Comment	Likelihood Reduction	Consequence Reduction				Control	Comment	Likelihood Reduction	Consequence Reduction				
3	Communications - Traffic broadcast	Information promulgated by the Holyhead Coastguard Operations Centre (CGOC)	10%	0%	6.88	4.44	7	Pilotage service	Control only applies between pilot boarding point and the Wylfa Marine Development Area	30%	5%	4.10	3.48	24-Oct-2016 Revised 02-Jun-2017	Kevin Riley - Stena Line Ports Ltd Neil Humphreys - Stena Line Ports Ltd Geoff Price - Amlwch Port Sue James - Holyhead Sailing Club Mike Butterfield - RYA Jane Templeton - Jacobs Adam Fitzpatrick - ABPmer
10	Passage planning	From berth to berth containing all relevant information on the area and contingency planning	15%	0%	6.79		9	Local Port Services - Harbour control office	Point of contact for harbour operation will coordinate emergency operations	5%	5%	3.50			
26	Communications equipment	VHF radios available onboard vessels	10%	10%	6.30		16	LPS broadcast (navigation and safety information)	Promulgate conditions and movements within the harbour to approaching vessels	5%	0%	3.49			
60	International COLREGS 1972 (as amended)		30%	0%	6.12		28	AIS coverage	Monitored by LPS marine personnel	5%	0%	3.48			
62	Emergency services equipment - shore side	Holyhead CGOC response following an incident in the area	0%	15%	5.47										
95	Standing Orders/SOPs	Vessel's procedures following an incident	0%	15%	4.81										
97	Visual observation (clear line of sight)		15%	0%	4.73										
125	Standards of Training, Certification and Watchkeeping for Seafarers (STCW)	Maintain training and competence levels for vessel crew	10%	5%	4.44										

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
8	Fire/explosion	Vessel alongside the MOLF	Fire on-board vessel leads to explosion. Multipole fatalities, major damage to berth, pollution (Tier 2), debris enters power station water intake causing damage. Vessel out of service until repairs complete.	50	4	4	3	3	Vessels take avoiding action resulting in a glancing blow. Minor damage to both vessels, no injuries, no pollution, adverse publicity. Vessels out of service during survey and repair.	10	1	1	0	0	4.27	1	Human error/fatigue - Ship Personnel
																7	Inadequate procedures in place onboard vessel
																8	Fire/Explosion
																11	Vessel breakdown or malfunction
																14	Vessel has unreported defect
																37	Failure to comply with safe systems of work
																48	Risk Assessment, Incomplete/not reviewed
																75	Inadequate maintenance/inspection
																80	Human error
																86	Competence
																102	Language problems

Control ID	Embedded Controls				Residual Risk	Current Risk	Control ID	Additional Controls				Residual Risk	Final Risk	Date	Assessors
	Control	Comment	Likelihood Reduction	Consequence Reduction				Control	Comment	Likelihood Reduction	Consequence Reduction				
62	Emergency services equipment - shore side	Mayday or Pan-Pan call to Coastguards	0%	5%	4.11	3.53	9	Local Port Services - Harbour control office	Coordinate emergency response	0%	5%	3.34	2.04	24-Oct-2016 Revised 02-Jun-2017	Kevin Riley - Stena Line Ports Ltd Neil Humphreys - Stena Line Ports Ltd Geoff Price - Amlwch Port Sue James - Holyhead Sailing Club Mike Butterfield - RYA Jane Templeton - Jacobs Adam Fitzpatrick - ABPmer
95	Standing Orders/SOPs		5%	5%	3.54		15	Hazardous cargoes, advance notice of	Vessels required to notify HA of any hazardous cargoes in advance	5%	5%	3.13			
126	Dangerous Goods in Harbour Areas Regulations 2016		5%	0%	3.53		19	Port Facility Emergency Plan	To include actions in the event of MoB	0%	5%	2.94			
							21	Oil spill contingency plans	Details actions to be taken in the event of oil spill	0%	5%	2.83			
							22	Contingency plan exercises		0%	5%	2.57			
							33	Training of port marine/operations personnel	This should include the use of equipment and implementation of the plans	0%	5%	2.35			
							44	Safe systems of work (H&S)	Based on risk assessment and industry best practice	10%	5%	2.09			
							70	Marine Safety Management System	Provides guidance and procedures based on risk assessments	5%	0%	2.07			
							112	PMSC compliance	Ensures all risk is reduced to as low as reasonably practicable (ALARP)	5%	0%	2.04			

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
9	Flooding	Vessel within the harbour	Vessel has ingress of water due to defect and strands within the harbour blocking the navigation channel. Multiple fatalities, pollution (Tier 2), loss of cargo, adverse publicity. Operations cease until wreck can be refloated or removed and investigation complete.	10	4	4	3	4	Ingress of water is contained and vessel berthed safely, minor injuries. Vessel out of service as survey/repairs completed, delays to operations.	5	1	2	0	2	6.41	6	Inadequate bridge resource management
																7	Inadequate procedures in place onboard vessel
																8	Fire/Explosion
																9	Loss of watertight integrity
																11	Vessel breakdown or malfunction
																25	Communication failure - Personnel
																26	Adverse weather conditions
																43	Malicious action by external parties
																55	Incapacitated master (drugs/alcohol)
																57	Vessel Ramps or Hatches not secure
																75	Inadequate maintenance/inspection
																76	Inadequate training/competence - Others
																78	Ship/Tug/Launch failure
																80	Human error
																86	Competence

Embedded Controls					Residual Risk	Current Risk	Additional Controls					Residual Risk	Final Risk	Date	Assessors
Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction			Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction				
118	Vessel maintenance	Maintenance schedule part of the vessel SMS	20%	20%	5.28	4.98	9	Local Port Services - Harbour control office	Coordinate emergency response	0%	5%	4.75	3.21	24-Oct-2016 Revised 02-Jun-2017	Kevin Riley - Stena Line Ports Ltd Neil Humphreys - Stena Line Ports Ltd Geoff Price - Amlwch Port Sue James - Holyhead Sailing Club Mike Butterfield - RYA Jane Templeton - Jacobs Adam Fitzpatrick - ABPmer
119	Vessel inspection/survey	Port and flag state inspections and surveys by classification society	10%	0%	5.21		21	Oil spill contingency plans		0%	5%	4.52			
120	Vessel secured for sea	Heavy items lashed to ensure they do not shift	0%	5%	4.98		22	Contingency plan exercises		0%	5%	4.29			
							33	Training of port marine/operations personnel	This should include the use of equipment and implementation of the plans	0%	5%	4.05			
							36	Availability of pollution response equipment		0%	5%	3.82			
							70	Marine Safety Management System	Provides guidance and procedures based on risk assessments	5%	5%	3.22			
							112	PMSC compliance	Ensures all risk is reduced to as low as reasonably practicable (ALARP)	5%	0%	3.21			

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
10	Grounding	Vessel within the harbour	Vessel grounds whilst manoeuvring to berth in adverse weather conditions. Hull damaged causing ingress of water. Vessel sinks causing obstruction in harbour. Multiple fatalities, pollution (Tier 2), loss of cargo, operations cease until vessel refloated/salvaged, and investigation complete national adverse publicity.	5	4	4	3	4	Vessel makes light contact with seabed, damaged holed but flooding contained and vessel berthed safely. Minor injuries, pollution (Tier 1), adverse publicity. Vessel out of service until repairs complete.	1	1	2	2	2	7.78	1	Human error/fatigue - Ship Personnel
																6	Inadequate bridge resource management
																7	Inadequate procedures in place onboard vessel
																8	Fire/Explosion
																9	Loss of watertight integrity
																10	Incorrect draught advised/promulgated
																11	Vessel breakdown or malfunction
																25	Communication failure - Personnel
																26	Adverse weather conditions
																28	Restricted visibility
																30	Failure to comply with VTS/LPS/SOPs
																38	Shore side light backscatter
																40	Failure of berth mooring systems
																43	Malicious action by external parties
																55	Incapacitated master (drugs/alcohol)
																61	Incorrect assessment of tidal flow
																72	Failure to follow passage plan
																76	Inadequate training/competence - Others
																78	Ship/Tug/Launch failure
																80	Human error
																84	Tugs - Inadequate/unavailable
																86	Competence
																102	Language problems
																103	Excessive vessel speed

Control ID	Embedded Controls				Residual Risk	Current Risk	Control ID	Additional Controls				Residual Risk	Final Risk	Date	Assessors
	Control	Comment	Likelihood Reduction	Consequence Reduction				Control	Comment	Likelihood Reduction	Consequence Reduction				
10	Passage planning	From berth to berth containing all relevant information on the area and contingency planning	10%	0%	7.72	7.63	7	Pilotage service		30%	5%	7.14	3.83	24-Oct-2016 Revised 02-Jun-2017	Kevin Riley - Stena Line Ports Ltd Neil Humphreys - Stena Line Ports Ltd Geoff Price - Amlwch Port Sue James - Holyhead Sailing Club Mike Butterfield - RYA Jane Templeton - Jacobs Adam Fitzpatrick - ABPmer
12	Draught, Accurate, declared and within max limits	Vessels draught calculated before entry to harbour	5%	0%	7.69		9	Local Port Services - Harbour control office		5%	5%	6.86			
13	Arrival/departure, advance notice of	Tide level observed on-site and made available to vessels	5%	0%	7.66		11	Dredging programme	Informed by the results of hydrographic survey	10%	5%	6.56			
95	Standing Orders/SOPs	Provided by the vessels owners/operators	5%	0%	7.63		16	LPS broadcast (navigation and safety information)	Promulgate conditions and movements within the harbour to approaching vessels	5%	0%	6.53			
							17	Hydrographic surveying program	Regular scheduled surveys in line with PMSC requirements	10%	0%	6.46			
							18	Safe allocation of berths (depth, available, suitable)		10%	0%	6.40			
							19	Port Facility Emergency Plan	To include actions in the event of MoB	0%	5%	6.16			
							21	Oil spill contingency plans	Details actions to be taken in the event of oil spill	0%	5%	5.91			
							22	Contingency plan exercises		0%	5%	5.67			
							30	Accurate tidal measurements	Tide gauges measure levels within the Harbour	10%	0%	5.62			
							31	Availability of latest hydrographic information	Results of hydrographic survey provided to UKHO for update of navigation charts for the area	10%	0%	5.60			
							33	Training of port marine/operations personnel	This should include the use of equipment and implementation of the plans	0%	5%	5.35			
							36	Availability of pollution response equipment	Harbour and contractors to have equipment available	0%	5%	5.10			
							39	Direction (Special) - Powers of Harbour/Pier Master	Provided after consultation with Trinity House Lighthouse Authority	10%	5%	4.82			
							57	Aids to navigation, provision and maintenance of	Buoys and light to identify navigable water	10%	0%	4.79			
							70	Marine Safety Management System	Provides guidance and procedures based on risk assessments	5%	5%	4.25			
							108	Requirement for notification of vessel defects	Details of vessel defects sent to LPS	5%	5%	3.86			
							112	PMSC compliance	Ensures all risk is reduced to as low as reasonably practicable (ALARP)	5%	0%	3.85			
							114	Directions (General) - issued by SHA	Allows SHA to regulate vessel speed	10%	0%	3.83			

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
11	Hazardous substance accidents	Accidental spill within the harbour	Pollutant/oil spill (Tier 1) from vessel/dock. Pollution is drawn into intake causing damage to drum screens. No injuries.	5	0	0	2	2	Small pollutant/oil spill from vessel/dock reported to marine personnel. Spill contained and removed.	1	0	0	1	0	3.81	1	Human error/fatigue - Ship Personnel
																5	Human error/fatigue - Port/Marine Personnel
																7	Inadequate procedures in place onboard vessel
																11	Vessel breakdown or malfunction
																23	Communication failure - Operational/procedural
																25	Communication failure - Personnel
																31	Failure to observe standing notices
																37	Failure to comply with safe systems of work
																43	Malicious action by external parties
																59	Inadequate procedures shore side
																62	Illegal discharges into the water
																69	Port Equipment (inc craft) mechanical breakdown/system malfunction
																75	Inadequate maintenance/inspection
																76	Inadequate training/competence - Others
																80	Human error
																86	Competence

Control ID	Embedded Controls				Residual Risk	Current Risk	Control ID	Additional Controls				Residual Risk	Final Risk	Date	Assessors
	Control	Comment	Likelihood Reduction	Consequence Reduction				Control	Comment	Likelihood Reduction	Consequence Reduction				
							9	Local Port Services - Harbour control office	Coordinate emergency response	5%	5%	3.34			
							15	Hazardous cargoes, advance notice of	Vessels required to notify HA of any hazardous cargoes in advance	5%	5%	3.19			
							20	Port waste management plan	Provide guidance to vessels on disposal of waste, produced by the SHA	5%	0%	3.17			Kevin Riley - Stena Line Ports Ltd Neil Humphreys - Stena Line Ports Ltd Geoff Price - Amlwch Port Sue James - Holyhead Sailing Club Mike Butterfield - RYA Jane Templeton - Jacobs Adam Fitzpatrick - ABPmer
							21	Oil spill contingency plans	Details actions to be taken in the event of oil spill	0%	5%	3.03		24-Oct-2016 Revised 02-Jun-2017	
							22	Contingency plan exercises		0%	5%	2.89			
						3.81	27	CCTV coverage	Used by LPS for monitoring and enforcement	5%	0%	2.88	2.56		
							33	Training of port marine/operations personnel	This should include the use of equipment and implementation of the plans	0%	5%	2.74			
							36	Availability of pollution response equipment	Harbour and contractors to have equipment available	0%	5%	2.60			
							70	Marine Safety Management System	Provides guidance and procedures based on risk assessments	5%	0%	2.58			
							112	PMSC compliance	Ensures all risk is reduced to as low as reasonably practicable (ALARP)	5%	0%	2.56			

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
12	Machinery related accidents	Steering/propulsion failure entering or leaving the harbour	Vessel inside harbour loses steerage/propulsion leading to allision/grounding at manoeuvring speed. Hull damaged leading to ingress of water and sinking of vessel. Harbour blocked by vessel, multiple fatalities, pollution (Tier 2), adverse publicity, debris enters intake. Operations cease until wreck removed and investigation complete.	5	4	4	3	3	Vessel loses steerage/propulsion. Emergency generator activates. Vessel berths safely and undergoes maintenance. No injuries, no pollution.	1	0	1	0	0	5.88	1	Human error/fatigue - Ship Personnel
																6	Inadequate bridge resource management
																7	Inadequate procedures in place onboard vessel
																11	Vessel breakdown or malfunction
																14	Vessel has unreported defect
																69	Port Equipment (inc craft) mechanical breakdown/system malfunction
																75	Inadequate maintenance/inspection
																76	Inadequate training/competence - Others

Control ID	Embedded Controls				Residual Risk	Current Risk	Control ID	Additional Controls				Residual Risk	Final Risk	Date	Assessors
	Control	Comment	Likelihood Reduction	Consequence Reduction				Control	Comment	Likelihood Reduction	Consequence Reduction				
22	Contingency plan exercises	Vessel drills for loss of power/propulsion	0%	10%	5.44	5.44	7	Pilotage service		10%	0%	5.11	3.10	24-Oct-2016 Revised 02-Jun-2017	Kevin Riley - Stena Line Ports Ltd Neil Humphreys - Stena Line Ports Ltd Geoff Price - Amlwch Port Sue James - Holyhead Sailing Club Mike Butterfield - RYA Jane Templeton - Jacobs Adam Fitzpatrick - ABPmer
							9	Local Port Services - Harbour control office	Coordinate emergency response	0%	5%	4.90			
							19	Port Facility Emergency Plan	To include actions in the event of MoB	0%	5%	4.70			
							21	Oil spill contingency plans	Details actions to be taken in the event of oil spill	0%	5%	4.50			
							22	Contingency plan exercises	Details actions to be taken in the event of oil spill	0%	5%	4.29			
							33	Training of port marine/operations personnel	This should include the use of equipment and implementation of the plans	0%	5%	4.09			
							39	Direction (Special) - Powers of Harbour/Pier Master	Harbour and contractors to have equipment available	0%	10%	3.66			
							70	Marine Safety Management System	Provides guidance and procedures based on risk assessments	5%	5%	3.43			
							108	Requirement for notification of vessel defects	Details of vessel defects sent to LPS	10%	0%	3.38			
							112	PMSC compliance	Ensures all risk is reduced to as low as reasonably practicable (ALARP)	5%	5%	3.10			

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
13	Machinery related accidents	Lifting equipment failure alongside the MOLF	Failure during unloading of vessels with load slung. Load released and lands on vessel deck causing major damage to vessel or failure during transfer of heavy cargo from vessel to quay. Multiple fatalities, no pollution (Tier 1), operations cease pending recovery and investigation.	5	4	4	0	3	Failure of lifting equipment causes automatic shutoff. Delay to operations while repairs are made.	1	0	0	0	1	5.41	1	Human error/fatigue - Ship Personnel
																5	Human error/fatigue - Port/Marine Personnel
																7	Inadequate procedures in place onboard vessel
																11	Vessel breakdown or malfunction
																14	Vessel has unreported defect
																23	Communication failure - Operational/procedural
																37	Failure to comply with safe systems of work
																69	Port Equipment (inc craft) mechanical breakdown/system malfunction
																75	Inadequate maintenance/inspection
																76	Inadequate training/competence - Others
																80	Human error
																86	Competence

Control ID	Embedded Controls				Residual Risk	Current Risk	Control ID	Additional Controls				Residual Risk	Final Risk	Date	Assessors
	Control	Comment	Likelihood Reduction	Consequence Reduction				Control	Comment	Likelihood Reduction	Consequence Reduction				
26	Communications equipment	VHF radios available on-board vessels	5%	5%	4.88	4.44	9	Local Port Services - Harbour control office	Coordinate emergency response	0%	5%	4.25	3.33	24-Oct-2016 Revised 02-Jun-2017	Kevin Riley - Stena Line Ports Ltd Neil Humphreys - Stena Line Ports Ltd Geoff Price - Amlwch Port Sue James - Holyhead Sailing Club Mike Butterfield - RYA Jane Templeton - Jacobs Adam Fitzpatrick - ABPmer
62	Emergency services equipment - shore side	Fire/ambulance service available onshore	0%	5%	4.69		19	Port Facility Emergency Plan	To include actions in the event of MoB	0%	10%	3.87			
95	Standing Orders/SOPs	Provided by the vessels owners/operators	5%	5%	4.48		44	Safe systems of work (H&S)	Used by port marine personnel based on risk assessment and industry best practice	15%	10%	3.42			
116	Weather forecasting	Advance warning gained from available met ocean forecasts.	10%	0%	4.44		70	Marine Safety Management System	Provides guidance and procedures based on risk assessments	5%	0%	3.40			
							112	PMSC compliance	Ensures all risk is reduced to as low as reasonably practicable (ALARP)	5%	0%	3.38			
							122	Shore side facility maintenance programme	All craneage and lifting equipment to undertake regular maintenance	10%	0%	3.33			

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
14	Other	Towage operations within the harbour	Towed cargo/barge caught by strong currents and/or wind. Tug unable to control barge and is girded leading to capsize and sinking. Multiple fatalities, pollution (Tier 2), loss of tug and cargo/barge, national adverse publicity. Operations cease until wreck removed and investigation complete.	5	4	4	3	3	Towed cargo/barge caught by strong currents and/or wind. Tug forced to stem the tide/wind or return to berth and await weather window. Delay to operations.	1	0	0	0	1	5.88	1	Human error/fatigue - Ship Personnel
																5	Human error/fatigue - Port/Marine Personnel
																6	Inadequate bridge resource management
																7	Inadequate procedures in place onboard vessel
																20	Tug failure towing equipment
																22	Failure to comply with Towage guidelines
																24	Communication failure - Equipment
																26	Adverse weather conditions
																37	Failure to comply with safe systems of work
																48	Risk Assessment, Incomplete/not reviewed
																61	Incorrect assessment of tidal flow
																76	Inadequate training/competence - Others
																78	Ship/Tug/Launch failure
																80	Human error
																84	Tugs - Inadequate/unavailable
																86	Competence
																103	Excessive vessel speed

Control ID	Embedded Controls				Residual Risk	Current Risk	Control ID	Additional Controls				Residual Risk	Final Risk	Date	Assessors
	Control	Comment	Likelihood Reduction	Consequence Reduction				Control	Comment	Likelihood Reduction	Consequence Reduction				
10	Passage planning	From berth to berth containing all relevant information on the area and contingency planning	5%	0%	5.85		7	Pilotage service	Pilot required it tug/tow exceed set criteria	5%	5%	4.73			
26	Communications equipment		5%	5%	5.31		9	Local Port Services - Harbour control office		5%	5%	4.50			
81	Tug/Workboat certification		5%	0%	5.28		13	Arrival/departure, advance notice of		5%	0%	4.48			
116	Weather forecasting	Advance warning gained from available internet resources and met ocean forecasts.	5%	0%	5.26		16	LPS broadcast (navigation and safety information)	Promulgate conditions and movements within the harbour to approaching vessels	5%	0%	4.45			Kevin Riley - Stena Line Ports Ltd Neil Humphreys - Stena Line Ports Ltd Geoff Price - Amlwch Port Sue James - Holyhead Sailing Club Mike Butterfield - RYA Jane Templeton - Jacobs Adam Fitzpatrick - ABPmer
125	Standards of Training, Certification and Watchkeeping for Seafarers (STCW)	Maintain training and competence levels for vessel crew	5%	5%	5.03		30	Accurate tidal measurements	Tide level observed on-site and made available to vessels	5%	0%	4.43			
134	Designated anchorages	Carried out by classification society and sets maximum limits for wind and wave height	15%	0%	4.96	4.96	31	Availability of latest hydrographic information	Results of hydrographic survey provided to UKHO for update of navigation charts for the area	0%	5%	4.22	3.87	24-Oct-2016 Revised 02-Jun-2017	
							40	Byelaws		5%	0%	4.20			
							44	Safe systems of work (H&S)	Based on risk assessment and industry best practice	5%	5%	3.97			
							57	Aids to navigation, Provision & maintenance of	Provided after consultation with Trinity House Lighthouse Authority	5%	0%	3.94			
							70	Marine Safety Management System	Provides guidance and procedures based on risk assessments	5%	0%	3.92			
							112	PMSC compliance	Ensures all risk is reduced to as low as reasonably practicable (ALARP)	5%	0%	3.89			
							114	Directions (General) - issued by SHA		5%	0%	3.87			

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
15	Other	Malicious actions by third party	Deliberate boarding of vessel. Protestors board vessels causing damage, vessel set adrift by malicious actions.	5	0	2	0	3	Deliberate boarding of vessel. Protestors attempting board vessels are stopped by security presence. No effects to operations.	1	0	0	0	1	4.28	43	Malicious action by external parties
																60	Protest by external parties
																63	Breach of security at berth/terminal/ship

Control ID	Embedded Controls				Residual Risk	Current Risk	Control ID	Additional Controls				Residual Risk	Final Risk	Date	Assessors
	Control	Comment	Likelihood Reduction	Consequence Reduction				Control	Comment	Likelihood Reduction	Consequence Reduction				
62	Emergency services equipment - shore side	Mayday or Pan-Pan call to Coastguards	0%	10%	3.96	3.50	9	Local Port Services - Harbour control office	Coordinate emergency response	0%	5%	3.35	1.33	24-Oct-2016 Revised 02-Jun-2017	Kevin Riley - Stena Line Ports Ltd Neil Humphreys - Stena Line Ports Ltd Geoff Price - Amlwch Port Sue James - Holyhead Sailing Club Mike Butterfield - RYA Jane Templeton - Jacobs Adam Fitzpatrick - ABPmer
130	Vessel safety management system (ISM code)		10%	5%	3.50		19	Port Facility Emergency Plan	To include actions in the event of MoB	0%	10%	3.06			
							27	CCTV coverage	Monitoring harbour area	20%	0%	2.98			
							70	Marine Safety Management System	Provides guidance and procedures based on risk assessments	5%	0%	2.97			
							111	ISPS compliance	Plans and procedures for safety of port facilities	15%	15%	2.42			
							112	PMSC compliance	Ensures all risk is reduced to as low as reasonably practicable (ALARP)	5%	0%	2.40			
							113	Port Security Plan		10%	10%	2.00			
							114	Directions (General) - issued by SHA		5%	0%	1.98			
							123	Afloat deterrent	Safety/guard boat	15%	15%	1.33			

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
16	Other	Displacement of vessels	Recreational and fishing vessels that would normally transit inshore, displaced into areas with higher traffic density offshore, or closer to the shore through areas with rocky outcrops and reefs (for example, Harry Furlong Reef). Collision (offshore) or grounding (inshore) due to vessel taking action to avoid vessels transiting to/from the Wylfa Marine Development Area. Vessel has major damage and sinks, loss of life, pollution (Tier 2), national adverse publicity.	5	4	4	3	4	Recreational and fishing vessels are displaced from the footprint of the MOLF, Breakwater and Outfall. Routes into, and out of the harbour area are also affected with laying of pots, fishing and recreational use displaced, leading to loss of sea area use and negative local publicity.	1	0	0	0	2	6.59	1	Human error/fatigue - Ship Personnel
																6	Inadequate bridge resource management
																7	Inadequate procedures in place onboard vessel
																16	Unplanned interaction with recreational/fishing craft
																25	Communication failure - Personnel
																26	Adverse weather conditions
																28	Restricted visibility
																33	High traffic density
																56	COLREGS failure to comply
																61	Incorrect assessment of tidal flow
																72	Failure to follow passage plan
																76	Inadequate training/competence - Others
																80	Human error
																86	Competence
																102	Language problems

Control ID	Embedded Controls				Residual Risk	Current Risk	Control ID	Additional Controls				Residual Risk	Final Risk	Date	Assessors
	Control	Comment	Likelihood Reduction	Consequence Reduction				Control	Comment	Likelihood Reduction	Consequence Reduction				
10	Passage planning	From berth to berth containing all relevant information on the area and contingency planning	10%	0%	6.54	5.92	9	Local Port Services - Harbour control office	Coordinate emergency response	5%	0%	5.86	5.80	24-Oct-2016 Revised 02-Jun-2017	Kevin Riley - Stena Line Ports Ltd Neil Humphreys - Stena Line Ports Ltd Geoff Price - Amlwch Port Sue James - Holyhead Sailing Club Mike Butterfield - RYA Jane Templeton - Jacobs Adam Fitzpatrick - ABPmer
41	Notices to mariners	Issued weekly by the Admiralty	10%	0%	6.48		16	LPS broadcast (navigation and safety information)	Promulgate conditions and movements within the harbour to approaching vessels	10%	0%	5.83			
60	International COLREGS 1972 (as amended)		15%	0%	6.39		28	AIS coverage	All dredge/construction vessels, including barges to carry AIS (A or B)	5%	0%	5.80			
62	Emergency services equipment - shore side	Mayday or Pan-Pan call to Coastguards	0%	5%	6.18										
125	Standards of Training, Certification and Watchkeeping for Seafarers (STCW)	Maintain training and competence levels for vessel crew	10%	5%	5.92										

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
17	Payload related accidents	Vessel unloaded incorrectly alongside the MOLF	Vessel stability compromised, large sheer forces and/or hogging/sagging cause loss of hull integrity. Ingress of water leads to vessel sinking alongside. Multiple fatalities, pollution (Tier 2), adverse publicity. Operations cease until wreck removed and investigation complete	5	4	4	3	4	Vessel takes on list. Operation stopped and list corrected with ballast or movement of cargo. Delay to operations, no injuries or pollution.	1	0	0	0	1	5.97	1	Human error/fatigue - Ship Personnel
																5	Human error/fatigue - Port/Marine Personnel
																7	Inadequate procedures in place onboard vessel
																8	Fire/Explosion
																9	Loss of watertight integrity
																11	Vessel breakdown or malfunction
																14	Vessel has unreported defect
																23	Communication failure - Operational/procedural
																25	Communication failure - Personnel
																26	Adverse weather conditions
																31	Failure to observe standing notices
																37	Failure to comply with safe systems of work
																49	Loss of vessels stability (due to other than loss of watertight integrity)
																59	Inadequate procedures shore side
																69	Port Equipment (inc craft) mechanical breakdown/system malfunction
																75	Inadequate maintenance/inspection
																76	Inadequate training/competence - Others
																80	Human error
																86	Competence
																105	Navigation equipment failure

Control ID	Embedded Controls				Residual Risk	Current Risk	Control ID	Additional Controls				Residual Risk	Final Risk	Date	Assessors
	Control	Comment	Likelihood Reduction	Consequence Reduction				Control	Comment	Likelihood Reduction	Consequence Reduction				
95	Standing Orders/SOPs	Provided by the vessels owner/operator	5%	5%	5.42		9	Local Port Services - Harbour control office	Ensures all risk is reduced to as low as reasonably practicable (ALARP)	0%	5%	4.91			
120	Vessel secured for sea		5%	5%	5.19		15	Hazardous cargoes, advance notice of	Vessels required to notify HA of any hazardous cargoes in advance	0%	5%	4.70			
121	Loading/unloading plan	Provided by the vessel using stability calculations and confirmed before operations proceed	15%	0%	5.12		18	Safe allocation of berths (depth, available, suitable)		0%	10%	4.28			
							19	Port Facility Emergency Plan	To include actions in the event of MoB	0%	5%	4.08			
							21	Oil spill contingency plans	Details actions to be taken in the event of oil spill	0%	5%	3.86			
							22	Contingency plan exercises	Details actions to be taken in the event of oil spill	0%	5%	3.65			
						5.12	33	Training of port marine/operations personnel	This should include the use of equipment and implementation of the plans	10%	5%	3.39	1.92	24-Oct-2016 Revised 02-Jun-2017	Kevin Riley - Stena Line Ports Ltd Neil Humphreys - Stena Line Ports Ltd Geoff Price - Amlwch Port Sue James - Holyhead Sailing Club Mike Butterfield - RYA Jane Templeton - Jacobs Adam Fitzpatrick - ABPmer
							36	Availability of pollution response equipment	Harbour and contractors to have equipment available	0%	5%	3.13			
							44	Safe systems of work (H&S)	Based on risk assessment and industry best practice	15%	10%	2.54			
							70	Marine Safety Management System		5%	5%	2.23			
							108	Requirement for notification of vessel defects	Details of vessel defects sent to LPS	5%	0%	2.21			
							112	PMSC compliance	Provides guidance and procedures based on risk assessments	5%	5%	1.92			

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
18	Ranging	Vessel on bulk quay ranging due to interaction with other vessel	Ro-Ro vessel manoeuvring to berth in adverse weather conditions causes excessive propeller wash and wake wave. Bulk vessel ranges on berth and moorings part causing vessel to drift from berth. Slow speed collision between vessels resulting in minor damage, minor injuries. Bulk vessel drifting until engines online and safely berthed.	5	1	3	0	2	Excessive wake from Ro-Ro manoeuvring causes bulk vessel to range on berth. Moorings hold, no injuries, no pollution.	1	0	1	0	0	4.53	1	Human error/fatigue - Ship Personnel
																6	Inadequate bridge resource management
																7	Inadequate procedures in place onboard vessel
																11	Vessel breakdown or malfunction
																24	Communication failure - Equipment
																25	Communication failure - Personnel
																26	Adverse weather conditions
																30	Failure to comply with VTS/LPS/SOPs
																31	Failure to observe standing notices
																32	Failure to observe Byelaws/local regulations
																40	Failure of berth mooring systems
																55	Incapacitated master (drugs/alcohol)
																72	Failure to follow passage plan
																76	Inadequate training/competence - Others
																78	Ship/Tug/Launch failure
																80	Human error
																86	Competence
																102	Language problems
																103	Excessive vessel speed

Control ID	Embedded Controls				Residual Risk	Current Risk	Control ID	Additional Controls				Residual Risk	Final Risk	Date	Assessors
	Control	Comment	Likelihood Reduction	Consequence Reduction				Control	Comment	Likelihood Reduction	Consequence Reduction				
3	Communications - Traffic broadcast	Information promulgated by the Holyhead Coastguard Operations Centre (CGOC)	5%	0%	4.51		7	Pilotage service	Pilot required it tug/tow exceed set criteria	30%	5%	3.64			
10	Passage planning	From berth to berth containing all relevant information on the area and contingency planning	5%	0%	4.48		9	Local Port Services - Harbour control office		5%	5%	3.47			
60	International COLREGS 1972 (as amended)		5%	0%	4.45		13	Arrival/departure, advance notice of	Notification sent to LPS	5%	0%	3.45			
95	Standing Orders/SOPs	Provided by the vessels owner/operator	5%	5%	3.93		16	LPS broadcast (navigation and safety information)	Promulgate conditions and movements within the harbour to approaching vessels	5%	0%	3.43			
116	Weather forecasting	Advance warning gained from available internet resources and met ocean forecasts.	5%	0%	3.91		18	Safe allocation of berths (depth, available, suitable)		10%	5%	3.24			
							19	Port Facility Emergency Plan	To include actions in the event of MoB	0%	5%	3.08			
							21	Oil spill contingency plans	Details actions to be taken in the event of oil spill	0%	5%	2.93			
							22	Contingency plan exercises	Details actions to be taken in the event of oil spill	0%	5%	2.77			
							32	Towage, available and appropriate		0%	25%	1.85			
						3.91	33	Training of port marine/operations personnel	This should include the use of equipment and implementation of the plans	0%	5%	1.67	0.18	24-Oct-2016 Revised 02-Jun-2017	Kevin Riley - Stena Line Ports Ltd Neil Humphreys - Stena Line Ports Ltd Geoff Price - Amlwch Port Sue James - Holyhead Sailing Club Mike Butterfield - RYA Jane Templeton - Jacobs Adam Fitzpatrick - ABPmer
							36	Availability of pollution response equipment	Harbour and contractors to have equipment available	0%	5%	1.39			
							39	Direction (Special) - Powers of Harbour/Pier Master	Provided after consultation with Trinity House Lighthouse Authority	5%	5%	1.16			
							70	Marine Safety Management System	Provides guidance and procedures based on risk assessments	5%	5%	0.93			
							112	PMSC compliance	Ensures all risk is reduced to as low as reasonably practicable (ALARP)	5%	5%	0.69			
							114	Directions (General) - issued by SHA	Allows HA to regulate vessel speed	5%	0%	0.53			
							124	Mooring studies and plans	Berths designed for the prevailing Met ocean conditions and mooring arrangements suitable for vessel size	0%	10%	0.18			
							129	Vessel master simulation training	Prior to operations, masters to practice berthing/unberthing using the vessels that will be entering the harbour and representative tidal flow at different states of tide and weather.	15%	0%	0.18			

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
19	Ranging	Adverse weather conditions affecting moored vessels	High wind speed off berth causes vessels to range. Moorings break causing vessel to drift. Minor damage to vessel, bollards pulled from quay, major injuries from mooring line snap back and bollards. Vessel unable to return safely to berth goes to emergency anchor in harbour until engines started.	5	2	3	0	2	High wind speed off berth causes vessels to range. Moorings break causing vessel to drift. Minor damage to vessel, bollards pulled from quay, major injuries from snap back and bollards. Vessel unable to return safely to berth goes to emergency anchor in harbour until engines started.	1	0	1	0	1	4.97	1	Human error/fatigue - Ship Personnel
																7	Inadequate procedures in place onboard vessel
																26	Adverse weather conditions
																37	Failure to comply with safe systems of work
																48	Risk Assessment, Incomplete/not reviewed
																61	Incorrect assessment of tidal flow
																80	Human error

Control ID	Embedded Controls				Residual Risk	Current Risk	Control ID	Additional Controls				Residual Risk	Final Risk	Date	Assessors
	Control	Comment	Likelihood Reduction	Consequence Reduction				Control	Comment	Likelihood Reduction	Consequence Reduction				
10	Passage planning	From berth to berth containing all relevant information on the area and contingency planning	5%	0%	4.94	4.84	9	Local Port Services - Harbour control office	Ensures all risk is reduced to as low as reasonably practicable (ALARP)	0%	5%	4.31	3.48	24-Oct-2016 Revised 02-Jun-2017	Kevin Riley - Stena Line Ports Ltd Neil Humphreys - Stena Line Ports Ltd Geoff Price - Amlwch Port Sue James - Holyhead Sailing Club Mike Butterfield - RYA Jane Templeton - Jacobs Adam Fitzpatrick - ABPmer
116	Weather forecasting	Advance warning gained from available internet resources and met ocean forecasts.	20%	0%	4.84		44	Safe systems of work (H&S)	Based on risk assessment and industry best practice	5%	5%	4.12			
							70	Marine Safety Management System	Provides guidance and procedures based on risk assessments	5%	5%	3.93			
							112	PMSC compliance	Ensures all risk is reduced to as low as reasonably practicable (ALARP)	5%	5%	3.74			
							124	Mooring studies and plans	Berths designed for the prevailing Met ocean conditions and mooring arrangements suitable for vessel size	20%	5%	3.48			

Assessment Number	Hazard Category	Hazard Scenario	Worst Credible	Frequency (Years)	Consequence				Most Likely	Frequency (Years)	Consequence				Baseline Risk	Cause ID	Causes
					People	Property	Planet	Port			People	Property	Planet	Port			
20	Stranding	Small recreational vessel on breakwater	Small unpowered craft (for example, kayak or sailing boat) strands on marine works during adverse weather conditions and is unable to return to shore. Loss of life, no pollution, national adverse publicity.	5	3	2	0	4	Small unpowered craft (for example, kayak or sailing boat) strands on marine works but is able to make contact with local RNLI/emergency services. Minor injuries/hypothermia, canoe/kayak recovered but sustains major damage, no pollution, adverse publicity.	1	1	1	0	2	6.47	24	Communication failure - Equipment
																26	Adverse weather conditions
																28	Restricted visibility
																36	Failure of Aid to Navigation (out of position/unlit)
																61	Incorrect assessment of tidal flow
																80	Human error

Embedded Controls					Residual Risk	Current Risk	Additional Controls					Residual Risk	Final Risk	Date	Assessors
Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction			Control ID	Control	Comment	Likelihood Reduction	Consequence Reduction				
62	Emergency services equipment - shore side	Mayday or Pan-Pan call to Coastguards	0%	15%	5.83	5.67	9	Local Port Services - Harbour control office	Point of contact to control harbour operations	10%	10%	5.20	4.68	24-Oct-2016 Revised 02-Jun-2017	Kevin Riley - Stena Line Ports Ltd Neil Humphreys - Stena Line Ports Ltd Geoff Price - Amlwch Port Sue James - Holyhead Sailing Club Mike Butterfield - RYA Jane Templeton - Jacobs Adam Fitzpatrick - ABPmer
116	Weather forecasting	Advance warning gained from available met ocean forecasts.	10%	0%	5.67		27	CCTV coverage	Monitoring harbour area	10%	0%	5.15			
							70	Marine Safety Management System	Provides guidance and procedures based on risk assessments	5%	0%	5.12			
							112	PMSC compliance	Ensures all risk is reduced to as low as reasonably practicable (ALARP)	5%	0%	5.10			
							142	International Convention for the Safety of Life at Sea (SOLAS) 1974	On call to be available in the event of emergency	0%	10%	4.68			

ABPmer
Quayside Suite, Medina Chambers, Town Quay, Southampton SO14 2AQ

T +44 (0)23 80 711840
F +44 (0)23 80 711841
E enquiries@abpmer.co.uk

www.abpmer.co.uk

Creating sustainable solutions for the marine environment