APPENDIX 6.1

Navigational Risk Assessment (NRA)

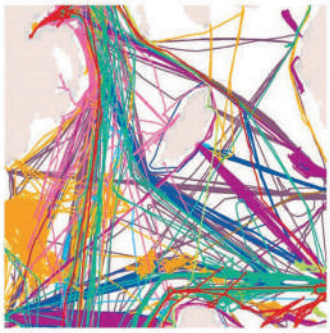
RPS

Iona Breakwater Project

Navigational Risk Assessment

August 2023





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Iona Breakwater Project

Navigational Risk Assessment

August 2023

https://www.argyll-bute.gov.uk/marriage/2022/02/isle-of-mull/

Document Information

Document History and Authorisation		
Title	Iona Breakwater Project	
	Navigational Risk Assessment	
Commissioned by	RPS	
Issue date	August 2023	
Document ref	R.3707	
Project no	R/5003/02	
Date	**Version**	**Revision Details**
26 August 2022	1	Issued for client comment
24 November 2022	2	Issued for client review
25 November 2022	3	Issued for client use
10 August 2023	4	Issued for client use -includes disposal ground alteration

Prepared (Author)	Approved (QM)	Authorised (PD)
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Suggested Citation

ABPmer, (2023). Iona Breakwater Project, Navigational Risk Assessment, ABPmer Report No. R.3707.
A report produced by ABPmer for RPS, August 2023.

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Executive Summary

Baile Mòr is the Isle of Iona terminal for the Iona Ferry. The port has a slipway providing passenger and vehicle access to the ferry, as well as being used by local fishing vessels, recreational and privately-owned craft. The Iona ferry route is operated by CalMac Ferries Ltd (CFL) and provides a lifeline service linking the Isle of Iona to the Isle of Mull. The Iona Slipway is particularly vulnerable to waves from North, East and South; reducing the time available for safe launching/landing at the pier. Wave action can also result in excessive movement of the vessel at the berth, making landing and holding of the vessel in position difficult.

The Iona Breakwater Project consists of a new rock armour breakwater and associated access dredging. This will result in a much-improved service, improved ability for lifeline services to travel to and from Iona and the facilitation of wider forms of economic development on both sides of the Sound.

RPS commissioned ABPmer to carry out a Navigational Risk Assessment (NRA) in support of the marine licensing application for the Iona Breakwater. In total, this NRA has identified 20 hazard scenarios which have been assessed. A total of 16 hazard scenarios were identified for the construction phase and 4 hazard scenarios for the operational phase. Consultation has been conducted with stakeholders to draw out local user opinion. To inform the consultees, information defining the baseline navigational environment has been used, including a traffic assessment from one year of AIS data collected between 01 November 2021 to 31 October 2022.

The initial assessment identified 10 assessments with a current risk score outcome of significant or higher. Following the NRA process, 17 mitigation measures were identified, split between the Construction and Operational phases of the proposed development. After implementation of appropriate mitigation, marine risk to navigational receptors was reduced to a level of 'as low as reasonably practicable' as required by the Port Marine Safety Code (DfT, 2016) through the adoption of future mitigation controls.

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1 Introduction

1.1 Background to project

Baile Mòr is the Isle of Iona terminal for the Iona Ferry. The port has a slipway providing passenger and vehicle access to the ferry, as well as being used by local fishing vessels, recreational and privately-owned craft. The Iona ferry route is operated by CalMac Ferries Ltd (CFL) and provides a lifeline service linking the Isle of Iona to the Isle of Mull. The current vessel on the route is the Motor Vessel (MV) *Loch Buie* (RPS, 2021).

The Iona Breakwater Project consists of a new rock armour breakwater and associated access dredging. This will result in a much-improved service, improved ability for lifeline services to travel to and from Iona and the facilitation of wider forms of economic development on both sides of the Sound.

The Iona Slipway is vulnerable to waves, particularly from the South; reducing the time available for safe launching/landing at the pier. Wave action can also result in excessive movement of the vessel at the berth, making landing and holding of the vessel in position difficult. The ferry holds its position at Iona using the weight of the ramp and the friction between the ramp and the slipway deck. The current berthing practice has a negative impact on service provision. These problems have had a direct impact on the lives of the people who live there. A day without a ferry operating results in essential services to the island being affected; such as medical, educational, refuse collection and other business deliveries (RPS, 2021).

1.2 Scope of work

RPS has commissioned ABPmer to carry out a Navigational Risk Assessment (NRA) in support of the marine licensing application for the Iona Breakwater. This NRA considers the effects of the proposed project on navigation and marine safety within the area proposed for the marine works, plus the wider effects of vessel traffic transiting to locations outside of the immediate area of study. The NRA assesses both the construction and operational phases of the proposed project, identifying appropriate mitigation measures for marine safety.

1.3 Study area overview

The Isle of Mull is located in the Inner Hebrides just of the west coast of Scotland in the council area of Argyll and Bute. Iona is located just off the west coast of the Ross of Mull, see Figure 1. The study area for the navigation assessment comprises the marine works within the Sound of Iona, plus the route the dredger and disposal craft will take between the dredge site at Baile Mòr and the proposed disposal site at Portnahaven, see Figure 2. The water space is outside of Statutory Harbour Authority limits, with the Maritime and Coastguard Agency (MCA) the responsible authority for marine safety.

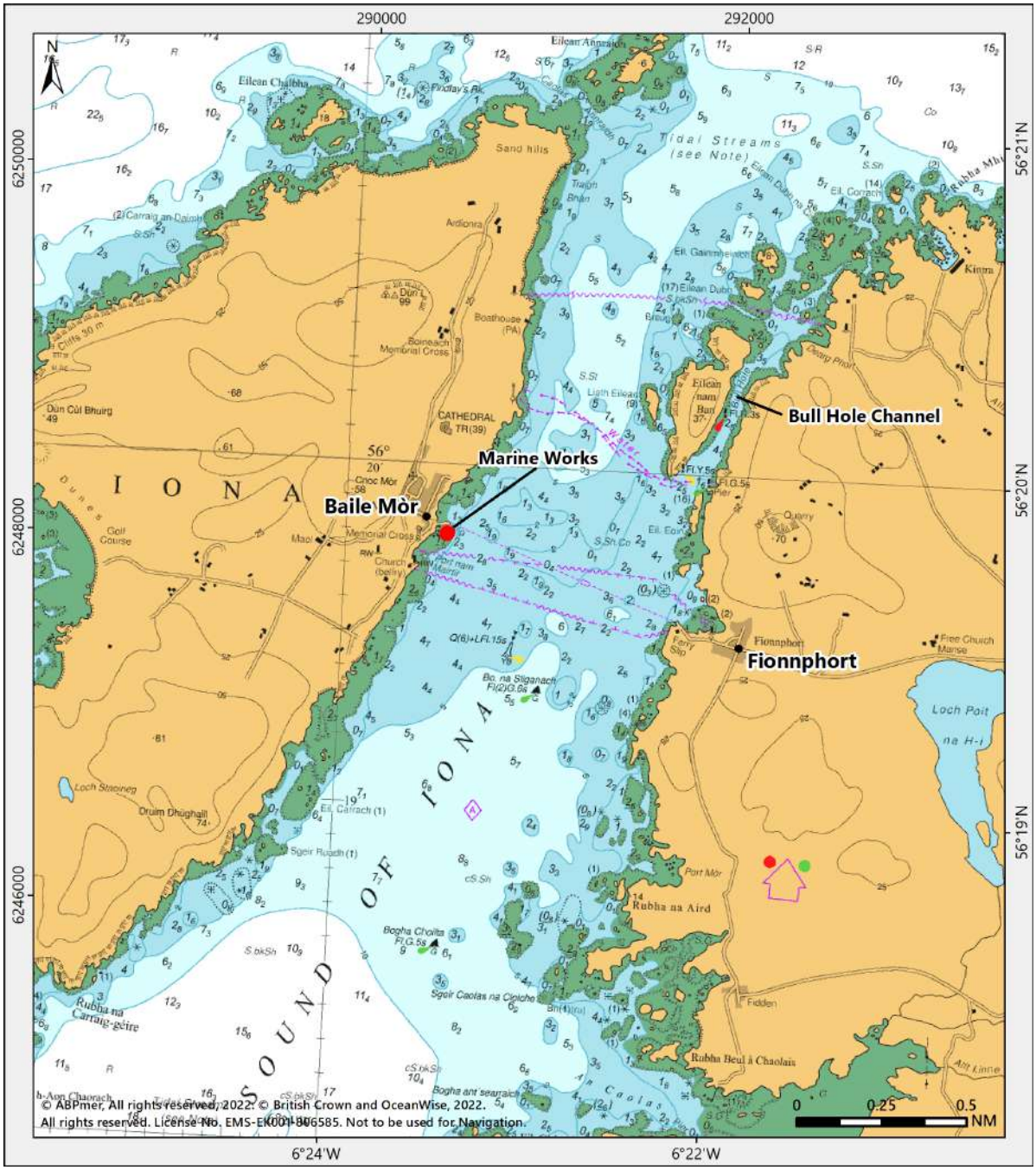

Figure 1. Sound of Iona Study Area

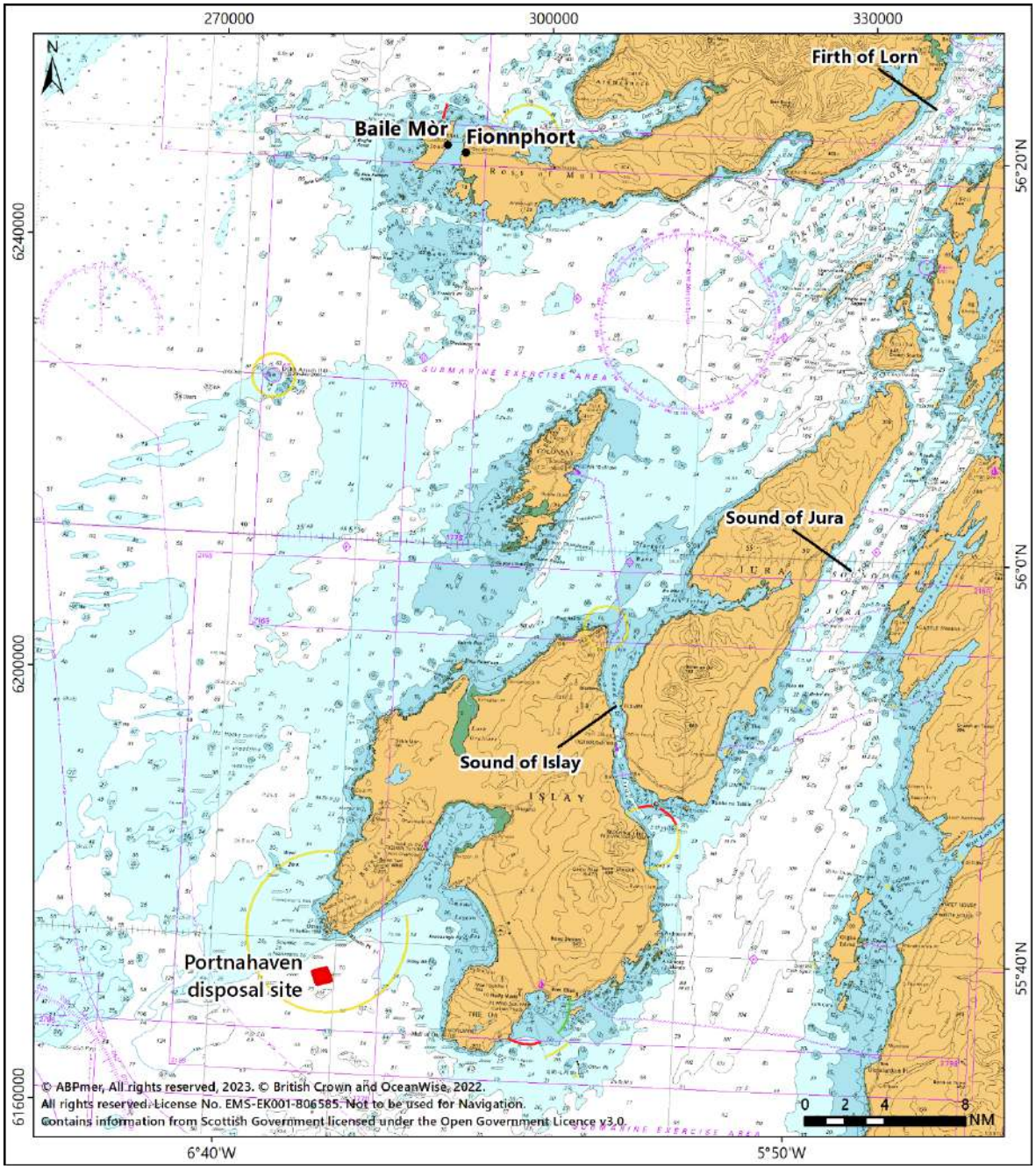

Figure 2. Wider Area Showing Portnahaven Dredge Disposal Site

1.4 Legislation and guidance

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

1.4.1 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 uphold the right of innocent passage as defined in Article 17 of UNCLOS; beyond the 12 Nautical Mile (nm) 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 in 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 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"*
>
> UK Government, 2011

The majority of port operations are administered by a Statutory Harbour Authority (SHA). Every SHA is self-governed with specific local legislation (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 a SHA is a range of national legislation which places statutory responsibility on the Harbour Master to ensure navigation and safety within the harbour limits; this includes the 'Harbours, Docks and Piers Clauses Act 1847' and the Harbours Acts 1964. Under such legislation, the Harbour Master may issue general or specific directions to control movements of vessels within their SHA in order to ensure safety. The breakwater and berth are located outside an established SHA and therefore the competent authority with respect to navigation is the MCA.

1.4.2 Secondary guidance

The UK National standard for the safe and efficient running of ports is the Department for Transport's (DfT) 'Port Marine Safety Code' (DfT, 2016) and its accompanying document 'A Guide to Good Practice on Port Marine Operations' (DfT, 2018). Certain sections of the following documents, which provide supplementary guidance, have also been considered in the preparation of this NRA:

- International Maritime Organization (IMO) Revised Guidelines for Formal Safety Assessment (FSA) for use in the IMO rule making process (IMO, 2018); and
- Marine Guidance Note (MGN 654) Offshore Renewable Energy Installations (OREI) safety response. Incorporating: Annex 1 Methodology for assessing marine navigational safety and emergency response risks of OREIs. Maritime and Coastguard Agency (MCA, 2021a).

As the competent authority 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 (GLA), Northern Lighthouse Board (NLB) has been consulted with respect to the lighting and marking of the proposed project. In its capacity as the marine facility owner, Argyll and Bute Council has also been consulted and has referenced its operating instructions in the form of its Marine Safety Management System. (A&BC, 2023).

1.4.3 ALARP and tolerability principles

Risk assessment is based on a comprehensive and formal assessment of hazards with a view to either eliminating unsafe activities or reducing risks to 'as low as reasonably practicable' (ALARP). ALARP is an industry-wide concept, applying to both health and safety and port marine safety. Regardless of whether a scenario produces a minor or significant hazard, mitigation in the form of risk controls need to be taken into account to ensure that the risks overall are ALARP. Central to this standard is the term 'reasonably practicable'. To meet this standard, the NRA has applied the ALARP principle with respect to each individual assessment, the purpose being, to consider if the identified hazard can be reduced to a point which is both 'reasonable' and practicable' to do so. ALARP has not been defined as a threshold or benchmark target.

Further, the concept of 'tolerability' seeks to define the point at which a risk has an unacceptable outcome (a function of frequency and consequence) when measured against key criteria. Those criteria in respect of marine risk are defined in the Code's Guide to Good Practice as:

- Human life;
- The environment;
- Port/port user operations; and
- Port/shipping infrastructure damage (DfT, 2018).

Determining whether the predicted level of risk is acceptable requires a two-part test:

- Firstly, is the risk tolerable; and
- Secondly, is the risk mitigated to ALARP.

When used as part of the NRA assessment process, relevant authorities (such as a Statutory Harbour Authority or developers) may determine whether a hazard outcome (risk) is both tolerable and ALARP.

2 Data Sources

2.1 Automatic identification system

Automatic Identification System (AIS) data from 01 November 2021 to 31 October 2022. AIS signals are broadly classified as 'Class A' and 'Class B'. AIS-A is carried by international voyaging ships with gross tonnage (GT) of 300 or more tonnes, fishing vessels with a Length Overall (LOA) of 15 m or more and all passenger ships regardless of size. AIS-B is sometimes carried by smaller vessels and is intended for use by smaller commercial vessels, the fishing sector and recreational vessel users; however, the use of AIS-B is non-compulsory and uses a lower strength transmitter than AIS-A. 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, though not all vessel types are necessarily present in the observed area:

- 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.

The data used in this study has been sourced from a commercial provider by ABPmer to create a geodatabase of anonymised vessel transits. The data was collected from a network of AIS receivers between 01 November 2021 and 31 October 2022.

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 this will not represent all recreational craft as many vessels of this type do not carry AIS transceivers as the use of AIS-B is non-mandatory. Using anecdotal information, it is known that the area is routinely used as a cruising route, local searches have identified that there are no yacht or sailing clubs within the study area.

2.3 Navigational features

Navigational features have been considered in this assessment and have been identified using information from UK Hydrographic Office (UKHO) Admiralty Chart Number 2617 'Sound of Iona'.

2.4 Maritime incidents

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

2.5 Metocean

Wave and tide conditions for the study have been taken from RPS wave and tide models. The wave model predicts the wave height and mean direction for a 1 in 1 year storm using different wind directions. The tidal flow vectors are from spring and neap ebb and flows. Wind conditions for the study area have been compiled using the SEASTATES[1] dataset provided by ABPmer. The data represent historical hourly wind and wave characteristics for a 40-year period to provide analysis of conditions for the area.

[1] ABPmer SEASTATES: www.seastates.net

3 Navigational Baseline

3.1 Navigational environment

The Sound of Iona separates the Islands of Mull and Iona, it is approximately 0.7 nm wide at the ferry crossing point. The Sound is approximately 4 nm long with the Isle of Erraid at the southern end and a number of smaller islands and skerries including Eilean nam Bàn, Eilean Dubh na Ciste and Eilean Ghòmhain. The Sound provides sheltered waters but can be exposed to south-westerly winds and swell from the south. There are multiple sand bars in the Sound which are known to shift after storm events. The tidal stream runs at a maximum of 2.5 knots (kts), which typically creates a choppy sea on the south running ebb tide when there is an opposing south-westerly wind (RPS, 2021).

Baile Mòr on the Isle of Iona is the location of Iona slipway and pier used by the Iona Ferry. Fionnphort is the Mull terminal for the Iona Ferry. Both ports have a slipway providing passenger and vehicle access to the ferry, plus a pier which is used by local fishing vessels, recreational and privately-owned craft.

Vessel traffic within the Sound of Iona can be characterised into two groups. The first is the ferry traffic which navigates between Fionnphort and Baile Mòr on the Isle of Iona (approximate east to west route, linking the Isles of Mull and the Isle of Iona). The second, is traffic transiting through the Sound (approximate north-east, south-west direction) which is comprised of fishing vessels, recreational vessels and the Staffa Tour boats which operate from Fionnphort and Iona Baile Mòr, see Figure 1 for locations.

The Iona ferry route is operated by CFL with the MV *Loch Buie* as the assigned vessel. The MV *Loch Buie* is 30.2 m length overall, with a beam of 10 m and a draught of 1.6 m. The crossing time is typically 10 minutes with the lifeline ferry service providing for passengers and occasional vehicles transported between the Isles of Mull and Iona.

3.2 Statutory responsibilities and management procedures

The marine access facilities at Baile Mòr slipway are owned by Argyll and Bute Council. However, the area does not form part of a Statutory Harbour Authority. This means the MCA, which is an executive agency of the Department for Transport (DfT), has the responsibility to ensure that the area is competently managed. The Iona to Fionnphort ferry is operated by CFL who provide the safety and management processes for all aspects of the shipboard operations including berthing.

The overnight berthing facility for the ferry is in a sheltered deep-water location in Bull Hole, see Figure 1. Bull Hole Jetty is located on the Isle of Eilean nam Ban, which CFL ferry staff access by boat from Dhearg Phort. The crossing is approximately 500 m, taking around 5 minutes to complete. There are safety risks associated with accessing the ferry via the 4.5 m boat, particularly during winter months. This means that in certain weather conditions the ferry is inaccessible and so the service is disrupted. The overnight berthing facilities at Bull Hole Channel and the access facilities at Dhearg Phort are owned by Caledonian Maritime Assets Limited (CMAL). It should be noted that the CFL crew are also available to carry out emergency medical evacuations from Iona when needed. This normally includes the crew accessing the ferry and then making the passage to Fionnphort to pick up the emergency services, before carrying out the crossing to Iona and back.

The overnight berthing facilities at Bull Hole Channel, located on the island of Eilean nam Ban are owned by Caledonian Maritime Assets Limited (CMAL). The waterside access facilities at Dearg Phort, used by CFL to board the transfer vessel to make the crossing to Eilean nam Ban are also owned by CMAL.

3.3 Aids to navigation

The Iona side of the Sound has (on average) greater water depth that the Mull side. At the southerly end of the Sound of Iona, depths are 6 to 8 m dropping off to 23 m. In the cross section between the two ferry terminals depths are *circa* 2 to 4 m. Lateral buoyage is arranged in a south to north orientation (i.e., port hand buoys on the Iona side, starboard hand buoys on the Mull side).

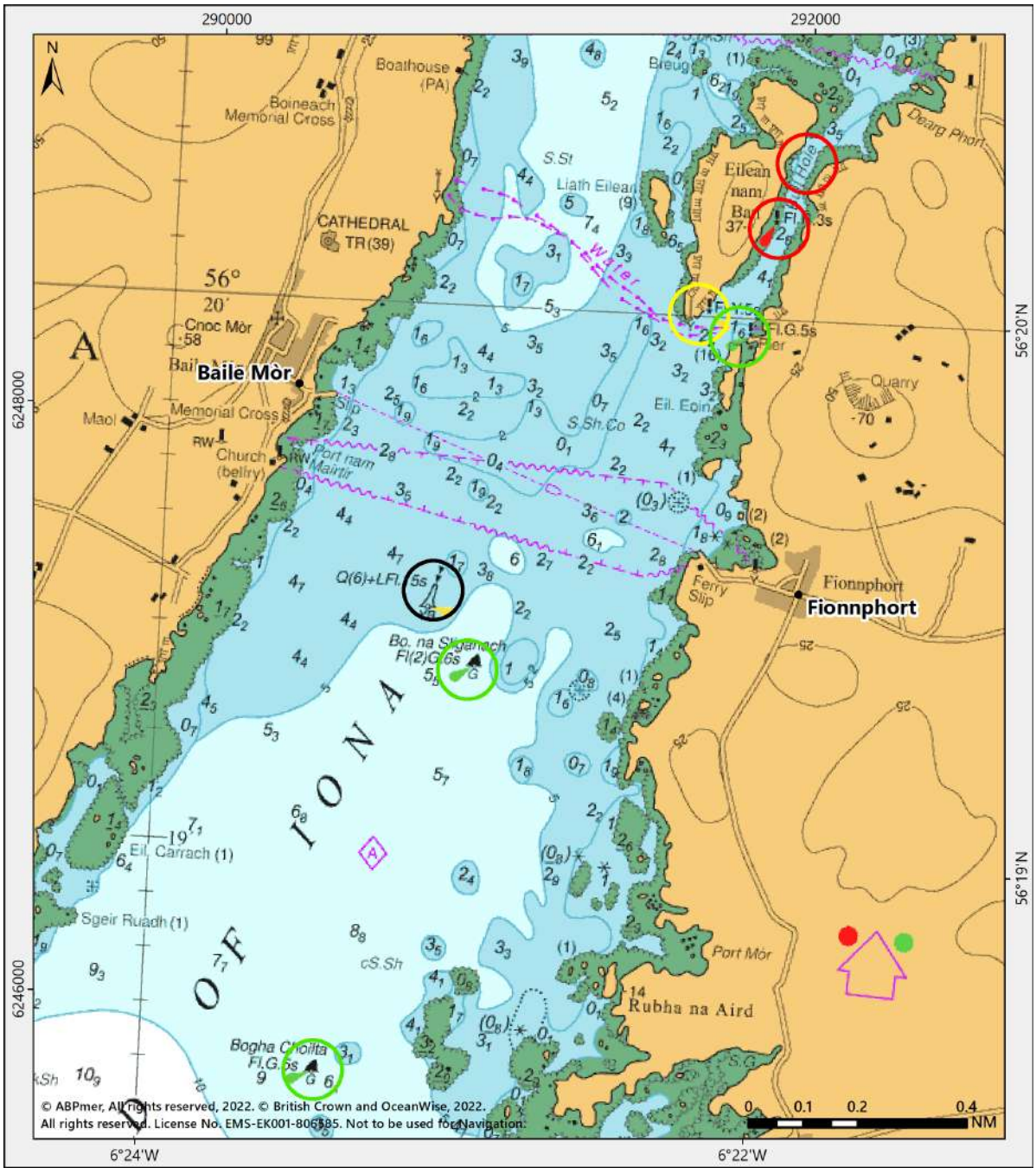

Figure 3. AtoN in the Sound of Iona

The following AtoN are established:

- Two lateral green marks (named as Bogha Choilta and Bo. na Silganach) in the Sound of Iona;
- One lateral red mark in the Bull Hole channel);
- A southern cardinal marker to marker approximately mid-way along the Sound of Iona;
- Two lateral port markers in Bull Hole Channel (on the berthing structure and one marking Little Bull Rock)
- One lateral starboard marker at the southern end of Bull Hole Channel; and
- One special mark at the southern end of Eilean Nam Ban.

3.4 Emergency response

A range of emergency response is available within the study area. The following organisations provide resources to assist if a marine emergency occurs.

3.4.1 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 Stornoway Coastguard Operations Centre in Lewis.

3.4.2 Local rescue organisations

There are nearest lifeboat stations to the Sound of Iona are listed below with a brief overview. The closest is located in Tobermory.

- **Islay Lifeboat Station** is manned by a voluntary crew operating an all-weather Severn Class lifeboat
- **Oban Lifeboat Station** is manned by a voluntary crew operating an all-weather Trent class lifeboat.
- **Tobermory Lifeboat Station** is manned by a voluntary crew operating an all-weather Severn class lifeboat.

3.5 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:

- RNLI: complete dataset of all callouts from 2010 to 2019 inclusive.
- MAIB: information includes accidents to ships and personnel reports to the MAIB from 2010 to 2019 inclusive.

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. This identifies that there were two RNLI recorded incidents in the 10-year period. The first was in 2010 and was recorded as a grounding; the other was in 2016 and was recorded as a vessel equipment failure.

There were three MAIB recorded incidents in the same 10-year period. The first was in 2012 and was categorised as a person in distress. The second and third were both in 2017 and recorded as a vessel equipment failure and a vessel grounding. Notably, both groundings were near Erraid in an area with numerous rocky outcrops which the chart identifies to cover and uncover with the tide.

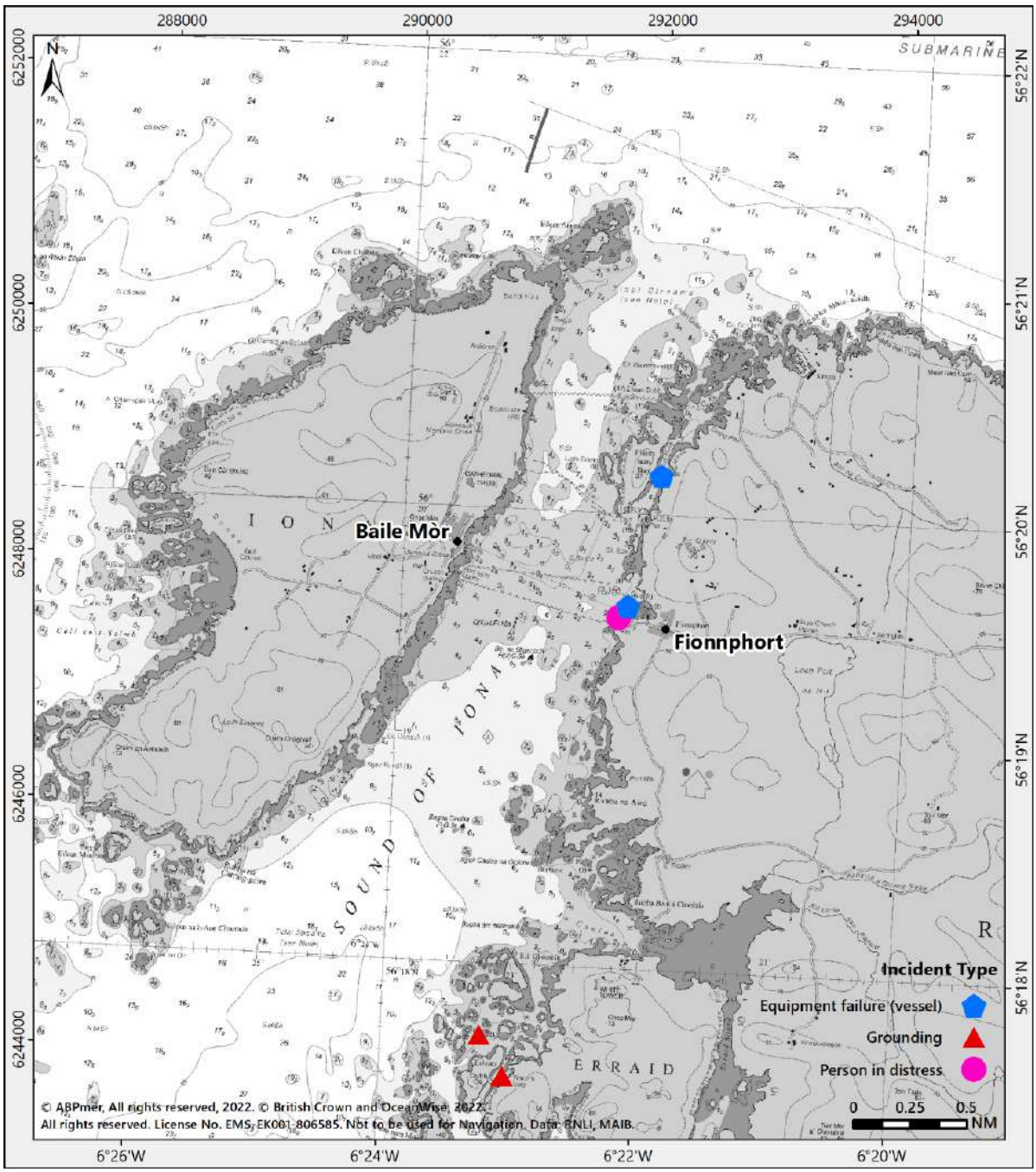

Figure 4. Marine Accidents and Incidents by type – 2010 to 2019

4 Metocean

4.1 Tides

Figure 5 shows a neap flood tide where the current flows in a northerly direction. The majority of the tidal flow is aligned to the Sound of Iona. The peak neap tide flow is around 1.56 knots (equivalently 0.80 m/s) and mainly occurs to the north of the villages of Baile Mòr and Fionnphort.

Figure 6 displays a neap ebb flow and shows the tidal current moving in a southerly direction. Again, this aligns to the orientation of the Sound of Iona. The peak tidal flow is approximately 2.0 knots (1.0 m/s) and located just to the north of the approximate midpoint between Baile Mòr and Fionnphort. Back eddies are likely close to shore of the Isle of Mull where small islands break up the flow at the northerly entrance to the Sound.

The tidal flows for a spring flood through the Sound of Iona are shown in Figure 7. The spring tide has a It has a peak flow of 2.02 knots (or equivalently 1.04 m/s) just north of the midpoint of the intersection between Baile Mòr and Fionnphort.

In Figure 8 the spring tide ebb flow is shown for the Sound of Iona, its peak flow is over 2.0 knots (1.0 m/s) just north of the midpoint between Iona and Fionnphort. This is the maximum tidal flow for both spring and neap ebbs and floods. It is likely that close to the island's shoreline there are back eddies, particularly on the Isle of Mull coast.

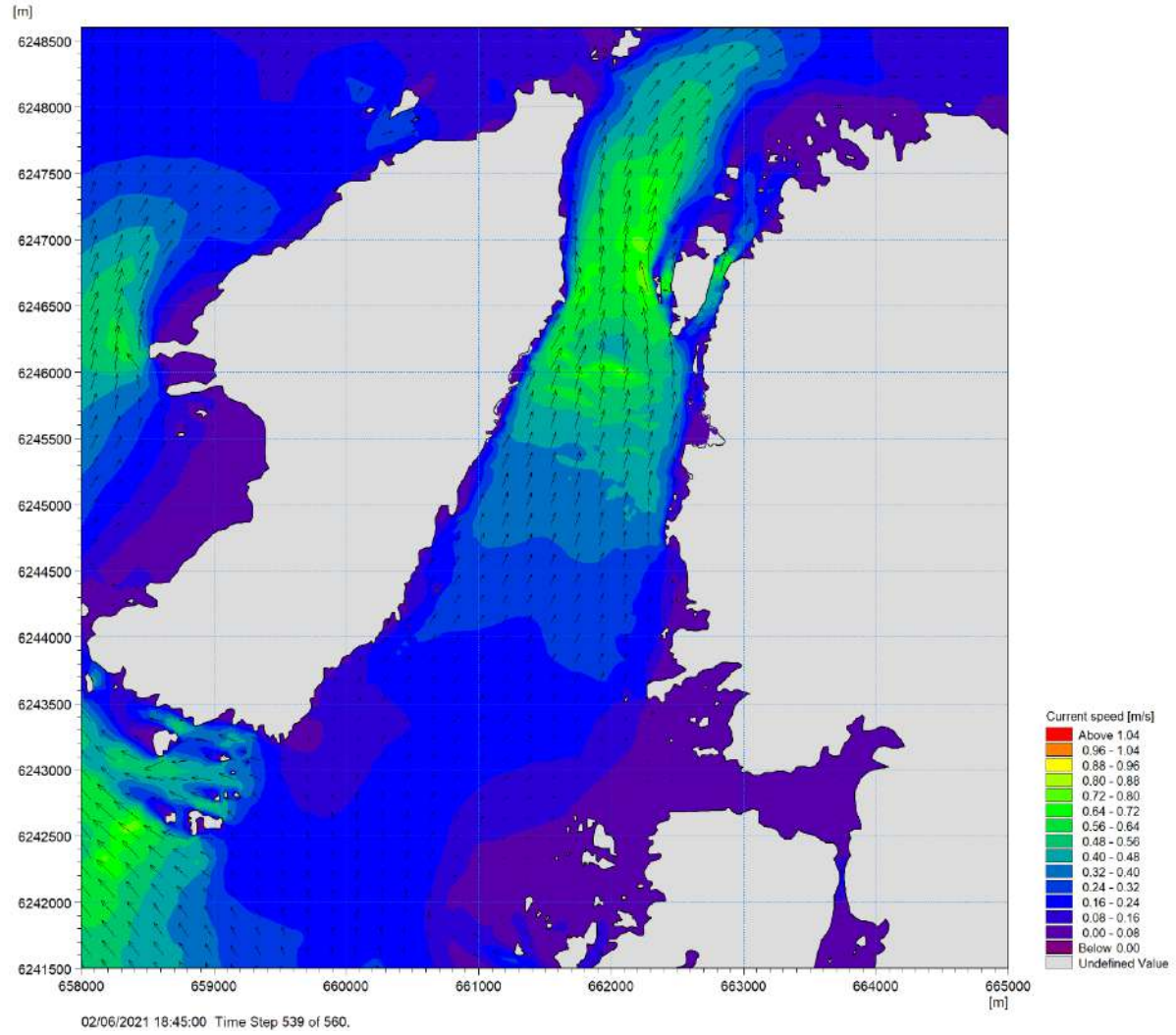

Figure 5. Typical neap tidal flood (north going) current flow through the Sound of Iona

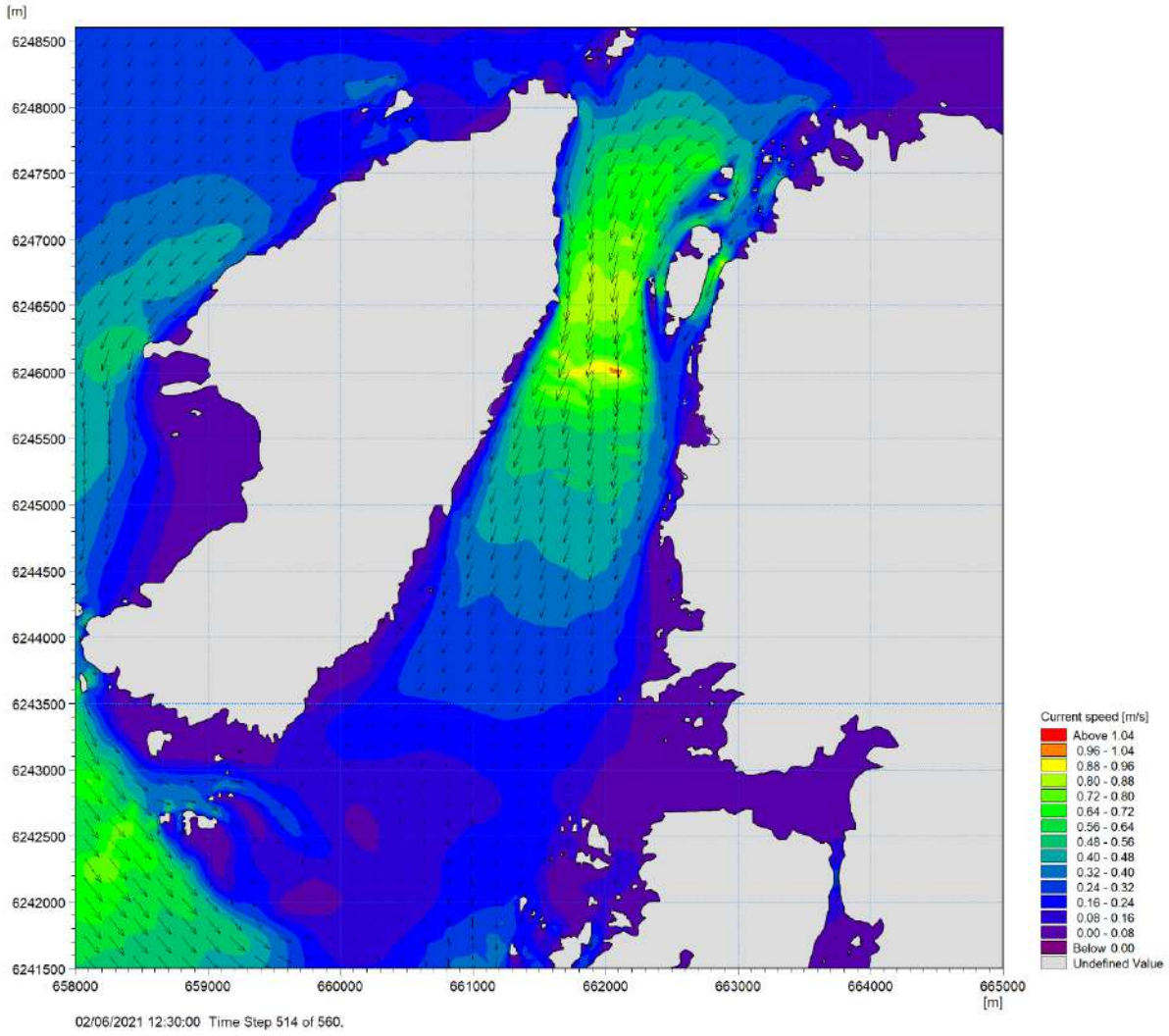

Figure 6. Typical neap tidal ebb (south going) flow through the Sound of Iona

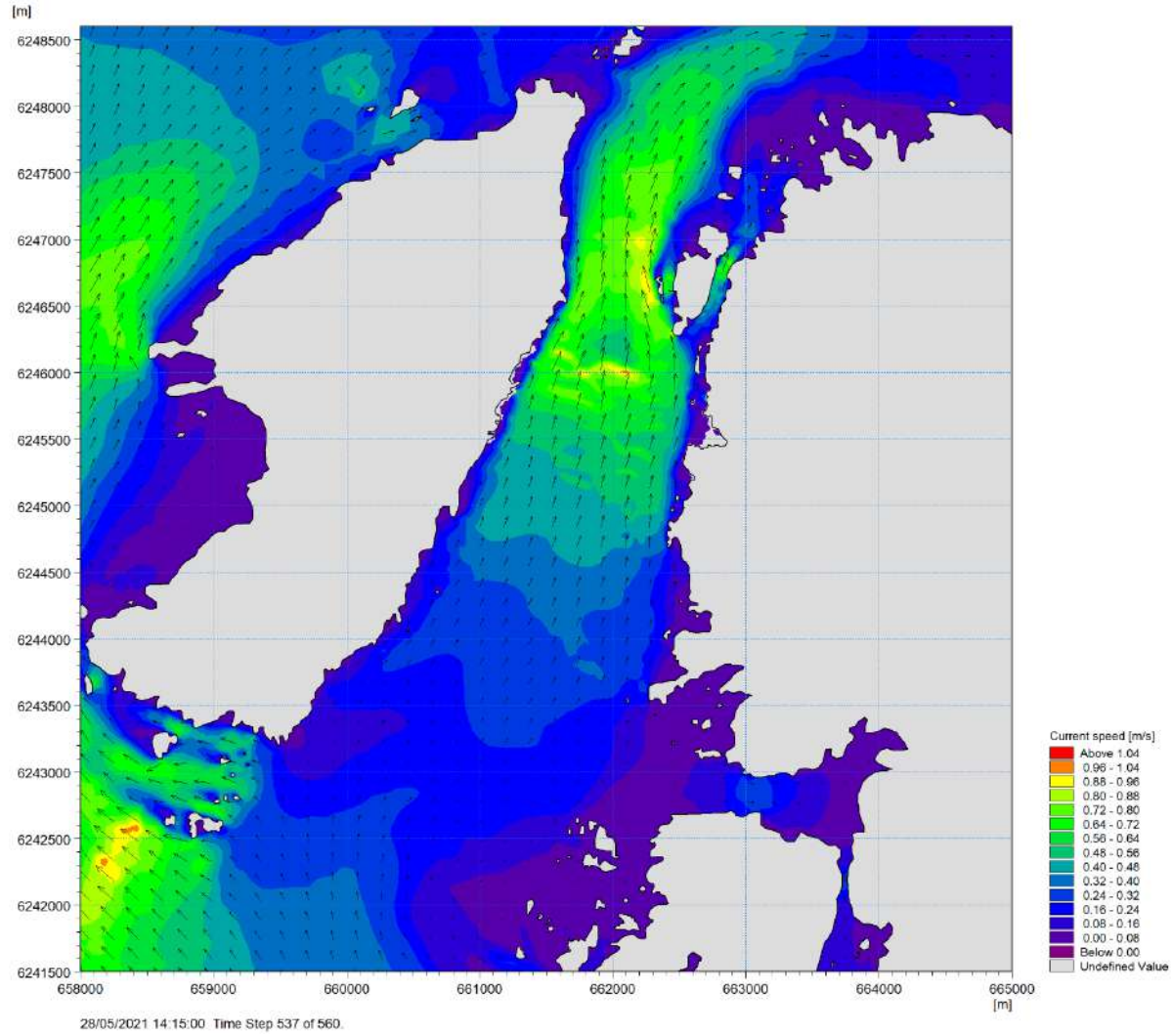

Figure 7. Typical spring tidal flood (north going) flow through the Sound of Iona

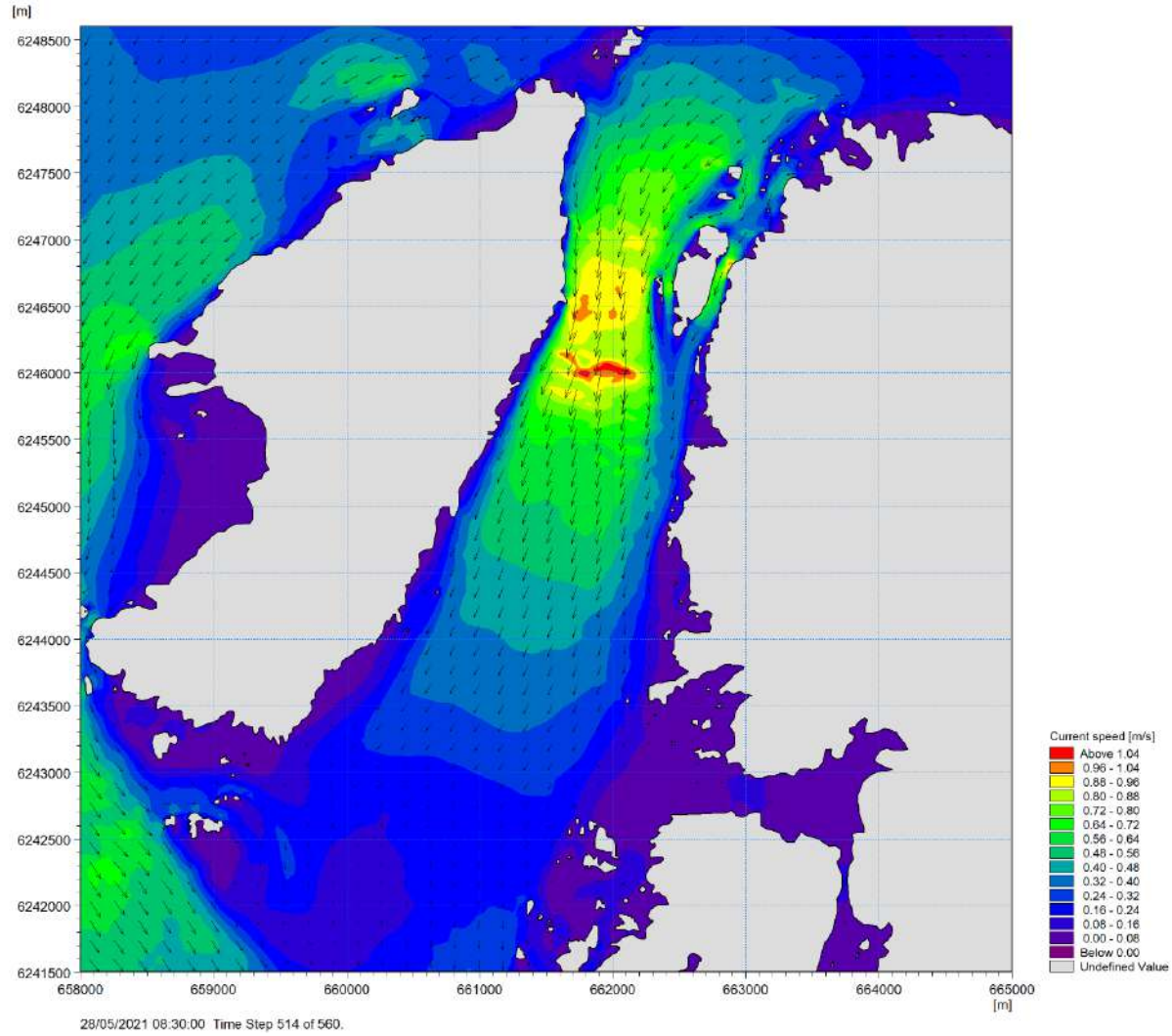

Figure 8. Typical spring tide ebb (south going) flow through the Sound of Iona

4.2 Waves

The model uses different wind directions in order to predict significant wave height during high water (since this will have higher waves due to the nature of tides). This has been carried out for a 1 in 1 year storm return period meaning these wave heights are likely to be experienced annually. The model has been run with wind coming from north (0°), west-southwest (240°), northwest (315°) and south-southwest (210°). Outputs from the wave model are shown Appendix A.

When wind is coming from 240 degrees (which roughly corresponds to west-southwest) the wave heights are much greater towards the southernly end of the Sound. Along the line roughly corresponding to the transect line between Iona and Fionnphort, the maximum wave heigh is 3.0 m. At the southern end of the Sound waves are over 5.0 m in height. The waves travel northerly aligned with the Sound.

When the wind is coming from 315 degrees (which roughly corresponds to northwest) Iona shelters the Sound. Maximum wave heights in the central area of the Sound are 1.0 m but this height increases closer to the northerly and southerly ends of Sound of Iona. The majority of waves travel towards the Isle of Mull.

With northerly winds, the most significant wave height in the Sound of Iona is 1.12 m with wave height decreasing towards the islands. Waves travel southerly aligned with the Sound of Iona.

When the wind is from 210 degrees (which roughly corresponds to (south-southwest)) waves travel northerly up the Sound of Iona parallel to the islands. Wave heights decrease northerly up the Sound with maximum wave height on the transect line between Baile Mòr and Fionnphort being 2.4 m. Maximum wave height at the southern end of the Sound is 3.6 m.

4.3 Wind conditions

Figure 9 shows a wind rose diagram for a location to the south of the proposed project area. This provides an indication of wind conditions. Figure 9 identifies that the wind is predominantly from the south, south west and west of the site and to a lesser extent from the south east. The strongest winds of greater than 16 m/s (Beaufort wind force 7) are predominantly from the south through to the south west. Due to the position of the Sound, it is likely that Iona provides some protection from north westerly winds.

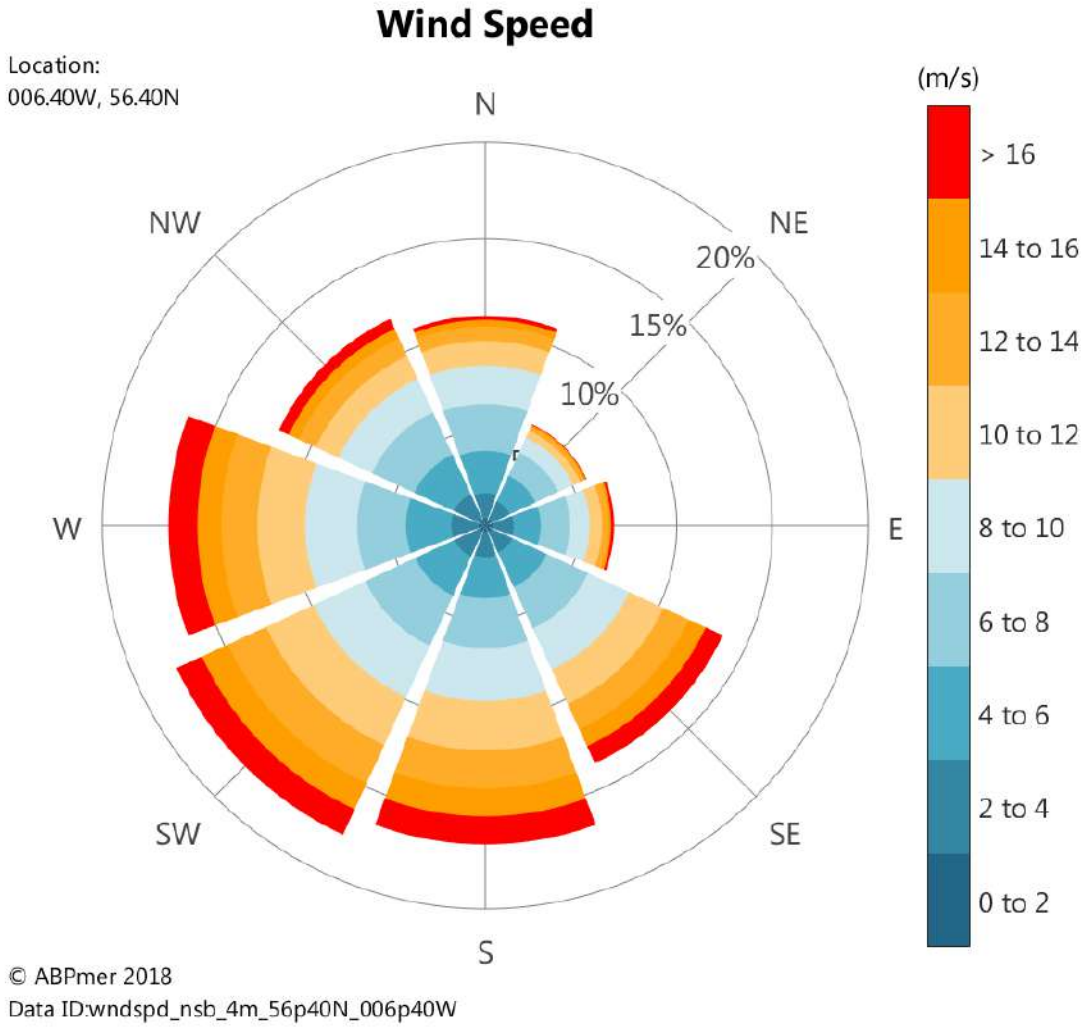

Figure 9. Wind rose for the study area

5 Marine Traffic Analysis

This section analyses the vessel traffic routeing through the study area using 365 days of data (from 01 November 2021 to 31 October 2022). Figure 10 to Figure 18 shows the AIS transits for the Sound of Iona, Figure 19 to Figure 27 show the AIS transits for the wider study area. Traffic density is presented in Figure 28 and Figure 29.

5.1 Recreational vessel movements

Figure 10 shows AIS transits for the recreational vessel movements through the study area. Whilst it is acknowledged that a large proportion of recreational vessels do not use AIS, the information still provides an indication of the vessel routeing through the area.

It can be seen from Figure 10 that recreational vessels tend to transit past the marine works close to the shore on either the Iona or the Fionnphort side, avoiding the shallower water at the centre of the Sound. A number of vessels transits can be seen in Bull Hole Channel which is a popular anchorage as it is sheltered from the prevailing wind and wave conditions for the area.

It is known from anecdotal information that a passage around the Isle of Mull, including transiting through the Sound of Iona is a popular cruising route. Vessels visiting the Western Isle may also plan an overnight anchorage in the Sound if the wind and wave conditions permit. Bull Hole Channel provides access to Fionnphort where a short tender ashore provides access to welfare services.

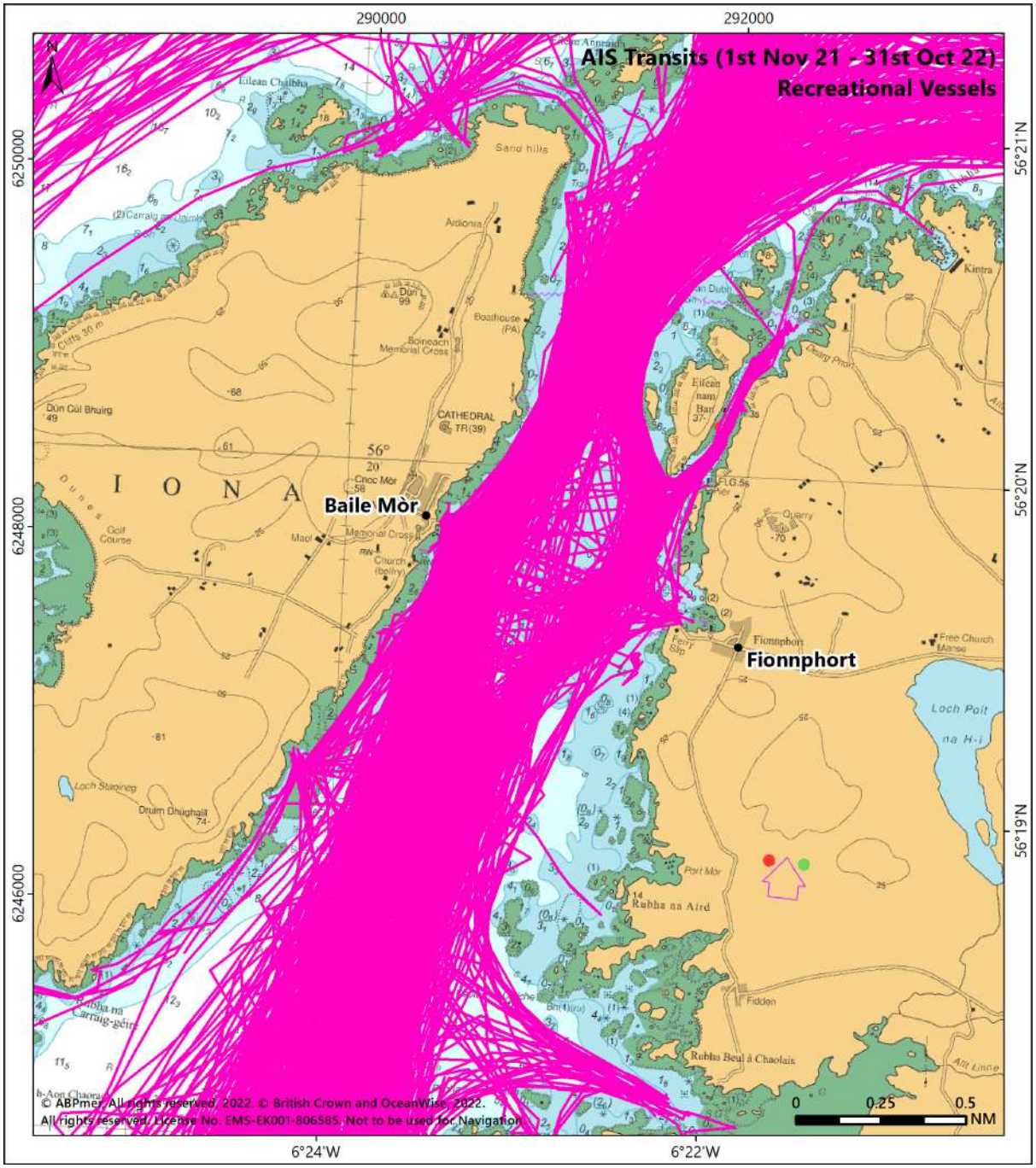

Figure 10. AIS Transits – Recreational vessels

5.2 Passenger vessels

The majority of passenger vessel transits are between Baile Mòr and Fionnphort as seen in Figure 11, these transits are predominantly the CFL ferries (including the MV Loch Buie, MV Loch Linnhe and MV Loch Tarbert). The differences in the routeing between Baile Mòr and Fionnphort are due to the ferry using a different passage around the shallower area in the centre of the Sound due to weather and tidal conditions at the time of the passage. A number of passenger vessel transits are also seen proceeding into/out of Bull Hole Channel. These are the ferry moving to its overnight mooring which is located on the north-eastern side of Eilean nam Ban.

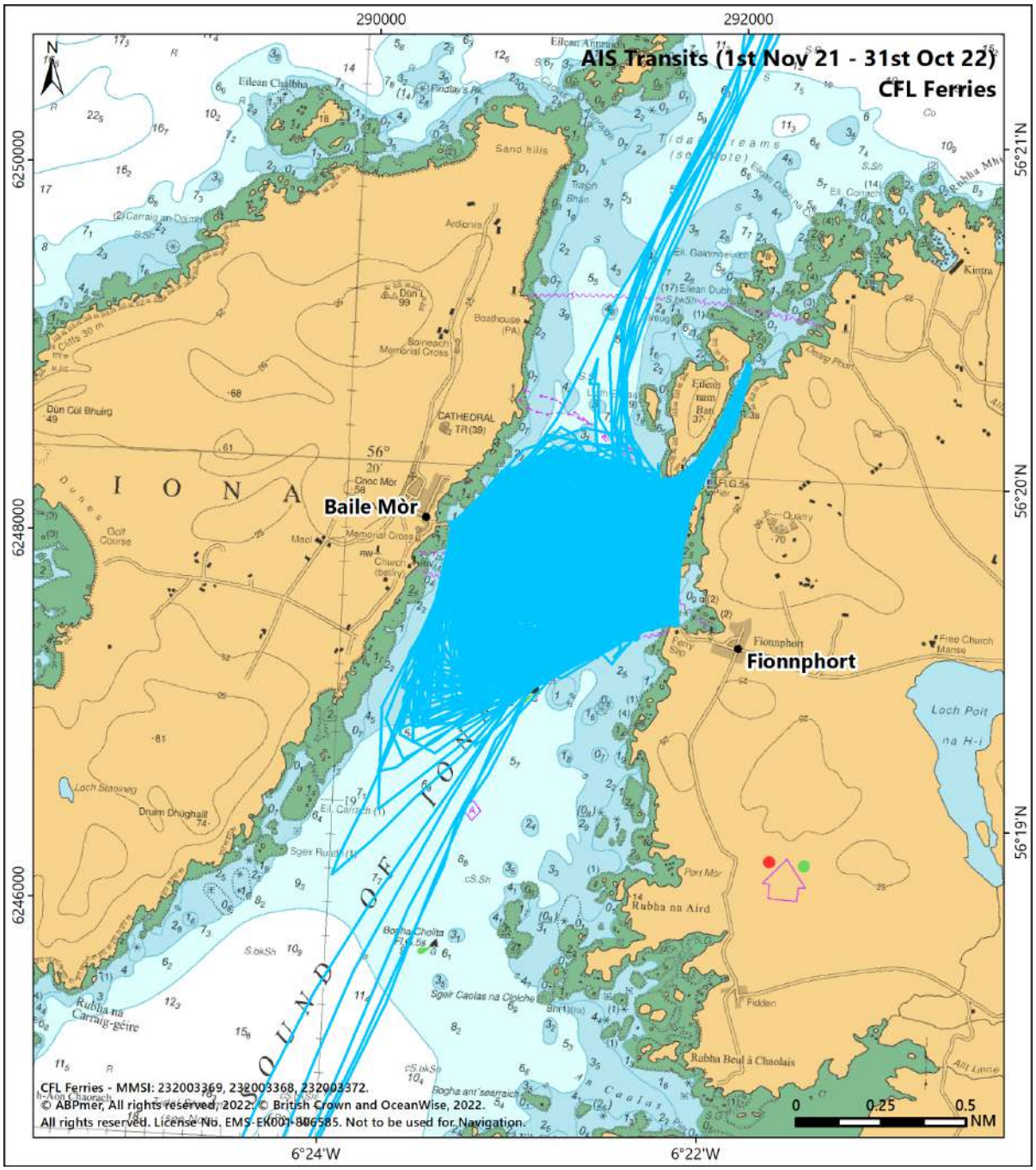

Figure 11. AIS Transits – Passenger Vessel – CFL Ferries only

There are also a number of passenger vessel movements along the Iona Sound, some of these transits will be associated with tour boats operating in the area, see Figure 12. Others are small passenger coded craft that ferry people across the Sound independently of the CFL ferry. Cruise ships also anchor at either end of the Sound.

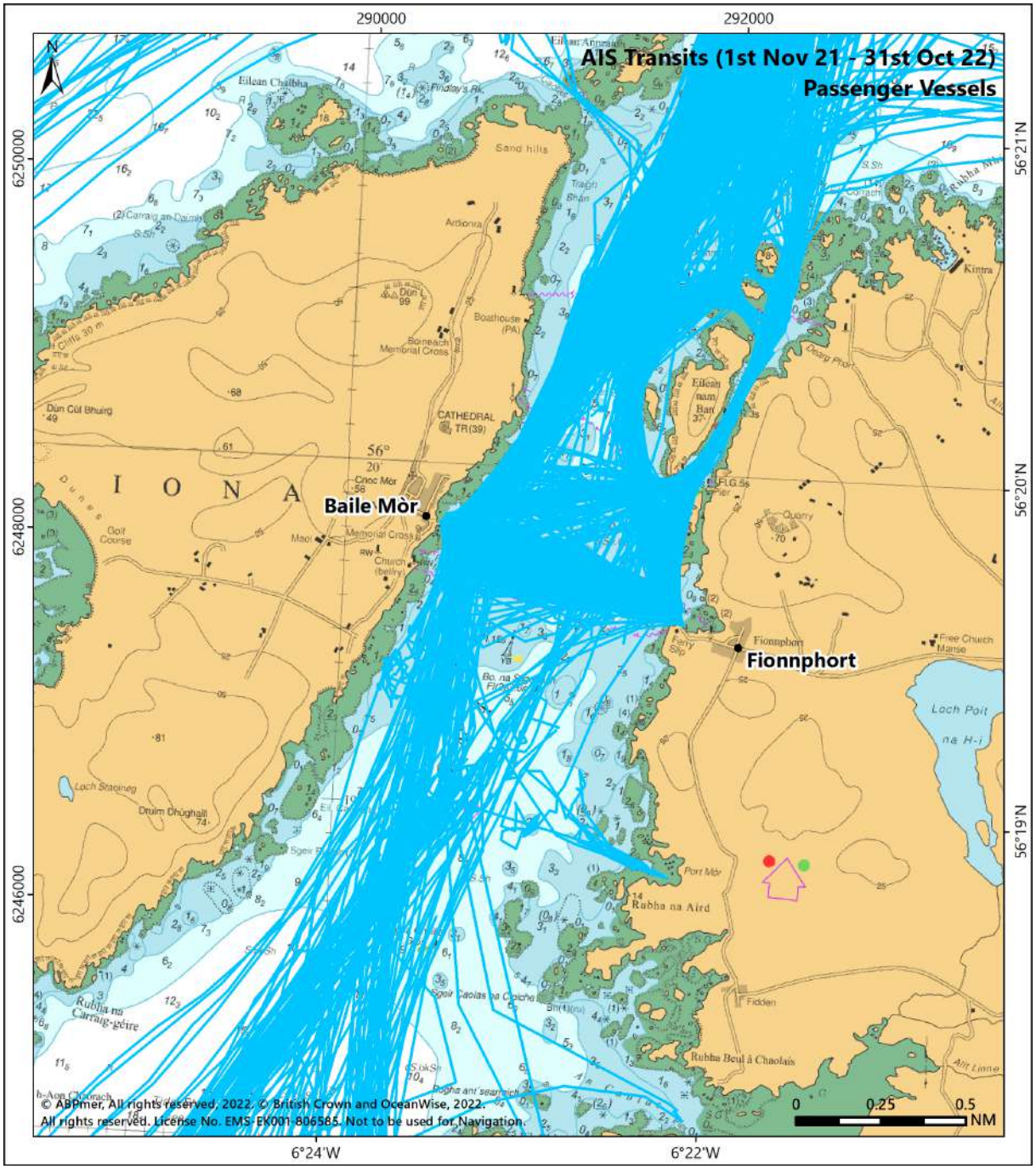

Figure 12. AIS Transits – Passenger Vessels (excluding CFL Ferries)

5.3 Fishing vessels

Fishing vessel activity is provided on Figure 13 which depicts AIS vessel activity in the study area. It can be seen from the limited data that fishing vessel transits are through the Sound of Iona, to/from Fionnphort as well as in close proximity to the shoreline. Interrogation of the AIS data shows that the majority of the transits have been made by two small AIS equipped fishing vessels. There is no requirement for fishing vessels less than 15 m LOA to use AIS and it is known that there many other small day fishing and potting boats operating within the area.

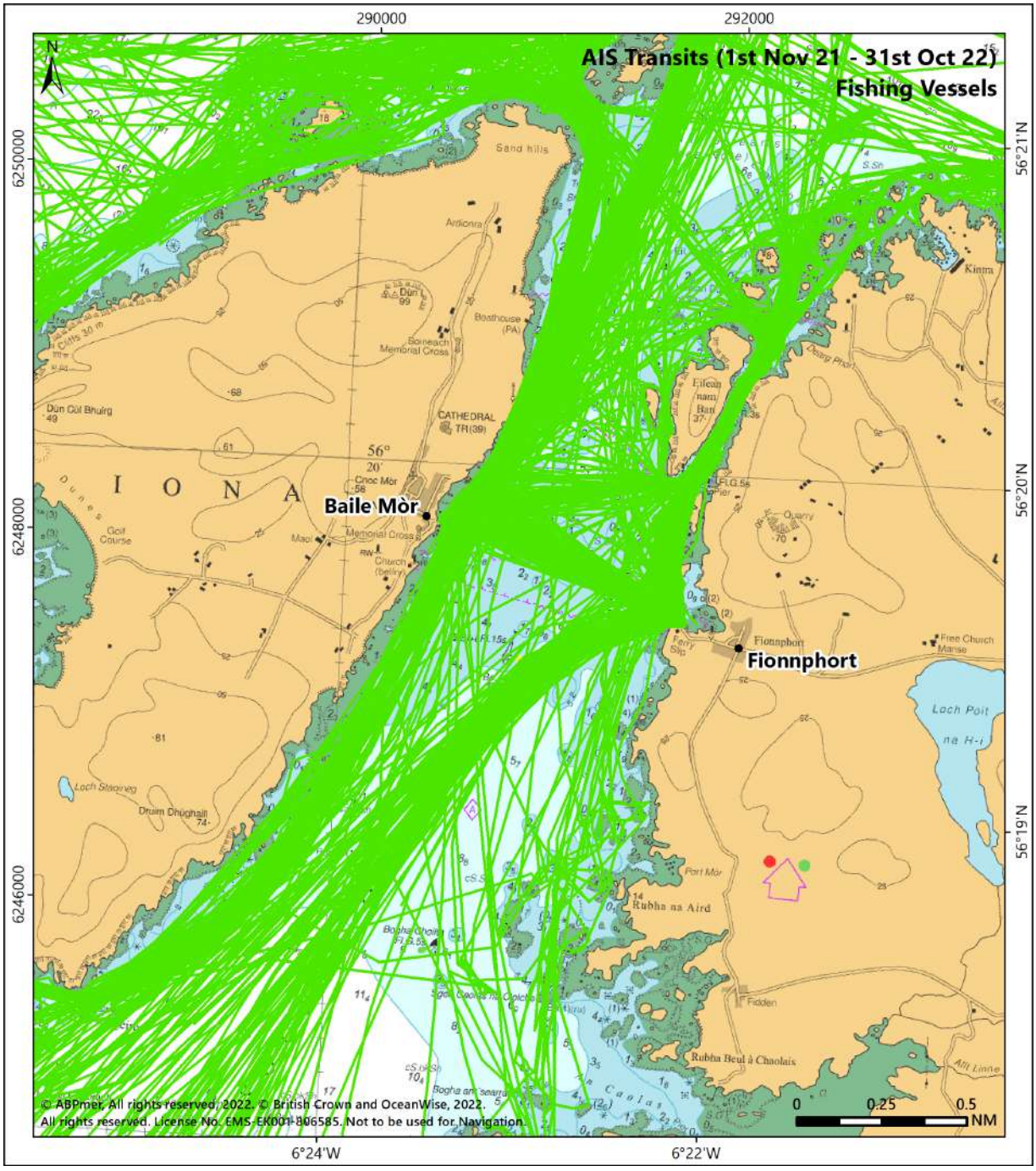

Figure 13. AIS Transits – Fishing vessels

5.4 Dredging or underwater operations

Figure 14 shows vessels categorized as being involved in dredging or underwater operations. Interrogation of the vessel tracks showed two different vessels which were being used for diving operations. As the limited number of tracks show this is not a vessel type that frequents the study area very often with a limited number of transits during the year dataset.

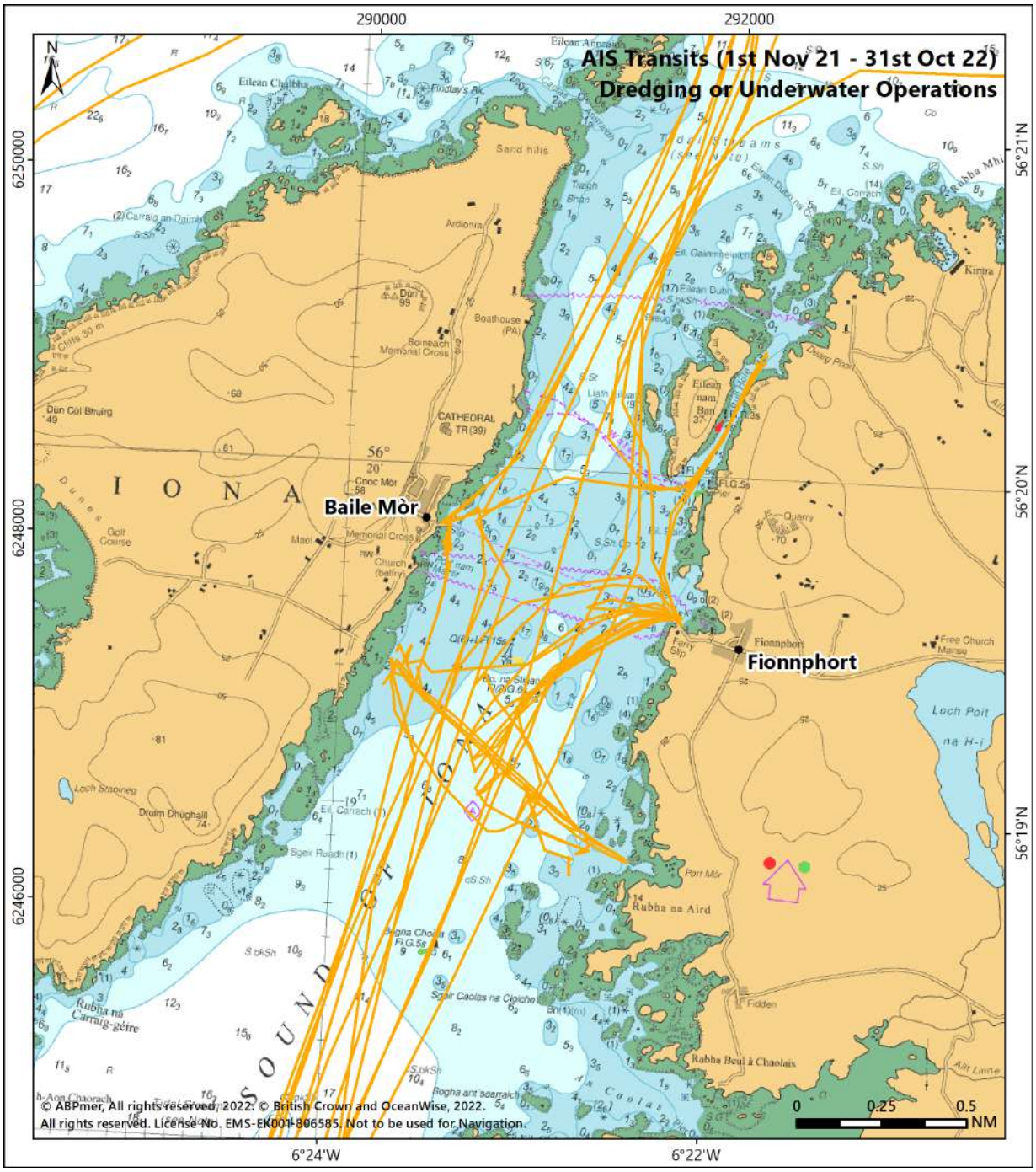

Figure 14. AIS Transits – Dredging or underwater operations

5.5 High speed craft

This AIS data shows high speed craft using the study area, investigation of specific craft routeing identifies vessels that are predominantly used for bathymetric and inshore survey work, multi-role private hire commercial craft and vessels used for sightseeing trips. As seen in Figure 15 the vessels in this category mainly operate in and out of Baile Mòr and keep to the west side of the Sound. Crossing traffic to the south of the Sound is generally indicative of survey work being carried out.

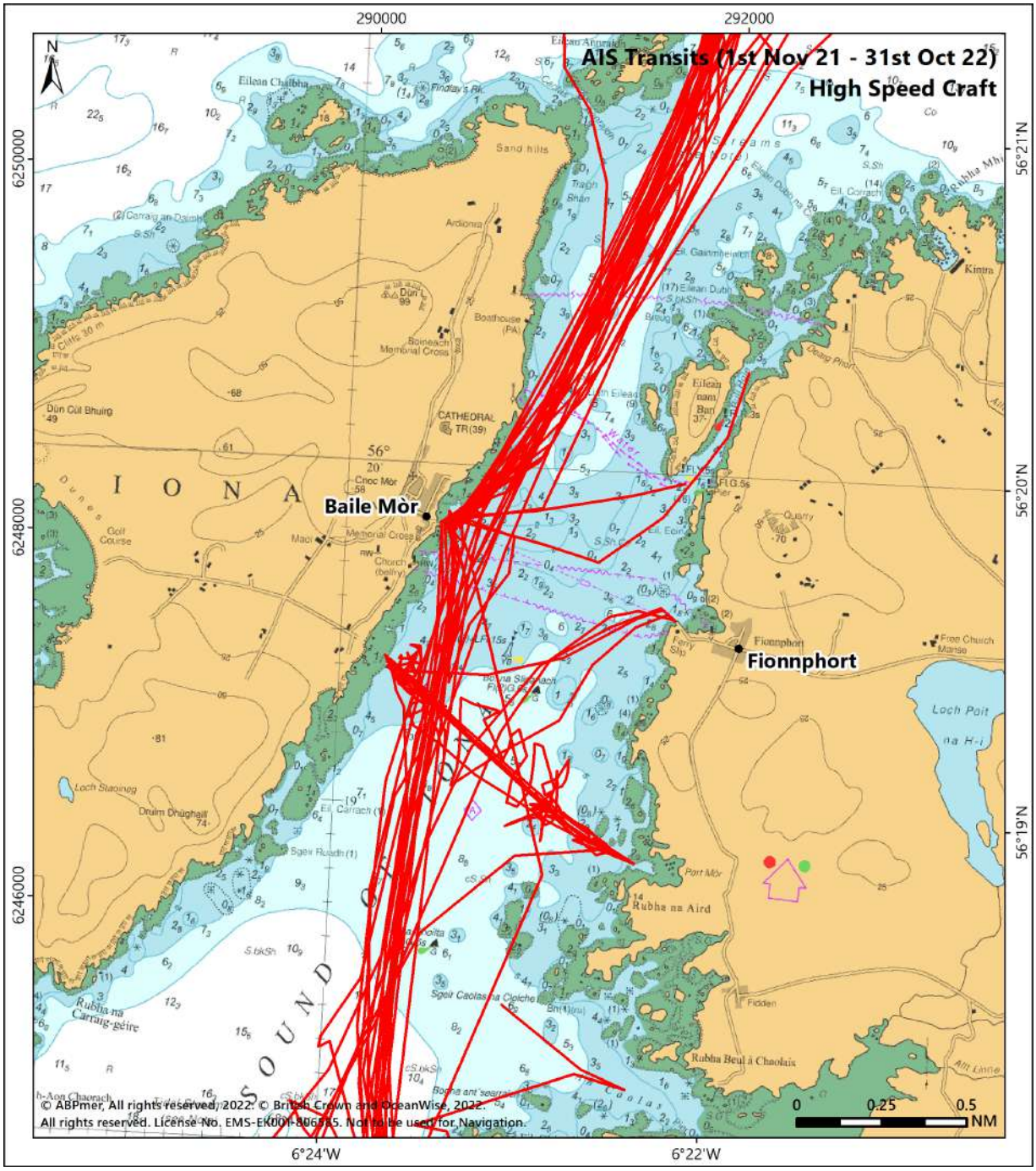

Figure 15. AIS Transits – High speed craft

5.6 Cargo vessels

There are very few movements made by cargo vessels in the Sound. Interrogation of the AIS data shows the cargo vessels to be small workboats and landing craft. The tracks shown in Figure 16 indicate that most of the transits were passing through the Sound, with only one transit indicating a port call at Baile Mòr.

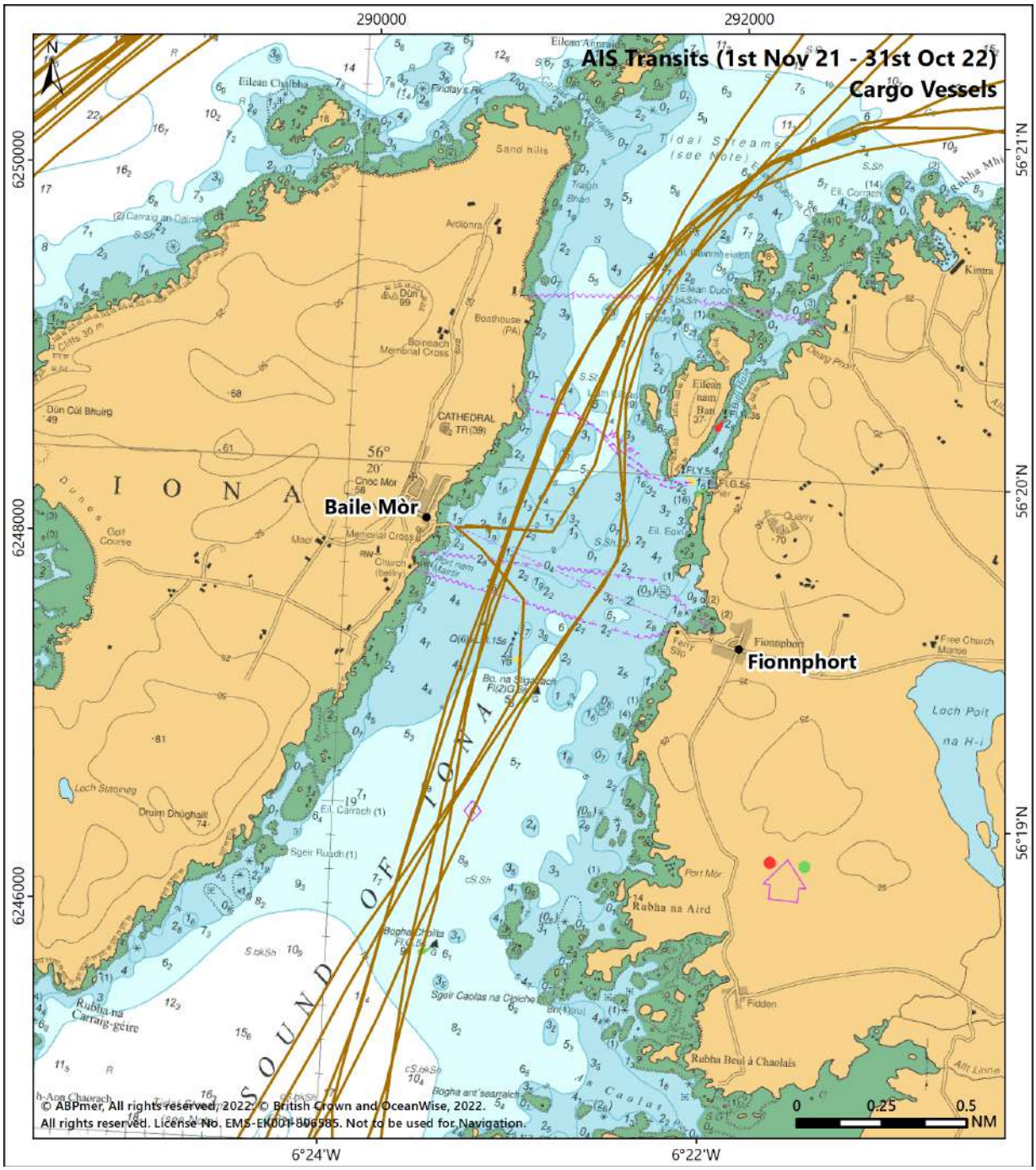

Figure 16. AIS Transits – Cargo vessels

5.7 Port service craft

Iona receives calls from several cruise ships throughout the year. These ships have too deep a draught to be able to safely navigate the Sound. As such they berth in safe water to either the north of south of the Sound and use tenders to ferry the passengers ashore. Figure 17 shows vessel tracks from a number of such cruise ship tenders. They typically disembark passengers at Baile Mòr, though a smaller number of vessel tracks indicate visits to Fionnphort. This category may also include workboats.

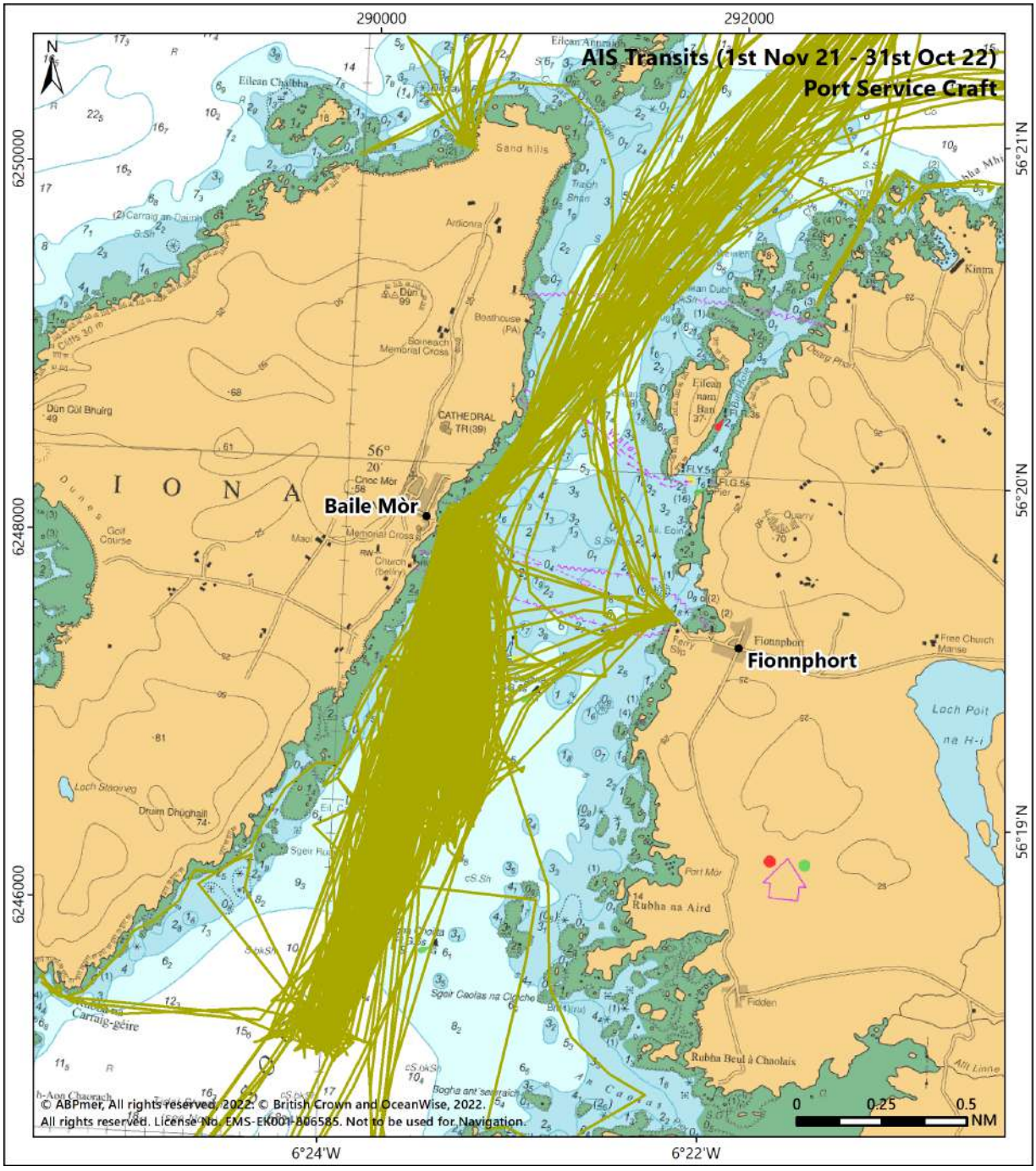

Figure 17. AIS Transits – Port service craft

5.8 Non-port service craft

Examination of the AIS data shows different vessel types within the category including workboats, Rigid Hull Inflatable Boats (RHIBs) and small tugs. Although Figure 18 indicates that few vessels falling into this category are present in the Sound, it should be noted that a number of similar small craft may be operating that are not broadcasting AIS signals. The majority of the transits are towards to the south of the Sound with calls into both Baile Mòr and Fionnphort. Some transits are in the vicinity of Bull Hole where it is known that workboats are used to ferry crew to and from the MV Loch Buie at its overnight berth on Eilean Nam Ban from Dearg Phort.

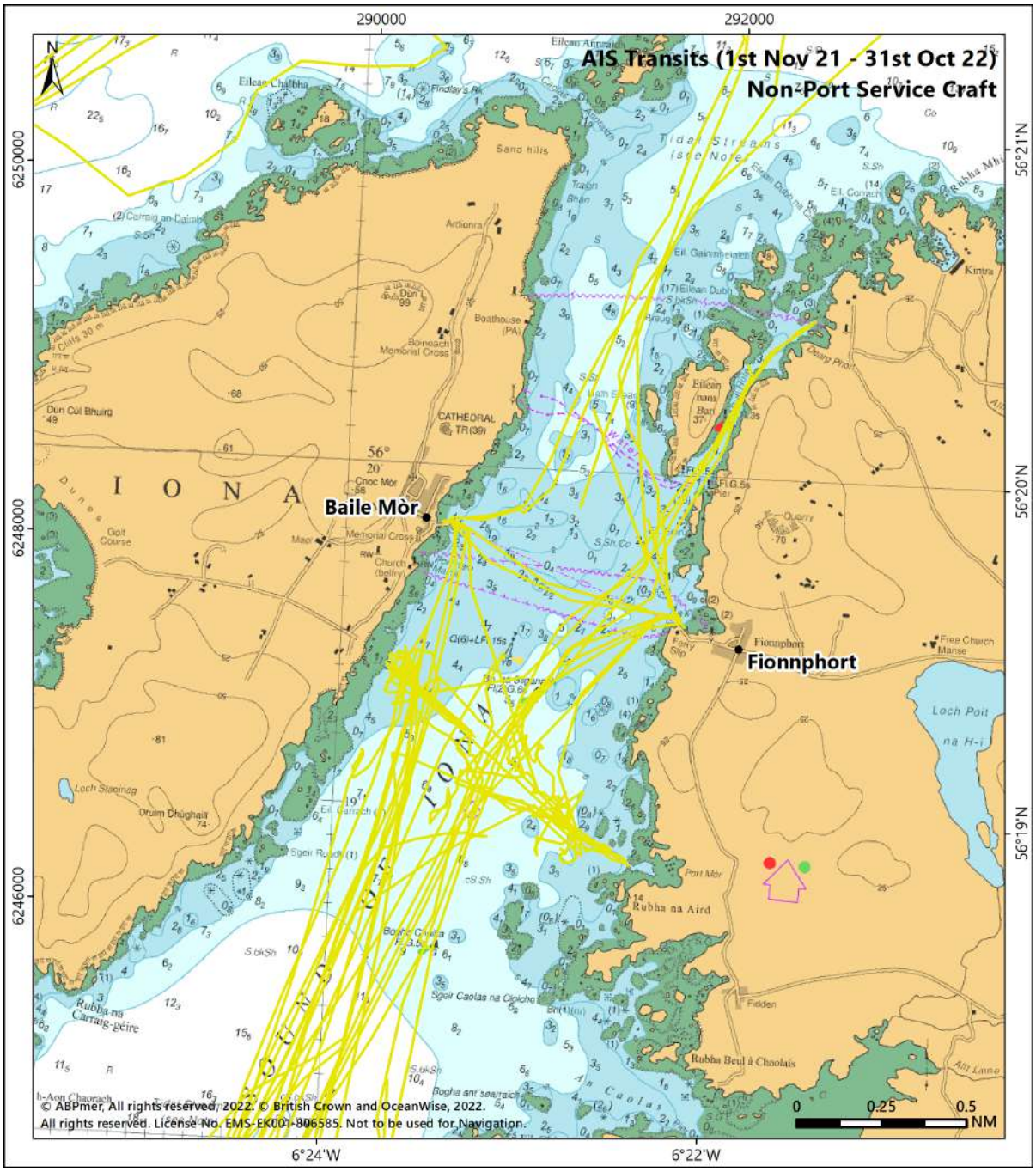

Figure 18. AIS Transits – Non-port service craft

5.9 Transit movements in the wider study area

This section provides a brief commentary on vessel routeing within the wider study area. This is of relevance to marine craft transiting to the work and dredge site from outside of the study area.

5.9.1 Recreational vessels

The west coast of Scotland is a popular yacht cruising destination. Figure 19 identifies the vessel transit patterns for recreational vessels in the wider study area. Many routes can be noted linking the bays and anchorages of the Western Isles, this is due to the typical size of recreational vessels being relatively small so they can transit close inshore. Many of the recreational vessels will be cruising during the summer months and will typically avoid areas offshore with commercial traffic.

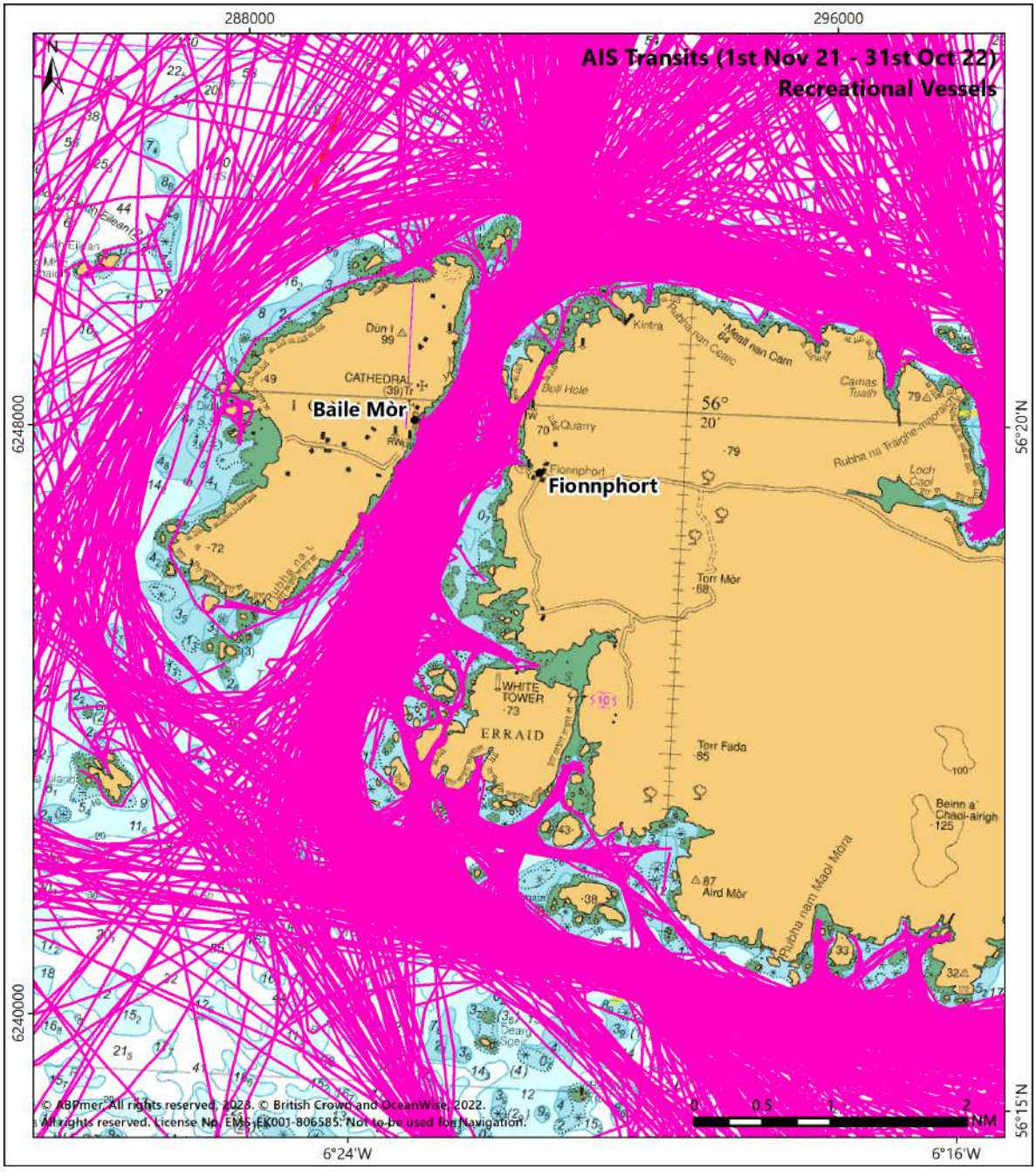

Figure 19. Wider area AIS Transits – Recreational vessels

5.9.2 Passenger vessels

There is a range of different passenger vessel routes in the wider study area as shown in Figure 20. There are multiple passenger vessel routes between the islands in the wider study area associated with the CFL ferry service, cruise vessels and tour vessels. A number of companies operate sightseeing boat trips to the islands of Staffa and Lunga which account for a large number of the vessel transits heading north of the study area.

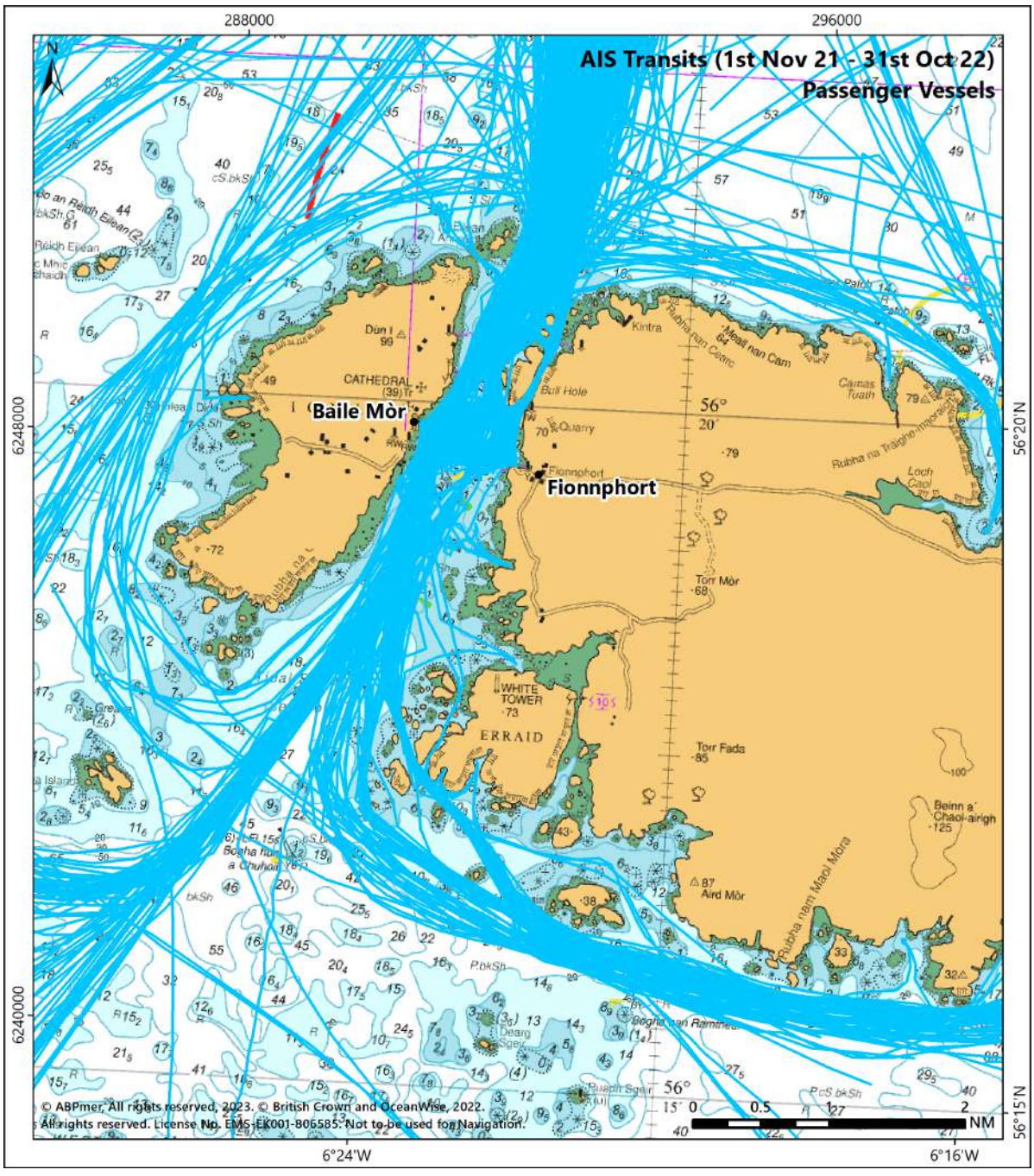

Figure 20. Wider area AIS Transits – Passenger vessels

5.9.3 Fishing vessels

Figure 21 shows that the wider study area is heavily used by fishing vessels with a large number of transits seen in the deeper waters to the west and south of the wider study area. It should be noted that information presented is not representative of all fishing craft, with smaller fishing vessels under 15 m in length unlikely to use AIS. This means particularly inshore around the islands; small day boats will add to the transits shown Figure 21.

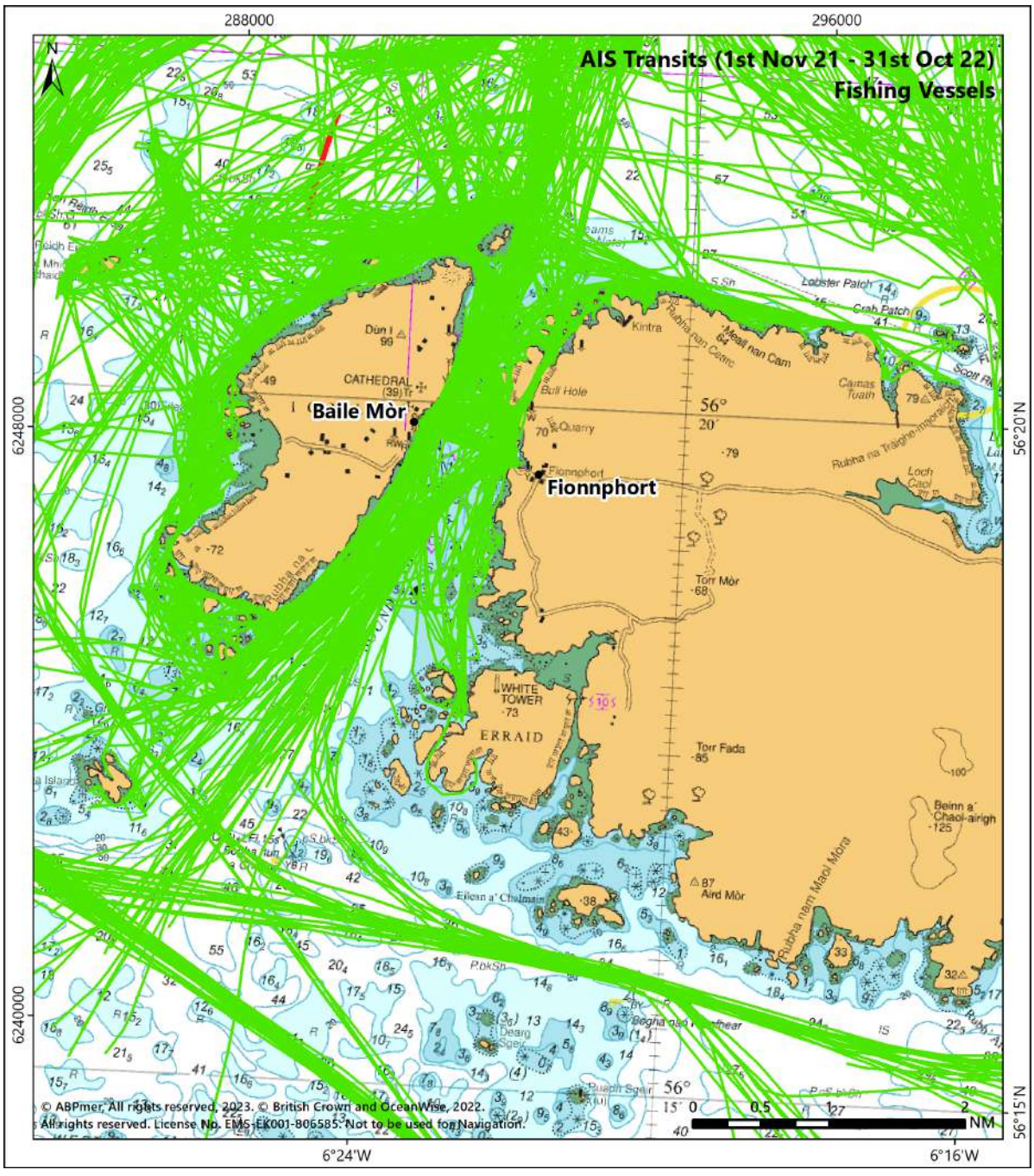

Figure 21. Wider area AIS Transits – Fishing vessels

5.9.4 Dredging or underwater operations

As indicated by Figure 22, there are relatively few transits within the wider area made by vessels falling in the dredger or underwater operations category. Interrogation of the data shows that most of the vessels are small boats that support recreational diving activities. The transits show that the Sound of Iona is used as a shortcut by some vessels.

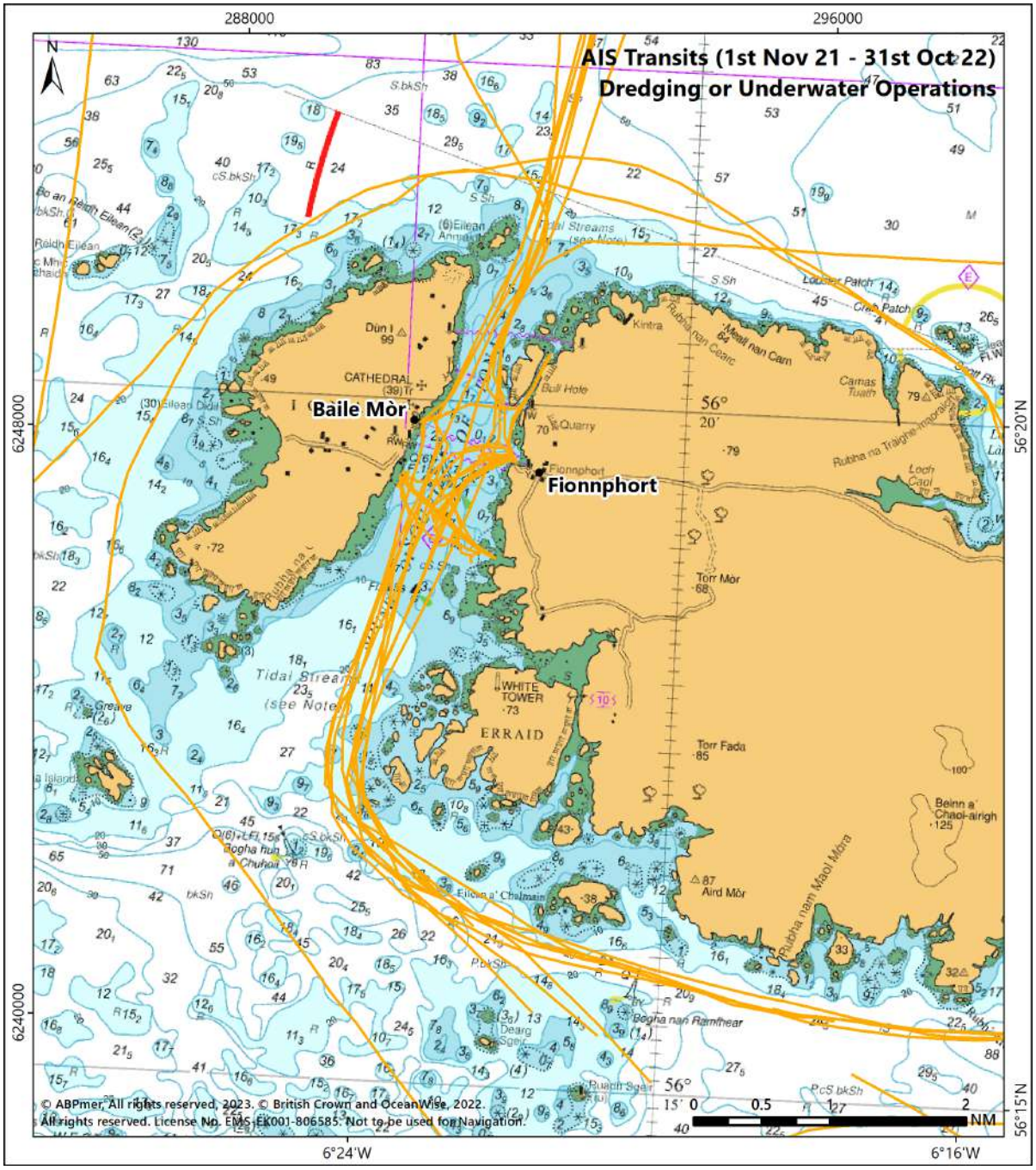

Figure 22. Wider area AIS Transits – Dredging or underwater operations

5.9.5 High speed craft

Figure 23 shows that a number of high speed craft operate in the wider area, both to north and south of the Sound and to south of Mull, but that these transits generally include passage through the Sound.

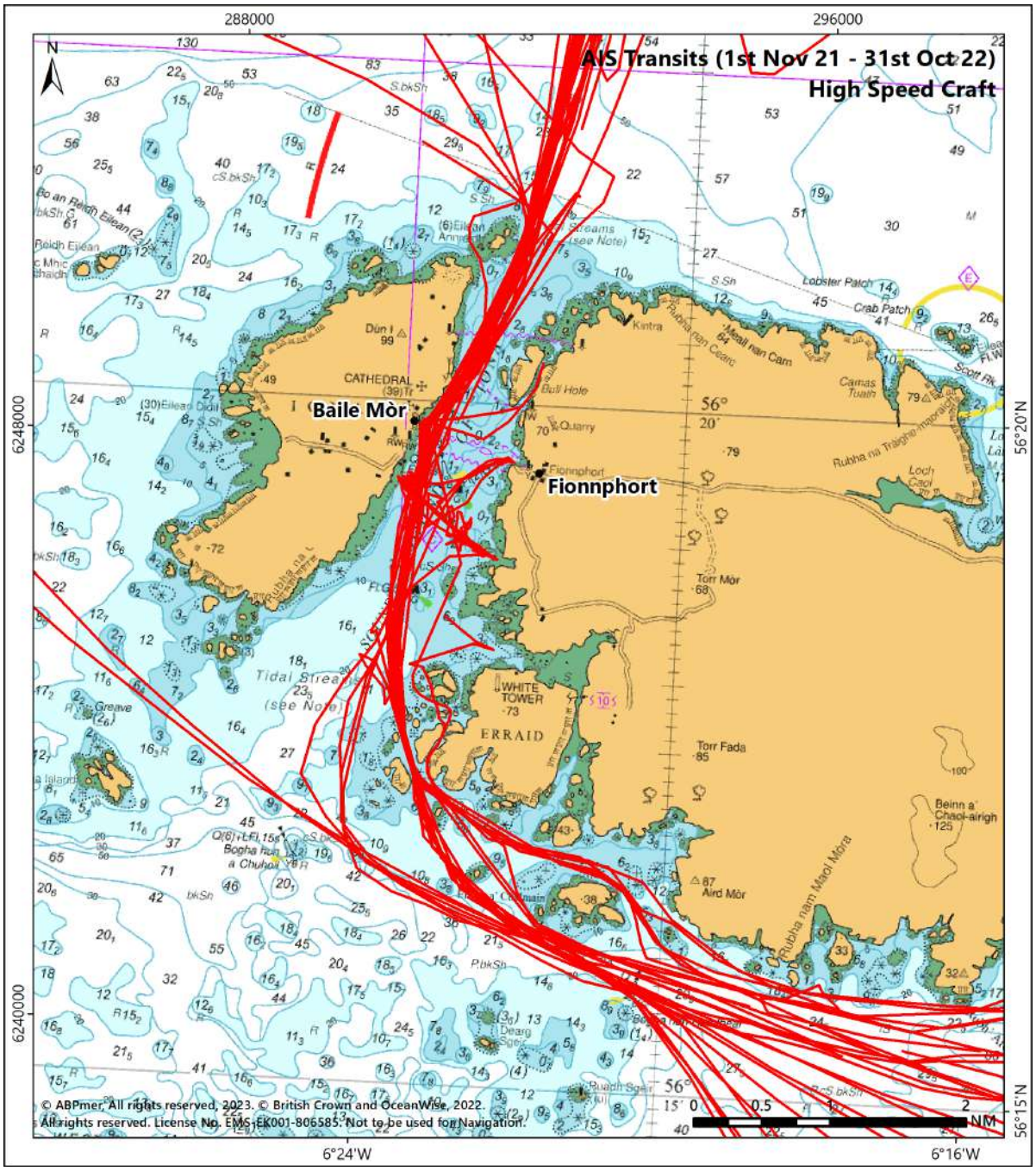

Figure 23. Wider area AIS Transits – High speed craft

5.9.6 Cargo vessels

Figure 24 shows that cargo vessel movements are predominately in the wider study area as opposed to the Sound. These tracks show that cargo vessels transit around the western side of the Isle of Iona and the north shore of the Isle of Mull when on passage to or from ports along Scottish west coast.

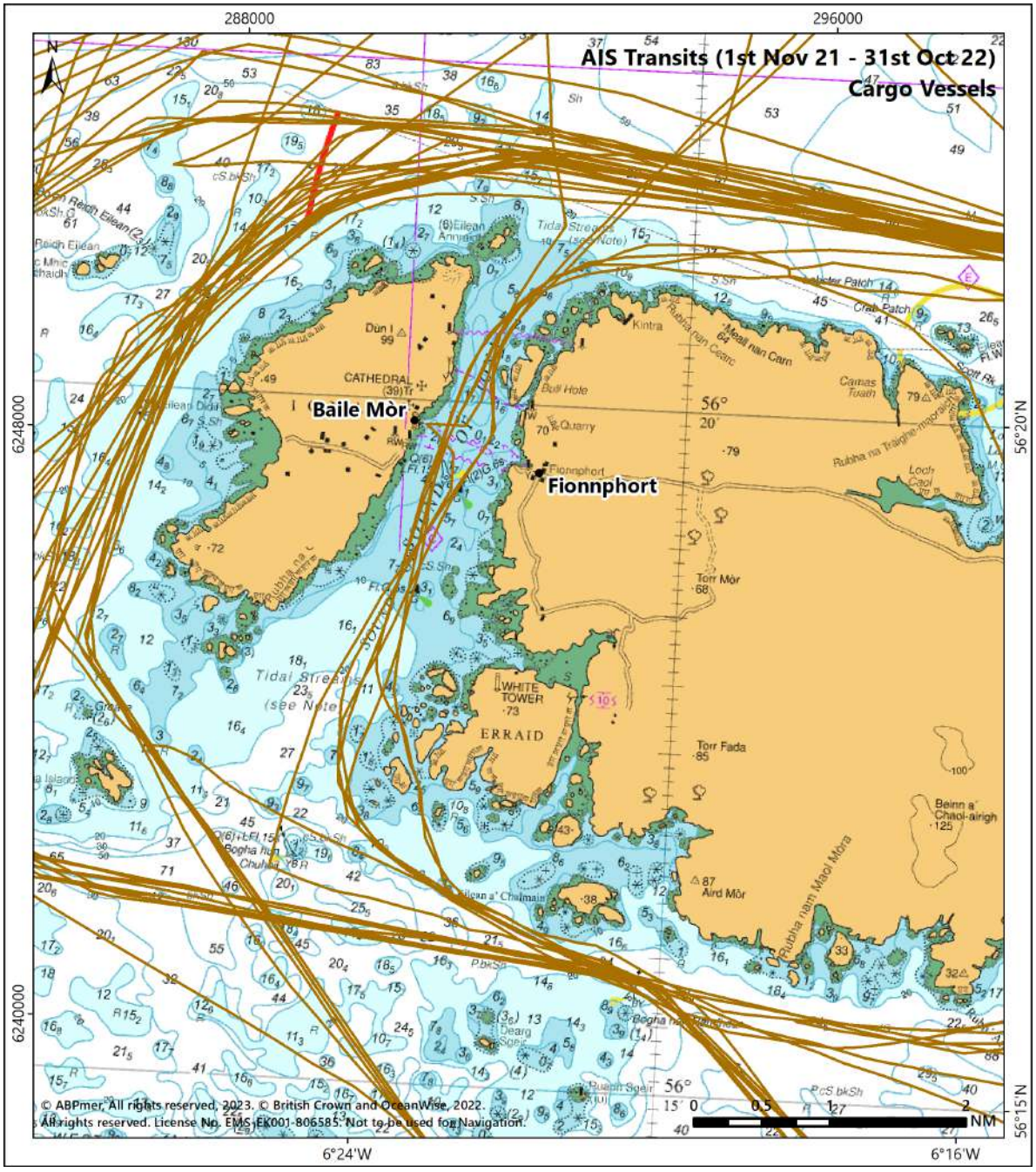

Figure 24. Wider area AIS Transits – Cargo vessels

5.9.7 Port service craft

The majority of non-port service transits through the wider study area are likely associated with workboats, tugs and towage operations. The transit routes of this category of vessels are shown in Figure 25 These transits are unlikely to be routine movement and will result from specific operations or towage requirements in the surrounding area. Most of the transits through the Sound are made by cruise ship tenders.

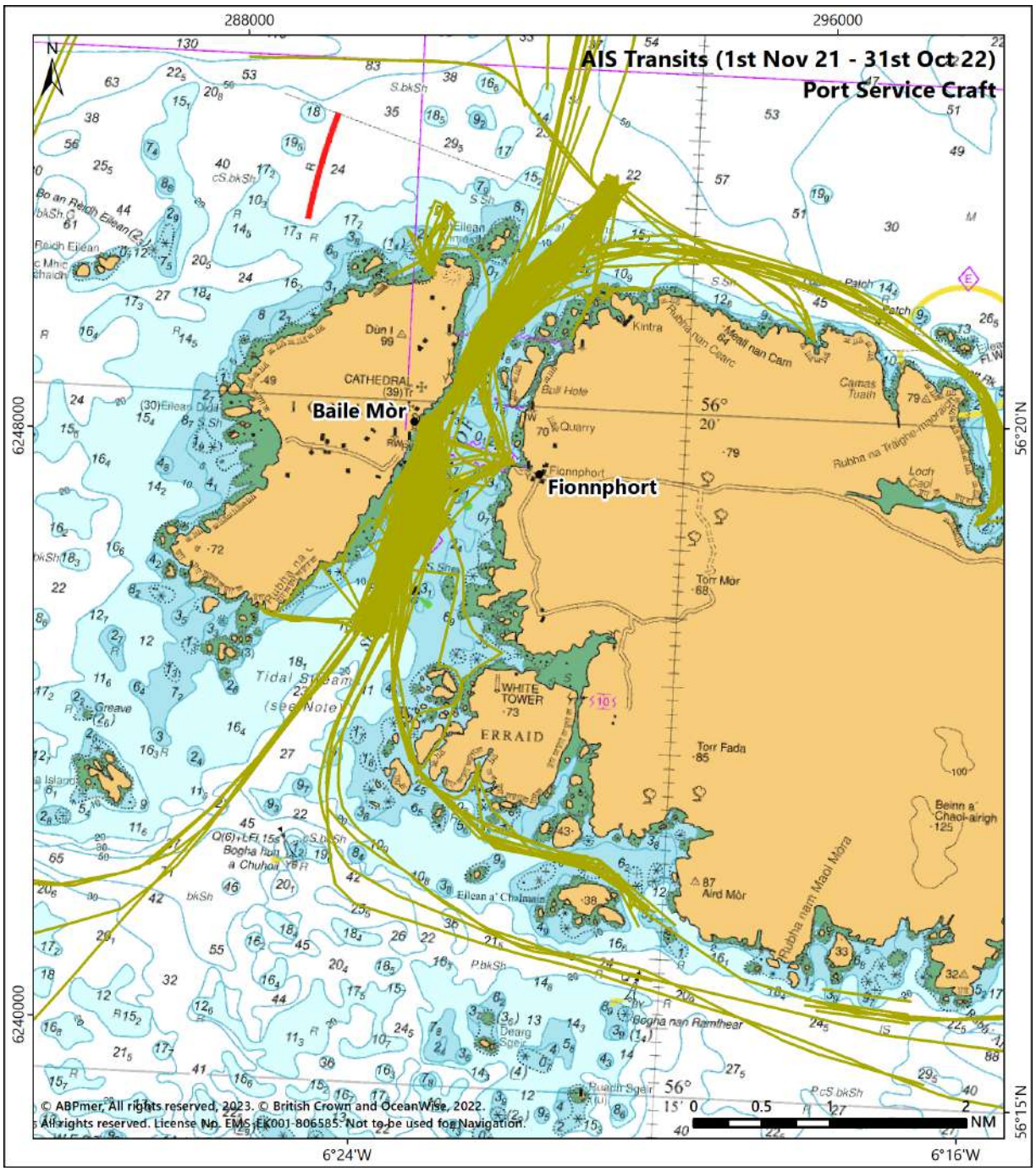

Figure 25. Wider area AIS Transits – Port service craft

5.9.8 Non-port service craft

Similarly to port service craft, the majority of non-port service transits through the wider study area are likely associated with workboats, tugs and towage operations. Vessels within this category are sometimes described as utility vessels. The transit routes of this category are shown in Figure 26. These transits are unlikely to be routine movement and will result from specific operations or towage requirements in the surrounding area.

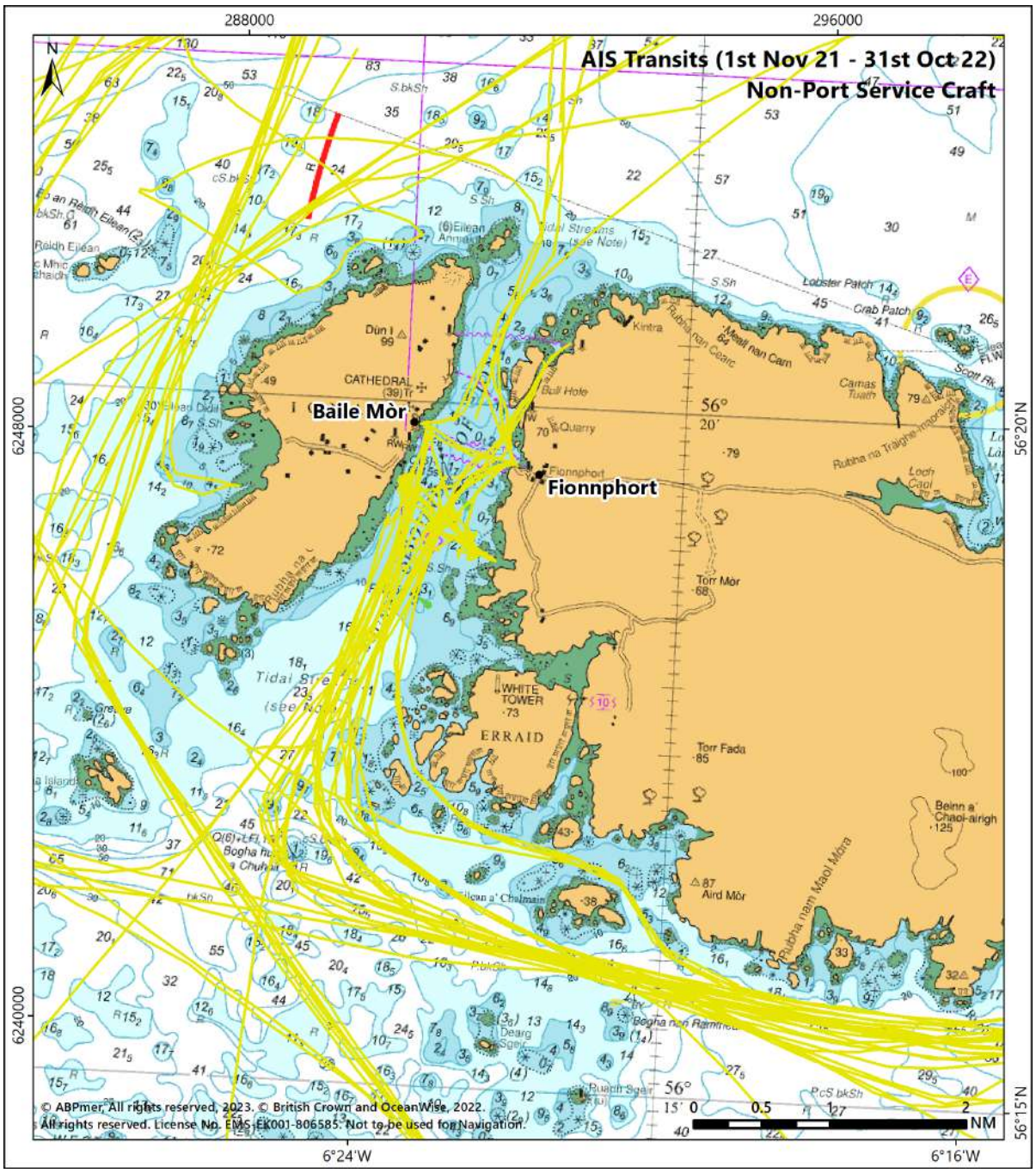

Figure 26. Wider area AIS Transits – Non-port service craft

5.9.9 Unknown vessels

Figure 27 shows the wider study area is frequently used by vessels of which do not define their AIS and are therefore classified as 'unknown'.

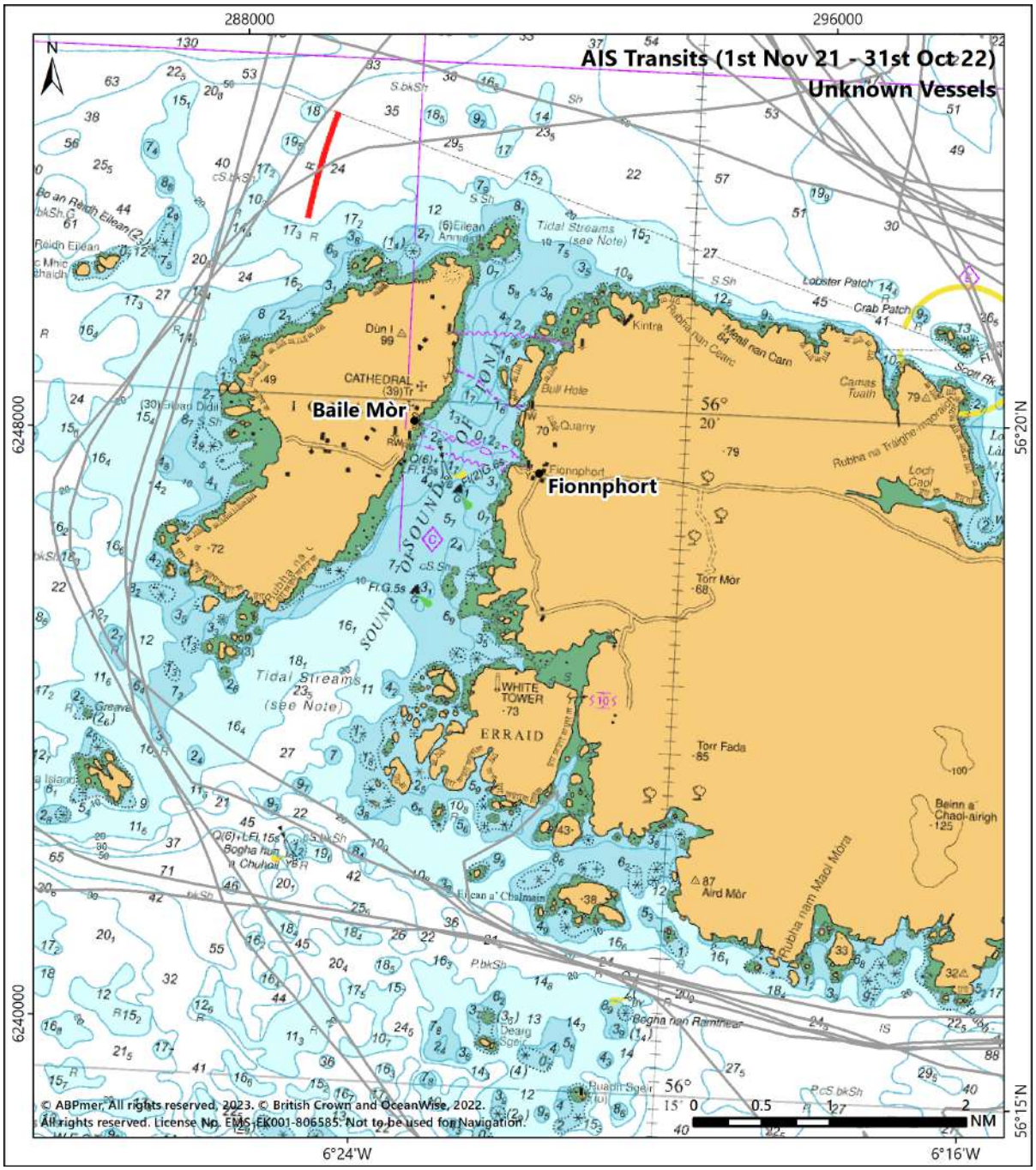

Figure 27. Wider area AIS Transits – Unknown vessels

5.10 Traffic density

Vessel density is shown in Figure 28 and identifies that within the study area there is a high-density of traffic crossing the Sound of Iona between Fionnphort and Baile Mòr. This is consistent with the ferry transits between these two locations. The other area that shows an increased level of vessel density is the area between Fionnphort and the Bull Hole Channel. This is likely due to the ferry proceeding to its overnight berth and the vessels that use Bull Hole Channel as an anchorage. There is comparatively light vessel density through the Sound of Iona due to the increased navigable width and quantity of vessels making the passage.

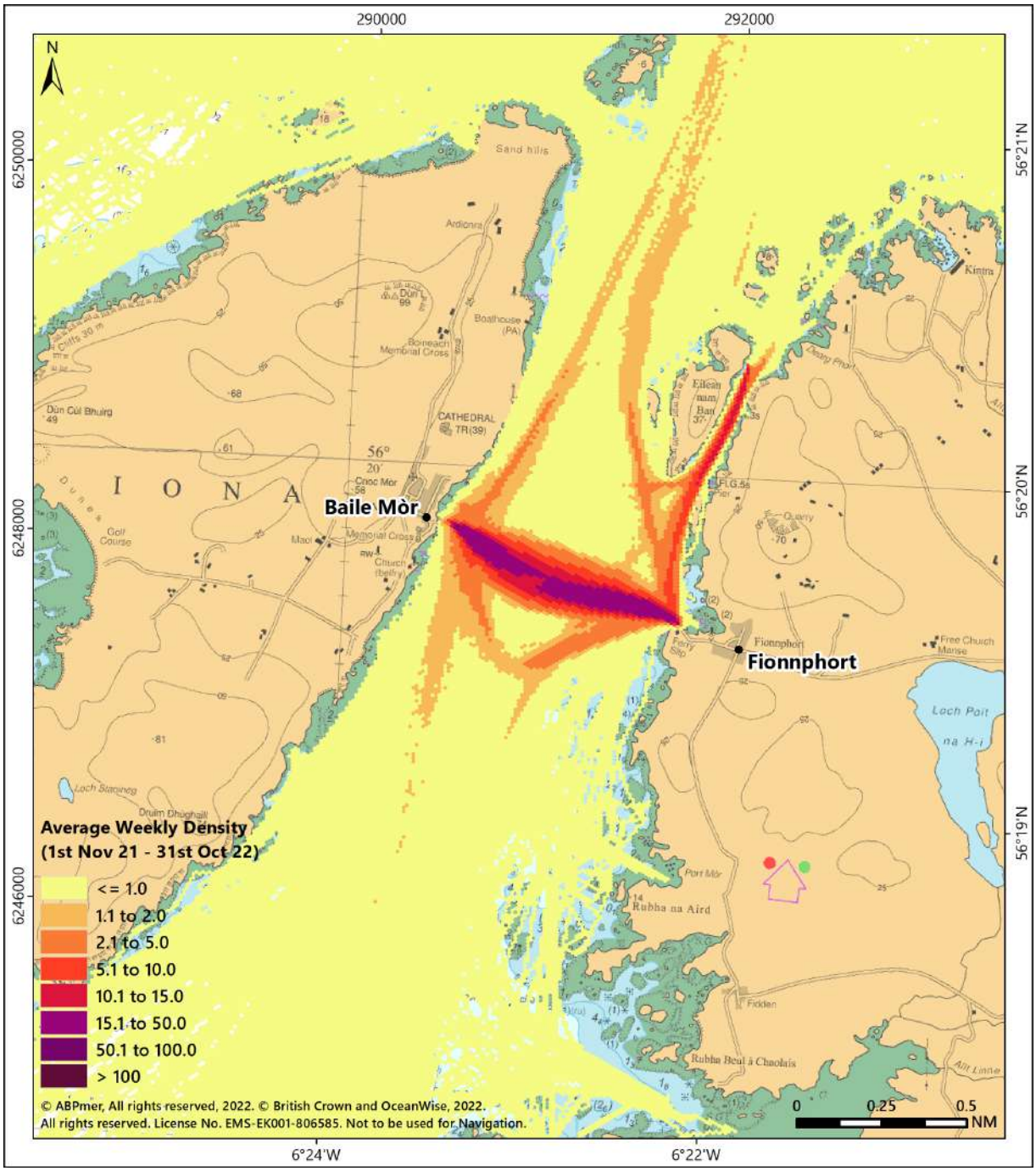

Figure 28. Average Weekly Vessel Density (using AIS from 01 Nov 2021 to 31 Oct 2022)

5.10.1 Vessel composition analysis

Vessel density indicates areas and routes with the greatest number of vessel movement. Where two areas or routes of dense vessel traffic meet a greater amount of vessel interaction can be expected. Vessel interaction through volume of numbers or the nature of the traffic flow increases levels of risk and may result in slower transit times. Transects have been drawn to allow the vessel transits through specific parts of the study area to be quantified. The transects are shown in Figure 29.

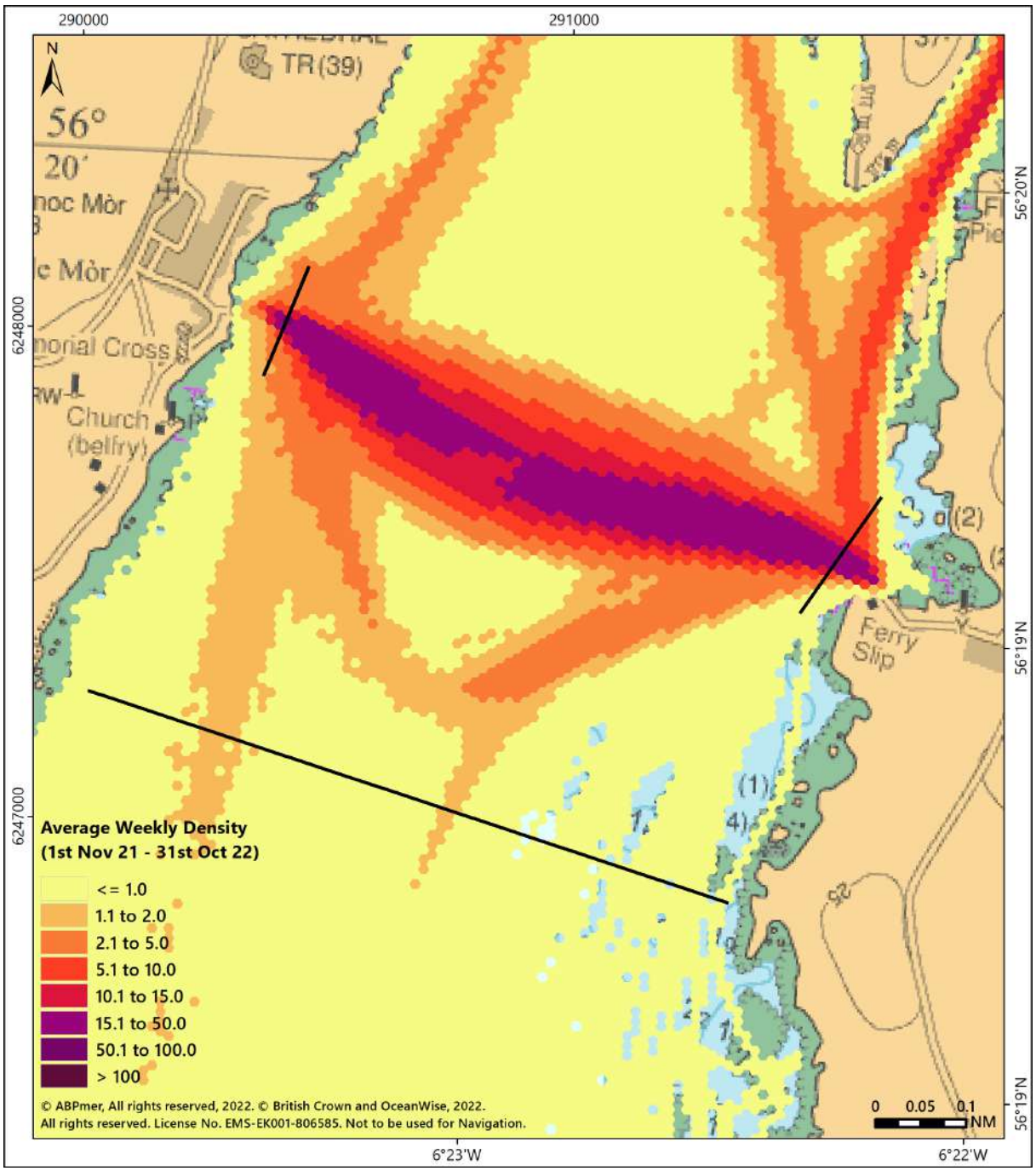

Figure 29. Transect Locations on Average Vessel Density

Table 1 to Table 3 detail the number of vessel transits per AIS group corresponding to the transect lines identified on Figure 29.

The transects are identifies as 'Sound of Iona' in Table 1, 'Fionnphort' in Table 2 and 'Iona' in Table 3 The data is representative of 365 days of AIS and percentage against each type of craft in the data record.

For the transect across the Sound of Iona there were fewer vessels traveling each month, however there was more variety in ship type. Table 1 identifies that the majority of vessel transits crossing the transect line in the Sound of Iona are recreational (56%). The next most predominant vessel type operating in that area were fishing (17%) and passenger (13%). The transect line across the Sound of Iona line was taken outside of the usual ferry route, passenger vessel transits will be associated with the ferry when it leaves the area for repair or refit and tour boat operators.

Table 1. Sound of Iona vessel transect

Ship type	Sound of Iona Transit Line Count (365 days)	Transit Count Percentage (%)
Non-Port Service Craft	17	1.8
Port Service Craft	59	6.4
Dredging or Underwater Operations	16	1.7
High Speed Craft	19	2.1
Passenger	120	13.0
Cargo	7	0.8
Fishing	165	17.8
Recreational	522	56.4
Total	**925**	**100**

There was a total of 4,718 vessels crossing the transect line across Fionnphort for the dataset. Of these 4,718 vessels 4,482 (95%) were passenger vessels, with 198 (4%) as fishing. A small percentage were made up of other vessel types. Table 2 identifies that nearly all movements in and out of Fionnphort recorded in the AIS dataset are the CFL ferry. It is likely that there were also movements from recreational boats, small fishing vessels and tour boat operators; but these vessels are not identified in the AIS record. From anecdotal information, it is known that vessel moorings are located in the area with both local and visiting craft making use of these year-round.

Table 2. Fionnphort vessel transect

Ship type	Sound of Iona Transit Line Count (365 days)	Transit Count Percentage (%)
Non-Port Service Craft	4	0.1
Port Service Craft	10	0.2
Dredging or Underwater Operations	4	0.1
High Speed Craft	1	0.0
Passenger	4,482	95.0
Fishing	198	4.2
Recreational	19	0.4
Total	**4,718**	**100**

There were 3,415 vessels crossing the transect line at Iona, Table 3 identifies that nearly all movements are passenger vessels (93%) with 110 (3%) as fishing vessels. However, from anecdotal information, it is known that vessel moorings are located in the area with both local and visiting craft making use of these year-round again.

Table 3. Iona vessel transect

Ship type	Sound of Iona Transit Line Count (365 days)	Transit Count Percentage (%)
Non-Port Service Craft	4	0.1
Port Service Craft	46	1.3
Dredging or Underwater Operations	4	0.1
High Speed Craft	28	0.8
Passenger	3,184	93.2
Cargo	1	0.0
Fishing	110	3.2
Recreational	38	1.1
Total	**3,415**	**100**

Table 4 to Table 6 detail the length of vessels by type crossed each of the transect lines in the study area.

Table 4. Vessel length comparison (Sound of Iona transect line)

Vessel Length	Number of Vessels								
	Non-Port Service Craft	Port Service Craft	Dredging or Underwater	High Speed Craft	Passenger	Cargo	Fishing	Recreational	All Ship Types
0-9	7	35	9	16	2		69	88	226
10-19	2	13	6	1	52	2	96	392	564
20-29	6	11	1	2	18	4		31	73
30-39	-	-	-	-	44	1	-	6	51
40-49	-	-	-	-	1	-	-	4	5
50-59	2	-	-	-	-	-	-	-	2
60-69	-	-	-	-	2	-	-	-	2
70-79	-	-	-	-	1	-	-	-	1
150-160	-	-	-	-	-	-	-	1	1
Total	**17**	**59**	**16**	**19**	**120**	**7**	**165**	**522**	**925**

Table 5. Vessel length comparison (Fionnphort transect line)

Vessel Length	Number of Vessels							
	Non-Port Service Craft	Port Service Craft	Dredging or Underwater	High Speed Craft	Passenger	Fishing	Recreational	All Ship Types
0-9	4	-	3	-	-	56	14	77
10-19	-	1	1	-	436	142	5	585
20-29	-	9	-	1	-	-	-	10
30-39	-	-	-	-	4,044	-	-	4,044
40-49	-	-	-	-	1	-	-	1
70-79	-	-	-	-	1	-	-	1
Total	**4**	**10**	**4**	**1**	**4,482**	**198**	**19**	**4,718**

Table 6. Vessel length comparison (Iona transect line)

Vessel Length	Number of Vessels								
	Non-Port Service Craft	Port Service Craft	Dredging or Underwater	High Speed Craft	Passenger	Cargo	Fishing	Recreational	All Ship Types
0-9	3	35	-	27	2	-	110	29	206
10-19	1	11	4	1	361	-	-	9	387
30-39	-	-	-	-	2,821	1	-	-	2,822
Total	**4**	**46**	**4**	**28**	**3,184**	**1**	**110**	**38**	**3,415**