Partners in UK offshore wind

MORGAN OFFSHORE WIND PROJECT: GENERATION ASSETS

Morgan - Mooir Vannin gap - navigational safety review: technical clarification note

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Image of an offshore wind farm

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Glossary

Term	Meaning
Applicant	Morgan Offshore Wind Limited.
Development Consent Order (DCO)	An order made under the Planning Act 2008 granting development consent for a Nationally Significant Infrastructure Project (NSIP).
Morgan Array Area	The area within which the wind turbines, foundations, inter-array cables, interconnector cables, scour protection, cable protection and offshore substation platforms (OSPs) forming part of the Morgan Offshore Wind Project: Generation Assets will be located.
Morgan Offshore Wind Project: Generation Assets	This is the name given to the Morgan Generation Assets project as a whole (includes all infrastructure and activities associated with the project construction, operations and maintenance, and decommissioning).
The Planning Inspectorate	The agency responsible for operating the planning process for applications for development consent under the Planning Act 2008.

Acronyms

Acronym	Description
AIS	Automatic Identification System
ALARP	As Low As Reasonably Practicable
BMC	Ben My Chree
CPA	Closest Point of Approach
CRNRA	Cumulative Regional Navigational Risk Assessment
ETV	Emergency Towage Vessel
FSA	Formal Safety Assessment
Hs	Significant Wave Height
HSC	High Speed Craft
ICW	In Collision With
IMO	International Maritime Organisations
IoMSPC	Isle of Man Steam Packet Company
IoMTSC	Isle of Man Territorial Seas Committee
ISM	International Safety Management
IWRAP	IALA's Waterway Risk Assessment Programme
MAIB	Marine Accident Investigation Branch
MCA	Maritime and Coastguard Agency
nm	Nautical Mile
NRA	Navigational Risk Assessment
MVOWFL	Mooir Vannin Offshore Wind Farm Limited
OSP	Offshore Substation Platforms

Acronym	Description
OWF	Offshore Wind Farm
PEIR	Preliminary Environmental Information Report
SoCG	Statement of Common Ground
SOLAS	Safety of Life at Sea
TSS	Traffic Separation Scheme
UK CoS	UK Chamber of Shipping

Units

Unit	Description
nm	Nautical Mile

1 EXECUTIVE SUMMARY

1.1.1.1 The Applicant noted that immediately prior to the completion of the Navigational Risk Assessment (NRA), a Scoping Report was issued for the Mooir Vannin Offshore Wind Farm in Isle of Man waters. The Applicant's response to REP1-051.21 (REP2-005), ExQ1.SN.1.17 (REP3-006) and Volume 4, Annex 7.1: Navigational Risk Assessment (APP-060) describes the process by which the Applicant considered the Mooir Vannin Offshore Wind Farm which was consistent with the relevant policy and guidance.

1.1.1.2 The cumulative assessment concluded that 2.5 nautical mile (nm) separation between the Mooir Vannin Array Area and Morgan Array Area was insufficient for safe navigation and consensus was reached with stakeholders that unacceptable effects on navigational safety existed as demonstrated in Statements of Common Ground (SoCG) with the Maritime and Coastguard Agency (MCA) (REP5-051), UK Chamber of Shipping (UK CoS) (REP5-048), Stena Line (REP3-029), Isle of Man Steam Packet Company (IoMSPC) (REP3-026) and Isle of Man Territorial Seas Committee (IoMTSC) (REP4-037).

1.1.1.3 At Deadline 5, the Applicant updated the Examining Authority that a refinement of the Mooir Vannin Offshore Wind Farm had been shared with stakeholders at their hazard workshop on 12 December 2024 which increased the separation distance to the Morgan Array Area to 4.1 nm (REP5-004/REP5-015) at a single point. Mooir Vannin Offshore Wind Farm Limited (MVOWFL) shared a position paper on the gap (REP5-075) noting that 4.1 nm ensured vessels could maintain adequate Closest Points of Approach (CPA) from other vessels and infrastructure, was consistent with what was already agreed as acceptable for the passage between the Morgan Array Area and Walney wind farms and was compliant with MGN654 (MCA, 2021) and PIANC (2018) guidance.

1.1.1.4 Noting that the full results of MVOWFL's assessment would not be available until after the close of the Morgan Generation Assets Examination, the Applicant commissioned a review of the gap, undertook additional navigation simulations with stakeholders and held a hazard review session.

1.1.1.5 A gap of 4.1 nm width exceeds the guidance of both PIANC and MGN654, notwithstanding the MCA's position that this does not constitute a corridor in this case (REP5-069). Whilst Stena Line in their response to ExQ2.SN.2.3 (REP5-088) disputed that it did meet guidance, the Applicant demonstrates compliance. Furthermore, in their response to ExQ2.SN.2.4, the MCA state that they are content that 4.1 nm complies with the guidance of MGN654 (REP5-069).

1.1.1.6 The refined separation exceeds or is comparable to precedent of constructed and consented offshore wind farms elsewhere in the UK with greater traffic volumes, including within the Irish Sea itself (REP4-005). Whilst both UK CoS (REP5-092) and Stena Line (REP5-088) note the limitations of direct comparison, in the absence of compelling evidence to the contrary, the Applicant contends that they provide useful evidence to support the conclusion that the risk is Tolerable.

1.1.1.7 Through nine navigation simulations involving masters of the IoMSPC and Stena Line in realistic worst case traffic and weather conditions, observed by the MCA, and then discussed through a hazard review session, three key themes of impacts related to the gap between the Morgan Array Area and Mooir Vannin were discussed between the Applicant and ferry operators:

- The passage between Mooir Vannin Array Area and Morgan Array Area will mostly be navigated by a single commercial vessel, the IoMSPC service between

Heysham and Douglas. Modelling of historical traffic data suggests that the likelihood of two commercial ships meeting in this location each year is less than 0.1%. Furthermore, during navigation simulations with stakeholders it was shown that there was now sufficient sea room for collision avoidance in worst credible traffic situations in full compliance with the Collision Regulations and the practice of good seamanship. Therefore, the risk of commercial vessel collisions has been reduced to Tolerable levels.

- As noted within the NRA (APP-060), high density Scallop fishing may be encountered in Isle of Man waters during specific seasons and the presence of both the Morgan Array Area and Mooir Vannin Array Area reduces the sea room for the IoMSPC to deviate around the fishing boats. Worst credible fishing situations were tested within the navigation simulations with the IoMSPC and it was shown that whilst it increased navigational complexity there was sufficient sea room to successfully navigate between them with adequate, safe passing distances consistent with their current practices. Whilst it was argued by IoMSPC that they were now unable to deviate around a fishing fleet entirely, or maintain the desired 1 nm CPA, the Applicant demonstrated that IoMSPC vessels do not routinely do this and that passing distances less than 1 nm from fishing boats moving at 2 kts are appropriate and in full compliance with the Collision Regulations Rule 8.
- The IoMSPC and Stena Line argued that 4.1 nm is not sufficient to account for mechanical failure resulting in an allision with a wind turbine. The Applicant noted that a mechanical failure of a RoRo/RoPax ferry within the area is very low, noting the high reliability and propulsion/steering redundancy of these vessels and limited historical incident record. The Applicant also notes that this is inconsistent to the conclusions of the assessment between Morgan Array Area and Walney wind farms which is a longer passage and therefore inherently riskier, to which stakeholders (including the IoMSPC and Stena Line) were satisfied the risks were Tolerable and As Low As Reasonably Practicable (ALARP) (REP3-026/REP3-029/REP3-030/REP5-048/REP5-051).
- The assessment also concluded that the presence of the Mooir Vannin Offshore Wind Farm limited the ability of vessels to route east of the Isle of Man in adverse weather. However, it was agreed this constraint was independent of the presence of the Morgan Generation Assets.

1.1.1.8 The Applicant accepts that the presence of the proposed offshore wind farms increases the risk of collision and allision for navigating vessels from the baseline. However, the Applicant's assessment provides a compelling, evidence-based and reasoned position that 4.1 nm can be navigated in realistic worst credible traffic and weather conditions, in full compliance with the Collision Regulations and the practice of good seamanship and therefore the risks of navigating this route has been reduced to Tolerable levels, consistent with the proposed sea area between Morgan Array Area and Walney wind farms. Furthermore, the Applicant has implemented appropriate and proportionate risk controls to manage this risk to ALARP.

1.1.1.9 Whilst the IoMSPC and Stena Line recognised that navigational safety had improved as a result of the refinement of the Mooir Vannin Array Area, they argued the risks remain unacceptable. During the subsequent discussion, it was argued that constructing four large offshore wind farms present inherent risks which cannot be mitigated and therefore there is no acceptable separation between the two offshore wind farms that would reduce the risks to Tolerable levels. On this basis, the Applicant

does not believe that any further mitigation of this gap is either necessary or would fully address the concerns of the IoMSPC and Stena Line.

1.1.1.10 The Applicant, therefore, considers that there are no unacceptable risks to navigational safety associated with the Morgan Generation Assets, including cumulative effects with the refined Mooir Vannin Offshore Wind Farm, and all risks have been reduced to ALARP.

1.1.1.11 At Issue Specific Hearing 3 (12 February 2025), the MCA confirmed that they were content the refined 4.1 nm gap is both Tolerable and ALARP and was confirmed in their final SoCG. Therefore, no further mitigation is required. The Applicant emphasises National Policy Statement EN-3 Paragraph 2.8.334 which states that the Secretary of State should make use of advice from the MCA on matters of navigational safety.

2 Introduction

2.1 Morgan Generation Assets

2.1.1.1 Morgan Offshore Wind Limited (the Applicant), a joint venture of bp Alternative Energy Investments Ltd. (hereafter referred to as bp) and Energie Baden-Württemberg AG (hereafter referred to as EnBW) is developing the Morgan Offshore Wind Project: Generation Assets (hereafter Morgan Generation Assets). The Applicant entered into an agreement for lease for the Morgan Generation Assets in early 2023. The Morgan Array Area is 280 km^2 located 20.1 nautical miles (nm) from the northwest coast of England and 12 nm from the Isle of Man. The water depths within the Morgan Array Area are between 49 m and 22 m below Lowest Astronomical Tide. Up to 96 wind turbines and four offshore substation platforms (OSPs) could be installed within the Morgan Array Area, with a minimum spacing of 1,400 m. The Morgan Generation Assets are a Nationally Significant Infrastructure Project requiring a Development Consent Order under the Planning Act 2008.

2.1.1.2 The Applicant conducted an extensive and comprehensive Navigation Risk Assessment (NRA) and Cumulative NRA (CRNRA) for the Morgan Generation Assets, including analysis, full bridge simulations and hazard workshops with stakeholders. Following the assessments to inform the Preliminary Environmental Information Report (PEIR), whereby unacceptable impacts on navigational safety were identified, the Applicant proposed a reduction in the Red Line Boundaries to stakeholders in January 2023 which were reassessed throughout 2023.

2.1.1.3 As a result of these changes, the NRA and CRNRA (APP-060) concluded that cumulative hazards created as a result of the adjacency of the Mona Offshore Wind Project, Morgan Offshore Wind Project Generation Assets and Morecambe Offshore Windfarm Generation Assets with existing offshore wind farms could be managed safely and that there was sufficient sea room between them in full compliance with the Collision Regulations and the practice of good seamanship. Therefore, the risks were Tolerable and ALARP. This is agreed in SoCG with the MCA, Trinity House and UK CoS (REP5-051/REP3-030/REP5-048).

2.1.1.4 The Examination of the Morgan Generation Assets is due to complete on the 10 March 2025.

2.2 Mooir Vannin Offshore Wind Farm

2.2.1.1 MVOWFL is proposing to develop the Mooir Vannin Offshore Wind Farm (hereafter referred to as Mooir Vannin). The Applicant has assessed Mooir Vannin appropriately in compliance with the relevant Planning Inspectorate guidance (Planning Inspectorate, 2019) as set out within Volume 4, Annex 7.1: Navigational Risk Assessment (APP-060), the Applicant's response to ExQ1.SN 1.17 (REP3-006) and the Applicant's response to the MCA's Written Representation (REP2-005).

2.2.1.2 During the shipping and navigation assessments undertaken to support PEIR during 2022, it was noted that an agreement for lease had been awarded to Orsted in 2015 for an area of seabed in Isle of Man territorial waters but no further information was available, nor was a Scoping Report issued publicly. As such it was treated as a Tier 3 Project as per the Planning Inspectorate's Advice Note Seventeen. There was, therefore, insufficient information for the Applicant to assess cumulative impacts on navigation.

2.2.1.3 The Scoping Report indicated that the Offshore Array Area covered the full extent of the Agreement for Lease area at 253 km^2, wholly located within the Isle of Man Territorial Sea. The 12 nm limit of the Isle of Man Territorial Sea formed its eastern boundary with the 6 nm limit forming the Offshore Array's western boundary with Maughold as its closest point at approximately 11 km.

2.2.1.4 The Scoping Report was issued on 18 October 2023 by MVOWFL, after completion of the Applicant's CRNRA (APP-060), navigation simulations and hazard workshop to inform the Environmental Statement. Noting the late stage at which information was provided, the Applicant endeavoured to include the Scoping Boundary of Mooir Vannin as a Tier 2 Project within its Application. However, this information was provided after the Round 4 Projects proposed mitigation had been formulated and subsequently agreed with stakeholders to be sufficient to address cumulative effects on navigation safety.

2.2.1.5 Following the release of this Scoping Report, an addendum to the CRNRA was prepared to consider the additional cumulative risks with the Mooir Vannin scoping boundary that might result to vessel traffic identified within the CRNRA. A summary of this addendum is provided in Section 2.3.

2.3 Summary of CRNRA Appendix D

2.3.1.1 The Appendix D of the CRNRA (APP-060) included a reassessment of the resulting impact on navigational safety of the addition of Mooir Vannin on the safety of passages north of the Morgan Array Area. At its closest point, the Mooir Vannin Scoping Boundary was approximately 2.5 nm from the Morgan Generation Assets Array Area.

2.3.1.2 The addendum to the CRNRA determined that the sea room between the Mooir Vannin Scoping Boundary and Morgan Array Area was inadequate for safe navigation given the expected traffic density and prevailing meteorological conditions. Vessels would be unable to maintain the desired 1.0 nm CPA from other vessels and structures. Following a desktop review of the hazards scored for the original CRNRA, two of the hazards originally agreed to be Medium Risk and ALARP without the presence of Mooir Vannin, were rescored to be High Risk and Unacceptable with the addition of Mooir Vannin. Namely, these hazards were the allision of a ferry/passenger vessel with a wind turbine or OSP, and the collision between a ferry/passenger vessel or a cargo/tanker with a small craft. Other risks were heightened but remained within the Medium Risk – Tolerable if ALARP scoring. It was therefore concluded that there were likely to be further impacts on ferry routes in typical and adverse conditions and an unacceptable risk to navigation safety, with the addition of Mooir Vannin.

2.3.1.3 Agreements that 2.5 nm separation was insufficient for safe navigation are given in the SoCG with MCA (REP5-051), UK CoS (REP5-048), Stena Line (REP3-029), IoMSPC (REP3-026) and IoMTSC (REP4-037).

2.4 Aims and objectives

2.4.1.1 As described in the Applicant's response to ExQ2.SN.2.6 (REP5-015), on 12 December 2024, during the Mooir Vannin hazard workshop, MVOWFL announced that, following feedback from multiple stakeholders, they have refined the Mooir Vannin array area. The Mooir Vannin array area was refined from approximately 253 km^2 to 211 km^2 and increased the separation distance to the Morgan Array Area to 4.1 nm, as shown in Figure 2.1. A shapefile of the new Mooir Vannin array area was shared by MVOWFL to the Applicant on 19 December 2024.

2.4.1.2 At Deadline 5, MVOWFL issued a position paper on the gap between Mooir Vannin and the Morgan Generation Assets (REP5-075), noting:

- MVOWFL sought to ensure that minimum 1 nm CPA was achievable within the gap between passing vessels and infrastructure (Paragraph 1.3.1.6 of REP5-075)
- As per the Applicant's SoCG with IoMSPC (REP3-026), the 4.1 nm separation distance would be acceptable in most weather conditions and credible traffic situations to ensure safe action can be taken to maintain CPA of >1 nm from other vessels structures (Paragraph 1.3.1.7 of REP5-075)
- MVOWFL note that 4.1 nm is compliant with MGN654 and PIANC guidance, but that they do not necessarily consider it a "corridor" due to the lack of consistent parallel infrastructure (Paragraph 1.4.1.4 of REP5-075).

2.4.1.3 No scoring of hazards was undertaken within the Mooir Vannin hazard workshop and therefore it was not clear whether stakeholders were satisfied that risks had been reduced to Tolerable levels either for Mooir Vannin in isolation or cumulatively with the Morgan Generation Assets. However, consultation feedback at the hazard workshop, and set out in MVOWFL's position paper (REP5-075), noted residual concerns that 4.1 nm remains insufficient.

2.4.1.4 The Applicant further notes that, given MVOWFL are anticipating submitting their ES with their Application in March 2025, the results of Mooir Vannin's own NRA will not be available until after the close of the Morgan Generation Assets Examination. Therefore, as set out in the Applicant's response to ExQ2.SN.2.6 (REP5-015), the Applicant has proactively commissioned the following activities to inform the Examining Authority on the effect of the increased separation on the Applicant's cumulative risk assessment:

- Undertake a review of the revised boundary and comparison with existing guidance and precedent
- Undertake analysis and modelling of likely meeting situations between vessels when passing between the Morgan Array Area and Mooir Vannin
- Undertake full bridge navigation simulations with the Isle of Man Steam Packet Company, Stena Line and Maritime and Coastguard Agency
- Undertake a hazard review session with stakeholders.

2.4.1.5 This position paper outlines the findings of this study.

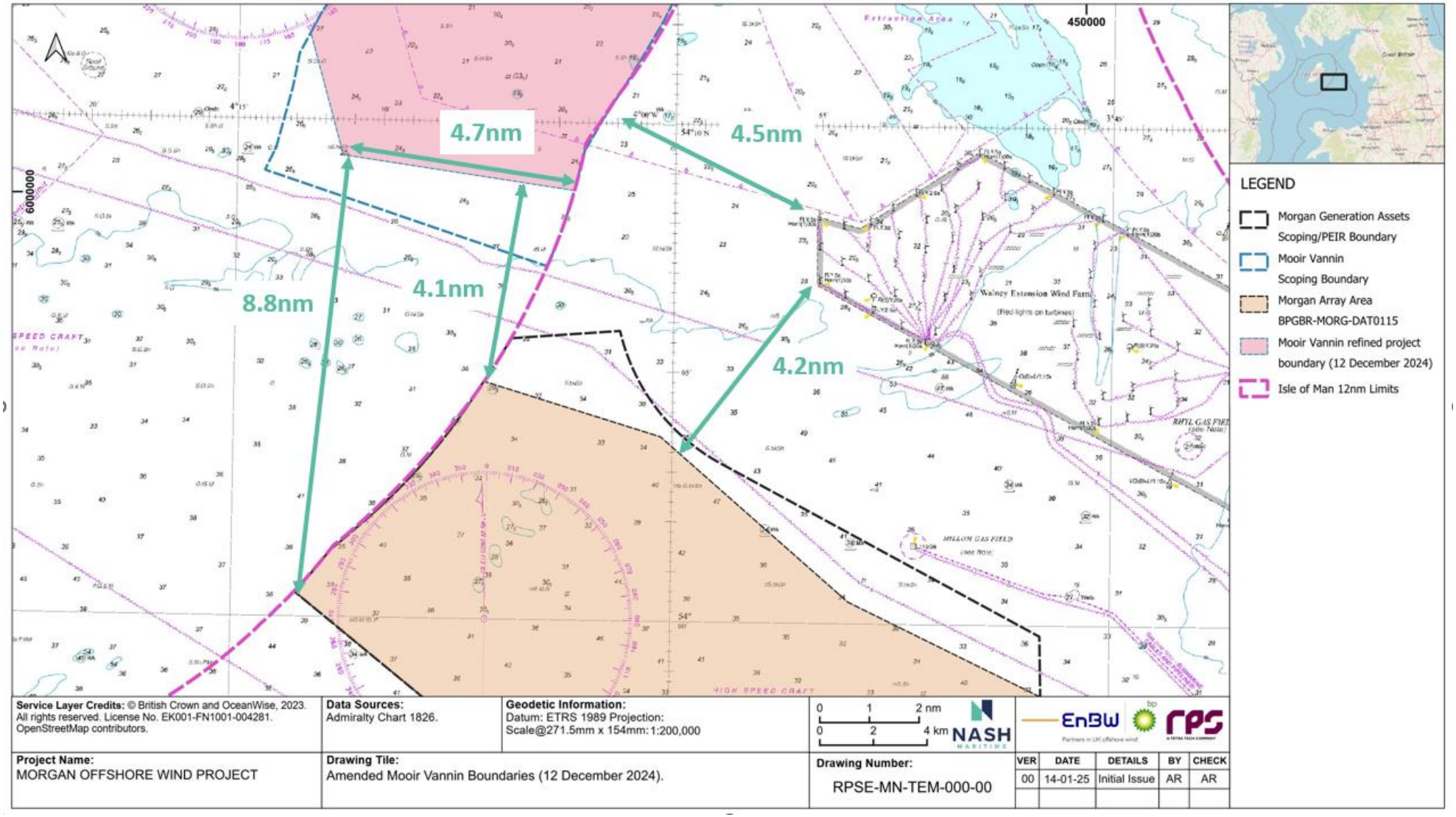

Figure 2.1: Amendments to southern boundary of Mooir Vannin Array Area (shared 12-December 2024).

2.5 Basis of assessment and assumptions

2.5.1 Datasets

2.5.1.1 All datasets used within this position paper are consistent with those utilised in Volume 4, Annex 7.1: Navigational Risk Assessment (APP-060). The full list of vessel datasets is detailed in section 1.3.5 of the NRA (APP-060). The two main sources of vessel traffic data of relevance for this assessment are:

- High fidelity Automatic Identification System (AIS) data for 2022 for the whole Irish Sea, procured on behalf of the Morgan Generation Assets.
- MGN654 compliant vessel traffic surveys, obtained from four separate vessel traffic surveys:
  - 14 day winter vessel traffic survey (21 November 2021 to 05 December 2021) collecting AIS, radar and visual observations.
  - 14 day summer vessel traffic survey (15 July 2022 to 29 July 2022) collecting AIS, radar and visual observations.
  - A top-up survey was undertaken in May 2023 to better capture activity to the northwest of the Morgan Array Area.
  - A second top-up vessel traffic survey was undertaken in November 2023 to ensure compliance with MGN654 survey data recency requirements (see Appendix D of the NRA [APP-060]).

2.5.2 Navigation simulations

2.5.2.1 Full bridge simulations were undertaken as a key part of the NRA both in 2022 to support the PEIR and in 2023 to support the Application. The Applicant undertook these collaboratively with the Mona Offshore Wind Project and Morecambe Generation Assets project, the ferry companies (IoMSPC, Stena Line and Seatruck, now CLdN) and the MCA as observers. These were considered by all stakeholders to be a highly useful exercise. As described within the CRNRA (APP-060), during the September 2023 simulations with IoMSPC, a single run was undertaken for a transit between the Morgan Array Area and Mooir Vannin Scoping Boundary with a meeting situation with other traffic which demonstrated that 2.5 nm was insufficient sea room and therefore the run failed. A detailed report of the findings of the simulations undertaken to inform the Environmental Statement is contained in Appendix E of the NRA (APP-060).

2.5.2.2 Following the refinement of the Mooir Vannin array area which increased the minimum distance between the two projects from 2.5 nm to 4.1 nm, the Applicant commissioned a further round of Navigation Simulations to understand the effect this had on navigational safety for passages between the Morgan Array Area and Mooir Vannin.

2.5.2.3 Like previous bridge simulations, these simulations were administered by HR Wallingford at their UK Ship Simulation Centre in January 2025. A letter was issued to the IoMSPC, Stena Line, UK CoS, MCA and Isle of Man Department of Infrastructure Harbours Division on 23 December 2024 inviting them to attend. Subsequent invitations were also issued to Morecambe Generation Assets and MVOWFL to attend as observers.

2.5.2.4 On 13 January 2025, a draft run list was issued and feedback sought ahead of the simulation sessions. The draft run list sought to build upon the 2023 simulations undertaken to inform the Environmental Statement and considered the worst credible

traffic situations that could arise between the Morgan Generation Assets and Mooir Vannin in realistic weather conditions.

2.5.2.5 A total of nine additional simulator runs were carried out on the 20 and 21 January 2025. The simulations were attended by Master Mariners and representatives from IoMSPC, Stena Line as well as the Applicant's own Master Mariners. The simulations were also observed by the MCA.

2.5.2.6 A summary of these runs and scenarios is provided in Table 2.1. Full minutes from these sessions are contained within Appendix A and a detailed report of the findings of the simulations undertaken to inform this assessment has been produced and is included within Appendix E.

2.5.2.7 It is noted that there were some limitations to the simulation sessions, including:

- The IoMSPC vessel, *Ben My Chree* (*BMC*), was used during runs rather than *Manxman*. It was agreed in 2023 that *BMC* would be conservative in terms of seakeeping and the *BMC* ship model had been previously validated. The attendees agreed this was appropriate.
- No night-time scenarios were run. The only change since the 2023 simulations was the addition of Mooir Vannin, for which the proponent of that project needs to consider the adequacy of their lighting arrangements, and it was agreed in previous simulations that none of the simulated scenarios were appreciably more challenging at night than during the day. Additionally, no runs were conducted in restricted visibility but it was noted this might necessitate greater passing distances but at slower transit speeds.
- Emergency scenarios were discussed verbally rather than simulated. Emergency situations (such as fire and loss of propulsion) were tested with operators during 2022/2023 simulations; the presence of Mooir Vannin does not alter the likelihood that such events occur. Hence, given the Mooir Vannin separation from Morgan Array Area is similar to between Morgan Array Area and Walney Extension, but for a shorter passage, it is considered that the conclusions from that assessment can be carried forward, so simulator time was focused on the question of sea space.
- Few adverse weather (> 2.5m Hs) simulations were run. The 2022/2023 simulations established that in adverse weather it would be prudent to navigate south of the Morgan Array Area rather than between the Morgan Array Area and Walney Wind Farms. The conditions were dependent on vessel size but were approximately 3 m significant wave height (Hs) and above and this was agreed with participants at those simulations. At the request of Stena Line, some adverse weather routes were simulated.

Table 2.1: Simulator runs (20-21 January 2025)

No.	Conditions	Route Description
1	Wind: SW (225) 15kts Waves: SW (225) 1.5m 6s	Familiarisation Run – IoMSPC (*BMC*) Heysham – Douglas route, with Stena Line (*Stena Estrid*) eastbound.
2	Wind: SW (225) 20-30kts Waves: SW (225) 2.5m 6s	Stena Line (*Stena Estrid*) transiting Liverpool-Belfast (East IoM) route through Morgan Walney, turning north, east of Mooir Vannin. IoMSPC (*BMC*) passing through Mooir Vannin-Morgan channel on Douglas-Heysham.

No.	Conditions	Route Description
3	Wind: SW (225) 20-30kts Waves: SW (225) 2.5m 6s	Stena Line (*Stena Estrid*) transiting Belfast-Liverpool (East IoM) route through Morgan Walney, turning south, east of Mooir Vannin. IoMSPC (*BMC*) passing through Mooir Vannin-Morgan channel on Heysham-Douglas.
4	Wind: SW (225) 20kts Waves: SW (225) 2.5m 6s	IoMSPC (*BMC*) transiting Heysham-Douglas with Three Trawlers fishing to the northwest of Morgan.
5	Wind: SW (225) 20kts Waves: SW (225) 2.5m 6s	Stena Line (*Stena Estrid*) and IoMSPC (*BMC*) both on route to Heysham, meeting at point between Morgan-Mooir Vannin-Walney before heading east, with tanker heading westward through the Morgan-Walney channel.
6	Wind: SW (225) 15kts Waves: SW (225) 1.5m 6s	Stena Line (*Stena Estrid*) heading north from the south of IoM. IoMSPC (*BMC*) on Heysham-Douglas route, with worst-case observed fishing fleet scenario (10 trawlers) north-west of Morgan.
7	Wind: SW (225) 15kts Waves: SW (225) 1.5m 6s	IoMSPC (*Manannan*) on Heysham-Douglas route, with worst-case observed fishing fleet scenario (10 trawlers) north-west of Morgan.
8	Wind: SW (225) 50kts Waves: SW (225) 4.2m 6s	Stena Line (*Stena Estrid)* transiting Douglas-Heysham route in adverse conditions (50kts Wind, 4.2m Swell).
9	Wind: SW (225) 50kts Waves: SW (225) 4.2m 6s	Stena Line (*Stena Estrid)* transiting northward to the west of Morgan Array Area and then east of Mooir Vannin Offshore Wind Project in adverse conditions (50kts Wind, 4.2m Swell).

2.5.2.8 The key conclusions of the navigation simulations agreed with all attendees were as follows:

- All manoeuvres could be accommodated in the worst credible situations tested with the presence of the offshore wind farms (OWFs) (with a 4.1 nm gap between Morgan Generation Assets and Mooir Vannin), in full compliance with the Collision Regulations and the practice of good seamanship.
- Fishing trawlers provide more complexity to the navigation situations given the irregularity in which they can operate but that vessels were able to successfully navigate between them with adequate passing distances consistent with their current practices under the worst credible situations tested.
- A reduction in speed may be required in this situation to enable safe passage. Although the space is adequate, it would no longer be open space and therefore does increase the risk above the present day. Moreover, impacts to journey time may be felt due to deviations or reductions in speed.
- There may be an effect on the crewing arrangements including hours of work/rest and the composition of the Bridge Team, which might require the Master to be more frequently called to the bridge.
- There is a reduction in the availability of alternative routes, such as in bad weather, but this was principally due to the presence of Mooir Vannin and the change in the southern boundary did not alter this as it had previously been agreed that the passage between Morgan Array Area and Walney wind farms would not be navigated in bad weather.

2.5.3 Hazard review session

2.5.3.1 On the completion of the nine simulator runs, a hazard review session was conducted to review the navigational hazards of Morgan Generation Assets in relation to the space between Morgan Array Area, Mooir Vannin and Walney wind farms. The hazard review session was attended by the Applicant, ferry operators (Stena Line and IoMSPC), MCA and UK CoS. Due to time constraints, all attendees agreed to focus the hazard review on the three hazards that involved ferries, rather than fishing or recreation vessels. It was agreed that the Applicant would review these based on the updated information but noted that they were all scored as Medium Risk and ALARP with the 2.5 nm separation at ES submission stage.

2.5.3.2 The three hazards identified for review during the hazard review were:

1. Collision – Ferry/Passenger or Cargo/Tanker in collision with (ICW) Small Craft
2. Allision – Ferry/Passenger with a wind turbine or OSP
3. Collision – Ferry/Passenger ICW Cargo/Tanker or Ferry/Passenger.

2.5.3.3 At the hazard review session, the project team recapped the key findings from the latest simulations, and the methodology (previously agreed in 2023) before stakeholders were invited to describe their remaining concerns regarding the three identified ferry hazards relating to Morgan Generation Assets and Mooir Vannin and Walney. It is noted that the previous hazard workshop, attendees from other organisations and stakeholders were present. Full minutes of the hazard review session are contained within Appendix A.

2.5.3.4 Following the successful simulation exercises, assessment against guidance and modelling, the Applicant presented its position that these risks had been reduced to ALARP following the refinement of the Mooir Vannin array area. However, it was argued by the IoMSPC and Stena Line that whilst the risks had reduced, they did not reduce them from Unacceptable levels and the risk ratings concluded in the 2023 hazard workshop should remain.

2.5.3.5 Section 3 presents the Applicant’s position on key areas of contention raised by stakeholders and the reasoning behind these conclusions. Section 40 then presents an updated risk assessment for the 4.1 nm gap compared to the assessment contained within the CRNRA Appendix D (APP-060).

3 NAVIGATIONAL SAFETY BETWEEN MORGAN ARRAY AREA AND MOOIR VANNIN

3.1 Introduction

3.1.1.1 Following the navigation simulation runs, stakeholders participated in a hazard review session, in which the results of the simulations were discussed in relation to three previously identified hazards relating to the navigational safety of ferries between Morgan Generation Assets, Mooir Vannin and Walney wind farms (namely Walney Extension).

3.1.1.2 Key areas of discussion are highlighted in **Section 3.2** to **Section 3.6.**

3.2 Compliance with guidance and precedent

3.2.1 Guidance

3.2.1.1 Section 7.6 of the CRNRA (NRA Appendix E APP-060), describes how the geometry of the passages between the Morgan Generation Assets, Mona Offshore Wind Project, Morecambe Generation Assets and existing offshore wind farms meets accepted guidance and existing precedent for navigation corridors or gaps between or alongside wind farm arrays.

3.2.1.2 Two principal guidance documents have been developed for the suitable spacing between OWFs; firstly the PIANC WG 161 (2018) guidance and secondly both the MGN654 Annex 2 shipping route template and 4.7.g. 20-degree rule (MCA, 2021). The results of this have been previously agreed through SoCG with key stakeholders with the MCA, Trinity House and UK CoS (REP5-051/REP3-030/REP5-048).

3.2.1.3 The Applicant has considered the gap following the refined Mooir Vannin array area in relation to these two guidance documents below:

- **PIANC Guidance**:
  - Section 7.6 of the CRNRA demonstrates that assuming a 200 m design vessel size and approximately 1,500 vessel movements per year, there is a requirement for 2.9 nm of sea room. This is precautionary given the majority of transits utilising this route would be the IoMSPC Manxman at 133 m.
  - Sensitivity analysis demonstrated that for a 300 m design vessel size 3.7 nm would be required, with a significant increase in vessel movements per year 4.1 nm would be required.
  - While Stena Line have commented during their response to ExQ2.SN.2.3 (REP5-088) that there is a strong likelihood that they will bring two eFlexer vessels into service on the Belfast – Liverpool route, these vessels are still notably smaller, with a length of 240 m, than the 300 m used to calculate the accepted lane distance according to PIANC Guidance. Nor are Stena Line likely to operate between the Morgan Array Area and Mooir Vannin array area.
  - The Applicant also notes that all other responses to ExQ2.SN.2.3 on the PIANC guidance do not dispute the parameters used by the Applicant in Section 7.6 of the CRNRA (APP-060) (see REP5-066, REP5-077 and REP5-092).
  - Therefore, the refined gap meets and exceeds the PIANC guidance.

- **MGN654**:
  - The Applicant notes that the gap between Mooir Vannin Array Area and Morgan Array Area is short and does not have parallel infrastructure which could be described as a “corridor”. The Applicant notes that the MCA in their response to ExQ2.SN.2.4 (REP5-069) state that they do not consider this to be a corridor and the MCA therefore state that the 20-degree rule does not apply.
  - Notwithstanding this, were a route of approximately 2.0 nm in length and 4.1 nm width to be assessed against this standard it would well exceed 20 degrees at >60 degrees.
  - MGN654 Annex 2 includes a shipping route template within which states that the “minimum separation distance between turbines on opposite sides of a route” is 3.5 nm.

3.2.1.4 The Applicant notes that the MCA in their response to ExQ2.SN.2.4 (REP5-069) state that they are content that the additional sea space complies with guidance in MGN654.

3.2.1.5 Within their response to ExQ2.SN.2.3 (REP5-088), Stena Line argue that the passage between Morgan Array Area, Walney wind farms and Mooir Vannin does not meet the 20-degree rule. As described above, both the MCA and the Applicant do not consider the passage between the Morgan Array Area and Mooir Vannin to be a corridor and therefore the 20-degree rule does not apply. Furthermore, due to the gap between the Walney Extension and Mooir Vannin of 4.5 nm, there is not parallel infrastructure on both sides of this route for its entire length, much like the passage between Ormonde, West of Duddon Sands, Walney and Barrow through which Stena transit daily and is approximately half the width.

3.2.2 Precedent

3.2.2.1 The Applicant’s response to Action Point 3 of ISH2 (REP4-005) provides examples of precedent where passages comparable to or narrower than 4.1 nm have been constructed or consented and deemed to be acceptable to navigational safety. This table has been amended to instead provide a comparison to the route between Morgan Array Area and the refined Mooir Vannin Array Area (see Appendix C).

3.2.2.2 Within the UK CoS response to ExQ2.SN.2.4 (REP5-092) they note that the only two of the aforementioned precedent case studies has been constructed. The Applicant contends that as they have been deemed to be acceptable for navigational safety by regulators and stakeholders based on their design and specific circumstances, they are still a valid comparison.

3.2.2.3 Within the Stena Line response to ExQ2.SN.2.4 (REP5-088) they argue that the passage between Ormond/Barrow, West of Duddon Sands and Walney is not comparable to the passage past Morgan Generation Assets. Stena Line argue that there is a limited channel effect on this route. However, Stena Line vessels operating on this route do so much closer to wind turbines than would be the case for passing in proximity to the Morgan Generation Assets. The higher density of turbines and less spacing of the West of Duddon Sands, Walney, Ormonde and Barrow wind farms would make identification of emerging small craft more challenging than the more than 50% greater spacing of the Morgan Generation Assets. There is a very similar merchant traffic density likely to pass between the Mooir Vannin Array Area and Morgan Array Area of between 1,250 and 1,500 vessels per year, so they exhibit very similar traffic profiles. The Applicant notes from AIS data that Stena Line vessels will

continue to run parallel to the Walney wind farms even when not constrained by Ormond and Barrow suggesting they are comfortable at such passing distances.

3.2.2.4 Whilst each offshore wind farm should be considered on a case by case basis, there is clear precedent for passages much narrower than 4.1 nm with greater traffic density to be deemed to be sufficient for safe navigation, as highlighted in Appendix C.

3.3 Meeting situations between commercial vessels

3.3.1.1 To ascertain the likelihood of a meeting situation as tested in the simulations, baseline commercial traffic was analysed to estimate the likely future case traffic profile of the Morgan/Mooir Vannin area. AIS track data collected from 2022 was used to analyse commercial transits, featuring cargo, tanker and passenger type vessels, to define the baseline traffic scenario, and assign likely future routes. A transit count for each commercial vessel type was taken from the assigned routes (labelled Blue, Green and Orange in Figure 3.1) to estimate the likely annual transits between the two offshore wind farms.

3.3.1.2 As noted in MVOWFL's Community Consultation Report (MVOWFL, 2025), the reduction in the northwest boundary increased the gap to Bahama Bank buoy "*to ensure the safest passage of the Mezeron service*". Therefore, it has been assumed that the Silver River transiting between Ramsey and Glasson would pass north of the Mooir Vannin Array Area (grey tracks shown in Figure 3.1).

Table 3.1: Daily commercial transit counts per route

	Cargo transits / Day		Passenger Transits / Day		Tanker Transits / Day		Total Transits / Day	
Route	Avg.	Max.	Avg.	Max.	Avg.	Max	Avg.	Max.
Blue – Douglas to Heysham	0.06	1	3.88	9	0	0	3.94	9
Green – Anglesey to Solway Firth	0.22	2	0	0	0.05	1	0.27	2
Orange – Liverpool to Belfast	0.16	2	1.21	5	0.11	2	1.48	6

3.3.1.3 The Blue route shown in Figure 3.1 represents the passage between Douglas and Heysham, passing between the Morgan Array Area and Walney wind farms. The IoMSPC conventional ferry accounted for 93% of transits on this route, on average 3.4 (max. 4) daily transits. The Manannan, Arrow and some commercial vessels were also identified.

3.3.1.4 The Green route shown in Figure 3.1 includes traffic from the southwest towards the Solway Firth and has less than 100 transits per year. The primary transits are conducted by small coastal cargo ships (80/year), and 18 tanker transits over the year. No passenger vessels are likely to follow this route.

3.3.1.5 The Orange route shown in Figure 3.1 represents vessels transiting east of the Isle of Man from Liverpool to Belfast, principally the Stena Line service accounting for 82% of transits. Other vessels include 55 cargo ship transits, and 39 tanker transits over the year, 35 of which were made by oil products tanker Keewhit.

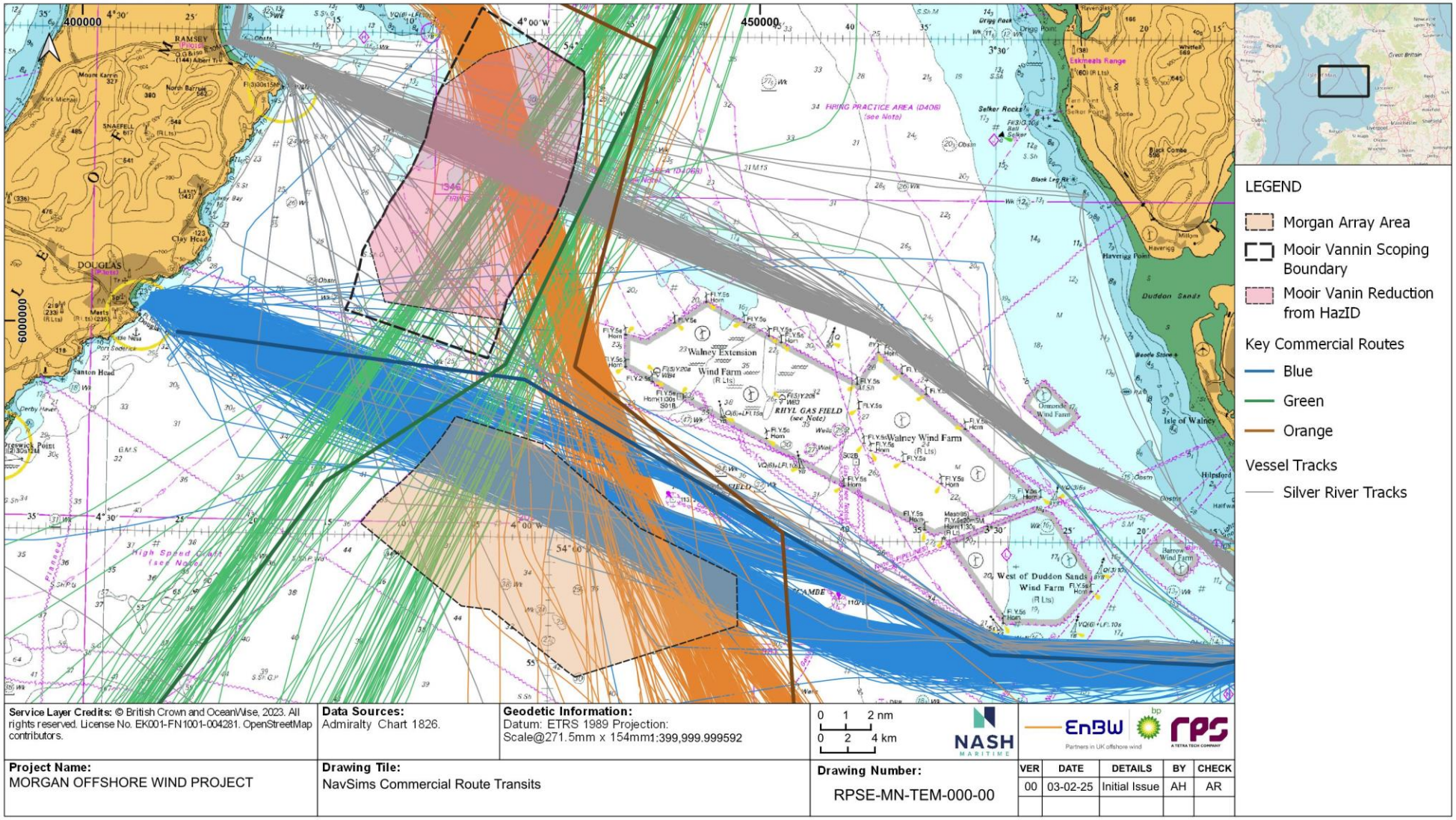

Figure 3.1: Impacted Commercial Vessel Transits

3.3.1.6 To estimate the likelihood of a future meeting scenario, the 2022 AIS data was remodelled to deviate the three main routes highlighted above around the offshore wind farms. Whilst it is noted that there is increased separation between the Bahama Buoy and Mooir Vannin Array Area which may be suitable for small coastal vessels, a precautionary assumption has been made that they will transit between the Morgan Array Area and Mooir Vannin Array Area.

3.3.1.7 The number of concurrent commercial ships in the hatched area directly between Morgan and Mooir Vannin was then calculated and represented as a percentage of time per year (Figure 3.2). The results indicated that for 93.6% of the year no commercial vessels would be present within the hatched area, for 6.4% of the year one commercial vessel is present (routinely the IoMSPC service), and for only 0.07% of the year there would be two commercial vessels present, with a maximum concurrency duration of circa 20 minutes and a region of approximately 4 nm by 4 nm within which to navigate.

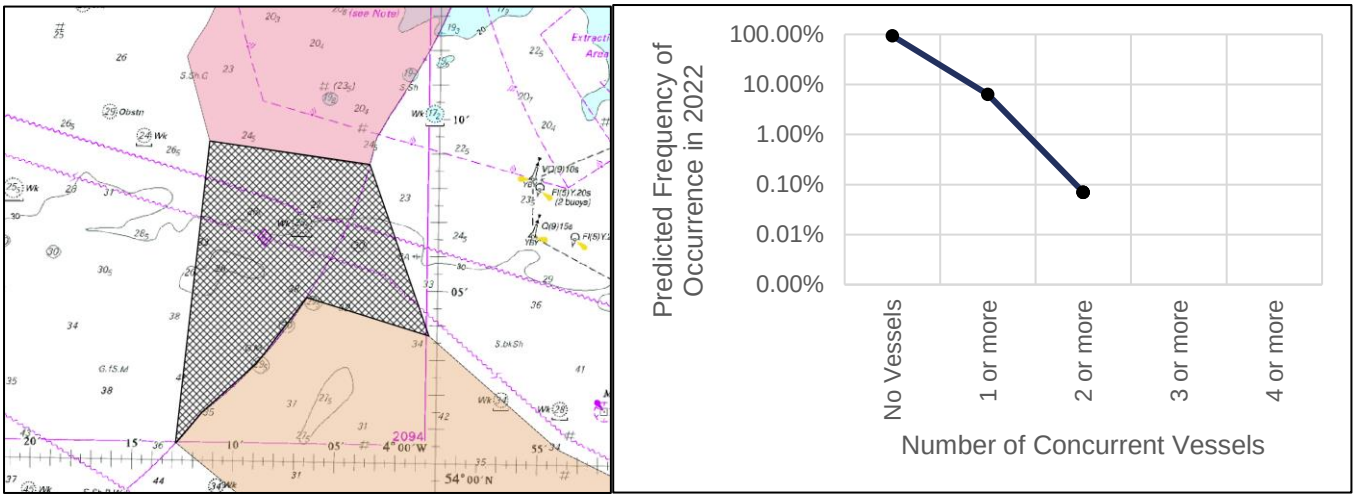

Figure 3.2: Commercial Vessel Meeting Situations

3.3.1.8 As the concurrency analysis above shows, the likelihood of a meeting situation between commercial vessels in the passage between Morgan and Mooir Vannin offshore wind farms is a rare event. However, in the event it may occur, it was deemed prudent to test whether the refinement to 4.1 nm between the Morgan Array Area and Mooir Vannin Array Area is sufficient to allow safe navigation. Multiple simulation runs were executed that featured both IoMSPC and Stena Line operating simultaneously, some with converging traffic and additional commercial vessels incorporated. These tested highly conservative and precautionary scenarios.

3.3.1.9 As shown in the minutes (Appendix A) and simulations report (Appendix E), Masters were to navigate in full compliance with the Collision Regulations and maintain adequate CPA from both the other commercial vessels and the offshore wind farms even with worst credible and conservative traffic situations. The hatched area of 4.1 nm minimum separation between the Morgan Array Area and Mooir Vannin, and with a length of approximately 5.0 nm is unlikely to cause any concern to either give way or stand on vessels.

3.3.1.10 Some areas of note were raised by stakeholders during the navigation simulations. Firstly, during Run 02, the northbound Stena Estrid met a tanker navigating south parallel to the boundary of Mooir Vannin. It was noted by Stena Line that the tanker may have chosen to route diagonally from the corner of Mooir Vannin to the corner of Walney Extension, which would have constrained the Stena vessel in turning to

starboard given the presence of the Walney Extension, albeit the result of the encounter was successful maintenance of adequate CPA. This situation is entirely the result of the presence of both Mooir Vannin and Walney Extension and the presence of the Morgan Array Area had no effect on this situation. It was noted by both Stena Line and IoMSPC that there was a heightened risk of incidents at the corners of the windfarms where traffic converges, but principally the Walney Extension.

3.3.1.11 Secondly, both Stena Line and IoMSPC noted that in these complex traffic situations enhanced manning may be required and the Master may be called to the vessel more frequently. Notwithstanding this requirement, which is a typical response to complex traffic situations or restricted visibility, the likelihood of these situations occurring is extremely low.

3.3.1.12 Thirdly, in some of the crossing situations, particularly Run 03, the Master chose to reduce vessel speed to let the stand on vessel pass clear ahead. When the BMC reduced to 8 knots, this resulted in increased roll of the vessel which would be less comfortable for some passengers albeit for a short period. A similar event happened during the 2023 navigation simulations (IoMSPC Run 03/Run 05 CRNRA Appendix E, APP-060) and it was noted at that time (and in the 2025 simulations) that the ship model for the BMC behaved more erratically at slow speed in beam seas in the simulator than would be expected in a real scenario. Noting the focus of the simulations was on the question of sea space between Morgan and Mooir Vannin it was agreed to focus the remaining simulator time elsewhere. It was agreed, however, that reducing speed would have impacts on passenger comfort.

3.4 Encounters with fishing vessels

3.4.1.1 Whilst undertaking the NRA, concerns were raised by the IoMSPC about the presence of small fishing boats to the northwest of the Morgan Array Area (in Isle of Man waters). The presence of the offshore wind farms would curtail their ability to avoid this fleet and maintain adequate CPA, thereby increasing the risk of a collision.

3.4.1.2 In total, four vessel traffic surveys took place between 2021 and 2023 (see Figure 3.3). These included 2 x 14 day MGN654 compliant surveys, a dedicated 14 day survey on fishing activity and a 14 day “top-up” survey prior to Application. The surveys included collection of both AIS and radar data to ensure full coverage of all types of vessels. It is evident that during two of the surveys high density fishing is observed northwest of the Morgan Array Area, but during two of the surveys no fishing is observed northwest of the Morgan Array Area in Isle of Man waters. The longer term 2022 AIS data used within the NRA, shows relatively little fishing within this area for larger vessels. Several key findings of this fishery were observed:

- It was confirmed that these are predominantly the Isle of Man Scallop fisheries which are controlled fisheries only active at specific times of the year
- The vessels engaged in fishing are small day boats, limited to favourable weather conditions
- The vessels are restricted in hours of operation and transit to/from either Douglas or Ramsey each day and are therefore active mostly in day light hours
- There is a significant spread of area fished, including due west of the Morgan Array Area and therefore clear of the passage between the two offshore wind farms

- No fishing takes place directly between the two array areas, with fishing limited to Isle of Man waters and noting that there are several cables and a wreck which vessels avoid within this area
- Fishing outside of Isle of Man waters, including within the Morgan Array Area, is predominantly clear of the gap and so would not pose a routine issue for IoMSPC
- Fishing is mostly Scallop dredging with vessels transiting at approximately two knots whilst actively fishing.

3.4.1.3 The May 2023 survey was noted to capture a “peak” period of this activity with good weather conditions and high numbers of vessels and has therefore been the focus of the following analysis. A daily count of fishing vessels within this region is shown in Table 3.2, with up to a dozen fishing vessels per day. It is notable that on days with less favourable conditions, the numbers of fishing vessels are lower; a result of their relatively small size which makes them sensitive to wave heights.

3.4.1.4 Analysis of every passage of the BMC between Heysham and Douglas and the density of fishing at that time during this two-week period is shown in Appendix B. Of the 53 crossings made by the BMC, approximately 13 (25%) had more than one fishing vessel present either between or immediately adjacent to the gap between the Mooir Vannin Array Area and Morgan Array Area.

Table 3.2: Daily fishing vessels NW of Morgan Array Area (May-2023 Survey).

Date	Count	Approximate Wave Height (12:00 UTC)
06/05/2023	5	0.4m
07/05/2023	4	0.5m
08/05/2022	0	1.3m
09/05/2023	11	0.3m
10/05/2023	10	0.9m
11/05/2023	12	0.5m
12/05/2023	9	0.5m
13/05/2023	8	0.1m
14/05/2023	8	0.4m
15/05/2023	8	0.6m
16/05/2023	13	0.6m

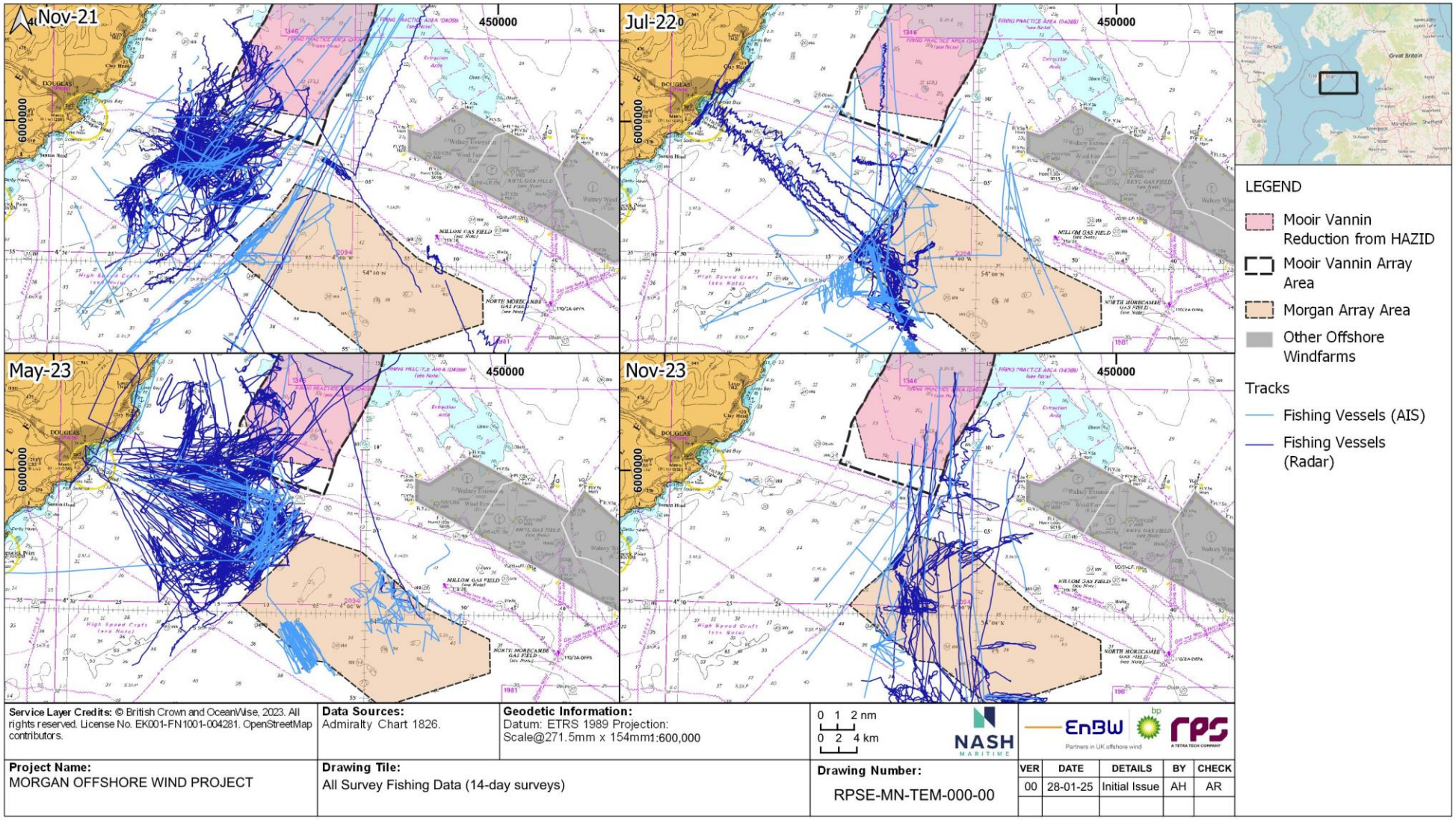

Figure 3.3: All Fishing Vessel Survey Data (AIS and Radar) in the Morgan/Mooir Vannin Area.

3.4.1.5 Based on the presence of these fishing boats, and with a 2.5 nm separation between the Morgan Array Area and Mooir Vannin Array Area, the risk of collision between commercial ferries and fishing boats was agreed with stakeholders to be Unacceptable (APP-060).

3.4.1.6 During the 2025 navigation simulations several high complexity fishing situations, based on worst case observed data, were put into the simulator and additional commercial traffic, not observed, were overlaid to determine how the IoMSPC would navigate under such conditions (Run 03, 05 and 06). It should be noted that for the majority of the year and passages the density and position of the fishing activity would pose no concern to the BMC. Features that qualified a timeframe as a worst-case scenario included both the frequency of vessels and the course of their tracks. Tracks that crossed perpendicular to the Morgan-Mooir Vannin gap would pose the most disruption to a ferry passage, noting above that this was an unlikely scenario. Following the simulations the conclusion was reached that the Masters could avoid the fishing vessels in worst credible situations whilst maintaining adequate safe separation, although 1 nm separation was not possible.

3.4.1.7 Following a review of both the data and simulations, stakeholders argued that, whilst the increased separation to 4.1 nm was welcomed, it was not sufficient to mitigate the risk from Unacceptable levels. Several key points were made to support this view (Appendix A):

- The presence of the two wind farms prevents the IoMSPC from navigating around all of the fishing boats, which is their stated primary action in such a situation
- 1 nm CPA is the limit of safe CPA and, in the simulations, this was not achieved
- In adverse weather, or at night, this would be more hazardous
- The wind farms would displace fishing into the “gap” increasing the risk further.

3.4.1.8 **Navigating around the fishing fleet**. In response to the first point raised, every passage of the BMC over the representative worst credible two week period from the May 2023 fishing top-up survey was analysed to assess the current manoeuvres undertaken in relation to fishing vessels (Appendix B). Out of the 53 BMC crossings observed throughout the May 2023 survey, 21 of these involved an interaction defined as within 1 nm of a fishing vessel. In 86% of these 21 interactions, it was noted that the BMC passed between two fishing vessels, suggesting this is routine and in line with standard practice, thereby demonstrating that Masters are comfortable at such distances. It should be noted that this analysis was based on the existing passages of the BMC and fishing positions. The presence of the Morgan Array Area would offset the passage to the north, which based on the plots contained within Appendix B, seems to contain less fishing density during these periods.

3.4.1.9 Four examples are highlighted within Figure 3.5. In the first example, on the 10 May 2023 at 08:00-09:00, the BMC passed clear of the fishing boats without navigating around the fleet. This resulted in CPAs to nearby vessels of approximately 0.5 nm despite a possible diversion to the south of the fleet only adding approximately 3.3 minutes to the total journey time (travelling at 18kts and maintaining a CPA of >1 nm from the fleet). A second example can be seen on the 11-May at 04:15-05:15 where the BMC is seen passing fishing vessels at a minimum CPA of approximately 0.4 nm. A possible diversion to the north of the fleet would have only added approximately 1.3 minutes to the total journey time.

3.4.1.10 In addition, even when presented with few fishing vessels, whereby diverting around would have less of an impact to the journey time, the BMC can be seen maintaining its course and passing between them. For example, on 13 May 2023 at 07:20-08:20,

the BMC passes between two fishing vessels with a CPA of 0.75 nm and 1.09 nm respectively. To have passed to the north would have added approximately 1.3 minutes to the total journey time. Similarly on the 14 May 2023 at 07:45-08:45 the BMC passes between a cluster of three fishing vessels with a minimum CPA of 0.6 nm. A diversion to the south would've added approximately just 1.4 minutes to the total journey time (Figure 3.5).

3.4.1.11 These observations suggest that avoiding the fishing fleet as a whole is not the primary navigational practice of the BMC when encountering fishing vessels. Consequently, whilst the presence of the two windfarms would reduce their ability to navigate around the fishing boats, this is not a routine practice and therefore does not make the risk profile unacceptable. It was also noted by IoMSPC that their preference when heading towards Douglas would be to pass to the north should they do so, thereby the presence of the southern boundary of Mooir Vannin Array Area is a greater constraint than the Morgan Array Area (Appendix A).

3.4.1.12 **1 nm CPA**. During the navigation simulations, a target CPA was agreed as 1 nm. It should be noted that there is no specific requirement to maintain 1 nm CPA. The Collision Regulations Rule 8 stipulates that "*Any action to avoid collision shall be taken in accordance with the Rules of this Part and shall, if the circumstances of the case admit, be positive, made in ample time and with due regard to the observance of good seamanship*." Furthermore, "*Action taken to avoid collision with another vessel shall be such as to result in passing at a safe distance.*" Safe distance is not defined and would be dependent on a range of conditions and is scenario specific. 1 nm is typically given in standing orders for an officer of the watch and where 1 nm cannot be maintained the Master should be called, but it does not indicate an imminent risk of collision.

3.4.1.13 Analysis was undertaken of the May 2023 vessel traffic survey (2 weeks) of the CPA given to fishing boats detected by either radar or AIS. The results are shown in Figure and demonstrate that the BMC frequently passed less than 1 nm from fishing vessels. 41% of all encounters within 2 nm of each other occurred at less than 1,500 m. This demonstrates that whilst the ferries may not be able to maintain 1 nm CPA in the busiest credible conditions, their passing distances and behaviour is consistent with the existing operational risk profile and the practice of good seamanship.

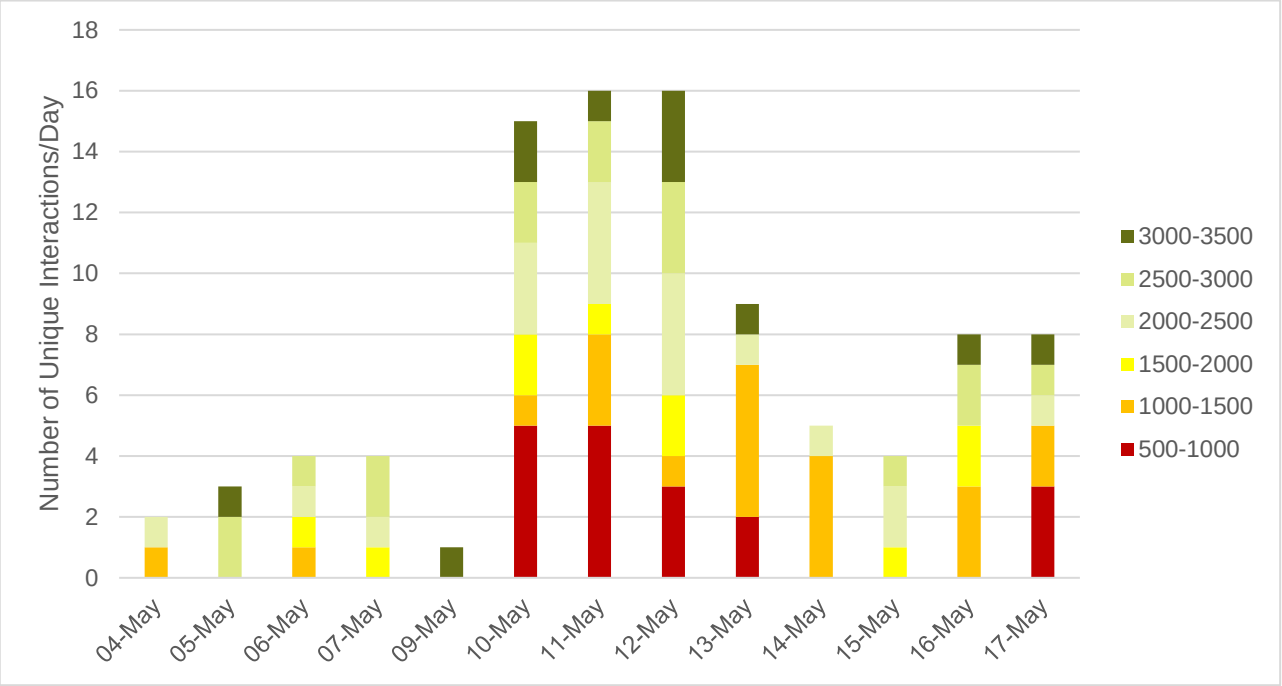

Figure 3.4: Fishing interactions involving BMC during May 2023 vessel traffic survey (metres).

3.4.1.14 **Risk at night and in adverse weather**: Thirdly, as noted above, the Isle of Man fishery is restricted to daytime fishing (05:00 to 21:00) and therefore the vast majority of encounters will be during the day. Furthermore, the timetable of the IoMSPC Heysham-Douglas route means that of the four crossings per day, only two are likely to be affected; the vessel would transit through this area at approximately 04:00-05:00, when fishing boats are departing Douglas, and at approximately 19:00-20:00, when many fishing boats have already returned to harbour. In addition, the size of the fishing boats and survey data (Table 3.2) demonstrate that fishing is unlikely to occur in bad weather, with the small fishing boats likely constrained to relatively calm sea states.

3.4.1.15 Were such a situation to be encountered in restricted visibility, it is anticipated that the IoMSPC would reduce speed in line with Rule 6 of the Collision Regulations but may seek greater passing distances. It is noted that in limited visibility when fishing boats may be active, the sea state is likely to be calm and therefore the fishing boats would present a clear radar target. No significant increase in the risk profile is, therefore, anticipated above the present day.

3.4.1.16 **Displacement post-construction**: Fourthly, there're is no evidence that the Isle of Man fishery would be displaced as a result of the construction of the two offshore wind farms. The scallops targeted are in fairly static areas which are routinely fished, thereby making the locations of higher density fishing more predictable. The fishery in question is limited to Isle of Man waters with no overlap with the Morgan Array Area. The Mooir Vannin Array Area was reduced in the southwest corner to avoid overlapping this fishery (MVOWFL, 2025) and the analysis presented above shows little if any fishing in this location (Figure 3.3). Furthermore, both the Morgan Generation Assets and Mooir Vannin Offshore Wind Farm design includes separation distances between wind turbines which could facilitate fishing.

3.4.1.17 In summary, the analysis undertaken above demonstrates that whilst the presence of the Morgan Array Area and Mooir Vannin Array Area does impact the optionality of how the IoMSPC navigates around fishing boats. 4.1 nm affords sufficient space to

safely navigate under the most complex situations that is consistent with the existing operational practices.

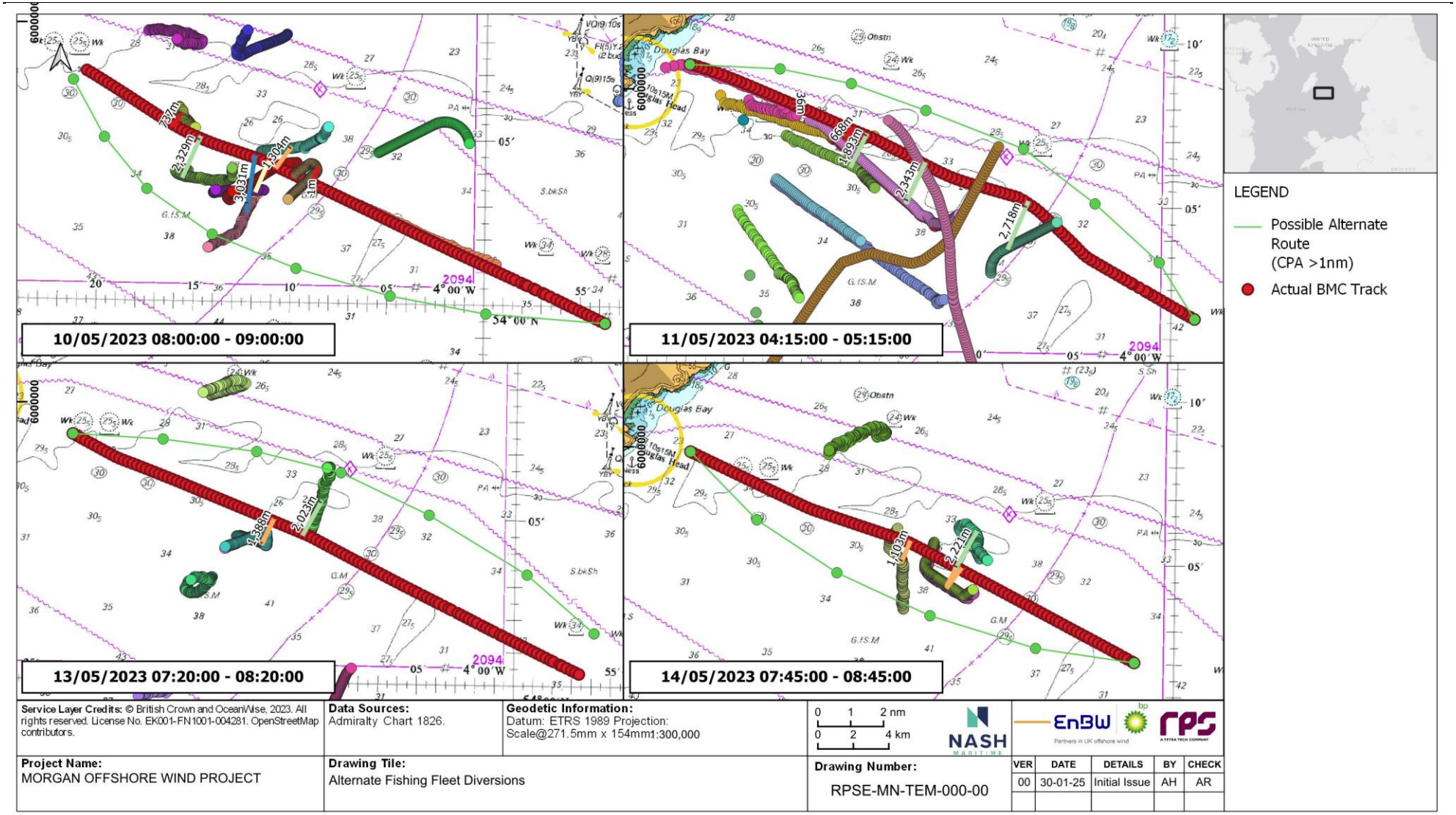

Figure 3.5: Fishing Fleet Avoidance - Alternate Fishing Fleet Diversions

3.5 Allision following mechanical failure

3.5.1.1 As noted above in Section 3.2, the refined boundary of the Mooir Vannin Array Area meets and exceeds both guidance and precedent of consented or constructed offshore wind farms elsewhere in the UK, which have greater traffic densities.

3.5.1.2 During the hazard review session (Appendix A), when reviewing the risk of allision between a ferry and an offshore wind farm, the IoMSPC and Stena Line argued that whilst an increase in separation to 4.1 nm reduced the risk, it did not mitigate the risk from Unacceptable levels. It was generally accepted by IoMSPC and Stena Line that the likelihood of a master of a ferry making such a mistake as to navigate into a wind turbine was very low given their experience, familiarity with the area and navigational aids onboard their vessel.

3.5.1.3 However, IoMSPC and Stena Line argued that the risk of mechanical failure and drifting onto the wind farms was unacceptably high. Whilst the Applicant accepts that mechanical failure could result in such a hazard occurring, the risk is Tolerable and appropriately mitigated for the following reasons:

3.5.1.4 **Low likelihood of breakdown**: industry and academic studies have demonstrated that complete failure of steering or propulsion is a rare event:

- IALA's Waterway Risk Assessment Programme (IWRAP) estimates a RoRo vessel loss of propulsion as once every ten years of continuous navigation. Noting that a RoRo would spend a large proportion of its time alongside loading/unloading and therefore the actual incident rate is likely once in twenty years
- The Formal Safety Assessment for RoPax vessels submitted to IMO noted a Mechanical Damage/Failure frequency of approximately 2×10^{-2} per ship year, which equate to once every fifty years (IMO, 2008)
- Some academic studies have given the rate per year based on analysis of historical incident data at 0.002 or 1 in 500 years (Dimitris and Vassalos, 2008) to 0.0154 or 1 in 65 years (Eliopoulou, Alissafaki, and Papanikolaou, 2023)
- Historically, breakdowns are disproportionately likely to occur in the approaches to ports and harbours rather than in passage due to the change from the mode of operation
- A review of historical incident data provided by the Marine Accident Investigation Branch (MAIB) shows that between 1992-2023, only a single incident of mechanical failure aboard a passenger vessel was reported within 10 nm of the Morgan Array Area. In this specific case, the vessel did not lose all propulsion and was able to return to port on its remaining operational engine
- Whilst examples of mechanical failures anecdotally highlighted by the ferry operators in recent years, the Applicant understands they did not result in total loss of propulsion and the vessel was quickly either able to rectify the issue or return to port by its own steam
- It is noted in several studies that trends in breakdown show vessels are becoming more reliable over time and it is noted that both the IoMSPC and Stena Line are modernising their fleet.

3.5.1.5 **Inconsistency with hazard workshop results for Morgan-Walney**: During the 2023 hazard workshop to support the Application, attended by stakeholders from a variety of industries, including the IoMSPC and Stena Line, it was agreed that the risk of

allision within the route between the Morgan Array Area and Walney wind farms was Medium Risk – Tolerable if ALARP. This route has more traffic and is longer and a similar width to the route between the Morgan Array Area and Mooir Vannin Array Area, and therefore a vessel will spend more time navigating this route and the likelihood of a vessel becoming disabled and drifting into a wind farm must be higher, but consensus was reached that it was manageable in that case. There is nothing inherently riskier for the route between Morgan Array Area and Mooir Vannin Array Area and therefore the risk in that case must be lower.

3.5.1.6 **Good industry record**: NASH Maritime have conducted detailed analysis of MAIB maritime incidents across the entire UK from 2000 to 2023 to identify incidents related to offshore wind farms. Based on the number of offshore wind farms and their years of operation, it was estimated that there were 496 years of operational experience across the UK, during which there had never been an incident of allision between a commercial vessel and a wind turbine. All recorded allisions were either project vessels, such as wind farm service vessels, or small craft, such as recreational or fishing vessels. There were no recorded allisions involving large commercial ships, such as ferries. A large proportion of these existing projects are located immediately adjacent to some of the busiest shipping routes in the country, including the approaches to Liverpool (Gwynt y Môr and Burbo Bank) or the Thames Estuary (Kentish Flats, Thanet, London Array, Greater Gabbard, Galloper). These routes have greater densities of vessel traffic than would be adjacent to the Morgan Array Area and therefore more likelihood of a disabled vessel incident.

3.5.1.7 **Redundancy**: It is also worth noting that all conventional Ro-Ro/RoPax vessels considered in this matter are equipped with twin propellers, at least two engines, and two rudders, ensuring very high redundancy in terms of propulsion and steering. The IoMSPC high-speed craft MANANNAN has an even greater level of redundancy, featuring four main engines with four individually steerable water jets. This high level of redundancy reduces the likelihood of a total loss of propulsion or steering capability.

3.5.1.8 **Breakdown may not result in allision**: Despite the low frequency of machinery failure incidents, it is important to note that not all such failures result in a vessel striking a wind farm. Firstly, the breakdown needs to specifically occur upwind of at least one wind farm, which is a small proportion of the overall journey length. Secondly, assuming a drift speed of 2 knots, it would take up to an hour for a vessel to drift from the centre of the route onto a structure, during which time there is opportunity to repair the failure, deploy an anchor or call for assistance. Thirdly, it is also possible that with 1,400 m spacing between wind turbines, a vessel drifting into the Morgan Array Area have a higher chance of not striking a wind turbine than a more dense offshore wind farm such as those already operating in the Irish Sea.

3.5.1.9 **Similarity to base case:** It is noted that at present both Stena Line and IoMSPC operate in very close proximity to existing offshore wind farms in the Irish Sea. In both of these cases, particularly West of Duddon Sands and Walney, there routes are upwind. Whilst the introduction of the Morgan Generation Assets would offset them closer towards the existing wind farms, they would not increase the likelihood of breakdown, and were a breakdown to occur they would drift towards an existing hazard. Despite these offshore wind farms being operational for many years, there have been no recorded incidents of a vessel breaking down and drifting towards OWFs in the central Irish Sea, further reinforcing the low likelihood of such an event occurring within the construction of the Morgan and Mooir Vannin OWFs.

3.5.1.10 **Substantial regulation of vessels**: To reduce the risk of mechanical failures and ensure redundancy, international maritime regulations impose strict requirements on vessel design, maintenance, and operation. Including:

- SOLAS (Safety of Life at Sea) Regulations, particularly Regulation 26 on machinery installations (requiring reliability, redundancy and repairability for propulsion), Regulation 29 on steering gear (independence of steering and reliability) and Regulation 41 concerning electrical installations (redundancy of generators to maintain steering and propulsion).
- International Safety Management (ISM) Code, particularly Section 10 on maintenance of ship and equipment requiring maintaining and testing of reliability and redundancy of critical systems.
- International Code of Safety for High-Speed Craft (HSC Code), particularly Chapter 9 on machinery requiring provisions for sustaining propulsion and Chapter 17 requiring handling, controllability and performance to maintain safe operation.

3.5.1.11 These regulations, coupled with vessel design redundancy and operational constraints, substantially mitigate the risk of mechanical failures resulting in vessel drift and allision with offshore wind farms, as other structures. Modern RoRo and RoPax vessels are engineered with multiple independent propulsion and steering systems, ensuring a high degree of operational reliability. Given the historically low incidence of mechanical failures, alongside these robust safety measures, the risk of allision due to mechanical failure can be considered to be Tolerable.

3.6 Routeing in adverse weather

3.6.1.1 During the hazard review session (Appendix A), the IoMSPC raised concerns that worst-case weather conditions were not simulated during their navigation simulations and highlighted that adverse weather conditions could have limited their visibility of the fishing vessels trawling northwest of Morgan (in Isle of Man waters) and affected their passage. As described in Section 3.4, in adverse sea states, the fishing fleet, given the size of the fishing vessels, would not be present. Furthermore, in particularly bad weather, the assessment has already demonstrated that the IoMSPC may choose to route south of the Morgan Array Area, therefore avoiding the passage between Morgan Array Area and Mooir Vannin Array Area entirely.

3.6.1.2 Stena Line also explained that their current adverse weather route could become unviable with the presence of Mooir Vannin. The Applicant notes that the presence of the Morgan Generation Assets, and Mona Offshore Wind Project and Morecambe Generation Assets, would require additional deviation for Stena Line to pass east of the Isle of Man, however, there was sufficient sea room should they still choose to do so (APP-025). It was noted that Stena Line may wish to retain optionality to navigate east but that with the offshore wind farms in place, it would be quicker to go west, which is their more frequent adverse weather route.

3.6.1.3 Figure 3.6 presents possible adverse weather routes with the addition of the Mooir Vannin Array Area. It demonstrates that Stena Line's adverse weather route between Heysham and Belfast (East of Isle of Man) would be challenged by the presence of Mooir Vannin, irrespective of the presence of the Morgan Array Area due to constraints to the west with Bahama Bank and to the east with Walney Extension (shown by the red and orange lines in Figure 3.6, respectively). Run 07, 08 and 09 of the simulations demonstrated that this route could be possible, but it would be more challenging (Appendix E).

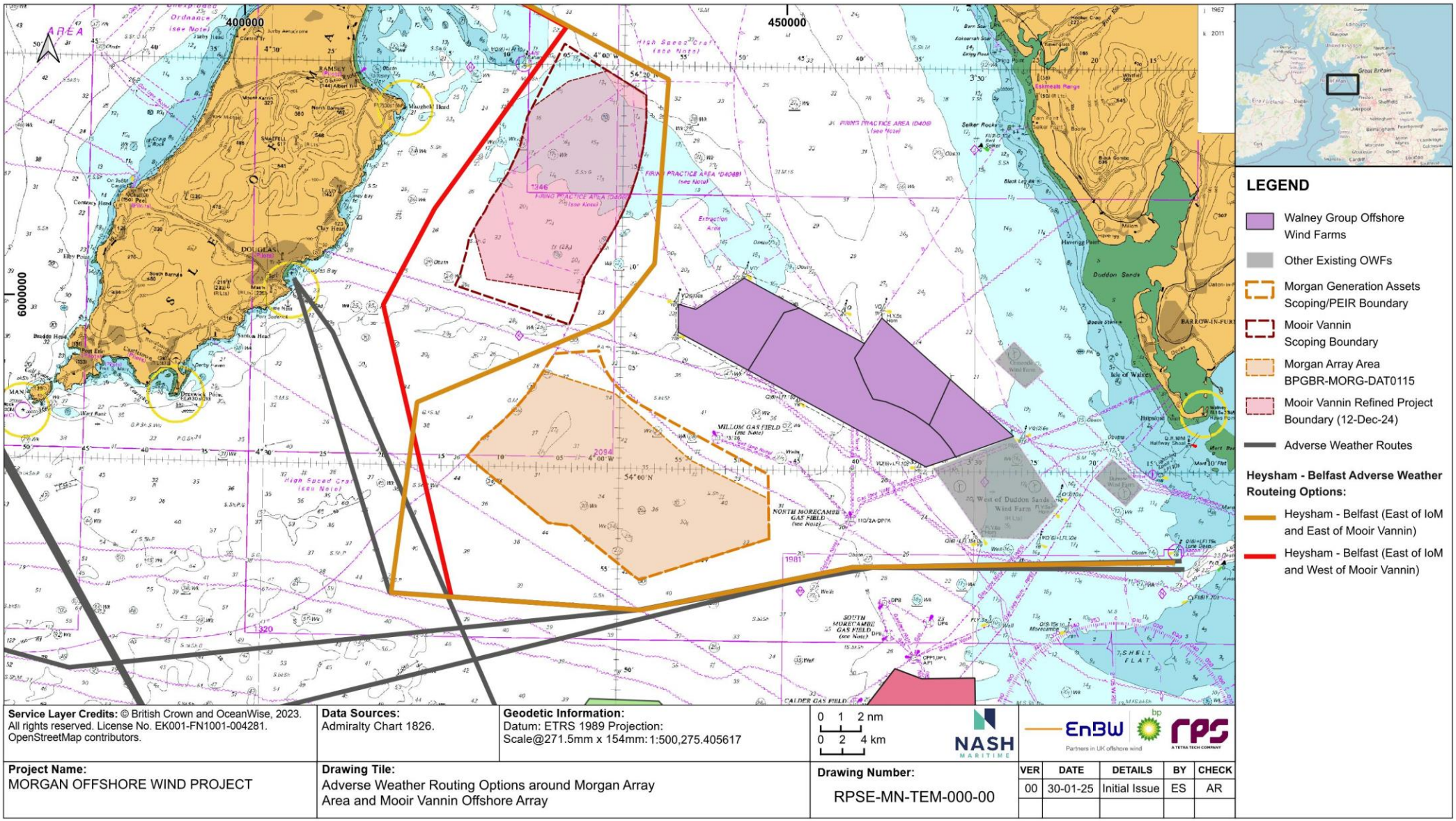

Figure 3.6: Adverse Weather Routes Around Morgan Generation Assets and Mooir Vannin

4 CUMULATIVE RISK ASSESSMENT UPDATE

4.1 Introduction

4.1.1.1 The cumulative risk assessment presented in the CRNRA (APP-060) was produced in accordance with MGN654 and follows the International Maritime Organisation's (IMO) Formal Safety Assessment (FSA). In summary, hazards were identified and the likelihood and consequence of these impacts assessed through the collection of significant datasets and analysis, navigation simulations and consultation with operators, including a hazard workshop, to determine a risk score for each hazard. Risk controls were then identified to determine whether the risks have been reduced to ALARP. Details on the risk criteria and matrix methodology are contained within Section 8 of the CRNRA (Appendix E of the NRA (APP-060)). During the hazard workshop for the CRNRA, consensus was reached with stakeholders that the risks were Medium Risk, Tolerable and ALARP. This is agreed in SoCGs with the MCA, Trinity House and UK CoS (REP5-051/REP3-030/REP5-048).

4.1.1.2 For the Mooir Vannin Offshore Wind Farm Scoping Boundary, the reassessment of the impact on navigational safety was discussed with stakeholders at the workshop and included within the addendum (CRNRA Appendix D (APP-060)) as described in Section 2. It was concluded that 2.5 nm was insufficient for safe navigation and Unacceptable risks existed. Namely, these hazards were the allision of a ferry/passenger vessel with a wind turbine or OSP, and the collision between a ferry/passenger vessel or a cargo/tanker with a small craft. Other risks were heightened but remained within the Medium Risk – Tolerable if ALARP scoring.

4.1.1.3 As described in Section 2.5.3, immediately following the navigation simulations undertaken on 20-21 January 2025, a hazard review session was undertaken with the IoMSPC and Stena Line to update the conclusions of the Mooir Vannin CRNRA Addendum. Following the successful simulation exercises, assessment against guidance and modelling, the Applicant presented its position that these risks had been reduced following the refinement of the Mooir Vannin Array Area. However, it was argued by the IoMSPC and Stena Line that whilst the risks had reduced, they did not reduce them from Unacceptable levels and the risk ratings concluded in the 2023 hazard workshop should remain. Therefore, consensus was not reached that the risk scores could be changed.

4.1.1.4 On this basis, Section 4.2 presents the results of the Applicant's assessment, but is based on the input of stakeholders, including the findings of the 2023 hazard workshop and January 2025 navigation simulations. Only the three hazards involving ferries were discussed with stakeholders during the hazard review session on 21 January 2025. The other six hazards were reassessed after the hazard review session by the Applicant in light of the findings of the navigation simulations, and this is highlighted in Table 4.1Table .

4.2 Results

4.2.1.1 The results of the Applicant's update of the CRNRA following the increase from 2.5 nm to 4.1 nm between the Morgan Array Area and Mooir Vannin Array Area are summarised below and shown in Table :

- 0 hazards were reassessed as High Risk – Unacceptable (previously assessed to be 2).

- 7 hazards were reassessed as Medium Risk – Tolerable (if ALARP) (previously assessed to be 6).
- 2 hazards were reassessed as Low Risk – Broadly Acceptable (previously assessed to be 1).

4.2.1.2 The full updated hazard log is contained within Appendix D.

4.2.1.3 **Hazard 3: Collision - Ferry/Passenger or Cargo/Tanker ICW. Small Craft**. The CRNRA demonstrated that whilst there was a low density of recreational and tug/service vessels likely to navigate between Morgan Array Area and Mooir Vannin Array Area, at times, high density fishing may be encountered west of the gap between them. As described in Section 3.4, high density fishing occurs only during specific seasons and times of day, and there is often adequate sea room to navigate this passage without taking any action. Through the navigation simulations and hazard review session which focused on the less likely worst-case scenarios it was demonstrated that whilst the presence of the offshore wind farms reduces their optionality to maintain 1 nm CPA when passing the fishing boats, there is sufficient sea room to maintain adequate passing distances from slow moving small boats that are consistent with how they currently operate. The additional sea room afforded by 4.1 nm separation compared to 2.5 nm separation improves their ability to increase separation, routeing north or south of the main groups of vessels. Thereby, the likelihood of encountering a fishing vessel has reduced and the sea room to take action to avoid a collision has increased. As a result, the likelihood scores of a most likely incident were reduced from Reasonably Probable (between 1 in 1 year to 1 in 10 years) to Unlikely (1 in 10 years to 1 in 100 years). The worst credible scores were similarly reduced from Unlikely to Extremely Unlikely (less than 1 in 100 years). This reduced the overall risk from Unacceptable to Medium Risk – Tolerable if ALARP.

4.2.1.4 **Hazard 5: Allision – Ferry/Passenger**. During the CRNRA as part of the Application (APP-060), it was concluded that 2.5 nm presents limited opportunity to maintain adequate CPA from fixed structures were other vessels present or opportunity should mechanical failure occur, resulting in assessed risk score of Unacceptable. It was agreed in the 21 January 2025 hazard review session that the refinement to 4.1 nm offered greater passing distances and so the likelihood of human error causing an allision was very low. An area of debate was the risk following mechanical failure. As noted in Section 3.5 through historical incident records, the likelihood of a RoRo/RoPax vessel breaking down and then drifting into an offshore wind farm is very low. Furthermore, the refined width of 4.1 nm both meets and exceeds existing guidance and precedent (Section 3.2) and so there is nothing inherently more hazardous about this route than any other proposed or construction passage between offshore wind farms elsewhere in the UK. Based on this, and noting the consensus reached at the Morgan hazard workshop in 2023, the Applicant has revised the likelihood of allision from Unlikely (between 1 in 10 years to 1 in 100 years) to Extremely Unlikely (less than once in 100 years), which is more consistent with that agreed with stakeholders for the longer Morgan-Walney passage. This reduced the overall risk from Unacceptable to Medium Risk – Tolerable if ALARP.

Table 4.1: Hazard Summary Table

ID.	Hazard Title	ES Scores (2.5 nm separation)				Updated Scores (4.1 nm Separation)				Consensus Status (21-Jan-2025)
		Frequency Scores		Risk Score	Risk Rating	Frequency Scores		Risk Score	Risk Rating	
		ML*	WC**			ML*	WC*			
1	Collision - Ferry/Passenger ICW. Cargo/Tanker or Ferry/Passenger	4	2	10.6	Medium Risk - Tolerable (if ALARP)	2	2	7.8	Medium Risk - Tolerable (if ALARP)	Not Agreed with IoMSPC/Stena Line
2	Collision - Cargo/Tanker ICW. Cargo/Tanker	2	1	5.1	Low Risk - Broadly Acceptable	2	1	5.1	Low Risk - Broadly Acceptable	Previously Agreed (2023)
3	Collision - Ferry/Passenger or Cargo/Tanker ICW. Small Craft	4	3	12.5	High Risk - Unacceptable	3	2	8.8	Medium Risk - Tolerable (if ALARP)	Not Agreed with IoMSPC/Stena Line
4	Collision - Small Craft ICW. Small Craft	4	3	9.6	Medium Risk - Tolerable (if ALARP)	3	2	6.7	Medium Risk - Tolerable (if ALARP)	Not Discussed
5	Allision - Ferry/Passenger	3	3	12.4	High Risk - Unacceptable	2	2	8.3	Medium Risk - Tolerable (if ALARP)	Not Agreed with IoMSPC/Stena Line
6	Allision - Cargo/Tanker	2	2	7.4	Medium Risk - Tolerable (if ALARP)	2	1	5.0	Low Risk - Broadly Acceptable	Not Discussed
7	Allision - Tug/Service & Small Project Vessels	5	3	10.5	Medium Risk - Tolerable (if ALARP)	4	2	7.6	Medium Risk - Tolerable (if ALARP)	Not Discussed
8	Allision - Fishing	4	3	9.6	Medium Risk - Tolerable (if ALARP)	4	2	7.6	Medium Risk - Tolerable (if ALARP)	Not Discussed
9	Allision - Recreational	4	3	9.6	Medium Risk - Tolerable (if ALARP)	3	2	6.7	Medium Risk - Tolerable (if ALARP)	Not Discussed

*ML = Most Likely Scenario **WC = Worst Credible Scenario

4.2.1.5 **Hazard: 1: Collision - Ferry/Passenger ICW. Cargo/Tanker or Ferry/Passenger**. As shown in Section 3.3, the likelihood of two commercial ships meeting between the Morgan Array Area and Mooir Vannin Array Area is very low. The navigation simulations highlighted that the presence of Mooir Vannin did have an influence on Stena Line's approach angle approaching the corner of Walney Extension, which impacted the types of crossing situations experienced. However, this primarily concerned the Mooir Vannin Offshore Wind Project and Walney Extension rather than the Morgan Generation Assets which had limited influence on this situation, albeit offsetting the IoMSPC route further north. Based on the very low likelihood of commercial ships meeting and the greater sea room afforded by the change in boundaries, the likelihood of a most likely occurrence was reduced from Reasonably Probable (between 1 in 1 years and 1 in 10 years to Extremely Unlikely (less than once in 100 years). This reduced the overall risk within the Medium Risk – Tolerable if ALARP designation and is consistent with the previously agreed scoring of the Morgan-Walney passage.

4.2.1.6 **Other hazards**: Whilst other hazards were not discussed with the IoMSPC and Stena Line, the Applicant has reviewed the likelihood of occurrence following the boundary refinement. The increased separation distance means that collision and allisions are less likely to occur for all other vessel types. As a result, the overall risk of five of the other hazards has been reduced, with one (allision of a cargo/tanker) falling from 'Medium Risk – Tolerable if ALARP' to 'Low Risk – Broadly Acceptable', noting the greater searoom available and low frequency of transits. All other hazards remained as 'Medium Risk' but had their corresponding frequencies reduced. The other hazard identified within this area was the collision of a cargo/tanker with another cargo/tanker. Given the frequency of cargo/tanker vessels through this channel, this hazard had already been considered of sufficiently low likelihood to have an overall risk score of 'Low Likely – Broadly Acceptable'.

4.2.1.7 In summary, the highest residual hazard remains the potential collision between a ferry and a small craft, followed by allision of a ferry and collision between a ferry and another commercial vessel. This reflects that whilst the likelihood has been reduced, ferries inherently carry a higher potential risk than other vessel types given their passenger carriage. However, all hazards which were Unacceptable have been reduced to Medium Risk - Tolerable if ALARP.

4.3 Additional mitigation options

4.3.1.1 During the navigation simulations and hazard review, a number of risk controls were proposed and discussed with stakeholders to further reduce the risk. These are discussed below.

4.3.2 Reduction in Array Area

4.3.2.1 Noting the stakeholder positions on insufficient sea room between the set out during the hazard review session (Appendix A), a possible mitigation could be further increasing the separation between the Morgan Array Area and Mooir Vannin Array Area.

4.3.2.2 As described in Section 3.2, the Applicant notes that the proposed separation of 4.1 nm meets and exceeds all relevant guidance, and notes this is confirmed in the MCA's response to ExQ2.SN.2.4 (REP5-069). The Applicant also notes that all responses to ExQ2.SN.2.3 on the PIANC guidance do not dispute the parameters used by the Applicant in Section 7.6 of the CRNRA (APP-060) (see REP5-066, REP5-077, REP5-088 and REP5-092). Furthermore, the Applicant notes that the separation

is greater than or comparable to what has been constructed or consented elsewhere in the UK, even with much greater traffic volumes.

4.3.2.3 The Applicant also notes that at the hazard workshop in 2023, the IoMSPC and Stena Line, with all other attendees (including the MCA), agreed that the passage between the Morgan Array Area and Walney wind farms was of sufficient width of between 4.1 nm and 5.3 nm for safe navigation, noting that this passage forms a corridor of significantly longer length than that of the Mooir Vannin and Morgan Array Area. It is not consistent to consider this route sufficient but the passage between Morgan Array Area and Mooir Vannin of similar widths but of shorter length as not sufficient.

4.3.2.4 During the hazard review session (Appendix A), the IoMSPC and Stena Line were questioned as to what might constitute an “acceptable” gap. It was argued that constructing four large OWFs present risks which cannot be adequately mitigated and therefore there is no acceptable separation between the OWFs that would reduce the risk to Tolerable levels. Notwithstanding that the Applicant believes that no mitigation is required, there is no basis by which the Applicant could amend the Morgan Array Area to satisfy the IoMSPC and Stena Line. Subsequently, at Issue Specific Hearing 3 and in their final SoCG, the IoMSPC also raised the desire to increase the gap width to 5.0 nm, but no justification was provided as to how the additional 0.9 nm would sufficiently mitigate this risk, other than it giving slightly greater searoom.

4.3.2.5 The Applicant also notes that it was concluded in several simulator runs that the limiting constraint on the IoMSPC’s ability to maintain the desired CPA of 1.0 nm was the presence of the Mooir Vannin Offshore Wind Farm, irrespective of the presence of the Morgan Generation Assets. Therefore, the Applicant would not be able to address this constraint.

4.3.3 Emergency Towage Vessels (ETVs)

4.3.3.1 At the hazard workshop in October 2023, some stakeholders (such as UKCoS and Stena Line) suggested introducing an Emergency Towage Vessel (ETV) in the Irish Sea to address disabled vessels drifting towards OWF structures. This was again discussed during the hazard review session on the 21 January 2025.

4.3.3.2 The Applicant’s position as set out in its response to ExQ2.SN.2.8 (REP5-015) is that ETVs are not required as they address a rare occurrence, have limited effectiveness in mitigating the identified risks, and incur significant costs. Given the increased separation from 2.5 nm to 4.1 nm, and the results of the risk assessment update reported above in Section 4.2, the Applicant’s position has not changed and is summarised below:

- **NRA Results**: During the hazard workshop in 2023, it was concluded the risks associated with Morgan Generation Assets with other Tier 1 and Tier 2 projects was Medium Risk and Tolerable if ALARP. Noting this included a separation distance between the Morgan Array Area to Walney wind farms similar to the refined 4.1 nm separation between Morgan Array Area and Mooir Vannin Array Area, this result should be consistent.
- **Cumulative Scenario**: The UK CoS only refers to a cumulative scenario for the introduction of an ETV. As such, the Examining Authority would not be justified in imposing this requirement solely on the Morgan Generation Assets. Both the MCA (REP5-069) and UK CoS (REP5-048) have stated that further consideration of towage should be conducted post-consent and does not preclude consent of the Morgan Generation Assets.

- **Low likelihood**: The likelihood of a ferry becoming disabled and drifting into an offshore wind farm is considered very low (see Section 3.5). Ferries are well-maintained and equipped with redundancy systems to mitigate mechanical failures (see Section 3.5).
- **Difference from base case**: Currently, ferries operate in close proximity to existing Irish Sea offshore wind farms, with passage plans often mirroring the distances maintained around the Walney group, West of Duddon Sands, and Gwynt-y-Mor offshore wind farms (see Section 3.5). The Applicant is unaware of any prior suggestion that ETVs are required in these contexts.
- **Difficulty in Attaching a Tow**: Establishing a tow using an ETV can be both challenging and hazardous. The JULIETTA D incident in the Netherlands (2022) required several hours to secure a tow and resulted in injuries. Similarly, during Storm Darragh on 7 December 2024, tow attempts off the Dutch coast were abandoned after a crew member was injured and airlifted to hospital, and another incident off France took five hours to establish a tow. In the Irish Sea's most significant incident, the Riverdance loss in 2008, attempting a tow would have been highly dangerous. Additionally, RoRo vessel designs make passing a messenger line more difficult, further limiting the effectiveness of an ETV.
- **Potential increase in risk**: The presence of an ETV in the study area may increase navigational risk, as it could itself become involved in a collision or allision, particularly if it encounters difficulty.
- **Response Times**: ETVs are most effective when they can respond immediately. However, given the proximity of ferry routes to the OWFs and the noted difficulties in establishing a tow, an ETV roaming the Irish Sea may not reach a casualty vessel in time to prevent an incident. Escorting individual ferries through the offshore wind farms would not be practical. Figure 4.1 the hypothetical central position an ETV could be stationed in the centre of the Irish Sea. Based on typical ETV sailing speeds (10–12 kts), response times would still be up to 2–3 hours for a vessel at risk of allision when passing between the Morgan Array Area and Mooir Vannin Array Area. In adverse weather, these response times would be extended. This was demonstrated in the JULIETTA D incident, where delays in reaching the vessel contributed to its eventual collision with offshore wind farm structures. Large ferries operating in crosswinds of Beaufort force 7–8 can drift at speeds of 2.8–3. kts, meaning a vessel adrift in such conditions could cover approximately 3 nm in just one hour. Given that key ferry routes pass about 1.5 nm from turbine array areas, an ETV departing from even the optimal central location would likely not arrive in time to prevent an allision. Therefore, ensuring there is safe separation between the offshore wind farms is the most effective means to mitigate this risk.
- **High Cost**: ETVs are highly expensive, which was the primary reason for the UK government's withdrawal of the ETV programme in 2010. They are justifiable only when there is strong evidence that they are proportionate to the risks, which the risk assessment in Section 4.2 does not demonstrate.
- **Unprecedented**: The Applicant emphasises that no similar requirement has been imposed on any other UK offshore wind farm. Imposing such a condition would set a significant precedent for the industry. Justification would require clear evidence demonstrating that the Irish Sea is inherently more dangerous than other regions with offshore wind farms and dense marine traffic, which has not been provided.

- **Government Led**: The Applicant has argued that ETV provision should be a government-led initiative, as it was previously in the UK and remains in other European nations. Responsibility for assessing the necessity of such a scheme lies with the MCA as the navigation authority, not the Applicant.

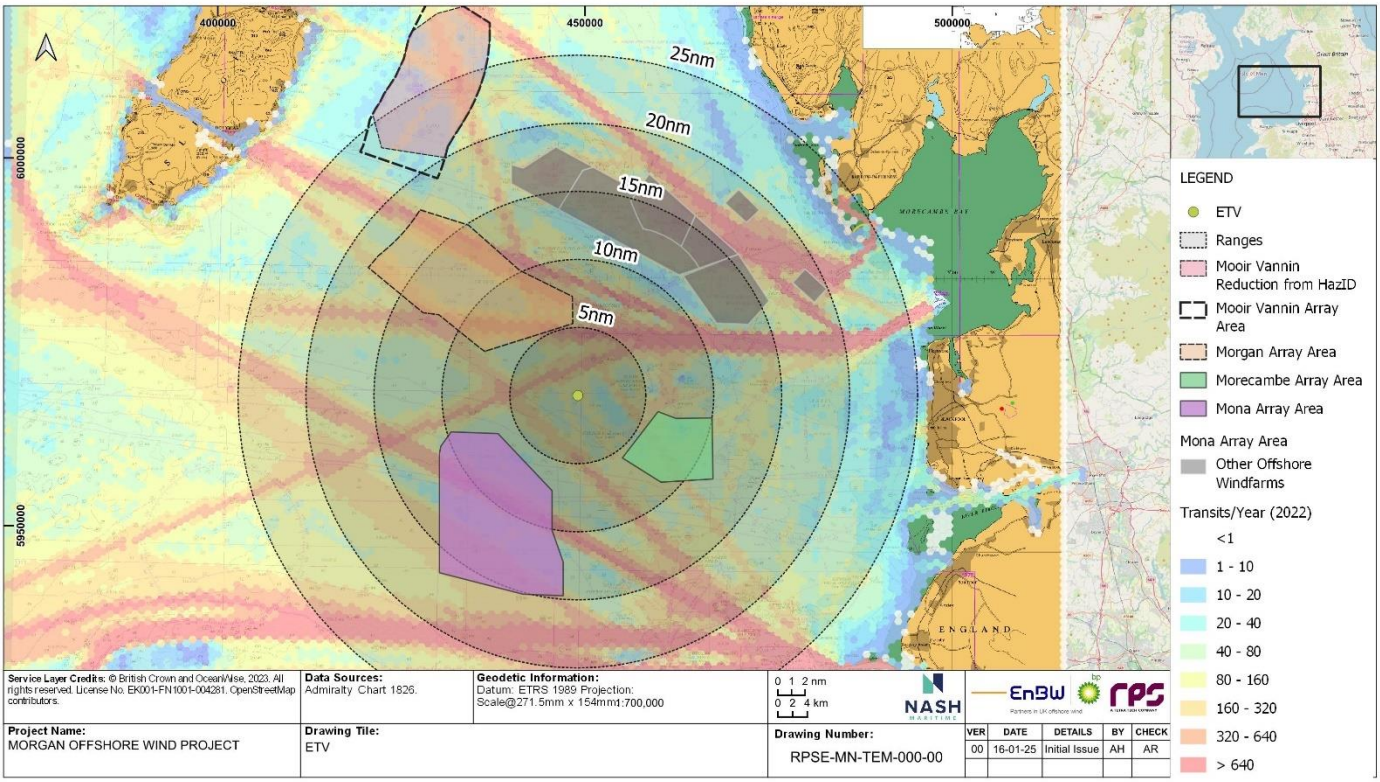

Figure 4.1: Hypothetical ETV station in central Irish Sea and distances that an ETV stationed here would need to cover in order to assist a nearby vessel.

4.3.3.3 In summary, the Applicant's position is that in the context of the Morgan Generation Assets, the very high cost of procuring and operating an ETV and its low effectiveness is considered disproportionate to the risks related to allision with OWF structures, particularly following the refinement of the boundary of the Mooir Vannin Array Area, and are therefore managed to As Low As Reasonably Practicable (ALARP).

4.3.4 Crash barriers

4.3.4.1 During the navigation simulations and hazard review session (Appendix A), the use of "crash barriers" around the offshore wind farms was raised as a potential risk control measure. Variations have been proposed such as a string of buoys secured by drag anchors, netting or subsurface hooks for securing dragging anchors.

4.3.4.2 Crash barrier mitigations are conceptual in nature based on research by Marin in the Netherlands during 2022 and 2023. There have been no real world implementation and there is no evidence that such a mitigation would be fully effective to prevent allisions.

4.3.4.3 Furthermore, crash barriers may prevent access of vessels into an offshore wind farm, particularly small craft such as yachts, fishing boats and project vessels and is therefore contrary to the UK's policy of open navigation within offshore wind farms. In addition, the presence of crash barriers could result in increased risk of snagging and allision for vessels that outweighs the benefits they might be provide.

4.3.4.4 Therefore, the Applicant does not believe this is an appropriate or realistic risk control measure.

4.3.5 Ship routeing measures

4.3.5.1 During the hazard review session (Appendix A), the IoMSPC raised the possibility of introducing a Traffic Separation Scheme (TSS) between the Projects. This was discussed during the 2022 and 2023 hazard workshop where no consensus was reached on their requirement.

4.3.5.2 A TSS can be effective at organising large traffic flows to reduce the risk of collision. As shown in Section 3.3, there are anticipated to be approximately four commercial vessel movements per day between the Morgan Array Area and Mooir Vannin Array Area, the overwhelming majority of which would be the regular IoMSPC service between Heysham and Douglas which is a single vessel for which the TSS would serve no benefit. In addition, the presence of a TSS could make it more challenging for small craft to navigate this route.

4.3.5.3 Furthermore, there is limited space available for a TSS which typically consists of two traffic lanes (at one or two nautical mile width) and a separation zone of a similar width, which if combined with the requisite offset from the array areas would not meet international best practice.

4.3.5.4 The Applicant notes that the MCA response to ExQ1.SN.1.2 that there are no plans to propose the introduction of a new TSS in the Irish Sea (REP3-038).

4.3.5.5 The Applicant notes that the creation of a TSS requires multi-national agreement and must be adopted at the IMO and therefore requires the highest level of justification. The Applicant does not believe both the risk in this region and the benefits of such a scheme justify its creation. Therefore, the Applicant does not believe this is an appropriate or proportionate risk control measure.

4.4 Summary

4.4.1.1 In summary, the Applicant accepts that the presence of the proposed offshore wind farms necessarily increases the risk of collision and allision for navigating vessels. As demonstrated through the CRNRA (APP-060) and agreed with stakeholders (MCA (REP5-051), Trinity House (REP3-030), UK CoS (REP5-048), IoMSPC (REP3-026) and Stena Line (REP3-029), the addition of the Mona, Morgan and Morecambe Offshore Wind Projects is Tolerable and ALARP, and outstanding concerns expressed by stakeholders relate only to the addition of the Mooir Vannin Offshore Wind Farm. However, the Applicant's assessment demonstrates that the increased width of 4.1 nm of the gap between the Morgan Array Area and Mooir Vannin Offshore Wind Farm has materially reduced the risk of navigating this route. Furthermore, the Applicant has implemented appropriate and proportionate risk controls to manage this risk.

4.4.1.2 Therefore, the Applicant considers that there are no unacceptable risk to navigational safety associated with the Morgan Generation Assets, including cumulative effects with the refined Mooir Vannin Offshore Wind Farm, and all risks have been reduced to ALARP.

4.4.1.3 At Issue Specific Hearing 3 (12 February 2025), the MCA advised that they considered the refined 4.1 nm gap to be both Tolerable and ALARP and was confirmed in their final SoCG. Therefore, no further mitigation is required. The Applicant emphasises National Policy Statement EN-3 Paragraph 2.8.334 which states that the Secretary of State should make use of advice from the MCA on matters of navigational safety.

4.5 References

Dimitris and Vassalos (2008). Risk evaluation for RoPax vessels. The Ship Stability Research Centre, Department of Naval Architecture and Marine Engineering, Universities of Glasgow and Strathclyde, Glasgow, UK. Available at: [redacted]

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PIANC (2018). WG161: Interaction between Offshore Wind Farms and Maritime Navigation

Appendix A Minutes of Navigation Simulations and Hazard Review Session

MOM Number	:	**REV. No.** : 02
MOM Subject	:	Mooir Vannin – Morgan Array Area Navigation Simulations

MINUTES OF MEETING

MEETING DATE	:	09:15 20-Jan-2025 – 12:15 21-Jan-2025
MEETING LOCATION	:	HR Wallingford Ship Simulation Centre & MS Teams
RECORDED BY	:	NASH Maritime
ISSUED BY	:	Andrew Rawson

PERSONS PRESENT:

Organisation	Date(s)	Attendee	Role	Initial
HR Wallingford	20-Jan-25 and 21-Jan-25	Mark McBride Ian Simpson Liam Monahan-Smith Lorcan Frewin	Manager of Ships and Dredging Master Mariner Simulator Operator Graduate Simulator Operator	**MM** **IS** **LMS** **LF**
NASH Maritime	20-Jan-25 and 21-Jan-25	Andrew Rawson Dominic Bell Amber Hutchinson	Associate Director Master Mariner Graduate Consultant	**AR** **DB** **AH**
NASH Maritime representing Morecambe Generation Assets	20-Jan-25 and 21-Jan-25	Eleanor Scott	Graduate Consultant	**ES**
Morgan Offshore Wind Limited (the Applicant)	20-Jan-25 and 21-Jan-25 (online)	Rosie Howatt Peter Gaches Patrick Munro Gina Roper	Offshore Consent Lead Project Consent Lead Legal Advisor (Burgess Salmon) Commercial Lead	**RH** **PG** **PM** **GR**
RPS Tetratech	20-Jan-25 and 21-Jan-25 (online)	Miriam Knollys	Principal Consultant	**MK**
IoMSPC	20-Jan-25 and 21-Jan-25	Tom Turner Chris Kelly John Lambert	Master Mariner / Fleet Operations Manager Master Mariner Master Mariner	**TT** **CK** **JL**
Stena Line	20-Jan-25 and 21-Jan-25	Mike Proctor Sean Fitzgerald Brian Greenwood	Master Mariner Master Mariner Legal Advisor	**MP** **SF** **BG**

Maritime and Coastguard Agency	20-Jan-25 and 21-Jan-25 (online)	Vaughan Jackson Sam Chudley Nick Salter	Offshore Renewables PM Marine Licensing Advisor Offshore Renewables Lead	**VJ** **SC** **NS**
UK Chamber of Shipping	21-Jan-25 (online)	Robert Merrylees	Policy Manager (Safety & Nautical) & Analyst	**RM**
APOLOGIES:				
Mooir Vannin OWF	N/A			

ITEM NO:	DISCUSSION ITEM:	Responsible party	Date
DAY 1 – Navigation Simulation (Nav-Sim) Runs			
1	**Introductions, Objectives and Project Summary Information**		
1.1	Brief introductions were made by all attendees. **TT** questioned whether the Project know why Mooir Vannin are not present. **AR** and **RH** confirmed that Mooir Vannin were invited to attend, but identified that they would not have anything specific to add in the context of the Nav Sims, as it would be for the individual captains to comment on transiting through the gap in their individual vessels. The Applicant respected their position and it was agreed that as the Applicant had the updated Mooir Vannin boundary nothing further was required from Mooir Vannin to inform the simulations.		
1.2	**AR** summarised the agenda for both days, explaining that Monday would be used for all the navigation simulation runs, and that Tuesday morning would be used for a risk review discussion.		
1.3	**AR** provided a recap of the projects proposed in the Irish Sea: Mona Offshore Wind Project, Morgan Offshore Wind Project: Generation Assets, Morecambe Offshore Windfarm: Generation Assets, Morgan-Morecambe Transmission Assets, and Mooir Vannin Offshore Wind Farm Limited (MVOWFL).		
1.4	**AR** gave a recap of the key parts of the process to date since 2019 for the Morgan Generation Assets: • 2022: Agreement for Lease and Scoping Report • Q2/Q3 2022: First navigation simulations and hazard workshop • Q1 2023: Mitigation through amendments to Boundaries • Q2 2023: PEIR including NRA • Q2/Q3 2023: Second navigation simulations and hazard workshop • Q3 2023: Scoping report for Mooir Vannin • Q2 2024: ES included updated NRA • Q3 – ongoing: Examination		
1.5	**AR** summarised the conclusions of the Morgan Generation Assets' Application and explained the Applicant's position on Mooir Vannin in the NRA, and the conclusion that the navigation risk between the		

	Morgan Array Area and Mooir Vannin Scoping Boundary was assessed as unacceptable. **AR** summarised the Mooir Vannin hazard workshop on 12-Dec-24 where MVOWFL presented a refined the site boundary such that the minimum distance between Mooir Vannin Array Area and Morgan Array Area is now 4.1nm, compared to 2.5nm, which was assessed in the NRA submitted with the Applicant. **AR** explained that there has been a lot of discussion within the Examination of the Morgan Generation Assets regarding the proximity of Mooir Vannin Offshore Wind Project. Therefore, the Applicant decided to proactively explore the effects on navigational safety of this increased separation distance in order to provide an update to the ExA at the next opportunity. **AR** emphasised that the focus is on the cumulative effects of both Morgan Generation Assets and Mooir Vannin Offshore Wind Project together, and that this is not an assessment of the Mooir Vannin Offshore Wind Farm.		
1.6	**AR** presented the proposed run list for navigation simulations and explained that this can be updated if required, based on discussions and progress throughout the day. **AR** presented the risk assessment criteria used during previous hazard workshops, which includes factors such as passenger comfort and impact on schedule as well as navigation safety.		
1.7	**AR** explained the notes attached to the draft run list, including that IoMSPC vessel the Ben-My-Chree (BMC) would be used in place of Manxman noting the BMC ship model has been previously verified with IoMSPC. **TT** and **CK** confirmed this was fine.		
1.8	**AR** explained that, given that nighttime simulations were ran in the last navigation simulations, and shown to be manageable, and the only change is the addition of Mooir Vannin for which the full details of its lighting arrangements are not available, a nighttime simulation would not be run. **AR** also noted that the short time scale of commissioning these simulations meant that it could not be effectively modelled in the simulator. **TT** expressed concern at the lack of a nighttime simulation with the presence of Mooir Vannin, due to the increased lighting that will be present. **MM** explained that due to the spacing of the OWFs, the last simulation found that the density of red lights is less than is currently present on existing windfarms. **MP** agreed with the Isle of Man Steam Packet Company (IoMSPC)'s concern and explained that the number of projects exacerbates the issue compared to other windfarms, due to the significant increase in the number of red lights. **AR** confirmed this would be noted and assessed qualitatively through the risk assessment process.		
1.9	**AR** explained that emergency scenarios were also tested during previous navigation simulation sessions. Therefore, it is not proposed as part of the core run list but noted that it could be included if so desired by attendees.		
1.10	**AR** noted that simulations in adverse weather has been raised by both the UK Chamber of Shipping (CoS) and Stena Line, but it was considered that vessels are unlikely to pass between the Morgan Generation Assets		

	and Mooir Vannin Offshore Wind Farm in adverse conditions based on previous simulations. **MP** explained that, previously, Mooir Vannin wasn't advanced enough to be considered. However, now that this can be considered a continuous channel, Stena Line think that a 20-degree rule should be carried out to be in compliance with MGN654. **MP** noted that the addition of Mooir Vannin creates a longer channel, and this route would traditionally be used in strong southwesterlies due to increased shelter from the Isle of Man (IoM). **AR** explained that a 50kt wind, 4m swell could be set up in one of the simulation rooms if desired. **SF** explained that he would no longer attempt the Belfast-Heysham passage with Mooir Vannin in place as the location of Mooir Vannin is where the key manoeuvring would take place and that it would now expose the vessel beam on to the SW winds when turning south past Mooir Vannin. **MM** noted that this is a fundamental problem with Mooir Vannin Offshore Wind Farm rather than the location of the Morgan Generation Assets. **CK** explained that the Manxman is a good seakeeping ship with better stabilizers, and that the IoMSPC masters have rarely had to weather route on the vessel. As a result, they don't have good statistics on the frequency of adverse weather routing.		
2	**Run 1 – Heysham to Douglas (Familiarisation Run)**		
2.1	**AR** noted that points would continue to be raised and discussed throughout the day and that the familiarization run should be started to get the runs underway. **AR** reminded attendees that the refined Mooir Vannin boundary (as of 12-Dec-24) is being used for all simulator runs in this session, with the minimum distance of 4.1 nm, compared to the 2.5 nm gap that was simulated at 2022/23 Nav-Sims.The familiarization run was undertaken, with the IoMSPC (BMC) transiting the Heysham – Douglas route, and with Stena Line transiting eastbound, in typical conditions (15 kts wind SW (225) and 1.5m 6s SW waves),		
2.2	**MM** noted that this situation was easily resolved with no real concerns. **MP** noted that the Stena Estrid did not appear on the radar. **CK** agreed. **MM** noted this and confirmed it should be sorted for the next run.		
3	**Run 2 – Stena Line Liverpool-Belfast (East IoM) with IoMSPC Douglas-Heysham**		
3.1	**MM** confirmed the next run could be done in both simulation rooms, one with the BMC transiting the Douglas-Heysham route, and one with the Stena Estrid, transiting from Liverpool to Belfast (East of the IoM). **MM** explained that the simulator rooms were set-up such that the vessels could realistically interact. **MM** noted that this run would also include one 90 m tanker east of Mooir Vannin, transiting southbound, as well some small craft (fishing vessels, yacht, and wind farm service vessels).		
3.2	**MP** noted that, in reality, the southbound tanker might not have kept so far away from the corner of the Walney extension. **SF** explained that a tanker would likely have travelled from the NE corner of Mooir Vannin to the West corner of Walney Extension in a straight diagonal to take the fastest route. In this event, the interaction would have become a bit more challenging.		

	MP emphasised that it is a concern that, in events like these, the largest increase in risk is at the corners of the windfarms and that there is likely more risk in real-world scenarios than in these ideal situations where vessels abide by the COLREGS and demonstrate good seamanship. **IS** asked whether this issue could be encountered around the Walney Extension that is currently in place without the addition of the new OWFs. **MP** acknowledged that it could but that it would be more likely with Mooir Vannin Offshore Wind Farm and Morgan Generation Assets given the necessary funnelling of traffic compared to the base case. **SF** added that stronger southwesterlies would mean that additional space would be kept between vessels and the turbines.		
3.4	**CK** noted no significant impact to the IoMSPC during this simulation run. They made a slight deviation to increase the closest point of approach (CPA) to the Stena Line vessel and were able to maintain 1nm from Morgan Generation Assets which is as close as they would be comfortable passing. The fishing boats did not pose a concern. **CK** noted that this behaviour would have changed slightly depending on weather conditions should they want to maintain greater separation from the OWFs. **MM** asked whether they would ever potentially pass south of Morgan Generation Assets to avoid traffic situations. **TT** and **CK** agreed that this would not be justifiable or worthwhile.		
3.5	**MP** noted the concern that the area is being transformed from open sea to near pilotage waters, increasing the baseline risk and requiring increased bridge manning. **IS** noted that the manning requirements were raised and acknowledged during the 2023 risk assessment and asked whether the presence of Mooir Vannin creates an additional effect. **TT** and **CK** explained that the impact to IoMSPC leaving Douglas is that the bridge manning would have to be slightly longer as a result. **MP** agreed that they would be impacted in the same way. **MP** noted that, even with increased bridge manning, there is still an increase in risk above baseline levels. **MP** added that, in the event of a breakdown or similar occurrence, the time available for engineers to fix issues is reduced. **MP** explained that, in a situation where a casualty needs to be assessed or winched up, the vessels need to be able to maintain the course requested by a SAR helicopter, for at least an hour. **DB** noted that typically the need to maintain a specific course is limited to the short period of winching rather than such a prolonged period. **IS** reiterated that it is the presence of Mooir Vannin that appears to compound that risk. **SF** summarised that the risks are the same, but the time exposure to these risks is increased with the additional project. **MP** noted that these risks must be taken extremely seriously such that these concerns can be evidenced in the future in the event an incident occurs.		
4	**Run 3 – Stena Line Belfast-Liverpool (East IoM) with IoMSPC Heysham-Douglas**		
4.1	**MP/SF** confirmed that this passage was easily comfortable for them, met COLREGs, and confirmed they stuck to the passage that they would expect any vessel coming down from west of Mooir Vannin to do.		

	SF acknowledged that for IoMSPC, it is likely that decision making in adverse weather would be easier as there was only a short turnaround of approximately 3-hours between being in the position whilst transiting in the other direction. **MM** noted that the IoMSPC reduced speed less than during previous simulations, when it was shown that a greater reduction in speed could result in the vessel exhibiting excessive roll motions. It was noted that in the simulator, a reduction in speed to c.8 knots resulted in more roll than would be expected in real life and the simulator has some conservatism but ultimately it would be more uncomfortable for passengers at slow speeds. It was also noted that this situation was largely independent of the gap between Morgan and Mooir Vannin. **MM** noted that Mooir Vannin does not have an impact on the encounter at the corner of Walney but it does affect the approach position and angle.		
4.2	**CK** and **TT** noted that a fishing vessel did not show on the radar and ECDIS was not working either, so one trawler was not noticed due to lack of visibility both on radar and visually. **MM** confirmed this was a simulator glitch and would be rectified for the following runs. **TT** noted they had to reduce speed a lot more coming into proximity of the windfarms to allow more time to assess the situation. **CK** noted that there would have been an increase in passenger discomfort for a short section of the passage. **CK** noted that cargo shift could have been experienced if the swell increased. **MM** noted that the fishing boats in Isle of Man waters offset the BMC north towards Mooir Vannin and the presence of Morgan Array Area had little effect on the action taken.		
4.3	**AR** asked Stena Line whether they would like to test a route in 50kts wind, and if so, which route. **SF** explained that in those conditions they would not make the transit north of Mooir Vannin, and they would likely come southward along the Welsh coast and then head eastward, straight across.		
4.4	**AR** suggested that the next run should look at the response of the BMC to the fishing fleet when coming out of Douglas, with a transiting tanker too. **All attendees** agreed this should be done next. **JL** added it would be useful to simulate two passenger ships meeting and transiting into Heysham at the same time with another ship also in the area. **AR** confirmed the next run would simulate two passenger ships (one IOMSPC vessel and one Stena Line vessel) meeting at the entrance to the Morgan-Walney route whilst on passage into Heysham, with another ship also in the area.		
5	**Run 4 – Stena Line and IoMSPC on route to Heysham via Morgan-Walney Route**		
5.1	**MM** informed all attendees of a power-cut minutes into the fifth simulator run. During the power-outage a discussion was held on risk control measures: **TT** highlighted that emergency issues like blackouts could occur on vessels in these scenarios and increase the risk of an incident.		

	DB noted that vessel masters could call a tug from Liverpool/Dublin in an event like this but also acknowledged that a tug is unlikely to venture out in very heavy weather. In this case, it was suggested that rig support vessels could come to assist in these situations. The **ferry operators** present maintained that some mitigation measure(s) should be in place for such a situation, and referenced the Ro-Ro vessel, *Riverdance,* which grounded off Heysham in 2008 after being hit by a large wave. **DB** commented that Riverdance could not have passed a tow line due to the weather and the dangers of having personnel out on deck. **Attendees** discussed the possibility of various measures, including a boom buffer. It was noted that this would stop vessels navigating into the wind farm. **AR** noted that this was contrary to the UK position that vessels should be able to navigate through an OWF. The possibility of a Force Majeure clause was also raised as a consideration in case of a failure. **TT** and **CK** highlighted the 5m limits of the *Manxman,* and the Marine Evacuation System (MES), and explained that the vessel cannot go to Dublin too far from land. **DB** noted that 5m would be associated with such significant winds that would never get into Heysham. **Ferry operators** explained that they felt additional towing capability or resource may well be required in these situations. **AR** noted that provision of an Emergency Tow Vessel (ETV) was discussed at the previous hazard workshops and given that vessel allisions were scored as Medium Risk and relatively unlikely, and the very high cost of procuring and operating an ETV would be disproportionate, this measure was not adopted. It was further noted that given the distance that the ETV would inevitably be from the vessel in need of assistance, it would likely take a minimum of 2 hours to reach the ferry. Given this time duration, the ferry could drift, potentially negating the benefit of an ETV. **DB** added that, further to the ETV reaching the vessel requiring assistance, getting the tow up may take additional time, as well as risking injuries to crew as was the case during the previously referenced incident involving *Riverdance.* It was noted that the potential use of drones to pass lines in the event of towage situations is being investigated. **MM** informed attendees that the power had been restored, and the fifth simulator run was rerun.		
5.2	**CK** noted that there was no risk of collision with the oncoming tanker and confirmed there was adequate sea room for manoeuvre.		
5.3	**SF** confirmed that this was similar to a relatively standard merging traffic exercise but explained that he was considering the position of the tanker when the Stena Line vessel passed in front of the tanker to join the Morgan-Walney route. **MP** emphasised that there is generally additional convergence at windfarm corners and therefore more potential for incidents.		
5.4	**IS** concluded that there was enough space to conduct manoeuvres to avoid convergence. **DB** commented that this was a crossing situation and the Stena Estrid should have gone to starboard around the BMC. **SF** agreed that the Stena Line vessel could have passed astern of the BMC. **MM** noted that this same situation could have occurred anywhere and the presence of Mooir Vannin hasn't substantially changed this situation.		

5.5	**AR** confirmed that the next run would see the BMC transiting through the fishing fleet that can be present south of Mooir Vannin, with Stena Line heading northward from the south of the IoM. **AR** noted that this was the worst case situation observed from the AIS data analysis , and would pose maximum obstruction to IoMSPC.		
6	**Run 5– Ben-my-Chree passage through worst case fishing fleet south of Mooir Vannin**		
6.1	**SF** confirmed that there was no real issue for Stena Line transiting northward toward the gap between Morgan Generation Assets and Mooir Vannin Offshore Wind Farm. Stena Line maintained 1nm distance from the Morgan Array Area and maintained space from fishing vessels.		
6.2	**TT** noted that the BMC maintained a 1nm distance from the closest most northerly fishing vessel and 0.66 miles from the turbines in the southwestern corner of Mooir Vannin.		
6.3	**TT** confirmed that the IoMSPC vessel would have passed south of the fishing vessels and had greater CPAs had the Stena Line vessel not been approaching from the south. **MM** noted that slowing down and allowing the Stena vessel to pass could have been an alternative option. **CK** noted that a master would be required in this scenario due to the precision required to navigate between fishing boats and maintain separation from the windfarm. It was noted that currently, in that scenario, they would turn to starboard to clear the fleet completely, which they would not be able to do with the presence of Mooir Vannin. It was agreed the presence of Morgan Array Area did not affect the ability to take this action.		
6.4	**AR** asked stakeholders whether there were any other scenarios that attendees wanted to try. **AR** suggested trying the same scenario with the Manannan (High-Speed vessel) instead of the BMC. **TT** and **CK** agreed.		
6.5	**MP** explained how the additional presence of Mooir Vannin will likely make the Stena adverse weather route East of the IoM impossible. It was therefore agreed that an additional run would be attempted for Stena Line in 50kts East of the IoM.		
7	**Run 6 – Manannan passage through fishing fleet south of Mooir Vannin**		
7.1	**TT** confirmed that it was relatively easy to clear traffic quickly with the High-Speed vessel. **TT** noted that the high-speed vessels are quite temperamental, and dynamics can change very quickly if something were to occur such as engine loss. **MM** asked if this is more likely to occur in adverse conditions. **TT** and **CK** confirmed it is, and that this is why more caution is required during bad conditions		
8	**Run 7/8 – Stena Line in Adverse Conditions (30-50kts Wind, 4.2m Swell)**		
8.1	**MP** commented that initially, heading south was okay, even at 50kts. However, after some deliberate poor seamanship to investigate the effects of getting bad weather behind the ship, the vessel experienced rolls of 11 degrees each way, which would not be acceptable. **MP** acknowledged that it could possibly be done better by going further south.		
8.2	**MM** explained that they are planning to do one more run in the morning to investigate the scenario of Stena Line heading northward to the west		

	of Morgan Array Area and then east of Mooir Vannin Offshore Wind Farm.		
8.3	**SF** explained that while they may get through the gap okay, the north eastern corner of Mooir Vannin Offshore Wind Farm will be more challenging. **IS** noted that the one run in the morning should provide evidence of their limited options with the addition of Mooir Vannin Offshore Wind Farm.		
8.4	**MP** noted that, if they were to pass west of Morgan Array Area to get between Mooir Vannin Offshore Wind Farm and Walney Extension, it is quite a significant diversion, and the vessel might still be quite exposed and would experience excessive roll.		
9	**Day 1 Debrief**		
9.1	**MM** noted that the following broad conclusions: • All manoeuvres could be accommodated in these worst credible situations with the presence of the OWFs (with a 4.1nm gap between Morgan Generation Assets and Mooir Vannin), particularly for commercial vessels, supposing everyone behaves in a 'seamanlike manner', and abides by regulations. • Fishing trawlers provide more complexity to the navigation situations given the irregularity in which they can operate but that vessels were able to successfully navigate between them. • A slowing vessel may be required in this situation to enable safe passage. Although the space is adequate, it would no longer be open space and therefore does increase the risk above the present day. Moreover, impacts to journey time may be felt due to deviations or reductions in speed. • There may be an impact on the crew included what time they're on duty, their shift patterns, experience levels and the type of crew required (i.e. experienced master). • There is a reduction in the availability of alternative routes, such as in bad weather, but this was principally due to the presence of Mooir Vannin and the change in the southern boundary did not alter this. All attendees agreed with this summary.		
9.2	**MP** asked whether each run would be assessed according to various criteria tomorrow. **MM** confirmed it would. **CK** raised visibility as a factor that would affect the outcomes, for example by increasing the CPA kept. All attendees agreed.		
DAY 2 – Final Nav-Sim Run and Hazard Review Workshop			
10	**Run 9 – Stena Line 'S-curve' Passage in Adverse Conditions (50kts, 4.2m Swell)**		
10.1	**MM** confirmed that the run would be for Stena Line to transit in adverse conditions (50kts wind) on the S-shaped transit between Mooir Vannin Offshore Wind Farm and Morgan Array Area and then northward between Mooir Vannin Offshore Wind Project and Walney Extension. **MM** explained that this is mostly experimental to identify what the roll on the vessel would be like when changing the heading in those conditions.		
10.2	**MP** and **SF** confirmed that there was little motion/roll in that position, maintaining 1nm CPA, but noted that there may be a challenge to get the vessel into that starting position.		

11	Hazard Review Workshop: Introductions and Navigation Simulation Summary		
11.1	Brief introductions were made by all attendees.		
11.2	**AR** summarized all the proposed projects in the Irish Sea and the key events in the Morgan Generation Assets application process to date, including the agreement for and grant of lease, the scoping assessment, PEIR, boundary changes (and subsequent reassessment and application), and the additional proposal of Mooir Vannin. **AR** summarized the main conclusions of the Morgan Generation Assets Application, namely that cumulatively (but without Mooir Vannin), the projects created no unacceptable risks to navigation. However, with the addition of the Mooir Vannin Scoping Boundary, the sea room between Morgan Array Area and Mooir Vannin Scoping Boundary was insufficient, and risks were unacceptable. It was also concluded that the projects individually and cumulatively would have a moderate adverse impact on ferry routeing.		
11.3	**AR** explained the reason for this third set of navigation simulations. Mooir Vannin OWF proposed a refined boundary at their hazard workshop (12-Dec-24) that increased the space between Mooir Vannin Array Area and Morgan Array Area to a distance of 4.1nm compared to 2.5nm as originally proposed. The Applicant notes that the results of Mooir Vannin's cumulative assessment will not be available until the end of the Morgan Examination. Therefore, Morgan Generation Assets wishes to provide an update to the ExA prior to completion of Examination on how the conclusions of the cumulative assessment have been affected by the change to Mooir Vannin boundary. **AR** highlighted the next dates for presenting information to the ExA: Issue Specific Hearing (ISH) 3 on 12-Feb-25 and Deadline 6 on 27-Feb-25. **MP** queried whether the new proposition for Mooir Vannin boundary is set in stone. **PG** explained that technically it could be changed prior to their application (expected March 2025) but that this is highly unlikely given what has been presented to stakeholders so far and communicated to the Morgan Generation Assets examination by Mooir Vannin Offshore Wind Farm Limited. **RH** explained that Morgan Generation Assets are expecting Mooir Vannin to have submitted this information to the ExA at Deadline 5, and therefore for it soon be in the public domain and unlikely to change. **AR** acknowledged the concern and explained that the assessment is being undertaken on the best information currently available. **MP** noted that Mooir Vannin have not attended this hazard review meeting and expressed that their attendance would have been helpful to provide clarity and/or confirmation on the situation. **PG** acknowledged this but reiterated that Mooir Vannin were invited to attend, but identified that they would not have anything specific to add in the context of the Nav Sims, as it would be for the individual captains to comment on transiting through the gap in their individual vessels. The Applicant respected their position and it was agreed that as the Applicant had the updated Mooir Vannin boundary nothing further was required from Mooir Vannin to inform the simulations.		
11.4	**AR** provided a recap of the cumulative assessment contained within the Application, specifically that 2.5nm (between Morgan Array Area and Mooir Vannin Array Area) would not enable vessels to maintain adequate CPA from vessels and structures.		

11.5	**MM** summarized the key findings from the simulations undertaken the day before. Two simulators were run but these were integrated such that IoMSPC and Stena Line could interact with one another. Simulations considered realistic but unlikely worst credible traffic scenarios rather than day to day situations. **MM** explained that the key conclusions were generally similar to past simulations. Overall, available sea room between Mooir Vannin and Morgan Generation Assets was sufficient for safe navigation, although it was acknowledged that the navigation risk was elevated from present/baseline risk, given the confinement. In these worst case scenarios there was potential for significant roll and higher passenger discomfort if a vessel had to slow down during higher wave conditions to avoid other vessels. **MM** explained that the Stena Line's current adverse weather route was expected to be blocked by Mooir Vannin OWF. However, an alternative route between Liverpool and Belfast (east of the Isle of Man) between Mooir Vannin Offshore Wind Farm and Morgan Generation Assets and then west of Mooir Vannin Offshore Wind Farm was simulated this morning. While the route proved viable, it might be challenging to ensure they can reach the 'starting' position that was used. **MM** added that the high-density IoM fishing fleet south of Mooir Vannin Offshore Wind Farm was also simulated using a worst credible real scenario observed following 56 days of vessel traffic surveys, with up to 11 trawlers in one simulation. IoMSPC found that the masters could avoid the fishing vessels adequately with safe separation, although 1nm CPA was not always possible. **MM** stated that the routes are more complex in channels compared to open sea so bridge manning may need to be increased. **MM** noted that no simulations were run at night or in poor visibility given that sea conditions are likely to be better when fog is present, and that Mooir Vannin's lighting arrangements are not fully known.		
11.6	**AR** added that simulations concentrated on the BMC rather than the Manxman, and one run also used Manannan (High Speed Vessel). **AR** invited opportunity for questions. **RM** asked what the timeline would be for provision of written and visual summary of this meeting for full digestion. **AR** confirmed that at the latest, this is hoped to be submitted at Deadline 6 on 27-February-2025 but there may be the opportunity to fast-track plots for early comment however this can't be guaranteed. **RM** noted it would be beneficial to get a review from the ferry operators prior to submission.		
12	**Hazard Review Workshop: Risk Assessment Process**		
12.1	**AR** explained that this is now the third iteration of the risk assessment, and therefore the methodology is the same as has been explained at previous sessions. **AR** explained that a draft hazard log was developed through the 2022 PEIR and 2023 Environmental Statement stages to form an initial assessment of risk which was presented in the NRA as part of the Application.		
12.2	**AR** explained that the risk assessment is based on standardized risk criteria for likelihood and consequence. The risk scoring methodology uses a most-likely and worst -credible scenario and how these metrics are appropriately weighted in the overall risk score.		

12.3	**AR** recaps the list of embedded risk controls included in project design.		
12.4	**AR** presented all the additional risk control measures that have been previously suggested at 2022/2023 Hazard Workshops.		
12.5	**AR** explained how the hazard log is displayed and walked through the scoring process for an example hazard. **AR** explained that the consequences should not have changed much since prior workshops, and that it is predominantly the likelihood that might have changed as a result of the boundary change and subsequent increase in gap distance. **MP** asked whether the previous scores are being changed or whether the hazards are being rescored entirely. **AR** explained the proposition that the risk scores for applicable hazard scenarios are taken from the previous hazard workshops and that these are used as a baseline for the updated scores. **AR** also proposed that the three hazards involving ferries should be focused on in this workshop, rather than for fishing and recreation. The Applicant will review these other scenarios based on the updated information but notes they were all scored as Medium Risk with the 2.5nm separation.		
13	**Hazard Review Workshop: Hazard 1 – 'Collision - Ferry/Passenger or Cargo/Tanker ICW Small Craft'**		
13.1	**AR** presented the first hazard: Collision between Ferry/Passenger or Cargo/Tanker with small craft (e.g. fishing vessel). **AR** summarized that this was given a high likelihood score (4) previously, given the lack of opportunity for manoeuvring out of the way of fishing vessels. **AR** summarized that the worst credible has potential for multiple fatalities, but the likelihood was lower than the most likely consequence (3). This was therefore deemed an unacceptable risk with the 2.5 nm separation.		
13.2	**AR** presented the fishing activity south of Mooir Vannin Offshore Array Area that may cause a significant issue for IoMSPC vessels navigating between Morgan Array Area and Mooir Vannin Offshore Array Area and noted that the most recent simulations featured these fishing vessels numerous times and all runs were achieved successfully, albeit with reduced CPA beyond the preferred 1nm. **TT** agreed but noted that the presence of Mooir Vannin prevents the master from taking early action to completely avoid the situation. **MP** highlighted that some of the fishing vessels currently fish within the Mooir Vannin Array Area and asked whether it is likely this will continue or whether fishing traffic is likely to condense as a result of the Project. **RH** noted that the fishing activity may be part of the reason why Mooir Vannin reduced their southern boundary.		
13.3	**MP** noted that the IoMSPC had been forced to transit < 1nm from a fishing vessel during the simulator run. **CK** agreed they were on the limit of a safe CPA and highlighted that, in adverse weather, it would have completely changed due to lack of visibility of the fishing vessels. **CK** added that with the Manannan, they came within 0.5nm which is unlikely to occur in real life, given the risk of coming that close and the unpredictable behaviour of fishing boats.		

	AR acknowledged this and noted that the IoMSPC routinely and are comfortable navigating within 1nm of fishing boats transiting at 2 knots without the presence of the OWFs. **MP** noted that when considering the number of transits like this that will occur over the 35 years operational lifecycle, it seems likely that an incident will occur at some point. **IS** proposed that restricted visibility should be considered as a separate risk item. **AR** recommended for consistency that the hazard list was kept the same.		
13.4	**CK** noted that nighttime decision-making and fatigue is a relevant factor to account for during transits at first light and in the evening where encounters with fishing boats are still likely. **AR** confirmed that the presence of Morgan Generation Assets will not affect the IoM fishing activities as they are restricted to IoM fisheries areas. **NS** questioned the project team whether there is an impact on the fishery and whether this will in turn dictate fishing movements. **RH** confirmed that the assessment concluded there would not be an impact on scallop fishing (for IoM or Scottish scallopers) and the design layout of Morgan Generation Assets would facilitate coexistence with fishing vessels. Even if this were not the case, those vessels fishing within the Morgan Generation Assets area do not fish within IoM waters and therefore, there would not be spill over into the area in question. **AR** summarized that the consequence is not likely to change from the previous scoring. However, while the CPAs in worst case situations were less than ideal in the simulations, the spacing is still considered acceptable and the increased distance does provide more space for manoeuvring. **MP** explained that, if 1 nautical mile CPA was difficult to maintain in the simulation then the likelihood over numerous transits for35 years of operation is thought to be more likely than 1 in 100 years and should therefore remain scored as a 4. **CK** agreed that the simulator runs proved that in the weather conditions tested, the vessel was only just within safe navigational limits and CPA from both windfarm and vessels.		
13.5	**JL** mentions that during certain runs, it will still be dark which may affect decision-making in those scenarios. **AR** explained that it seems unlikely it would happen multiple times during the project lifecycle, and that the simulation from the previous day was the worst-case fishing situation that had been seen in the vessel traffic surveys and so would be infrequent. **TT** explained that there have been a few near misses, and there would be concern passing less than 1nm from the fishing vessels. **MP** emphasised concern that were an incident to ever occur, it would be deemed the fault of the operator, rather than the windfarm. **CK** pointed out that whilst the worst-case fishing scenarios were tested, the worst sea state was not. **AR** explained that those fishing vessels, given their small size, as shown in the survey data would not be there in the event of adverse sea states.		
13.6	**PG** noted that the nature of the resource (scallops) meant that the fixing ground was reasonably fixed as it is linked to sediment types (unlike the pelagic fishing activity) and therefore, the scenario would not change if Morgan Generation Assets were not present (i.e., there would still be a need (in this worst case scenario) to route to the north to bypass the		

	fishing fleet, and therefore, Morgan Generation Assets cannot influence this scenario). **MM** acknowledged that the presence of the Mooir Vannin Offshore Wind Farm prevents them from avoiding the fishing fleet in a typical way, by stopping them routing north and then coming south into Douglas. **JL** added that the increased spacing doesn't seem to help the situation as the fishing boats are still going to be there and will likely just move further north. **AR** explained that the number of fishing boats wouldn't change in such a scenario and therefore the increased gap distance will lower the density of vessels and increase the space between fishing vessels that the ferry could then pass through in a manner consistent with their current behaviour. **JL** asked whether the data indicates whether fishing vessels are likely to aggregate around the boundaries and turbine structures as is seen elsewhere. **TT** notes that some use nets, so it cannot be exclusive to scallop fishing.		
13.7	**IS** acknowledged that if dealing with the fishing vessels as a fleet, rather than individual vessels, then the presence of Mooir Vannin does prevent their preferred avoiding action (to the north). **AR** noted that this is not evident to be current practice, based analysis of their current practice. **CK** argued that if possible, they always go around the whole fleet, and only go through them if they can't. **TT** agreed. **JL** expressed concern that the 2-week dataset doesn't reflect all scenarios. **TT** suggested that the presence of Mooir Vannin prevents early action to be taken despite the increased gap, and therefore the likelihood has not reduced to the extent required by the assessment criteria. **IS** reiterates that it is whether the boundary change specifically that influences the score. **TT** notes varying perspectives on the risk, comparing the mathematical view that the less dense distribution of fishing vessels will improve navigation through the fleet, with the mariners' reservations influenced by previous experience and their reduced ability to avoid the whole fleet. **All attendees** agreed that the presence of Morgan Generation Assets does not have the means to further influence the risk associated with this particular scenario as it relates to the presence of Mooir Vannin to the north of the fishing grounds. With regard to the overall risk score, it was agreed that there would be an agreement to disagree, and that the next hazard should be discussed. The Applicant's position is that a separation of 4.1 nm reduces the (very unlikely worst case) risks to Medium Risk, whilst the IoMSPC and Stena Line contend the risks are still unacceptable. The MCA and UK Chamber of Shipping did not comment.		
14	**Hazard Review Workshop: Hazard 2 – 'Allision - Ferry/Passenger'**		
14.1	**AR** presented the second hazard: Allision of a Ferry/Passenger. **AR** explained that the likelihood of the most likely scenario was previously scored as 3 and the same scoring was given for the worst credible scenario, which meant that the overall risk was deemed unacceptable due to the high consequences. **AR** suggested that the consequence is unlikely to change as a result of the increased space, but the likelihood has improved as there is far greater separation from the wind farm boundaries from the passage plan routes and therefore more time to react to an incident.		

14.2	**MP** noted that the drift time has increased on the western side of Morgan Generation Assets and Mooir Vannin Offshore Wind Farm route in predominant wind. Currently a 1.6-mile drift, with an additional drift time of about an hour to take mitigating action.		
14.3	**AR** explained that, looking at precedent elsewhere, this gap is wider than many passages between other OWFs, such as in the North Sea or specifically in the Irish Sea between Ormonde and West of Duddon Sands and Walney. **MP** argued that the windfarms being proposed are significantly larger than these other windfarms, such that vessels are constrained for a greater period of time. **IS** suggested that there are two types of transit here: a vessel in normal transit and a transit in which a vessel is disabled, where the risk is much higher. **IS** added that the duration of the passage is a significant factor when considering the drift distance. Therefore, **IS** questioned whether 4.1nm is any better than 2.5nm. All stakeholders agreed that 4.1nm is much improved on 2.5nm.		
14.4	**AR** explained that, at the previous hazard workshop, a consensus was reached that 4.2nm (between Morgan Generation Assets and Walney Extension) is a sufficient space to account for the low likelihood of a drifting vessel scenario to Medium Risk and ALARP levels. In that regard, the transit between Mooir Vannin Offshore Wind Farm and Morgan Generation Assets is therefore no riskier than the transit between Morgan Generation Assets and Walney Extension, and must be safer than the previous 2.5 nm separation. **MP** noted that he may have scored the previous risk scores differently given recent learned experience. It was suggested that the difference in the risk of a vessel breaking down versus an allision because of a navigational/human error was not differentiated adequately in previous scoring. **AR** noted that the hazard being assessed in both 2022 and 2023 clearly identified a disabled vessel as a possible cause. **AR** pointed out that the separation between projects is greater than in practise elsewhere, and the RoRos operating in the area are more reliable and must meet a higher standard of redundancy than cargos/tankers elsewhere between OWFs which are deemed acceptable. **AR** asked attendees why is this is being considered more dangerous than in other locations where there have been no incidents. **TT** noted back to previous loss of vessel control experience. **TT** explained that a new software system was the reason for initial issues with the IoMSPC vessel reliability. **AR** noted that there have not been any mass loss of life events anywhere in the world, and there have been no allision events between a ship and turbine in the UK and therefore the industry safety standard is high.		
14.5	**JL** made the argument that as more wind farms are built, the overall risk of an allision increases and the same is true for the Irish Sea. **MP** similarly stated that the timespan listed in the assessment criteria is very large and that there is high potential for one transit (of the hundreds and thousands that will occur in 100 years) to not go to plan and result in an allision with a turbine. **SF** added that he would have transited the area 10,000 times in the project's 35-year lifespan.		

	AR noted that this is reflected around existing windfarms and is comparable.		
14.6	**MP** acknowledged that the risk is inevitably less likely due to the increased distance between the projects. However, according to the criteria of the risk assessment, he does not think the risk can be considered any less likely than a 3. **SF** agreed that while the risk may reduce, it does not warrant moving down an entire category to a 2. **IS** suggested that an allision as a result of a mechanical failure and as a result of human/routine mistakes should be split into two separate hazards. **AR** and **DB** explained that the likelihood of a master or other crew member making a mistake of that magnitude is extremely low. **MP** concluded that mechanical failure was likely not included in the previous risk assessment. **DB** responded that, during the 2023 workshop, there had been no discussion regarding separating out human error from mechanical failure and the discussion on allision risks amongst stakeholders included both human error and mechanical failure. **AR** reiterated that, if this was the case, the scoring in the 2023 risk assessments included within the Application would be too high if only accounting for a navigational error. Therefore, the base score of 3 must have included an appreciation of both human error and mechanical failures. **IS** concluded that the previous 2.5nm was unacceptable, whether in the event of a breakdown or not. Now, 4.1nm is considered by stakeholders to be unacceptable only in the event of a breakdown. **AR** reiterated that there are multiple windfarms with consent that have much less than 4.1 nm separation and have significantly greater traffic densities. **SF** acknowledged that 4.2nm was previously accepted for the Morgan Generation Assets to Walney Extension passage, so on that logic, the extension to 4.1nm is an improvement within the same parameters as the previous risk assessment. **MP** argued that while this is true, it still does not capture what is now deemed an important distinction that was not previously accounted for (the difference in risk between allisions caused by breakdowns or navigational errors). **AR** suggested that, in the interest of time, and given the circular nature of the debate, the next hazard is discussed. **All attendees** agreed that there would be an agreement to disagree, and that the next hazard should be discussed. The Applicant's position is that a separation of 4.1 nm reduces the risks to Medium Risk, whilst the IoMSPC and Stena Line contend the risks are still unacceptable. The MCA and Chamber of Shipping did not comment.		
15	**Hazard Review Workshop: Hazard 3 – 'Collision – Ferry/Passenger ICW Cargo/Tanker or Ferry/Passenger'**		
15.1	**AR** presented the third hazard involving ferries: collision of a ferry/passenger with another ferry/passenger or a cargo/tanker vessel. **AR** presented the commercial passage plans through the Project area to explain which scenarios some of the simulations the previous day were trying to create. **AR** explained that Mooir Vannin did have an influence on Stena Line's approach angle near Walney Extension, which impacted the types of crossing situations experienced. **SF** agreed.		

	AR summarized that the hazard was scored as Medium Risk in the previous hazard workshop.		
15.2	**MP** added that it is the eastern channel to Mooir Vannin that is particularly relevant to this hazard (between Walney Extension and Mooir Vannin), but the boundary change only really affects the southern boundary, so it is unlikely that this would make much difference to the likelihood. **All attendees** agreed that the risk would remain as Medium Risk with the boundary changes. **AR** summarized that there is consensus that the risk is better overall, but that IoMSPC and Stena Line did not believe the scores need to be changed using the criteria. **All attendees** agreed.		
15.3	**PG** suggested that the ExA are likely to ask what mitigation would be required to change the collision and allision risk scores if the boundary change has not reduced the risk sufficiently to change the score. **MP** and **TT** summarised that constructing four large windfarms presents risks that cannot be mitigated to an adequate level in the opinion of stakeholders. Therefore, there is no acceptable separation width between the Morgan Array Area and Mooir Vannin Array Area. **MP** asked whether there would be further analysis with regard to the 20-degree rule with the addition of Mooir Vannin Offshore Wind Farm. **AR** explained that PIANC guidance is probably better guidance than the 20 degree rule as it takes in to account separation distances, and its accuracy is not limited by the length of the channel. **AR** noted that the PIANC guidance requires a separation of less than 4.1nm for the sizes of vessels and frequency of transits through that route. **MP** asked whether this had already been assessed. **AR** explained that the calculations are already within the CRNRA and confirmed that an update to this analysis would be shared with stakeholders. **AR** confirmed that PIANC stipulates 3.7 nm is minimum distance for a 300m vessel (noting maximum sizes of vessels between Morgan Generation Assets and Mooir Vannin Offshore Wind Farm are likely to be less than 200m).		
15.4	**AR** thanked all attendees for their attendance.		

Appendix B IoMSPC Ben-my-Chree Douglas-Heysham Transits

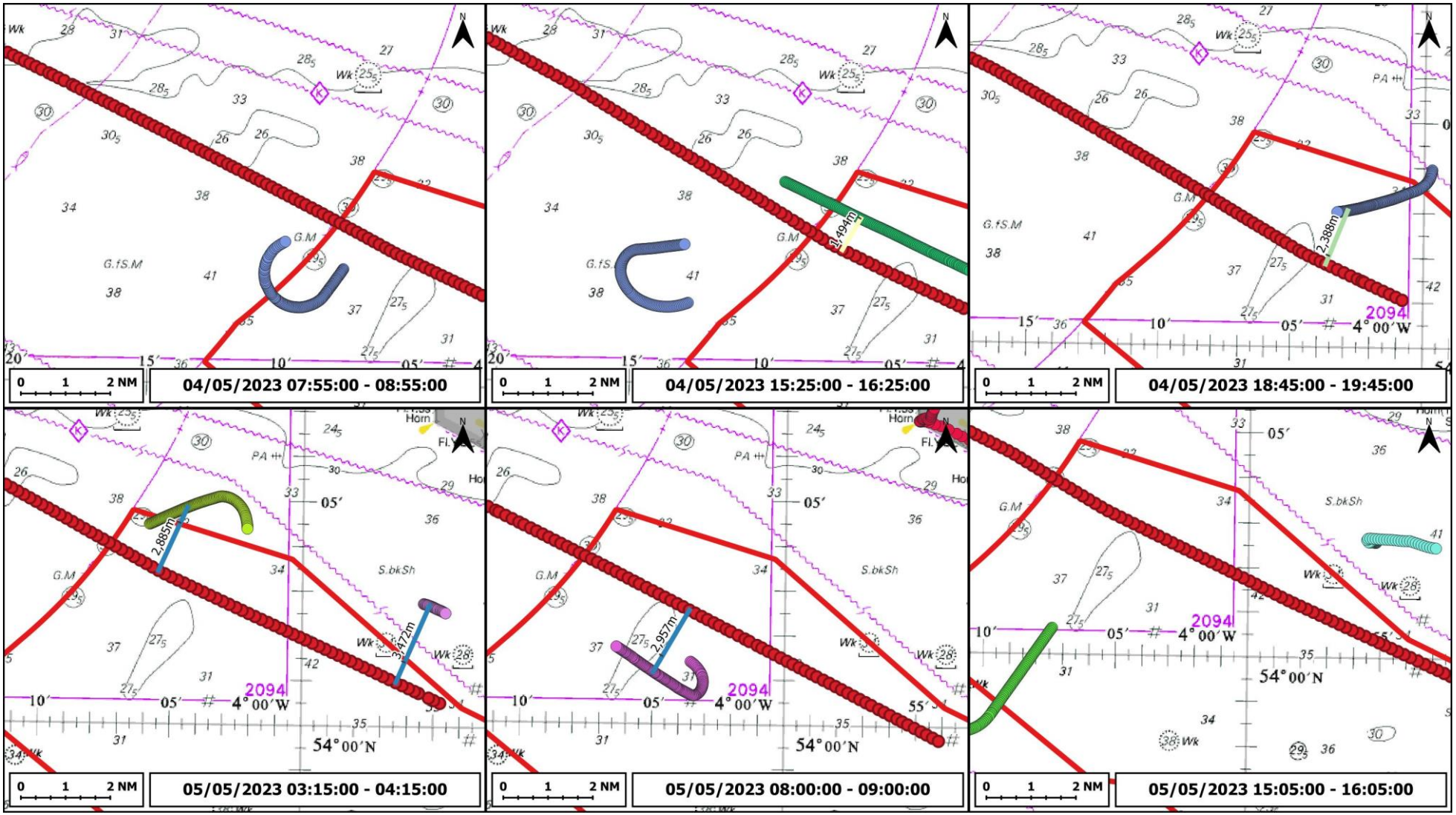


Figure B.1: Ben-my-Chree Radar Analysis 1

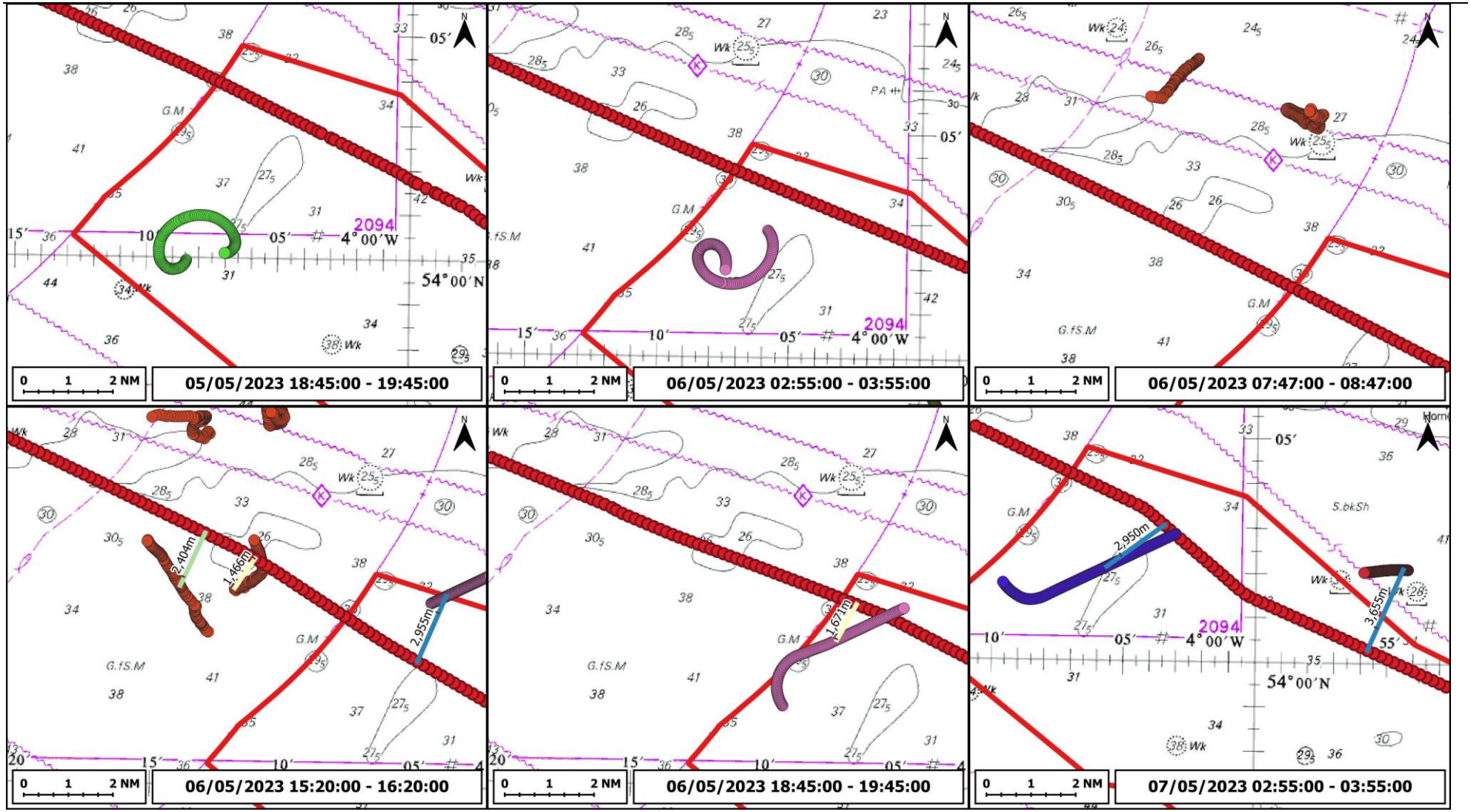


Figure B.2: Ben-my-Chree Radar Analysis 2

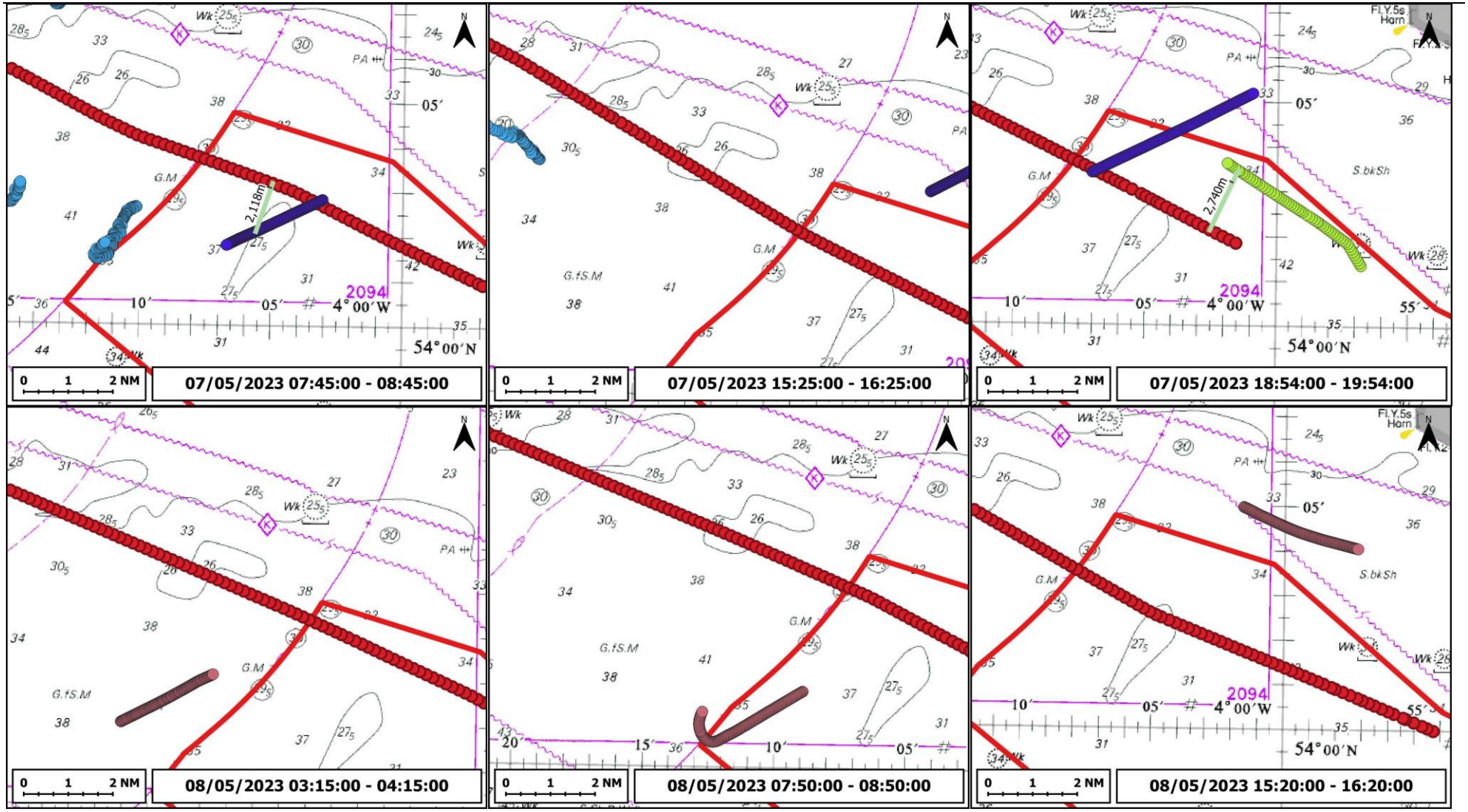


Figure B.3: Ben-my-Chree Radar Analysis 3

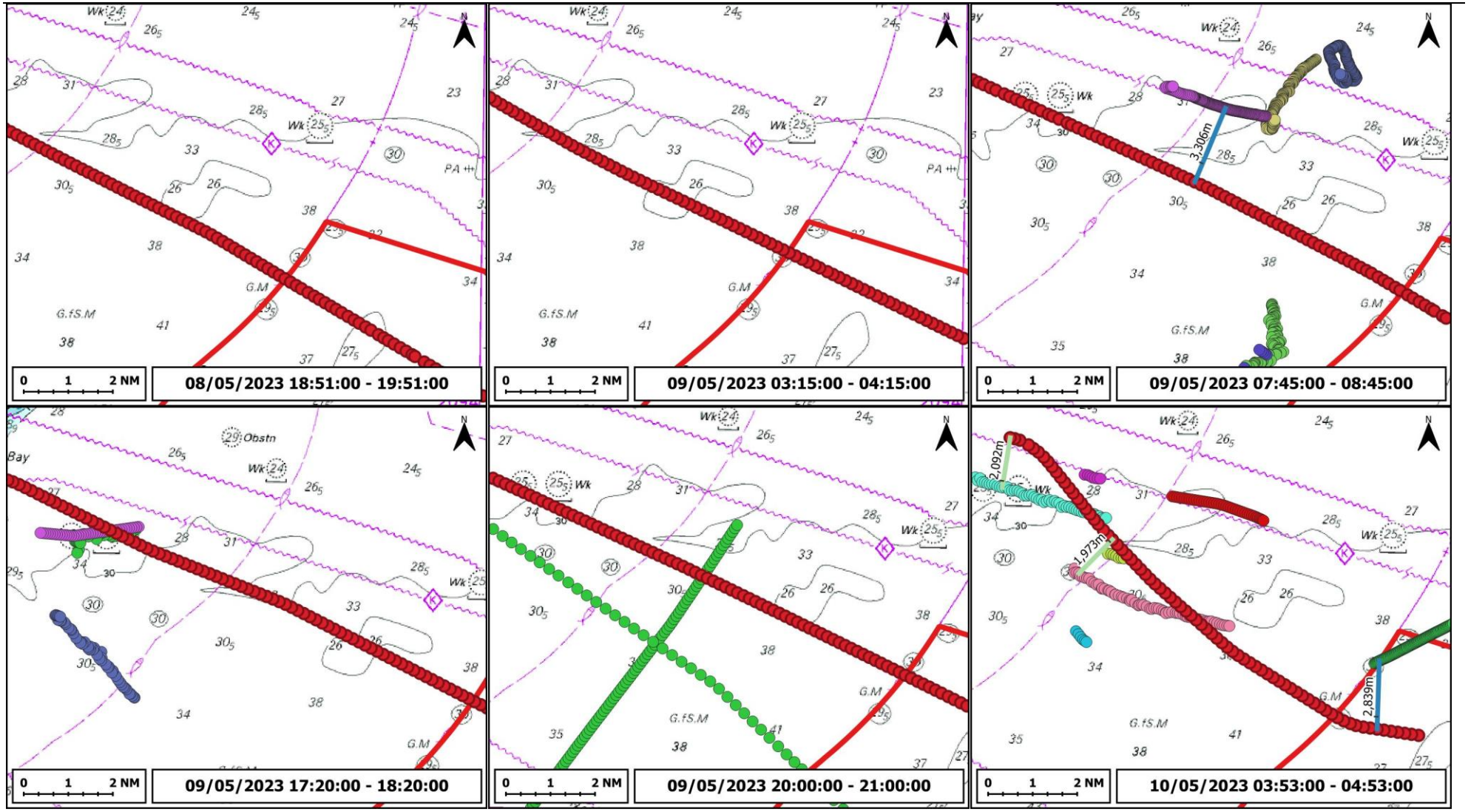


Figure B.4: Ben-my-Chree Radar Analysis 4

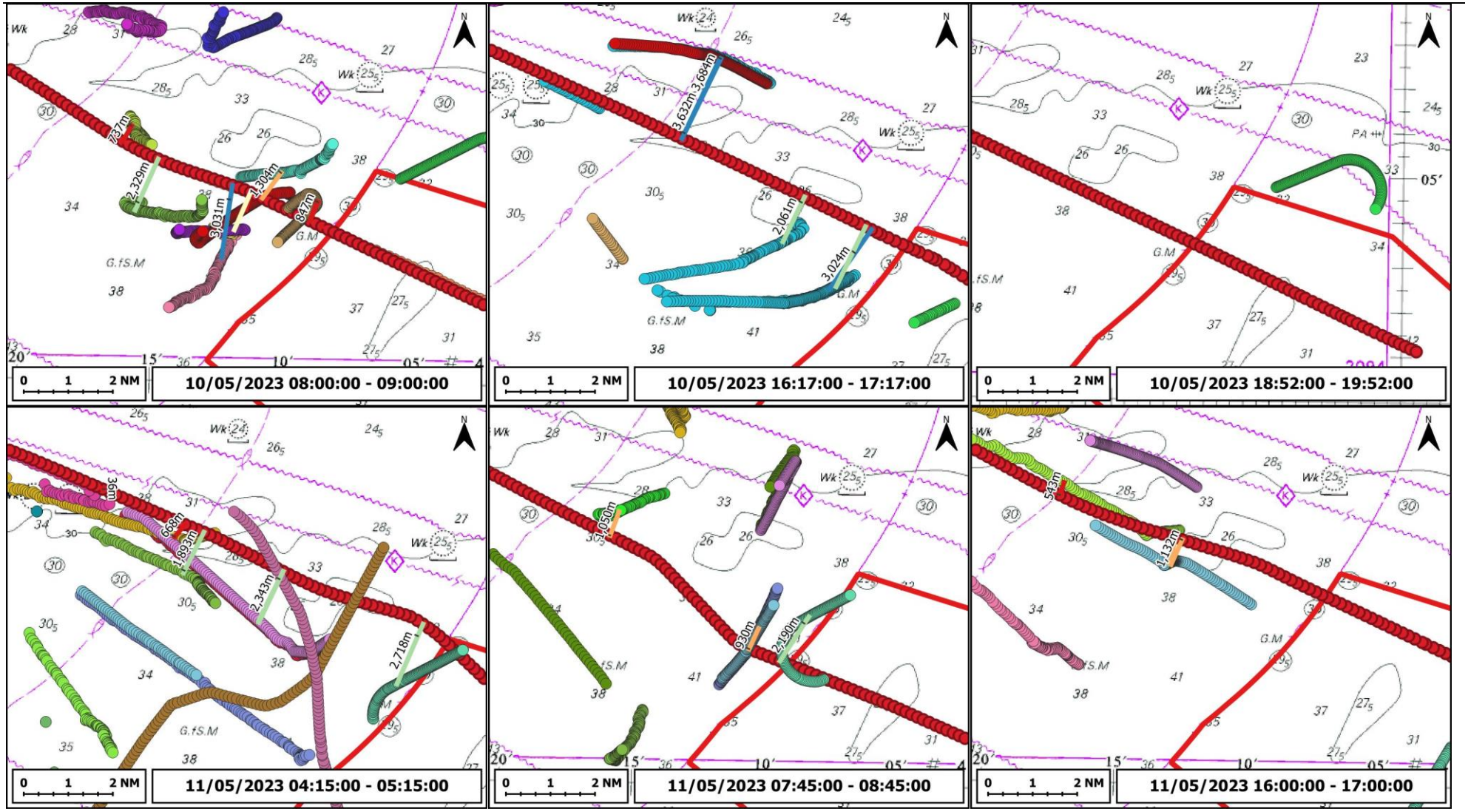


Figure B.5: Ben-my-Chree Radar Analysis 5

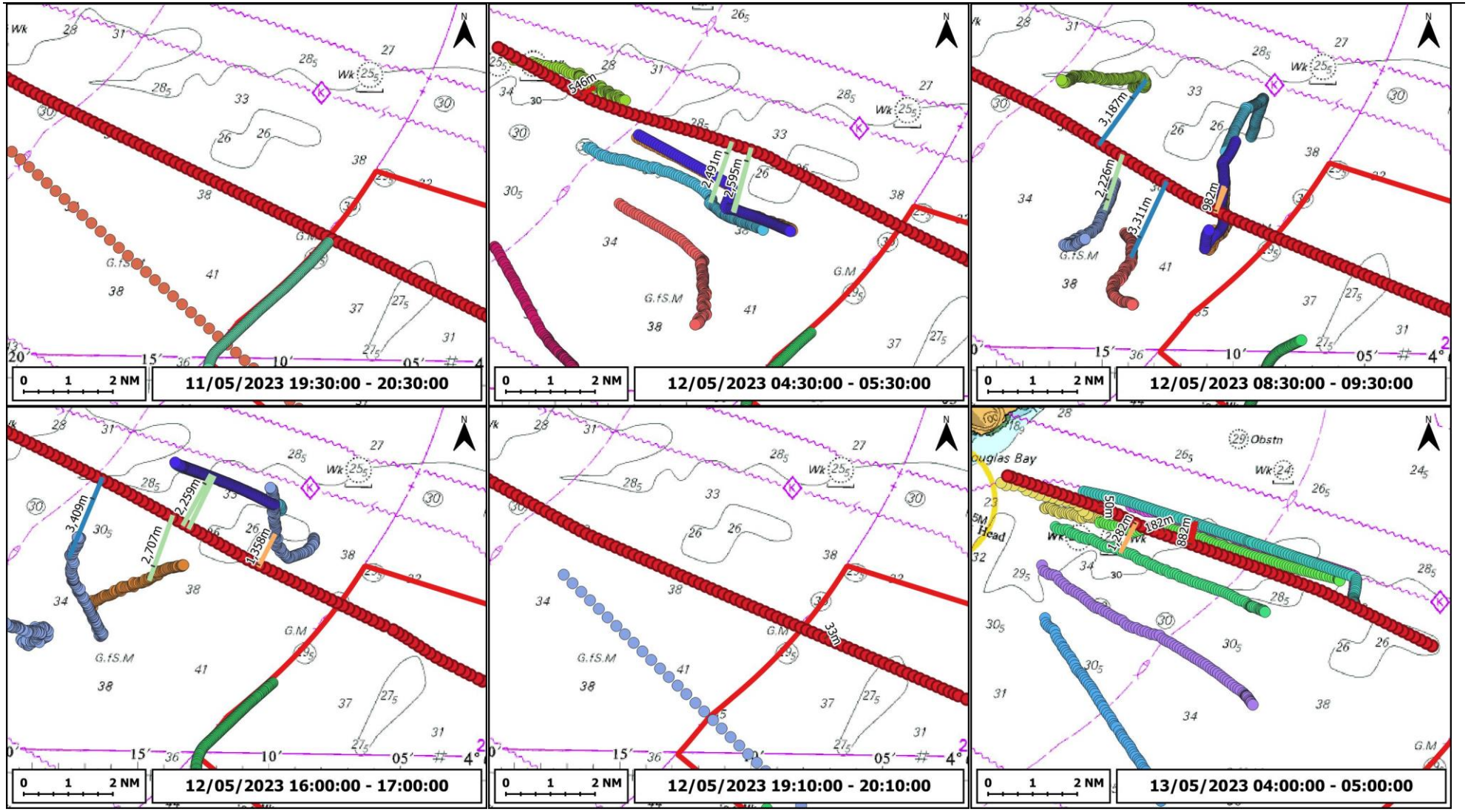


Figure B.6: Ben-my-Chree Radar Analysis 6

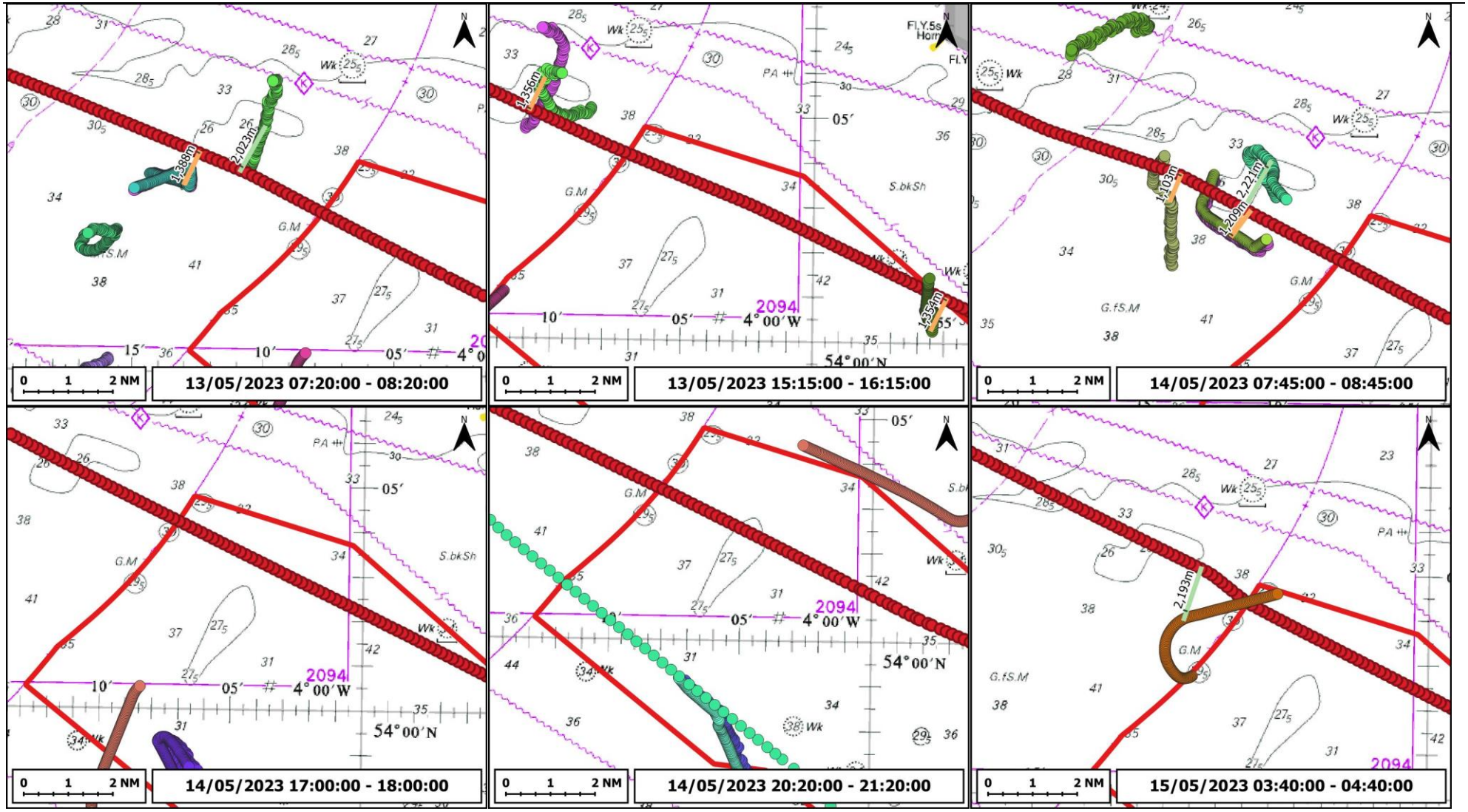


Figure B.7: Ben-my-Chree Radar Analysis 7

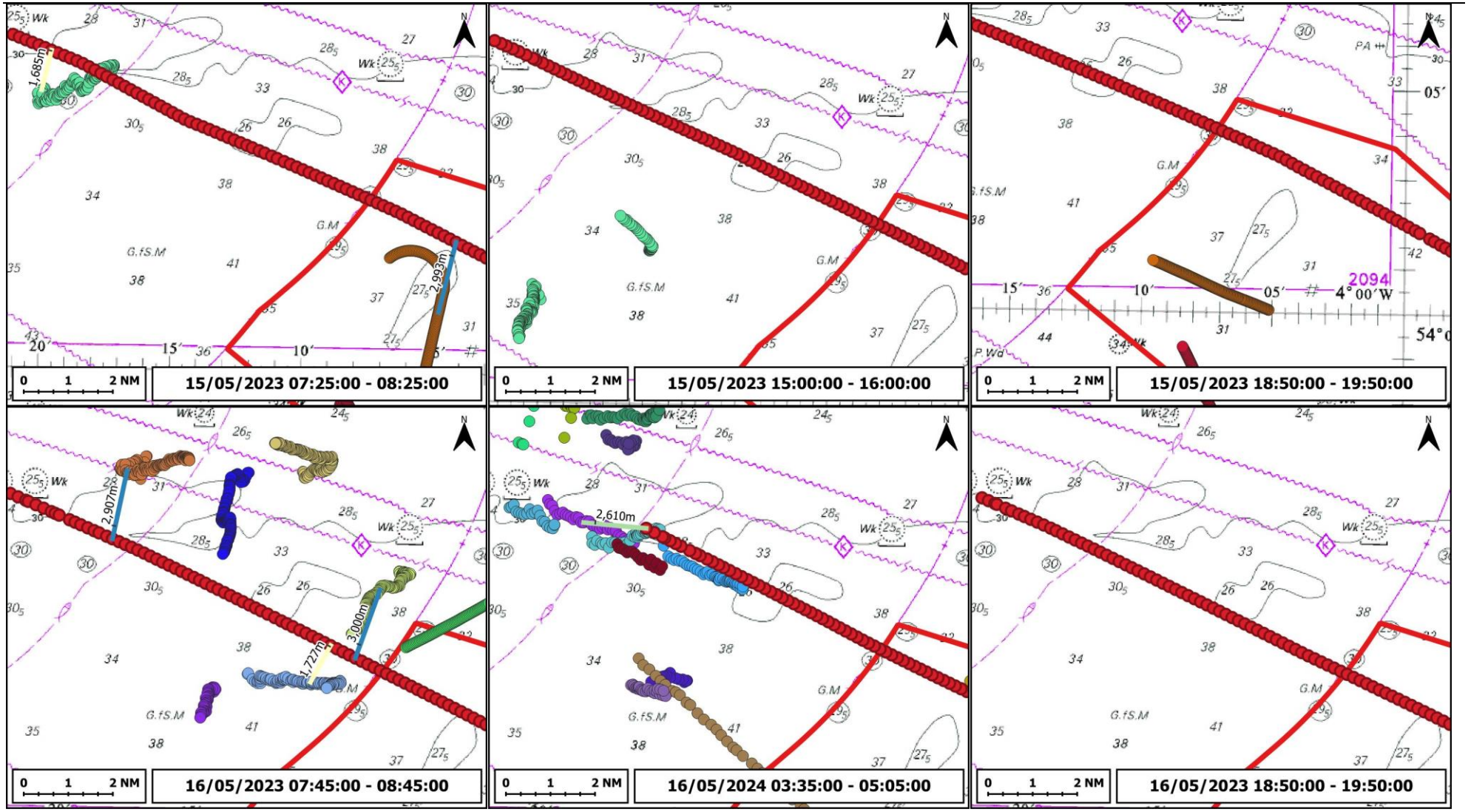


Figure B.8: Ben-my-Chree Radar Analysis 8

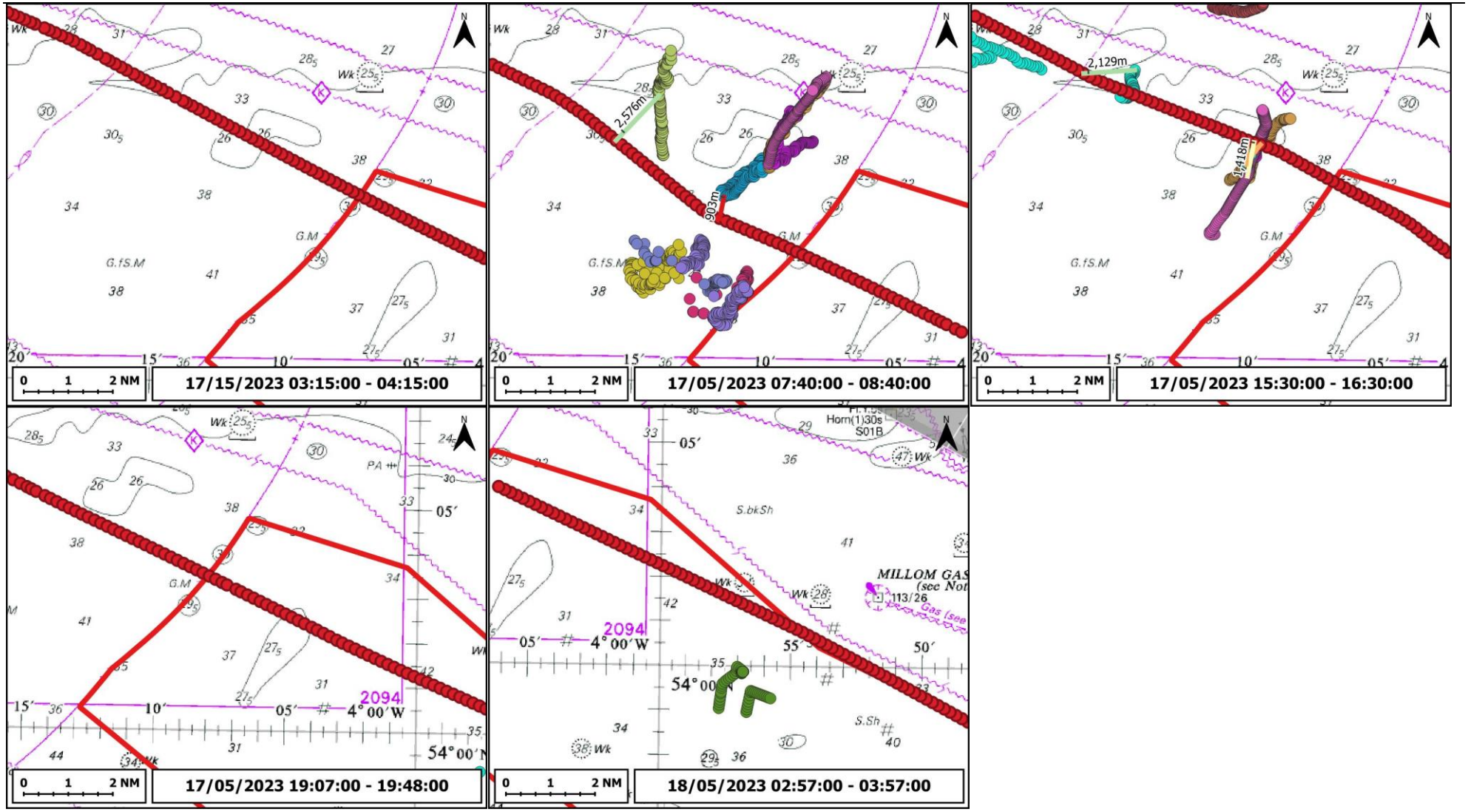


Figure B.9: Ben-my-Chree Radar Analysis 9

Appendix C Summary of precedent (updated from Table 1.1 of Annex 3.1 to Applicant's Response to ISH 2 Action Point 2 and 3: Shipping and Navigation (REP4-005))

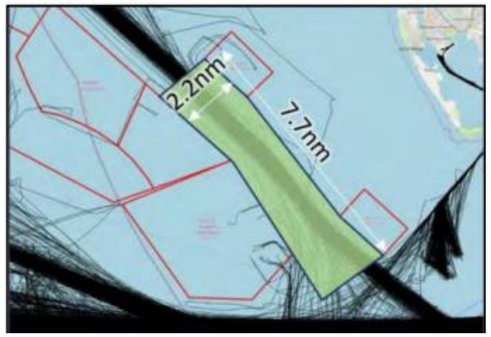
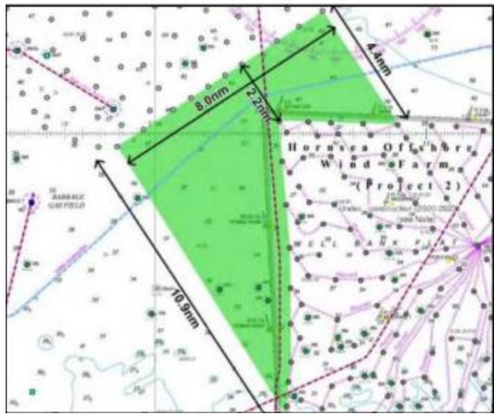
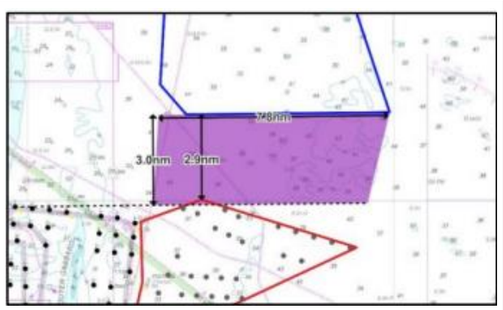
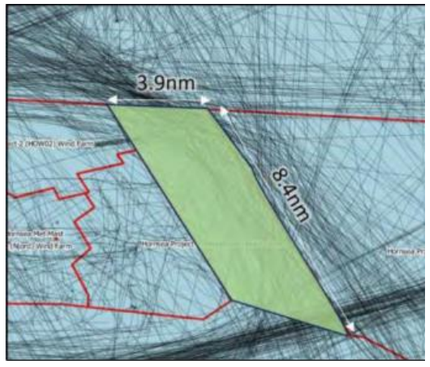
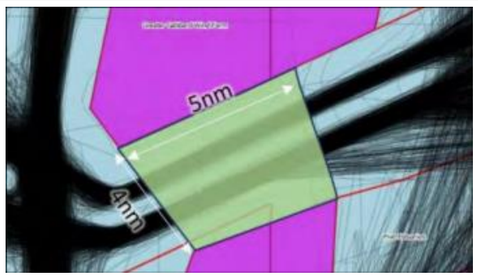
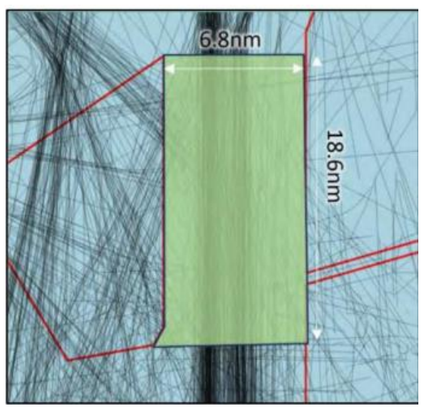
Figure.	Description	Commentary	Context with Morgan- Mooir Vannin
	**Name:** Ormonde/Barrow Walney/West of Duddon Sands **Dimensions**: 2.2 nm by 7.7 nm. **Approximate Transits/Year**: 1,333 **Average/Max Vessel Size**: 125 m / 142.5 m	**Status**: Operational Details of how the ALARP conclusion was reached are not available, but it is noted: • Route is marked by a series of cardinal marks approximately 600 m from WTGs • It is understood that that there is limited fishing activity within that passage • The majority of transits are by the same operator (Stena Line) with three sailings per day • Some commercial traffic but less than 100 m length (less than one per day) • Most recreational and fishing on transit (and higher density inshore to east of Ormonde/Barrow) • CTVs crossing route from Barrow to OWFs • The 2.2 nm gaps are of limited length rather than a continual passage	The full NRA for these offshore wind projects was not available. The traffic profile is not dissimilar, and the passage is narrower compared to the passage between Morgan-Mooir Vannin. Alternatively, this route could be shown as two corridors with an area of clear sea space between them. In this context, the gap is still almost 50% less than the refined Mooir Vannin-Morgan gap.
	**Name**: Hornsea Four-Hornsea Two **Dimensions**: 2.2 nm (at narrowest) by 8 nm. **Approximate Transits/Year**: 2,190 **Average/Max Vessel Size**: 165 m / Unknown *Image source: Hornsea Four Application*.	**Status**: Hornsea Two Operational, Hornsea Four Consented Section 19.3 of the Hornsea Four NRA noted: • The gap was not initially included in the Project design • The “bow” shape offers advantages in flexibility to enable course adjustments • Low meeting probability at the location of the narrowest point • Key stakeholders, including DFDS (the principal user) were satisfied with the width of the gap • There is a low volume of fishing vessels at the location of the gap • Concluded that gap does not pose a significant risk to safe navigation.	Morgan-Mooir Vannin has similar vessel movements, although there is less fishing activity in the area surrounding the pinch point at Hornsea compared to Morgan-Mooir Vannin. The DFDS route affected by Hornsea is a freight only service rather than a passenger service. The narrowest point in 2.2 nm compared to the narrowest point between Morgan and Mooir Vannin which is 4.1 nm wide.
	**Name**: Five Estuaries-East Anglia Two **Dimensions**: 2.86/3.0 nm by 7.8 nm **Approximate Transits/Year**: 5,100 **Average/Max Vessel Size**: 193 m / 240 m *Image source: Five Estuaries Application.*	**Status**: East Anglia Two consented, Five Estuaries Examination Section 17 of the Five Estuaries NRA noted: • Majority of transits are Stena Line and DFDS Seaways regular runners • The gap was of sufficient width to meet guidance requirements of MGN654/PIANC and others • Concluded that gap has relevant embedded mitigation measures in place for the corridor to be considered to meet safety of navigation expectations.	Morgan-Mooir Vannin has less vessel movements which are of a smaller size and includes a passenger ferry route. The narrowest point between Morgan-Mooir Vannin is also >1 nm wider than the Five Estuaries-East Anglia Two passage. In both examples, the gap widens considerably away from the centre point.

Figure.	Description	Commentary	Context with Morgan- Mooir Vannin
	**Name**: Sheringham and Dudgeon Extension **Dimensions**: 3.2 nm wide **Approximate Transits/Year**: 4,745 **Average/Max Vessel Size**: Not known *Image source: Sheringham and Dudgeon Extension Application.*	**Status**: Consented There was significant debate during the Examination of Sheringham and Dudgeon Extension for the navigable width between the shallow waters in the Outer Dowsing Channel and the proposed extension. The Applicant's original proposal was a 2.3 nm gap but this was increased through the Examination to 3.2 nm by removing a section of the OWF. It is noted that the this example does not have wind turbines on both sides of the passage.	Morgan-Mooir Vannin passage is nearly 2 nm wider than initially proposed for Sheringham and Dudgeon (2.2 nm), and nearly 1 nm wider than the amended boundaries (3.2 nm). The volume of traffic in this example is also greater.
	**Name:** Hornsea Three-Hornsea One **Dimensions:** 3.9 nm by 8.4 nm **Approximate Transits/Year:** 1,716 **Average/Max Vessel Size:** 133 m / 333 m	**Status:** Hornsea One operational, Hornsea Three consented Section 22.9 of the Hornsea Three NRA noted: • Route enabled regular freight services between the UK and Europe • Radar interference is anticipated to be limited • Modelling of collision and allision risk showed a modest change in risk • No significant concerns were raised by consultees	Hornsea Three-Hornsea One passage is 0.2 nm narrower than Morgan-Mooir Vannin and 0.3 nm narrower than Morgan-Walney. When combined with Morgan-Walney, the entire passage length (and width) is not dissimilar to Hornsea3-Hornsea1. The vessel traffic profile is relatively similar between the two examples.
	**Name:** Galloper-Greater Gabbard **Dimensions:** 4 nm by 5 nm **Approximate Transits/Year:** 5,851 **Average/Max Vessel Size:** 182 m / 400 m	**Status:** Operational This route exists on the east arm of the Sunk Traffic Separation Scheme between the OWFs and therefore traffic is bound by Rule 10 of the Collision Regulations, with Cardinal Marks providing a safe buffer from the OWFs.	The passage is almost identical width (0.1 nm narrower) to Morgan-Mooir Vannin, and has more traffic and is therefore managed by a TSS as a further risk control.
	**Name:** Vanguard-Boreas **Dimensions:** 6.8 nm by 18.6 nm. **Approximate Transits/Year:** 4,745 **Average/Max Vessel Size:** 155 m / 399 m	**Status:** Consented Proposed route between the Vanguard and Boreas sites. This route safeguards the existing Deep-Water Route via DR1 light-buoy used by large commercial shipping.	Whilst the passage is 2.7 nm wider than Morgan-Mooir Vannin, it has significantly more traffic and is managed by a Deep Water Route as a further risk control.

Appendix D Morgan-Walney Hazard Log (Updated based on the refined Mooir Vannin Boundary)

ID	Haz. Rank	Area	Hazard Title	Possible Causes	Embedded Risk Controls	ES Scores (2.5 nm separation)													Updated Scores (4.1 nm Separation)			
						Realistic Most Likely Scenario	Realistic Most Likely (ML) Scores					Realistic Worst Credible Scenario	Realistic Worst Credible (WC) Scores								ML	WC		
							People	Property	Environment	Business	Frequency		People	Property	Environment	Business	Frequency	Risk Score	Risk Rating		Frequency	Frequency	Risk Score	Risk Rating
1	3	Morgan-Walney	Collision - Ferry/ Passenger ICW. Cargo/ Tanker or Ferry/ Passenger	Reduced Sea room Between OWFs; Human Error/Poor Seamanship; Failure to Comply with COLREGs; Fatigue; Radar Interference from WTGs; Mechanical Failure; Adverse Weather; Avoidance of Small Craft; Reduced Visibility;	Notice to Mariners; Site Marking and Charting; ERCOP; Layout Plan and Lines of Orientation.	Multiple major injuries; Moderate damage to vessel; Minor pollution; Widespread adverse publicity; Short term interruption to ferry services.	3	3	2	3	4	Significant loss of life; Constructive Loss; Serious pollution (Tier 2); International adverse publicity. Ferry out of service.	5	5	4	5	2	10.6	Medium Risk – Tolerable (if ALARP)	2	2	7.8	Medium Risk - Tolerable (if ALARP)
2	9	Morgan-Walney	Collision - Cargo/ Tanker ICW. Cargo/ Tanker	Reduced Sea room Between OWFs; Human Error/Poor Seamanship; Failure to Comply with COLREGs; Fatigue; Radar Interference from WTGs; Mechanical Failure; Adverse Weather; Avoidance of Small Craft; Reduced Visibility;	Notice to Mariners; Site Marking and Charting; ERCOP; Layout Plan and Lines of Orientation.	Multiple minor injuries; Moderate damage to vessel; Minor pollution; Widespread adverse publicity; Vessel requires drydock.	2	3	2	3	2	Single fatalities; Constructive Loss; Major pollution incident (Tier 3); National adverse publicity.	4	5	5	4	1	5.1	Low Risk - Broadly Acceptable	2	1	5.1	Low Risk - Broadly Acceptable
3	1	Morgan-Walney	Collision - Ferry/ Passenger or Cargo/ Tanker ICW. Small Craft	Reduced Sea room Between OWFs; Increased Project Vessel Movements; Human Error/Poor Seamanship; Failure to Comply with COLREGs; Fatigue; Radar Interference from WTGs; Mechanical Failure; Adverse Weather; Avoidance of Small Craft; Reduced Visibility;	Notice to Mariners; Site Marking and Charting; ERCOP; Incident Investigation and Reporting; Layout Plan and Lines of Orientation; Marine Operating Guidelines; Vessel Standards; Training; Compliance of Project Vessels; Vessel Traffic Monitoring.	Multiple major injuries; Moderate damage to vessel; Minor pollution; Widespread adverse publicity; Short term interruption to ferry services.	3	3	2	3	4	Multiple fatalities; Loss of small craft; Moderate pollution incident (Tier 2); National adverse publicity.	5	4	3	4	3	12.5	High Risk - Unacceptable	3	2	8.8	Medium Risk - Tolerable (if ALARP)

MORGAN OFFSHORE WIND PROJECT: GENERATION ASSETS

ID	Haz. Rank	Area	Hazard Title	Possible Causes	Embedded Risk Controls	ES Scores (2.5 nm separation)													Updated Scores (4.1 nm Separation)			
						Realistic Most Likely Scenario	Realistic Most Likely (ML) Scores					Realistic Worst Credible Scenario	Realistic Worst Credible (WC) Scores								ML	WC		
							People	Property	Environment	Business	Frequency		People	Property	Environment	Business	Frequency	Risk Score	Risk Rating		Frequency	Frequency	Risk Score	Risk Rating
4	5	Morgan-Walney	Collision - Small Craft ICW. Small Craft	Reduced Sea room Between OWFs; Increased Project Vessel Movements; Human Error/Poor Seamanship; Fatigue; Radar Interference from WTGs; Mechanical Failure; Adverse Weather; Avoidance of Small Craft; Reduced Visibility;	Notice to Mariners; Site Marking and Charting; ERCOP; Periodic Exercises; Incident Investigation and Reporting; Layout Plan and Lines of Orientation; Marine Operating Guidelines; Vessel Standards; Training; Compliance of Project Vessels; Vessel Traffic Monitoring.	Multiple minor injuries; Moderate damage to small craft; No pollution; Minor adverse publicity.	2	2	1	2	4	Single fatalities; Loss of small craft; Moderate pollution incident (Tier 2); National adverse publicity.	4	4	3	4	3	9.6	Medium Risk - Tolerable (if ALARP)	3	2	6.7	Medium Risk - Tolerable (if ALARP)
5	2	Morgan-Walney	Allision - Ferry/ Passenger	Presence of WTGs; Reduced Sea room Between OWFs; Increased Project Vessel Movements; Human Error/Poor Seamanship; AtoNs Failure; Fatigue; Radar Interference from WTGs; Mechanical Failure; Adverse Weather; Avoidance of Small Craft; Reduced Visibility;	Notice to Mariners; Site Marking and Charting; Safety Zones; ERCOP; Periodic Exercises; Incident Investigation and Reporting; Aids to Navigation; Air Draught Clearance; Layout Plan and Lines of Orientation; Vessel Traffic Monitoring.	Multiple major injuries; Moderate damage to vessel; Minor pollution; Widespread adverse publicity; Repairs to WTGs; Short term interruption to ferry services.	3	3	2	4	3	Multiple fatalities; Serious damage to vessel; Serious pollution (Tier 2); International adverse publicity; Loss of WTGs; Ferry out of service.	5	5	3	5	3	12.4	High Risk - Unacceptable	2	2	8.3	Medium Risk - Tolerable (if ALARP)
6	8	Morgan-Walney	Allision - Cargo/ Tanker	Presence of WTGs; Reduced Sea room Between OWFs; Increased Project Vessel Movements; Human Error/Poor Seamanship; AtoNs Failure; Fatigue; Radar Interference from WTGs; Mechanical Failure; Adverse Weather; Avoidance of Small Craft; Reduced Visibility;	Notice to Mariners; Site Marking and Charting; Safety Zones; ERCOP; Periodic Exercises; Incident Investigation and Reporting; Aids to Navigation; Air Draught Clearance; Layout Plan and Lines of Orientation; Vessel Traffic Monitoring.	Multiple minor injuries; Moderate damage to vessel; No pollution; Widespread adverse publicity; Repairs to WTGs.	2	3	1	3	2	Single fatalities; Drydock required; Serious pollution incident (Tier 2); National adverse publicity; Loss of WTGs.	4	5	4	5	2	7.4	Medium Risk - Tolerable (if ALARP)	2	1	5.0	Low Risk - Broadly Acceptable

ID	Haz. Rank	Area	Hazard Title	Possible Causes	Embedded Risk Controls	ES Scores (2.5 nm separation)													Updated Scores (4.1 nm Separation)			
						Realistic Most Likely Scenario	Realistic Most Likely (ML) Scores					Realistic Worst Credible Scenario	Realistic Worst Credible (WC) Scores					Risk Score	Risk Rating	ML	WC		
							People	Property	Environment	Business	Frequency		People	Property	Environment	Business	Frequency			Frequency	Frequency	Risk Score	Risk Rating
7	4	Morgan-Walney	Allision - Tug/Service & Small Project Vessels	Presence of WTGs; Reduced Sea room Between OWFs; Increased Project Vessel Movements; Human Error/Poor Seamanship; AtoNs Failure; Fatigue; Radar Interference from WTGs; Mechanical Failure; Adverse Weather; Avoidance of Small Craft; Reduced Visibility;	Notice to Mariners; Site Marking and Charting; Safety Zones; ERCOP; Periodic Exercises; Incident Investigation and Reporting; Aids to Navigation; Air Draught Clearance; Layout Plan and Lines of Orientation; Marine Operating Guidelines; Vessel Standards; Training; Compliance of Project Vessels.	Multiple minor injuries; Moderate damage to small craft; No pollution; Minor adverse publicity; Repairs to WTGs.	2	2	1	2	5	Single fatalities; Loss of small craft; Moderate pollution incident (Tier 2); National adverse publicity; Repairs to WTGs.	4	4	3	4	3	10.5	Medium Risk - Tolerable (if ALARP)	4	2	7.6	Medium Risk - Tolerable (if ALARP)
8	5	Morgan-Walney	Allision - Fishing	Presence of WTGs; Reduced Sea room Between OWFs; Increased Project Vessel Movements; Human Error/Poor Seamanship; AtoNs Failure; Fatigue; Radar Interference from WTGs; Mechanical Failure; Adverse Weather; Avoidance of Small Craft; Reduced Visibility;	Notice to Mariners; Site Marking and Charting; Safety Zones; Fishing Liaison Plan; ERCOP; Periodic Exercises; Incident Investigation and Reporting; Aids to Navigation; Air Draught Clearance; Layout Plan and Lines of Orientation.	Multiple minor injuries; Moderate damage to small craft; No pollution; Minor adverse publicity; Repairs to WTGs.	2	2	1	2	4	Single fatalities; Loss of small craft; Moderate pollution incident (Tier 2); National adverse publicity; Repairs to WTGs.	4	4	3	4	3	9.6	Medium Risk - Tolerable (if ALARP)	4	2	7.6	Medium Risk - Tolerable (if ALARP)
9	5	Morgan-Walney	Allision - Recreational	Presence of WTGs; Reduced Sea room Between OWFs; Increased Project Vessel Movements; Human Error/Poor Seamanship; AtoNs Failure; Fatigue; Radar Interference from WTGs; Mechanical Failure; Adverse Weather; Avoidance of Small Craft; Reduced Visibility;	Notice to Mariners; Site Marking and Charting; Safety Zones; ERCOP; Periodic Exercises; Incident Investigation and Reporting; Aids to Navigation; Air Draught Clearance; Layout Plan and Lines of Orientation.	Multiple minor injuries; Moderate damage to small craft; No pollution; Minor adverse publicity; Repairs to WTGs.	2	2	1	2	4	Single fatalities; Loss of small craft; Moderate pollution incident (Tier 2); National adverse publicity; Repairs to WTGs.	4	4	3	4	3	9.6	Medium Risk - Tolerable (if ALARP)	3	2	6.7	Medium Risk - Tolerable (if ALARP)

Appendix E HR Wallingford Simulation Report

Morgan and Mooir Vannin Offshore Wind Farm Development

Navigation Simulation Study

DJR7238-RT001 R02-00
21 February 2025

Document information

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Contents

Appendices

Tables

Figures

1 Introduction

There are four Offshore Wind Farms (OWFs) being proposed in the Irish Sea, collectively referred to as 'the Projects', as follows:

- Morgan Generation Assets being developed by bp/EnBW
- Mona Generation Assets being developed by bp/EnBW
- Morecambe Generation Assets being developed by Flotation Energy/Cobra
- Mooir Vannin Offshore Wind Farm being developed by Mooir Vannin Offshore Wind Farm Limited.

To help in understanding the potential navigation impacts of the OWFs on existing commercial ferries in the region, the Projects are carrying out extensive shipping and navigation studies. This includes a Cumulative Regional Navigation Risk Assessment (CRNRA) which considers the impacts brought about by all Projects and individual Navigation Risk Assessments (NRAs), which consider impacts brought about by each Project in isolation.

HR Wallingford have previously been commissioned by bp/EnBW through RPS and NASH Maritime to undertake navigation simulation studies with the involvement of the ferry companies. These provided an early and detailed understanding of the potential impact to the passage plans for ferries navigating between and around the Morgan, Mona and Morecambe OWFs. This work is presented in Reference 1. Following the findings of the initial navigation simulations and the hazard workshop, several high risk, unacceptable hazards were identified and therefore commitments to boundary changes were made in December 2022 to increase the sea room between the OWFs, which were assessed in a further navigation simulation study, as described in Reference 2. This latter study also examined the Mooir Vannin OWF Scoping Boundary with the Isle of Man Steam Packet Company.

The work concluded that, at that time, there was insufficient space between the Morgan Array Area and Mooir Vannin Scoping Boundary and therefore unacceptable risks of collision and allision existed. On 12 December 2024, Mooir Vannin Offshore Wind Farm Limited presented a refined boundary as part of their hazard workshop, which increased the separation distance to the Morgan Array Area from 2.5 nm to 4.1 nm.

Following this, the Morgan Generation Assets team have been conducting an update to the cumulative assessment to determine whether there would now be sufficient space for safe navigation following the change. Part of the assessment included a further navigation simulation study, carried out by HR Wallingford in a similar manner to the previous work. This was used to examine the impact of the proposed Mooir Vannin OWF on the navigation area between it and the Morgan Array Area.

This update to the navigation simulation for the Morgan Array Area and Mooir Vannin OWF included an simulation session conducted with attendance by the following ferry companies:

- Isle of Man Steam Packet Company (IOMSPC).
- Stena Line Ferries (Stena Line).

2 Navigation simulation configuration

2.1 Layout

The navigation simulation configuration was modified from that created for the previous real time navigation simulation studies, to include the proposed Mooir Vannin OWF boundaries. The layout is illustrated in Figure 2.1.

OWF boundaries were provided by NASH Maritime in digital shape file format, which were converted to AutoCAD and incorporated into the simulation configuration. The extent of the new proposed boundaries for the Mooir Vannin OWF layout that was simulated in this study were as shown in Figure 2.2.

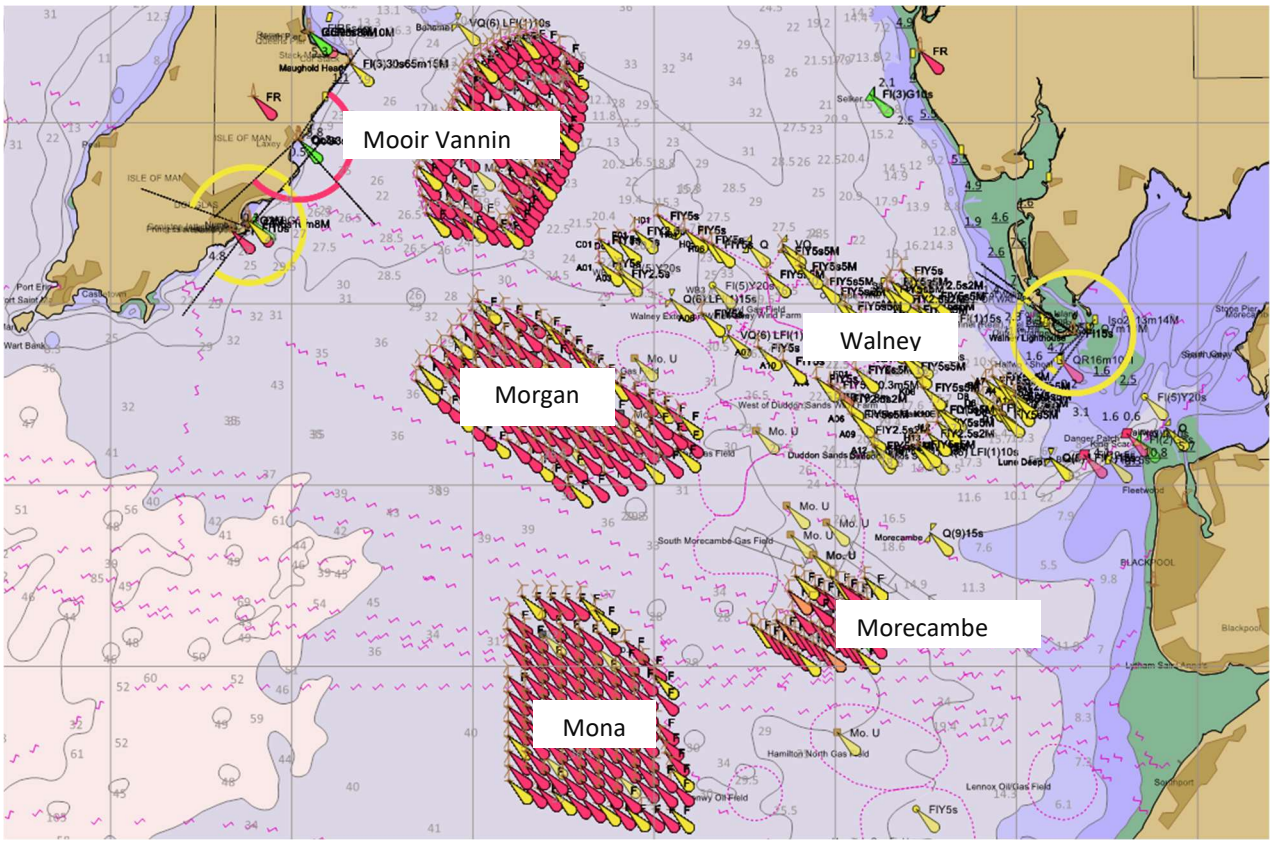


Figure 2.1: OWF layout

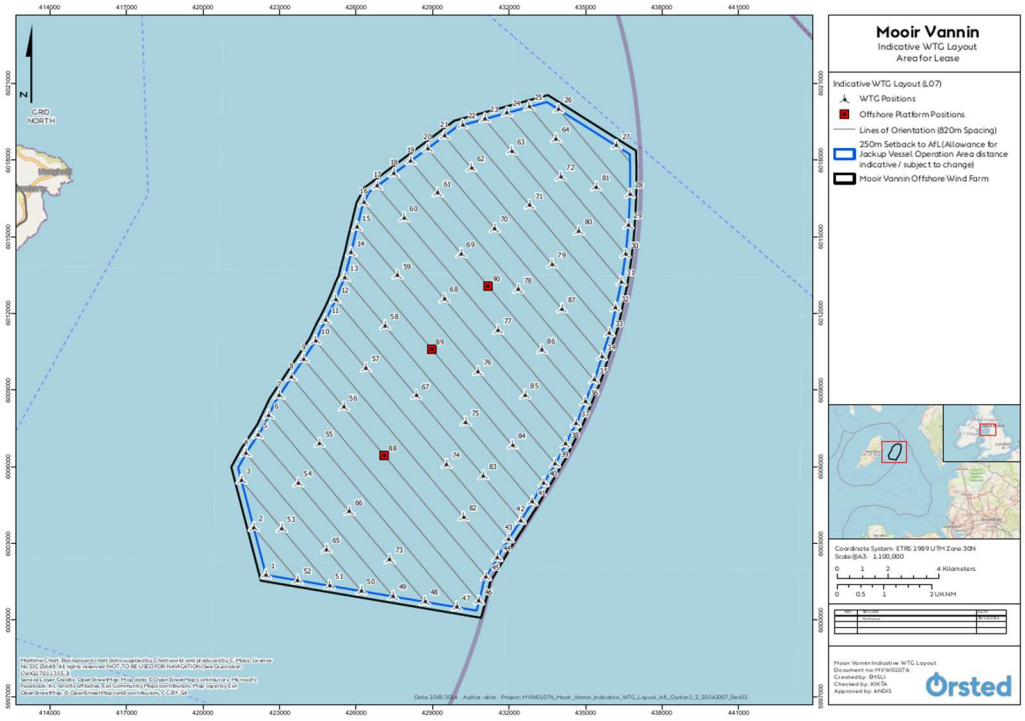


Figure 2.2: Refined boundaries of the Mooir Vannin OWF

The key distances between the Morgan, Mooir Vannin and Walney OWF boundaries are shown in Figure 2.3, in nautical miles.

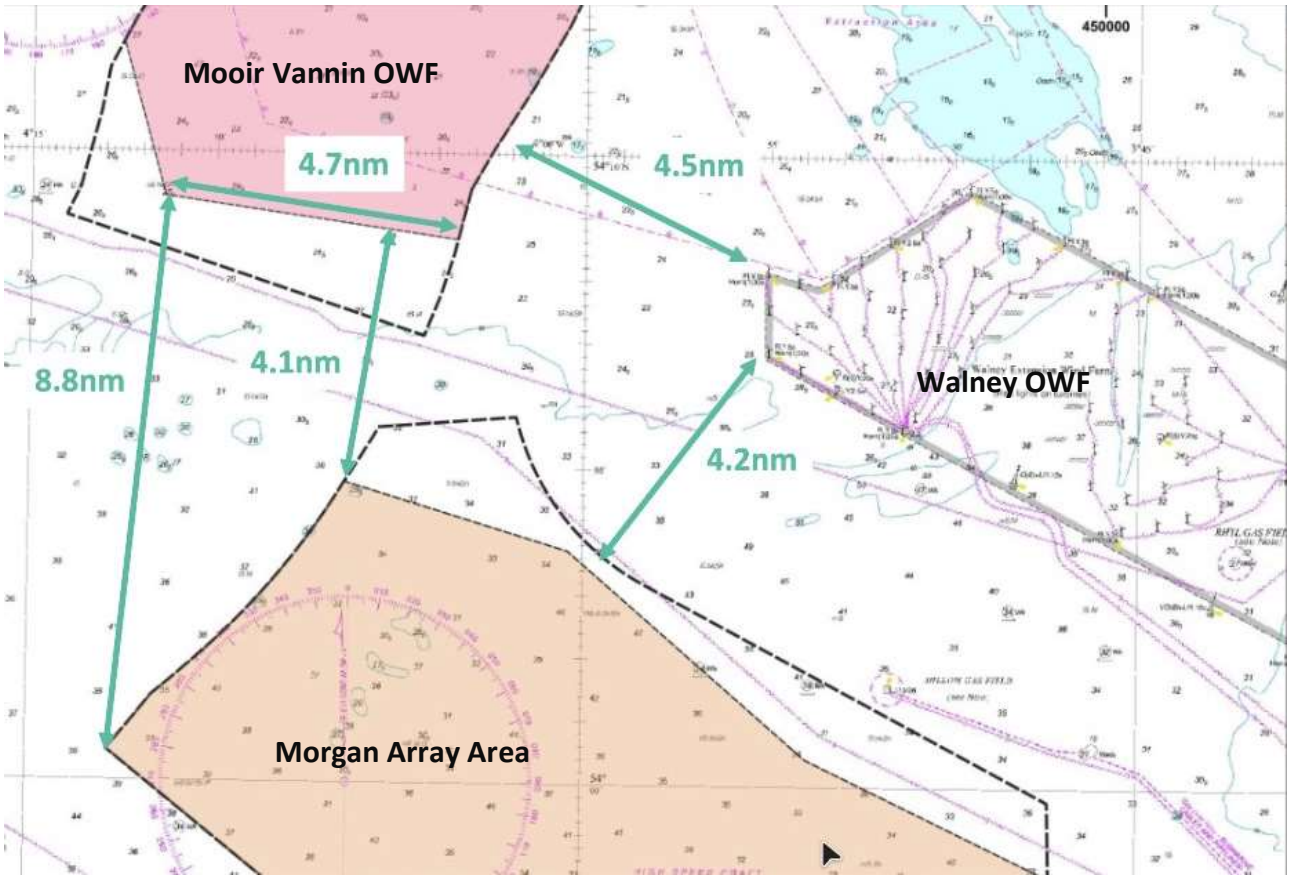


Figure 2.3: Distances from OWF boundaries (with previous boundaries shown as black dashed lines)

2.2 Environmental conditions

2.2.1 General

Various data on the environmental conditions in the area of interest were analysed in detail during the previous study. This analysis was presented and verified with operators during the simulation sessions conducted in 2022, as summarised in Reference 1, which contains other configuration details. For example, the annual wave rose for the Mona/Morgan area is shown in Figure 2.4.

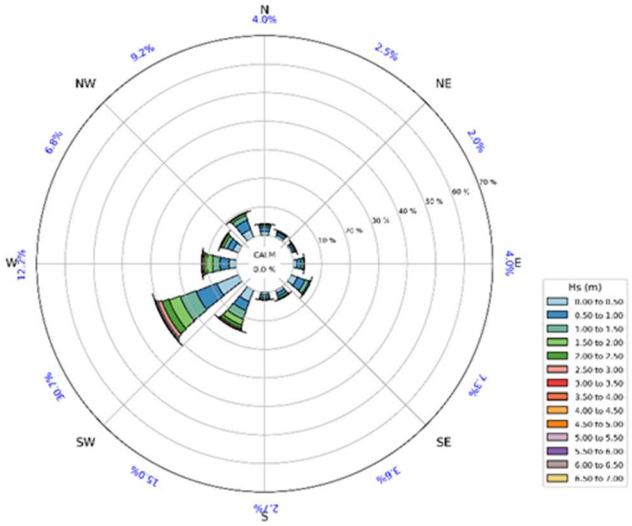


Figure 2.4: Annual wave rose: Location B - Mona/Morgan

Source: NWS 1980-2021

For the areas of interest for this study the worst waves, from a navigation and ship handling perspective, were predominately from a south westerly direction. This was due to the direction of prevailing weather in the region and because the OWFs are exposed to the maximum fetch when the sea and swell are associated with south westerly winds.

Based on further consideration of these data during the present study, the simplified environmental data presented in Table 2.1 were used as the basis for setting the environmental conditions for the simulation runs.

There was only minor spatial variation in the general conditions across the area of interest and the simplified data better represented the level of precision considered during the simulation (i.e. to the nearest 0.5 m of significant wave height).

It should be noted that the monthly summer and winter conditions shown in Table 2.1 could occur in any season, as the descriptor is only indicative, although, in general, the worst conditions will be experienced during the winter.

Table 2.1: Simplified environmental data

Description	Significant wave height, Hs (m)	Spectral peak wave period, Tp (s)	Corresponding approximate wind speed (knots)
Weekly	1.5	5.5	SW 15 (F 4)
Fortnightly	2	6	SW 20 (F5)
Monthly (summer)	2.5	6.5	SW 25-30 (F6-7)
Monthly (winter)	3	7	SW 31-40 (F7-F8 Gale)
Annually	4.0	10	SW 40 -50(F9- F10 Storm)

2.2.2 Bathymetry, water levels and current flows

The simulation model for the Irish Sea used in the present study was the same as that used for the 2022 work, as detailed in Reference 1.

The effects of the current and changes in water level are important in the Irish Sea and needed to be considered for passage planning. However, for the purposes of this work their effects were not considered to be critical so were not specifically evaluated.

2.2.3 Visibility

The visibility can be reduced in the simulation visual scene to represent the effect of fog or heavy rain, however this feature was not used in this simulation study.

2.3 Ship manoeuvring models

For the 2022 study, specific ship manoeuvring models were created, which were verified by representatives from the stakeholder ferry companies. This was to ensure that the response to any helm, engine or tug control, along with the effects of the local wind, wave and current conditions were realistic.

The same ship manoeuvring models were available for use in this study, details of which are contained in Table 2.2.

Details of the verification process for the ship manoeuvring models is contained in Reference 1.

Table 2.2: Ship manoeuvring models

Characteristic	Units	96 m x 26 m CAT Manannan	125 m x 23 m RoRo Ben-My-Chree	133 m x 26 m RoRo Manxman	142 m x 25 m RoRo Seatruck Progress	215 m x 28 m RoRo Stena Estrid
Length overall	m	95.5	125.2	133	142.0	214.5
Length between perpendiculars	m	86.0	115.1	122	133.5	202.5
Beam	m	26.0	23.4	25.7	25.0	27.8
Loading condition						
Mean draught	m	3.4	5	5.2	5.2	6.4
Displacement	tonnes	1,300	7,700	11,400	10,700	23,700
Propulsion						
Main engine type		4xCAT 3618 Diesel	2 x MaK 9M32 Diesel	4 x Diesel Electric	2xMAN7L48/60BCR Diesel	2xMaK 12M43C Diesel
Engine power (total)	kW	28,800	8,640	15,700	16,000	25,200
No. of propellers and type		4 x water jet	2 x CPP	2 x CPP	2 x CPP	2 x CPP
Bow thruster	tonnes	N/A	28	45	27.5	72
Rudder type	-	n/a	Flapped	Bulb	Spade	Flapped
Rudder angle	°	30	45	45	55	45
Manoeuvring engine order						
Full Ahead	knots	34	19	20	21.9	22
STOP	knots	0	0	0	0	0
Full Astern	knots	-17	-13.3	-14	-17.5	-15.4
Windage area						
Windage lateral	m^2	1,015	2,422	3,230	2,999	5,316
Windage frontal	m^2	363	654	719	712	825
Wind speed		**Beam wind force (t)**				
15 knots		3	7	10	9	16

20 knots		5	13	18	16	29
25 knots		8	21	27	25	45
30 knots		11	30	39	37	65
35 knots		16	40	54	50	88

3 Navigation simulation

3.1 Simulation session

The navigation simulation session was held between 20 and 21 January 2025 at HR Wallingford's UK Ship Simulation Centre and was attended by those shown in Table 3.1.

Table 3.1: Simulation Team

Name	Company	Role	In person	Remote
Rosie Howatt	bp	Developer	x	
Miriam Knollys	RPS	EIA Lead	x	
Dr Andrew Rawson	NASH Maritime	Principal Consultant	x	
Captain Dominic Bell	NASH Maritime	Consultant Mariner	x	
Eleanor Scott	NASH Maritime	Director	x	
Amber Hutchinson	NASH Maritime	Project Manager	x	
Capt Tom Turner	IOMSPC	Fleet Manager	x	
Capt Chris Kelly	IOMSPC	Master Mariner	x	
John Lambert	IOMSPC	Office of the Watch	x	
Michael Proctor	Stena	Superintendent	x	
Sean Fitzgerald	Stena	Master Mariner	x	
Brian Greenwood	Clyde & Co	Solicitor on behalf of Stena Line	x	
Sam Chudley	MCA	Marine specialist	x	
Vaughan Jackson	MCA	Marine specialist		x
Dr Mark McBride	HR Wallingford	Project Director	x	
Liam Monahan-Smith	HR Wallingford	Project Manager	x	
Lorcan Frewin	HR Wallingford	Simulator Operator	x	
Captain Ian Simpson	HR Wallingford	Staff Master Mariner	x	

3.2 Scope

The main aim of the simulation study was to assess the navigation space between the revised array area boundaries to provide an understanding of any remaining potential safety of navigation impacts on individual ferry operators.

The work set out to:

- Provide further engagement with the ferry companies
- Assess whether shipping and navigation safety can be maintained between the Morgan and Mooir Vannin OWFs with the revised Mooir Vannin boundaries.

The conditions for the simulation runs were informed by the results of the previous simulation sessions that were completed with the stakeholder ferry companies, with special reference to considering runs in which failure or marginal assessments had been made.

3.3 Assessment criteria

The assessment criteria in used in the simulation sessions are outlined in Table 3.2, which was the same as that used previously.

Table 3.2: Assessment criteria

No.	Criteria	Description	Assessment
1	Ship Control	Was full control of the vessel maintained throughout the run, given the prevailing conditions and ship characteristics?	**Success**: Ship remains under full control for duration of simulation.
			Marginal: Whilst ship remained under control, it was considered at the limits of acceptable seamanship.
			Fail: Ship lost control and could not be manoeuvred acceptably.
2	Clearances from Fixed Infrastructure	Was sufficient sea room maintained from fixed objects to reduce the risk of allision/contact, given the prevailing conditions and ship characteristics?	**Success**: Passing distances from fixed objects met requirements in the passage plans.
			Marginal: Ship navigated closer to fixed hazards than defined in the passage plans but maintained sufficient control to continue to navigate safely.
			Fail: Ship came within unacceptably close proximity to a fixed hazard or entered the wind farm boundary.
3	Clearances from Other Vessels	Was sufficient maintained from other vessels to reduce the risk of collision, given the prevailing conditions and ship characteristics?	**Success**: Passing distances from other vessels met requirements in the passage plans.
			Marginal: Ship navigated closer to other vessels than defined in the passage plans but maintained sufficient control to continue to navigate safely.
			Fail: Ship came within unacceptably close proximity to another vessel and there was a risk of collision.
4	Under Keel Clearance	Was suitable under keel clearance to avoid grounding maintained, given the prevailing conditions and ship characteristics?	**Success:** Ship retained substantial under keel clearance throughout the passage (>5 m).
			Marginal: Under keel clearance thresholds were breached but safe navigation could be maintained.
			Fail: Ship either grounded or had unacceptable under keel clearance.
5		Was there sufficient control and sea room to respond to possible	**Success**: It was deemed the vessel was capable to respond to an emergency if require.

No.	Criteria	Description	Assessment
	Capacity and Space to Respond to Emergencies	emergency situations, given the prevailing conditions and ship characteristics?	**Marginal:** It was deemed the vessel's capability to respond to an emergency situation is compromised but any incident would be unlikely to occur.
			Fail: It was deemed the vessel does not have the capability to respond to an emergency without an incident occurring.
6	Avoidance of Excessive Roll Induced Cargo Shift	Did the Vessels route expose it to conditions likely to result in cargo shift or damage?	**Success**: All vessel effects considered to be within normal limits.
			Marginal: Potentially Hazardous Sea Conditions encountered (slamming, surfing or broaching etc) but vessel could take action to reduce the risk and prevent incident.
			Fail: Conditions experienced likely to result in hazardous incidents (slamming, surfing, or broaching etc).
7	Avoiding Dangerous Sea Conditions	Did the vessel's route expose it to potentially dangerous Metocean phenomenon?	**Success**: All vessel effects considered to be within normal limits.
			Marginal: Potentially Hazardous Sea conditions encountered (slamming, surfing, or broaching etc) but vessel could take action to reduce the risk and prevent incident.
			Fail: Conditions experienced likely to result in hazardous incidents (slamming, surfing, or broaching etc).
8	Maintaining Passenger Comfort	Did the vessel's route result in conditions likely to induce motion sickness for passengers?	**Success:** Conditions considered benign for passenger travel.
			Marginal: Conditions considered likely to result in motion sickness amongst some passengers.
			Fail: Conditions not considered viable for passenger ferry services.
9	Impact on Vessel Schedule	Did the vessel's route result in delays to vessel's schedule through re-routing or reduction in speed?	**Success:** No or negligible impact on schedule.
			Marginal: Delays experienced, however, comparable to current operating performance.
			Fail: Route likely to result in significant delays for vessel.

Additionally, based on guidance provided by the stakeholder ferry companies in previous studies, the closest point of approach (CPA) criteria in Table 3.3 were considered.

Table 3.3: CPA thresholds provided by ferry operators

Operator	From other vessels	From fixed infrastructure
IoMPSC	>1 or 2 nm	>1 or 2 nm
Stena Line	>1 nm	>1 nm

3.4 Presentation of results

All aspects of each simulation run were recorded such that it could be replayed and documented.

The data and results from each real time simulation run are presented in a range of formats, as described in the following sections.

3.4.1 Simulation run summary

After each run a simulation run summary table entry was completed to provide a high level record of each runs and the assessment. These are presented in Appendix A.

3.4.2 Simulation run plots

Appendix B contains the vessel track plots and associated information for each run, which describe:

- The location of the run
- The initial conditions
- A description of the scenario
- A plot of the vessel tracks
- A timeline of events and a corresponding plot.

4 Navigation simulation session

4.1 Simulation runs

As previously mentioned, the navigation simulation session was undertaken between 20 and 21 January 2025 at HR Wallingford's UK Ship Simulation Centre. A total of 9 simulation runs were carried out, with Runs 01 to 08 completed on 20 January and a single run, Run 09, carried out on 21 January 2025.

Runs 01 to 05 were performed with two integrated ship bridge simulators so that two vessels could be operated by individual masters within the same simulation environment. The others (Runs 06 to 09) were carried out with a single ship bridge simulators.

In Runs 01 to 05, one ship bridge represented the Ben-My-Chree, operated by an IOMSPC Master, and the other represented the Stena Estrid, operated by a Stena Line Master. This allowed the two ferry companies who attended the session to both be directly involved in the first 5 runs. For the remaining runs, Run 06 examined the Manannan vessel, operated by an IOMSPC Master, and Runs 07 to 09 were heavy weather runs undertaken with the Stena Estrid, operated by a Stena Line Master.

For IOMSPC, the simulation runs focussed on the Ben-My-Chree, as it was agreed with IoMSPC representatives to be a conservative case to the Manxman, although one run (Run 06) was also carried out with the fast-ferry, the Manannan.

For Stena, the simulation runs focussed on the Stena Estrid and the route between Liverpool and Belfast.

4.2 Conclusions

The main conclusions from the simulation session were as follows:

- Overall, there was found to be sufficient space for safe navigation in the navigation corridors between the Morgan and Mooir Vannin, and Walney OWFs, albeit that at times, the desired CPAs were not met, although adequate clearances were still available.
- Where CPAs of less than 1 NM occurred, the Masters found those situations to be acceptable, as the vessels were not at risk of collision with other vessels or contact with structures. In most cases where the CPA to the OWF was less than 1 NM, an alternative strategy could have been used that would have increased the CPA to at least 1 NM.
- When the vessels need to be slowed down in the limiting wave conditions, greater vessel motions occurred, so passenger comfort may be an issue in those cases, although for a relatively short time. This would be irrespective of the presence of the OWFs.
- It was acknowledged, as before, that the ferry passage routes are now constrained by the passages between the OWFs, so the general navigation risk is elevated, although it was still found to be ALARP.
- Stena found that the presence of the Mooir Vannin OWF made the route along the east of the Isle of Man difficult (Stena's heavy weather route), so it may be unavailable to them once the OWFs are in place requiring the use of the adverse weather route west of the Isle of Man.
- It was also acknowledged that an enhanced bridge team may be required due to the need for a Master to be on the bridge in certain circumstances, as is currently the case for situations, such as restricted visibility and vessel encounters where the Officer Of the Watch (OOW) requires Command assistance.
- The night time situation was not simulated, however, it was discussed. It was considered to be no different to that which has been discussed previously, acknowledging that the Mooir Vannin OWF will add additional red lights into that area, although the design of the wind turbines and their lighting is not known at this time. Another issue with operating at night is the increased level of concentration required, especially within the areas of OWF lights.
- Similarly, restricted visibility was also not simulated, but was discussed, with the same conclusions as before.
- Stena wished to examine a route heading north, transiting west and then north of the Morgan OWF and then along the corridor between the Mooir Vannin and Walney OWFs, in heavy weather conditions (Run 09). This was found to be acceptable, although the approach to the starting point of this run may be unacceptable, as might be the transit around the north of the Mooir Vannin OWF. It was also noted to be a significantly longer route than if they were to use their normal adverse weather route to the west of the Isle of Man, which would require fewer course changes.

5 References

1. HR Wallingford, 'Morgan and Mona Offshore Wind Farms Development – Navigation Simulation Study – All sessions', Report no. DJR6687-RT003-R05-00, 14 Mar 2023.
2. HR Wallingford, 'Morgan, Mona and Morecambe Offshore Wind Farms – Navigation Simulation Study – 2023', Report no. DJR6687-RT005-R03-00, 30 Nov 2023.

Appendices

A Simulation run summary

Table A.1: Simulation run summary

Run ID	Route	Vessels	Wind conditions (Dir, speed)	Wave conditions (Dir, Hs, Tp)	Other traffic	Notes	1 Ship control	2 Clearance - Fixed	3 Clearance - Ships	4 Under keel clearance	5 Respond to emergency	6 Avoid cargo shift	7 Avoid dangerous seas	8 Maintain passenger comfort	9 Impact on schedule
01	Heysham to Douglas Belfast to Liverpool	Ben-My-Chree Stena Estrid	SW (225) 15 knots	SW (225) 1.5m 6s	No other traffic	Familiarisation run No concerns raised	S	S	S	N/A	N/A	S	S	S	S
02	Heysham to Douglas Liverpool to Belfast (E IoM)	Ben-My-Chree Stena Estrid	SW (225) 20 knots	SW (225) 2.5m 6s	1 x tanker (90m) southbound east of MV Fishing/WFSV/ yachts	**Stena**: Tanker stayed on west side of route between the Walney and Mooir Vannin OWFs, but would likely have taken more of a straight line, which would have made it more challenging. Mates may not have same experience as the Masters present in the simulation, so enhanced staffing may be needed onboard, and for longer. **IoMSPC**: Went to starboard to give Stena vessel as much room as possible. Both agreed that it would have been more difficult in worse conditions and so enhanced staffing may be necessary, but risk still increased, when compared with open sea navigation. Vessel mechanical issues and emergency scenarios will also need to be taken into account. Vessel coming from the north has to come further east around the Mooir Vannin OWF so its southerly passage (between Mooir Vannin and Walney OWFs) is then such that the likelihood of an interaction with another vessel is higher.	S	M	M	N/A	N/A	S	S	S	S

Run ID	Route	Vessels	Wind conditions (Dir, speed)	Wave conditions (Dir, Hs, Tp)	Other traffic	Notes	1 Ship control	2 Clearance - Fixed	3 Clearance - Ships	4 Under keel clearance	5 Respond to emergency	6 Avoid cargo shift	7 Avoid dangerous seas	8 Maintain passenger comfort	9 Impact on schedule
03	Liverpool to Douglas Belfast to Liverpool (E IoM)	Ben-My-Chree Stena Estrid	SW (225) 20 knots	SW (225) 2.5m 6s	2 x tankers (90m) westbound north of Morgan 3 x trawlers northbound Yacht	**Stena**: No particular issues. Waited to see what Ben-My-Chree would do and they altered both speed and course (even though one may have been adequate) so no issues. Discussion on routes in and around Mooir Vannin and Morgan and no change to previous conclusions other than Mooir Vannin now precludes a route to the east of IoM. So Stena now have to route to west of IoM. **IoMSPC**: Northern-most fishing vessel was not on radar so issues "seeing" it. Reduced speed more, whereas it would not be necessary without OWFs. When speed was reduced the ship model became less controllable that might be expected in real life, but it would have become more uncomfortable for passengers. Also, more roll when vessel slowed (to less than 8 knots). No particular issues with commercial vessels, so it was the fishing vessels that was the main concern, but were successfully avoided.	S	M	M	N/A	N/A	S	S	M	M
04	Douglas to Heysham Belfast to Liverpool	Ben-My-Chree Stena Estrid	SW (225) 20 knots	SW (225) 2.5m 6s	1 x tanker westward	**Stena**: Stena Estrid came in front of the tanker to run parallel with Ben-My-Chree. CPA would have been 0.5 NM, so was not concerned with Ben-My-Chree, but was concerned about the tanker. Another Officer of the Watch may have come round to the stern. Content to have CPA of at least 0.5 NM to other vessels. If weather was more inclement, would have come round behind Ben-My-Chree. **IoMSPC**: Assessed traffic and no risk of collision with tanker. Crossing situation with Stena as the stand-on vessel, so took no action. However, could have taken action, if necessary, and opened up space to starboard to ease situation. Adequate space available in this scenario and had other options to slow or change course, but the run highlighted greater overall risks, even though they may be ALARP.	S	S	M	N/A	N/A	S	S	S	S

Run ID	Route	Vessels	Wind conditions (Dir, speed)	Wave conditions (Dir, Hs, Tp)	Other traffic	Notes	1 Ship control	2 Clearance - Fixed	3 Clearance - Ships	4 Under keel clearance	5 Respond to emergency	6 Avoid cargo shift	7 Avoid dangerous seas	8 Maintain passenger comfort	9 Impact on schedule
05	Heysham to Douglas Liverpool to Belfast	Ben-My-Chree Stena Estrid	SW (225) 20 knots	SW (225) 2.5m 6s	11 trawlers	**Stena**: On approach, could see that the fishing vessels were heading towards the Mooir Vannin OWF instead of into open water. Attempted to keep 1 NM off wind farm and fishing vessels, otherwise straightforward. **IoMSPC**: CPA to trawler on approach was about 0.23 NM and then CPA about 0.7 NM to Mooir Vannin OWF, but 1 NM to fishing boats. Would have had to call a Master to the bridge for the transit of the narrower part and to negotiate the other fishing vessels. Presence of Mooir Vannin OWF will prevent some approaches from the north to Douglas, which is the preferred direction, so that they are heading into the predominant southerly wind and wave conditions.	S	M	M	N/A	N/A	S	S	S	M
06	Heysham to Douglas	Manannan	SW (225) 15 knots	SW (225) 1.5m 6s	11 trawlers and Stena Estrid	**IoMSPC**: No significant issues, as Manannan can be manoeuvred better than the Ben-My-Chree. However, such a high speed craft is more prone to de-clutching the engine, or experiencing fouling with fishing gear, which may cause issues. Due to the high speed, problems happen more quickly so need to be more cautious in collision avoidance. Once speed is lost, passenger comfort can become an issue. CPA to Morgan OWF was about 1 NM, so compromised to ensure at least 1 NM to other vessels. Noted that although there is space to manoeuvre in these situations, the risk is elevated when compared with open sea.	S	M	S	N/A	N/A	S	S	S	S
07	Belfast to Liverpool	Stena Estrid	SW 30 to 40 knots	SW 3.5m 7s	No other traffic	**Stena**: Heavy weather run. No particular concerns with ship control or motions in the conditions (roll motions of up to about 4 degrees).	S	S	S	N/A	N/A	S	S	S	S
08	Belfast to Liverpool	Stena Estrid	SW 50 knots	SW 4.2m 7s	No other traffic	**Stena**: Heavier weather run heading S and E. Noted that the vessel motions were OK when heading south, but on the limit (10+ degrees roll) when heading ESE between the Morgan and Walney OWFs.	S	S	S	N/A	N/A	S	S	S	S

Run ID	Route	Vessels	Wind conditions (Dir, speed)	Wave conditions (Dir, Hs, Tp)	Other traffic	Notes	1 Ship control	2 Clearance - Fixed	3 Clearance - Ships	4 Under keel clearance	5 Respond to emergency	6 Avoid cargo shift	7 Avoid dangerous seas	8 Maintain passenger comfort	9 Impact on schedule
09	Liverpool to Belfast	Stena Estrid	SW 50 knots	SW 4.2m 7s	No other traffic	**Stena**: Heavier weather run heading N and E/NE, to E of the Mooir Vannin OWF to examine likely vessel motions. Achieved the required CPAs from all boundaries and made heading changes without any significant vessel motions of note, so it appears to be a viable route. However, the challenge would be getting to the start position of this run, but that was not assessed as part of this work. Another issue would be the turn to head west around the north of the Mooir Vannin OWF, when the ship would be more exposed to beam-on waves, which may induce significant roll motions.	S	S	N/A	N/A	N/A	S	S	S	N/A

B Simulation run plots

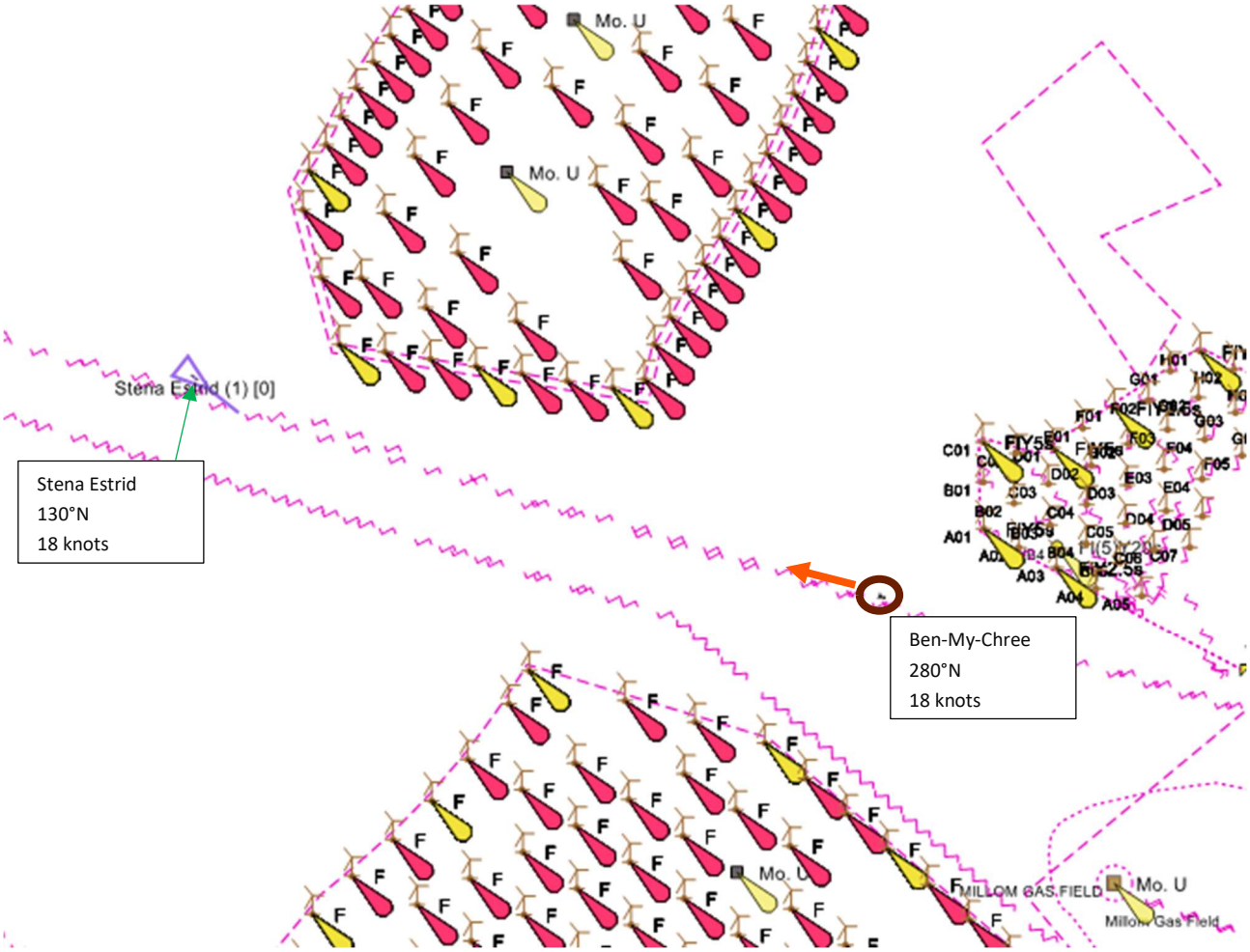
Run: 01

Location: Morgan – Mooir Vannin

Model	Passage direction	Pilot	Wind Direction	Wind Speed	Wave Hs	Wave Tp
Ben-My-Chree	280°N	TT	225°	15 knots	1.5m	6.0s
Stena Estrid	110°N	MP	225°	15 knots	1.5m	6.0s

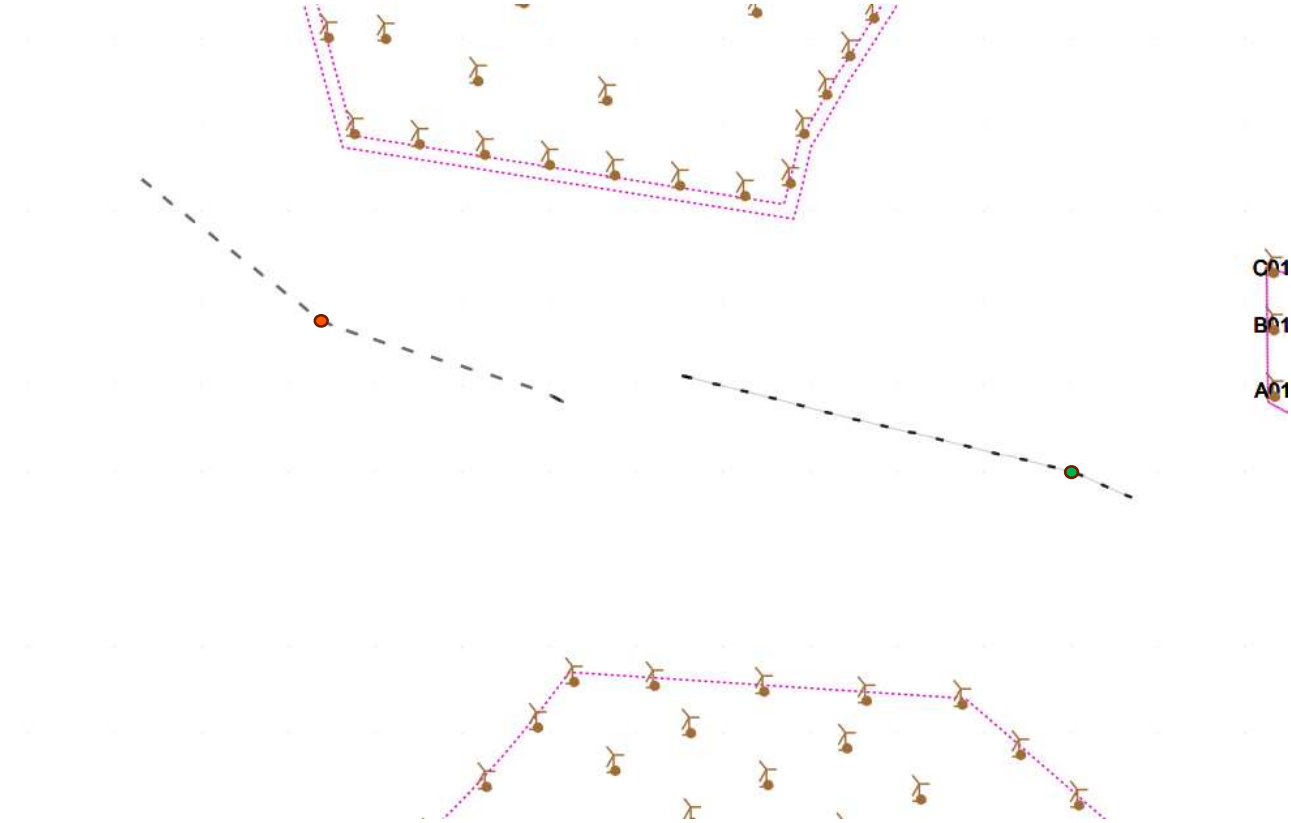
Scenario

Familiarisation run. Attempting to transit between Morgan OWF and Mooir Vannin OWF with a Stena Estrid transit from Belfast to Liverpool.



Actions of Vessels

Time	Ben-My-Chree	Stena Estrid	Comments
03:00	Adjusted heading to 282°N	-	-
08:00	-	Adjusted heading to 131°N	-



Run: 02

Location: Morgan – Mooir Vannin

Model	Passage direction	Pilot	Wind Direction	Wind Speed	Wave (Hs)	Wave (Tp)
Ben-My-Chree	110°N	MP	225°N	20 knots	2.5 m	6.0 s
Stena Estrid	285°N	TT	225°N	20 knots	2.5 m	6.0 s

Scenario

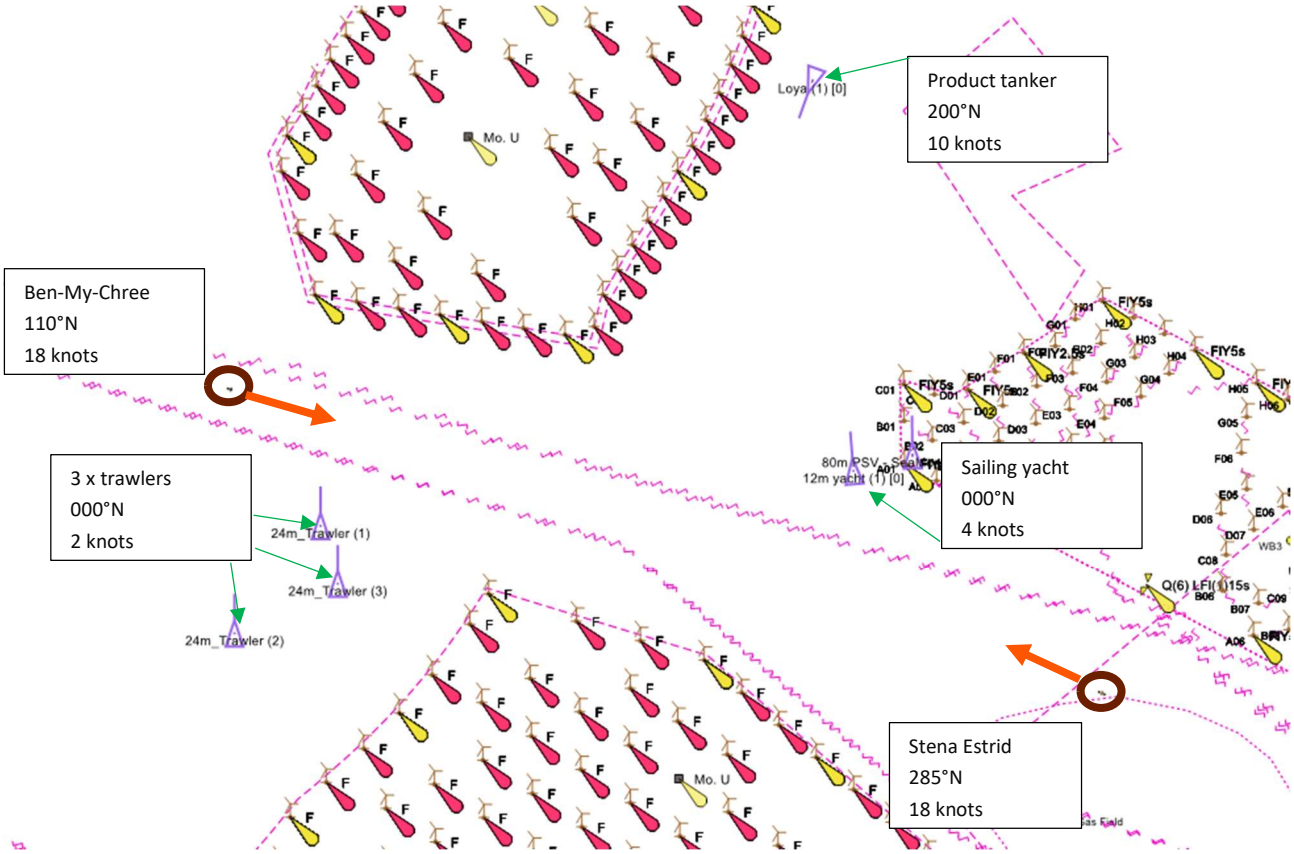
Transit Ben-My-Chree from Douglas to Heysham through Mooir Vannin-Walney and then Morgan-Walney corridor.

Stena Estrid westbound through Morgan-Walney corridor then heading NE between Mooir Vannin and Walney.

3 x trawlers expected in scallop fisheries.

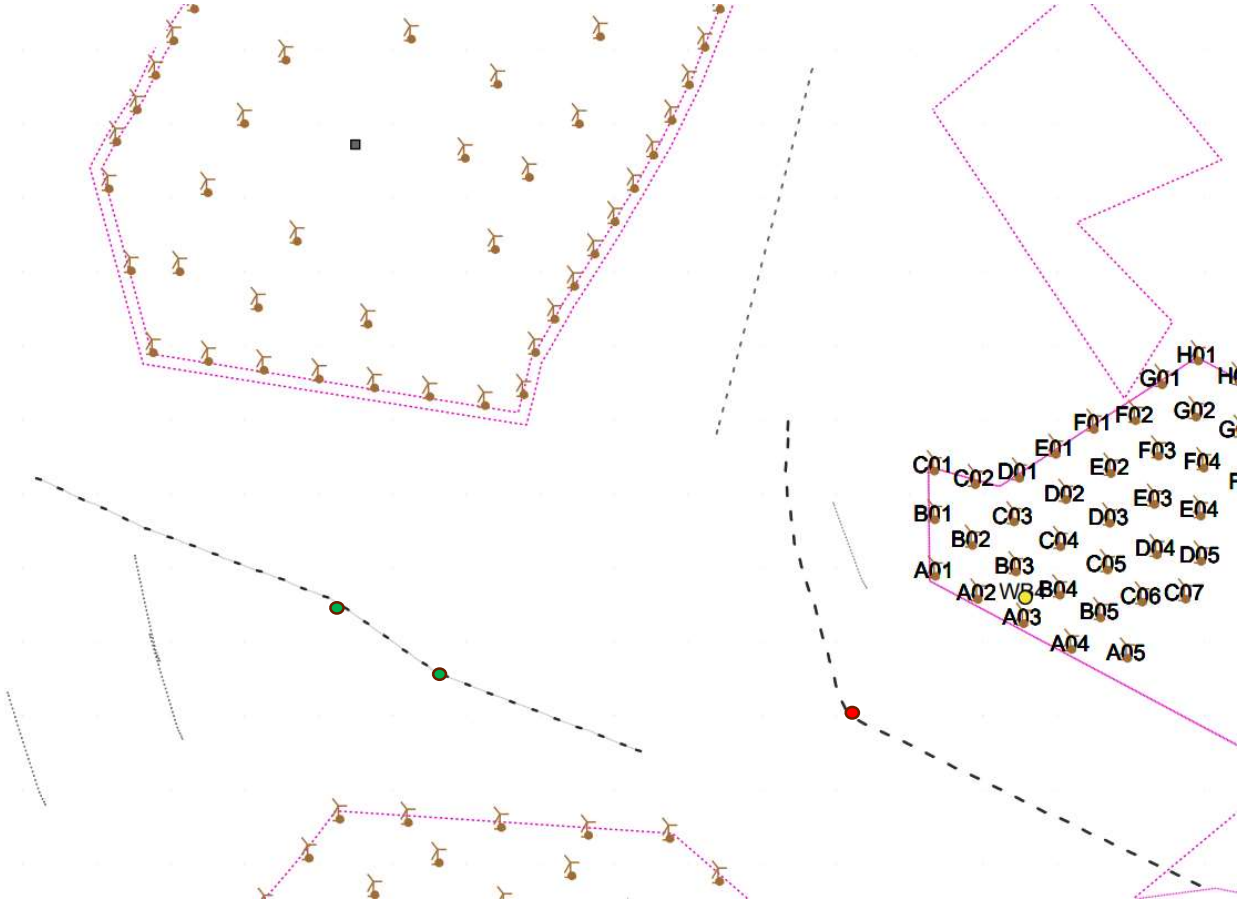
Products tanker heading south through Mooir Vannin and Walney for Morgan-Walney corridor.

Sailing vessel heading north through Mooir Vannin-Walney area.



Actions of Vessels

Time	Ben-My-Chree	Stena Estrid	Comments
14:00	-	Adjusted heading to 130°N	-
15:00	Adjusted heading to 330°N	-	-
20:00	-	Adjusted heading to 110°N	-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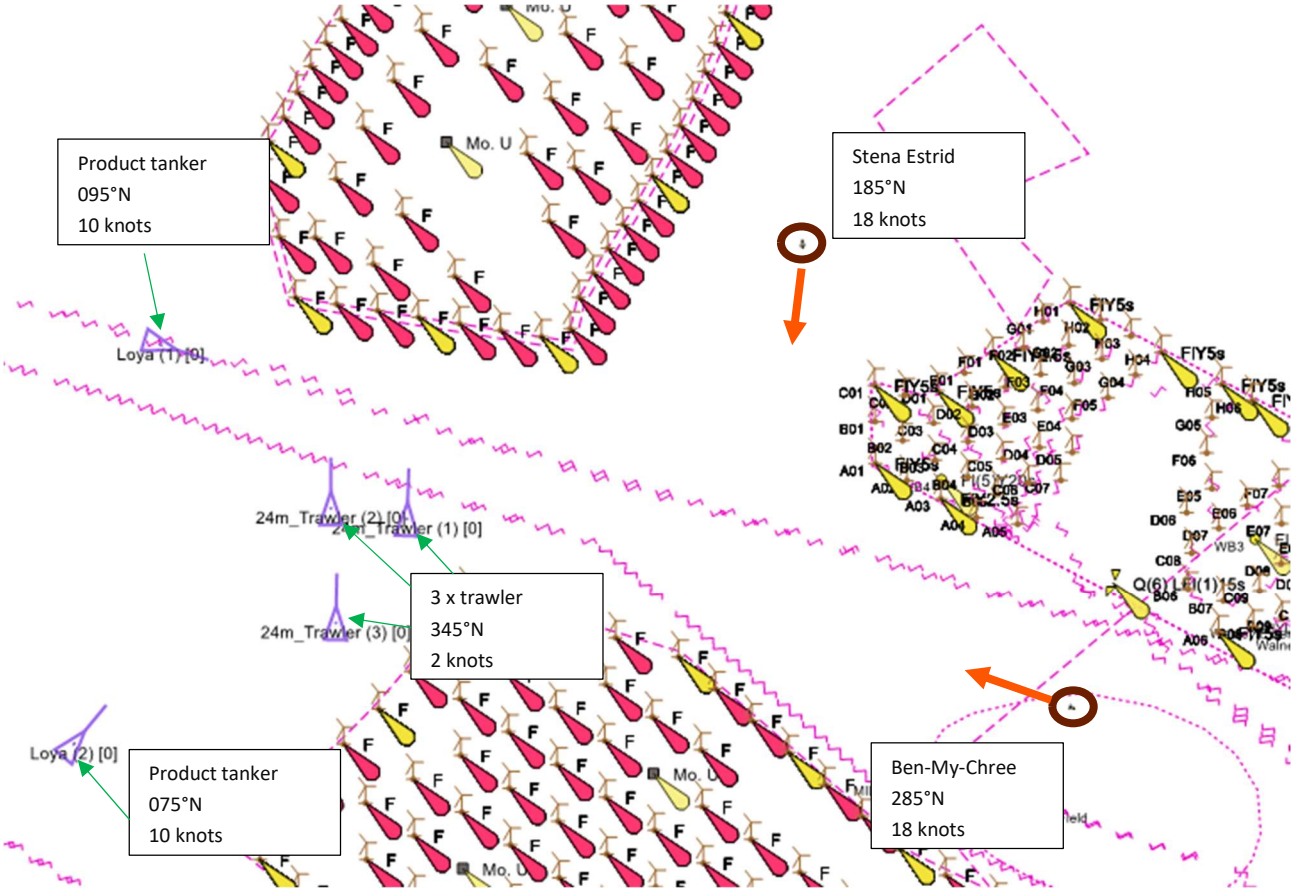
Run: 03

Location: Morgan – Mooir Vannin

Model	Passage direction	Pilot	Wind Direction	Wind Speed	Wave Hs	Wave Tp
Stena Estrid	185°N	SF	225°	20 knots	2.5m	6.0s
Ben-My-Chree	285°N	TT	225°	20 knots	2.5m	6.0s

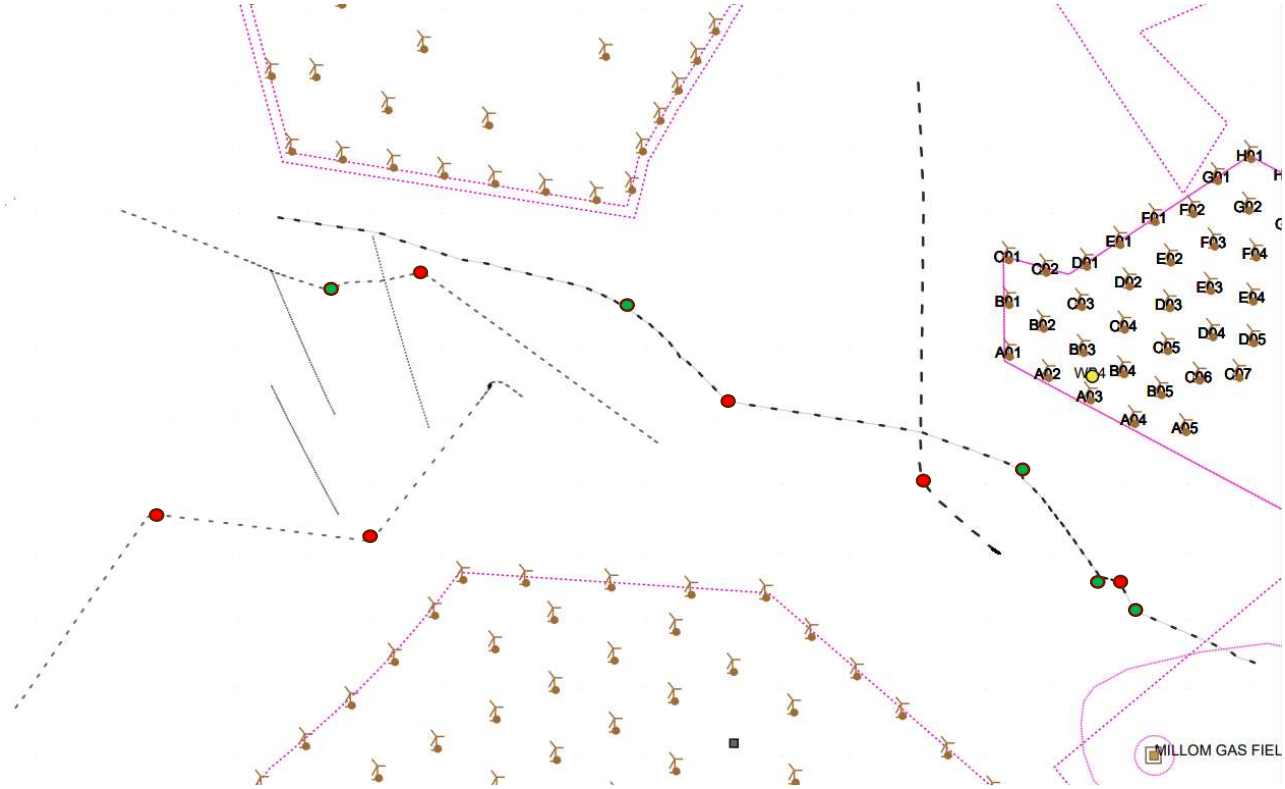
Scenario
Transit Ben-My-Chree from Liverpool to Douglas through Walney corridor.
Stena Estrid heading south through Mooir Vannin Walney for Morgan Walney corridor.
3 x trawlers expected in scallop fisheries.
2 x product tankers heading east through Morgan Mooir Vannin for Morgan Walney corridor.
Sailing vessel heading north through Mooir Vannin Walney.



Actions of Vessels

Time	Ben-My-Chree	Stena	Tanker 1	Tanker 2
05:00	Adjusted heading to 329°N			
06:00	Adjusted heading to 285°N			

Time	Ben-My-Chree	Stena	Tanker 1	Tanker 2
10:00	Adjusted heading to 329°N Speed over ground (SOG) reduced to 10 knots	-		
16:00	-	Adjusted heading to 122°N		Adjusted heading to 100°N
25:00	Adjusted heading to 282°N SOG increased to 18 knots		Adjusted heading to 080°N	
30:00			Adjusted heading to 122°N	Adjusted heading to 045°N
34:00	Adjusted heading to 320°N			
39:00	Adjusted heading to 310°N			
47:00	Adjusted heading to 283°N			



Run: 04

Location: Morgan – Mooir Vannin

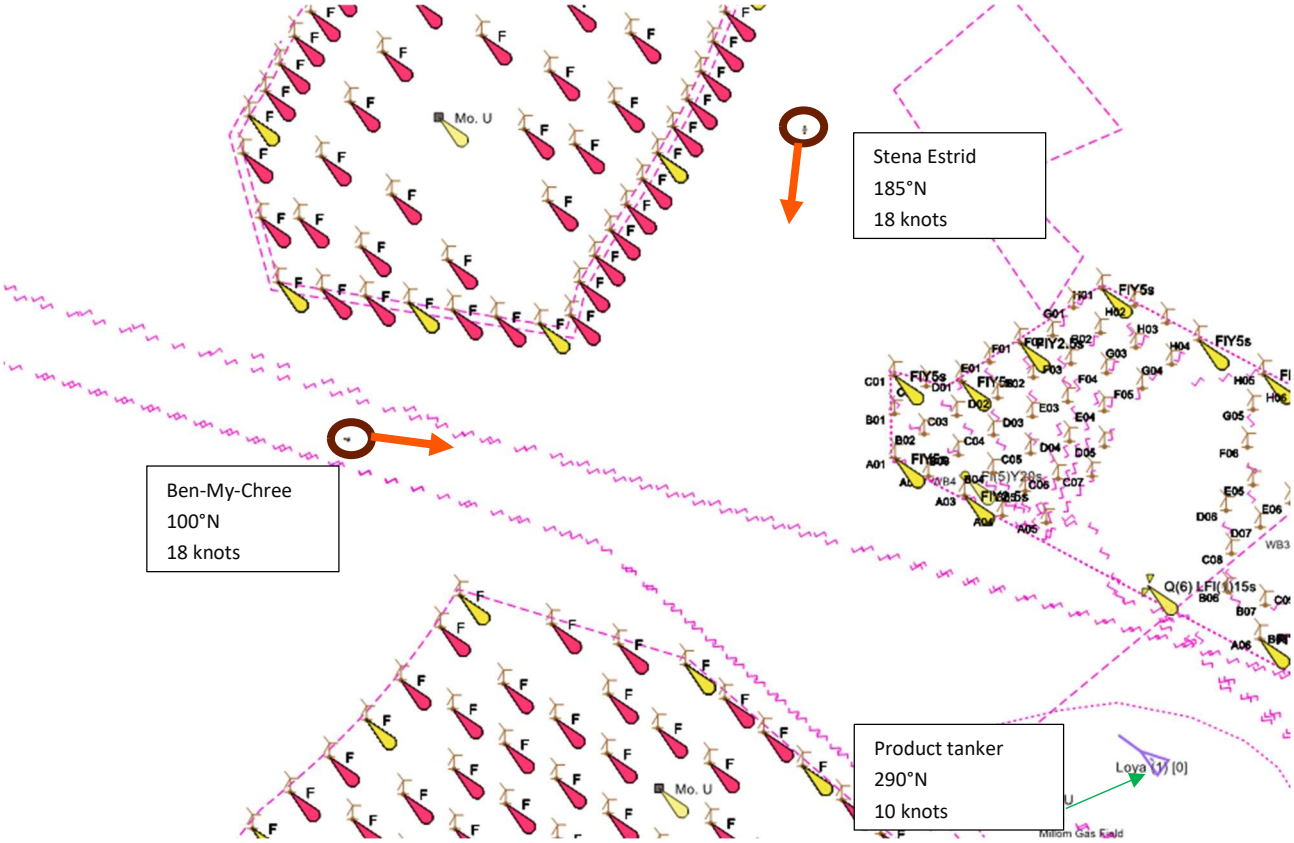
Model	Passage direction	Pilot	Wind Direction	Wind Speed	Wave Hs	Wave Tp
Stena Estrid	185°	SF	225°	20 knots	2.5m	6.0s
Ben-My-Chree	100	TT	225°	20 knots	2.5m	6.0s

Scenario

Attempting to transit Ben-my-Chree to Liverpool through Walney corridor.

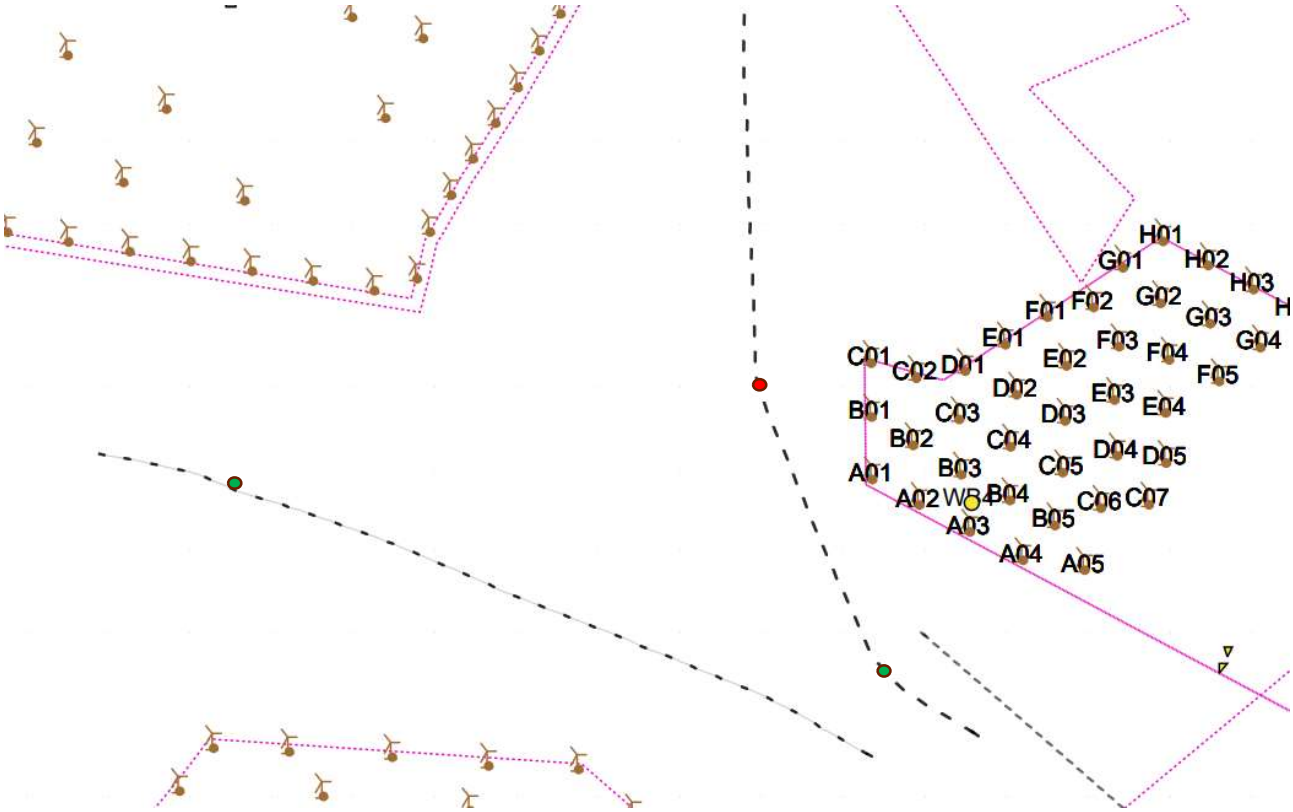
Stena Estrid heading south past Morgan and Mooir Vannin for Morgan Walney corridor.

Ben-My-Chree passed close to trawlers in Morgan Mooir gap but was not aware of trawler 1 due to lack of visibility on radar and ECDIS.



Actions of Vessels

Time	Ben-My-Chree	Stena	Comments
15:00	Adjust heading to 110°N		
25:00		Adjusted heading to 160°N	
27:00		Adjusted heading to 120°N	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Run: 05

Location: Morgan – Mooir Vannin

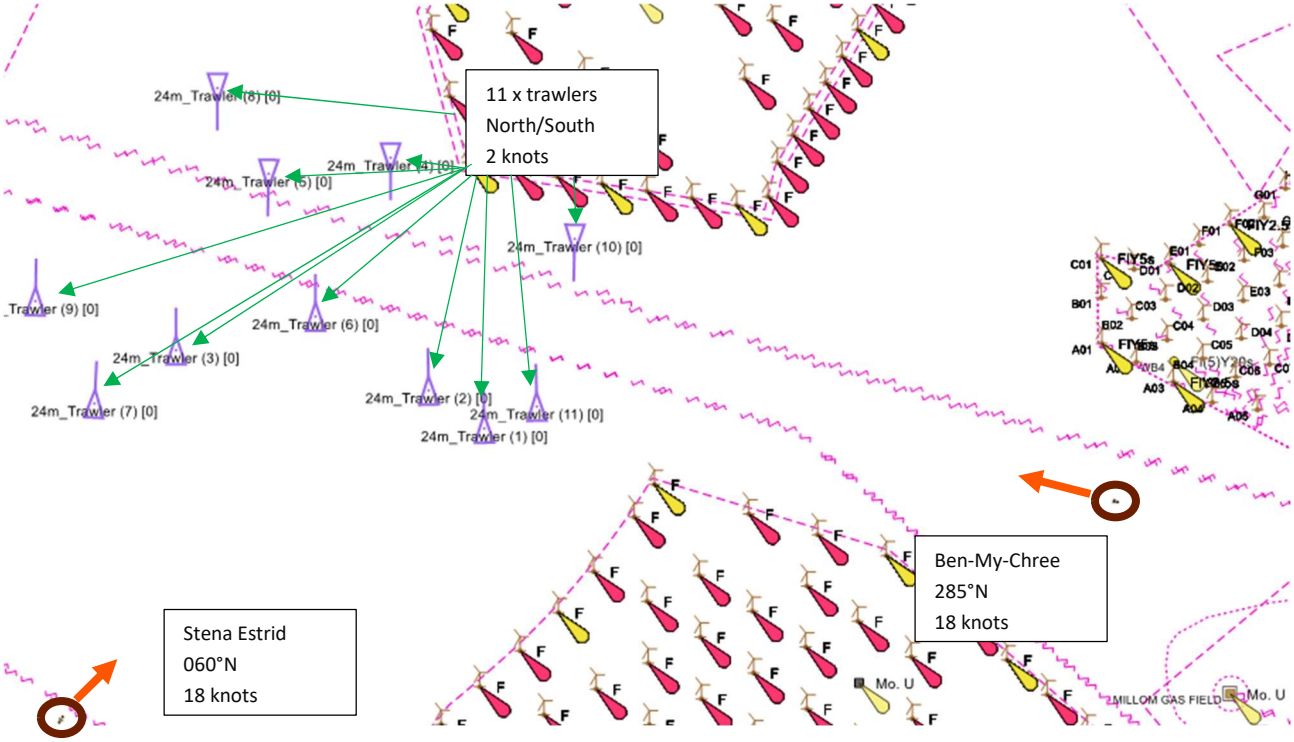
Model	Passage direction	Pilot	Wind Direction	Wind Speed	Wave Hs	Wave Tp
Stena Estrid	280°	MP	225°	20 knots	2.5m	6.0s
Ben-My-Chree	100	TT	225°	20 knots	2.5m	6.0s

Scenario

Attempting to transit Ben-My-Chree from Liverpool through Morgan Mooir Vannin constraint.

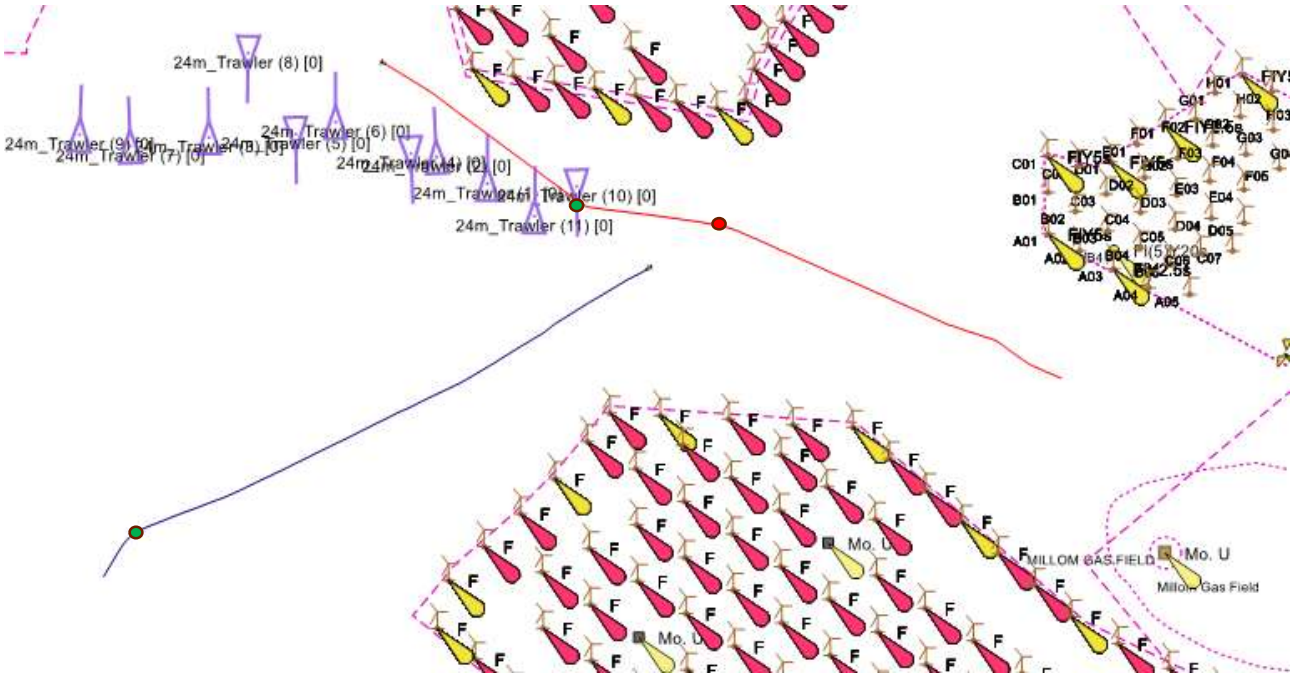
Full fishing fleet (11 x trawlers) in IoM waters.

Stena Estrid transit east through Morgan Mooir Vannin gap.



Actions of Vessels

Time	Ben-My-Chree	Stena	Comments
02:00		Adjusted heading to 070°N	
21:00	Adjusted heading to 276°N		
28:00	Adjusted heading to 205°N		


24m_Trawler (8) [0]
24m_Trawler (6) [0]
24m_Trawler (5) [0]
24m_Trawler (10) [0]
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MILLOM GAS FIELD
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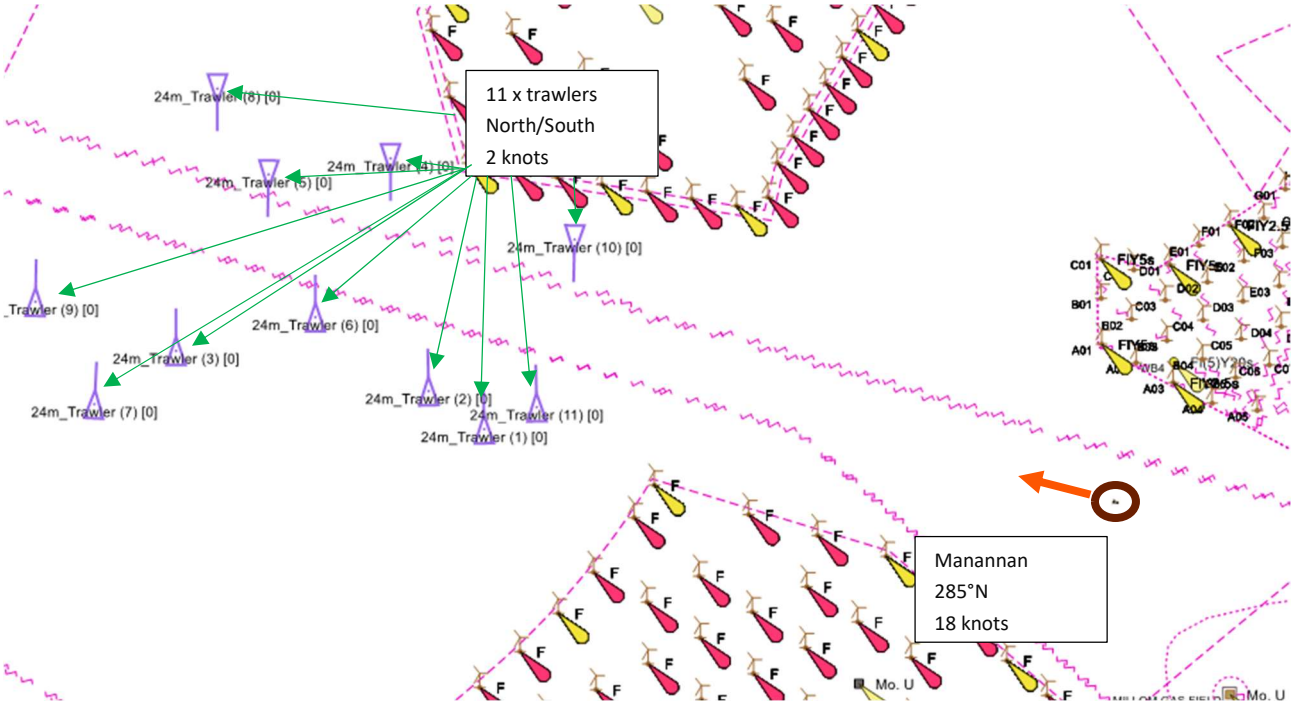
Run: 06

Location: Morgan – Mooir Vannin

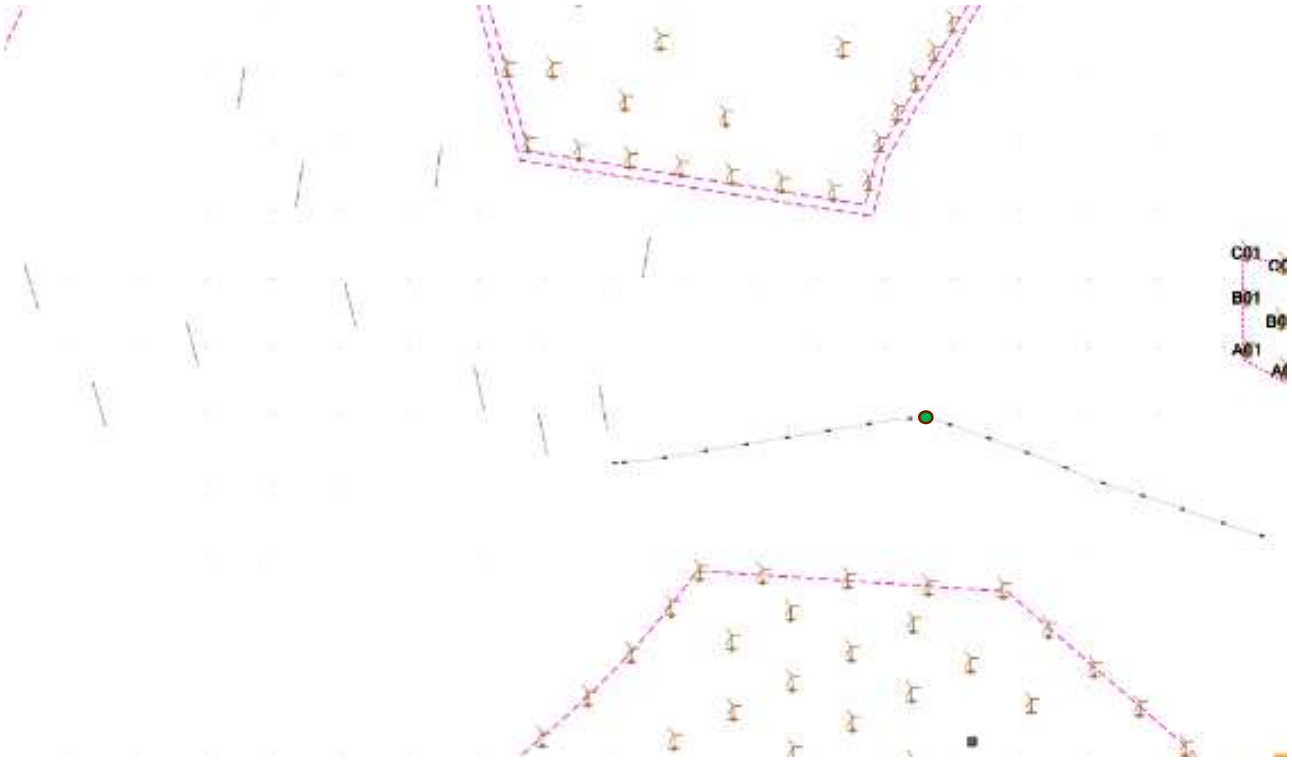
Model	Passage direction	Pilot	Wind Direction	Wind Speed	Wave Hs	Wave Tp
Manannan	285°	TT	280°	15 knots	1.5m	6.0s

Scenario
11 trawlers with Manannan manoeuvring from Liverpool to Douglas.



Actions of Vessels

Time	Manannan	Target vessel	Comments
08:00	Adjusted heading to 259°N		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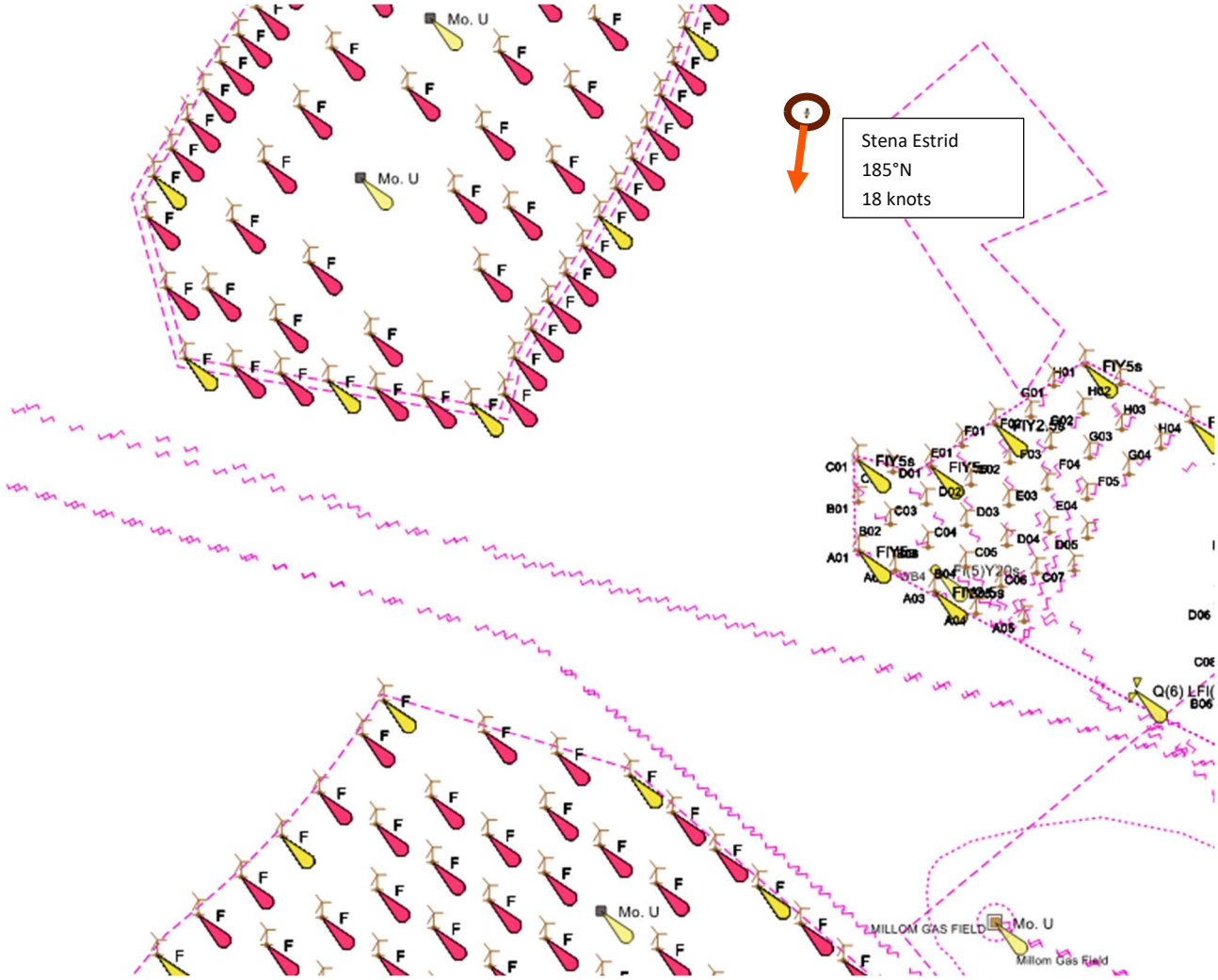
Run: 07

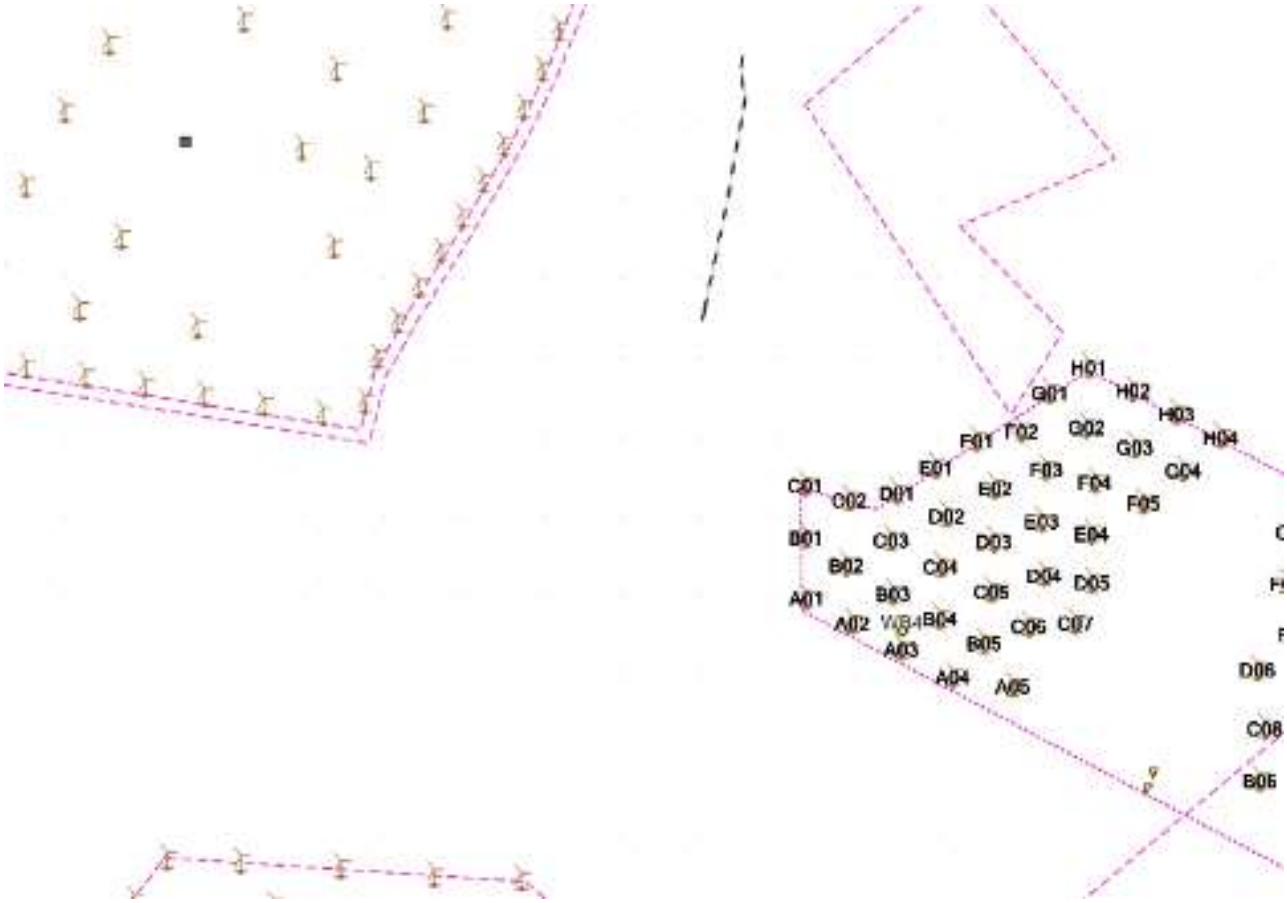
Location: Morgan – Mooir Vannin

Model	Passage direction	Pilot	Wind Direction	Wind Speed	Wave Hs	Wave Tp
Stena Estrid	170°N	MP	225°N	35 knots ± 5 knots	3.5m	7.0s

Scenario

Transit south through Walney Mooir Vannin.

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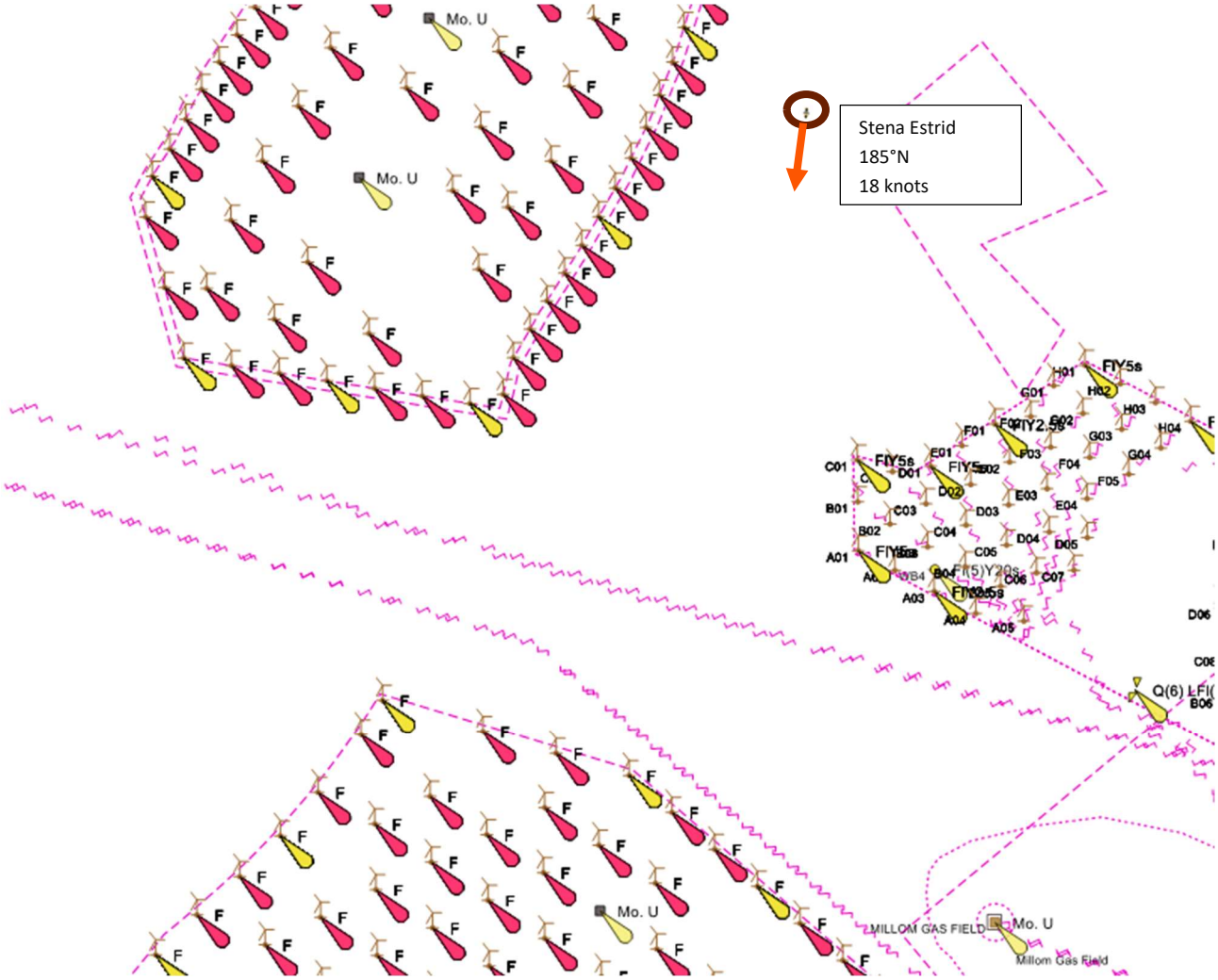
Run: 08

Location: Morgan – Mooir Vannin

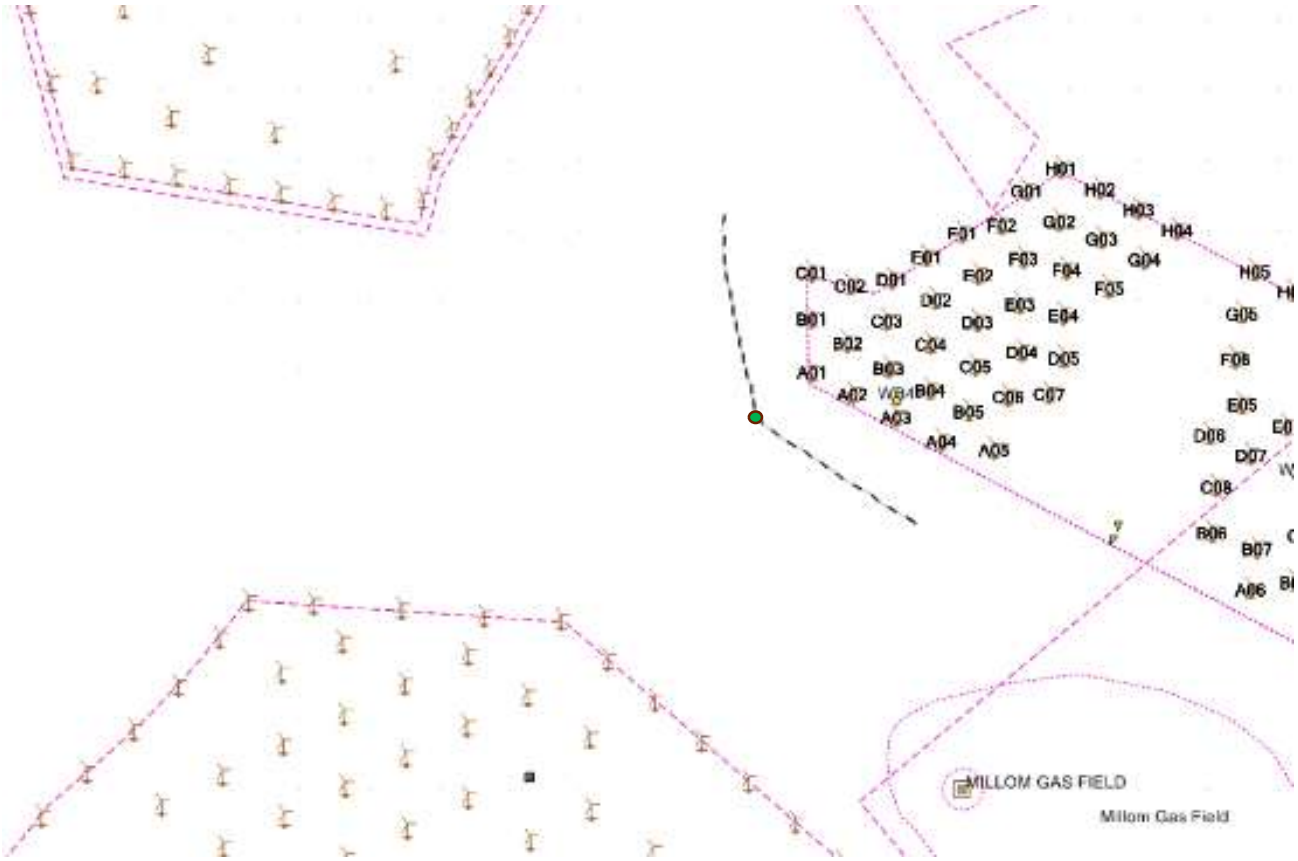
Model	Passage direction	Pilot	Wind Direction	Wind Speed	Wave Hs	Wave Tp
Stena Estrid	170°N	MP	225°N	50 knots	4.2m	9.6s

Scenario
Transit south through Walney Mooir Vannin channel with beam on conditions. Heading east in Morgan-Walney channel.



Actions of Vessels

Time	Stena Estrid	Comments
10:00	Amend heading to 130°N	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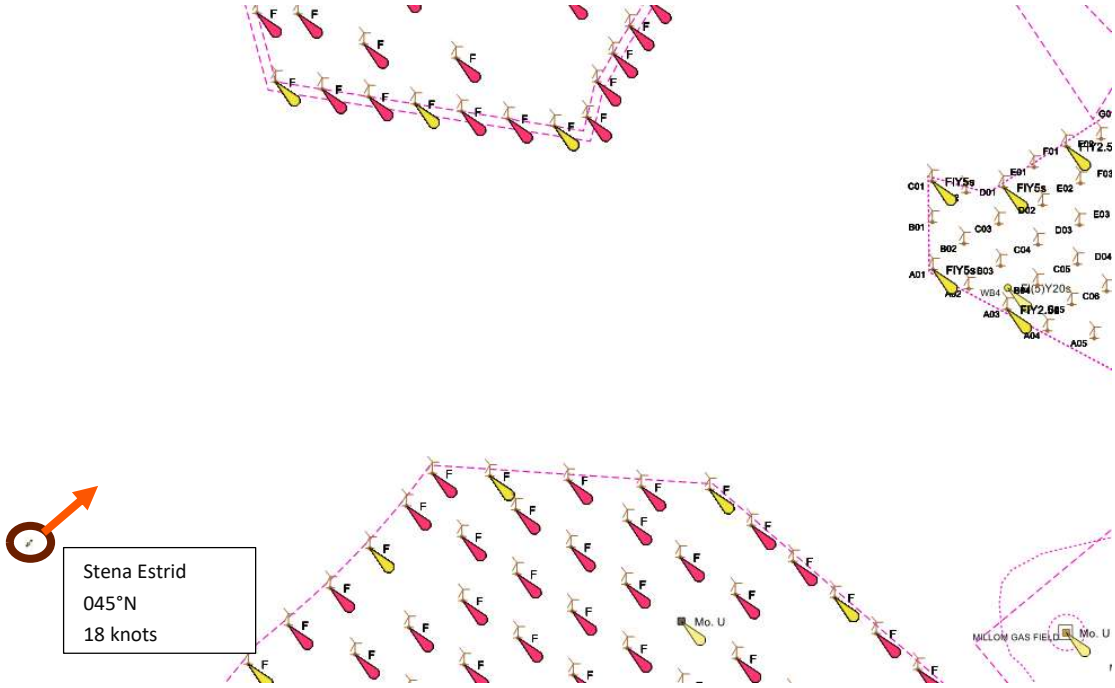
MILLOM GAS FIELD
Millom Gas Field

Run: 09

Location: Morgan - Mooir

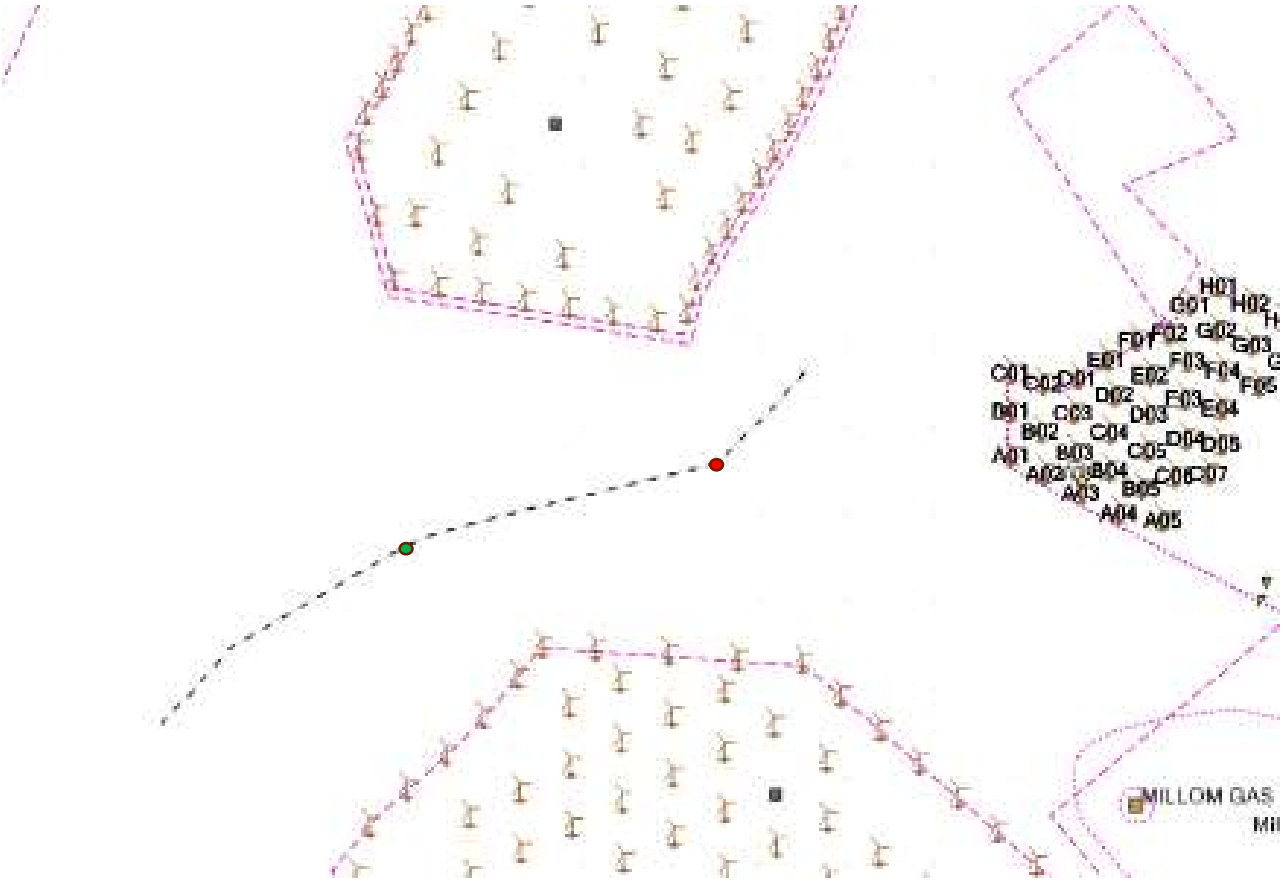
Model	Passage direction	Pilot	Wind Direction	Wind Speed	Wave Hs	Wave Tp
Stena Estrid	035°N	MP	225°N	50 knots	4.2m	9.6s

Scenario
Transit from Anglesey North through Morgan-Mooir Vannin gap.



Actions of Vessels

Time	Stena Estrid	Comments
10:00	Adjust heading to 060°N	
30:00	Adjust heading to 045°N	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MILLOM GAS

We design smarter, more resilient solutions across both the natural and built environment to help everyone live and work more sustainably with water.

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Howbery Park
[redacted]

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IMR 719286

ISO 9001 Quality Management Systems CERTIFIED
FS 516431

ISO 45001 Occupational Health and Safety Management CERTIFIED
OHS 595357

ISO 14001 Environmental Management CERTIFIED
EMS 558310