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# Marine Characterisation Research Project (MCRP)

## 22UK1877\_Morlais\_Report\_of\_Survey\_Summer23

Menter Môn

Marine Characterisation Research Project (MCRP)

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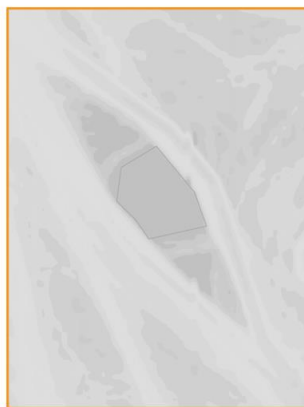
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## MENTER MÔN

### MORLAIS VESSEL TRAFFIC SURVEY METHODOLOGY AND GUIDELINES OF SURVEY – SUMMER 2023



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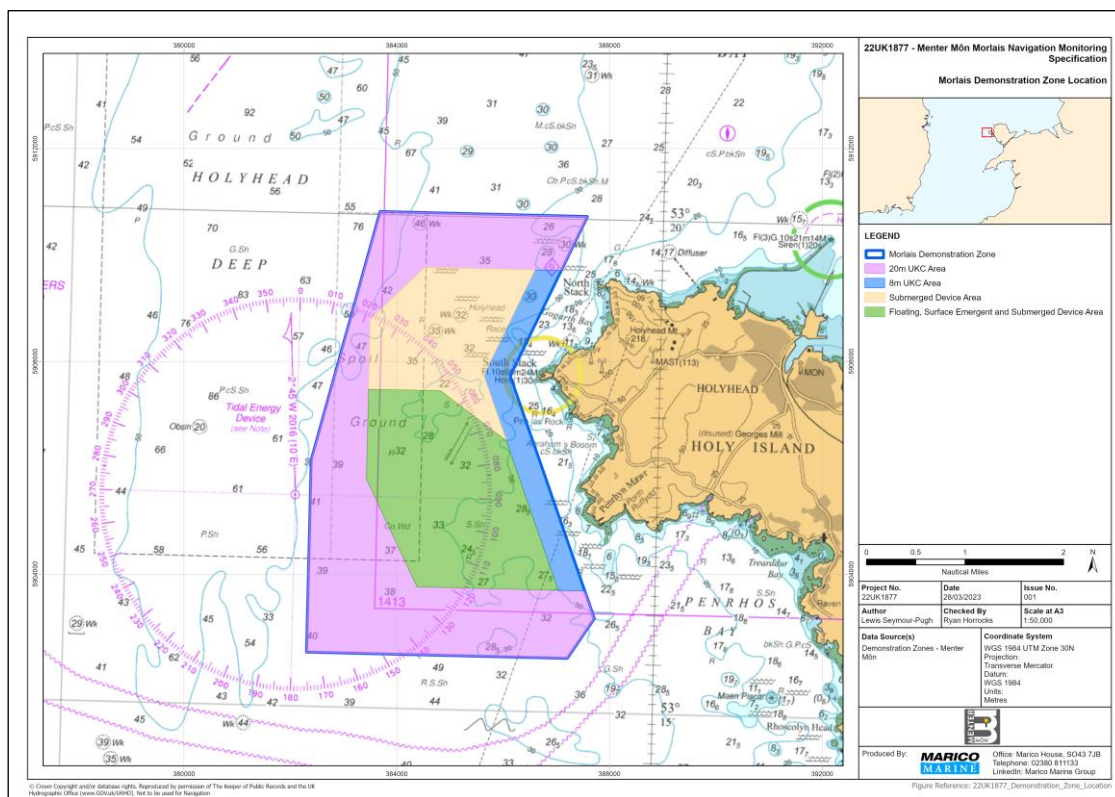
## ABBREVIATIONS

Abbreviation	Detail
AIS	Automatic Identification System
CCTV	Closed Circuit Television
HW	High Water
IMO	International Maritime Organisation
kt	Knot (unit of speed equal to nautical mile per hour, approximately 1.15 mph)
LW	Low Water
m	Metre
Marico Marine	Marine and Risk Consultants Ltd
MCA	Maritime and Coast Guard Agency
MDZ	Morlais Demonstration Zone
nm	Nautical Mile
NRA	Navigation Risk Assessment
RIB	Rigid - hulled Inflatable Boat
VHF	Very High Frequency (radio communication)

# 1 INTRODUCTION

Menter Môn commissioned Marine and Risk Consultants (Marico Marine) to undertake a Navigation Risk Assessment (NRA) for the Morlais Tidal Demonstration Zone (MDZ). To satisfy the requirements for the NRA, a summer and winter Vessel Traffic Survey (VTS) has been undertaken. This report details the findings of the summer survey which was conducted between Wednesday 16<sup>th</sup> August and Thursday 7<sup>th</sup> September, involving AIS, Radar and visual observations of vessels transiting through the Morlais Demonstration Zone (MDZ).

The MDZ is shown below in **Figure 1**.



*Figure 1 – Morlais Demonstration Zone as per the Marine License.*

## 1.1 PURPOSE

The survey was conducted in line with MGN 654 (M+F) entitled - *Safety of Navigation: Offshore Renewable Energy Installations (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response*. In order to fulfil the MCA requirements for offshore installations, it is necessary to collect the following navigational data:

- Radar data;
- AIS data; and

- Visual observations.

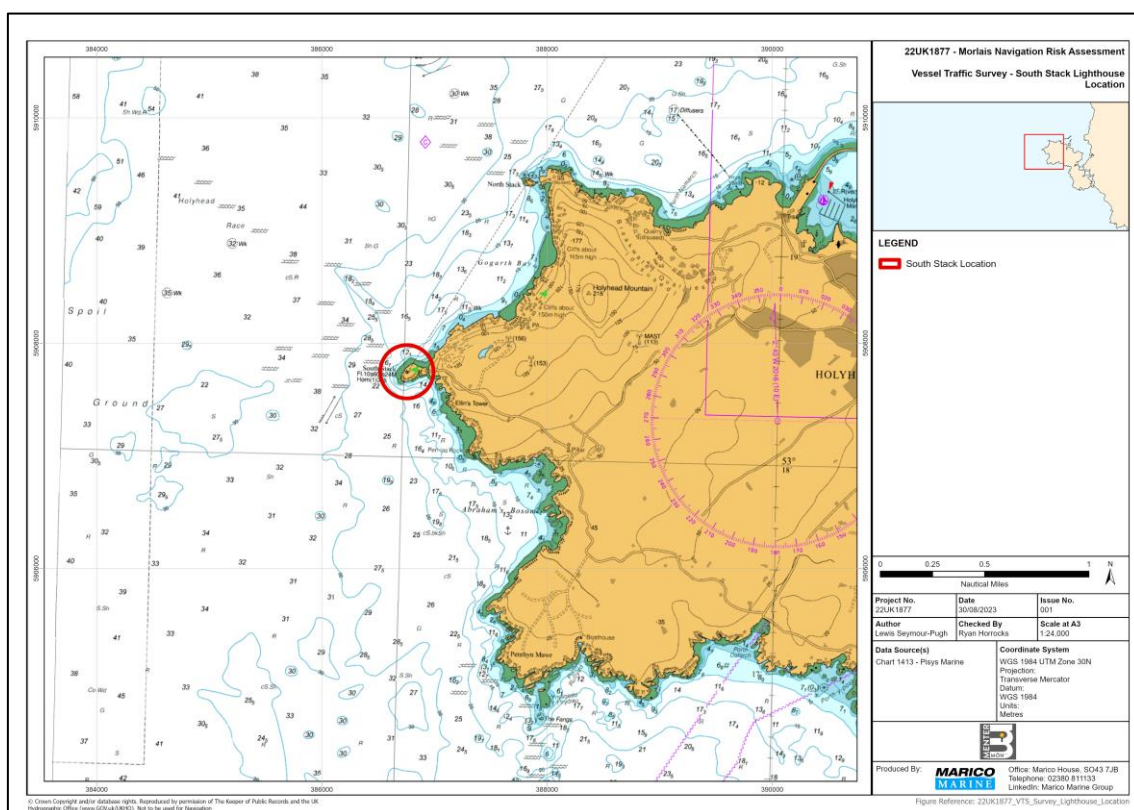
The MCA reiterated the requirement for radar data collection for all Offshore Renewable Energy Installations. The validity of the data is generally referenced to the most recent survey period advises: *“An up to date, traffic survey of the proposed development area concerned should be undertaken within 12 months prior to submission of the EIA Report. This should include all the vessel and craft types found in the area and total at least 28 days duration but also take account of seasonal variations and peak times in traffic patterns and fishing operations”* (MGN 654). This survey report presents 14 days of data which will be supplemented, in due course, with a winter period survey.



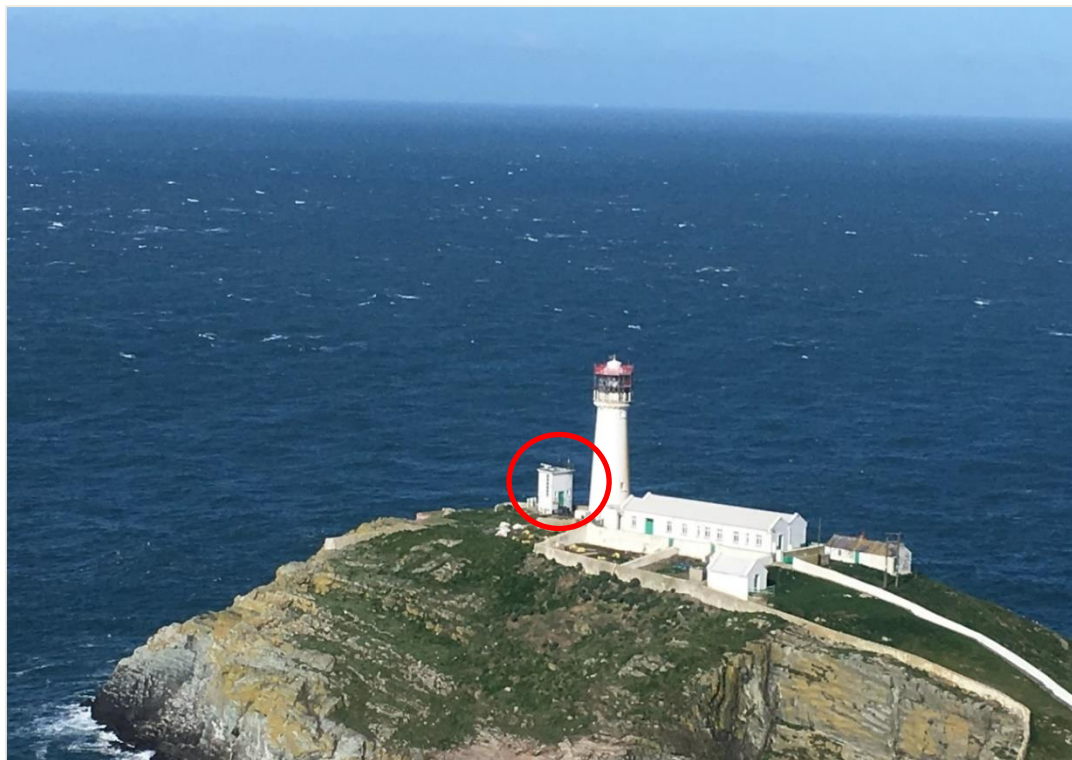
## 2 SURVEY SET UP

### 2.1 SURVEY LOCATION

The survey was conducted from South Stack lighthouse to the west of Holy Island. The location offered the best line of sight over the study area as well as an uninterrupted power supply and fog house building on which to deploy the equipment. Permission was provided by Trinity House for this purpose under a formal licence.



*Figure 2: Location of South Stack Lighthouse.*



*Figure 3: Position of survey equipment.*

## 2.2 SURVEY EQUIPMENT

The equipment specification was as follows;

- a Simrad HALO-6 Pulse compression RADAR:
  - Antenna size: 6 ft. (1.8 m);
- CCTV Camera:
  - a Predator PTZ Camera PRED60-28-G-W 28 x Optical Zoom 360Vision CCTV With Wiper;
- Marine VHF Antenna (for AIS);
- StarLink satellite broadband equipment;
- Equipment Box comprising:
  - Desktop PC with data recording software;
  - SR162 Professional AIS receiver;
  - Uninterruptible Power Supply Unit;
- Installation Materials.
- Survey processing:
  - Wärtsilä Navi-Harbour WebVTS 5.0 system.



*Figure 4: Equipment in position on fog house roof.*



*Figure 5: Survey computer stack.*

## 2.3 SURVEY TIMELINE

The survey timeline runs from 16<sup>th</sup> August to 7<sup>th</sup> September, where the effects of Storm Betty lead to minor equipment damage during the first week of the survey which was subsequently repaired. The overall survey campaign duration was chosen to include the August bank holiday as it was noted to be a period of peak vessel transits.

## 2.4 MOBILISATION AND INSTALLATION

Equipment mobilisation is a standard operation for Marico Marine engineers/personnel. This was undertaken on 3<sup>rd</sup> to 5<sup>th</sup> July 2023. It included:

- Arrived and reported to TH Site representative;
- Visual inspection of the installation site and updated RAMS document if required;
- Unloaded all survey equipment and transport (by hand) to site;
- Deployed radar on the roof of the Fog Signal Building:
  - Lifted radar into place and secured;
  - Ran cables (power and data) and secured.
- Deployed CCTV and AIS roof of the Fog Signal Building:
  - Lifted CCTV and AIS into place and secured;
  - Ran cables (power and data) and secured.
- Deployed Equipment Box on the ground adjacent the roof of the Fog Signal Building.
- Set-up ethernet link to remote Operator workstation located offsite.
- Connected power supply and tested.

Approximate duration of installation works 4-5 hours.

To facilitate delivery of equipment to site, Marico Marine secured the assistance of local removers to help lift the equipment to and from the site.

## 2.5 DE-MOBILISATION AND REMOVAL

It was Marico Marine's preference that equipment be left on site plugged in for the duration of the granted licence to avoid equipment failures. This was at the discretion of Trinity House and required their approval via licence. When not in use, the equipment should be unplugged between survey periods. If the equipment needs to be removed or once the licence has expired, then the work to demobilise said equipment is standard operation for Marico Marine engineers/personnel and will include:

- Removal of radar from the roof of the Fog Signal Building;

- Disconnect radar and lower to ground;
  - Remove cables (power and data).
- Removal of CCTV and AIS from roof of the Fog Signal Building:
  - Disconnect CCTV and AIS and lower to ground;
  - Remove cables (power and data).
- Remove Equipment Box and onsite workstation;
- Check site is tidy and nothing is left behind (remove any litter from site).
- Contact TH Site Representative to confirm completion of survey.

Approximate duration of demobilisation works 2-3 hours.



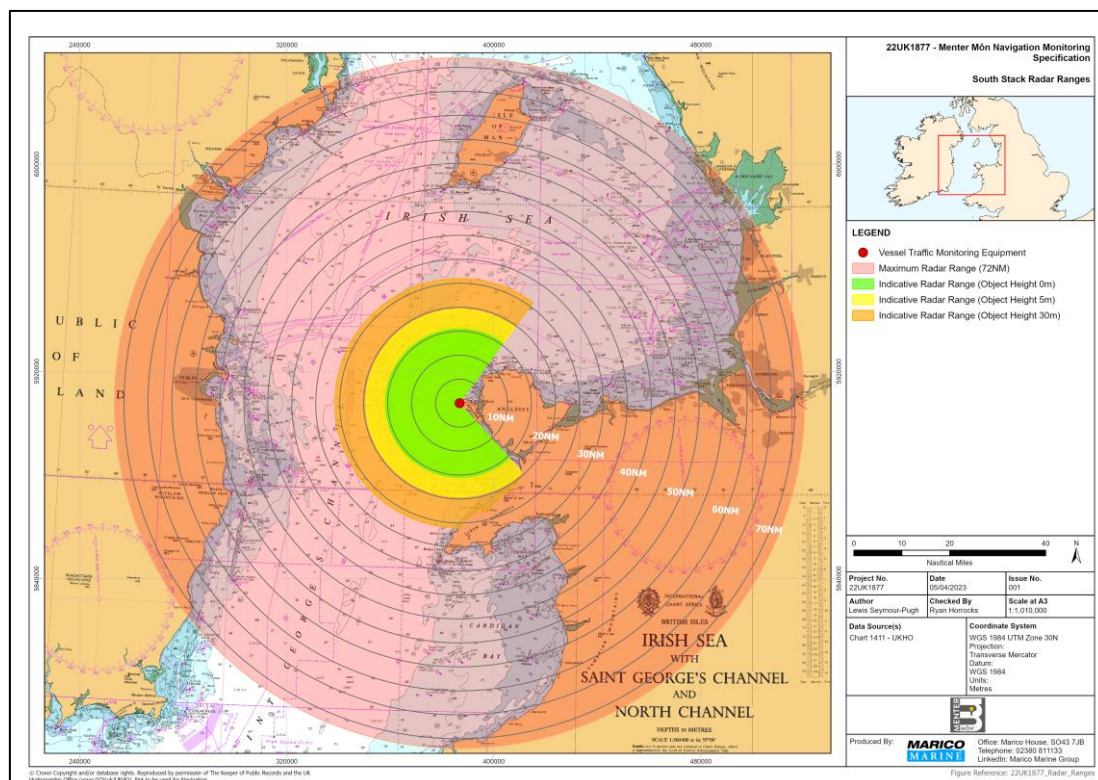
### 3 SURVEY DETAILS

#### 3.1 DETECTION RANGE & ASPECTS

X-Band radar delivers high-resolution coverage with optimal target separation. The images produced by radar include hard targets such as ships and coastlines. X band radar also presents reflections from the sea surface, known as ‘sea clutter’. Given a wind speed of more than approximately 6 knots, the backscatter from the sea surface becomes visible in radar images which can contain valuable information on the actual sea state. X-band radar systems scan the ocean surface in real-time at high temporal (1–2 s) and spatial (5–10 m) resolution. An area of sea surface of several square kilometres can therefore be continuously monitored. X-band radar systems are designed to be installed on moving vessels or, as in this case, on fixed platforms.

The main limitations of X-band radar are the limited range, and the requirement for sufficient sea clutter (and associated significant wave height) to allow clear imaging. Due to the limited range of X-band radar, a fixed platform will be installed reasonably close to the area of interest.

Coverage of the X-Band radar has been modelled using the Cambridge Pixel SPX Tool and indicative radar coverage is shown in **Figure 6**.



*Figure 6: South Stack Modelled Radar Ranges.*

It should be noted that the high scanner height and steep sided cliff resulted in a blind spot at the base of the cliffs where vessels hugging the coast and well inshore of the development area would not always be detectable.

## 3.2 DATA SUMMARY

AIS and radar targets were recorded through NaviHarbour, an application developed by Wartsilla, which was used to track vessel positions and the time they transited within the MDZ. Positional data was recorded at 10 second intervals. This data was then converted into text files for both the radar and AIS targets and included Time, Date, Latitude, Longitude, Course, Speed. AIS also included the following additional attributes: MMSI, Type, Call Sign etc. The data was then inputted into a spatial database for analysis in a Geographic Information System (GIS).

### 3.3 TIDAL CONDITIONS

**Table 1** shows the tidal speeds and range for the study area during the survey period. The survey was of sufficient duration to include a full tidal cycle of spring and neap tides.

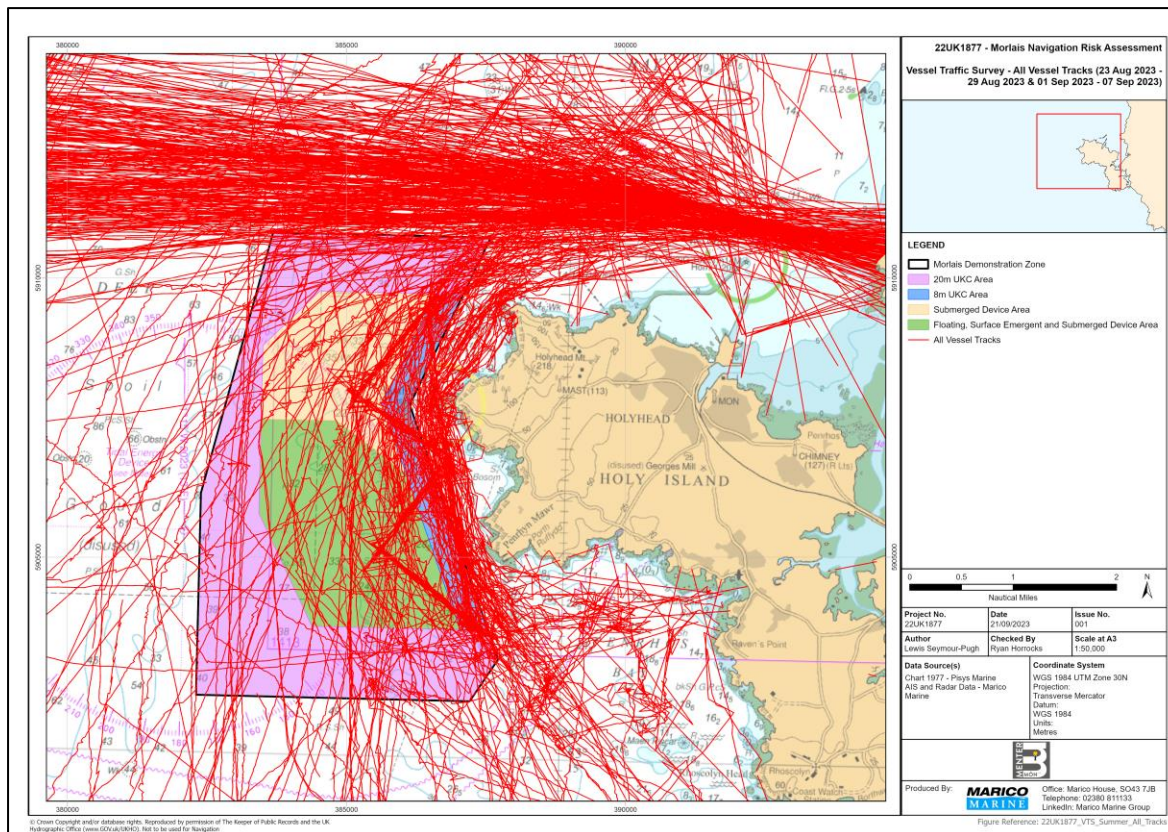
*Table 1: Tidal diamond for at Holyhead (Source: Admiralty Total Tide).*

Time (HW)	Direction	Spring Rate (kt)	Neap Rate (kt)
-6	047	0.8	0.4
-5	044	3.2	1.6
-4	046	4.1	2.0
-3	038	4.1	2.0
-2	024	1.9	1.0
-1	266	1.2	0.6
HW	249	3.3	1.7
+1	228	4.5	2.2
+2	225	4.4	2.2
+3	223	4.3	2.1
+4	217	2.6	1.3
+5	211	1.4	0.7
+6	180	0.2	0.1



## 4 SURVEY TRAFFIC RESULTS

Figure 7 provides the overview traffic of total vessel data across the two-week summer survey. Figure 8 shows specifically the non-AIS targets collected by radar.



*Figure 7 – All Vessel Tracks*

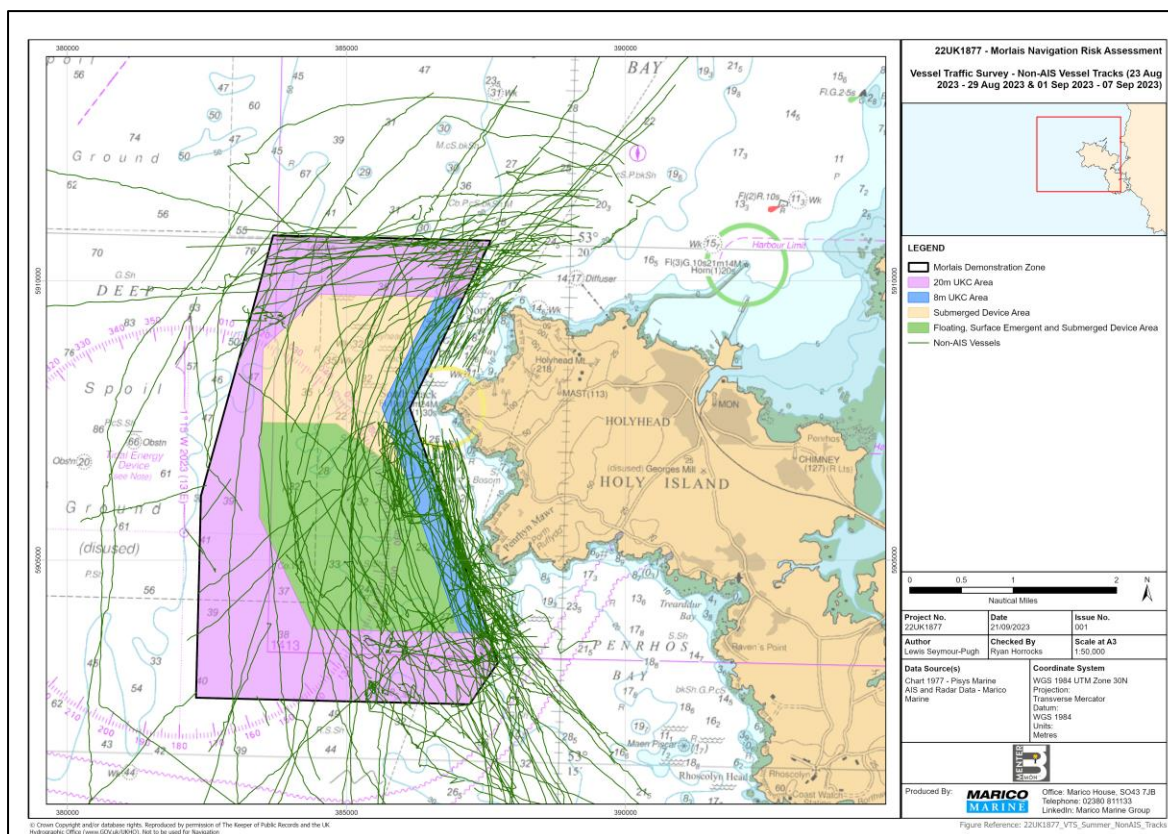


Figure 8 – Non-AIS (radar) Vessel Tracks

## 4.1 AIS TRACK CATEGORIES

The following figures demonstrate the numbers of tracks of each specific vessel type that were present during the survey period and transited in or around the demonstration zone.



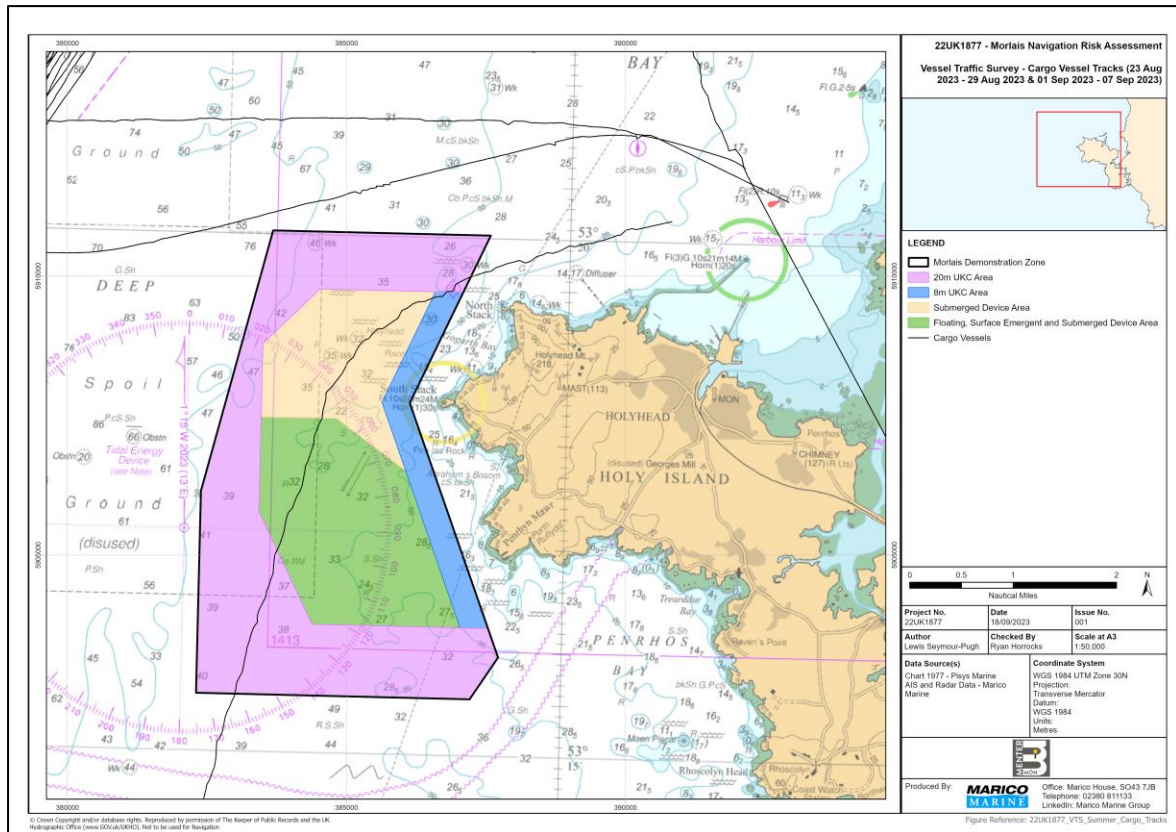


Figure 9 – Cargo Vessel Tracks

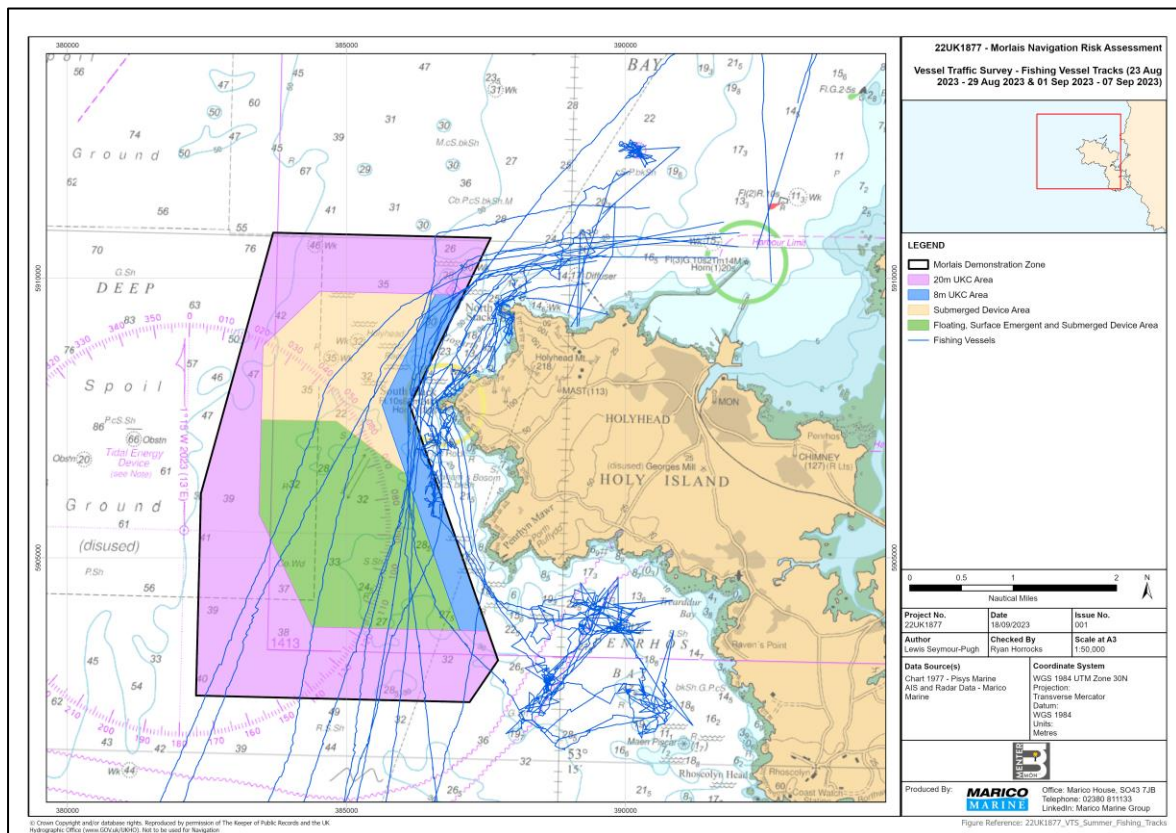


Figure 10 – Fishing Vessel Tracks

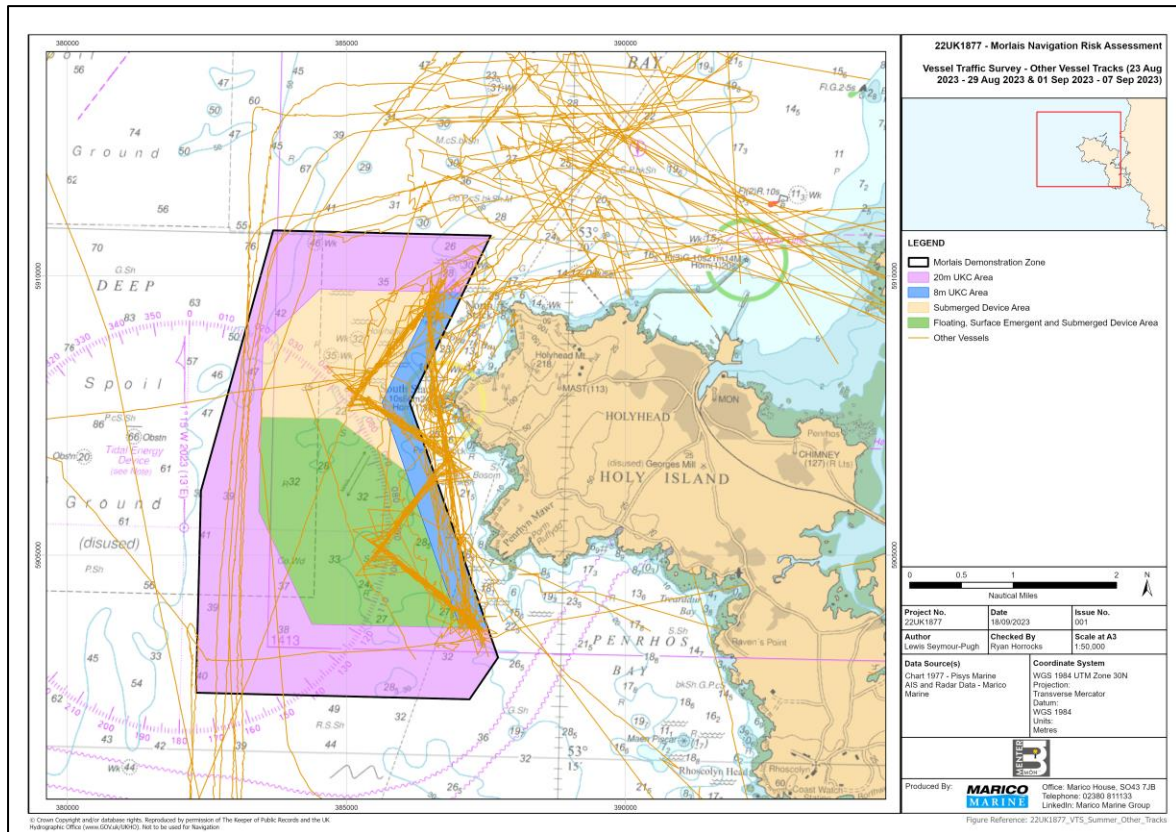


Figure 11 - Other Vessel Tracks

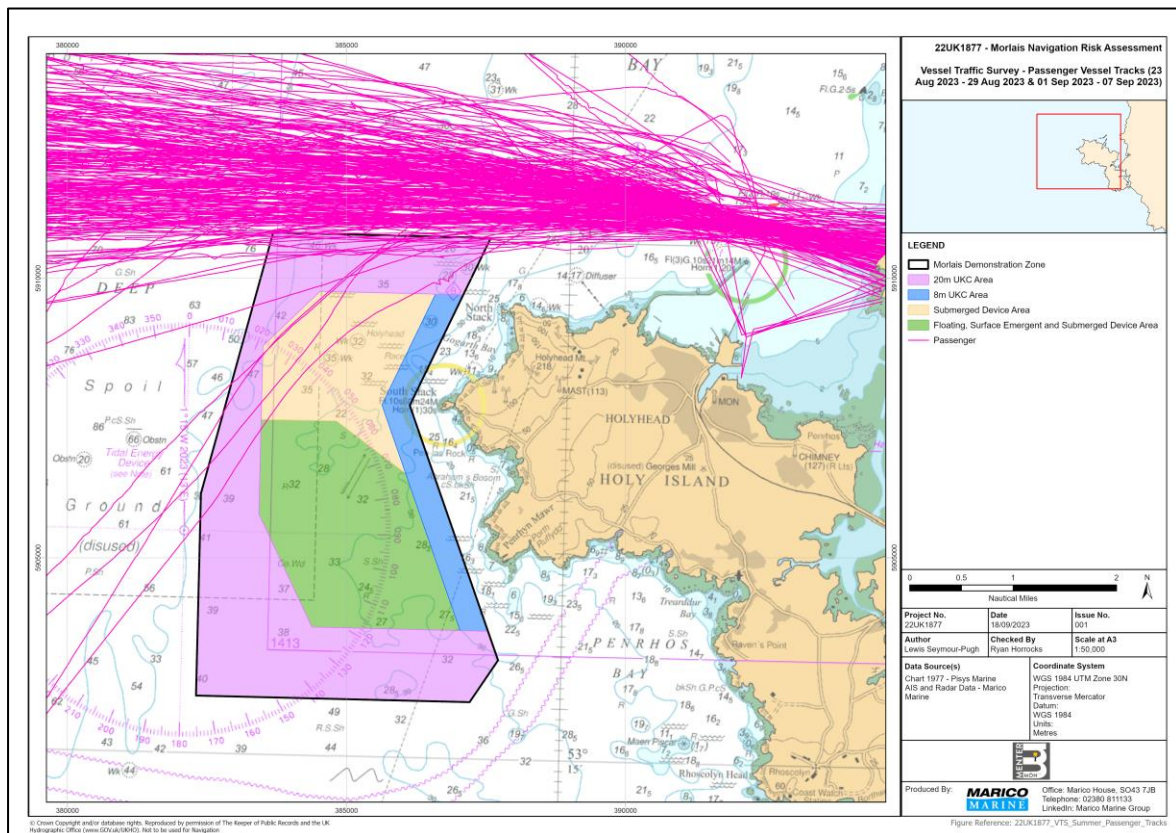


Figure 12 - Passenger Vessel Tracks



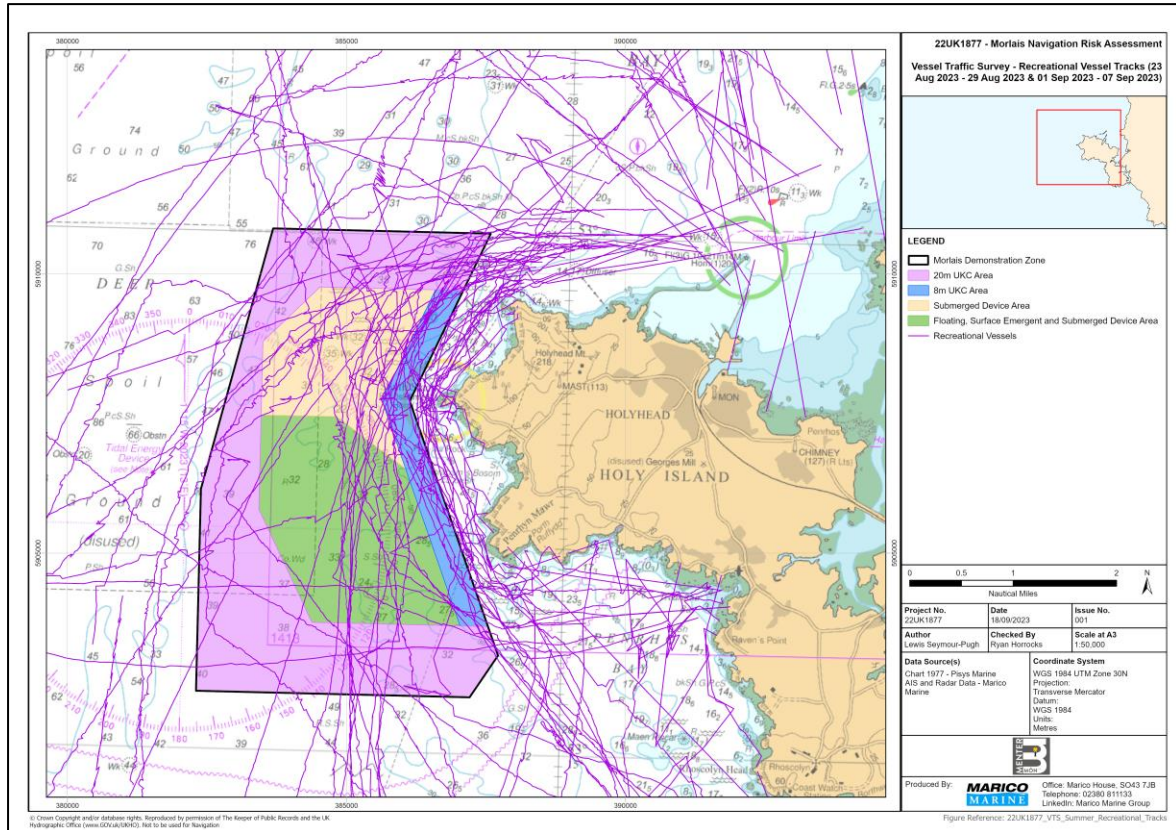


Figure 13 – Recreational Vessel Tracks

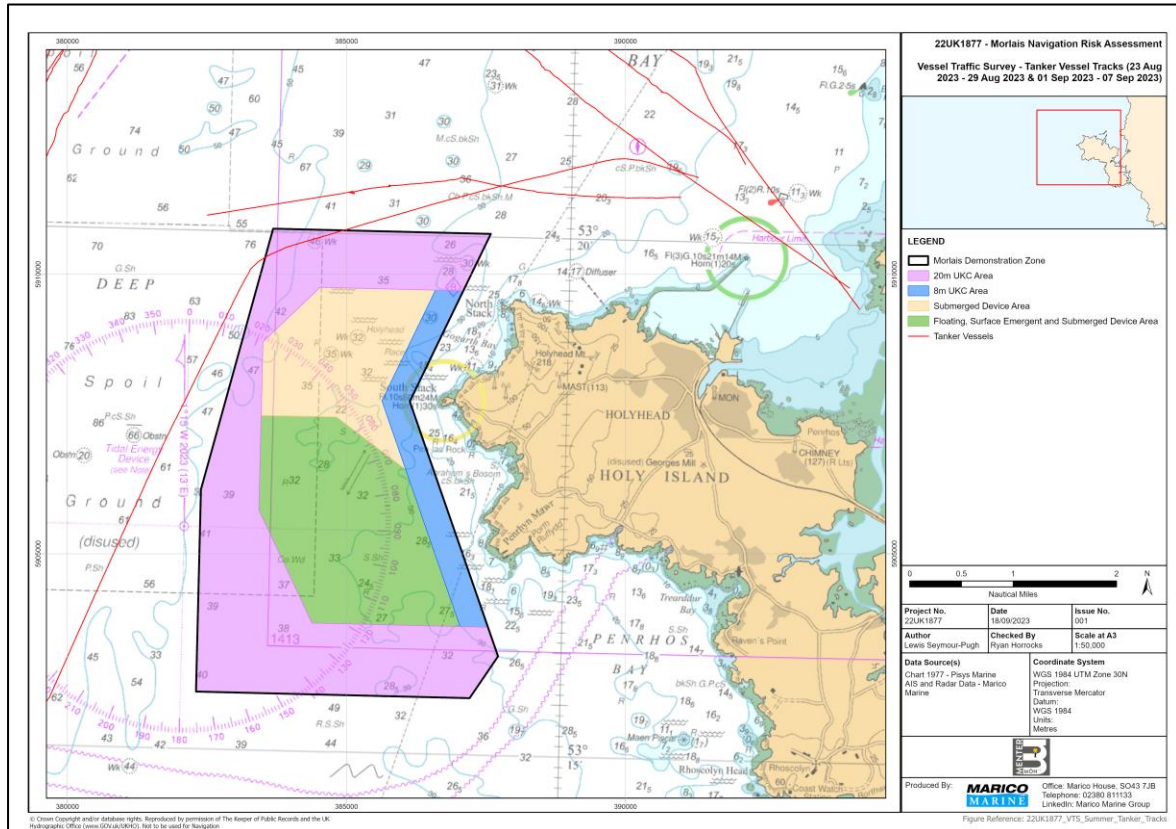
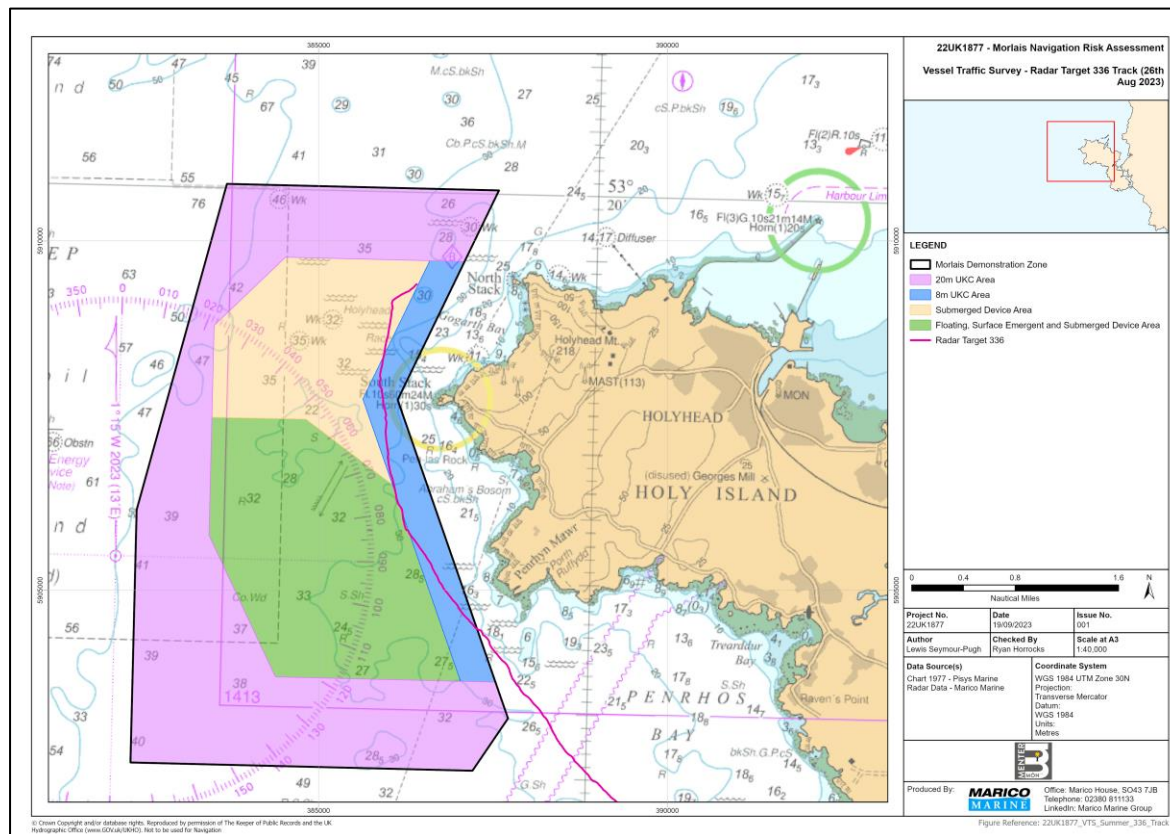


Figure 14 – Tanker Vessel Tracks

## 4.2 RADAR TARGET TRACKS

Radar targets were marked and recorded within both the NaviHarbour software and Visual Records Log to provide both geospatial data and images of radar vessels, as seen in **Figure 15** and **Figure 16**.



*Figure 15 – Radar Target 336 Track*



*Figure 16 – CCTV Image of radar Target 336*

## Annex A    Visual Observation Log Example



	Time First Observed	Time (Enter MDZ)	Time (Exit MDZ)	Ship Type	Vessel Name	MMSI	Length	Beam	Course/Heading (°)	Speed	Notes	Surveyor
1	6.31	6.47	7.02	Fishing Vessel	Sarah H	235002249	/	/	137	5.5	First observed transiting in between the MDZ and Coastline at 6.31, approached the area from NE and has been underway and stationary. Entered the Zone at 6.47 through Zone 13 and crossed the SE portion of the MDZ. Exited the zone at 6.31 on the Southern extent, Zone 12	RH
2	6.56	/	7.00	Recreational	/	/	/	/	NE /		Red Kayak spotted in Zone 5/Kayak Zone 2 paddling through the eastern side of the zone travelling NE towards Holyhead, approx 7m	RH
3	8.39	8.40	9.02	Recreational	/	/	/	/	221	17.6	First observed traveling SW from Holyhead towards the MDZ. Small Pleasure craft entered the MDZ via zone 4. Slowed down when inside the MDZ (Zone 8). Proceeded to stay on the eastern extent of the MDZ towards the shore. Stopped to fished outside of the MDZ in Zone 14. Proceeded south to head back inot the MDZ via Zone 13. Left the MDZ at 9.15 Via Zone 13 and proceeded SW.	RH
4	8.36	8.45	9.15	Sailing Vessel	Menai IV	232007949	/	/	351.9	7.7	First observed on AIS travelling north towards the MDZ. Sail boat entered the MDZ through zone 12. Travelled the full extent of the zone. Proceeded to head north and travel out the MDZ via zone 3 towards Holyhead (NE)	RH
5	8.53	/	/	Recreational	/	/	/	/	N /		2 kaykers observed travelling around the South Stack island, approx 7m, red and blue, Hugged the shore line, did not enter the MDZ.	RH
6	9.39	9.42	13:05	Port Tender	MV Seecat C	235022763	11	5	218.9	13.1	Fisrt observed travelling SW from Holyhead to MDZ. Entered MDZ via in zone 3 travelling SW. remained stationary within zone 8 of the zone to fish. Charter Fishing vessel not port tender. Started to head south through zone 10. Staitoinary in zone 10. Entered MDZ again at 13:43 and left at 14:30	RH
7	10.02	10.05	11.48	Sailing Vessel	/	/	/	/	255.5	5.4	First observed travelling west towardss MDZ from Holyhead. Entered zone via zone 3. Left the MDZ by travelling south via zone 5. reentered the MDZ via zone 10.	RH
8	10.07	10:31	11.09	Sailing Vessel	Jo Jo	232023274	10	3	242.3	6.2	First observed heading west towards MDZ from Holyhead. Proceeded to travel south, bewtween MDZ and coastline. Crossed into MDZ via zone 12. Ldft MDZ via zone 12.	RH
9	10.35	/	/	Recreational	/	/	/	/	S	/	Fisrt observed travelling south, 2 kayakers, one yellow, one black, approx 7m, hugged the shoreline, did not enter the MDZ.	RH
10	10.39	/	/	Sailing Vessel	/	235092448	/	/	233.8	6.3	Fisrt observed travelling SW from Holyhead to MDZ. Proceeded south between the MDZ and coastline. Did not enter the MDZ.	RH
11	10.57	/	/	Jet Ski	/	/	/	/	N	/	First observed travelling north within Zone 13 between the MDZ and Coastline, approx 5m, did not enter the MDZ, fishing off jet ski near south stack	RH
12	11.03	12:24	12:29	Pleasure Craft	/	/	/	/	217.9	8.2	Fisrt observed travelling SW from Holyhead to MDZ. Proceeded south between the MDZ and coastline. Did not enter the MDZ. Stopped to fish near south stack island.	RH
13	11.12	/	/	Recreational	/	/	/	/	S	/	Travelling South one tandem kayak, yellow/black, approx 10m, hugged the shoreline, did not enter the MDZ.	RH
14	11.16	11.17	11.18	Recreational	/	/	/	/	N	/	Rib first observed tranisting towards MDZ, entered through zone 13. Left through zone 13, stayed east of the boundary continued bewtween MDZ and coastline	RH
15	11.18	11.18	11.19	Pleasrue craft	Explorer	232047700	/	/	259.5	27.4	Rib First oberseved travelling west towards MDZ, entered through zone 13. Left through zone 13, stayed east of the boundary continued bewtween MDZ and coastline	RH
16	11.24	11.28	11.3	Recreational	/	/	/	/	N	/	Rib first observed tranisting towards MDZ, stayed east of the boundary continued bewtween MDZ and coastline, entereted southern extent of bouadary	RH
17	11.24	/	/	Recreational	/	/	/	/	N	/	6 Kayaks, Travelling north, hugged the shoreline, did not enter the MDZ.	RH
18	11.25	11.28	12:20	HSC	SKYE	232011169	14	5	209.8	14.7	Observed travelling SW before entering MDZ, Entered MDZ via zone 9. moored to marinus, people have borded marinus.	RH
19	11.28	/	/	Recreational	/	/	/	/	S	/	4 jet skis travelling past south stack, hugged the shoreline, did not enter the MDZ.	RH
20	11.31	/	/	Recreational	/	/	/	/	N	/	Rib Observed travelling North hugged the shoreline, did not enter the MDZ.	RH
21	11.35	11.37	11.44	Fishing Vessel	/	/	/	/	N	/	Observed travelling North, entereted MDZ via zone 13, lef the MDZ via zone 12 and proceeded to travel North	RH
22	11.31	/	/	Recreational	/	/	/	/	N	/	Rib Observed travelling North hugged the shoreline, did not enter the MDZ.	RH
23	11.43	/	/	Fishing Vessel	/	/	/	/	N	/	Travled just east of the MDZ and proceeded to travel east.	SB
24	12.07	/	/	Recreational	/	/	/	/	S	/	Observed travelling south near South Stack, hugged the shoreline, did not enter the MDZ.	SB
25	12.11	/	/	Recreational	/	/	/	/	N	/	Rib Travelling north, stayed between the MDZ and coastline.	SB



## Annex B    CCTV Image Examples



*Figure 17 – Kayakers observed during survey.*



*Figure 18 – Recreational sailing vessel observed during survey.*



*Figure 19 – Fishing vessel observed during survey.*



*Figure 20 – Passenger ferry observed during survey.*

## Annex C      Survey Weather Log

## OCEAN CONDITIONS DURING SURVEY

The survey watchkeeper recorded weather log data at the start of watch as shown in **Table 2**.

*Table 2: Survey weather log.*

Date	Time	Tem pera ture	Wind Speed	Wind Direc tion	Weather Type	Visib ility	Cloud Cover	Sea State
16/8/2023	5:55	12	3	SE	Sunny	G	Clear	Calm
16/8/2023	12:24	20	8	N	Sunny	G	Slight Cover	Calm
16/8/2023	15:00	20	11	NNE	Sunny	G	Clear	Calm
17/8/2023	5:57	14	9	E	Sunny	G	50%	Calm
17/8/2023	11:37	21	9	SE	Sunny	G	Clear	Calm
17/8/2023	15:00	23	14	SE	Sunny	G	20%	Calm
18/8/2023	5:55	15	10	E	Cloudy	G	75%	Calm
18/8/2023	11:06	19	12	ESE	Cloudy	G	90%	Calm
18/8/2023	15:12	21	14	ESE	Cloudy	M	100%	Calm
19/8/2023	5:59	16	37(60)	SSW	Cloudy with rain & wind	M	100%	Choppy
19/8/2023	12:50	18	27	SSW	Windy & Rainy	M	50%	Very Rough
20/8/2023	5:50	16	15	SSW	Cloudy & overcast	G	50%	Calm
20/8/2023	13:55	18	21	SSW	Cloudy	G	75%	Some Chop
21/8/2023	5:59	16	19	SSW	Cloudy & overcast	G	30%	Choppy
21/8/2023	11:15	18	22	SSW	Cloudy, Overcast & Rainy	P	100%	Choppy
21/8/2023	16:40	18	23	SSW	Sunny Spells	G	60%	Choppy
22/8/2023	6:00	16	20	SW	Cloudy & overcast	G	50%	Choppy
22/8/2023	12:58	18	16	SW	Overcast	G	100%	Choppy
22/8/2023	17:00	18	15	SSW	Sunny Spells	VG	60%	Choppy
23/8/2023	5:57	15	12	WSW	Gloomy	G	100%	Calm
23/8/2023	10:56	16	10	SSE	Fair	G	10%	Calm
23/8/2023	15:13	16	11	SSW	Rainy & overcast	P	100%	Choppy
24/8/2023	5:59	15	11	NW	Cloudy	G	90%	Choppy
24/8/2023	12:06	16	15	NW	Cloudy	VG	100%	Choppy
24/8/2023	15:09	16	6	W	Clear	E	10%	Calm
25/8/2023	5:53	13	8	WNW	Clear	VG	50%	Choppy
25/8/2023	13:17	16	12	WNW	Overcast	VG	90%	Choppy
26/8/2023	5:57	13	11	NW	Gloomy	G	80%	Choppy
26/8/2023	13:01	17	11	NNW	Sunny	E	5%	Choppy

27/8/2023	5:48	14	18	NW	Gloomy	VG	50%	Some Chop
27/8/2023	13:09	15	12	WNW	Overcast	G	100%	Choppy
28/8/2023	5:52	14	11	NNW	Gloomy	VG	20%	Some Chop
28/8/2023	13:03	16	12	WNW	Sunny	VG	10%	Some Chop
29/8/2023	6:00	15	8	W	Gloomy	VG	50%	Some Chop
29/8/2023	13:01	16	17	NW	Overcast	VG	60%	Some Chop