Llŷr Floating Offshore Wind Survey Device
Vessel Traffic Risk Assessment

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Presented to	Floventis Energy
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Revision Number	Date	Summary of Change
00	08 December 2022	Initial Draft
01	16 December 2022	Updates
02	12 January 2023	Updates
03	17 February 2023	Updates Post Consultation

Table of Contents

Table of Figures

Table of Tables

Abbreviations Table

Abbreviation	Definition
AIS	Automatic Identification System
ALARP	As Low As Reasonably Practicable
ARPA	Automatic Radar Plotting Aid
Ah	Ampere Hours
AtoN	Aid to Navigation
FLiDAR	Floating Light Detecting and Ranging
GB	Gigabytes
GSM	Global System for Mobile
GPS	Global Positioning System
HMCG	His Majesty's Coastguard
IMO	International Maritime Organisation
LED	Light Emitting Diode
m	Metre
MCZ	Marine Conservation Zone
MHPA	Milford Haven Port Authority
nm	Nautical Mile
nm^2	Nautical Mile Squared
NRW	Natural Resource Wales
OWF	Offshore Wind Farm
PEXA	Military Practice and Exercise Area
RADAR	Radio Detecting and Ranging
UK	United Kingdom
UTC	Coordinated Universal Time
W	Watts
WGS84	World Geodetic System 1984

1 Introduction

Floventis Energy intend to deploy a meteorological and oceanographic (metocean) survey device to support the Llŷr 1 and Llŷr 2 Project, a proposed offshore wind farm (OWF) to be located off the southwest Pembrokeshire coast in the Celtic Sea. It is intended that a WINSEA Floating Light Detection and Ranging (FLiDAR) survey device and additional wave buoy will be deployed for a duration of one year to collect data on current atmospheric and oceanographic measurements with an expected deployment date in Spring 2023, subject to weather windows. The proposed deployment is envisioned to be floating with double or triple mooring lines with the associated wave buoy anchored separately nearby.

This report presents the analysis of a 28-day vessel traffic dataset which was compiled using Automatic Identification System (AIS), Radio Detection and Ranging (Radar), and visual observation data. The analysis focuses on the area surrounding the proposed device location.

The objectives of this report are as follows:

- To analyse vessel traffic in proximity to the FLidar and wave buoy; and
- To highlight where mitigations are required.

1.1 Potential Location of FLidar and Wave Buoy

The proposed FLidar and wave buoy will be located in the western half of the Llŷr 2 site, approximately 780 metres (m) to the east of the western boundary of the site and approximately 20 nautical miles (nm) southwest of the Pembroke coast. The associated wave buoy will be situated a few hundred metres away from the main FLidar and wave buoy.

The coordinates of the proposed FLidar location in presented in Table 1-1.

Table 1-1 Coordinates of FLidar

Device Location	Latitude (World Geodetic System 1984(WGS84))	Longitude (WGS84)
FLidar	51° 20' 5.4678" North	005° 17' 58.3786” West

1.2 Specifications of FLidar and wave buoy

The FLidar and wave buoy is used for gathering atmospheric and oceanographic measurement data while the associated wave buoy is used for gathering wave and weather measurements. The data that will be collected will include and not be limited to:

- Wind speed and direction at a range of heights;
- Surface wind;
- Atmospheric pressure, humidity, and temperature;
- Wave parameters (height and direction); and

- Water depth, temperature, and current profile.

Further descriptions of the FLidar and wave buoy is presented in Table 1-2. Following this, an illustration of the FLidar and wave buoy is presented in Figure 1-1 and the associated wave buoy in Figure 1-2

Table 1-2 Specifications of FLidar and Wave Buoy

Device	Specifications and Dimensions	Aids to Navigations (AtoN)	Duration of Deployment
FLidar	▪ 3m x 3m x 5m (Maximum Height x Width x Length) ▪ Max weight 12 tonne when ballast in operation ▪ Power source: 400Watts (W) from wave energy, 1200W from solar panel, 100W back-up methanol fuel cell. ▪ 800 Ampere Hours (Ah) battery ▪ 128 GigaBytes (GB) storage on board ▪ Global System for Mobile (GSM) and Satellite ready	FLidar: ▪ Light Emitting Diode (LED)-based flashlight on top of mast with 5 nautical mile (nm) range (5 flashing yellow lights every 20 seconds. Flash rate not to exceed 30 per minute). ▪ St. Andrews Cross top mark. ▪ Self-contained beacon. ▪ Identification Plate ▪ AIS transmitter Wave Buoy: ▪ LED based flashlight with 2-3 nm range (5 flashing yellow lights every 20 seconds. Flash rate will not exceed 30 per minute)	12 Months

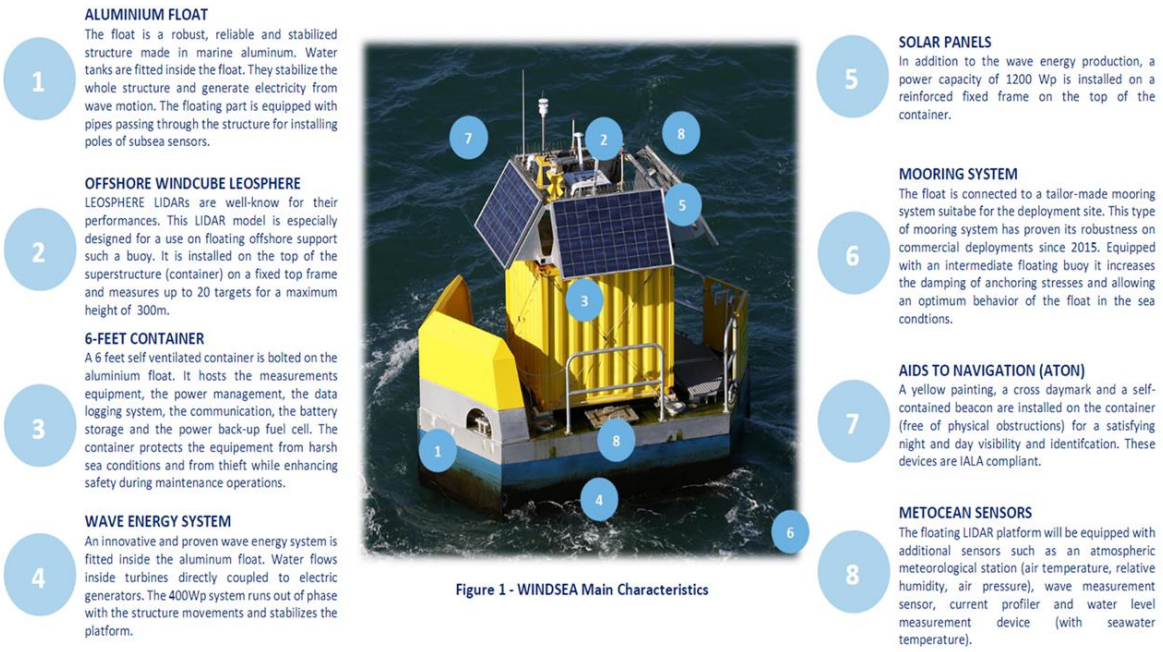

Figure 1-1 Proposed WINDSEA FLidar

Figure 1-2 Proposed Wave Buoy

1.3 Survey Data

AIS, Radar and visual data has been collected via two dedicated vessel traffic surveys. The data covers two seasonal time periods each covering 14 full days, for a total combined data period of 28-days. The two survey periods are:

- Summer 2021 – 12th of August at 16:00 Coordinated Universal Time (UTC) to 26th August at 16:00 UTC; and
- Winter 2022 – 5th of March at 00:00 UTC to 19th March at 23:00[1] UTC.

These specific time periods were chosen to ensure that any seasonal variation in vessel movement and activity within the survey area was accounted for.

1.4 Study Area

The preliminary study for this report has been defined as a 10nm buffer around the previous Atlantic Array Zone[2] at the entrance to the Bristol Channel, off the coast of South Wales and North Devon given this was the area in which the vessel traffic survey was undertaken. The area is approximately 72.8 square nautical miles (nm^2) and contains both Llŷr 1 and Llŷr 2. The study area relative to the proposed FLidar is presented in Figure 1-3.

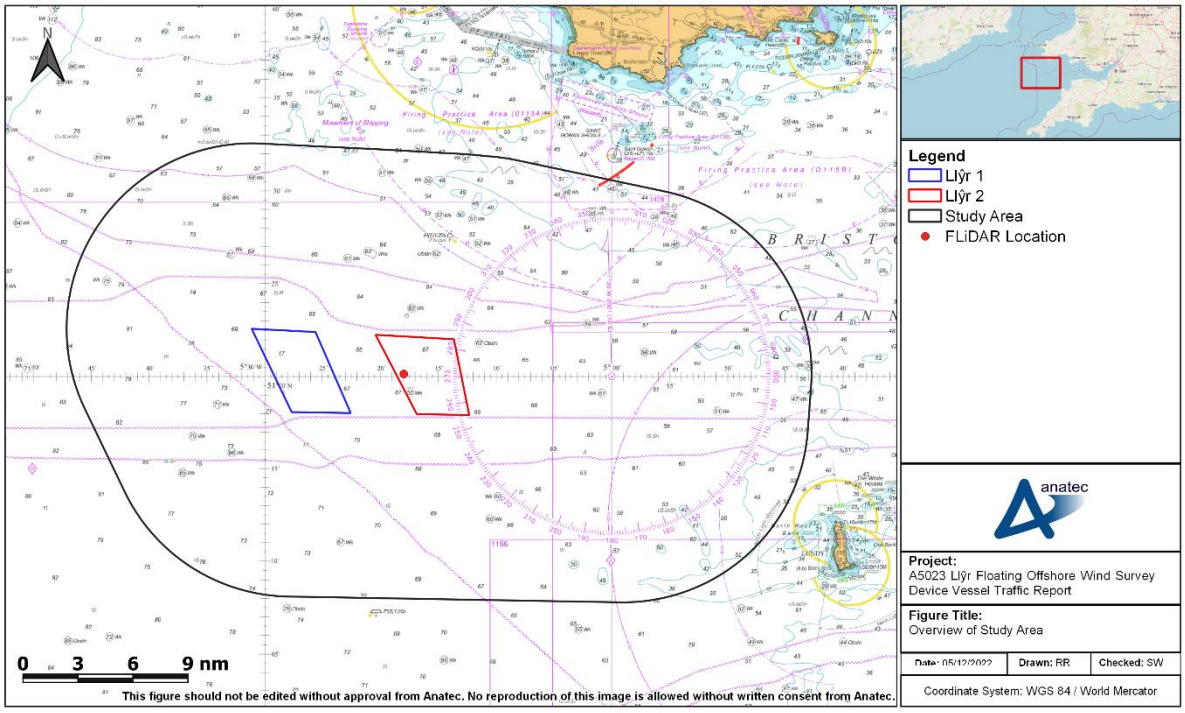

Figure 1-3 Overview of Study Area

[1] The survey vessel Karima left the site on 12th March 2022 at 12:00 UTC due to adverse weather conditions and returned to the site on 13th March 2022 at 11:00 UTC.
[2] Initial search area for potential offshore windfarm sites sites.

2 Consultation

Table 2.1 lists feedback which has been provided to date in relation to an initial proposed location within Llŷr 1.

Table 2-1 Consultation Feedback on Initial Location in Llŷr 1

Consultee and Date	Feedback
Trinity House 2nd November 2022	**This feedback was given on a previous location within Llŷr 1.** Trinity House advised that they consider these works are likely to cause an obstruction, and potential danger, to navigation. Therefore, we would expect to see some form of risk assessment for the marine traffic in the area to accompany your marine licence application to Natural Resource Wales (NRW).
Milford Haven Port Authority (MHPA) 7th November 2022	**This feedback was given on a previous location within Llŷr 1.** As the 'field areas' are well outside MHPA Port Limits, then it doesn't constitute any navigation hazard to MHPA per se. NRW are responsible for the Welsh government consent and MHPA would recommend that the details are notified to the MCA as it is their water space. If project is planning to deploy the FLidar from Port of Pembroke, then we would need to see risk assessments and method statements prior to being towed out through the Haven and back for maintenance/recovery.
Maritime and Coastguard Agency 9th November 2022	**This feedback was given on a previous location within Llŷr 1.** Expect project to consider AIS traffic data and recommend staying 1nm away from the main shipping routes (90% of traffic). On the understanding the above is considered, and the following risk mitigation measures take place; ▪ All maritime safety legislation is complied with; ▪ Issue local notification to marine users, including fisherman's organisations, relevant authorities and other local stakeholders, to ensure that they are made fully aware of the activity at least five days before commencement of the works; ▪ Ensure that 'the deployments' do not encroach on any recognised anchorage, either charted or noted in nautical publications, within the proposed area; ▪ Notify HM Coastguard via zone28@hmcg.gov.uk ; ▪ Notify the Source Data Receipt team, UK Hydrographic Office (email: sdr@ukho.gov.uk) of commencement of the activities. The information supplied must include the start date and end date, a description of the works, positions of the work area (WGS84), and details of any marking arrangements; ▪ The UKHO should also be notified once the buoy has been removed;

Consultee and Date	Feedback
	▪ Suitable arrangements should be made to ensure the deployments remain secure to the seabed for the conditions expected in the area, with a programme of regular inspection and maintenance of the works in place; ▪ Appropriate recovery arrangements of all the equipment should be in place for decommissioning of the buoy; and ▪ Adhere to any requirements of Trinity House for marking and lighting arrangements
Meeting with MCA and Trinity House 23rd November 2022	**This feedback was given on a previous location within Llŷr 1, however a location in Llŷr 2 was also discussed.** Meeting to discuss the proposed location of the FLidar survey device for the Llŷr Project. Key points are noted below: ▪ Project queried if the application goes ahead with a navigation risk assessment and licence application, will the location of the device likely be accepted? Trinity House stated the device is in the best location possible (in Llŷr 1), but it is an obstruction and a danger so AIS, appropriate lighting and marking and licence will all mitigate the risk to as low as possible but will still be an overall danger hence why marine licence is required. ▪ Project noted there is flexibility on location of device and is keen to receive feedback on proposed location and if it will be significantly better to relocate elsewhere i.e., Llŷr 2. Trinity House noted that if device moved to Llŷr 2 it may be an exemption as less likely to cause obstruction to main routes. Trinity House noted the move is a preference to them. They also queried aligning with English requirements even though the FLidar will be located under NRW remit in Welsh waters. ▪ MCA stated that Llŷr 2 is less of a risk for obstruction and preferable, but they would want to explore other mitigations i.e., mooring arrangement verification. The MCA thought the application would come under marine licence for either site due to proximity to traffic routes nearby and the size of the device ▪ Trinity house noted that the AIS licence applications are currently on an approx. 6 month delay. SW queried if AIS is a must if not able to get licence in time of deployment. Trinity House stated that if device is in Llŷr 1 it's a must, if in Llŷr 2 it may be an option.

2.1 Updates Post 2022 Consultation

Following consultation undertaken, and to accommodate feedback received, the FLidar and wave buoy has been moved from a proposed location in Llŷr 1 to a location in Llŷr 2 as shown in Section 1.

Table 2-2 also lists additional feedback which has been provided in relation to the Band 1 marine licence application.

Table 2-2 Consultation Feedback Band 1 Submission

Consultee and Date	Feedback
MCA Band 1 Consultation Response 20th January 2023	MCA re-iterated their previous stance that 'the activity does constitute a significant risk to navigation safety due to the size of the device, location and duration of deployment'. Therefore, and in accordance with the Band 1 Marine License guidance requirements, they did not agree the activity is not a navigational hazard. The MCA were content the risk controls mentioned in the Vessel Traffic Risk Assessment are appropriate for reducing navigation risk to As Low as Reasonably Practicable (ALARP); however, the MCA wanted understand detail regarding the monitoring of the FLiDAR buoy, action plans if it breaks free and the recovery arrangements in place.
MCA Band 1 Consultation Response 25th January 2023	As per Band 1 Marine License guidance on the NRW website, noted it is within their remit to confirm whether the proposed activity below Mean High Water Spring is likely to have an impact on the safety of others at sea. NRW's guidance states you must have confirmation from the MCA that your proposed works will not pose a risk to others prior to application.
Trinity House Band 1 Consultation Response 26th January 2023	Trinity House remains of the opinion that this activity is likely to obstruct and pose a danger to navigation and as such NRW may wish to review the marine licence requirements in this regard.

Following consultation undertaken and clarification this Vessel Traffic Risk Assessment has now been updated to support a Band 2 Marine Licence Application.

3 Navigational Features

Figure 3-1 shows charted navigational features which are present in proximity to the study area.

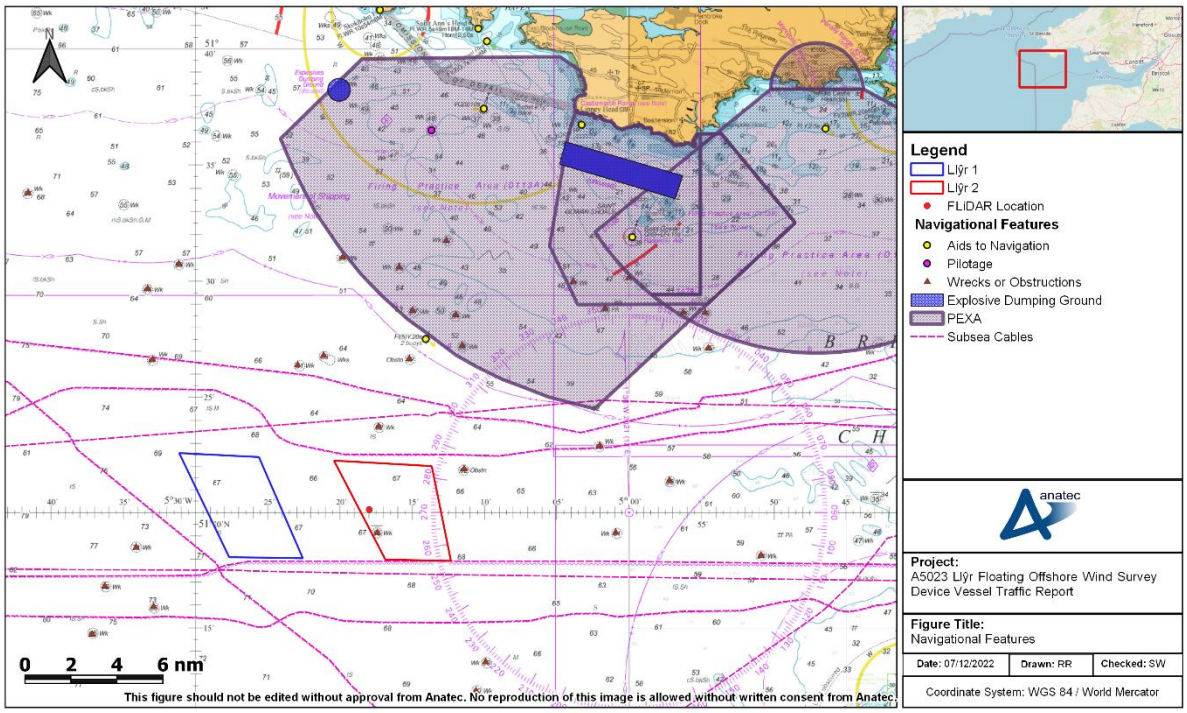

Figure 3-1 Navigational Features

The proposed FLidar and wave buoy will be located at a depth of approximately 67m.

The closest Aid to Navigation (AtoN) to the FLidar and wave buoy is a Light Buoy approximately 7.7nm to the north northeast on the perimeter of a military Practice and Exercise Area (PEXA). Several PEXAs are situated to the northeast along the South Wales coast and there are no restrictions on the right to enter the areas at any time as these areas are only operational when considered to be clear of shipping.

Several wrecks and obstructions are within the wider area with one wreck situated in Llŷr 2, approximately 0.8nm form the FLidar and wave buoy at a depth of 55m. No wrecks or obstructions are present in Llŷr 1.

Many subsea cables also pass through the area with the closest to the FLidar and wave buoy approximately 2.4nm to both the north and south with no cables passing through either of the Llŷr sites.

A pilot boarding station is situated 17nm north of the FLidar and wave buoy device at the entrance to Milford Haven (UK) and is used by vessels bound for Barry, Cardiff, Newport, Avonmouth, Bristol, Sharpness, and Gloucester (all UK).

To the north, there are two explosive dumping grounds located within the PEXAs, just southwest of the Pembrokeshire coast.

4 Vessel Traffic Analysis

This section presents analysis of the vessel tracks recorded using AIS, Radar and visual observations within the study area during the combined 28-day data period. The full data set was assessed to identify any vessels deemed as representing 'temporary' traffic (i.e., activity which could be considered non-routine such as survey or guard vessels), with these tracks removed from further analysis to ensure the focus of the analysis was routine passing traffic.

For all data that was included in the analysis, 92% of vessel data was recorded via AIS with the remaining data recorded via Radar.

4.1 Vessel Type

The vessel tracks recorded via AIS and Radar within the study area during both data periods are colour-coded by vessel type and presented in Figure 4-1.

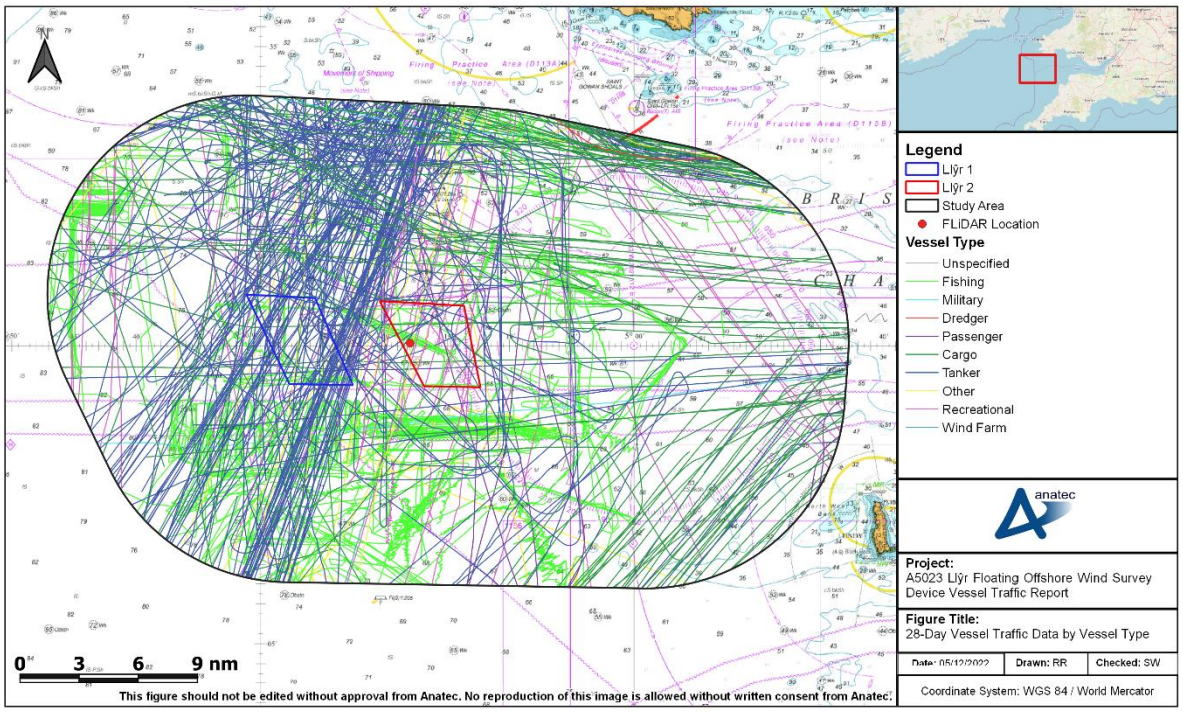

Figure 4-1 Vessel Traffic by Vessel Type - Summer 2021/Winter 2022

An average of between 14 and 15 unique vessels per day were present within the study area across the 28-day data period, noting that the 12th, 13th, and 19th March were partial days for Radar data coverage. The most common vessel types in the area were tankers (38%), cargo vessels (25%). Fishing vessels (16%) and recreational vessels (13%) were also present.

Overall, 11% of all vessel traffic in the study area, or an average of between two and three unique vessels per day, intersected Llŷr 2. The most recorded vessel types intersecting the sites were recreational vessels (38%), tankers (26%), and fishing vessels (14%).

4.1.1 Commercial

Commercial vessel tracks (mainly cargo and tankers, and some passenger vessels) recorded via AIS within the study area during both survey periods are colour-coded by vessel type and presented in Figure 3.2. It is noted that commercial vessels were only recorded via AIS.

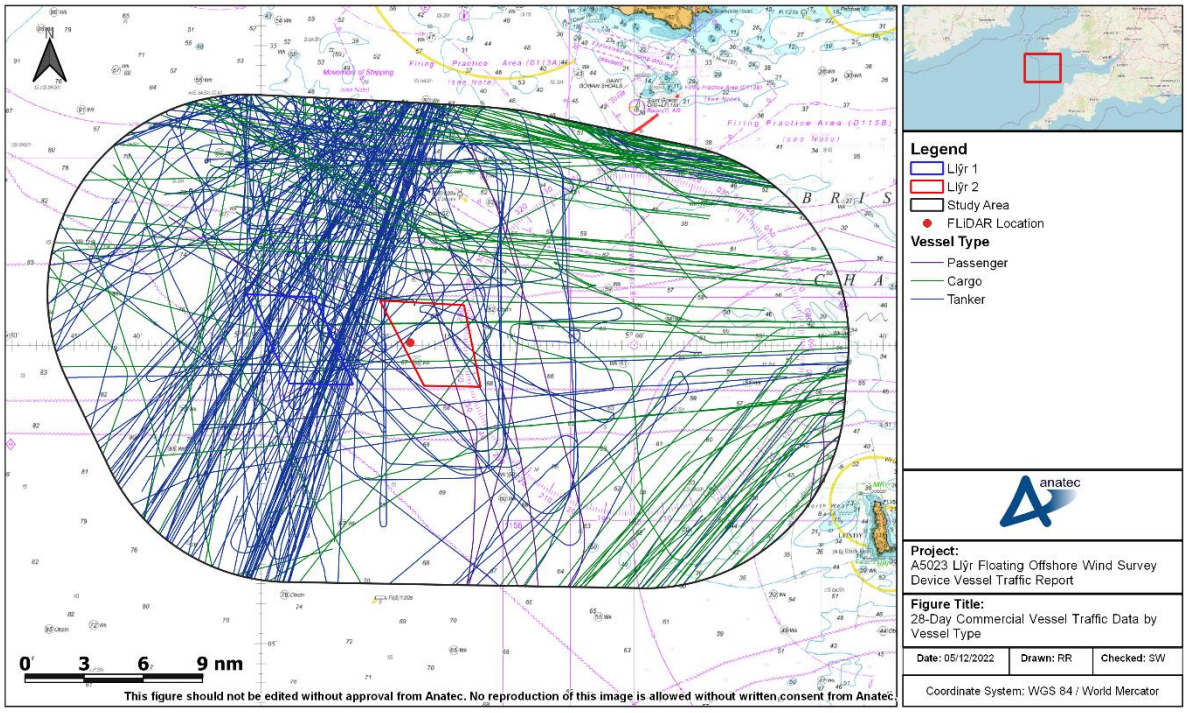

Figure 4-2 Commercial Vessel Tracks by Vessel Type - Summer 2021/Winter 2022

Commercial traffic in the study area accounted for 65% of all vessel traffic recorded. Vessels were observed on three main routes. The heaviest route was dominated by tankers on a defined northeast-southwest transit to/from ports in Milford Haven (UK), both Pembroke Port and the Port of Milford Haven. This route is noted to be split into three smaller routes with vessels transiting to/from The English Channel, The Mediterranean, and the USA.

Cargo vessels are seen utilising a route to the southeast of the study area transiting to/from the Bristol Channel and the southeast. These vessels are transiting between various ports in the Bristol Channel, mainly Port of Portbury and Port Talbot and transiting to various locations, predominantly ports and harbours in Belgium and the Netherlands. This route is approximately 15nm to the southeast of the proposed FLidar and wave buoy.

To the northern extent of the study area, a commercial route utilised by mainly cargo vessels with some tankers passes on an east-west bearing to/from the Bristol Channel. This route is common for vessels transiting between ports and harbours within the Bristol Channel and other destinations within the UK and Ireland.

Passenger vessels were seasonal with only limited tracks present in the summer period. Routeing was predominantly north-south to the east of the proposed FLidar and wave buoy on routes Dublin (Ireland) -Cherbourg (France) and to/from other UK and Ireland destinations.

It is noted that within the study area, there a number of tankers 'waiting for orders' present in the vicinity of the proposed FLidar and wave buoy . There is sea room available for these 'waiting' tankers to continue to make these transits.

In regard to commercial vessels intersecting Llŷr 2, tankers (72% of intersecting commercial traffic) were seen to be waiting for orders and not on direct transits, cargo vessels (22%) were mainly transiting east-west to/from the Bristol Channel, and the singular passenger vessel transiting north-south to Cherbourg (France).

4.1.2 Fishing

The fishing vessel tracks recorded via AIS and Radar within the study area during both data periods are presented in Figure 4-3. Overall, 81% of fishing vessel tracks were recorded via AIS.

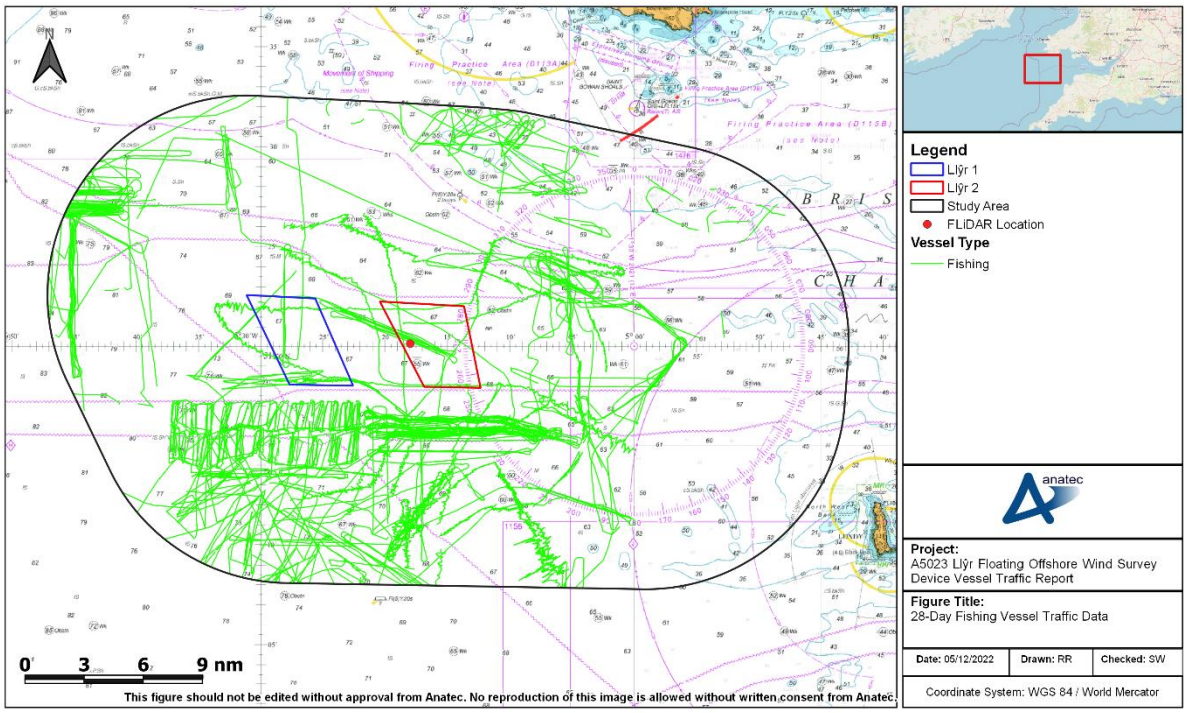

Figure 4-3 Fishing Vessel Tracks - Summer 2021/Winter 2022

There was an average of between one and two unique fishing vessels per day within the study area during the summer data period with only one fishing vessel being recorded every seven days within the winter period and so can be concluded that fishing in the area is seasonal.

Fishing activity was present mainly to the south of the proposed FLidar and wave buoy with active fishing in the south of the study area as well as to the northwest extent. Those vessels

that could be associated with a gear type were mainly beam trawlers (52% of all fishing tracks) and potters (23%). Demersal trawlers and seiners were also recorded.

Active beam trawling was present within Llŷr 2, directly north of the proposed FLidar and wave buoy location. Beam trawling was more common in the region surrounding Llŷr 2 with different vessels fishing south of the site. Potting vessels were engaged in activity approximately 3nm to the southwest of Llŷr 2.

4.1.3 Recreational

The recreational vessel tracks recorded via AIS and Radar within the study area during both data periods are presented in Figure 4-4. Overall, 78% of recreational vessel tracks were recorded via AIS.

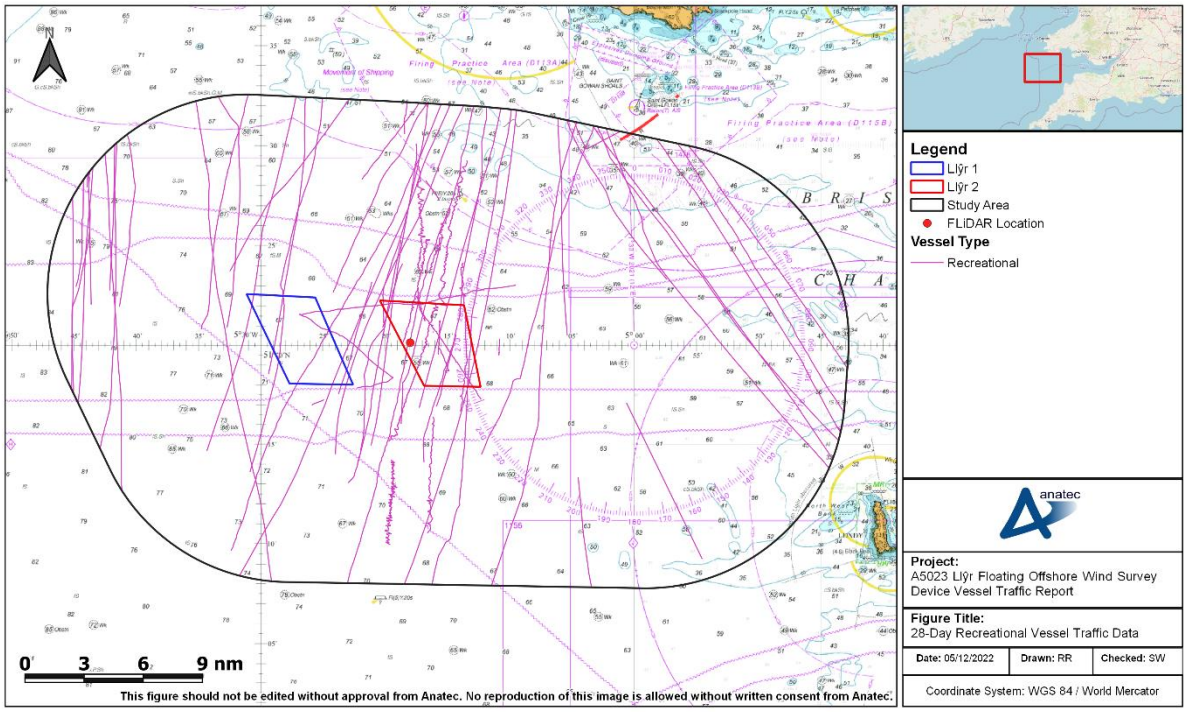

Figure 4-4 Recreational Vessel Tracks - Summer 2021/2022

Recreational vessel activity was seasonal with an average of four unique vessels present per day within the study area during the summer survey period compared to the winter survey period where only four unique recreational vessels were recorded during the entire period, equating to one recreational vessel every three to four days.

Most vessels were transiting on a north-south bearing across the width of the study area. Vessels are seen likely transiting to/from Milford Haven as well as to Lundy Island and north Devon coast to the east. Recreational traffic was noted passing both east and west of the proposed FLidar and wave buoy location within Llŷr 2.

4.2 Main Commercial Routes

As per the request from the MCA, the main routes and their corresponding 90th percentiles were identified for the commercial vessel traffic transiting to and from the port of Milford Haven. The main commercial routes and their corresponding 90th percentiles are presented in Figure 4-5. Following this, details of each route is summarised in Table 4-1.

None of these main commercial routes were identified as passing within Llŷr 2 or in proximity to the proposed FLidar and wave buoy location and the location is at least 1nm clear of the edge of any percentiles. The closest routes to the proposed FLidar and wave buoy location are the northeast-southwest route from Pembroke (UK) to the English Channel (Route 1) situated approximately 3nm to the west, and the east-west route from the Bristol Channel ports Portbury and Bristol to Liverpool (UK) and ports and harbours in Ireland (Route 6) approximately 4nm north.

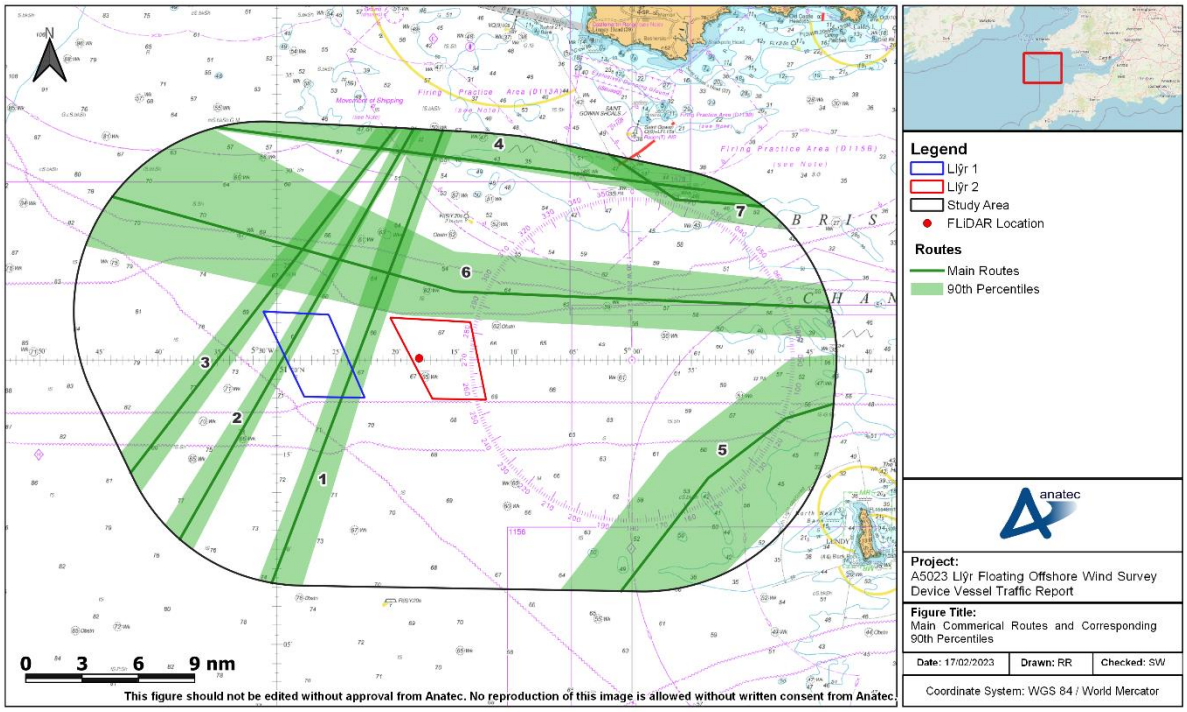

Figure 4-5 Main Commercial Routes and Corresponding 90th Percentiles

Table 4-1 Description of Main Commercial Routes

Route ID	Description of Route
1	Pembroke (UK) – English Channel
2	Pembroke / Milford Haven (UK) – Gibraltar (GI) and the Mediterranean
3	Pembroke / Milford Haven (UK) – United States and Mediterranean
4	Avonmouth (UK) – Ireland (Dublin, Cork, Ringaskiddy)

Route ID	Description of Route
5	Bristol Channel ports Bristol, Talbot, and Portbury (all UK) – English Channel
6	Bristol Channel ports Bristol and Portbury (all UK) – Liverpool (UK) and Ireland
7	Avonmouth (UK) – Ireland and Holyhead (UK)

5 Hazard Review and Embedded Mitigation

5.1 Embedded Mitigation

The following table summarises the embedded mitigation associated with the FLidar and wave buoy:

Table 5-1 Embedded Mitigation

	Description
Legislation	All maritime safety legislation shall be complied with.
Notice to Mariners	Project will issue Notice to Mariners, including fisherman's organisations, relevant authorities and other local stakeholders, to ensure that they are made fully aware of the activity. Trinity House request that the Notices to mariners must be issued at least 14 days prior to the commencement of any offshore works and relevant updates issued accordingly and copied to navigation@trinityhouse.co.uk.
Anchorage Area	Project has ensured that 'the deployments' do not encroach on any recognised anchorage, either charted or noted in nautical publications, within the proposed area.
HM (His Majesty's) Coastguard Notification	Project to notify HM (His Majesty's) Coastguard via zone28@hmcg.gov.uk.
United Kingdom Hydrographic Office (UKHO) Notification	Project to notify the Source Data Receipt team UKHO (email: sdr@ukho.gov.uk) of commencement of the activities. The information supplied must include the start date and end date, a description of the works, positions of the work area (World Geodetic System 84), and details of any marking arrangements.
UKHO Removal Notification	The UKHO should also be notified once the buoy has been removed.
Maintenance	Suitable arrangements should be made to ensure the deployments remain secure to the seabed for the conditions expected in the area, with a programme of regular inspection and maintenance of the works in place.
Decommissioning Arrangements	Appropriate recovery arrangements of all the equipment should be in place for decommissioning of the buoy.
Lighting and Marking	Adhere to any requirements of Trinity House for marking and lighting arrangements.
AIS Transmission	The project will submit a licence to transmit an AIS signal, and ensure the AIS is active throughout the deployment

	Description
Mooring Arrangements	Will be independently verified.
90th Percentiles	Location sits out with (more than 1nm) main route 90th percentiles.
Towing to Site	If project is planning to deploy the FLidar from Port of Pembroke, then MHPA would need to see risk assessments and method statements prior to being towed out through the Haven and back for maintenance/recovery.

5.2 FLidar Monitoring and Recovery

The FLiDAR is fitted with Global Positioning System (GPS) tracker which allows the contractor to locate the buoy at any time. The FLiDAR is monitored 24/7. There is an excursion radius for set each buoy and if the buoy goes outside this radius the FLiDAR contractor receives an alert.

5.2.1 Action Plan if Flidar Breaks Free

The project has an emergency response plan in place. Included within this plan is the FLiDAR emergency response chain, located on the FLiDAR. This chain will be deployed in the event that that the buoy is displaced outside the excursion radius.

5.2.2 Recovery Arrangements if Required

In the event the buoy is displaced outside the excursion radius the emergency response plan will be implemented. The contractor will notify the local authorities and deploy a vessel to retrieve the buoy as soon as practicable.

5.3 Navigational Safety Hazard Review

The following table summarises the risk in relation to both the baseline features (Section 3) and the traffic analysis (Section 4) which consideration for embedded mitigations listed in Section 5.

Table 5-2 Navigational Safety Hazard Review

Survey Device	Commercial Vessels when considered with Embedded Mitigation (Section 3.1.1)	Fishing Vessels when considered with Embedded Mitigation (Section 3.1.2)	Recreational Vessels when considered with Embedded Mitigation (Section 3.1.3)	Additional Mitigation Required?	Are Risks Reduced to ALARP
FLidar and wave buoy	Location sits clear of main routes, more than 1nm mile from 90th percentiles. Whilst some vessels do pass in close proximity as the device is well marked and promulgated vessels will be able to make minor deviations to stay clear.	Limited fishing activity with the vicinity. As the device is marked and promulgated vessels will be able to stay clear without significant impact on operations.	Limited recreational activity with the vicinity. As the device is marked and promulgated vessels will be able to stay clear without significant impact on routeing. The recreational traffic will also have sufficient sea room to be able to remain clear of commercial traffic.	No	Yes

6 Summary

Following consultation with MCA and Trinity House in 2022 the project has moved the FLidar and wave buoy from Llŷr 1 to Llŷr 2, reducing the overall interaction with commercial vessels and therefore reducing the risk levels.

When considering the location in Llŷr 2 along with marine traffic data and the embedded mitigations in place the proposed location for deployment is considered low risk from a transiting vessel, recreational and fishing navigational safety perspective.

Both the MCA and Trinity House requested that a Band 2 licence is applied for given that the FLidar and wave buoy does pose a risk to navigation (noting this risk is mitigated to ALARP with the measures included within this report).

It is recognised that the developer must guarantee that the FLidar and wave buoy remains lit, marked, and on station during its whole deployment period. Plans will be in place should any failures to do so occur, to rectify these as soon as possible.