Rampion 2 Wind Farm

Category 6: Environmental Statement

Volume 4, Appendix 13.1 Navigational risk assessment

Date: August 2023
Revision A

Document Reference: 6.4.13.1
Pursuant to: APFP Regulation 5 (2) (a)
Ecodoc number: 004866487-01

Document revisions

Revision	Date	Status/reason for issue	Author	Checked by	Approved by
A	04/08/2023	Final for DCO Application	Anatec	RED	RED

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Rampion 2 Offshore Wind Farm Navigational Risk Assessment

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Date	24 February 2023
Revision Number	07
Document Reference	A4460-RED-NRA-01

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Revision Number	Date	Summary of Change
00	12 March 2021	First Issue
01	16 April 2021	Revised following GoBe review
02	7 May 2021	Revised following Wood review
03	31 March 2022	Revised following post PEIR consultation
04	7 October 2022	Revised following project design updates
05	23 November 2022	Revised following WSP review
06	3 February 2023	Revised following RED review
07	24 February 2023	Revised to add Appendix H

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Glossary of Terms

Term	Definition
Allision	The act or process of a moving object striking a stationary object.
Aspect	An individual environmental topic. Shipping and navigation is one of a number of offshore aspects.
Automatic Identification System (AIS)	A system by which vessels automatically broadcast their identity, key statistics including location, destination, length, speed and current status. Most commercial vessels and European Union (EU) fishing vessels over 15m length overall (LOA) are required to carry AIS.
Baseline	The existing conditions as represented by the latest available survey and other data which is used as a benchmark for making comparisons to assess the impact of development.
Cable burial risk assessment	Risk assessment to determine suitable burial depths for cables, based on hazards such as anchor strike, fishing gear interaction and seabed mobility.
Collision	The act or process of one moving object striking another moving object.
Cumulative risk	Additional changes caused by a development in conjunction with other similar developments or as a combined risk of a set of developments.
DCO Application	An application for consent to undertake a Nationally Significant Infrastructure Project made to The Planning Inspectorate who will consider the application and make a recommendation to the Secretary of State, who will decide on whether development consent should be granted for the development.
Design envelope	A description of the range of possible elements that make up the design options under consideration for a development. This envelope is used to define a development for Environmental Impact Assessment (EIA) purposes when the exact engineering parameters are not yet known. This is also often referred to as the 'Rochdale Envelope' approach.
Electromagnetic Field (EMF)	An electric and magnetic force field that surrounds a moving electrical charge.
Embedded mitigation measures	Measures to avoid or reduce risks to shipping and navigational safety that are directly incorporated into the preferred masterplan for a development.

Term	Definition
Environmental Impact Assessment (EIA)	A process which identifies the environmental effects of a proposed development, both negative and positive.
Environmental Statement (ES)	The written output presenting the full findings of the Environmental Impact Assessment (EIA).
Proposed DCO Limits	Area that encompasses all planned infrastructure at the submission of the Environmental Statement (ES).
European Union (EU)	The political and economic union of 27 European member states.
Formal Safety Assessment (FSA)	A structured and systematic process for assessing the risks and costs (if applicable) associated with shipping activity.
Future case	The assessment of risk based on the predicted growth in future shipping densities and traffic types as well as foreseeable changes in the marine environment.
Geographical Information System (GIS)	A system that captures, stores, analyses, manages and presents data linked to location. It links spatial information to a digital database.
Geophysical	Relating to the physics of the Earth.
Helicopter Refuge Area	A defined area between offshore wind farm surface infrastructure which does not itself contain any surface infrastructure, designed to support access for Search and Rescue (SAR) assets and serve as an escape route.
Impact	The changes resulting from an action.
Inshore Traffic Zone (ITZ)	An International Maritime Organization (IMO) routeing measure designed to protect local traffic including small craft. There are various restrictions associated with its use (see Section 7.2).
International Maritime Organization (IMO) routeing measure	Predetermined shipping routes and areas established by the IMO to improve the safety of shipping at sea.
Main commercial route	Defined transit route (mean position) of commercial vessels identified within the specified study area.
Marine aggregate	Marine dredged sand and/or gravel.

Term	Definition
Marine Management Organisation (MMO)	An executive non-departmental public body, sponsored by the Department for Environment, Food & Rural Affairs (DEFRA).
Marine Guidance Note (MGN)	A system of guidance notes issued by the Maritime and Coastguard Agency (MCA) which provide significant advice relating to the improvement of the safety of shipping at sea, and to prevent or minimise pollution from shipping.
Maximum Design Scenario (MDS)	The maximum design parameters of each asset for a development (both on and offshore) considered to the worst case for any given aspect.
Nationally Significant Infrastructure Project (NSIP)	Major infrastructure developments in England and Wales that bypass normal local planning requirements. These include proposals for renewable energy projects.
Navigational Risk Assessment (NRA)	A document which assesses the overall impact to shipping and navigation of a proposed Offshore Renewable Energy Installation (OREI) based on Formal Safety Assessment (FSA).
Offshore Renewable Energy Installation (OREI)	In the context of offshore wind development, offshore Wind Turbine Generators (WTG) and the associated electrical infrastructure such as offshore substations.
PEIR Assessment Boundary	Area that encompasses all planned infrastructure at the submission of the Preliminary Environmental Information Report (PEIR).
Planning Inspectorate	An executive agency of the Ministry of Housing, Communities and Local Government which deals with planning appeals, national infrastructure planning applications, examinations of local plans and other planning related and specialist casework in England and Wales.
Preliminary Environmental Information Report (PEIR)	The written output of the Environmental Impact Assessment (EIA) undertaken for a development used to support public consultation.
Radio Detection and Ranging (Radar)	An object-detection system which uses radio waves to determine the range, altitude, direction or speed of objects.
Rampion 1	The existing Rampion Offshore Wind Farm fully commissioned in November 2018.

Term	Definition
User	A recipient of a hazard.
Regular operator	A commercial operator whose vessel(s) are observed to transit through a particular region on a regular basis.
Safety Zone	A statutory marine zone demarcated for the purposes of safety around a possibly hazardous installation or works/construction area.
Scoping Boundary	Area that encompasses all planned infrastructure at the submission of the Scoping Report.
Scoping Opinion	A report presenting the written opinion of the Secretary of State as to the scope and level of detail of information to be provided in the Environmental Statement (ES) for a development.
Scoping Report	A report presenting the findings of an initial stage in the Environmental Impact Assessment (EIA) process.
Secretary of State	The body who makes the decision to grant development consent.
Significance	A measure of the importance of an environmental effect, defined by criteria specific to the environmental aspect.
Stakeholder	A person or organisation with a specific interest (commercial, professional or personal) in a particular issue.
Study area	A buffer of up to 10 nautical miles (nm) applied around the Proposed DCO Limits, defined in order to provide local context to the analysis of risks by capturing the relevant routes and vessel traffic movements within and in proximity to the Proposed DCO Limits (see Section 3.4).
Traffic Separation Scheme (TSS)	A traffic management route system ruled by the International Maritime Organization (IMO). The traffic lanes (or clearways) indicate the general direction of transit which apply of the vessels in that zone; vessels navigating within a TSS all sail in the same direction or they cross the lane at an angle as close to 90 degrees (°) as possible.
Transboundary effects	Assessment of changes to the environment caused by the combined effect of past, present and future human activities and natural processes on other European Economic Area (EEA) member states.
The Applicant	Rampion Extension Development (RED), the developer of Rampion 2.
The Proposed Development	The onshore and offshore infrastructure associated with the Rampion 2 Offshore Wind Farm.

Term	Definition
Unexploded Ordnance (UXO)	Explosive weapons (bombs, shells, grenades, land mines, naval mines, etc.) that did not explode when they were employed and still pose a risk of detonation, potentially may decades after they were used or discarded.
Unique vessel	An individual vessel identified on any particular calendar day, irrespective of how many tracks were recorded for that vessel on that day. This prevents vessels being over counted. Individual vessels are identified using their Maritime Mobile Service Identity (MMSI).
Vessel Traffic Service (VTS)	A service implemented by a Competent Authority designed to improve the safety and efficiency of vessel traffic and to protect the environment. The service should have the capability to interact with the traffic and to respond to traffic situations developing in the VTS area.

Abbreviations Table

Abbreviation	Definition
ABP	Associated British Ports
AC	Alternating Current
AIS	Automatic Identification System
ALARP	As Low as Reasonably Practicable
ALB	All-Weather Lifeboat
ARPA	Automatic Radar Plotting Aid
ATBA	Area to Be Avoided
AW189	AgustaWestland 189
BBC	British Broadcasting Corporation
BEIS	Department for Business, Energy and Industrial Strategy
BMAPA	British Marine Aggregate Producers Association
BWEA	British Wind Energy Association
CAA	Civil Aviation Authority
CBA	Cost Benefit Analysis
CCTV	Closed Circuit Television
CD	Chart Datum
CHIRP	Confidential Human Factors Incident Reporting Programme

Abbreviation	Definition
COLREGs	Convention on International Regulations for Preventing Collisions at Sea
CTV	Crew Transfer Vessel
DCO	Development Consent Order
DECC	Department of Energy and Climate Change
DF	Direction Finding
DfT	Department for Transport
dML	Deemed Marine Licence
DSC	Digital Selective Calling
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EMF	Electromagnetic Field
ERCoP	Emergency Response Cooperation Plan
ES	Environmental Statement
ESRI	Environmental Systems Research Institute
FLO	Fisheries Liaison Officer
FSA	Formal Safety Assessment
GEFO	Gesellschaft füer Oeltransporte
GLA	General Lighthouse Authority
GMDSS	Global Maritime Distress and Safety System
GPS	Global Positioning System
GRP	Glass Reinforced Plastic
GT	Gross Tonnage
HAT	Highest Astronomical Tide
HMCG	His Majesty's Coastguard
HRA	Helicopter Refuge Area
HSE	Health, Safety and Environment
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
IFA2	Interconnexion France-Angleterre 2
IHO	International Hydrographic Organization
ILB	Inshore Lifeboat

Abbreviation	Definition
IMCA	International Marine Contractors Association
IMO	International Maritime Organization
IPS	Intermediate Peripheral Structure
ITZ	Inshore Traffic Zone
kHz	Kilohertz
km	Kilometre
kt	Knot
LAT	Lowest Astronomical Tide
LOA	Length Overall
LPG	Liquefied Petroleum Gas
m	Metre
MAIB	Marine Accident Investigation Branch
MCA	Maritime and Coastguard Agency
MDS	Maximum Design Scenario
MEPC	Marine Environment Protection Committee
MGN	Marine Guidance Note
MHWS	Mean High Water Springs
MMSI	Mobile Maritime Service Identity
MOD	Ministry of Defence
MPCP	Marine Pollution Contingency Plan
MSC	Mediterranean Shipping Company
MSI	Maritime Safety Information
NAVTEX	Navigational Telex
NFFO	National Federation of Fishermen’s Organisations
nm	Nautical Mile
nm^2	Square Nautical Mile
NOREL	Nautical Offshore Renewable Energy Liaison
NPS	National Policy Statement
NRA	Navigational Risk Assessment
NSIP	Nationally Significant Infrastructure Projects
OREI	Offshore Renewable Energy Installation

Abbreviation	Definition
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
PEIR	Preliminary Environmental Information Report
PEXA	Practice and Exercise Area
PLA	Port of London Authority
PNT	Positioning, Navigation and Timing
QHSE	Quality, Health, Safety and Environment
Racon	Radar Beacon
Radar	Radio Detection and Ranging
RED	Rampion Extension Development
RIB	Rigid Inflatable Boat
RNLI	Royal National Lifeboat Institution
Ro-Ro	Roll-On/Roll-Off
RYA	Royal Yachting Association
SAR	Search and Rescue
SCADA	Supervisory Control and Data Acquisition
SMS	Safety Management System
SOLAS	Safety of Life at Sea
SONAR	Sound Navigation Ranging
SOV	Service Operation Vessel
SPS	Significant Peripheral Structure
TCE	The Crown Estate
TSS	Traffic Separation Scheme
UECC	United European Car Carriers
UK	United Kingdom
UKHO	United Kingdom Hydrographic Office
US	United States
UTC	Coordinated Universal Time
UTM	Universal Transverse Mercator
UXO	Unexploded Ordnance
VDL	Volker Dredging Limited
VHF	Very High Frequency

Abbreviation	Definition
VTS	Vessel Traffic Services
WGS84	World Geodetic System 1984
WTG	Wind Turbine Generator
°	Degree

1 Introduction

1.1 Background

1. Anatec was commissioned by Rampion Extension Development Limited (RED), hereafter referred to as 'The Applicant', to undertake a Navigational Risk Assessment (NRA) for the proposed Rampion 2 Offshore Wind Farm (hereafter 'the Proposed Development'). The Proposed Development Consent Order (DCO) Limits referred to in this NRA consists of the offshore component only and is, where relevant, split into the array area and offshore export cable corridor. This NRA presents information on the Proposed Development relative to the existing and estimated future navigational activity and forms the technical Appendix to **Chapter 13: Shipping and navigation, Volume 2** of the ES (Document Reference 6.2.13).

1.2 Navigational Risk Assessment

2. An Environmental Impact Assessment (EIA) is a process which identifies the environmental effects of a proposed development, both negative and positive. An important requirement of the EIA for offshore projects is the NRA. Following the Maritime and Coastguard Agency (MCA) methodology (MCA, 2013) and Marine Guidance Note (MGN) 654 (MCA, 2021), this NRA includes:

- Outline of methodology applied in the NRA;
- Summary of consultation undertaken with shipping and navigation stakeholders to date;
- Lessons learnt from previous offshore wind farm developments;
- Summary of the project description relevant to shipping and navigation;
- Baseline characterisation of the existing environment;
- Discussion of potential impacts on navigation, communication and position fixing equipment;
- Cumulative and transboundary overview;
- Future case vessel traffic characterisation;
- Collision and allision risk modelling;
- Assessment of navigational risk (following the Formal Safety Assessment (FSA) process);
- Outline of embedded mitigation measures; and
- Completion of MGN 654 Checklist.

3. Potential hazards are considered for each phase of development as follows:

- Construction;
- Operation and maintenance; and
- Decommissioning.

4. The assessment of the Proposed Development is based on a parameter-based design envelope approach, which is recognised in the Overarching National Policy Statement (NPS) for Energy (EN-1) (Department of Energy

and Climate Change (DECC), 2011), the NPS for Renewable Energy Infrastructure (EN-3) (DECC, 2011) and *Planning Inspectorate Advice Note Nine: Rochdale Envelope* (The Planning Inspectorate, 2018). The design envelope includes conservative assumptions to form a Maximum Design Scenario (MDS) which is considered and assessed for all risks. Further details on the design envelope are provided in **Chapter 4: The Proposed Development, Volume 2** of the ES (Document Reference 6.2.4).

5. The shipping and navigation baseline and risk assessment has been undertaken based upon the information available and responses received at the time of preparation, including the MDS as discussed above.

2 Guidance and Legislation

2.1 Legislation

6. Planning policy on offshore renewable energy Nationally Significant Infrastructure Projects (NSIP) specifically in relation to shipping and navigation is contained in the NPS for Renewable Energy Infrastructure (EN-3) (DECC, 2011). Additionally, planning policy on NSIP for ports is contained in the NPS for Ports (Department for Transport (DfT), 2012). Section 13.2 of **Chapter 13: Shipping and navigation, Volume 2** of the ES (Document Reference 6.2.13) summarises the relevant matters within NPS EN-3 and the NPS for Ports and where they are considered in the Environmental Statement (ES).

2.2 Primary Guidance

7. The primary guidance documents used during the assessment are the following:

- *MGN 654 (Merchant and Fishing) Safety of Navigation: Offshore Renewable Energy Installations (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response* (MCA, 2021);
- *Methodology for Assessing the Marine Navigational Safety & Emergency Response Risks of Offshore Renewable Energy Installations (OREI)* (MCA, 2013); and
- *Revised Guidelines for FSA for Use in the IMO Rule-Making Process* (International Maritime Organization (IMO), 2018).

8. MGN 654 highlights issues that shall be considered when assessing the effect on navigational safety from offshore renewable energy developments, proposed in United Kingdom (UK) internal waters, UK territorial sea or the UK Exclusive Economic Zone (EEZ).

9. The MCA require that their methodology is used as a template for preparing NRAs. It is centred on risk management and requires a submission that shows that sufficient controls are, or will be, in place for the assessed risk to be judged as broadly acceptable or tolerable with mitigation (see Section 3.2). Across **Chapter 13: Shipping and navigation, Volume 2** of the ES (Document Reference 6.2.13) and the NRA both base and future case levels of risk have been identified and what measures are required to ensure the future case remains broadly acceptable or tolerable with mitigation.

2.3 Other Reference Documents

10. Other reference documents used during the assessment are as follows:

- *International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) Recommendation O-139 on The Marking of Man-Made Offshore Structures* (IALA, 2021);

- *IALA Guideline G1162 The Marking of Offshore Man-Made Structures* (IALA, 2021);
- *The Royal Yachting Association's (RYA) Position on Offshore Renewable Energy Developments: Paper 1 (of 4) – Wind Energy* (RYA, 2019);
- *Standard Marking Schedule for Offshore Installations* (DECC, 2011);
- *UK Marine Policy Statement* (HM Government, 2011);
- *South Inshore and South Offshore Marine Plan* (Department for Environment, Food & Rural Affairs (DEFRA), 2018) and
- *Marine and Coastal Access Act 2009.*

2.4 Lessons Learnt

11. There is considerable benefit for The Applicant in the sharing of lessons learnt within the offshore industry. The NRA, and in particular the risk assessment undertaken in **Chapter 13: Shipping and navigation, Volume 2** of the ES (Document Reference 6.2.13), includes general consideration for lessons learnt and expert opinion from previous offshore wind farm developments and other sea users, capitalising upon the UK's position as a leading generator of offshore wind power. This includes the shipping and navigation chapter of the ES for the existing and neighbouring Rampion Offshore Wind Farm (hereafter Rampion 1) (E.ON, 2012).

3 Navigational Risk Assessment Methodology

3.1 Formal Safety Assessment Methodology

12. A shipping and navigation user can only be exposed to a risk caused by a hazard if there is a pathway through which a risk can be transmitted between the source activity and the user. In cases where a user is exposed to a risk, the overall significance of risk to the user is determined. This process incorporates a degree of subjectivity. The assessments presented herein for shipping and navigation users have considered the following criteria:

- Baseline data and assessment;
- Expert opinion;
- Level of stakeholder concern including output of the Hazard Workshop;
- Time and/or distance of any deviation;
- Number of transits of specific vessels and/or vessel types; and
- Lessons learnt from existing offshore developments.

13. It is noted that, with regards to commercial fishing vessels, the methodology and assessment has been applied to hazards considering commercial fishing vessels in transit. A separate methodology and assessment have been applied in **Chapter 10: Commercial fisheries, Volume 2** of the ES (Document Reference 6.2.10) to consider hazards on commercial fishing vessels including safety risks which are directly related to commercial fishing activity (rather than commercial fishing vessels in transit) and risks of a commercial nature.

3.2 Formal Safety Assessment Process

14. The IMO FSA process (IMO, 2018) as approved by the IMO in 2018 under Maritime Safety Committee – Marine Environment Protection Committee (MEPC).2/circ. 12/Rev.2 will be applied to the risk assessment within this NRA, and informs **Chapter 13: Shipping and navigation, Volume 2** of the ES (Document Reference 6.2.13).

15. The FSA process is a structured and systematic methodology based upon risk analysis and Cost Benefit Analysis (CBA) (if applicable) to reduce impacts to As Low as Reasonably Practicable (ALARP). There are five basic steps within this process as illustrated by Figure 3.1 and summarised in the following list:

- Step 1 – Identification of hazards (a list is produced of hazards prioritised by risk level specific to the problem under review);
- Step 2 – Risk assessment (investigation of the causes and initiating events and risks of the more important hazards identified in step 1);
- Step 3 – Risk control options (identification of measures to control and reduce the identified risks);
- Step 4 – CBA (identification and comparison of the benefits and costs associated with the risk control options identified in step 3); and

- Step 5 – Recommendations for decision-making (defining of recommendations based upon the outputs of steps 1 to 4).

Figure 3.1 Flow chart of the FSA methodology

16. It is noted that hazards of a commercial nature are considered outside the remit of the NRA but have been assessed using the FSA process in **Chapter 13: Shipping and navigation, Volume 2** of the ES (Document Reference 6.2.13), where appropriate.

3.2.1 Hazard Workshop Methodology

17. A key tool used in the NRA process is the Hazard Workshop which ensures that all hazards are identified and the corresponding risks qualified in discussion with relevant consultees. Table 3-1 and Table 3-2 define the severity of consequence and the frequency of occurrence rankings that have been used to assess risks within the hazard log, completed based on the outputs of the Hazard Workshop.

Table 3-1 Severity of consequence ranking definitions

Rank	Description	Definition			
		People	Property	Environment	Business
1	Negligible	No perceptible impact	No perceptible impact	No perceptible impact	No perceptible impact

Rank	Description	Definition			
		People	Property	Environment	Business
2	Minor	Slight injury(s)	Minor damage to property i.e., superficial damage	Tier 1 local assistance required	Minor reputational risks – limited to users
3	Moderate	Multiple minor or single serious injury	Damage not critical to operations	Tier 2 limited external assistance required	Local reputational risks
4	Serious	Multiple serious injuries or single fatality	Damage resulting in critical impact on operations	Tier 2 regional assistance required	National reputational risks
5	Major	More than one fatality	Total loss of property	Tier 3 national assistance required	International reputational risks

Table 3-2 Frequency of occurrence ranking definitions

Rank	Description	Definition
1	Negligible	< 1 occurrence per 10,000 years
2	Extremely unlikely	1 per 100 to 10,000 years
3	Remote	1 per 10 to 100 years
4	Reasonably probable	1 per 1 to 10 years
5	Frequent	Yearly

18. The severity of consequence and frequency of occurrence are then used to define the significance of risk via a tolerability matrix approach as shown in Table 3-3. The significance of risk is defined as Broadly Acceptable (low risk), Tolerable (intermediate risk) or Unacceptable (high risk).

Table 3-3 Tolerability matrix and risk rankings

Severity of Consequence	5					
	4					
	3					
	2					
	1					
		1	2	3	4	5

	Frequency of Occurrence

	Unacceptable (high risk)
	Tolerable (intermediate risk)
	Broadly Acceptable (low risk)

19. Once identified, the significance of risk will be assessed to ensure it is ALARP. Further risk control measures may be required to further mitigate a hazard in accordance with the ALARP principles. Unacceptable risks are not considered to be ALARP.

3.3 Methodology for Cumulative Risk Assessment

20. The hazards identified in the FSA are also assessed for cumulative risks with the inclusion of other projects and proposed developments. Given the varying type, status and location of developments, a tiered approach to cumulative risk assessment has been undertaken, which splits developments into tiers depending upon project status, proximity to the Proposed DCO Limits and the level to which they are anticipated to cumulatively impact relevant users. It also considers data confidence, most notably in terms of the level of certainty over the location and timescales for a development.

21. The tiers are summarised in Table 3-4, with the level of assessment undertaken for each tier included. It is noted that an aggregate of the criterion is used to determine the tier of each development. For example, if a development is located within 30nm of the Proposed DCO Limits and may impact a main commercial route within 1nm of the array area but the development is only scoped, it may still be allocated to Tier 1.

3.4 Study Area

22. A buffer of up to 10nm has been applied around the Proposed DCO Limits, as shown in Figure 3.2, as the study area for shipping and navigation (hereafter the study area).

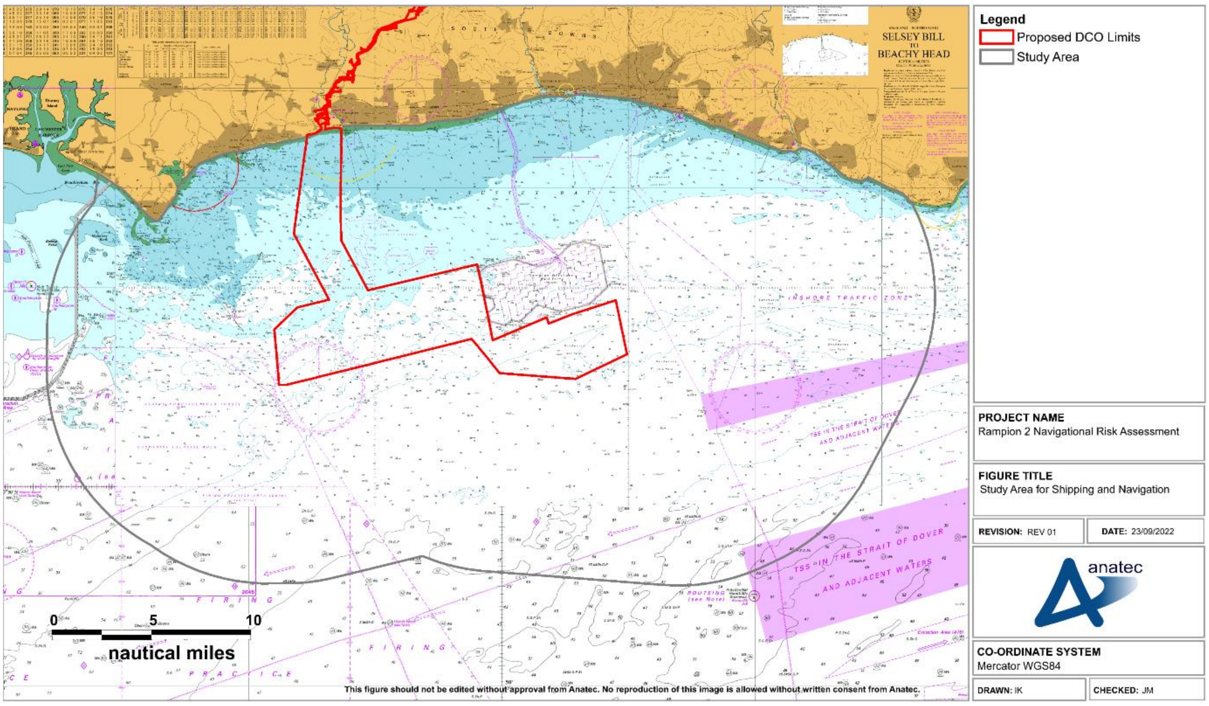

Figure 3.2 Study area for shipping and navigation

23. The study area has been defined in order to provide local context to the analysis of risks by capturing the relevant routes, vessel traffic movements and historical incident data within and in proximity to the Proposed DCO Limits. Navigational features wholly or partially outside the study area are considered where appropriate, e.g., the Dover Strait Traffic Separation Scheme (TSS).

24. A 10nm study area has been used in the majority of UK offshore wind farm NRAs, including, for example, Hornsea Project Three Offshore Wind Farm and Norfolk Vanguard Offshore Wind Farm, both of which were awarded consent from a shipping and navigation perspective in 2020.

Table 3-4 Cumulative development screening summary

Tier	Minimum Development Status	Criterion	Data Confidence Level	Level of Cumulative Risk Assessment
1	Under construction, consented or under determination	▪ May impact a main commercial route passing within 1nm of the array area and/or interacts with traffic which may be directly displaced by the array area. ▪ Raised as having possible cumulative effect during consultation. *Offshore wind farms:* ▪ Up to 30nm from the Proposed DCO Limits. *Oil and gas infrastructure:* ▪ Up to 5nm from the Proposed DCO Limits. *Marine aggregate dredging areas:* ▪ Up to 15nm from the Proposed DCO Limits.	High or medium	Quantitative cumulative re-routeing of main commercial routes
2	Under construction, consented or under determination	▪ May impact a main commercial route passing within 1nm of the array area and/or interacts with traffic which may be directly displaced by the array area. *Offshore wind farms:* ▪ Between 30 and 60nm from the Proposed DCO Limits. *Oil and gas infrastructure:* ▪ Between 5 and 10nm from the Proposed DCO Limits. *Marine aggregate dredging areas:* ▪ Between 15 and 30nm from the Proposed DCO Limits.	High or medium	Qualitative cumulative re-routeing of main commercial routes

Tier	Minimum Development Status	Criterion	Data Confidence Level	Level of Cumulative Risk Assessment
3	Scoped or under examination	▪ Does not impact a main commercial route passing within 1nm of the array area and does not interact with traffic which may be directly displaced by the array area. *Offshore wind farms:* ▪ Up to 60nm from the Proposed DCO Limits. *Oil and gas infrastructure:* ▪ Up to 10nm from the Proposed DCO Limits. *Marine aggregate dredging areas:* ▪ Up to 30nm from the Proposed DCO Limits.	Low	Qualitative assumptions of routeing only

25. Offshore wind farm developments are screened out if over 60nm from the Proposed DCO Limits or within 60nm of the Proposed DCO Limits but have not yet been scoped.

26. Similarly, oil and gas infrastructure is screened out if over 10nm from the Proposed DCO Limits or within 10nm of the Proposed DCO Limits but have not yet had a basis of design submitted.

27. Marine aggregate dredging areas are screened out if over 30nm from the Proposed DCO Limits or within 30nm of the Proposed DCO Limits but have not had a bilateral agreement application submitted.

28. These distances represent a conservative approach, noting that beyond these distances it is not considered feasible that a cumulative effect would be present. This is a typical approach undertaken for the cumulative risk assessment in NRAs, with these distances chosen based on the unique nature of vessel movements within the English Channel which are highly dictated by IMO routeing measures and cross channel ports.

4 Consultation

4.1 Stakeholders Consulted in the Navigational Risk Assessment Process

29. Key shipping and navigation stakeholders have been consulted in the NRA process. The following stakeholders have been consulted via dedicated meetings:

- MCA;
- Trinity House;
- UK Chamber of Shipping;
- RYA;
- Shoreham Port;
- Newhaven Port & Properties;
- Littlehampton Harbour Board;
- Associated British Ports (ABP) Southampton;
- Britannia Aggregates;
- Cemex UK Marine;
- Hanson Aggregates Marine; and
- Tarmac Marine.

30. As well as being consulted directly, the RYA also agreed to pass on information regarding the Proposed Development to its member clubs for consideration and provided feedback. Additionally, the Dover Strait User Group (in April 2021) and NAB Vessel Traffic Service (VTS) User Group (in October 2022) have been consulted.

31. As well as consulting with the organisations outlined above, 23 Regular Operators identified from the vessel traffic surveys were provided with an overview of the Proposed Development and offered the opportunity to provide comment (the full Regular Operator letter is presented in Appendix D). The full list of Regular Operators identified is provided below:

- Aggregate Industries UK;
- Amasus Shipping;
- Arklow Shipping;
- Bernhard Schulte;
- Britannia Aggregates;
- Brittany Ferries;
- Carnival;
- Cemex UK Marine;
- CLdN;
- DEME;
- DFDS Seaways;
- Elbdeich Bereederungs;
- Gesellschaft füer Oeltransporte (GEFO);
- Grimaldi;
- Hanson Aggregates Marine;
- HAV Shipping;
- James Fisher Shipping;
- JR Shipping;
- Jungerhans Maritime Services;
- Mediterranean Shipping Company (MSC);
- Stolt-Nielsen;
- Tarmac Marine;
- United European Car Carriers (UECC); and
- Van Dam Shipping.

32. CLdN, Britannia Aggregates, Cemex UK Marine, DEME, Hanson Aggregates Marine and Tarmac Marine provided feedback directly (see relevant entries in

Table 4-1), while Volker Dredging Limited (VDL) also responded through the British Marine Aggregate Producers Association (BMAPA) which were provided the Regular Operator letter for circulation among marine aggregate dredging representatives.

4.2 Consultation Responses

33. Various responses have been received from stakeholders during consultation undertaken in the NRA process, either during conference calls, via email correspondence or through the Scoping Opinion (The Planning Inspectorate, 2020). The key points and where they have been addressed in the NRA or **Chapter 13: Shipping and navigation, Volume 2** of the ES (Document Reference 6.2.13) are summarised in Table 4-1.

34. The consultation responses reflect the evolution of the DCO Limits throughout the NRA process, starting with the Scoping Boundary, evolving to the Preliminary Environmental Information Report (PEIR) Assessment Boundary, and finally evolving to the DCO Limits at the ES stage which are assessed in this NRA. Further details of these changes are provided in Section 6.1, noting that the consultation feedback from shipping and navigation users has been a key driver in the changes.

Table 4-1 Summary of key points raised during consultation

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
RYA	1 July 2020 Email correspondence	The proposal to undertake visual identification of recreational craft in combination with surveys for other users is welcomed.	Visual observations recorded during geophysical surveys undertaken in July and August 2020 are considered in Section 10.2.3.3.
		Suggest that vessel traffic surveys are undertaken between mid-June and no later than the August bank holiday since bad weather at the end of August can give poor recreational vessel data. There is no preference for the timing of the winter vessel traffic survey.	The summer vessel traffic survey was undertaken between 17 and 30 June 2022 (see Section 5.2). An additional vessel traffic survey was undertaken between 8 and 22 August 2020 (noting that the 2020 August bank holiday was 31 August 2020) (see Appendix G).
		The plan to validate the vessel traffic survey data with clubs and training centres is welcomed provided that there is a clear method for translating the findings of the NRA into the EIA hierarchy to eliminate identified risks. Additionally, it would be useful to speak directly with clubs around the landfall location.	The RYA agreed to pass on information regarding the Proposed Development to its member clubs for consideration (see Section 4.1) and feedback has been taken into account (see 23 October 2020 entry in Table 4-1). The NRA methodology including the IMO FSA process is described in Section 3.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		In addition to Automatic Identification System (AIS) data, the RYA Coastal Atlas identifies boating areas around the UK following consultation with member clubs.	The RYA Coastal Atlas has been used to assist with characterising recreational vessel movements within and in proximity to the Proposed DCO Limits (see Section 10.2.3.2).
MCA	2 July 2020 Email correspondence	Content with the intended approach for the vessel traffic surveys in principle although October is quite early for a 'winter' survey.	The winter vessel traffic survey was undertaken between 1 and 15 November 2020 (see Section 5.2).
Trinity House	2 July 2020 Email correspondence	Vessel traffic data from 2020 could be affected by the restrictions imposed in response to COVID-19, especially with regards to recreational traffic, and this will need to be assessed accordingly.	The approach to data collection and results have been discussed and agreed with the MCA (see Section 5.4.2) and a vessel traffic survey for summer 2022 has been undertaken (see Section 5.1). Additionally, 12 months of AIS data covering 2019 has been used to validate the findings of the vessel traffic surveys and identify any tangible effects of COVID-19 (see Appendix C).

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
MCA	29 July 2020 Scoping response	The Environmental Statement (ES) should supply detail on the possible impact on navigational issues for both commercial and recreational craft, specifically: ▪ Collision risk; ▪ Navigational safety; ▪ Visual intrusion and noise; ▪ Risk management and emergency response; ▪ Marking and lighting of site and information to mariners; ▪ Effect on small craft navigational and communication equipment; ▪ The risk to drifting recreational craft in adverse weather or tidal conditions; and ▪ The likely squeeze of small craft into the routes of larger commercial vessels.	Displacement of existing routes and activity and subsequent increases in collision risk are scoped into the risk assessment undertaken from Section 18 and quantitative modelling of collision risk has been undertaken in Section 16. Effects on navigation, communication and position fixing equipment including visual intrusion and noise are considered in Section 13. Reduction of emergency response provision is scoped into the risk assessment undertaken from Section 18 with risk management and marking, lighting and promulgation of information considered as part of the embedded mitigation measures in Section 24. Drifting allision risk is scoped into the risk assessment undertaken from Section 18 and quantitative modelling of drifting allision risk has been undertaken in Section 16.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		Attention needs to be paid to routeing, particularly in heavy weather ensuring shipping can continue to make safe passage without large-scale deviations. Cumulative and in-combination effects on shipping routes should also be considered.	Displacement of existing routes is scoped into the risk assessment undertaken from Section 18 and anticipated post wind farm routeing has been modelled in Section 15.5.2. Adverse weather impacts on routeing is considered in Section 12. Displacement of existing routes at a cumulative level is considered in Section 14.2.
		There are concerns over the available sea room the Proposed Development may leave for vessels entering and exiting the Inshore Traffic Zone (ITZ). There are also concerns on the impacts this will have on the safety of both commercial vessels and pilot boats during pilotage operations.	Displacement of existing routes and activity and subsequent increases in collision risk are scoped into the risk assessment undertaken from Section 18 and quantitative modelling of collision risk has been undertaken in Section 16. The Proposed DCO Limits is set back 1.5nm from the ITZ (see Section 6.1) noted that this represents a decrease in the area considered at Scoping and PEIR.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		An NRA will need to be submitted in accordance with MGN 543 (since superseded by MGN 654), MGN 372 and the MCA's methodology. The NRA should be accompanied by a detailed MGN 543 (now MGN 654) Checklist.	The NRA has considered MGN 654, the MCA's methodology and the IMO guidelines for FSA as primary guidance (see Section 2.2). An MGN 654 Checklist has been completed (see Appendix A).
		Attention should be paid to cabling routes and where appropriate burial depth for which a Cable Burial Index study should be completed. If cable protection measures are required, the MCA will accept a 5% reduction in surrounding depths referenced to Chart Datum (CD).	Cable burial and a cable burial risk assessment are considered as part of the embedded mitigation measures in Section 24.
		Consideration will need to be given to the implications of the site size and location on Search and Rescue (SAR) resources and an Emergency Cooperation Plan (ERCoP) should be undertaken. Attention should be paid to the level of Radio Detection and Ranging (Radar) surveillance, AIS and shore-based Very High Frequency (VHF) radio coverage and appropriate mitigation such as communication features.	Reduction of emergency response provision including SAR is scoped into the risk assessment undertaken from Section 18 with marking, lighting and promulgation of information considered as part of the embedded mitigation measures in Section 24. The Proposed DCO Limits incorporates Helicopter Refuge Areas (HRA) to support access for SAR assets. An ERCoP will be undertaken post consent (see Section 25).

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		Hydrographic surveys should fulfil the requirements of the International Hydrographic Organization (IHO) order 1a standard, with the final data supplied to the MCA.	Detailed and accurate hydrographic surveys will be undertaken periodically at intervals agreed with the MCA (see Section 25).
Littlehampton Harbour Board	30 July 2020 Scoping response	The shoreward 2nm of the cable landing envelope falls within the Competent Harbour Authority area and so there is likely to be a need for pilotage during some types of vessel operation in this area. The eastern edge of the cable envelope is also immediately adjacent to Littlehampton Harbour's pilot boarding station and should be reviewed further in the NRA.	Ports and related services relating to Littlehampton Harbour are described in Section 7.4.4 and restrictions on port access including use of pilotage services is scoped into the risk assessment undertaken from Section 18.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		Littlehampton Harbour's two commercial quaysides are used for the import of roadstone in coasters up to 80 metres (m) Length Overall (LOA). The upcoming construction of the A27 Arundel bypass may lead to a significant increase in traffic volumes associated with Littlehampton Harbour since a proportion of the necessary aggregate may come from the port.	The potential for increases in vessel traffic volumes out of Littlehampton Harbour are considered in the establishment of the future case vessel traffic (see Section 15.1) and consultation has been undertaken with Highways England (see **Chapter 24: Transport, Volume 2** of the ES (Document Reference 6.2.24). The specific activity associated with Littlehampton Harbour is considered in the risk assessment undertaken from Section 18.
		Due to the under keel clearance at Littlehampton harbour entrance, calls by coasters occur only on the spring tide windows so are often missed in AIS sampling. There are currently ten commercial fishing vessels, seven active charter angling vessels and three active resident workboats operating out of Littlehampton Harbour, very few of which broadcast on AIS, and the Proposed Development is likely to impact all of these groups.	Port related traffic out of Littlehampton Harbour based on the vessel traffic surveys (which includes Radar data in addition to AIS) is described in Section 11.3.4.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		The vast majority of recreational vessels operating from Littlehampton Harbour do not use AIS and so this cannot be relied on as the only source of vessel traffic data.	Port related traffic out of Littlehampton Harbour based on the vessel traffic surveys (which includes Radar data in addition to AIS) is described in Section 11.3.4.
		The harbour entrance breakwaters at Littlehampton Harbour are due for replacement by 2025 which will be a significant infrastructure project possibly at the same time as the construction of the Proposed Development.	The potential for increases in vessel traffic volumes out of Littlehampton Harbour are considered in the establishment of the future case vessel traffic (see Section 15.1).
Trinity House	4 August 2020 Scoping response	A comprehensive vessel traffic analysis in accordance with MGN 543 (since superseded by MGN 654) should be undertaken and possible cumulative and in-combination effects on shipping routes and patterns should be adequately assessed.	The methodology for vessel traffic analysis is described in Section 5.2 and includes compliance with MGN 654. The outputs of the vessel traffic analysis are provided in Section 10. Displacement of existing routes at a cumulative level is considered in Section 14.2.
		Proposed layouts should conform to MGN 543 (since superseded by MGN 654) and significant consideration should be given to the layout of the current Rampion 1 including alignment with the current operational site.	An indicative worst-case layout for shipping and navigation is provided in Section 6.2.1 with the final layout to be agreed with the MCA and Trinity House post-consent as required under the DCO (see Section 24).

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		The development should be marked with marine aids to navigation in accordance with the general principles outlined in IALA Recommendation O-139 and additional aids to navigation such as buoys may be necessary to mitigate risks, particularly during construction. All marine navigational marking will need to be agreed with Trinity House.	The NRA has considered IALA Recommendation O-139 and G1162 (see Section 2.3). The use of lights, marks, sounds, signals and other aids to navigation including a buoyed construction area around the array as required by Trinity House, MCA and Civil Aviation Authority (CAA) is considered as part of the embedded mitigation measures in Section 24 and further marine aids to navigation considerations have been provided in Section 24.1.
		A decommissioning plan should be considered including consideration for any obstruction left in situ.	A decommissioning plan will be developed post consent (see Section 25).
		Possible navigational marking of the export cables and the vessels laying them should be considered as should the impact on navigation and requirement for appropriate risk mitigation measures if cable protection is required.	No lighting or physical marking for the export cables is anticipated to be required during the operation and maintenance phase (see Section 24.1.2.3) and post construction monitoring of the cable protection, including burial depths, is described in Section 25.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
Ministry of Defence (MOD)	4 August 2020 Scoping response	There are concerns that any turbines or structures erected in Danger Area D037 would impact on the Navy's freedom to exercise within the Danger Area (including exercises involving ships) and cause physical obstructions.	Military Practice and Exercise Areas (PEXAs) are described in Section 7.8 and displacement of existing activity is scoped into the risk assessment undertaken from Section 18.
		In the interests of air safety, it is requested that the development is fitted with MOD accredited aviation safety lighting in accordance with the CAA, Air Navigation Order 2016.	The use of lights, marks, sounds, signals and other aids to navigation as required by Trinity House, MCA and CAA is considered as part of the embedded mitigation measures in Section 24.
Newhaven Port & Properties	4 August 2020 Consultation meeting	The south-eastern corner of the Scoping Boundary is too close to the Dover Strait Traffic Separation Scheme (TSS) and could create a pinch point for vessel traffic.	Displacement of existing routes and activity and subsequent increases in collision risk are scoped into the risk assessment undertaken from Section 18 and quantitative modelling of collision risk has been undertaken in Section 16. The Proposed DCO Limits represents a reduction in total area covered compared to the Scoping Boundary, including at the eastern extent in proximity to the Dover Strait TSS (see Section 6.1).

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		Recreational traffic ceased entirely at the Port of Newhaven at the start of the COVID-19 outbreak but has now [as of August 2020] returned to normal levels.	The summer vessel traffic survey was undertaken between 16 and 30 August 2022 (see Section 5.2) and the effect of COVID-19 has been acknowledged (see Section 5.4.2).
		The pilot boarding station for the Port of Newhaven is far enough from the Scoping Boundary that there is not expected to be any effect on pilot operations.	Ports and related services relating to the Port of Newhaven are described in Section 7.4.2 and restrictions on port access including use of pilotage services is scoped into the risk assessment undertaken from Section 18.
		The AIS data presented in the Scoping Report is reflective of vessel traffic movements in the area.	Noted.
		The proposed NRA methodology is satisfactory.	Noted.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
MCA and Trinity House	5 August 2020 Consultation meeting	Vessel traffic issues which persisted for Rampion 1 will still be a factor for the Proposed Development, including the ITZ which will need to be assessed carefully.	Displacement of existing routes and activity and subsequent increases in collision risk are scoped into the risk assessment undertaken from Section 18 and quantitative modelling of collision risk has been undertaken in Section 16. The shipping and navigation chapter of the ES for Rampion 1 (E.ON, 2012) is considered as a data source for lessons learnt (see Section 2.4).
		The displacement of vessel traffic between the south of Rampion 1 and the Dover Strait TSS may be an issue, with a general squeezing of traffic flows and potential subsequent impact on pilotage.	Displacement of existing routes and activity and restrictions on port access including use of pilotage services are scoped into the risk assessment undertaken from Section 18. The Proposed DCO Limits represents a reduction in total area covered compared to the Scoping Boundary, including at the eastern extent in proximity to the Dover Strait TSS (see Section 6.1).
		The Dover Strait User Group is a good target audience and therefore would be useful to approach.	The Applicant presented at a meeting of the Dover Strait User Group in April 2021.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		Rampion 1 is considered a good layout for SAR and it is important that this is not impacted by the Proposed Development noting that, given the general area, SAR access is of particular importance.	The Proposed Development array area incorporates HRAs to the west and south of Rampion 1 and reduction of emergency response provision including SAR capability is scoped into the risk assessment undertaken from Section 18
		Content with the NRA methodology, in line with MGN 543 (since superseded by MGN 654) and its annexes.	Noted.
UK Chamber of Shipping	10 August 2020 Consultation meeting	Access to the St Helens anchorage may be impacted and additionally collision risk between moving and anchored vessels requires consideration.	Anchorage areas including the recommended anchorage off St Helens Fort are described in Section 7.4.6.2 and reduced access to ports including port related activity such as anchoring is scoped into the risk assessment undertaken from Section 18.
		The AIS data presented in the Scoping Report for cargo vessels and tankers is reflective of expectations in the area.	Noted.
		The proposed NRA methodology is satisfactory and there are no considerable issues.	Noted.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
The Planning Inspectorate	11 August 2020 Scoping Opinion	Unclear as to what refinement of offshore components or identification of additional impact pathways could occur that would lead to amendment of the study area. The study area should clearly be set out with reference to the "*standard*" 10nm buffer that is stated and its basis within relevant legislation and guidance.	The study area used for the Scoping Report (RED, 2020) has been maintained despite a reduction in the size of the Proposed DCO Limits in order to ensure consistency and continue to capture all relevant features (e.g., Dover Strait TSS). Consequently, the study area considered is a minimum 1nm buffer of the Proposed DCO Limits and is presented and justified in Section 3.4.
		There is a high degree of overlap in the assessment of effects on offshore recreational users across other marine users, shipping and navigation and socio-economics. The Inspectorate expects that these matters will be considered as part of the assessment(s) of inter-related effects.	The effect on recreational users has been considered as an inter-related effect in Section 13.14 of **Chapter 13: Shipping and navigation, Volume 2** of the ES (Document Reference 6.2.13). The socio-economic effect of the Proposed Development has been considered in **Chapter 17: Socio-economics, Volume 2** of the ES (Document Reference 6.2.17).

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		It should clearly be set out how the risk assessment approach leads to an assessment of significance of effect and are consistent/compatible with the terminology as set out in the Scoping Report.	The *Revised Guidelines for FSA for Use in the Rule-Making Process* (IMO, 2018) have been applied to the risk assessment, noting that this differs from the standard assessment methodology applied for other aspects. The methodology used for the risk assessment is outlined in Section 3.
		The scope, outcomes and agreements reached during the Hazard Workshop should be specifically set out (such as in the form of technical appendices or other standalone reports).	Points raised at the Hazard Workshops are outlined in Table 4-1 (see 23 February 2021 and 6 September 2022 entries) and the hazard log – the main output of the Hazard Workshops – is provided in full in Appendix B.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		It should be explained how the assessment has factored in shipping and navigation effects on the nine marine aggregate dredging areas intersecting the study area. It is unclear if such effects are to be considered part of the 'baseline' conditions or whether a future baseline is required accounting for changes in dredging activity. Such effects may also need to be considered as part of the cumulative effects assessment of combined risks associated with the Proposed Development and aggregate activity on other users.	Consultation with marine aggregate dredging stakeholders has been undertaken and marine aggregate dredgers have been considered as a user in the risk assessment (see Section 18), both for the assessment of the Proposed Development in isolation and as part of the cumulative risk assessment.
Shoreham Port	12 August 2020 Consultation meeting	The area of search and wide design envelope leads to similar concerns raised for Rampion 1, namely that there is significant uncertainty over what area will be developed.	The Proposed DCO Limits represents a reduction in total area covered compared to the Scoping Boundary (see Section 6.1).

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		Should access to the Dover Strait TSS be blocked from the east of Rampion 1 then vessels will be required to travel much further west out of Shoreham Port to access the TSS which would have implications on the attractiveness of the port for commercial use, noting that the majority of commercial traffic out of Shoreham Port utilises the TSS. The economic effects on the port need to be considered.	The Proposed DCO Limits represents a reduction in total area covered compared to the Scoping boundary, including at the eastern extent in proximity to the Dover Strait TSS (see Section 6.1) such that vessels will be able to safely navigate between the Dover Strait TSS and Shoreham Port to the east of the Proposed DCO Limits (see Section 15.5.2). A commercial risk on port access is considered in in **Chapter 13: Shipping and navigation, Volume 2** of the ES (Document Reference 6.2.13), nothing that commercial risk is considered out with the technical scope of the NRA.
		Any extension of Rampion 1 to the west may result in vessels holing up inshore of the site.	Displacement of existing routes and activity and subsequent increases in grounding risk are scoped into the risk assessment undertaken from Section 18. It is noted that the Proposed DCO Limits represents a reduction in total area covered compared to the Scoping Boundary, including at the western extent in proximity to the Owers Bank (see Section 6.1).

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		There are no concerns with the offshore export cable corridor location.	Noted.
		The effects of COVID-19 are still present [as of August 2020] with a downturn in pleasure craft and visitors to ports infrequent. No yachts from France, Belgium and Germany have visited in 2020. Commercial volumes at Shoreham Port are down around 30% and there remains uncertainty over the possible effects post Brexit. The 12-month dataset from 2019 will be reflective of commercial vessel movements.	The effect of COVID-19 has been acknowledged (see Section 5.4.2) and port related traffic out of Shoreham Port based on the vessel traffic survey data is described in Section 11.3.1, noting that this includes vessel traffic survey data collected in August 2022. The effects of Brexit are considered in the establishment of the future case vessel traffic (see Section 15.1). An analysis of 12 months of AIS data recorded within and in proximity to the Proposed DCO Limits is provided in Appendix E.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
RYA	19 August 2020 Consultation meeting	The south-eastern corner of the Scoping Boundary is close to the Dover Strait TSS and this causes some concern. The NRA should consider small numbers of recreational craft engaged in long distance cruising passing through the area.	Displacement of existing routes and activity and subsequent increases in collision risk are scoped into the risk assessment undertaken from Section 18 and quantitative modelling of collision risk has been undertaken in Section 16. It is noted that the Proposed DCO Limits represents a reduction in total area covered compared to the Scoping boundary, including at the eastern extent in proximity to the Dover Strait TSS (see Section 6.1).
		The need to keep a safe distance when passing at the western extent of the Scoping Boundary may limit available sea room and squeeze small craft into a narrow channel given the likely presence of construction buoyage and the Owers/Looe.	Displacement of existing routes and activity and subsequent increases in collision risk are scoped into the risk assessment undertaken from Section 18. It is noted that the Proposed DCO Limits represents a reduction in total area covered compared to the Scoping Boundary, including at the western extent in proximity to the Owers Bank (see Section 6.1).

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		The portions of the Scoping Boundary developed will determine the effects of displacement of recreational traffic with interaction more likely the closer inshore the development is undertaken. Refinement of the Scoping Boundary is key.	The Proposed DCO Limits represents a reduction in total area covered compared to the Scoping boundary (see Section 6.1).
		Initially recreational vessels were excluded from marinas and clubs due to COVID-19 but since the first lockdown [June 2020] the RYA has participated in campaigning to promote their return and a peak in recreational activity can be expected between mid-July and mid-August.	The summer vessel traffic survey was undertaken between 16 and 30 August 2022 (see Section 5.2) and the effect of COVID-19 has been acknowledged (see Section 5.4.2).

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		The seasonal difference in recreational vessel traffic between summer and winter periods observed in the data used in the Scoping Report is to be expected noting that such traffic is largely located inshore of Rampion 1. The displacement of any larger recreational craft into inshore waters could result in interaction with small craft and should be considered in the NRA. Otherwise, smaller craft (such as dinghies) are unlikely to be affected by the presence of the Proposed Development.	The vessel traffic surveys indicated a similar seasonal difference in recreational vessel traffic to that observed in the data used in the Scoping Report (see Section 10.2.3). Displacement of existing routes and activity and subsequent increases in collision risk are scoped into the risk assessment undertaken from Section 18.
		East-west recreational traffic through the study area ranging between the Solent and Eastbourne will be most affected by the presence of the Proposed Development as would north-south traffic out of the Port of Newhaven and Brighton Marina.	Recreational vessel movements across the area as a whole are described in Section 10.2.3 and port related traffic out of the Port of Newhaven and Brighton Marina based on the vessel traffic surveys is described in Section 11.3.2 and Section 11.3.3, respectively. Displacement of existing routes and activity are scoped into the risk assessment undertaken from Section 18.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		A large proportion of the recreational traffic in the area is under sail and therefore will be presented with additional challenges in certain weather conditions to make safe passage in proximity to the wind farm, particularly at the western extent of the Scoping Boundary if sailing westwards into a prevailing south-westerly wind.	Drifting allision risk is scoped into the risk assessment undertaken from Section 18. It is noted that the Proposed DCO Limits represents a reduction in total area covered compared to the Scoping Boundary, including at the western extent in proximity to the Owers Bank (see Section 6.1).
		From consultation undertaken by the RYA the national level of AIS uptake by recreational vessels is around 20% but the ratio may be higher in this area.	Approximately 89% of recreational vessel tracks (see Section 10.2.3.1) were recorded on AIS throughout the 28-day vessel traffic surveys.
CLdN	1 October 2020 Email correspondence	CLdN have a number of vessels which pass by the proposed site every week, but they are transiting through the TSS and have no need to enter the proposed site. A vessel breaking down is always an issue but that is the same for any wind farm development. There are no issues which will adversely affect CLdN' current trade routes for the Proposed Development.	Commercial ferries including those operated by CLdN are described in Section 10.2.2. Drifting allision risk is scoped into the risk assessment undertaken from Section 18.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
UECC	19 October 2020 Email correspondence	UECC has four vessels whose passage out of the Port of Southampton will be impacted by the south-western corner of the search area. Feedback from the Masters is that this will not have much effect and safe sailing will remain. The vessels will have to make a small adjustment on one waypoint, but the total distance of the route will remain about the same.	Commercial ferries including those operated by UECC are described in Section 10.2.2. Main commercial route deviations are considered in Section 15.5.2 and displacement of existing routes and activity is scoped into the risk assessment undertaken from Section 18.
RYA and member clubs	23 October 2020 Email correspondence	Whether recreational traffic at Shoreham Port may be significant was queried, particularly in relation to traffic associated with the Sussex Yacht Club. Furthermore, whether there is significant traffic at Brighton Marina and Littlehampton Harbour other than recreational boating (such as fishing, diving or sightseeing tours) was queried.	Port related traffic out of Shoreham Port, Brighton Marina and Littlehampton Harbour based on the vessel traffic surveys is described in Section 11.3.1, Section 11.3.3 and Section 11.3.4, respectively.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		Whether the high proportion of reported incidents being recreational vessels is a reflection of traffic volume, poor maintenance or lack of training was queried.	Analysis of historical incident data within and in proximity to the Proposed DCO Limits is provided in Section 9. The high proportion of recreational vessels involved in incidents responded to by the Royal National Lifeboat Institution (RNLI) may be attributed to the high volume of recreational activity in the nearshore area where the RNLI is most likely to respond to an incident.
		There are few safe havens for recreational craft seeking shelter along this coast with those that are available very tide dependent for access. Mitigation measures and construction should avoid restricting access to safe havens.	Access to safe havens for small craft in adverse weather conditions is assessed in Section 12.3.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		From a recreational boating point of view, the Proposed Development should be sited within the Scoping Boundary immediately to the west or to the south of Rampion 1 with the NRA to look very carefully at the risks to recreational boating when siting anywhere else within the Scoping Boundary.	It is noted that the Proposed DCO Limits represents a reduction in total area covered compared to the Scoping Boundary, including at the eastern and western extents (see Section 6.1). Structure deployment across the maximum extent of the array area is considered as part of the MDS for shipping and navigation (see Section 6.7) used as input to the risk assessment from Section 18.
		In recent years the silting up of Brighton Marina has become a challenge and it is postured that disruption to the seabed from construction methods (increased sedimentation) could create coastal navigation problems.	Reduction in under keel clearance is scoped into the risk assessment undertaken from Section 18.
Britannia Aggregates	30 October 2020 Email correspondence	Britannia Aggregates delivers cargoes into Shoreham Port and the Port of Newhaven (and occasionally Portsmouth Port and the Port of Southampton) that may be dredged on marine aggregate licence areas close to the Isle of Wight, in the central English Channel and in the Outer Thames/east coast.	Active marine aggregate dredging areas are described in Section 7.3 and marine aggregate dredger movements are characterised in Section 10.2.5.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		Some of the routes to and from the licence areas to these ports could be impacted by the Proposed Development depending upon where the new Wind Turbine Generators (WTGs) are placed; in particular the Shoreham to East Channel licences could entail a detour of 8 to 10nm which is significant in terms of fuel and time. These transit routes should be considered.	Marine aggregate dredger movements are characterised in Section 10.2.5 and are considered in the identification of main commercial routes in Section 11. The commercial risk due to vessel displacement is assessed as part of the risk assessment in **Chapter 13: Shipping and navigation, Volume 2** of the ES (Document Reference 6.2.13), nothing that commercial risk is considered out with the technical scope of the NRA. The Proposed DCO Limits represents a reduction in total area covered compared to the Scoping Boundary, including at the eastern extent (see Section 6.1).

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
DEME	30 October 2020 Email correspondence	The Scoping Boundary covers a relatively large region and there are concerns that DEME operated vessels sail in proximity to the Scoping Boundary including over the offshore export cable corridor and over the proposed area of build to reach destinations such as Shoreham Port and the Port of Newhaven. This may cause conflicts with transit routes and therefore these concerns should be taken into account when assessing the navigational risks and determining the areas where structures are installed.	Marine aggregate dredger movements are characterised in Section 10.2.5 and are considered in the identification of main commercial routes in Section 11. Main commercial route deviations are considered in Section 15.5.2 and displacement of existing routes and activity is scoped into the risk assessment undertaken from Section 18.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
VDL	5 November 2020 Email correspondence	VDL holds marine aggregate licences for Areas 340 and 351 East of the Isle of Wight and also for Area 461 and GIE St Nicolas in the East English Channel. Cargoes are regularly landed at Shoreham Port and the Port of Newhaven from the Isle of Wight and East Channel concessions and it is important that steaming times are not increased as a result of the Proposed Development. Even small increases in steaming distances can have a significant impact on the profitability of operations.	Marine aggregate dredger movements are characterised in Section 10.2.5 and are considered in the identification of main commercial routes in Section 11. Main commercial route deviations are considered in Section 15.5.2 and displacement of existing routes and activity is scoped into the risk assessment undertaken from Section 18. The commercial risk due to vessel displacement is assessed as part of the risk assessment in **Chapter 13: Shipping and navigation, Volume 2** of the ES (Document Reference 6.2.13), nothing that commercial risk is considered out with the technical scope of the NRA.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
Littlehampton Harbour Board	18 November 2020 Consultation meeting	Less than 50% of the small commercial vessels operating out of Littlehampton harbour are on AIS and it is anticipated that less than 20% of vessels inshore at Littlehampton Harbour are on AIS.	Port related traffic out of Littlehampton Harbour based on the vessel traffic surveys is described in Section 11.3.4 and includes minimal commercial vessel activity. Although there were no recreational vessels transiting to/from Littlehampton Harbour detected by Radar in the winter 2021/summer 2022 datasets, approximately 58% of recreational vessels were recorded on AIS in the summer 2020 dataset.
		Vessels can spend anywhere between six hours and two days at the Littlehampton anchorage area awaiting suitable weather.	Littlehampton Harbour and its associated temporary anchorage is described in Section 7.4.4.
		Any vessel operating within the Competent Harbour Authority area would likely require pilotage including any cable laying vessel that may be operating in the pilotage area for the Proposed Development.	Littlehampton Harbour and its associated pilotage is described in Section 7.4.4.
Littlehampton Harbour Board	16 December 2020 Email correspondence	The non-AIS vessels observed in the summer survey data is accurate for the routes taken.	Noted.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		A route for a monthly (on average) 80m coaster extending direct from the Dover Strait TSS to the east to the anchorage and from the harbour direct to the TSS should be included in any assessment with any detour potentially meaning that Littlehampton Harbour becomes less attractive to shipping as many vessels rushing to make the tide would have a further delay. For those without a chance of making entry on arrival locally, the detour is less of an issue but the long stay at the anchorage is our key risk with the cable.	The route between Littlehampton Harbour and the Dover Strait TSS has been included in the characterisation of the main commercial routes in Section 11.2. Main commercial route deviations are considered in Section 15.5.2 and displacement of existing routes and activity and interaction with sub-sea cables is scoped into the risk assessment undertaken from Section 18. There is also an MGN 654 compliant navigation corridor which may be used by vessels accessing Littlehampton Harbour (see Section 17). The commercial risk due to vessel displacement is assessed as part of the risk assessment in **Chapter 13: Shipping and navigation, Volume 2** of the ES (Document Reference 6.2.13), nothing that commercial risk is considered out with the technical scope of the NRA.
MCA	23 February 2021 Hazard Workshop	Infrastructure within a routeing measure is not allowed under the South Inshore and South Marine Plan, and the ITZ is part of the routeing measures referred to in the plan.	The Proposed DCO Limits is set back 1.5nm from the ITZ (see Section 6.1) noted that this represents a decrease in the area considered at Scoping and PEIR.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
RYA	23 February 2021 Hazard Workshop	Consideration of the spacing between structures and use of Notices to Mariners may serve as suitable mitigation measures for hazards associated with recreational vessels.	The minimum spacing between structures is 830m (see Section 6.2.1) and internal allision risk is scoped into the risk assessment undertaken from Section 18. Notifications to Mariners are considered as part of the embedded mitigation measures in Section 24.
		Safe havens are sparse along this part of the coast and consist primarily of harbours.	Access to safe havens for small craft in adverse weather conditions is assessed in Section 12.3.
		Impacts relating to emergency response for recreational activity offshore of the array should be considered.	Reduction of emergency response provision is scoped into the risk assessment undertaken from Section 18.
Shoreham Port	23 February 2021 Hazard Workshop	The indicative worst-case layout for shipping and navigation does reflect the worst case for shipping given that it blocks access to the Dover Strait TSS lanes from Shoreham Port.	Main commercial route deviations including routeing between Shoreham Port and the Dover Strait TSS are considered in Section 15.5.2 and displacement of existing routes is scoped into the risk assessment undertaken from Section 18. The Proposed DCO Limits represents a reduction in total area covered compared to the PEIR Assessment Boundary, including at the eastern extent (see Section 6.1).

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		Notices to Mariners for Rampion 1 became somewhat excessive.	Notifications to Mariners are considered as part of the embedded mitigation measures in Section 24 and feedback will be provided to the marine coordinator.
Littlehampton Harbour Board	23 February 2021 Hazard Workshop	The indicative worst-case layout for shipping and navigation [at PEIR] cuts off Littlehampton Harbour entirely.	Main commercial route deviations including routeing to/from Littlehampton Harbour are considered in Section 15.5.2 and displacement of existing routes is scoped into the risk assessment undertaken from Section 18. There is also an MGN 654 compliant navigation corridor (not present at PEIR) which may be used by vessels accessing Littlehampton Harbour (see Section 17).
Cemex UK Marine	23 February 2021 Hazard Workshop	Fishing vessels avoid passing through Rampion 1 in winter and instead pass to the west. Any decision for routeing with a wider spacing between structures at the Proposed Development would be for the individual skippers.	Fishing vessel movements are characterised in Section 10.2.6 and indicate good agreement with the seasonal variation indicated.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		The risk of a marine aggregate dredger breaking down and drifting on the ebb tide into the export cable route should be considered.	Drifting allision risk is scoped into the risk assessment undertaken from Section 18. There is also an MGN 654 compliant navigation corridor which may be used by vessels accessing Littlehampton Harbour (see Section 17) with marine aggregate dredgers considered as a user.
		Radar performance should be incorporated into the assessment.	Effects on marine Radar are considered in Section 13.7.
Tarmac Marine	23 February 2021 Hazard Workshop	The issue of marine aggregate dredgers in transit from port to dredging areas and dredging activity itself require consideration, particularly in relation to the risk of a vessel losing power leaving to a drifting allision incident. A suitable clearance may be determined in consultation with BMAPA but should be sufficient to allow emergency anchoring in such circumstances.	Displacement of existing routes and drifting allision risk are scoped into the risk assessment undertaken in **Chapter 13: Shipping and navigation, Volume 2** of the ES (Document Reference 6.2.13) with marine aggregate dredgers considered as a user.
Tarmac Marine	19 March 2021 Email correspondence	The minimum width of the pinch point between the Owers Light Buoy and the site of 1.9nm is sufficient but there is a preference for a lit buoy to be placed on the wind farm side to better define the gap for navigation.	Noted as a potential mitigation and will be discussed with Trinity House as noted in Section 24.1.2.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		There is a need for sufficient clearance between the southern limit of aggregate area 396 and the nearest turbine in case of a loss of propulsion during future dredging operations. Based on a trial undertaken a few years ago a clearance of at least 1,000m from the licence boundary is requested. Additionally, the location of the substation south-east of area 396 would need siting somewhat further away [than at PEIR] from the licence boundary.	Consultation with marine aggregate dredging stakeholders has been undertaken as part of **Chapter 7: Other marine users, Volume 2** of the ES (Document Reference 6.2.7). The worst-case layout for shipping and navigation places the offshore substations internally rather than on the perimeter of the Proposed DCO Limits, and this is highlighted as part of the assessment of drifting allision risk in Section 20.3.2.
		Suggest consideration of the use of leading lights/lines to highlight the lay of cables from the wind farm.	Noted as a potential mitigation and will be discussed with Trinity House as noted in Section 24.1.1.
Hanson Marine	24 March 2021 Email correspondence	The minimum distance to aggregate area 435 of 1nm is the minimum acceptable for a contingency response in deploying of an anchor. However, there is concern over the proposed proximity to other aggregate areas should they ever be used as a third party.	Consultation with marine aggregate dredging stakeholders has been undertaken as part of **Chapter 7: Other marine users, Volume 2** of the ES (Document Reference 6.2.7).

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		Concerned by the potential for a concentration of commercial, fishing and leisure craft into the Owers Light Buoy east/west transit area. The pinch point of 1.9nm [at PEIR] should be an adequate distance with buoyage.	Noted as a potential mitigation and will be discussed with Trinity House as noted in Section 24.1.2, noting that the distance between Proposed DCO Limits and the Owers Light Buoy has increased to approximately 2.1nm (see Section 7.6).
		Concerned by the potential impact of increased craft activity and movements across the aggregate area where the wind farm may significantly condense local activity. This also applies with craft coming from the south heading to a nearby port that will funnel into the areas en-route to land.	Internal navigation within the array is considered in the risk assessment undertaken from Section 18. Also, a safety case for the navigation corridor has been undertaken including consideration of marine aggregate dredging areas and activity (see Section 17.9).
		Concerned by Radar interference from the wind farm and, in addition, the impact the wind farm may have on VHF communications and request further investigation.	Effects on marine Radar are considered in Section 13.7 and effects on VHF are considered in Section 13.1 and Section 13.2.
		Suggest consideration of the use of leading lights/lines to highlight the lay of cables from the wind farm.	Noted as a potential mitigation and will be discussed with Trinity House as noted in Section 24.1.1.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
Littlehampton Harbour Board	24 March 2021 Email correspondence	Cable burial of 1m close to Littlehampton Harbour's charted anchorage for larger vessels is concerning but content that this will be addressed in the cable burial risk assessment.	The cable burial risk assessment will ensure burial or protection is undertaken based on relevant mitigations and is considered as part of the embedded mitigation measures in Section 24.
		Cable burial at 1m depth within 1nm of Mean High Water Springs (MHWS) is also concerning given the frequency of small leisure craft, fishermen, racing safety/committee boats, temporary race marks, visiting yachts and lifeboats anchoring in this area. Buoyage similar to that in place around the existing cable landing at Worthing will help to mitigate this.	Noted as a potential mitigation and will be discussed with Trinity House as noted in Section 24.1.1.
		All marine operations falling within Littlehampton Harbour's pilotage district should be consulted on with the Littlehampton Harbour Board in advance. Any operation of vessels over 20m in length at low UKC or any vessels engaged in cable burial may be subject to pilotage.	Marine coordination to manage project vessels throughout construction and maintenance periods is considered as part of the embedded mitigation measures in Section 24.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
Cemex UK Marine	29 March 2021 Email correspondence	The natural reluctance of seafarers to enter within the established development will inevitably result in compression of traffic routes between the north-west boundary and the Owers buoy and similarly between the south-east boundary and the western limit of the south-west lane of the Dover Strait TSS.	Displacement of existing routes and activity is scoped into the risk assessment undertaken from Section 18.
		The presence of the development area is likely to displace to the south, vessels making for the Dover Strait ITZ with the consequence that an increase in head-on or near head-on encounters will occur between vessels approaching the ITZ and vessels leaving the south-west bound TSS.	Displacement of existing routes and activity and subsequent increases in collision risk are scoped into the risk assessment undertaken from Section 18 and quantitative modelling of collision risk has been undertaken in Section 16. The Proposed DCO Limits is set back 1.5nm from the ITZ (see Section 6.1) noted that this represents a decrease in the area considered at Scoping and PEIR.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		AIS indicates that during winter commercial fishing vessels following the significant transit route to/from the south towards/departing Shoreham Port avoid passing through Rampion 1. In the case that this practice is adopted with respect to the Proposed Development there will then be significant displacement of commercial fishing vessels to the east or west of the Proposed Development. This would increase the number of encounters between fishing vessels in transit and marine aggregate dredgers working the current active extraction areas.	Fishing vessel movements are characterised in Section 10.2.6 and indicate good agreement with the seasonal variation indicated. Displacement of fishing vessels and subsequent increases in collision risk are scoped into the risk assessment undertaken from Section 18. The Proposed DCO Limits represents a reduction in total area covered compared to the PEIR Assessment Boundary including at the eastern extent (see Section 6.1). There is also an MGN 654 compliant navigation corridor which may be used by fishing vessels accessing Shoreham Port (see Section 17).

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		The potential increase in encounters referred to should be considered in the context of potential reduced Radar performance of vessels navigating in close proximity to the wind farm structures. Radar performance considerations should be based on evidence of the Radar performance of relevant vessel types navigating in close proximity to the offshore structures proposed for the development as opposed to being based on generic Radar performance studies.	Effects on marine Radar are considered in Section 13.7.
		Current active aggregate areas are hemmed in to the south and west by the northern limit of the development site and the eastern limit of the export cable corridor potentially reducing available sea room for marine aggregate dredgers to operate and take avoiding action in the case of encounters with other vessels.	Displacement of existing routes and activity and subsequent increases in collision risk are scoped into the risk assessment undertaken from Section 18 and quantitative modelling of collision risk has been undertaken in Section 16.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		Given the close proximity of current aggregate areas the adequacy of the proposed cable burial depth of 1m must be confirmed and the possibility of it being breached by the anchor penetration of a drifting vessel attempting to come to her anchor without power must be assessed.	The cable burial risk assessment will ensure burial or protection is undertaken based on relevant mitigations and is considered as part of the embedded mitigation measures in Section 24.
		The draft hazard log generally underplays the potential impact of the development on general navigation in the area (interrelationship of all risks) and the impact on marine aggregate dredgers and commercial fishing vessels in particular.	Inter-related effects are considered in **Chapter 13: Shipping and navigation, Volume 2** of the ES (Document Reference 6.2.13). Marine aggregate dredgers and commercial fishing vessels are considered as users in the risk assessment undertaken from Section 18.
RYA	1 April 2021 Email correspondence	Any assessment should be based on accurate surveys of recreational traffic and should avoid an emphasis on AIS as most recreational craft are not fitted with AIS transponders.	Approximately 89% of recreational vessel tracks (see Section 10.2.3.1) were recorded on AIS throughout the 28-day vessel traffic surveys, noting that vessel traffic surveys were compliant with MGN 654 and the methodology discussed with stakeholders (including the RYA) in advance.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		Any assessment should determine recreational traffic densities north (inshore) and south (offshore) of the Proposed Development to ensure an accurate assessment.	Recreational vessel movements across the area as a whole are described in Section 10.2.3.
		Recreational representatives recommend siting the development south or west of Rampion 1 to avoid navigational squeeze in the area between the development and Selsey Bill but also to avoid recreational traffic being squeezed between the southern boundary and Dover Strait TSS.	It is noted that the Proposed DCO Limits represents a reduction in total area covered compared to the PEIR Assessment Boundary, including at the eastern and western extents (see Section 6.1). Structure deployment across the maximum extent of the array area is considered as part of the MDS for shipping and navigation (see Section 6.7) used as input to the risk assessment undertaken from Section 18.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		The NRA should: ▪ Note the number of recreational vessels using and crossing the area; ▪ Include vessel traffic survey logs as an annex; ▪ Indicate the number of vessels carrying AIS and Radar reflectors; ▪ Use vessel traffic surveys undertaken between 15 June and 15 August; ▪ Provide detailed assessments of how risk is determined as ALARP; ▪ Compare the NRA surveys and the appropriate MMO full yearly AIS survey for the UK; ▪ Consider the RYA Coastal Atlas and general boating areas against the vessel traffic surveys; and ▪ Consider recreational vessel movements in adverse weather.	Recreational vessel movements across the area as a whole are described in Section 10.2.3 and the visual observations log from the vessel traffic surveys is provided in Appendix F. The vessel traffic survey and long-term traffic data undertaken for the NRA is more advanced than the terrestrial MMO surveys. The summer vessel traffic survey was undertaken between 16 and 30 June 2022 It is not possible to assess use of Radar reflectors by vessels. The NRA methodology including the ALARP process (which has been applied directly in the risk assessment from Section 18) and is described in Section 3. The RYA Coastal Atlas has been used to assist with characterising recreational vessel movements within and in proximity to the Proposed DCO Limits (see Section 10.2.3.2). Access to safe havens for small craft in adverse weather conditions is assessed in Section 12.3.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
Littlehampton Harbour Board	7 April 2021 Email correspondence	A target burial depth is not a mitigation in itself but simply an intent to mitigate. A mitigation would be a minimal depth of cover at time of installation and also a minimum depth of cover throughout the cable's lifetime.	The cable burial risk assessment will ensure burial or protection is undertaken based on relevant mitigations and is considered as part of the embedded mitigation measures in Section 24.
		A 1m actual depth of cover is not expected to be sufficient to mitigate the risk of anchor interaction. It should be confirmed if analysis such as anchor penetration trials has or will be undertaken. The cable burial risk assessment may account for this but should be reviewed and approved by the Littlehampton Harbour Board.	The cable burial risk assessment will ensure burial or protection is undertaken based on relevant mitigations and is considered as part of the embedded mitigation measures in Section 24. Littlehampton Harbour Board will be noted as a consultee for the cable burial risk assessment.
		Monitoring of cable burial via annual bathymetry surveys and a remedial response plan if shallower depths of cover than agreed are detected is considered as an expected mitigation.	Monitoring of cable burial will be addressed by the Cable Specification Installation and Monitoring Plan which is a consent condition.
		A line of buoyage marking the cable route up to 1nm offshore from MHWS is expected to mitigate leisure mariners anchoring off the beach.	Noted as a potential mitigation and will be discussed with Trinity House as noted in Section 24.1.1.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		A permanent relocation of the western two charted Arun Yacht Club seasonal race markers may be required.	Noted and consultation will be undertaken with Arun Yacht Club (and the RYA) on the matter prior to any construction works.
		Anchor interaction should be considered for recreational vessels with a most likely consequence of 'no interaction' challenged in favour of anchors of any type or size of vessel snagging on the cable or its protection resulting in dumping of the anchor and therefore an inability to use the anchor in an emergency thereafter.	Acknowledged in hazard log (see Appendix B) although recreational vessel and small craft anchors are unlikely to penetrate the cable. This will be considered further as part of the cable burial risk assessment.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
Shoreham Port	15 August 2021 Section 42 response	Traffic will be cut off from direct access to the Dover Strait TSS resulting in a need for larger vessels to pass west of Rampion 1 and Rampion 2. This will have a negative impact on the commercial viability of the port.	The Proposed DCO Limits represents a reduction in total area covered compared to the PEIR Assessment Boundary, including at the eastern extent in proximity to the Dover Strait TSS (see Section 6.1) such that vessels will be able to safely navigate between the Dover Strait TSS and Shoreham Port to the east of the Proposed DCO Limits (see Section 15.5.2). There is also an MGN 654 compliant navigation corridor which may be used by vessels accessing Shoreham Port (see Section 17). A commercial risk on port access is considered in in **Chapter 13: Shipping and navigation, Volume 2** of the ES (Document Reference 6.2.13), nothing that commercial risk is considered out with the technical scope of the NRA.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
Trinity House	16 September 2021 Section 42 response	Trinity House are not phasing out the use of Intermediate Peripheral Structures (IPS) marking and given the Proposed Development's proximity to shore, IPS marking may well be required. Therefore, text suggesting that IPSs are being phased out should be removed.	IPS marking will be agreed in consultation with Trinity House as noted in Section 24.1.2.2.
		The project should not adversely affect the current lines of orientation at Rampion 1.	An indicative worst-case layout for shipping and navigation is provided in Section 6.2.1. The Proposed DCO Limits incorporates HRAs to support access for SAR assets.
RYA	16 September 2021 Section 42 response	Following COVID-19 recreational activity is unlikely to have returned to normal by August 2020 and only eight days of the summer vessel traffic survey fell within the recommended survey period of 15 June to 15 August (see 1 April 2021 entry). The accuracy of the NRA with respect to recreational use may have been reduced due to COVID-19 and this partial survey period. It is recommended that an additional recreational craft survey is undertaken between 15 June and 15 August 2022 to confirm and validate the NRA findings.	A further 14 days of vessel traffic survey data from July/August 2022 has been assessed including recreational craft. In addition to the vessel traffic survey data, RYA Coastal Atlas data (Section 10.2.3.2), visual observation data from geophysical surveys (Section 10.2.3.3) and long-term AIS data (Appendix E) has assisted the characterisation of recreational vessel movements.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		No further concerns are raised with respect to sea room (navigational squeeze) in the area of the Owers, Looe Channel and Selsey Bill, with the reduction in the total area covered by the PEIR Assessment Boundary in comparison with the Scoping Boundary addressing the concerns previously raised. We concur with the PEIR findings.	Noted in the assessment of collision risk for third-party vessels from Section 18.
		On the basis of vessel displacement over a large spatial extent, further work should be undertaken to indicate the level of emissions increase associated with displacement in comparison with the overall carbon reduction/emissions budget of the development.	Risk to the environment is considered within the risk assessment as per the NRA methodology (see Section 3) and further consideration of emissions may be found in **Chapter 29: Climate change, Volume 2** of the ES (Document Reference 6.2.29).

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		Assumptions in relation to the sufficient experience of crews of recreational craft should be supported by peer reviewed data and literature to demonstrate justification for these assertions, including monitoring to confirm this assumption during construction and operation.	It is required by law that all vessels proceeding to sea within UK waters comply with the Merchant Shipping Regulations and this includes pleasure craft. Whilst it is noted that exemptions to regulations are permitted based on vessel size and use, vessels are required to comply with the fundamental principles of safe navigation including the Convention on International Regulations for Preventing Collisions at Sea (COLREGs) and the International Convention for the Safety of Life at Sea (SOLAS), notably SOLAS V Regulation 34 (Voyage/Passage Planning) – Safe navigation and avoidance of dangerous situations. Any infringements of the regulations in the vicinity would be addressed by the MCA who are responsible for ensuring vessels comply with all applicable regulations within UK waters, proceeding from a UK port or under the UK flag.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		In order to minimise collision risk, the 830m spacing between structures should be made a condition (for example via a marine licence or similar) for the Proposed Development.	The final array layout will be agreed with the MCA and Trinity House post-consent as per DCO requirements or deemed Marine Licence (dML) (Table 24-1) but will be within the parameters set out in the ES including the 830m minimum spacing (a small decrease from PEIR associated with the reduction in the DCO Limits).

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		Given that a recreational craft adrift is unlikely to be able to anchor to arrest drift and avoid a collision/allision the RYA does not agree that the frequency of occurrence of the hazard is negligible as the mitigation proposed does not prevent a collision/allision. Additionally, there is no consideration for the potential for a recreational craft to be driven against a structure and capsized by weather and wave conditions and so the RYA does not agree that the consequences of a drifting allision would be moderate. Consideration should be made as to whether the development will allow sufficient time for a response (such as the RNLI) to reach a drifting craft before a collision/allision occurs.	The assessment of drifting allision risk for recreational vessels gives due consideration to the limited options available in terms of emergency action and the level of emergency response resources in the region. The frequency of occurrence has subsequently been amended to 'extremely unlikely'. However, given the reduced speed at which a drifting allision would likely occur, the severity of consequence remains 'moderate'.
		No further concerns are raised with respect to small craft use of safe havens.	Noted in Section 12.3.
		MGN 543 has now been superseded and the NRA should be reviewed and revised with respect to the recreational aspects of MGN 654.	The NRA has considered MGN 654 as primary guidance and an MGN 654 Checklist has been completed (see Appendix A).

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
Littlehampton Harbour Board	16 September 2021 Section 42 response	Do not believe there is fair consideration of the economic impacts of displacement to all types of leisure and commercial vessels using Littlehampton Harbour and local waters due to vessel traffic assessments occurring during the COVID-19 pandemic and an over reliance on AIS data.	The commercial risk due to vessel displacement is assessed as part of the risk assessment in **Chapter 13: Shipping and navigation, Volume 2** of the ES (Document Reference 6.2.13), nothing that commercial risk is considered out with the technical scope of the NRA.
		The degree of export cable protection and cable burial depth requires full assessment to ensure the risks of both anchor interaction and reduction in under keel clearance in these areas is properly mitigated.	Cable burial and a cable burial risk assessment are considered as part of the embedded mitigation measures in Section 24.
		Concerned with sufficiency of engagement with Littlehampton Harbour's commercial fishing fleet.	Ongoing liaison with fishing fleets will be maintained with a Fisheries Liaison Officer (FLO) (Table 24-1). Further consultation is being undertaken with **Chapter 10: Commercial fisheries, Volume 2** of the ES (Document Reference 6.2.10).

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		Certain construction and support vessels must receive a Littlehampton Harbour Board pilot before undertaking certain activities within the port's Competent Harbour Authority area with the view to award Pilot Exemption Certification to vessel masters as efficiently as possible.	Noted in Section 7.4.4.
Hanson Aggregates Marine	16 September 2021 Section 42 response	The risk of anchor snagging across any cable route between landfall and the array area or between the turbine infrastructure requires consideration.	Acknowledged in the sub-sea cable interaction risk assessment (see Section 20.6).
		Consideration of dredger routeing between Area 435 and beaches at Pevensey and Eastbourne needs to be incorporated in the assessment as this data may be excluded or not have occurred during the survey period. Ship movements consisting of two to three weeks of activity can occur associated with beach/coastal protection projects at these locations.	The long-term AIS data analysis (see Appendix E) did not indicate marine aggregate dredging activity between Area 435 and beaches at Pevensey and Eastbourne; however, a more general consideration is given to east-west transits of all vessel types within the risk assessment.
MCA	21 September 2021 Section 42 response	The PEIR chapter and NRA require review and update to reflect MGN 654, including the MGN checklist.	The NRA has considered MGN 654 as primary guidance and an MGN 654 Checklist has been completed (see Appendix A).

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		The hazard list and risk control log should be included.	The risk control log which include a list of the hazards scoped into the risk assessment is provided in Section 23.
		The terminology and language used in the NRA reflects EIA reporting when it should be consistent with the NRA methodology. It is recommended that the NRA is submitted in Anatec format.	The NRA has been updated to ensure consistency with the MCA's NRA methodology and using Anatec's document template.
		Queried whether grounding risk has been considered.	Grounding risk is addressed within the risk assessment from Section 18.
		Queried whether any more up-to-date Marine Accident Investigation Branch (MAIB) and RNLI data has been considered post-2017 and when Rampion 1 was installed.	Updated MAIB and RNLI incident data between 2010 and 2019 has been considered (see Section 9).
		Queried whether any other risk controls have been considered such as amendments to the red line boundary.	The Proposed DCO Limits represents a reduction in total area covered compared to the Scoping Boundary and PEIR Assessment Boundary (see Section 6.1).

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
UK Chamber of Shipping	21 September 2021 Section 42 response	Concerned with navigational safety around the full extent of the PEIR Assessment Boundary and in particular the western extent which creates a pinch point with Selsey Bill and effectively cuts off Littlehampton Harbour from the south.	The Proposed DCO Limits represents a reduction in total area covered compared to the PEIR Assessment Boundary, including at the western extent in proximity to Selsey Bill (see Section 6.1).
		Do not consider there to be any exceptional circumstance in this instance to bypass the Marine Planning Policies in relation to overlap of the red line boundary with the ITZ. Amendment of the red line boundary to avoid the ITZ would reduce the deviation required for vessels accessing Shoreham Port and the Dover Strait TSS.	The Proposed DCO Limits is set back 1.5nm from the ITZ (see Section 6.1) noted that this represents a decrease in the area considered at Scoping and PEIR.
		Not supportive of the effective "blocking off" of large areas of sea room as exhibited by the anticipated main routes post wind farm in the PEIR.	The Proposed DCO Limits represents a reduction in total area covered compared to the PEIR Assessment Boundary (see Section 6.1) and a navigation corridor located west of Rampion 1 (see Section 17) provides an additional option to/from Littlehampton Harbour and Shoreham Port.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		For the purposes of SAR and navigational safety request at least one line of orientation maintained between Rampion 1 and the proposed development. Furthermore, two lines of orientation as set out in MGN 654 are preferred within the proposed development unless a sufficient safety case can be presented to the MCA.	The final layout to be agreed with the MCA and Trinity House post-consent as required under the DCO (see Section 24). The Proposed DCO Limits incorporates HRAs to support access for SAR assets, Including between Rampion 1 and Rampion 2.
		Expect that the ES chapter and updated NRA will be fully compliant with MGN 654.	The NRA has considered MGN 654 as primary guidance and an MGN 654 Checklist has been completed (see Appendix A).
		A single 10-year period is unnecessarily short for accident data and may not accurately reflect historic incidents and safety of navigation.	An additional 10 years of MAIB incident data (2000 to 2009) has been considered to validate the findings of the more recent data (see Section 9).
		The future traffic baseline (10% increase) is conservative and a range of up to 30% should be considered particularly given the traffic volumes on the South Coast.	The future traffic baseline is considered in Section 15, noting that a 20% future case has now been incorporated in addition to a 10% future case. A 30% future case would be an extreme scenario and 10%/20% is considered conservative.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		The inclusion of a navigational corridor [located west of Rampion 1] would require consultation with ports in the vicinity (particularly Shoreham Port and Littlehampton Harbour).	Shoreham Port Authority and Littlehampton Harbour Board have been consulted on the navigation corridor located west of Rampion 1 including via dedicated meetings and the second Hazard Workshop (see Section 17.12).
		If the navigational corridor [located west of Rampion 1] was implemented, traffic coming from the TSS to the Solent would (under COLREGs) give way to traffic exiting the corridor forcing a starboard turn towards the wind farm.	Considered in the navigation corridor safety case (see Section 17) and the third party vessel to vessel collision risk assessment (see Section 20.1.3).
Littlehampton Harbour Board	10 January 2022 Consultation meeting	The outcomes of the risk assessment issue are a matter of terminology rather than outright disagreement with the assessment of risks deemed 'tolerable' not being furthered.	Risks assessed as 'tolerable' are deemed to be such with the associated embedded mitigation measures in place (see Section 24).

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		Main concern is the cable burial and anchoring vessels in proximity to the export cables, with relocation of the anchorage location potentially required. Based on feedback from developments in the Wash there is a preference to address issues upfront including through involvement in the cable burial risk assessment.	Increased interaction with sub-sea cables is considered in the risk assessment (see Section 20.6). The cable burial risk assessment will ensure burial or protection is undertaken based on relevant mitigations and is considered as part of the embedded mitigation measures in Section 24. Littlehampton Harbour Board will be noted as a consultee for the cable burial risk assessment.
		Recreational users do not navigate internally within Rampion 1 in poor conditions.	Considered in the internal allision risk assessment (see Section 20.3.3).
		Although the navigation corridor [located west of Rampion 1] is welcomed overall it may introduce new risks whilst mitigating others for vessels and would unlikely be justified for Littlehampton Harbour commercial shipping alone given the low volumes of vessel movements.	Considered in the navigation corridor safety case (see Section 17).

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
Shoreham Port Authority	24 January 2022 Consultation meeting	The main issue from Rampion 1 was the lack of sea room in the Inshore Traffic Zone (ITZ).	Considered in the third party vessel to vessel collision risk assessment (see Section 20.1.3). The Proposed DCO Limits is set back 1.5nm from the ITZ (see Section 6.1) noted that this represents a decrease in the area considered at Scoping and PEIR.
		The width of the navigation corridor [located west of Rampion 1] may dictate commercial user preference between using the corridor and transiting east of the Proposed Development (and Rampion 1).	Considered in the navigation corridor safety case (see Section 17) noting that the navigation corridor will be MGN 654 compliant in terms of width. Also, it is noted that the Proposed DCO Limits represents a reduction in total area covered compared to the PEIR Assessment Boundary, including at the eastern extent.
		Vessels will take the safest option in adverse weather.	Noted with regard to Shoreham Port in the risk assessment of local port access (see Section 20.4).
RYA	25 January 2022 Consultation letter	AIS indicated that east-west craft tend to avoid Rampion 1 by taking a track north or south, i.e., recreational users are avoiding Rampion 1 by making early course corrections to minimise the distance travelled on passage along the South Coast.	Considered in the vessel displacement risk assessment (see Section 20.1).

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		There is an offshore recreational passage (cruising) route to the south of Rampion 1 which crosses through the array area.	The structures exclusion zone located south of Rampion 1 may be used for navigation by east-west recreational craft for navigation and is considered in the risk assessment of collision risk (see Section 19.1.3).
		AIS data for the period Rampion 1 has been operating indicates that recreational traffic is displaced, rather than sailing through the offshore wind renewable site. Any assumption in the current NRA that states craft will continue to sail through the wind farm area should be corrected to reflect the scenario that craft will be displaced.	The minimum spacing between structures of 830m is considered sufficient for safe internal navigation, noting that this is slightly greater than the minimum spacing at Rampion 1. Internal allision risk is considered in the risk assessment (see Section 20.3.3).
		The Proposed Development should not interfere with or undermine the use and siting of existing aids to navigation. These current markers are key navigational aids and boats wishing to transit to the south of the shallows will have a complicated navigational route, especially in a prevailing south west wind causing a leeward grounding risk, if the array area is closer inshore.	The Proposed DCO Limits represents a reduction in total area covered compared to the PEIR Assessment Boundary (see Section 6.1) including at the western extent. Consideration is given the use of existing aids to navigation in the risk assessment (see Section 20.4.6).

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		Concerned that commercial traffic approaching Shoreham Port could be displaced into recreational areas and to avoid this there may be a need for some form of traffic separation if the Proposed Development displaces traffic inshore.	The Proposed DCO Limits is set back 1.5nm from the ITZ (see Section 6.1) noted that this represents a decrease in the area considered at Scoping and PEIR. Subsequently, no deviation of the main commercial route between the Dover Strait TSS and Shoreham Port is anticipated (see Section 15.5.2).
		With respect to the north-south cross-Channel passage traffic, together with the indication that recreational users appear to be avoiding transits through Rampion 1, it is suggested that a navigation channel is provided between Rampion 1 and Rampion 2.	The structures exclusion zone located west of Rampion 1 serves as a north-south navigation corridor (see Section 6).
UK Chamber of Shipping	25 January 2022 Consultation meeting	Whether or not a distance of 4.7nm between the navigation corridor and crossing traffic headed to the Solent would be sufficient would be dependent on the layout and level of traffic as well as issues such as potential for cluttered Radar or foggy conditions.	Based on analysis in Section 13.7, effects of Radar interference on vessels at distances greater than 0.5nm from the WTGs are not anticipated to be significant under MGN 654. Additionally, taking COLREGs Rule 6 on safe speed into consideration with the fact that mariners are used to navigating in foggy conditions, it is not anticipated that this will be a significant factor in collision risk.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		Initial thoughts were that corridor [located west of Rampion 1] appeared to be of benefit to Littlehampton Harbour (due to the large reduction in route distance compared to deviating around the array) and that the corridor would offer vessels additional options dependent on weather. However, it was also considered that the exit from the corridor could be a pinch point.	It is expected that both the give way vessel and stand-on will exhibit good seamanship in line with the COLREGs to reduce increased collision risk at the pinch point at the exit from the corridor (see Section 20.1.3).
		Regarding the future worst case dog leg route from the TSS passing east of the boundary, it was stated that one point of concern would be the risk posed to vessels travelling in opposite directions with visual interference from turbines factored in – this should be sought to be avoided from a shipping and navigation point of view.	The Proposed DCO Limits represents a reduction in total area covered compared to the PEIR Assessment Boundary, including at the eastern extent (see Section 6.1). Additionally, the potential for visual interference has been considered in the risk assessment of collision risk (see Section 19.1.3).
RYA	1 February 2022 Email correspondence	Content that areas of concern had been addressed by the Assessment Boundary changes, but the main concern was a route along which a small concentration of craft appeared to be transiting within the Proposed DCO Limits.	The structures exclusion zone located south of Rampion 1 may be used for navigation by east-west recreational craft for navigation and is considered in the risk assessment of collision risk (see Section 19.1.3).

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		The main consideration for a drifting craft is SAR response time.	Noted in the drifting allision risk assessment (see Section 20.3.2)
MCA	1 March 2022 Email correspondence	Support the corridor [located west of Rampion 1] provided it has sufficient width and the entry/exit of the southern end is unimpeded, i.e., a slight adjustment to the RLB required.	A safety case for the navigation corridor located west of Rampion 1 has been undertaken in Section 17. No surface infrastructure will be located within the HRA or in the space directly to the south (see Section 6).
		The corridor [located west of Rampion 1] would be beneficial and reduce risks associated with traffic transiting around the eastern and southern boundaries.	Noted in the navigation corridor safety case (Section 17.12)
		The separation distance of at least 4.7nm between the corridor [located west of Rampion 1] and TSS traffic provides sea room to minimise rights of way issues with traffic exiting the TSS.	Noted in the navigation corridor safety case (Section 17.12)
		The ITZ could be used as an escape channel.	Noted in the navigation corridor safety case (Section 17.12)

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
UK Chamber of Shipping	13 April 2022 Consultation meeting	Following on from discussions with the MCA that the distance is sufficient for rights of way issues, the Chamber is firmly in support of the navigation corridor and its introduction into the NRA.	Noted in the navigation corridor safety case (Section 17.12).
		Wish to see the Proposed DCO Limits further drawn westwards to alleviate the doubling back of traffic between the Dover Strait TSS and Shoreham Port.	The Proposed DCO Limits represents a reduction in total area covered compared to the PEIR Assessment Boundary, including at the eastern extent (see Section 6.1).
UK Chamber of Shipping	6 September 2022 Second Hazard Workshop	The change in the DCO Limits is satisfactory, particularly with regard to the separation from the ITZ.	Noted in the risk assessment of collision risk (see Section 19.1.3).
		The indicative MDS layout includes an isolated structure in the south west which may be a concern in relation to allision risk.	Noted in the risk assessment of allision risk (see Section 20.3.1).
RYA	6 September 2022 Second Hazard Workshop	The DCO Limits represent a positive change from those previously considered with the clear gaps between Rampion 1 and Rampion 2 particularly useful.	Noted in the navigation corridor safety case (Section 17.12).

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		There may be a potential issue of crossing traffic between vessels transiting through the structures exclusion zones and this is a matter for consideration in the NRA.	Considered in the navigation corridor safety case (Section 17.617.12).
CA	6 September 2022 Second Hazard Workshop	The DCO Limits represent an improvement from those presented at the first Hazard Workshop [the PEIR Assessment Boundary].	Noted in the navigation corridor safety case (Section 17.12).
Shoreham Port Authority	6 September 2022 Second Hazard Workshop	Satisfied with the reduction to the extent of the DCO Limits to the east in line with Rampion 1 in relation to access for routeing to/from Shoreham Port.	Noted in the risk assessment of collision risk (see Section 19.1.3).
Littlehampton Harbour Board	6 September 2022 Second Hazard Workshop	The DCO Limits represent a positive change from those previously considered.	Noted in the navigation corridor safety case (Section 17.12).
ABP Southampton	6 September 2022 Second Hazard Workshop	Vessel traffic displaced to the south west will be converged into a tighter space with the Isle of Wight.	Noted in the risk assessment of vessel displacement (see Section 19.1.1).
Cemex UK Marine	6 September 2022	The DCO Limits represent a positive change from those previously considered.	Noted in the navigation corridor safety case (Section 17.12).

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
	Second Hazard Workshop	There remains an area of concern relating to active dredging operations in areas close to the Proposed Development export cable corridor and array area.	Further consultation with marine aggregate dredging stakeholders has been undertaken as part of **Chapter 7** which considers risks to active marine aggregate dredging.
		In the event of a breakdown/emergency anchoring, it is likely that anchors of marine aggregate dredgers will penetrate through 1.5m of seabed and this is a concern.	Noted in the increased interaction with sub-sea cables risk assessment (see Section 20.6). The cable burial risk assessment will ensure burial or protection is undertaken based on relevant mitigations and is considered as part of the embedded mitigation measures in Section 24
		The Radar index of a monopile will be different to that of a multileg foundation and this should be accounted for when comparing against other developments (including Rampion 1) in terms of effects of wind turbines on Radar use.	Effects on marine Radar are considered in Section 13.7.
Tarmac Marine	6 September 2022 Second Hazard Workshop	The changes to the DCO Limits look helpful on the whole, with the gap between the Owers Light Buoy and the Proposed Development array area also beneficial.	Noted in the navigation corridor safety case (Section 17.12) and the risk assessment of collision risk (see Section 19.1.3).
NAB VTS User Group meeting	5 October 2022	Update provided to the NAB VTS user group on the project.	No response or action required.

4.3 Hazard Workshops

35. A key element of the consultation phase were the Hazard Workshops, meetings of local and national marine stakeholders to identify and discuss potential shipping and navigation hazards. Using the information gathered from the Hazard Workshops, a hazard log was produced for use as input into the risk assessment undertaken in **Chapter 13**. This ensured that expert opinion and local knowledge was incorporated into the risk assessment and that the hazard log was site-specific.

4.3.1 Hazard Workshop Attendance

36. The first Hazard Workshop was held via teleconferencing (due to restrictions incurred by the COVID-19 pandemic) on 23 February 2021. The Hazard Workshop was attended by all of the parties listed in Section 4.1.

37. Regular operators were given the opportunity to attend the Hazard Workshop but other than the marine aggregate dredging companies (who were contacted through BMAPA) none did so. Likewise, the National Federation of Fishermen's Organisations (NFFO) chose not to attend.

38. The second Hazard Workshop was held via teleconferencing on 6 August 2022 and was attended by all of the parties listed in Section 4.1 except Newhaven Port & Properties and Britannia Aggregates, and in addition Brittany Ferries.

4.3.2 Hazard Workshop Process and Hazard Log

39. During the Hazard Workshops, key maritime hazards associated with the construction, operation and maintenance and decommissioning of the Proposed Development were identified and discussed. Where appropriate, hazards were considered by vessel type to ensure risk control options could be identified on a type-specific basis.

40. Following the first Hazard Workshop, the risks associated with the identified hazards were ranked in the hazard log based upon the discussions held during the workshop, with appropriate embedded mitigation measures identified, including any additional measures required to reduce the risks to ALARP. The hazard log was then provided to the Hazard Workshop attendees for comment and their feedback incorporated into the NRA.

41. Following the second Hazard Workshop, the hazard log was updated based on reconsideration of the previously identified hazards and associated risks during the workshop. The hazard log was again provided to the Hazard Workshop attendees for comment and their feedback incorporated into the NRA.

42. The hazard log has been used to inform the risk assessment from Section 18 and is provided in full in Appendix B.

5 Data Sources

43. This section summarises the main data sources used to characterise the shipping and navigation baseline relative to the Proposed Development.

5.1 Summary of Data Sources

44. The main data sources used to characterise the shipping and navigation baseline relative to the Proposed Development are outlined in Table 5-1.

Table 5-1 Data sources used to inform shipping and navigation baseline

Data	Source(s)	Purpose
Vessel traffic	Summer vessel traffic survey data consisting of AIS, Radar and visual observations for the study area (14 days, 16 to 30 June 2022) recorded from a dedicated survey vessel on-site.	Characterising vessel traffic movements within and in proximity to the Proposed DCO Limits. When considered alongside the vessel traffic survey data used for validation purposes, the vessel traffic baseline is in line with MGN 654 (MCA, 2021) requirements.
	Winter vessel traffic survey data consisting of AIS, Radar and visual observations for the study area (14 days, 1 to 15 November 2020) recorded from a dedicated survey vessel on-site.	
	Geophysical survey data consisting of non-AIS visual observations within and in proximity to the Proposed DCO Limits (July to August 2020) recorded from a survey vessel on-site.	Characterising non-AIS vessel traffic movements within and in proximity to the Proposed DCO Limits.
	AIS data for the study area (12 months 2019) (hereafter the 'long-term vessel traffic data') recorded from coastal receivers.	Validation of the vessel traffic surveys and characterising seasonal variations and tangible effects of COVID-19 (in the case of the summer 2020 dataset).
	Summer vessel traffic survey data consisting of AIS, Radar and visual observations for the study area (14 days, 8 to 22 August 2020) recorded from a dedicated survey vessel on-site.	

Data	Source(s)	Purpose
	Winter vessel traffic survey data consisting of AIS, Radar and visual observations for the study area (14 days, 2 to 16 December 2022) recorded from a dedicated survey vessel on-site.	
	Anatec's ShipRoutes database (2022).	Secondary source for characterising vessel traffic movements including cumulatively within and in proximity to the Proposed DCO Limits.
Maritime incidents	MAIB marine accidents database (2000 to 2019).	Review of maritime incidents within and in proximity to the Proposed DCO Limits.
	RNLI incident data (2010 to 2019).	
	DfT UK civilian SAR helicopter taskings (2015 to 2022).	
Marine aggregate dredging	Marine aggregate dredging areas (licenced and active) (The Crown Estate (TCE), 2022).	Characterising marine aggregate dredging areas within and in proximity to the Proposed DCO Limits.
	Transit routes (BMAPA, published 2009, downloaded 2020)[1].	
Recreational traffic density and features	*UK Coastal Atlas of Recreational Boating 2.1* (RYA, 2019).	Characterising recreational activity within and in proximity to the Proposed DCO Limits.
Other navigational features	Admiralty Charts 1652, 1991, 2037, 2044, 2154, 2450 and 2675 (United Kingdom Hydrographic Office (UKHO), 2021/22.	Characterising other navigational features in proximity to the Proposed DCO Limits.
	Admiralty Sailing Directions Dover Strait Pilot NP28 (UKHO, 2020).	
Weather	*Rampion Offshore Wind Farm Metocean Survey and Assessment* (Emu, 2011)	Characterising weather conditions in proximity to the Proposed DCO Limits for use as input in the collision and allision risk modelling.

[1] Given the age of this data source it was found to not be wholly reflective of marine aggregate dredger movements within the study area. It is noted that the AIS data (both the vessel traffic survey data and long-term vessel traffic data) was considered comprehensive for marine aggregate dredgers.

Data	Source(s)	Purpose
	Case studies of past weather events (Met Office, 2019).	Identifying periods of adverse weather in proximity to the PEIR Assessment Boundary.

5.2 Vessel Traffic Surveys

45. Four dedicated vessel traffic surveys have been undertaken as outlined in Table 5-1, with the winter 2020 and summer 2022 primarily used to inform the characterisation of vessels traffic movements in Section 10. An earlier vessel traffic survey (summer 2020) is detailed in Appendix G. A later vessel traffic survey (winter 2022) undertaken to ensure compliance with MGN 654 – in terms of the requirement for data collection within 24 months of the DCO Application – is detailed in Appendix H.

46. The vessel traffic surveys were undertaken by the guard vessels *Karima* (IMO number 7,427,403) and *Star of Hope* (IMO number 7,521,091), in agreement with the MCA and Trinity House.

47. A number of vessel tracks recorded during the survey period were classified as temporary (non-routine), such as the tracks of the survey vessel and tracks of vessels associated with wind farm support at the existing Rampion 1 and were therefore excluded from the characterisation of the vessel traffic baseline. Vessels undertaking a survey at the Interconnexion France-Angleterre 2 (IFA2) project were also removed from the analysis, as well as a vessel carrying out an Unexploded Ordnance (UXO) survey at Brighton.

5.3 Long-Term Vessel Traffic Data

48. The long-term vessel traffic data consisting of Automatic identification System (AIS) covering 12 months in 2019 was collected from coastal receivers. Taking into account the distance offshore of the Proposed DCO Limits, the long-term vessel traffic data is considered to be comprehensive for the study area. The assessment of this dataset allowed seasonal variations to be captured and any tangible effects of COVID-19 to be observed.

49. The dataset is assessed in full in Appendix E.

5.4 Data Limitations

5.4.1 Automatic Identification System Data

50. The carriage of AIS is required on board all vessels of greater than 300 Gross Tonnage (GT) engaged on international voyages, cargo vessels of more than 500GT not engaged on international voyages, passenger vessels irrespective of size built on or after 1 July 2002, and fishing vessels over 15m Length Overall (LOA).

51. Therefore, for the vessel traffic surveys larger vessels were recorded on AIS, while smaller vessels without AIS installed (including fishing vessels under 15m LOA and recreational craft) were recorded, where possible, on the Automatic Radar Plotting Aid (ARPA) Radar on board the *Karima* and *Star of Hope*. A proportion of smaller vessels also carry AIS voluntarily, typically utilising a Class B AIS device.

52. The proportion of vessel tracks recorded via AIS or Radar for each survey period is detailed in Table 5-2.

Table 5-2 Proportion of vessel tracks recorded via AIS or Radar per survey period

Survey Period	Proportion of Vessel Tracks (%)	
	AIS	Radar
Summer 2020	94	6
Winter 2020	98	2
Summer 2022	99	1
Winter 2022	99	1

53. The long-term vessel traffic data – an AIS only dataset – assumes that vessels under a legal obligation to broadcast via AIS will do so. Both the long-term vessel traffic data and the AIS component of the vessel traffic survey data assume that the details broadcast via AIS is accurate (such as vessel type and dimensions) unless there is clear evidence to the contrary.

5.4.2 COVID-19

54. It is acknowledged that COVID-19 has had a substantial effect on shipping movements globally. Therefore, the vessel traffic survey data collected in 2020 may be influenced by COVID-19. However, in line with *Advice Note Seven: Environmental Impact Assessment* (The Planning Inspectorate, 2020), The Applicant has agreed the approach to data collection and the results with relevant stakeholders including the MCA. Additionally, during consultation input has been sought from relevant stakeholders regarding the shifting pattern of vessel movements due to COVID-19, with the consensus that at the time of the 2020 vessel traffic surveys (undertaken in August and November) commercial vessel movements could be considered to be relatively reflective of normal circumstances in the region (see various entries in Table 4-1).

5.4.3 Historical Incident Data

55. Although all UK commercial vessels are required to report accidents to the Marine Accident Investigation Branch (MAIB), non-UK vessels do not have to report unless they are in a UK port or within 12nm territorial waters (noting that the study area is not located entirely within 12nm territorial waters) or carrying

passengers to a UK port. There are also no requirements for non-commercial recreational craft to report accidents to the MAIB.

56. The Royal National Lifeboat Institution (RNLI) incident data cannot be considered comprehensive of all incidents in the study area. Although hoaxes and false alarms are excluded, any incident to which a RNLI resource was not mobilised has not been accounted for in this dataset.

5.4.4 United Kingdom Hydrographic Office Admiralty Charts

57. The United Kingdom Hydrographic Office (UKHO) admiralty charts are updated periodically and therefore the information shown may not reflect the real time features within the region with total accuracy. However, during consultation input has been sought from relevant stakeholders regarding the navigational features baseline.

6 Project Description Relevant to Shipping and Navigation

58. The NRA reflects the design envelope which is detailed in full in **Chapter 4: The Proposed Development, Volume 2** of the ES (Document Reference 6.2.4). The following subsections outline the maximum extent of the Proposed Development for which any shipping and navigation hazards are assessed.

6.1 Proposed DCO Limits

59. For the purposes of the NRA, the Proposed DCO Limits is considered to be the offshore component of the Proposed Development, consisting of the array area and offshore export cable corridor.

60. The array area is located approximately 7.3nm south of the West Sussex coast. The total area covered by the array area is approximately 57 square nautical miles (nm^2) with charted water depths ranging between 14 and 60m below Chart Datum (CD). The total area covered by the offshore export cable corridor is approximately 17nm^2 with charted water depths ranging between zero (nearshore) and 21m below CD.

61. The key coordinates defining the boundary of the offshore element of the Proposed DCO Limits are illustrated in Figure 6.1 and provided in Table 6-1 using World Geodetic System 1984 (WGS84) Universal Transverse Mercator (UTM) Zone 30N.

62. It is noted that the array area represents a decrease of approximately 38% in total area covered compared to the equivalent area considered at Scoping, and approximately 17% decrease in total area covered compared to the equivalent area considered at PEIR.

63. At both the PEIR and ES stages, the extent of the Assessment Boundary was reduced from that considered at Scoping due to issues raised in relation to a number of aspects, including by shipping and navigation stakeholders (see various entries in Table 4-1). The key reductions were:

- Eastern extent reduced by up to approximately 5.9nm from Scoping Boundary, resulting in the Assessment Boundary no longer overlapping the Inshore Traffic Zone (ITZ) (minimum setback of approximately 1.5nm) and increased distance from the Dover Strait TSS (minimum setback of approximately 4.2nm);
- Western extent reduced by up to approximately 1.6nm from Scoping Boundary, resulting in an increased distance from the Owers Light Buoy (minimum setback of approximately 2.1nm); and
- Structures exclusion zone for surface infrastructure established west of Rampion 1 (distance approximately 1.3nm) and south of Rampion 1 (distance approximately 1.0nm).

64. The Scoping Boundary and PEIR Assessment Boundary are included as a dashed grey line and dashed black line in Figure 6.1, respectively.

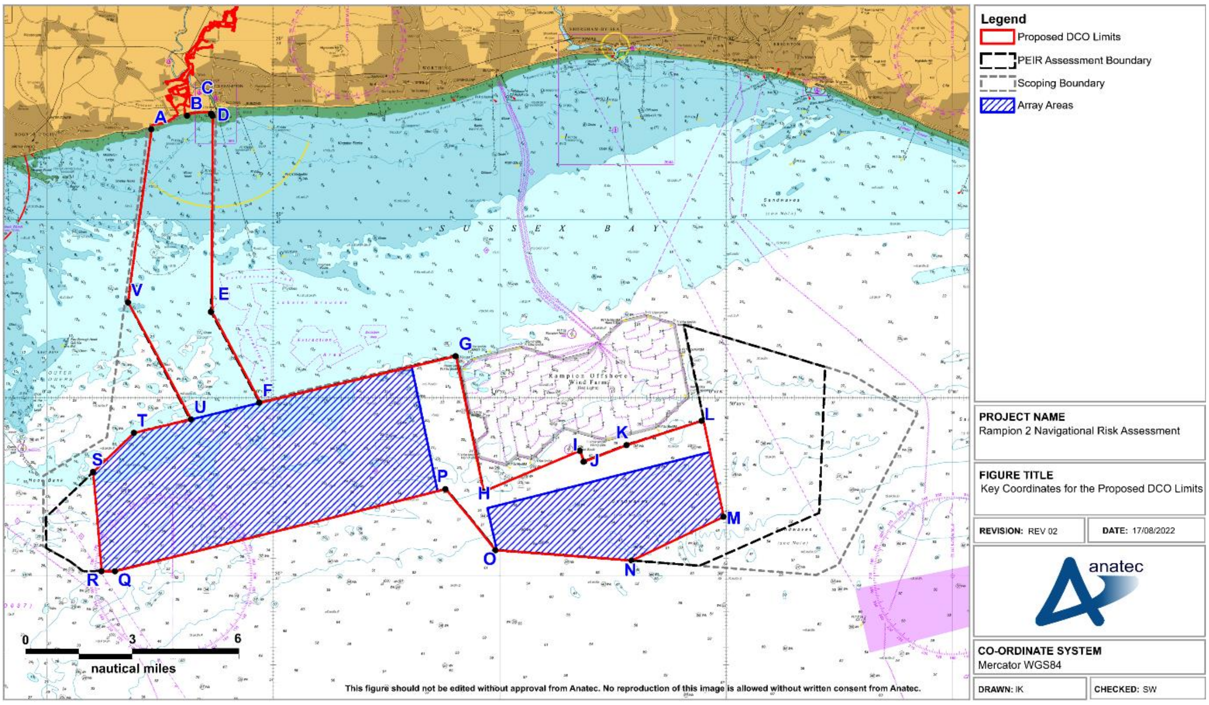

Figure 6.1 Key coordinates for the Proposed DCO Limits

Table 6-1 Key coordinates for the Proposed DCO Limits

Point	Latitude	Longitude		Point	Latitude	Longitude
A	50° 47′ 32.22″ N	000° 35′ 23.11″ W		L	50° 39′ 21.66″ N	000° 11′ 04.51″ W
B	50° 47′ 55.15″ N	000° 33′ 48.09″ W		M	50° 36′ 39.95″ N	000° 10′ 07.00″ W
C	50° 47′ 58.57″ N	000° 32′ 44.84″ W		N	50° 35′ 25.96″ N	000° 14′ 10.08″ W
D	50° 47′ 55.16″ N	000° 32′ 41.27″ W		O	50° 35′ 43.61″ N	000° 20′ 11.28″ W
E	50° 42′ 25.17″ N	000° 32′ 45.44″ W		P	50° 37′ 26.64″ N	000° 22′ 23.65″ W
F	50° 39′ 52.38″ N	000° 30′ 37.22″ W		Q	50° 35′ 08.20″ N	000° 36′ 59.44″ W
G	50° 41′ 10.82″ N	000° 21′ 56.48″ W		R	50° 35′ 08.09″ N	000° 37′ 35.77″ W
H	50° 37′ 22.29″ N	000° 20′ 42.96″ W		S	50° 37′ 55.21″ N	000° 37′ 58.07″ W
I	50° 38′ 31.26″ N	000° 16′ 27.62″ W		T	50° 39′ 01.27″ N	000° 36′ 09.26″ W
J	50° 38′ 12.81″ N	000° 16′ 17.72″ W		U	50° 39′ 24.37″ N	000° 33′ 38.16″ W
K	50° 38′ 40.88″ N	000° 14′ 23.61″ W		V	50° 42′ 41.19″ N	000° 36′ 24.93″ W

6.1.1 Relationship with United Kingdom Round 3 Development Zone

65. The Proposed DCO Limits represents a combination of two development zones, namely the area awarded in 2019 under the TCE wind farm extension process (to the west of Rampion 1) and the remainder of the original Round 3 Zone 6 area (to the south-east of Rampion 1).

66. Figure 6.2 presents the following:

- Proposed DCO Limits;
- Consented Rampion 1 site boundary; and
- Original Round 3 Zone 6 area of search.

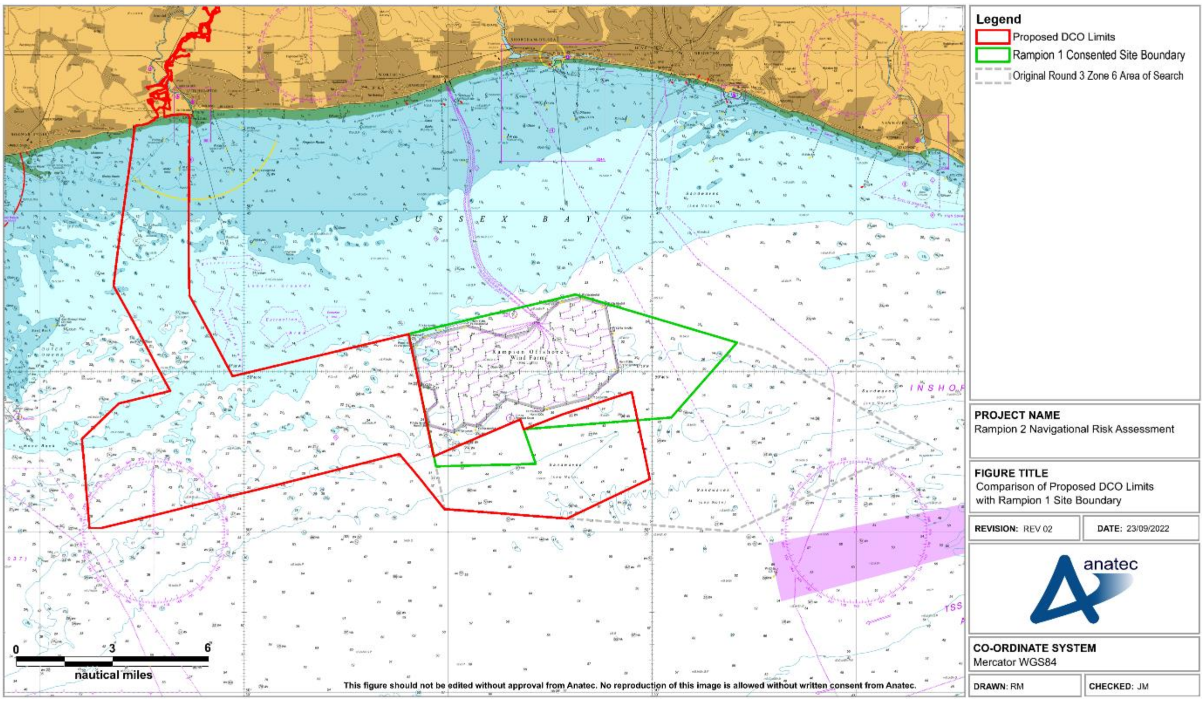

Figure 6.2 Comparison of Proposed DCO Limits with Rampion 1 boundary

67. It can be seen that the consented site boundary for Rampion 1 covered a greater extent than the area ultimately developed, including an overlap into the Dover Strait ITZ similar to that proposed by the PEIR Assessment Boundary for the Proposed Development. Upon refinement, the Proposed DCO Limits is set back from the ITZ.

6.2 Surface Infrastructure

6.2.1 Indicative Worst-Case Layout

68. Up to 93 surface structures will be installed, consisting of 90 Wind Turbine Generators (WTG) and three offshore substations. All surface structures will be located within the array area component of the Proposed DCO Limits, and in particular no surface structures will be located within the structures exclusion zones.

69. Although the final locations of infrastructure have not yet been defined, an indicative worst-case layout has been determined for shipping and navigation and is presented in Figure 6.3.

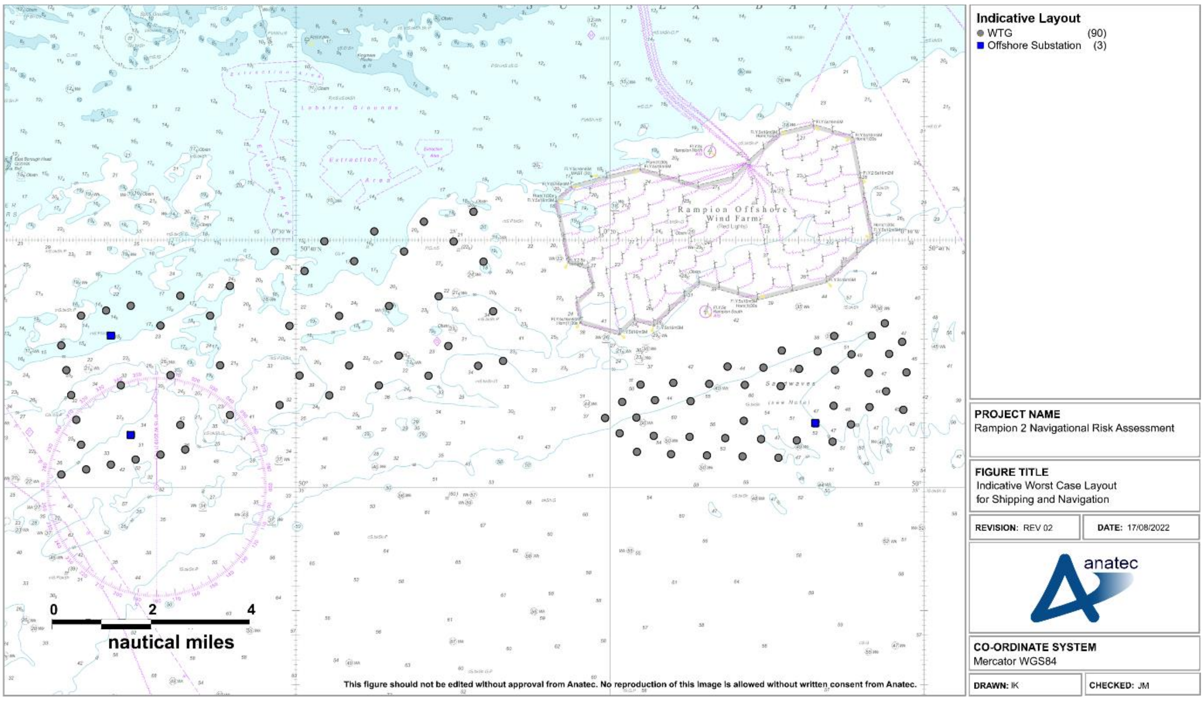

Figure 6.3 Indicative worst-case layout for shipping and navigation

70. Two MGN 654 compliant Helicopter Refuge Areas (HRA) are incorporated into the indicative layout. The HRA located between the western boundary of Rampion 1 and the eastern boundary of the extension site has a minimum width (measured tip to tip) of 1.3nm. The HRA located between the southern boundary of Rampion 1 and the northern boundary of the remainder of the original Round 3 Zone 6 area has a minimum width (measured tip to tip) of 1.0nm. These HRAs will facilitate the transition for Search and Rescue (SAR) assets between Rampion 1 and Rampion 2. No surface infrastructure will be located within the HRA or in the space directly to the south.

71. As part of the worst-case for shipping and navigation, the three offshore substations are all located in proximity to where regular routeing vessel traffic is anticipated to pass closest (see Section 15.5.2), noting that based on consultation with marine aggregate dredging stakeholders the offshore substations have been positioned at internal locations rather than on the perimeter to reduce exposure to marine aggregate dredging activity occurring in proximity.

72. The minimum spacing between structures (measured centre-to-centre) is 830m and the layout is considered to be compliant with the requirements of MGN 654 (MCA, 2021).

6.2.2 Wind Turbine Generators

73. The WTGs within the indicative layout each have a maximum rotor diameter of 172m and maximum blade tip height (above Lowest Astronomical Tide (LAT)) of 285m, noting that these values represent the worst case for shipping

and navigation rather than the Proposed Development as a whole but fall within the scope of the design envelope.

74. Four-legged jacket foundations with suction buckets have been considered as the MDS for shipping and navigation as this foundation type provides the maximum structure dimension at the sea surface. The MDS WTG measurements assuming use of four-legged jacket foundations with suction buckets are provided in Table 6-2, noting that the values provided are specific to the worst-case selected for shipping and navigation and do not necessarily represent the maximum within the design envelope overall.

Table 6-2 MDS for shipping and navigation – WTGs

Parameter	MDS for shipping and navigation
Foundation type	Four-legged jacket with suction buckets
Dimensions at sea surface	20×20m
Maximum blade tip height (above LAT)	285m
Minimum air gap (above MHWS)	22m
Maximum rotor diameter	172m

75. As well as four-legged jackets with suction buckets, the other foundation types under consideration include monopiles, three- or four-legged jacket foundations with pin piles and three-legged jacket foundations with suction buckets. Descriptions of each foundation type under consideration are provided in **Chapter 4: The Proposed Development, Volume 2** of the ES (Document Reference 6.2.4).

6.2.3 Offshore Substations

76. The offshore substations may be installed on either monopile or jacket foundations, but in both cases will have maximum topside dimensions of 80×50m.

6.3 Sub-Sea Cables

77. Various types of sub-sea cables will be installed and can be categorised as follows: array cables, offshore interconnector cables and export cables. Each of these categories is summarised in the following subsections.

6.3.1 Array Cables

78. The array cables will connect individual WTGs to offshore substations. Up to 135nm of array cables will be required with the final length dependent on the final array layout. All array cables will be installed within the array area component of the Proposed DCO Limits, inclusive of the structures exclusion zones.

6.3.2 Offshore Interconnector Cables

79. The offshore interconnector cables will provide interlink connections between the offshore substations within the array area. Up to two offshore interconnector cables will be required with a total length of up to 22nm with the final length dependent on the final array layout.

6.3.3 Export Cables

80. The export cables will carry the energy generated by the WTGs from the array area to shore. Up to four export cables will be required with a combined total length of up to 92nm and will be installed within the offshore export cable corridor component of the Proposed DCO Limits. The export cables will make landfall at Climping, West Sussex.

6.3.4 Cable Burial

81. Where available, the primary means of cable protection will be by seabed burial. The extent and method by which the sub-sea cables will be buried will depend on the results of a detailed seabed survey of the final cable routes and associated cable burial risk assessment. For the array and offshore interconnector cables the target burial depth is 1.0m and for the export cables the target burial depth is between 1.0 and 1.5m.

82. Where cable burial is not possible, alternative cable protection methods may be deployed which will again be determined within the cable burial risk assessment. It is noted that there are no cable crossings anticipated for the export cables.

83. Cable burial and protection is captured in the embedded mitigation measures (see Section 24).

6.4 Construction Phase

84. The offshore construction phase will last for up to approximately four years. Figure 6.4 outlines an indicative construction programme for the Proposed Development which indicates the maximum duration of construction for each element.

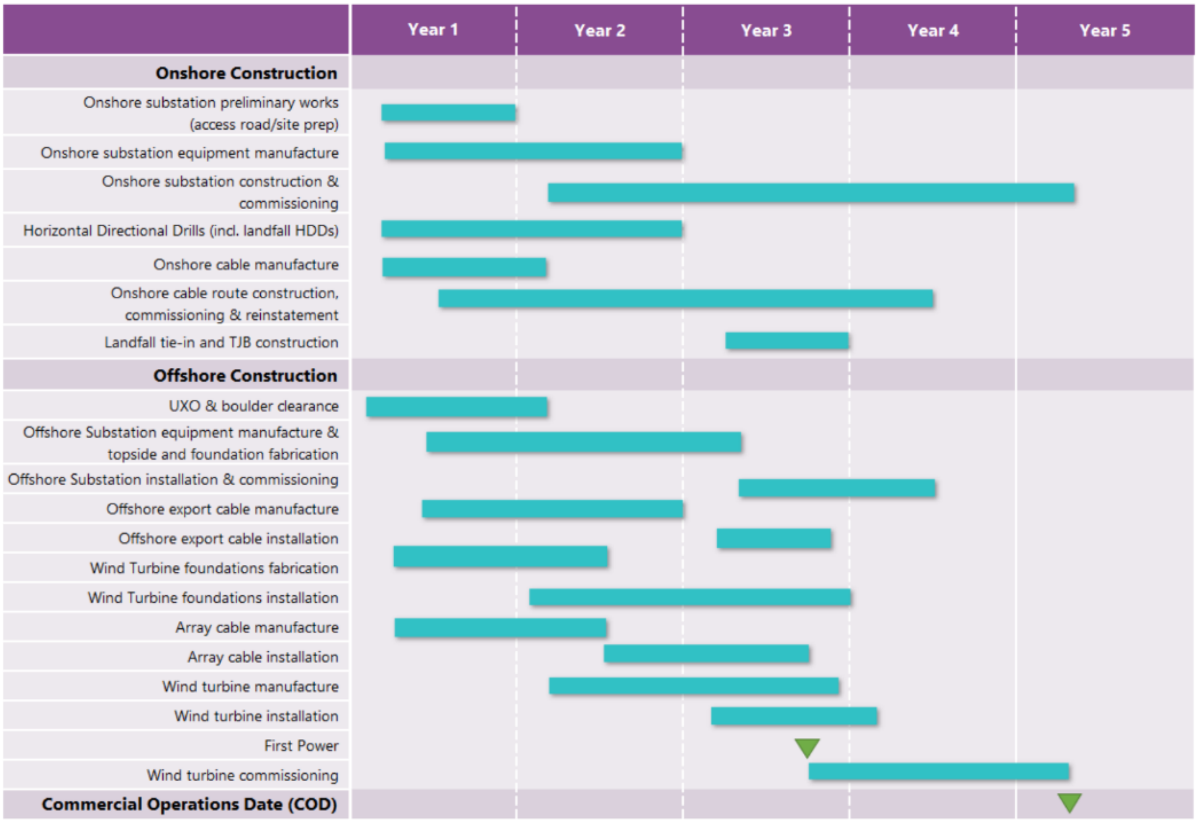

Figure 6.4 Indicative construction programme

6.5 Indicative Vessel and Helicopter Numbers

6.5.1 Construction Vessels

85. Up to 2,413 return trips by construction vessels may be made throughout the construction phase, breaking down as summarised in Table 6-3.

Table 6-3 Maximum vessel numbers per construction activity

Construction Activity	**Maximum number of vessels**	**Maximum number of return trips**
Foundation installation	25	680
WTG installation	22	1,033
Offshore substation installation	37	228
Export cable installation	24	154
Array cable installation	21	318
Total	**129**	**2,413**

6.5.2 Helicopters during Construction

86. Up to 530 return trips by helicopters may be made throughout the construction phase, breaking down as summarised in Table 6-4.

Table 6-4 Maximum helicopter numbers per construction activity

Construction activity	Maximum number of helicopters	Maximum number of return trips
Foundation installation	0	N/A
WTG installation	2	500
Offshore substation installation	2	30
Export cable installation	0	N/A
Array cable installation	0	N/A
Total	**4**	**530**

6.5.3 Operation and Maintenance Vessels

87. Up to 869 return trips per year by up to a peak of 21 operation and maintenance vessels at any one time may be made throughout a maximum 30-year operational lifetime operation and maintenance phase.

88. During both the construction and operation and maintenance phases, logistics will be managed by a marine coordination team with an integrated Health, Safety and Environment (HSE) management system in place to ensure control of all vessels and their respective works as per Table 24-1. The Proposed Development will be operational 24/7.

6.6 Decommissioning Phase

89. The decommissioning sequence will generally be the reverse of the construction sequence and involve similar types and numbers of vessels. The decommissioning duration of the offshore infrastructure may take the same amount of time as construction of the Proposed Development, up to four years, although this indicative timing may reduce.

6.7 Maximum Design Scenario

90. The MDS for each shipping and navigation hazard is provided in Table 6-5 and is based on the parameters described in the previous subsections.

Table 6-5 MDS by Hazard for Shipping and Navigation

Potential Hazard	Phase(s)	MDS for Shipping and Navigation	Justification
Vessel displacement	Construction	▪ Single continuous construction phase of up to four years; ▪ Up to 128 vessels making up to 2,413 return trips; ▪ Full build out of the Proposed DCO Limits (excluding HRA); ▪ Buoyed construction area encompassing the maximum extent of the Proposed DCO Limits including presence of 500m construction Safety Zones and 50m pre commissioning Safety Zones; and ▪ Up to four offshore export cables with a combined total length of 92nm.	Largest possible extent, greatest number vessel activities associated with the export cable corridor (noting that construction/ decommissioning vessel activities associated with the Proposed DCO Limits will be contained within the buoyed construction/ decommissioning area) and greatest duration resulting in the maximum spatial and temporal effect on vessel displacement.
	Operation and maintenance	▪ Operation and maintenance phase of up to 30 years; ▪ Up to 21 vessels at any one time making up to 869 return trips per year; ▪ Full build out of the Proposed DCO Limits (excluding HRA); and ▪ Presence of 500m operational Safety Zones for major maintenance activities.	

Potential Hazard	Phase(s)	MDS for Shipping and Navigation	Justification
	Decommissioning	The MDS for the decommissioning phase will be similar to the construction phase noting that from a shipping and navigation perspective the activities during both of these phases will be similar.	
Increased vessel to vessel collision risk between a third-party vessel and a project vessel	Construction	▪ Single continuous construction phase of up to four years; ▪ Up to 128 vessels making up to 2,413 return trips; ▪ Full build out of the Proposed DCO Limits (excluding HRA); and ▪ Buoyed construction area encompassing the maximum extent of the Proposed DCO Limits (excluding HRA) including presence of 500m construction Safety Zones and 50m pre commissioning Safety Zones.	Largest possible extent, greatest number of vessel movements and activities associated with the Proposed Development and greatest duration resulting in the maximum spatial and temporal effect on vessel to vessel collision risk involving a third-party vessel and a project vessel.
	Operation and maintenance	▪ Operation and maintenance phase of up to 30 years; ▪ Up to 21 vessels at any one time making up to 869 return trips per year; ▪ Full build out of the Proposed DCO Limits (excluding HRA); and ▪ Presence of 500m operational Safety Zones for major maintenance activities.	

Potential Hazard	Phase(s)	MDS for Shipping and Navigation	Justification
	Decommissioning	The MDS for the decommissioning phase will be similar to the construction phase noting that from a shipping and navigation perspective the activities during both of these phases will be similar.	
Increased vessel to vessel collision risk between third-party vessels	Construction	▪ Single continuous construction phase of up to four years; ▪ Full build out of Proposed DCO Limits (excluding HRA); ▪ Buoyed construction area encompassing the maximum extent of the Proposed DCO Limits (excluding HRA) including presence of 500m construction Safety Zones and 50m pre commissioning Safety Zones; ▪ Up to four offshore export cables with total length 92nm.	Largest possible extent, greatest number of construction vessel activities associated with the export cable corridor (noting that construction/decommissioning vessel activities associated with the Proposed DCO Limits will be contained within the buoyed construction/decommissioning area) and greatest duration resulting in the maximum spatial and temporal effect on vessel to vessel collision risk between third-party vessels.
	Operation and maintenance	▪ Operation and maintenance phase of up to 30 years; ▪ Full build out of the Proposed DCO Limits (excluding HRA); and ▪ Presence of 500m operational Safety Zones for major maintenance activities.	

Potential Hazard	Phase(s)	MDS for Shipping and Navigation	Justification
	Decommissioning	The MDS for the decommissioning phase will be similar to the construction phase noting that from a shipping and navigation perspective the activities during both of these phases will be similar.	
Vessel to structure allision risk	Construction	▪ Single continuous construction phase of up to four years; ▪ Full build out of the Proposed DCO Limits (excluding HRA); ▪ Buoyed construction area encompassing the maximum extent of the Proposed Development array area including presence of 500m construction Safety Zones and 50m pre commissioning Safety Zones; ▪ Up to 90 wind turbines and three offshore substation platforms partially constructed or not yet commissioned and located as per Figure 6.3; ▪ Wind turbines on four-legged jackets with suction bucket foundations; and ▪ Offshore substation platforms on monopile or jacket foundations.	Largest possible extent, greatest number of surface infrastructure and greatest duration resulting in the maximum spatial and temporal effect on vessel to structure allision risk.

Potential Hazard	Phase(s)	MDS for Shipping and Navigation	Justification
	Operation and maintenance	▪ Operation and maintenance phase of up to 30 years; ▪ Full build out of the Proposed Development array area; ▪ Up to 90 wind turbines and three offshore substation platforms located as per Figure 6.3; ▪ Wind turbines on four-legged jackets with suction bucket foundations; and ▪ Offshore substation platforms on monopile or jacket foundations.	
	Decommissioning	The MDS for the decommissioning phase will be similar to the construction phase noting that from a shipping and navigation perspective the activities during both of these phases will be similar.	
Reduced access to local ports	Construction	▪ Single continuous construction phase of up to four years; ▪ Up to 128 vessels making up to 2,413 return trips; ▪ Full build out of the Proposed DCO Limits (excluding HRA); ▪ Buoyed construction area encompassing the maximum extent of the Proposed DCO Limits (excluding HRA) including presence of 500m construction Safety Zones and 50m pre commissioning Safety Zones.	Largest possible extent, greatest number of vessel activities associated with the Proposed DCO Limits and greatest duration resulting in the maximum spatial and temporal effect on access to local ports.

Potential Hazard	Phase(s)	MDS for Shipping and Navigation	Justification
	Operation and maintenance	▪ Operation and maintenance phase of up to 30 years; ▪ Up to 21 vessels at any one time making up to 869 visits per year ▪ Full build out of the Proposed DCO Limits (excluding HRA); ▪ Presence of 500m operational Safety Zones for major maintenance activities.	
	Decommissioning	The MDS for the decommissioning phase will be similar to the construction phase noting that from a shipping and navigation perspective the activities during both of these phases will be similar.	
Reduction of under keel clearance	Operation and maintenance	▪ Operation and maintenance phase of up to 30 years; ▪ Up to 135nm of array cables; ▪ Up to 22nm of offshore interconnector cables; ▪ Up to four offshore export cables with total length 92nm; ▪ Minimum burial depth of 1.0m for all sub-sea cables; ▪ Cable protection requirement for up to 20% of all sub-sea cables; and ▪ Up to four array cable crossings.	Largest possible extent of seabed infrastructure and greatest duration resulting in the maximum spatial and temporal effect on under keel clearance.

Potential Hazard	Phase(s)	MDS for Shipping and Navigation	Justification
Anchor interaction with sub-sea cables	Operation and maintenance	▪ Operation and maintenance phase of up to 30 years; ▪ Up to 135nm of array cables; ▪ Up to 22nm of offshore interconnector cables; ▪ Up to four offshore export cables with a combined total length of 92nm; ▪ Minimum burial depth of 1.0m for all sub-sea cables; ▪ Cable protection requirement for up to 20% of all sub-sea cables; and ▪ Up to four array cable crossings.	Largest possible extent of seabed infrastructure and greatest duration resulting in the maximum spatial and temporal effect on anchor interaction with sub-sea cables.

Potential Hazard	Phase(s)	MDS for Shipping and Navigation	Justification
Interference with marine navigation, communications and position fixing equipment	Operation and maintenance	▪ Operation and maintenance phase of up to 30 years; ▪ Full build out of Proposed DCO Limits (excluding HRA); ▪ Presence of 500m operational Safety Zones for major maintenance activities; ▪ Up to 90 wind turbines and three offshore substation platforms located as per Figure 6.3; ▪ Wind turbines on four-legged jackets with suction bucket foundations; ▪ Offshore substation platforms on monopile or jacket foundations; ▪ Up to 135nm of array cables; ▪ Up to 22nm of offshore interconnector cables; and ▪ Up to four offshore export cables with a combined total length of 92nm.	Largest possible extent of surface and seabed infrastructure resulting in the maximum spatial and temporal effect on interference with marine navigation, communications and position fixing equipment.
Reduction of emergency response capability	Operation and maintenance	▪ Operation and maintenance phase of up to 30 years; ▪ Full build out of the Proposed DCO Limits (excluding HRA); ▪ Up to 90 wind turbines and three offshore substation platforms located as per Figure 6.3; ▪ Up to 21 vessels at any one time making up to 869 return trips per year.	Largest possible extent, greatest number of vessel activities associated with the Proposed Development, greatest number of surface infrastructure and greatest duration resulting in the maximum spatial and temporal effect on emergency response capability.

7 Navigational Features

91. A plot of the navigational features within and in proximity to the Proposed DCO Limits is presented in Figure 7.1. Each of the features shown are discussed in the following subsections and have been identified using the most detailed UKHO admiralty chart available.

92. It is noted that no charted spoil or dumping grounds were identified in proximity to the Proposed DCO Limits.

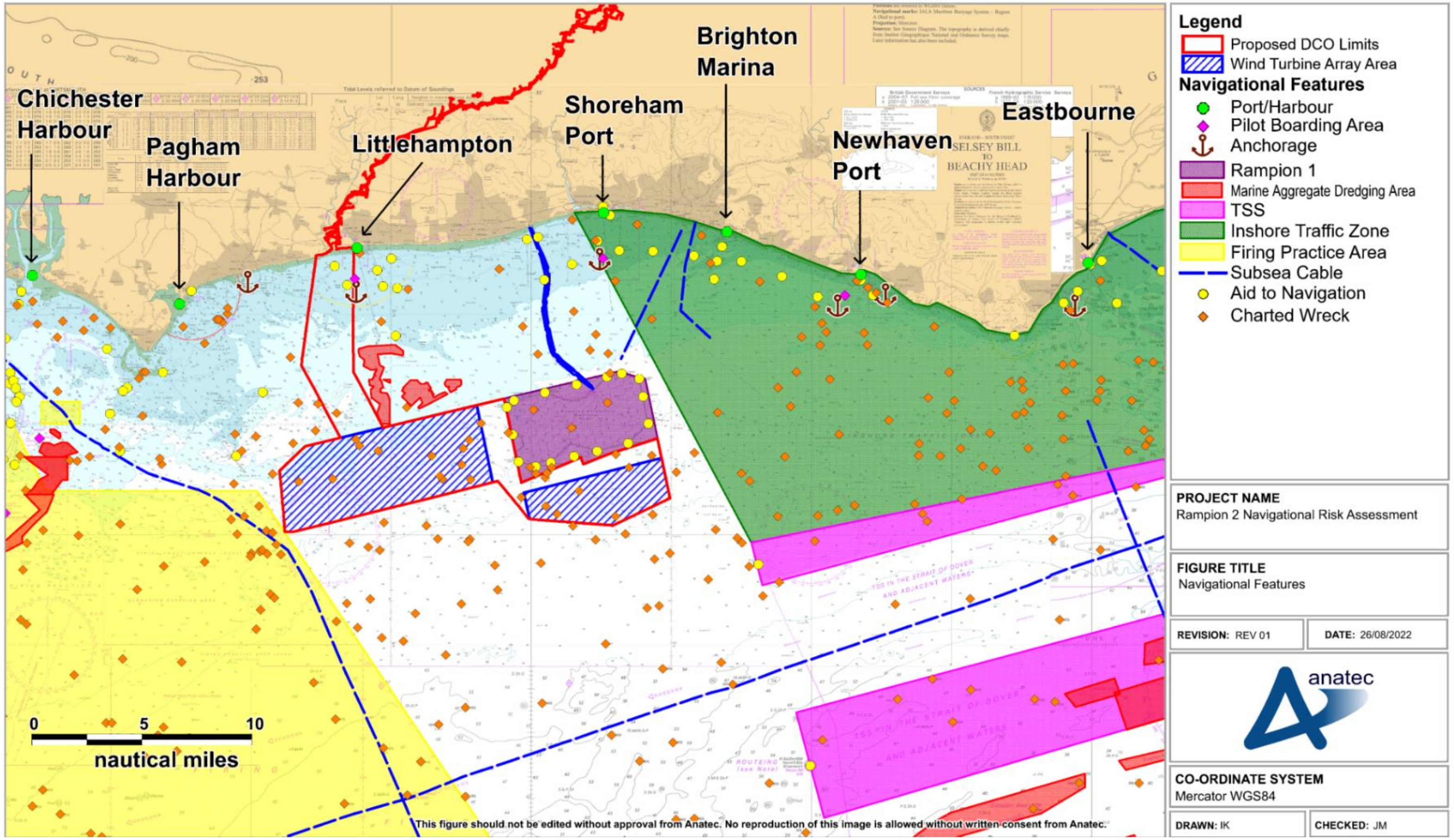

Figure 7.1 Navigational features in proximity to the Proposed Development

7.1 Other Offshore Wind Farm Developments

93. Rampion 1 lies immediately north of the array area, as illustrated in Figure 7.1, and shares its eastern, southern and western boundaries with the Proposed DCO Limits. Rampion 1 was fully commissioned in November 2018 and is currently the only UK offshore wind farm within the English Channel (including wind farms under construction or consented).

7.2 IMO Routeing Measures

94. The IMO routeing measures within a wider area surrounding the Proposed DCO Limits are shown in Figure 7.2. The main IMO routeing measure present in the area is the Dover Strait routeing measure consisting of TSS lanes, separation zones and an ITZ.

95. The Dover Strait TSS lies approximately 4.2nm from the Proposed DCO Limits at the closest point. Another TSS, the Off Casquets TSS, is located approximately 76nm south-west of the Dover Strait TSS, with a large proportion of vessels utilising both TSSs when making passage within the English Channel.

96. The ITZ covers the sea area eastward of the line joining Shoreham and the CS1 light buoy (see Section 7.6) with the Proposed DCO Limits set back from this feature by approximately 1.5nm. The ITZ is designed to protect local traffic including small craft and its use is subject to various restrictions including (but not limited to) the following:

- Vessels should not use the ITZ when they can safely use the appropriate lane within the adjacent TSS;
- Vessels of less than 20m, recreational vessels, and vessels engaged in fishing may use the ITZ; and
- Vessels may use the ITZ when on route to/from a port or other destination within the ITZ.

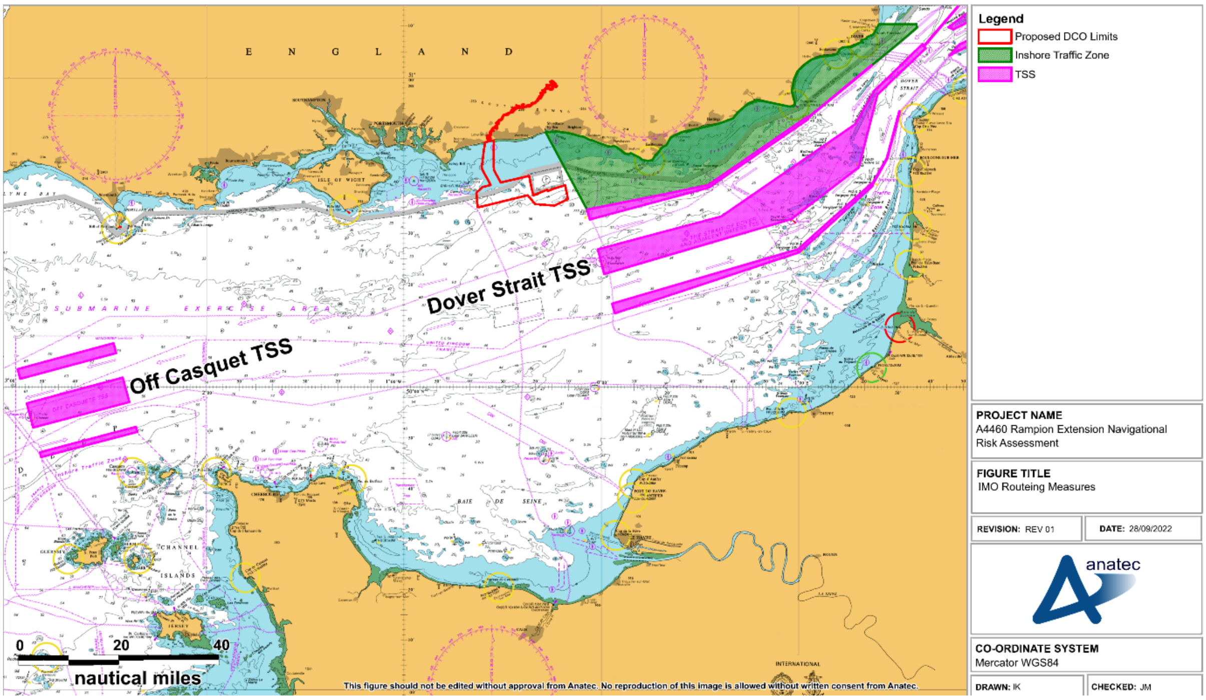

Figure 7.2 IMO routeing measures in proximity to the Proposed Development

7.3 Marine Aggregate Dredging Areas

97. Several marine aggregate dredging areas are present within the area surrounding the Proposed DCO Limits, as illustrated in Figure 7.1. The closest extraction areas lie immediately east of the offshore export cable corridor, and are operated by Cemex, Tarmac Marine and Hanson Aggregates Marine. There are also groups of marine aggregate dredging areas to the west of the Proposed DCO Limits (near the Isle of Wight) and to the south-east of the Proposed DCO Limits (within and south of the Dover Strait TSS).

7.4 Ports, Harbours and Related Facilities

98. Several ports and harbours are located along the coast close to the Proposed DCO Limits, as illustrated in Figure 7.1. The closest port to the array area is Shoreham Port, located approximately 9.5nm to the north. Littlehampton Harbour is located immediately east the offshore export cable corridor.

99. The following subsections provide further details on the main ports and harbours in proximity to the Proposed DCO Limits (all UK): Shoreham, Newhaven, Brighton, Littlehampton and ports located in the Solent.

7.4.1 Shoreham Port Authority

100. Shoreham Port is located approximately 9.5nm north of the Proposed DCO Limits. The Admiralty Sailing Directions describe Shoreham Port as a "*medium sized port handling general cargo, timber, seaborne aggregates, quarried stone and slag, as well as oil, grain and scrap*" (UKHO, 2020). Anchorage can

be found between 1.5 and 2nm from the harbour in water depths of 6 to 8m below CD including at a recommended anchorage approximately 2nm south of the harbour entrance.

101. The pilot boarding station for Shoreham Port is charted adjacent to the recommended anchorage with pilots boarding within 2nm of the harbour entrance from four hours before high water until such time as tidal conditions after high water make entry to the harbour unsafe. Pilotage is compulsory for a number of vessels including those greater than 50m LOA and those carrying dangerous goods or marine pollutants in bulk.

7.4.2 Newhaven Port Authority

102. The Port of Newhaven is located approximately 11.9nm north-east of the Proposed DCO Limits. The Admiralty Sailing Directions state that the Port of Newhaven "*is used commercially and as a cross-Channel passenger ferry terminal with services to Dieppe*" (UKHO, 2020). The passenger ferry route is considered further in Section 11.2.

103. Two anchorage locations are recommended in the approaches to the Port of Newhaven; one is located in the nearshore area off Seaford in water depths of 5.5m below CD and the other is located approximately 1.5nm south-west of the head of the west breakwater for the Port of Newhaven in water depths of 14m below CD.

104. The pilot boarding station for the Port of Newhaven is charted inshore of the recommended anchorage to the south-west, approximately 1nm from the breakwater. Pilotage is compulsory for all vessels greater than 49m LOA.

7.4.3 Brighton Marina

105. Brighton Marina is located approximately 9.7nm north of the Proposed DCO Limits. The Admiralty Sailing Directions state that Brighton Marina "*consists of an outer tidal harbour and an impounded inner harbour entered through a three gate lock system*" (UKHO, 2020). Apart from the marina there are no landing places at Brighton and no pilotage services are operated.

7.4.4 Littlehampton Harbour

106. Littlehampton Harbour is located approximately 8.2nm north of the array area and immediately east of the offshore export cable corridor. The Admiralty Sailing Directions describe Littlehampton Harbour as a "*small commercial and yachting port*" (UKHO, 2017). A temporary anchorage is located approximately 2nm south of the harbour entrance in depths of 5m and offers reasonable shelter. Small craft may anchor nearer the harbour entrance, clear of the leading line, according to the wind. During consultation, the Littlehampton Harbour Board noted that vessels can spend anywhere between six hours and two days at the anchorage area whilst awaiting suitable weather (see 18 November 2020 entry in Table 4-1).

107. The pilot boarding station for Littlehampton Harbour is charted inshore of the recommended anchorage, approximately 1.5nm south of the harbour entrance. Pilotage is compulsory for all merchant vessels and vessels should not approach closer than 1nm from the harbour entrance until the pilot is onboard. Under the Harbour Revision Order 1988, the Competent Harbour Authority area for Littlehampton Harbour Board extends 3nm from the low water mark of ordinary spring tides (Littlehampton Harbour, 2021). This is illustrated in Figure 7.3.

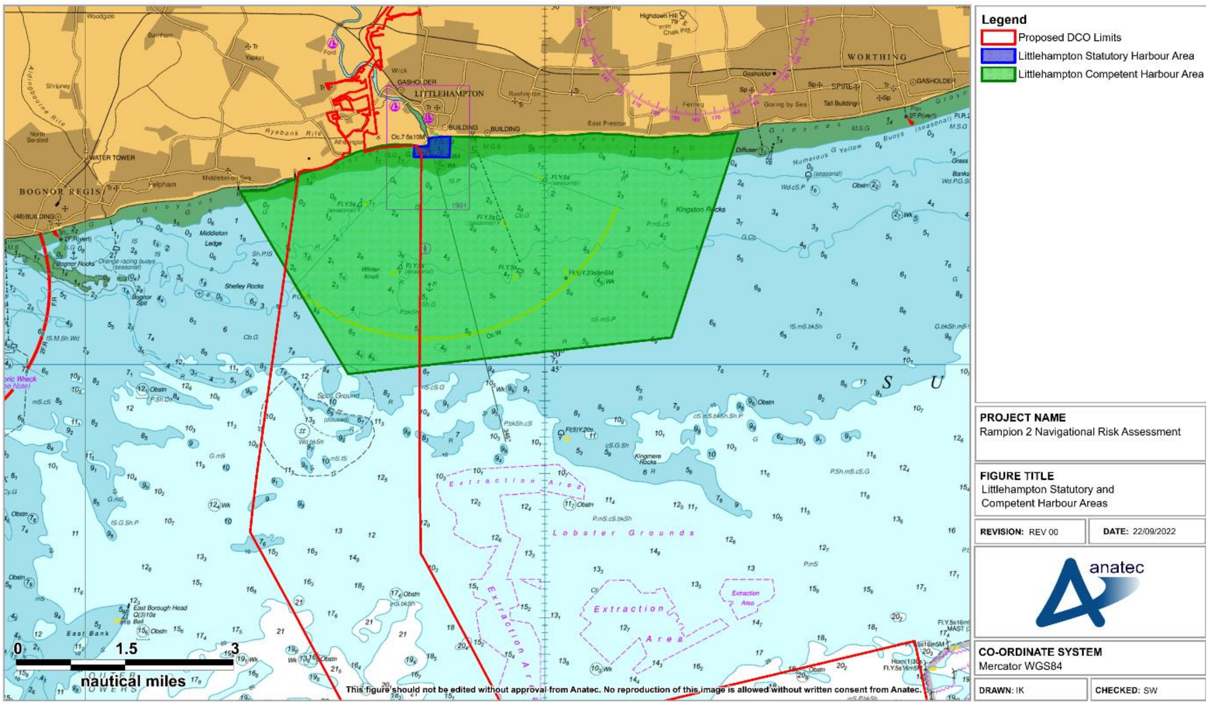

Figure 7.3 Littlehampton Statutory and Competent Harbour Authority areas

108. Therefore, as noted by the Littlehampton Harbour Board during consultation, certain construction and support vessels must receive a pilot before undertaking certain activities within the port's Competent Harbour Authority area with the view to award Pilot Exemption Certification to vessel masters as efficiently as possible (see 16 September 2021 entry in Table 4-1).

7.4.5 Ports and Harbours within the Solent

109. The Solent is the strait separating the UK mainland from the Isle of Wight and incorporates a number of ports including the Port of Southampton, Portsmouth International Port, Langstone Harbour, Chichester Harbour and Cowes Harbour. Although located west of the study area, a significant volume of vessel traffic headed to and from these ports does pass through the study area (see Section 10), with the Port of Southampton in particular one of the busiest ports in the UK due to its wide range of facilities and natural deep-water harbour.

110. There are numerous navigational features located in the eastern approaches to the Solent, including the NAB Tower, Deep Water Channel and Anchorage, various pilot boarding areas and the Southampton VTS. The Southampton VTS provides for safe and efficient movement of vessels within the VTS area, with the eastern extent of the VTS area defined by a 7nm radius from the NAB Tower.

7.4.6 Vessel Arrivals

7.4.6.1 Department for Transport Data

111. The number of vessel arrivals at the most visited commercial ports in the area as reported by the DfT is presented in Figure 7.4 (noting a general trend of reduced arrivals during 2020 due to the effects of COVID-19). These statistics exclude some vessel movements which occur within port or harbour limits, but nevertheless give a clear indication of the relative traffic levels and trends.

112. It can be seen that the Port of Southampton is the most frequented commercial port in the area followed by Portsmouth Port, although both ports have experienced a general downward trend in vessel arrivals in recent years. Among ports located within the study area, the Port of Newhaven is the most frequented followed by Shoreham Port.

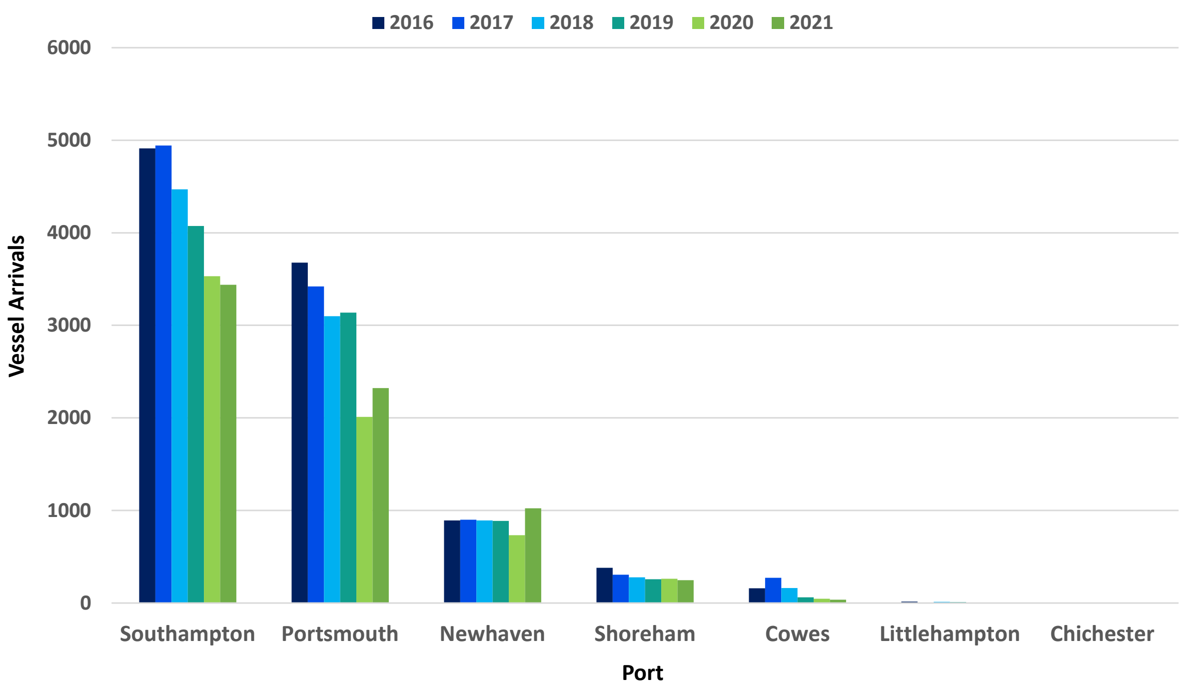

Figure 7.4 Vessel arrivals to commercial ports in proximity to the Proposed DCO Limits (DfT, 2016 to 2020)

7.4.6.2 Littlehampton Harbour Visiting Yacht Data

113. Littlehampton Harbour Board provided visiting yacht data to the harbour in February 2022. These include the annual total of visiting yachts and yearly comparison by month of visiting yachts, as illustrated in Figure 7.5 and Figure 7.6, respectively.

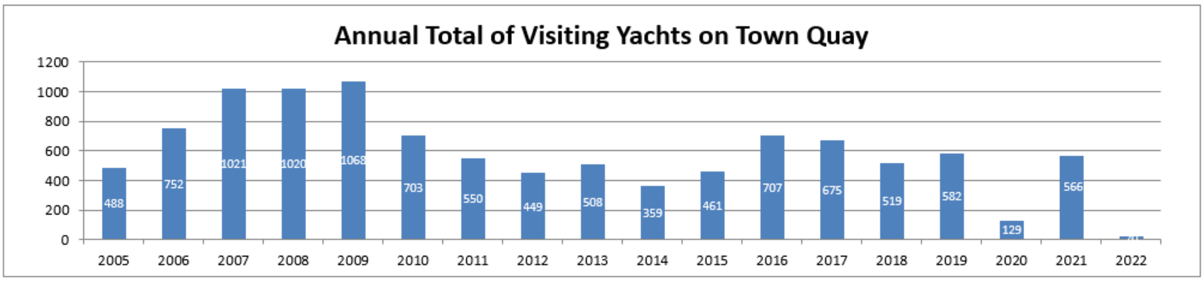

Figure 7.5 Annual Total Visiting Yachts on Town Quay

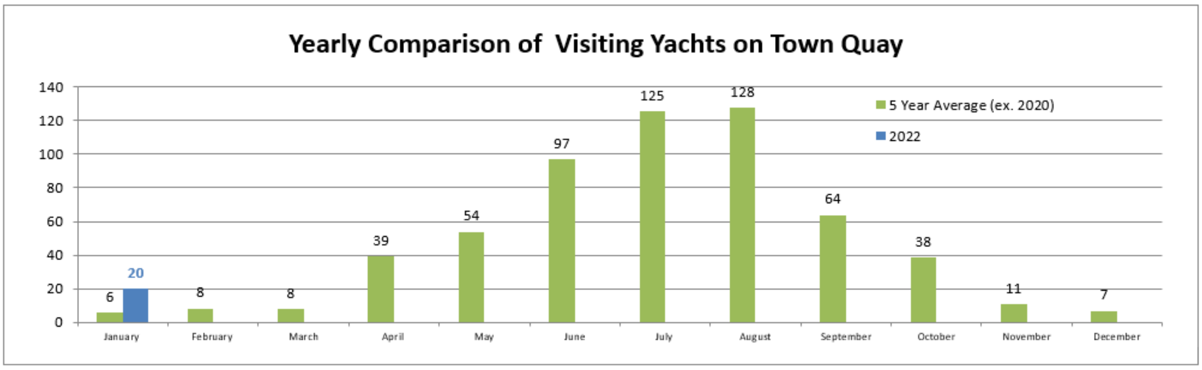

Figure 7.6 Yearly comparison by month of visiting yachts on Town Quay

114. Excluding 2020 (for which the number of visiting yachts was substantially lower due to COVID-19), there has been average of 535 visiting yachts per year in the most recent 10-year period. The five-year average (excluding 2020) indicates that July and August constitute the peak season for visiting yachts to Littlehampton Harbour, with numbers dropping off considerably in the winter months.

7.5 Charted Anchorage Areas

115. Anchorage areas associated with Shoreham Port, the Port of Newhaven and Littlehampton Harbour are considered in Section 7.4. There are no additional charted anchorage areas within or in proximity to the Proposed DCO Limits, although an anchorage off Eastbourne (located approximately 16nm east of the Proposed DCO Limits) and a recommended anchorage off St Helens Fort (located approximately 16nm west of the Proposed DCO Limits – not shown in Figure 7.1) are noted.

7.6 Key Aids to Navigation

116. Various aids to navigation are located in proximity to the Proposed DCO Limits, with key aids to navigation illustrated in Figure 7.1. There are aids to navigation on all structures associated with Rampion 1 (only aids to navigation on Significant Peripheral Structures (SPS) around the perimeter of Rampion 1 are shown in Figure 7.1), as well as at the exit/entrance to the Dover Strait TSS. The CS1 light buoy, marking the end of the westbound lane of the TSS, is located approximately 4.9nm south-east of the Proposed DCO Limits.

117. Excluding aids to navigation associated with Rampion 1, the closest aid to navigation to the Proposed DCO Limits is the Owers Light Buoy, a south cardinal mark located approximately 2nm to the west and placed to protect vessels from the shallows of the Owers Bank.

118. There are several seasonal race marks for Arun Yacht Club located in the nearshore area off Littlehampton Harbour. Two of these are located within the offshore export cable corridor and are typically present between March and November of each year.

7.7 Sub-Sea Cables

119. There are a number of sub-sea cables in proximity to the Proposed DCO Limits, including export cables and array cables for Rampion 1 as well as the IFA2 cable. The IFA2 cable is the closest sub-sea cable to the Proposed DCO Limits, located approximately 0.6nm to the south-west.

7.8 Military Practice and Exercise Areas

120. A firing practice area (D037) is located in the area and lies less than 0.1nm from the western extent of the Proposed DCO Limits. No restrictions are placed on the right to transit the firing practice area at any time, with operations conducted using a clear range procedure – exercises and firing only take place when the area is considered to be clear of all shipping.

7.9 Charted Wrecks

121. A high number of charted wrecks are present within the area surrounding the Proposed DCO Limits; 24 such wrecks are located within the array area with the shallowest at a depth of 12m below CD. There is one charted wreck within the offshore export cable corridor at a depth of 14m below CD.

122. Non-charted wrecks (which are not considered a danger to safe navigation) are considered in **Chapter 16: Marine Archaeology, Volume 2** of the ES (Document reference 6.2.16).

8 Meteorological Ocean Data

123. This section presents meteorological and oceanographic statistics local to the Proposed DCO Limits, primarily based on *Rampion Offshore Wind Farm Metocean Survey and Assessment* (Emu, 2011). The data presented in this section is used as input to the collision and allision risk modelling (see Section 16).

8.1 Wind Direction

124. The distribution of wind direction data recorded within the eastern half of the Proposed DCO Limits between January and May 2011 is presented in Figure 8.1, in the form of a wind rose.

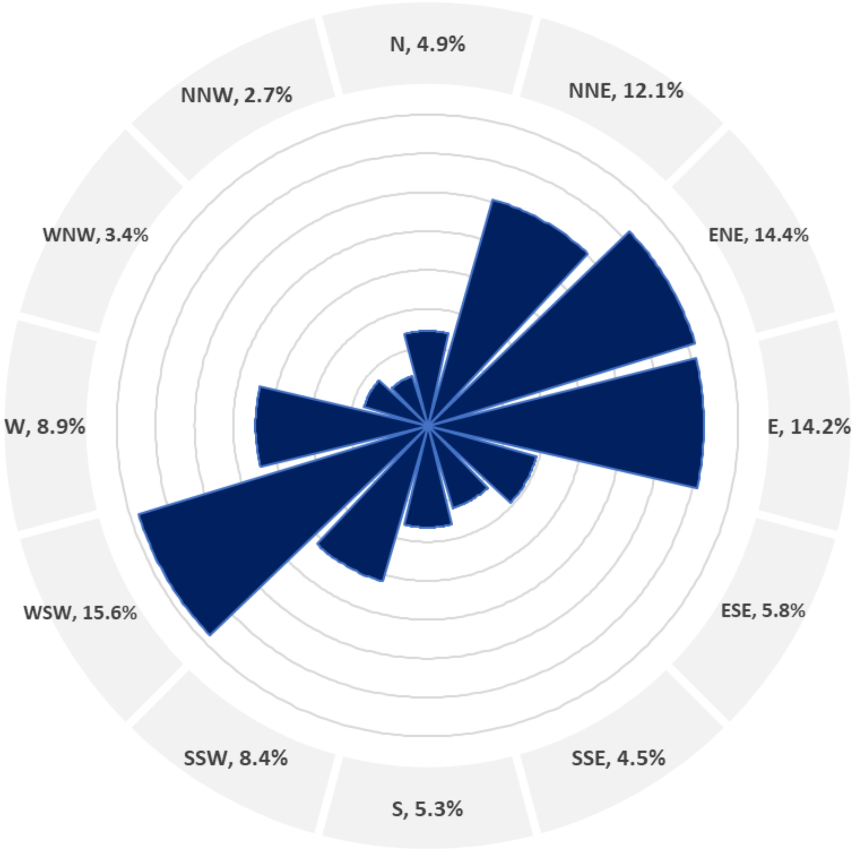

Figure 8.1 Wind direction distribution in proximity to Proposed DCO Limits (Emu, 2011)

125. It can be seen that winds are predominantly from the west-south-west (15.6%) and east-north-east (14.4%).

126. Wind direction data provided by Littlehampton Harbour Board covering the periods of the vessel traffic surveys (see Section 5.2) included substantial variation in wind direction, although south-westerly winds were most prominent.

8.2 Significant Wave Height

127. Significant wave height data recorded approximately 4.0nm north of the array area and 1.9nm east of the offshore export cable corridor in 2003 has been analysed. Table 8-1 presents the proportion of the significant wave height within each of three defined ranges which are categorised as calm, moderate and severe sea states.

Table 8-1 Sea state distribution in proximity to Proposed DCO Limits

Significant Wave Height (m)	Sea State	Proportion (%)
<1	Calm	74
1 to 5	Moderate	26
≥5	Severe	0

8.3 Visibility

128. The annual average incidence of poor visibility (defined as the proportion of a year where the visibility can be expected to be less than 1 kilometre (km)) is 3% (UKHO, 2017).

8.4 Tidal Speed and Direction

129. Tidal speed and direction data recorded at Rampion 1 between November 2010 and February 2011 has been analysed. Table 8-2 presents the peak flood and ebb direction and speed values obtained.

Table 8-2 Peak flood and ebb speed and direction data

Tidal Scenario	Tidal Speed (Knots)	Tidal Direction (°)
Flood	2.1	065
Ebb	2.1	235

130. Based upon the available data, no impacts are expected at high water that would not also be expected at low water, and vice versa. The wind farm structures are not expected to have any additional impact on the existing tidal streams in relation to their effect on existing shipping and navigation users.

9 Emergency Response and Incident Overview

131. This section summarises the existing emergency response resources (including SAR) and reviews historical maritime incident data to assess baseline incident rates in proximity to the Proposed DCO Limits.

9.1 Search and Rescue Helicopters

132. In July 2022, the Bristow Group were awarded a new 10-year contract by the MCA (as an executive agency of the DfT) beginning in September 2024 to provide helicopter SAR operations in the UK. Bristow have been operating the service since April 2015.

133. The SAR helicopter service is currently operated out of 10 base locations around the UK, with the closest to the SAR helicopter base to the Proposed DCO Limits is Lee-on-Solent, located approximately 24nm to the north-west, as illustrated in Figure 9.1. This base operates AgustaWestland 189 (AW189) helicopters. The Lydd SAR helicopter base is located approximately 45nm north-east of the Proposed DCO Limits (not shown in Figure 9.1) and also operates the AW189.

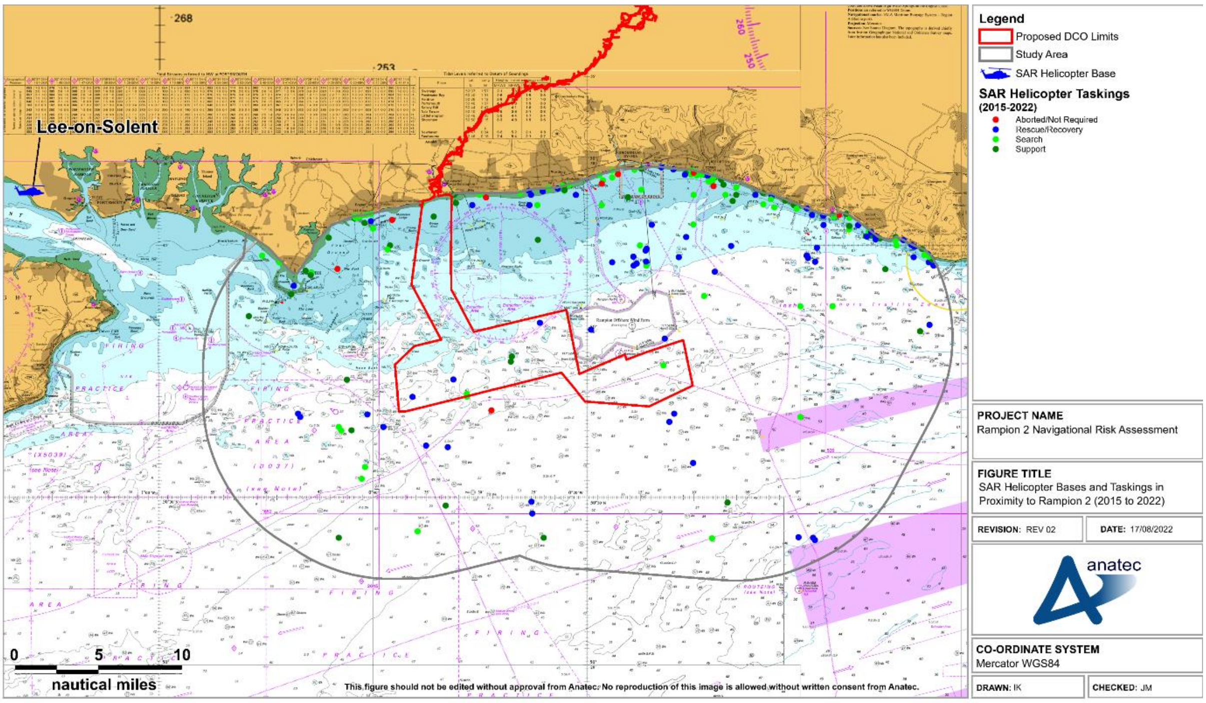

Figure 9.1 SAR helicopter bases and taskings in proximity to the Proposed Development (2015 to 2022)

134. The SAR helicopter taskings undertaken between April 2015 and March 2020 within the study area are presented in Figure 9.1, colour-coded by tasking type.

135. A total of 235 SAR helicopter taskings were undertaken for incidents within the study area between April 2015 and March 2022, corresponding to an average of 39 taskings per year. The majority of these taskings were "*search*" (37%) or "*rescue/recovery*" (34%). Seven SAR helicopter taskings were undertaken within the array area, and two within the offshore export cable corridor.

9.2 Royal National Lifeboat Institution

136. The RNLI is organised into six divisions, with the relevant region for the Proposed Development being the East division. Based out of more than 230 stations, there are over 400 active lifeboats across the RNLI fleet, including both All-Weather Lifeboats (ALB) and Inshore Lifeboats (ILB). There are a number of RNLI stations in proximity to the Proposed DCO Limits, as illustrated in Figure 9.2.

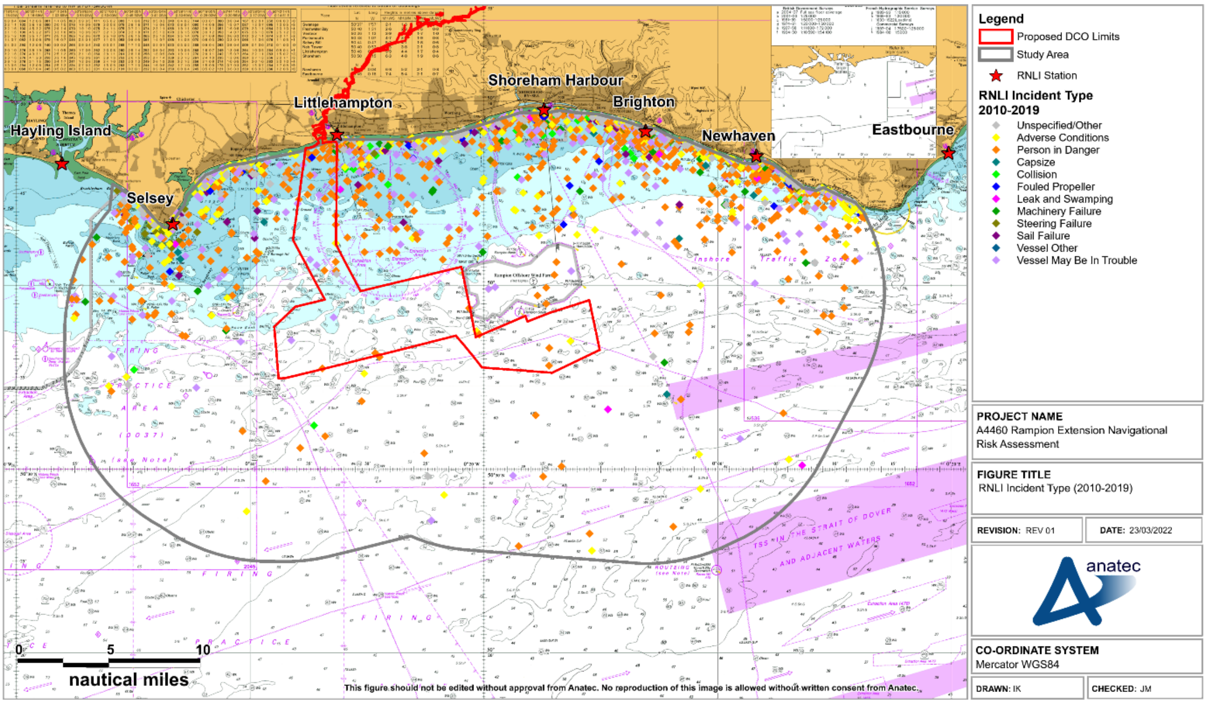

Figure 9.2 RNLI stations and incidents by type in proximity to the Proposed Development (2010 to 2019)

137. The closest RNLI station to the array area is at Selsey (approximately 7.9nm to the north-west), where both an ALB and ILB are in use. The closest RNLI station to the offshore export cable corridor is at Littlehampton Harbour (approximately 380m to the east of the landfall location). Given that the RNLI have an operational limit of 100nm, it is anticipated that an incident occurring in proximity to the Proposed Development would likely result in a response from an RNLI asset.

138. The incidents recorded within the RNLI data between 2010 and 2019 occurring within the study area are presented in Figure 9.2, colour-coded by

incident type. Following this, Figure 9.3 shows the same data colour-coded by casualty type. It is noted that incidents which were deemed hoaxes or false alarms have been excluded from the analysis.

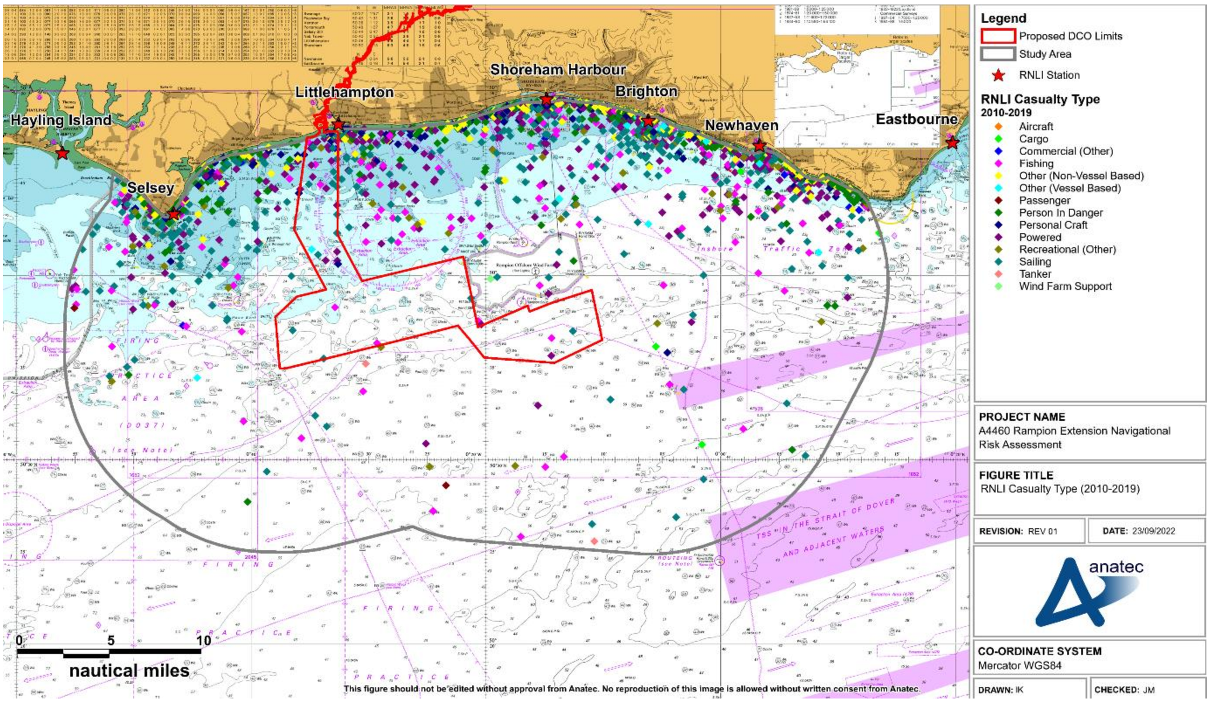

Figure 9.3 RNLI stations and incidents by casualty in proximity to the Proposed Development (2010 to 2019)

139. A total of 1,891 incidents were responded to by the RNLI within the study area between 2010 and 2019. This corresponds to an average of 189 incidents per year; however, it is noted that the majority of incidents (approximately 93%) occurred within 5nm of the coast whilst the number of incidents further offshore was much lower. Throughout the 10-year period, eight incidents occurred within the array area, and 49 incidents within the offshore export cable corridor.

140. The most common incident types recorded were "*machinery failure*" (37%), "*person in danger*" (24%). Excluding "*person in danger*" and non-vessel based incidents, the most common vessel types recorded were recreational vessels (48%) followed by personal craft (7%) and fishing vessels (7%). The high proportion of recreational vessels may be attributed to the high volume of recreational activity in the nearshore area where the RNLI is most likely to respond to an incident.

9.3 Maritime Rescue Coordination Centres and Joint Rescue Coordination Centres

141. His Majesty's Coastguard (HMCG), a division of the MCA, is responsible for requesting and tasking SAR resources made available to other authorities and

for coordinating the subsequent SAR operations (unless they fall within military jurisdiction).

142. The HMCG coordinates SAR operations through a network of 11 Maritime Rescue Coordination Centres (MRCC), including a Joint Rescue Coordination Centre (JRCC) based in Hampshire.

143. All of the MCA's operations, including SAR, are divided into 18 geographical regions. Area 8 – "*South East England*" – covers the south east coast of England from the Essex–Kent border to the West Sussex–Hampshire border, and therefore covers the area encompassing the Proposed Development. The Dover MRCC is located within Area 8 approximately 63nm north-east of the Proposed DCO Limits, as illustrated in Figure 9.4 and coordinates the SAR response for maritime and coastal emergencies within the district boundary.

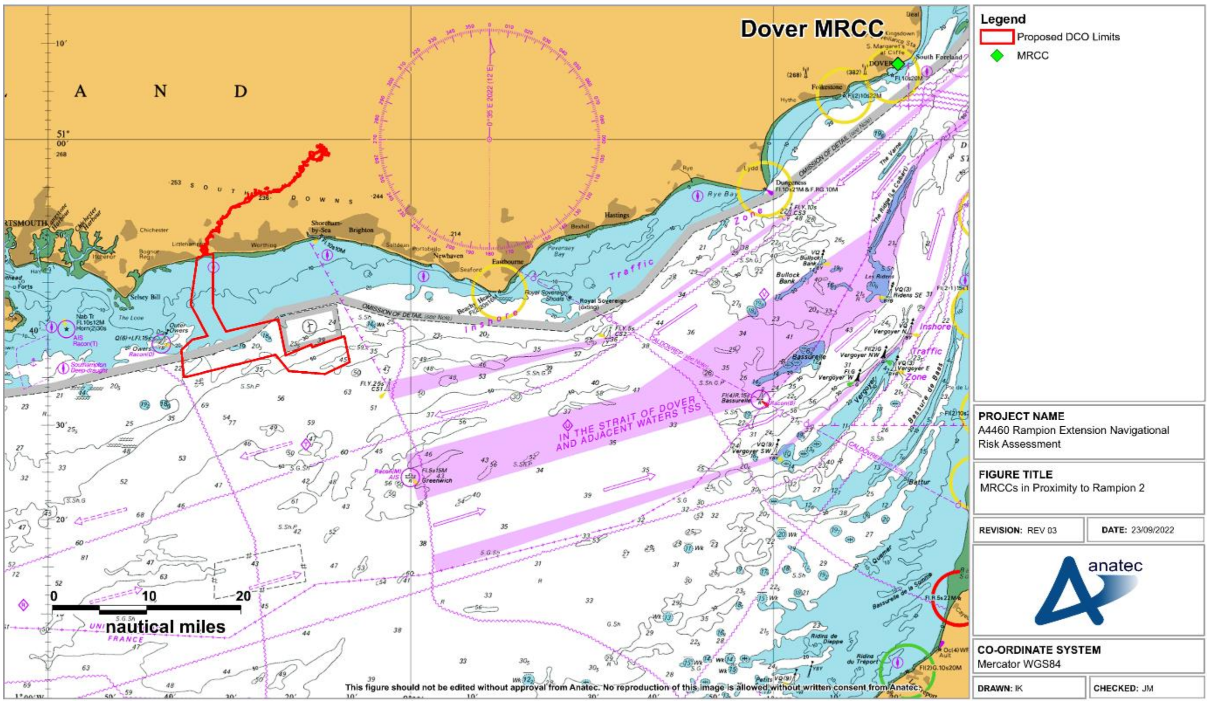

Figure 9.4 MRCCs in proximity to the Proposed Development

9.4 Global Maritime Distress and Safety System

144. The Global Maritime Distress and Safety System (GMDSS) is a maritime communications system used for emergency and distress messages, vessel to vessel routeing communications and vessel to shore routine communications. It is implemented globally and vessels engaged in international voyages are obliged to carry GMDSS certified communication equipment.

145. There are four GMDSS sea areas, and in the UK it is the responsibility of the MCA to ensure Very High Frequency (VHF) coverage from coastal stations within sea area A1. The Proposed Development is located within an A1 sea

area, as shown in Figure 9.5, and therefore in the event of an emergency any vessel located in proximity to the Proposed Development would be able to contact HMCG via VHF.

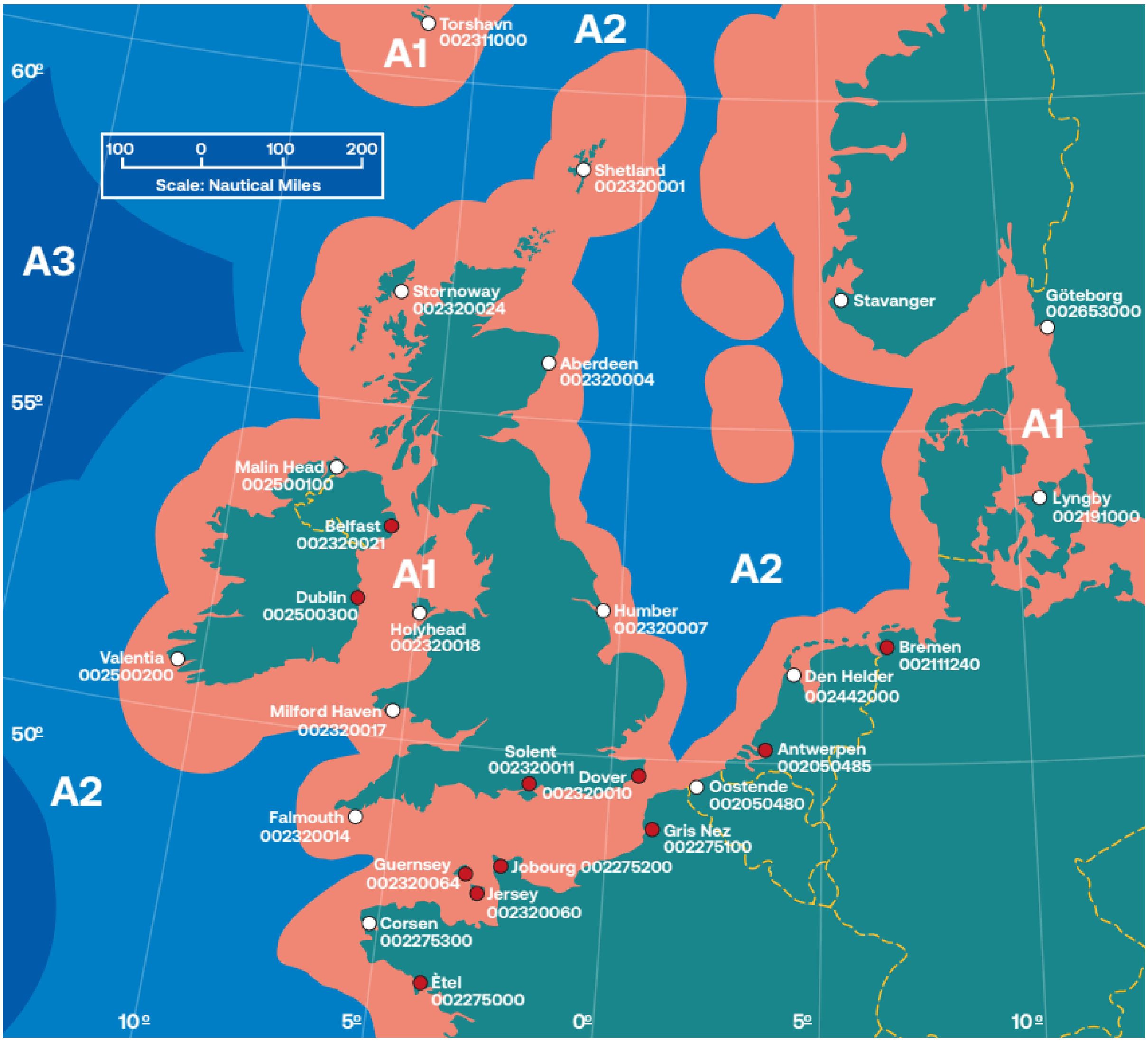

Figure 9.5 GMDSS sea areas (MCA, 2021)

9.5 Marine Accident Investigation Branch

146. All UK flagged vessels and non-UK flagged vessels in UK territorial waters (12nm), a UK port or carrying passengers to a UK port are required to report incidents to the MAIB. Data arising from these reports are assessed within this section, covering the ten-year period between 2010 and 2019.

147. The incidents recorded within the MAIB data between 2010 and 2019 occurring within the study area are presented in Figure 9.6, colour-coded by incident type. Following this, Figure 9.7 shows the same data colour-coded by the type of vessel(s) involved in each incident.

148. A total of 145 incidents were recorded by the MAIB within the study area between 2010 and 2019, which corresponds to an average of between 14 and 15 incidents per year. Throughout the 10-year period, six incidents occurred within the array area and five incidents within the offshore export cable corridor.

149. The most common incident types recorded were "*machinery failure*" (29%), *"accident to person"* (17%), and "*loss of control*" (11%). The main vessel types involved in incidents were fishing vessels (30%), "*other commercial*" vessels (17%), and dry cargo vessels (11%).

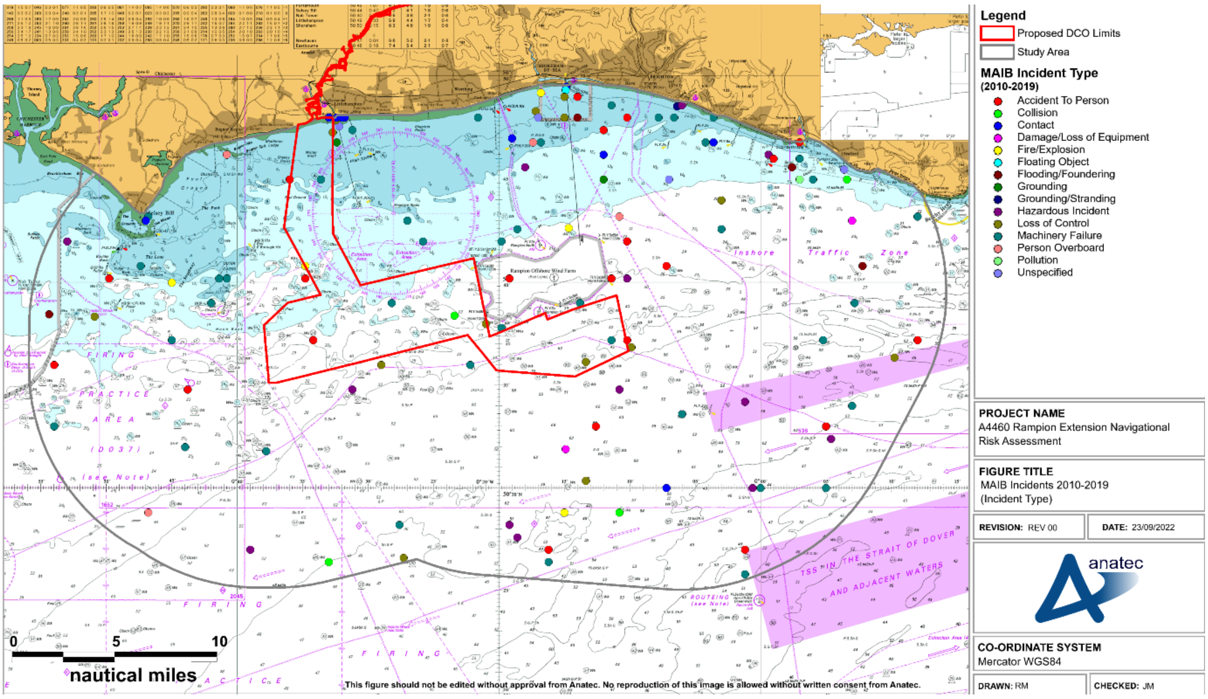

Figure 9.6 MAIB incidents by incident type within study area (2010 to 2019)

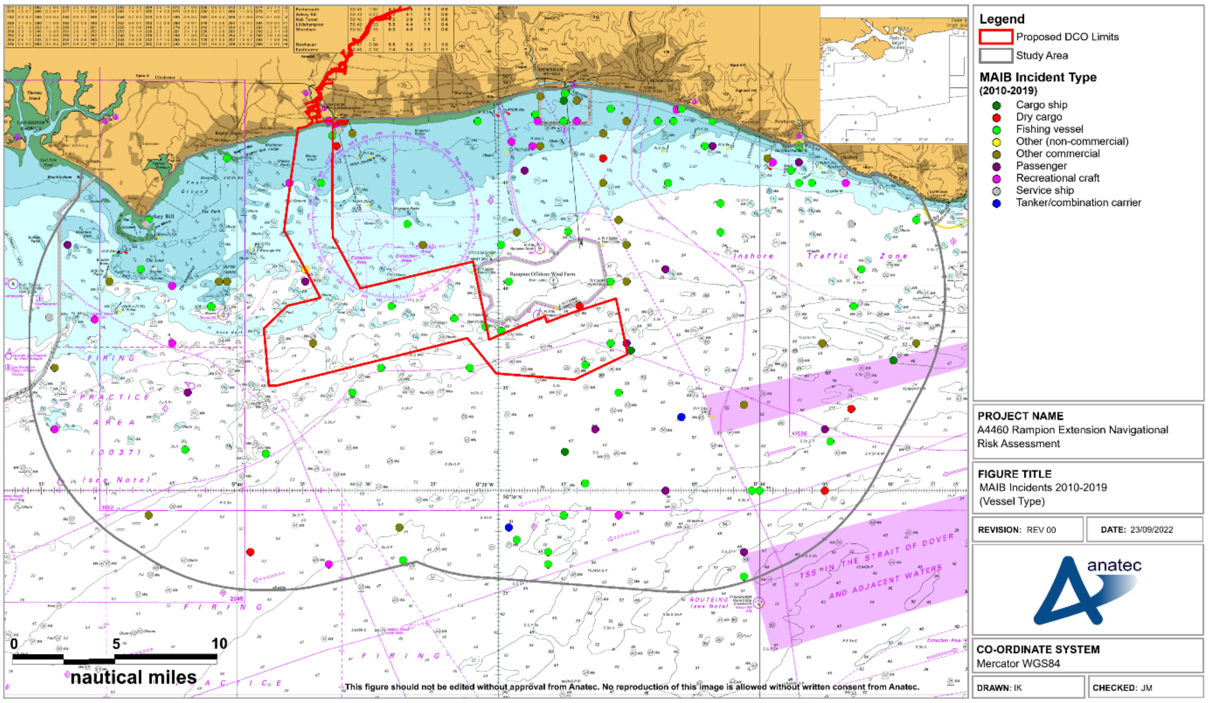

Figure 9.7 MAIB incidents by vessel type within study area (2010 to 2019)

150. A review of older MAIB incident data within the study area between 2000 and 2009 indicates that the number of incidents has slightly decreased over time, with 155 unique incidents recorded in the 10-year period, corresponding to an average of 15 to 16 incidents per year. Of the recorded incidents, incident types were primarily *"machinery failure"* (37%) and *"accident to person"* (20%). Vessel types involved included fishing vessels (40%), passenger vessels (23%) and *"other commercial"* vessels (16%).

9.6 Historical Offshore Wind Farm Incidents

9.6.1 Incidents Involving UK Offshore Wind Farm Developments

151. As of September 2022, there are 41 operational offshore wind farms in the UK, ranging from the North Hoyle Offshore Wind Farm (fully commissioned in 2003) to Triton Knoll Offshore Wind Farm (fully commissioned in 2022). Between them these developments encompass approximately 18,850 fully operational WTG years.

152. MAIB incident data has been used to collate a list of reported historical collision and allision incidents involving UK offshore wind farm developments[2], which is summarised in Table 9-1. Other sources have also been used to produce this list including the UK Confidential Human Factors Incident

[2] Includes only incidents reported to an accident investigation branch or an anonymous reporting service. Unconfirmed incidents have not been considered noting that to date only one further alleged incident has been rumoured but there is no evidence to confirm.

Reporting Programme (CHIRP) for Aviation and Maritime, International Marine Contractors Association (IMCA) and basic web searches.

Table 9-1 Summary of historical collision and allision incidents involving UK offshore wind farm developments

Incident Vessel	Incident Type	Date	Description of Incident	Vessel Damage*	Harm to Persons	Source
Project	Allision	7 August 2005	WTG installation vessel allision with WTG base whilst manoeuvring alongside it. Minor damage sustained to a gangway on the vessel, the WTG tower and a WTG blade.	Minor damage to gangway on the vessel	None	MAIB
Project	Allision	29 September 2006	Offshore services vessel allision with rotating WTG blade.	None	None	MAIB
Project	Allision	8 February 2010	Work boat allision with disused pile following human error with throttle controls whilst in proximity. Passenger later diagnosed with injuries and no serious damage sustained by vessel.	Minor	Injury	MAIB
Project / third-party	Collision	23 April 2011	Third-party catamaran collision with project guard vessel within harbour.	Moderate	None	MAIB

Incident Vessel	Incident Type	Date	Description of Incident	Vessel Damage*	Harm to Persons	Source
Project	Allision	18 November 2011	Cable-laying vessel allision with WTG foundation following watchkeeping failure. Two hull breaches to vessel.	Major	None	MAIB
Project / project	Collision	2 June 2012	Crew Transfer Vessel (CTV) allision with flotel. Nine persons safely evacuated and transferred to nearby vessel before being brought back in to port.	Moderate	None	UK CHIRP
Project	Allision	20 October 2012	Project vessel allision with WTG monopile following human error (misjudgement of distance). Minor damage sustained by vessel.	Minor	None	MAIB
Project	Allision	21 November 2012	Passenger transfer catamaran allision with buoy following navigational error. Vessel abandoned by crew of 12 having been holed, causing extensive flooding but no injuries sustained.	Major	None	MAIB

Incident Vessel	Incident Type	Date	Description of Incident	Vessel Damage*	Harm to Persons	Source
Project	Allision	21 November 2012	Work boat allision with unlit WTG transition piece at moderate speed following navigational error. Vessel able to proceed to port unassisted with no water ingress but some structural damage sustained.	Moderate	Injury	MAIB
Project	Allision	1 July 2013	Service vessel allision with WTG foundation following machinery failure. Minor damage sustained by vessel.	Minor	None	IMCA Safety Flash
Project	Allision	14 August 2014	Standby safety vessel allision with WTG pile. Oil leaked by vessel which moved away from environmentally sensitive areas until leak was stopped.	Minor with pollution	None	UK CHIRP
Third-party	Allision	26 May 2016	Third-party fishing vessel allision with WTG following human error (autopilot). Lifeboat attended the incident.	Moderate	Injury	Web search (RNLI, 2016)

Incident Vessel	Incident Type	Date	Description of Incident	Vessel Damage*	Harm to Persons	Source
Project	Allision	16 January 2020	Project vessel allision with WTG. Injury sustained by crew member but vessel able to proceed to port unassisted.	None	Injury	Web search (Vessel Tracker, 2020)
Project	Allision	27 January 2020	Project vessel allision with WTG. Minor damage to vessel and WTG sustained, with no personal injuries.	Minor	None	Marine Safety Forum
Third-party	Allision	9 June 2022	Fishing vessel allision with WTG resulting in damage to vessel and two minor injuries for crew members. RNLI lifeboat escorted vessel under its own power to port.	Minor	Injury	Web search (RNLI, 2022)

(*) As per incident reports.

153. The worst consequences reported for vessels involved in a collision or allision incident involving a UK offshore wind farm development has been flooding, with no life-threatening injuries to persons reported.

154. As of September 2022, there have been no third-party collisions directly as a result of the presence of an offshore wind farm in the UK. The only reported collision incident in relation to a UK offshore wind farm involved a project vessel hitting a third party vessel whilst in harbour.

155. As of September 2022, there have been 13 reported cases of an allision between a vessel and a WTG (under construction, operational or disused) in the UK, with all but two involving a support vessel for the development and the errant vessel in each case under power rather than drifting. Therefore, there has been an average of 1,570 years per WTG allision incident in the UK, noting that this is a conservative calculation given that only operational WTG hours have been included (whereas allision incidents counted include non-operational WTGs).

9.6.2 Incidents Involving Non-UK Offshore Wind Farms

156. It is acknowledged that collision and allision incidents involving non-UK offshore wind farm developments have also occurred. However, it is not possible to maintain a comprehensive list of such incidents.

157. One high profile non-UK incident which is noted is that involving a bulk carrier in January 2022 which broke its anchor chain during a storm in Dutch waters and collided with a nearby anchored vessel. The vessel began to take on water, leading to all crew members being evacuated by helicopter. The vessel then continued to drift towards shore including through an under construction offshore wind farm where it allided with a WTG foundation and a platform foundation before being taken under tow.

9.6.3 Incidents Responded to by Vessels Associated with UK Offshore Wind Farms

158. From news reports, basic web searches and experience at working with existing offshore wind farm developments, a list has been collated of historical incidents responded to by vessels associated with UK offshore wind farm developments, which is summarised in Table 9-2. The initial cause of these incidents is not related to the offshore wind farm in question.

159. Table 9-2 comprises known incidents that were responded to by a wind farm vessel. Additional incidents associated with the construction or operation of offshore wind farms are also known to have occurred. These incidents typically involve an accident to person which requires medical attention (including emergency response) but does not affect the operation of the vessel involved.

Table 9-2 Historical incidents responded to by vessels associated with UK offshore wind farm developments

Incident Type	Date	Related Development	Description of Incident	Source
Capsize	21 June 2018	Walney Offshore Wind Farm	HMCG issued mayday relay broadcast following trimaran capsize. Support vessel for Walney arrived and recovered two persons from the water who were then winched onboard a Coastguard helicopter.	Web search (4C Offshore, 2018)

Incident Type	Date	Related Development	Description of Incident	Source
Capsize	5 November 2018	Race Bank Offshore Wind Farm	Fishing vessel capsized resulting in two persons in the water. Vessel operating at the nearby Race Bank reported to have assisted with the rescue which also involved a Belgian military helicopter and the RNLI.	Web search (British Broadcasting Corporation (BBC), 2018)
Vessel in distress	15 May 2019	London Array Offshore Wind Farm	Yacht in difficult sought shelter by tying up to a WTG but suffered damage and a person in the water. Support vessel for London Array identified and secured the casualty vessel and recovered the person in the water. The support vessel raised the alarm to the Coastguard. The Coastguard later instructed the support vessel to return to port and seek medical assistance for the casualty vessel's occupant.	Web search (The Isle of Thanet News, 2019)
Drifting	7 July 2019	Gwynt y Môr Offshore Wind Farm	Speedboat suffered mechanical failure stranding four persons. Support vessel for Gwynt y Môr responded to an 'all-ships' broadcast from the Coastguard and prevented the casualty vessel drifting into the Gwynt y Môr array. The support vessel later towed the casualty vessel back towards port.	Web search (Renews, 2019)

Incident Type	Date	Related Development	Description of Incident	Source
Machinery failure	28 September 2019	Race Bank Offshore Wind Farm	Fishing vessel suffered mechanical failure and launched flares. Guard vessel and Service Operation Vessel (SOV) for Race Bank both immediately offered assistance until the MCA's arrival on-scene.	Internal daily progress report received by Anatec
Vessel in distress	13 December 2019	Race Bank Offshore Wind Farm	Passing vessel got into difficulty and guard vessel for Race Bank was requested to assist. The Coastguard later requested that the guard vessel tow the casualty vessel into port.	Internal daily progress report received by Anatec
Search	21 May 2020	Walney Offshore Wind Farm	Coastguard contacted guard vessel for Walney reporting red flare sighting at the wind farm. Guard vessel proceeded to undertake search but did not find anything to report.	Internal daily progress report received by Anatec
Aircraft crash	15 June 2020	Hornsea Project One	United States (US) jet crashed into sea during routine flight. CTV and SOV for Hornsea Project One joined the search for the missing pilot.	Web search (4C Offshore, 2020)
Fire/ explosion	15 December 2020	Dudgeon Offshore Wind Farm	Fishing vessel experienced explosions on board with crew injured. SOV for Dudgeon deployed its Fast Rescue Boat (FRB) and evacuated the casualty vessel.	Web search (Offshore WIND, 2020)

Incident Type	Date	Related Development	Description of Incident	Source
Vessel in distress	3 June 2021	Robin Rigg	Wind farm CTV fire alarm sounded, with the engine then shut down. A support vessel for Robin Rigg was able to assist in escorting the vessel to port.	Web search (Vessel Tracker, 2021)
Drifting	17 July 2021	Neart na Gaoithe	Small dinghy with two children aboard drifted offshore due to strong winds. A guard vessel associated with Neart na Gaoithe was able to retrieve the children.	Web search (Edinburgh Evening News, 2021)
Allision	9 June 2022	Westermost Rough	Fishing vessel allided with a WTG at Westermost Rough. A supply vessel was among the responders as an RNLI lifeboat escorted the vessel under its own power to port.	Web search (Vessel Tracker, 2022)

10 Vessel Traffic Movements

160. This section presents an overview of vessel traffic movements within the study area, primarily based upon the findings of the summer and winter vessel traffic surveys undertaken in November 2020 and June 2022 (see Section 5.2).

161. A number of vessel tracks recorded during the survey periods were classified as temporary (non-routine), such as the survey vessel, vessels performing wind farm duties associated with Rampion 1, vessels surveying the IFA2 cable and a vessel undertaking a UXO survey at Brighton. These have therefore been excluded from the analysis.

162. A plot of the vessel tracks recorded during the 14-day summer survey period within the study area, colour-coded by vessel type and excluding temporary traffic, is presented in Figure 10.1. Following this, Figure 10.2 presents the same data converted to a density heat map.

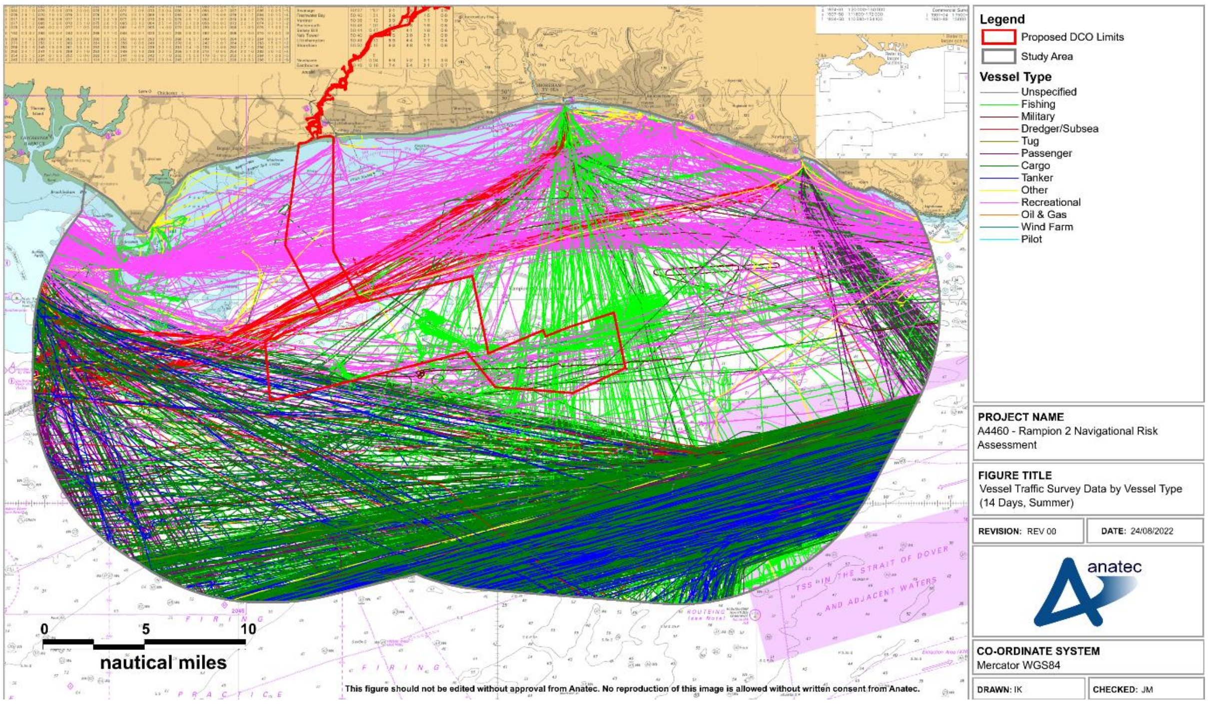

Figure 10.1 Vessel traffic survey data by vessel type (summer 2022)

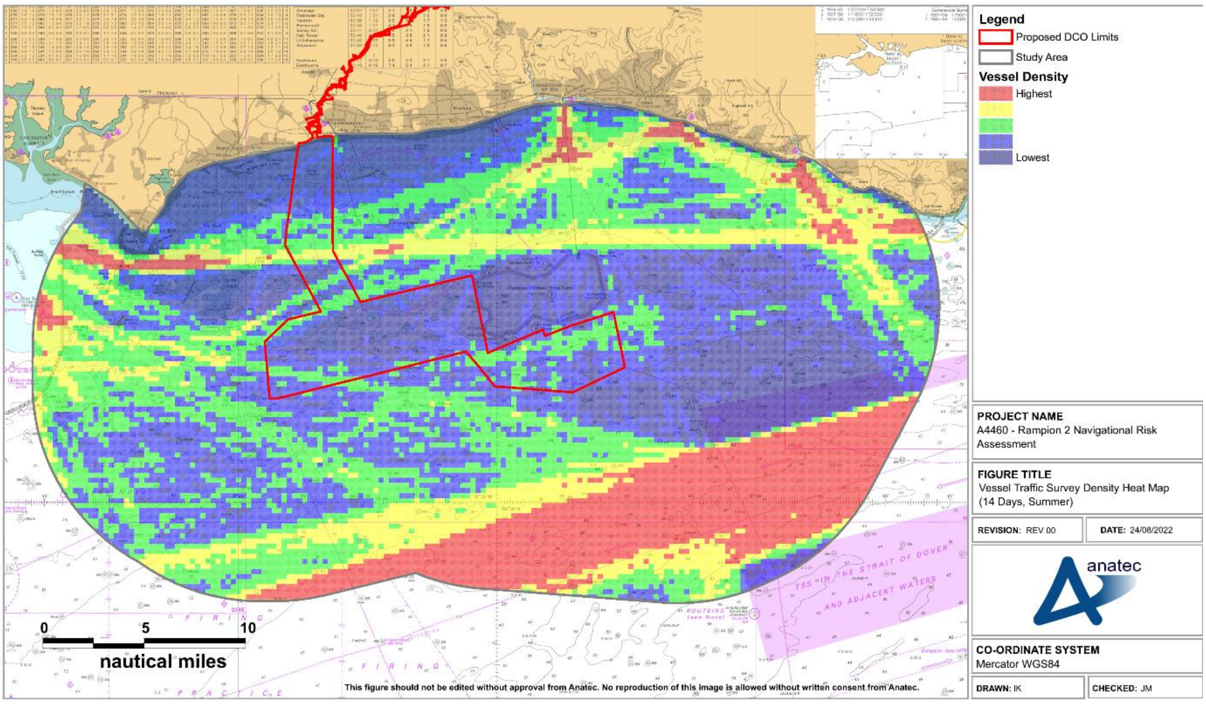

Figure 10.2 Vessel traffic density heat map (summer 2022)

163. A plot of the vessel tracks recorded during the 14-day winter survey period within the study area, colour-coded by vessel type and excluding temporary traffic, is presented in Figure 10.3. Following this, Figure 10.4 presents the same data converted to a density heat map.

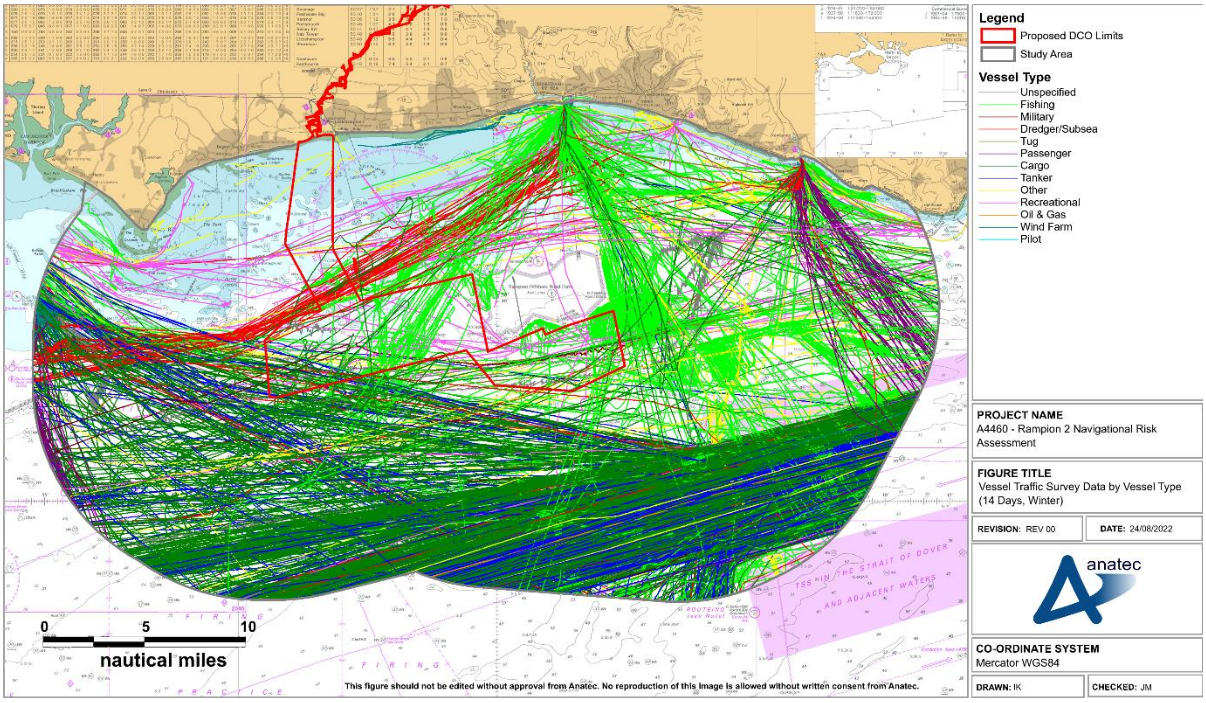

Figure 10.3 Vessel traffic survey data by vessel type (winter 2020)

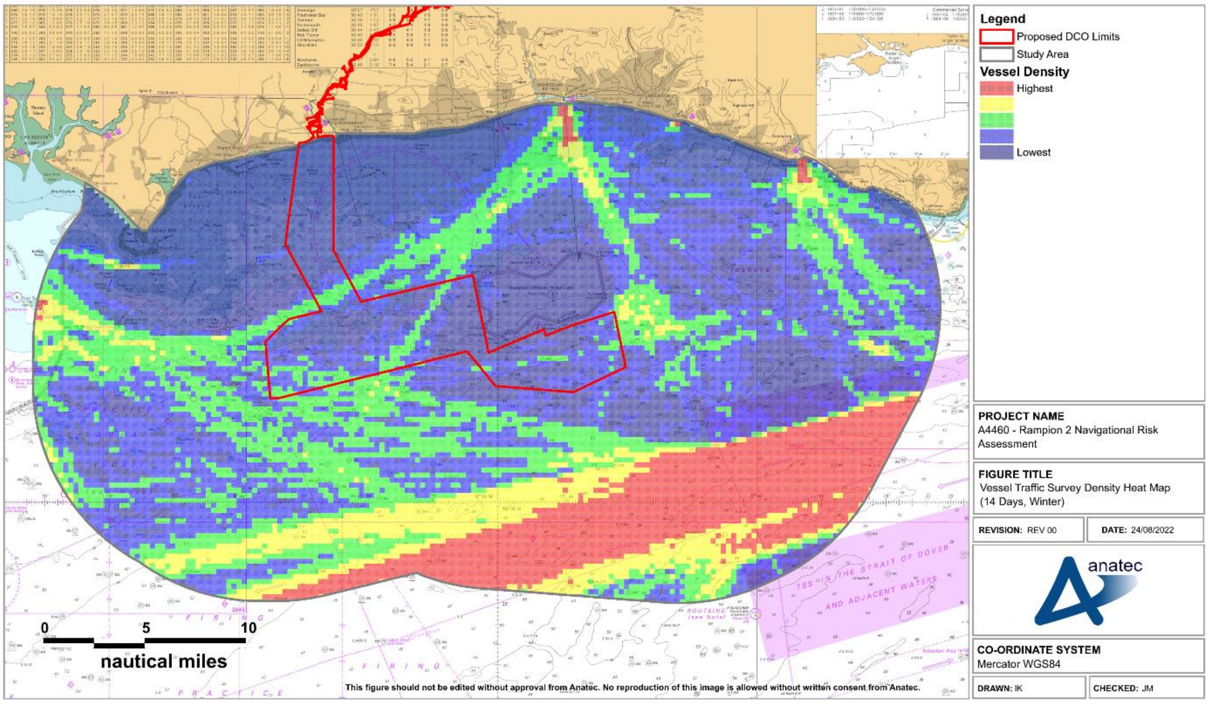

Figure 10.4 Vessel traffic density heat map (winter 2020)

10.1 Vessel Counts

164. For the 14 days analysed in summer, there was an average of 210 unique vessels per day recorded within the study area. An average of 15 unique vessels per day was recorded intersecting the array area and 15 unique vessels per day intersecting the offshore export cable corridor.

165. For the 14 days analysed in winter, there was an average of 143 unique vessels per day recorded within the study area. An average of 11 unique vessels per day was recorded intersecting the array area and three to four unique vessels per day intersecting the offshore export cable corridor.

166. Figure 10.5 illustrates the daily number of unique vessels recorded within the study area, as well as intersecting the array area and offshore export cable corridor, during the summer survey period. Throughout the summer survey period approximately 7% of vessel traffic recorded within the study area intersected the array area, and 7% intersected the offshore export cable corridor.

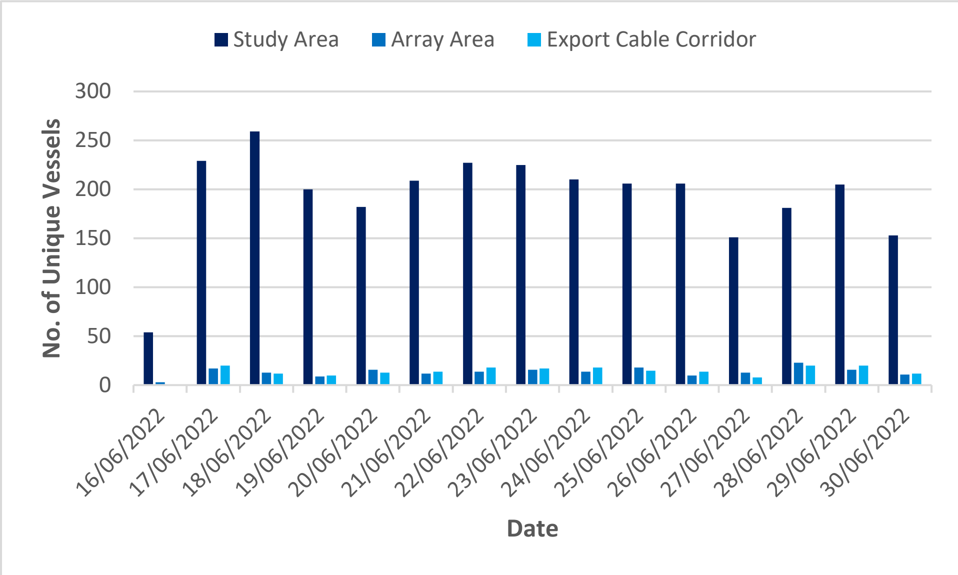

Figure 10.5 Daily counts within study area, array area and offshore export cable corridor (summer 2022)

167. The busiest full day recorded within the study area throughout the summer survey period was 18 June, when 259 unique vessels were recorded. The busiest full day recorded during the summer survey period within the array area was 28 June, when 23 unique vessels were recorded. The busiest full day recorded during the summer survey period within the offshore export cable corridor were 17, 28, and 29 June, when 20 unique vessels were recorded each.

168. The quietest full day recorded within the study area throughout the summer survey period was 27 June when 151 unique vessels were recorded. The quietest full day recorded within the array area was 19 June, when nine unique vessels were recorded. The quietest full day recorded within the offshore export cable corridor was 27 June, when eight vessels were recorded.

169. Figure 10.6 illustrates the daily number of unique vessels recorded within the study area, as well as intersecting the array area and offshore export cable corridor, during the winter survey period. Throughout the winter survey period approximately 7% of vessel traffic recorded within the study area intersected the array area, and 2% intersected the offshore export cable corridor.

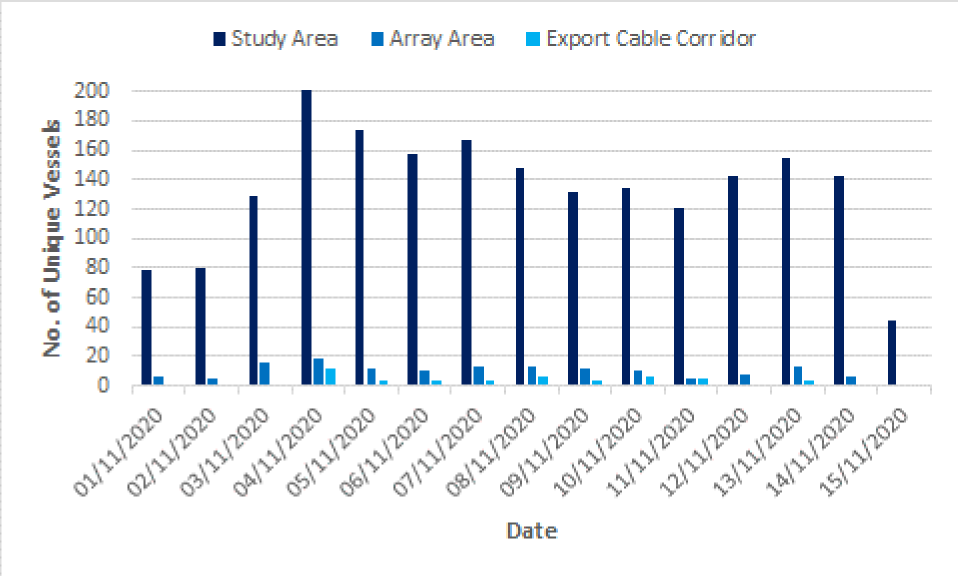

Figure 10.6 Daily counts within study area, array area and offshore export cable corridor (winter 2020)

170. The busiest full day recorded within the study area throughout the winter survey period was 4 November when 202 unique vessels were recorded. The busiest full day recorded during the winter survey period within the array area was also 4 November when 19 unique vessels were recorded. The busiest full day recorded during the winter survey period within the offshore export cable corridor was also 4 November, when 12 unique vessels were recorded.

171. The quietest full day recorded within the study area throughout the summer survey period was 2 November when 80 unique vessels were recorded. The quietest full days recorded within the array area were 2 and 11 November, when five unique vessels were recorded each. The quietest full days recorded within the offshore export cable corridor were the 2 and 3 November when no vessels were recorded.

10.2 Vessel Type

172. The percentage distribution of the main vessel types recorded passing within the study area, as well as intersecting the array area and offshore export cable corridor, during the summer survey period is presented in Figure 10.7. The same distribution for the winter survey data is presented in Figure 10.8.

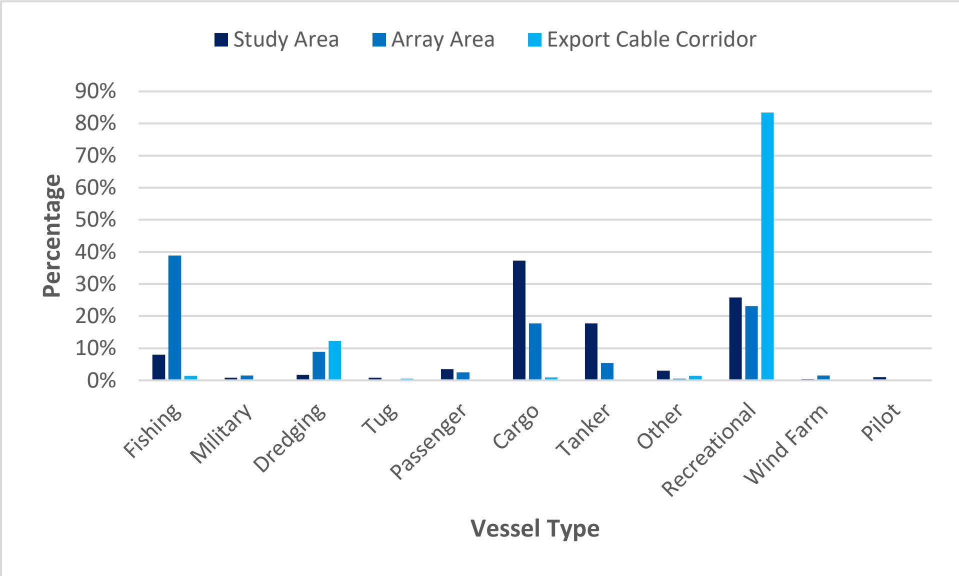

Figure 10.7 Vessel type distribution (summer 2022)

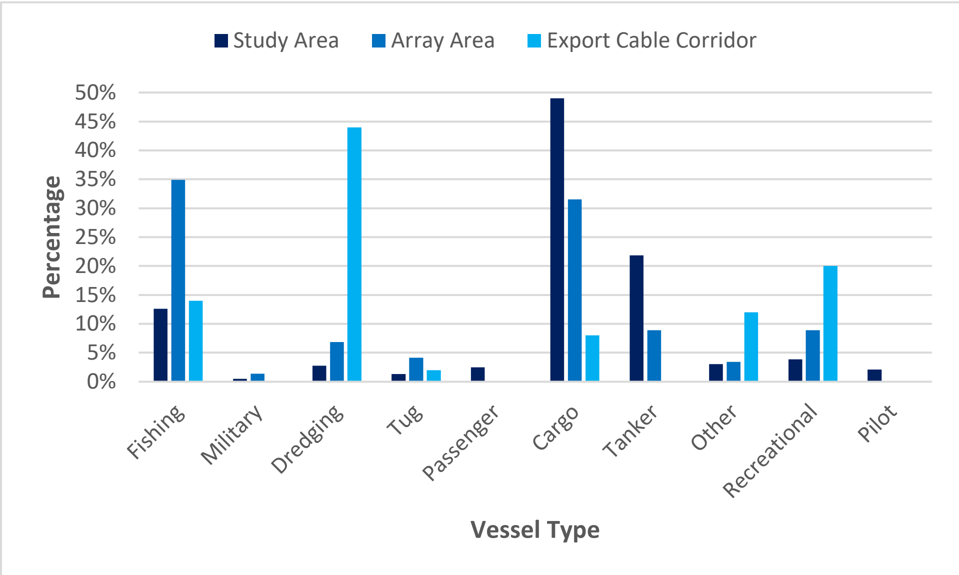

Figure 10.8 Vessel type distribution (winter 2020)

173. Throughout the summer period, the main vessel types within the study area were cargo vessels (37%), recreational vessels (26%), tankers (18%) and fishing vessels (8%). Throughout the winter period, the main vessel types were cargo vessels (49%), tankers (22%) and fishing vessels (13%). It should be noted that the cargo vessel category includes commercial ferries which generally broadcast their vessel types on AIS as cargo or passenger.

174. The following subsections consider each of the main vessel types individually.

10.2.1 Cargo Vessels

175. Figure 10.9 presents a plot of cargo vessels, including commercial ferries, recorded within the study area during the two 14-day survey periods.

176. Throughout the summer survey period an average of 77 unique cargo vessels per day were recorded within the study area. Throughout the winter survey there was an average of 70 cargo vessels per day. The regular cargo vessels operating within the study area included Roll-On/Roll-Off (Ro-Ro) vessels operated by CLdN.

177. Main destinations included the Port of Southampton (UK), Le Havre (France) and Dublin (Ireland), with the majority of cargo vessel traffic westbound out of the Dover Strait TSS. Only a small proportion of cargo vessels were recorded inshore of the Proposed DCO Limits, primarily transiting to/from Shoreham Port and the Port of Newhaven.

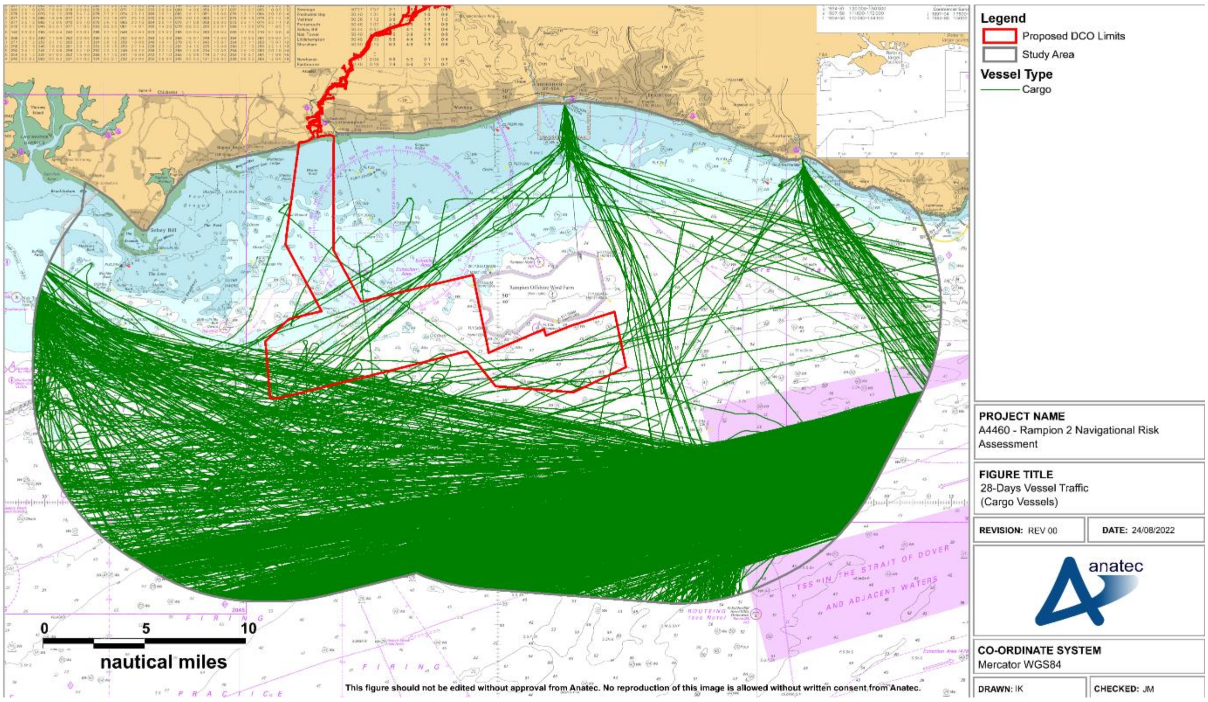

Figure 10.9 Cargo vessels within study area (28 days)

10.2.2 Commercial Ferries

178. Figure 10.10 presents a plot of commercial ferries, recorded within the study area during the two 14-day survey periods, colour-coded by operator.

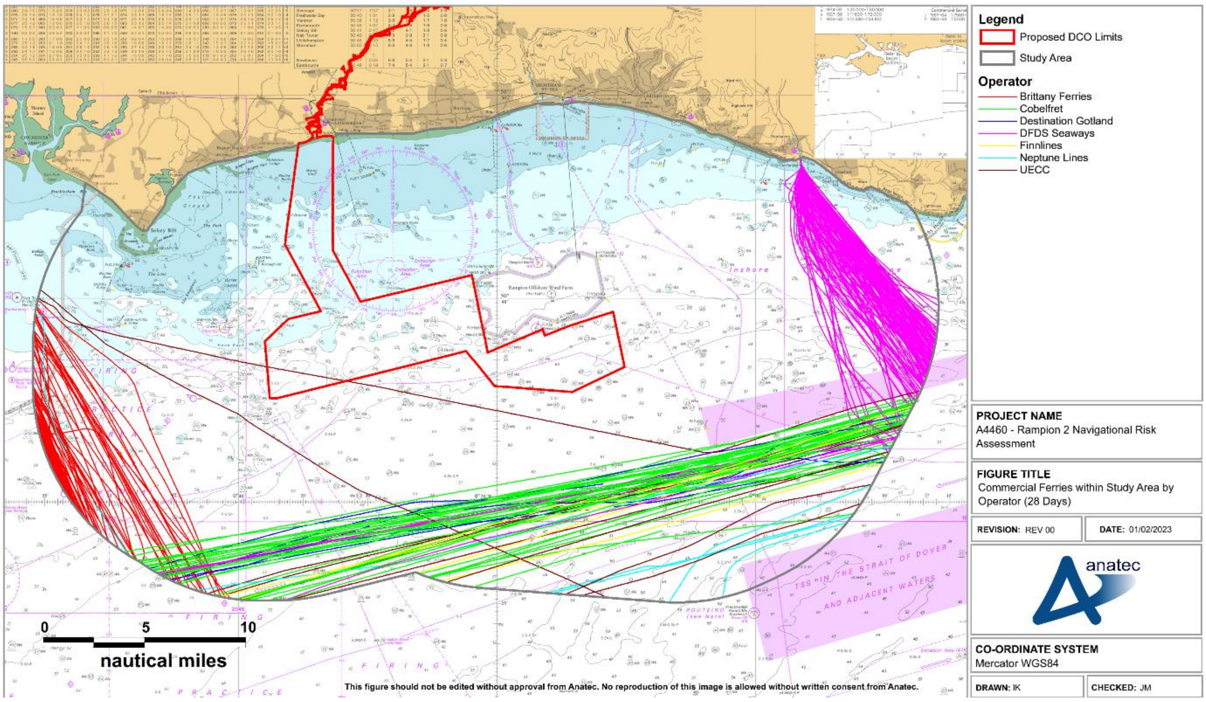

Figure 10.10 Commercial ferries within study area (28 days)

179. It is noted that during the long-term vessel traffic analysis (see Appendix C), the Ro-Ro passenger ferry *Etretat*, operated by Brittany Ferries, was the most frequently recorded commercial ferry. Due to COVID-19, the *Etretat* stopped operating in March 2020 and therefore was not recorded during either of the survey periods. The vessel has since been taken over by Stena Line and is now operating in the Baltic Sea (Maritime Executive, 2021). Brittany Ferries intend to resume services between Portsmouth Port and Le Havre in March 2023.

180. Brittany Ferries, DFDS Seaways and CLdN were the main commercial ferry operators during the survey period. Brittany Ferries primarily operated routes between Portsmouth Port (UK) and Ouistreham (Caen) (France)/Le Havre. DFDS Seaways primarily operated a route between the Port of Newhaven (UK) and Dieppe (France). CLdN primarily operated routes through the Channel utilising the IMO routeing measures.

10.2.3 Recreational Vessels

10.2.3.1 Vessel Traffic Survey Data

181. Figure 10.11 presents a plot of recreational vessel activity recorded within the study area throughout the two 14-day survey periods.

182. Throughout the summer survey period an average of 53 unique recreational vessels per day were recorded within the study area. Throughout the winter survey period an average of five to six unique recreational vessels per day were recorded in the study area.

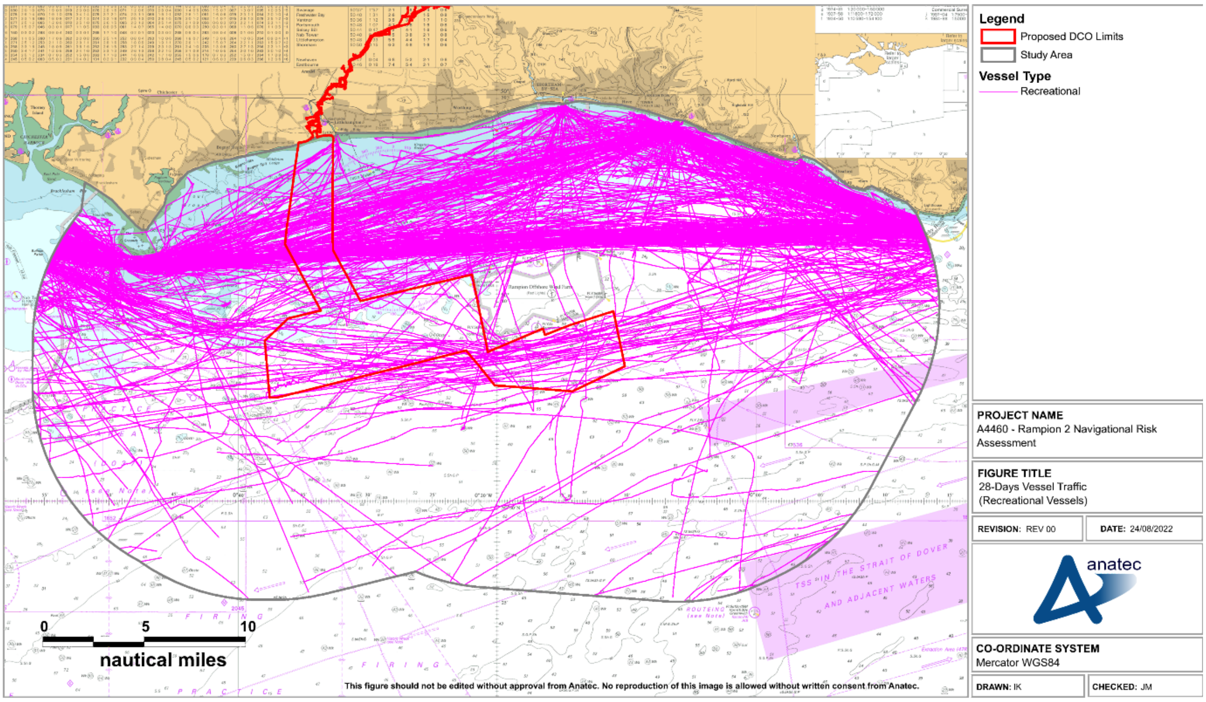

Figure 10.11 Recreational vessels within study area (28 days)

183. Recreational vessels were predominantly observed transiting in nearshore areas including to/from Brighton Marina, ports in the Solent, Shoreham Port, the Port of Newhaven and Littlehampton Harbour. However, some activity was recorded further offshore including east-west transits offshore of Rampion 1. Recreational dive charter vessels visiting numerous wrecks in the area were also observed as well as multiple tours to Rampion 1 based out of Brighton Marina.

184. Approximately 98% of recreational vessels throughout the 28-day survey period were recorded on AIS, with 2% recorded on Radar.

10.2.3.2 Royal Yachting Association Coastal Atlas

185. The RYA Coastal Atlas may be used to "*help identify and protect areas of importance to recreational boaters, to advise on new development proposals and in discussions over navigational safety*" (RYA, 2019). The RYA Coastal Atlas includes a heat map indicating the density of recreational activity around the UK coast.

186. Figure 10.12 presents a plot of the RYA Coastal Atlas heat map relative to the Proposed DCO Limits.

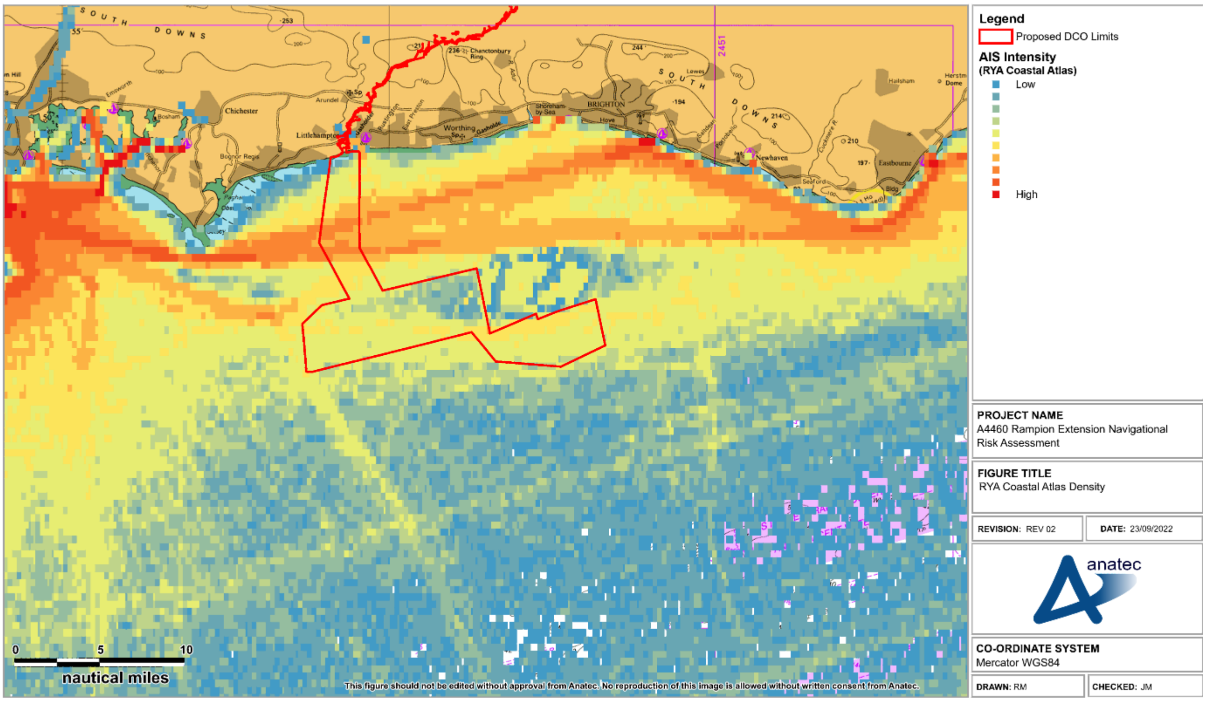

Figure 10.12 RYA Coastal Atlas density

187. The overall density of recreational activity is heaviest towards the coast, with the density gradually dropping off offshore of the Proposed DCO Limits. Distinctive routes can be identified out of the Dover Strait TSS and the Solent including east-west routeing offshore of Rampion 1 which passes through the structures exclusion zone south of Rampion 1.

188. It can be seen that the density of recreational activity within the existing Rampion 1 is highly variable and includes some areas of heavy use.

10.2.3.3 Visual Observations During Geophysical Surveys

189. During geophysical surveys undertaken on-site at the offshore export cable corridor in July and August 2020, further visual observations of vessels not broadcasting on AIS and located within or in proximity to the Proposed DCO Limits were collected. Figure 10.13 presents a plot of the non-AIS vessel activity recorded, including recreational vessels.

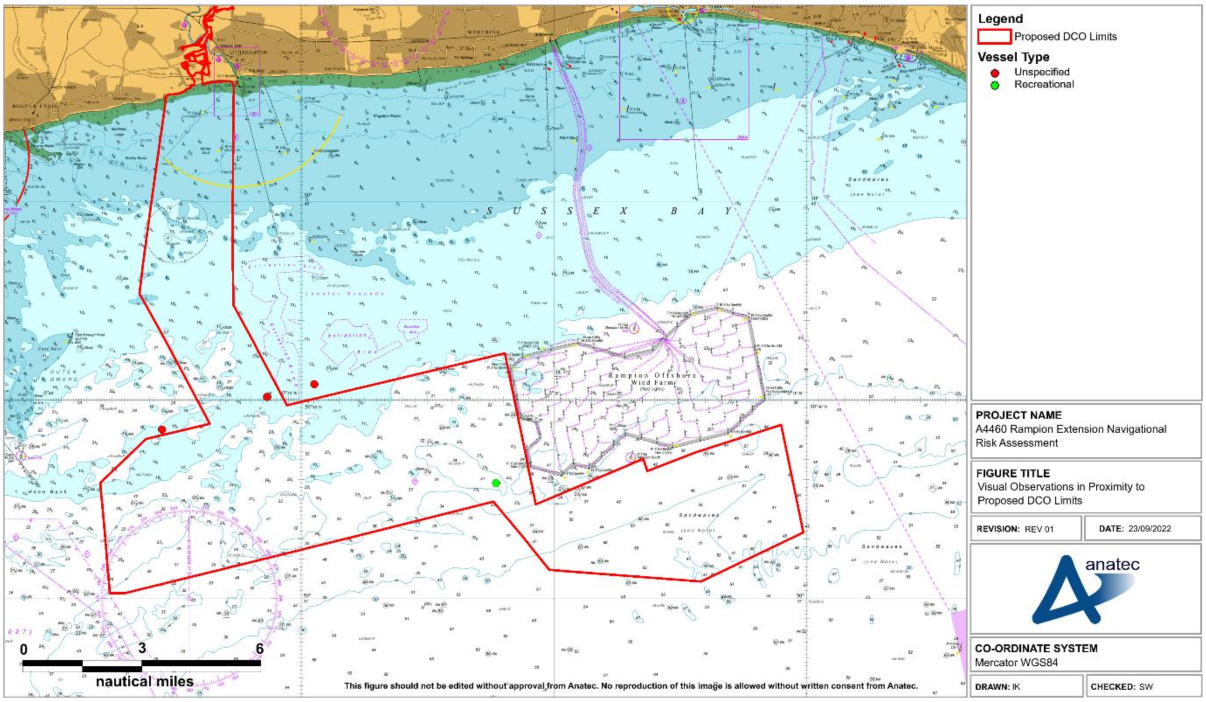

Figure 10.13 Visual observations in proximity to Proposed DCO Limits

190. A total of three unique vessels were observed and logged whilst the geophysical surveys were ongoing (noting that multiple points are plotted in Figure 10.13 for one vessel), with observations typically in the southern half of the offshore export cable corridor and the portion of the array area immediately west of Rampion 1.

191. The full visual observations log is provided in Appendix F.

10.2.4 Tankers

192. Figure 10.14 presents a plot of tankers recorded within the study area during the two 14-day survey periods.

193. Throughout the summer survey period an average of 37 unique tankers per day were recorded within the study area. Throughout the winter survey period an average of 31 unique tankers per day were recorded within the study area.

194. Main destinations included Le Havre, Port Jerome (France) and Fawley (UK). Tankers were recorded transiting the Dover Strait TSS, as well as transiting to/from the Solent.

195. Tanker activity inshore of the Proposed DCO Limits was negligible, with one tanker recorded visiting Shoreham Port during the 28-day period.

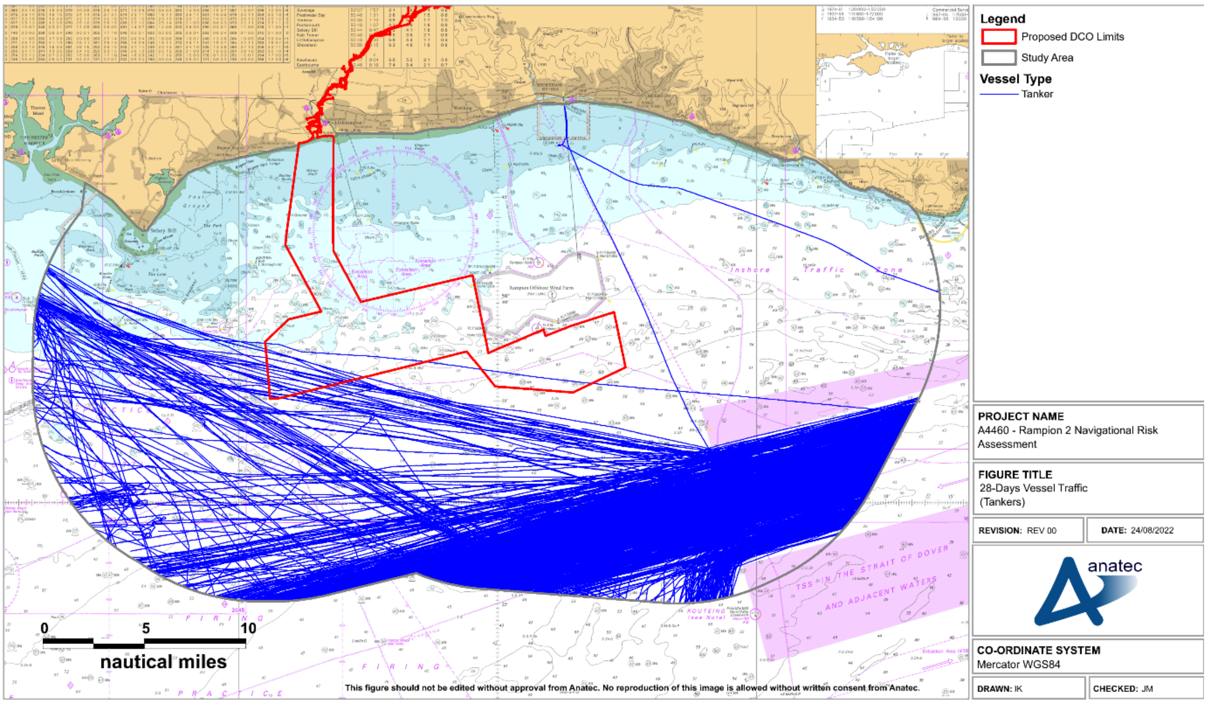

Figure 10.14 Tankers within study area (28 days)

10.2.5 Marine Aggregate Dredgers

196. Figure 10.15 presents a plot of the marine aggregate dredging activity recorded within the study area throughout the two 14-day survey periods.

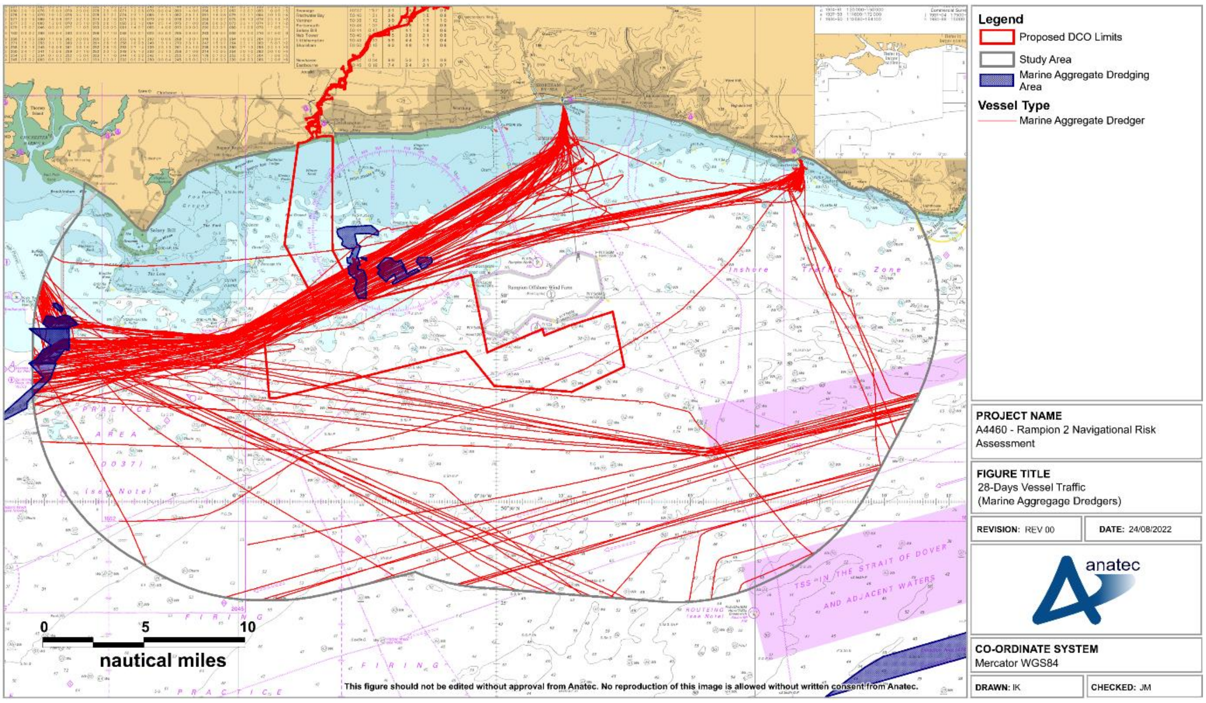

Figure 10.15 Marine aggregate dredgers within study area (28 days)

197. An average of three to four unique marine aggregate dredgers were recorded per day within the study area during each 14-day survey period. Marine aggregate dredgers were most frequently recorded transiting to various dredging areas to the west of the Proposed DCO Limits and immediately east of the offshore export cable corridor.

198. The vessel traffic survey data shows good agreement with the description of marine aggregate dredger movements provided by marine aggregate dredging representatives during consultation (see various entries in Table 4-1).

10.2.6 Fishing Vessels

10.2.6.1 Vessel Traffic Survey Data

199. Figure 10.16 presents a plot of fishing vessel activity recorded within the study area throughout the two 14-day survey periods.

200. Throughout the summer survey period an average of 16 unique fishing vessels per day were recorded within the study area. Throughout the winter survey period an average of 18 unique fishing vessels per day were recorded within the study area. Fishing vessels were recorded on passage through the study area as well as actively engaged in fishing, most notably within the Proposed DCO Limits south and east of Rampion 1. Transits through the Rampion 1 array in and out of Shoreham Port were noted primarily during the summer survey period with such transits during the winter survey period typically to the west of Rampion 1.

201. Approximately 96% of fishing vessels throughout the two 14-day survey periods were recorded on AIS, with 4% recorded on Radar.

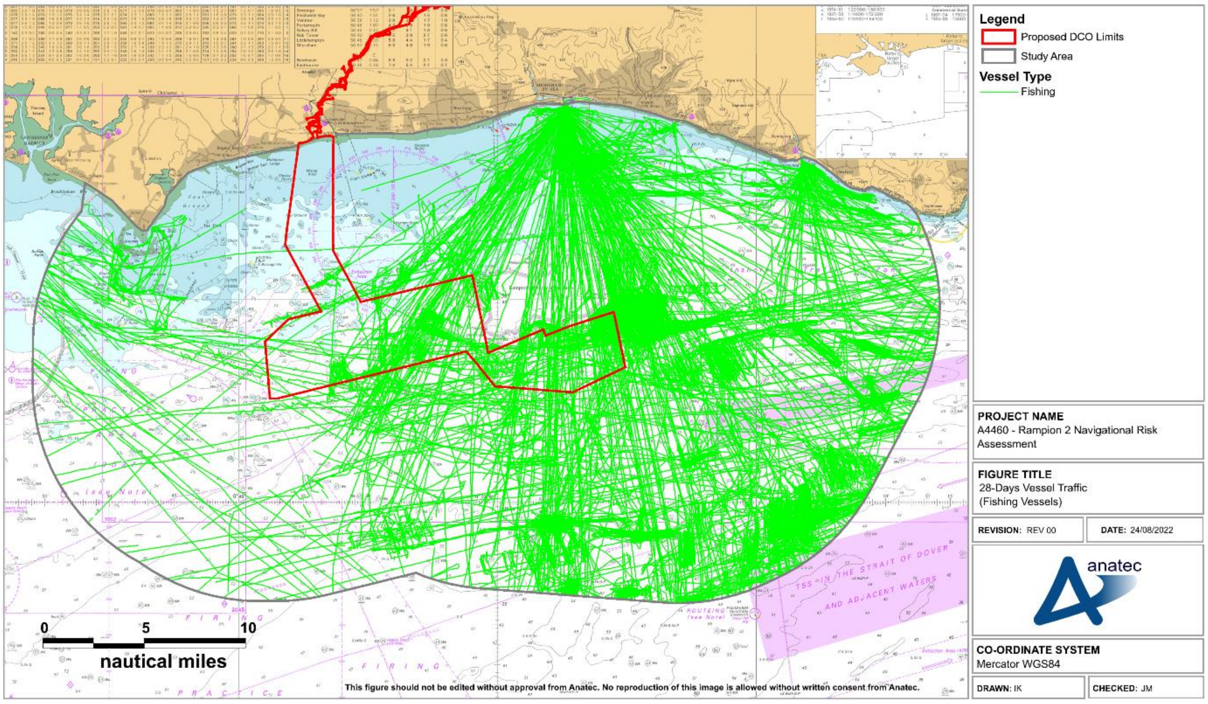

Figure 10.16 Fishing vessels within study area (28 days)

10.2.6.2 Visual Observations during Geophysical Surveys

202. Figure 10.13 presents a plot of the non-AIS vessel activity recorded whilst geophysical surveys were being undertaken on-site at the offshore export cable corridor in July and August 2020 (see Section 10.2.3.3 for further information), including fishing vessels.

203. A total of 47 fishing vessels were observed and logged whilst the geophysical surveys were ongoing (noting that multiple points are plotted in Figure 10.13 for some vessels), with observations most frequent within the central and southern portions of the offshore export cable corridor and the western extent of the array area.

204. The full visual observations log is provided in Appendix F.

10.2.7 Pilot Vessels

205. Figure 10.17 presents a plot of pilot vessels recorded within the study area during the two 14-day survey periods.

206. Throughout the summer survey period an average of two unique pilot vessels per day were recorded within the study area. Throughout the winter survey period an average of three unique pilot vessels per day were recorded within the study area. Pilot vessels were primarily recorded operating in nearshore areas out of their respective ports, including at Shoreham Port, the Port of Newhaven and the Solent.

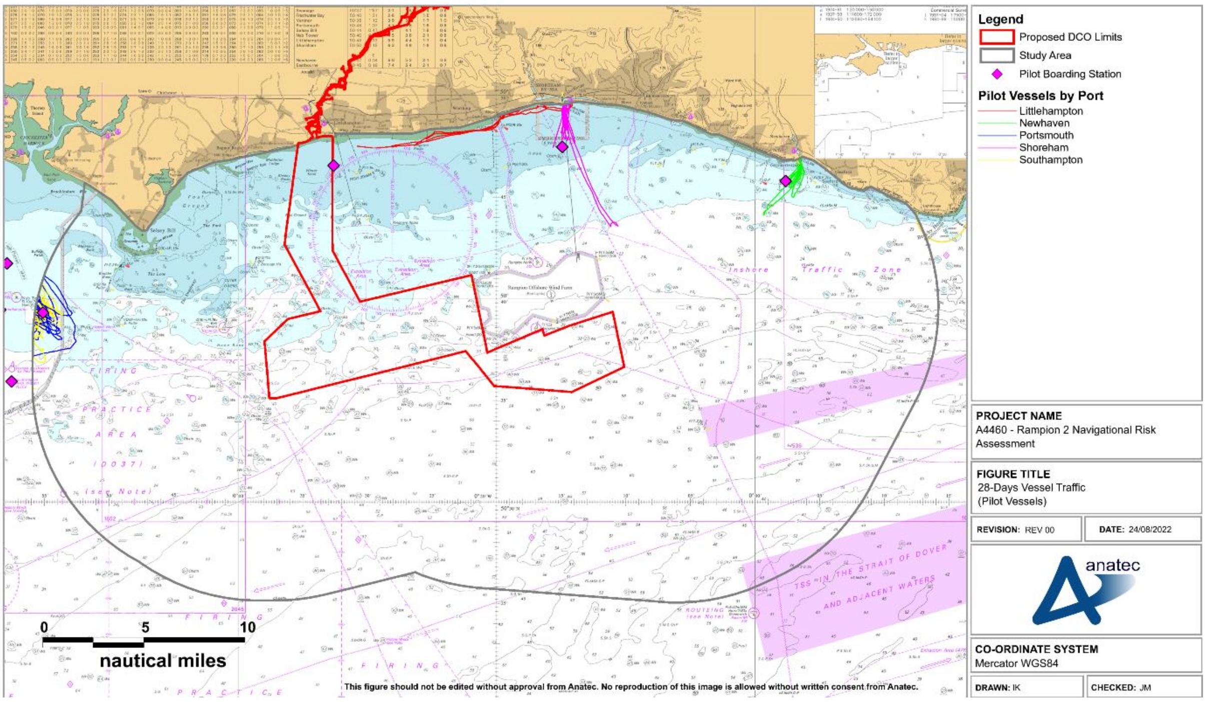

Figure 10.17 Pilot vessels within study area (28 days)

10.2.8 Anchored Vessels

207. Anchored vessels can be identified based upon the AIS navigational status which is programmed on the AIS transmitter on board a vessel. However, information is manually entered into the AIS, and therefore it is common for vessels not to update their navigational status if only at anchor for a short period of time.

208. For this reason, those vessels which travelled at a speed of less than one knot (kt) for more than 30 minutes had their corresponding vessel tracks individually checked for patterns characteristic of anchoring activity. After applying these criteria, 55 anchored vessels were identified within the study area, corresponding to an average of two anchored vessels per day. Of the anchored vessels identified, 60% broadcast an AIS navigational status of "*at anchor*". Figure 10.18 presents a plot of anchored vessels recorded within the study area throughout the two 14-day survey periods.

209. The majority of anchoring activity was associated with Shoreham Port, the Port of Newhaven and the Solent, with only one anchored vessel associated with Littlehampton Harbour. The closest anchoring activity to the Proposed DCO Limits was a cargo vessel approximately 0.25nm west of the offshore export cable corridor. Anchored vessels during the summer survey period were predominately tankers (29%) and recreational vessels (25%) and during the winter survey period were predominantly marine aggregate dredgers (30%) and cargo vessels (26%).

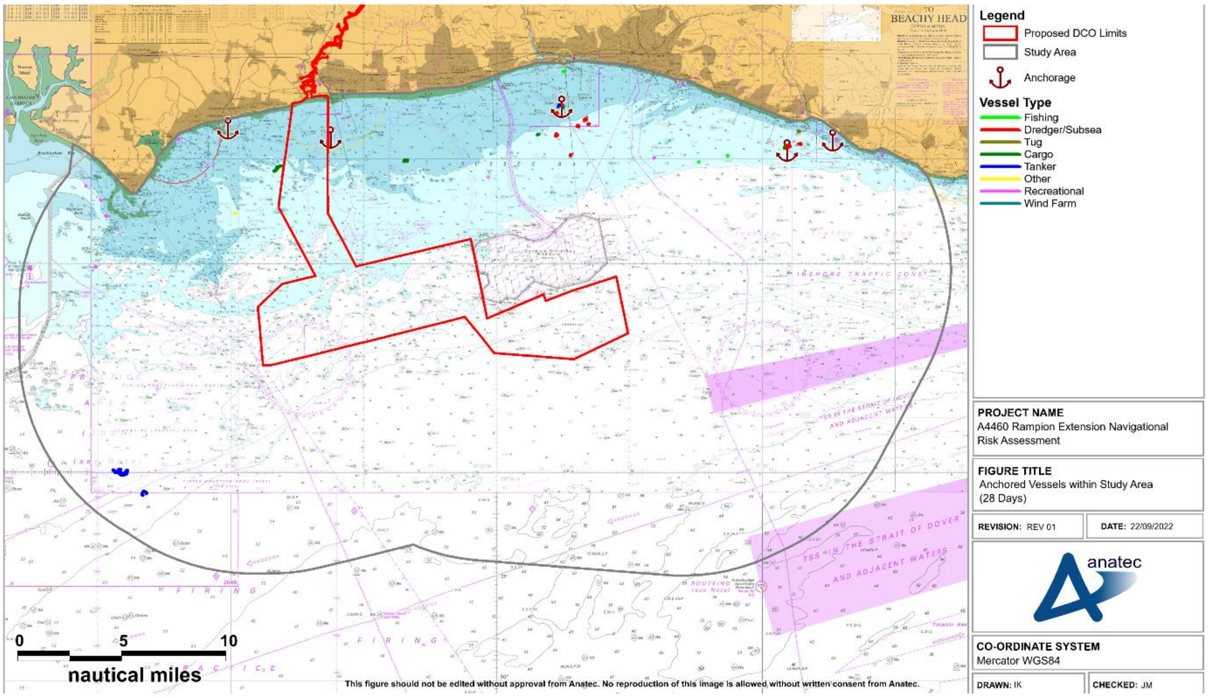

Figure 10.18 Anchored vessels within study area (28 days)

10.3 Vessel Size

10.3.1 Vessel Length

210. Vessel LOA was available for approximately 98% of vessels recorded throughout the two 14-day survey periods and ranged from 3m for a sailing vessel to 400m for several containerships. Figure 10.19 illustrates the distribution of vessel lengths recorded throughout each survey period.

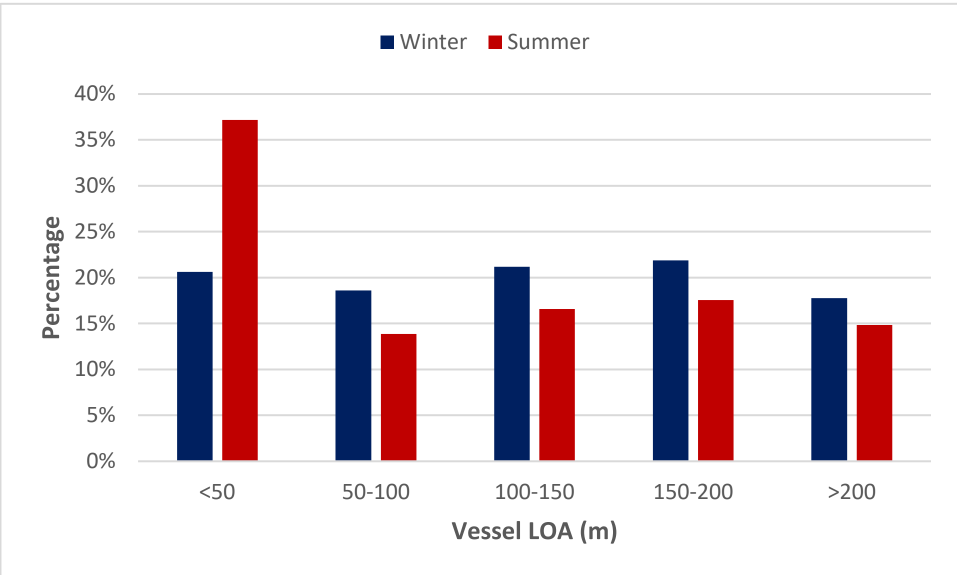

Figure 10.19 Vessel length distribution (summer and winter 2020)

211. Excluding the proportion of vessels for which a length was not available the average length of vessels within the study area throughout the summer and winter survey periods was 110m and 135m, respectively. The difference in average vessel length between the two survey periods may be attributed to the greater presence of small recreational vessels in the summer period.

212. Figure 10.20 presents a plot of the vessel tracks recorded throughout the survey periods, colour-coded by vessel length.

213. Larger LOA vessels were typically recorded out of the Dover Strait TSS, either continuing to make passage westbound within the English Channel or heading to ports in the Solent. Smaller LOA vessels were typically recorded within the Proposed DCO Limits and inshore of the Proposed DCO Limits, with the exception of the passenger ferry route between the Port of Newhaven and Dieppe.

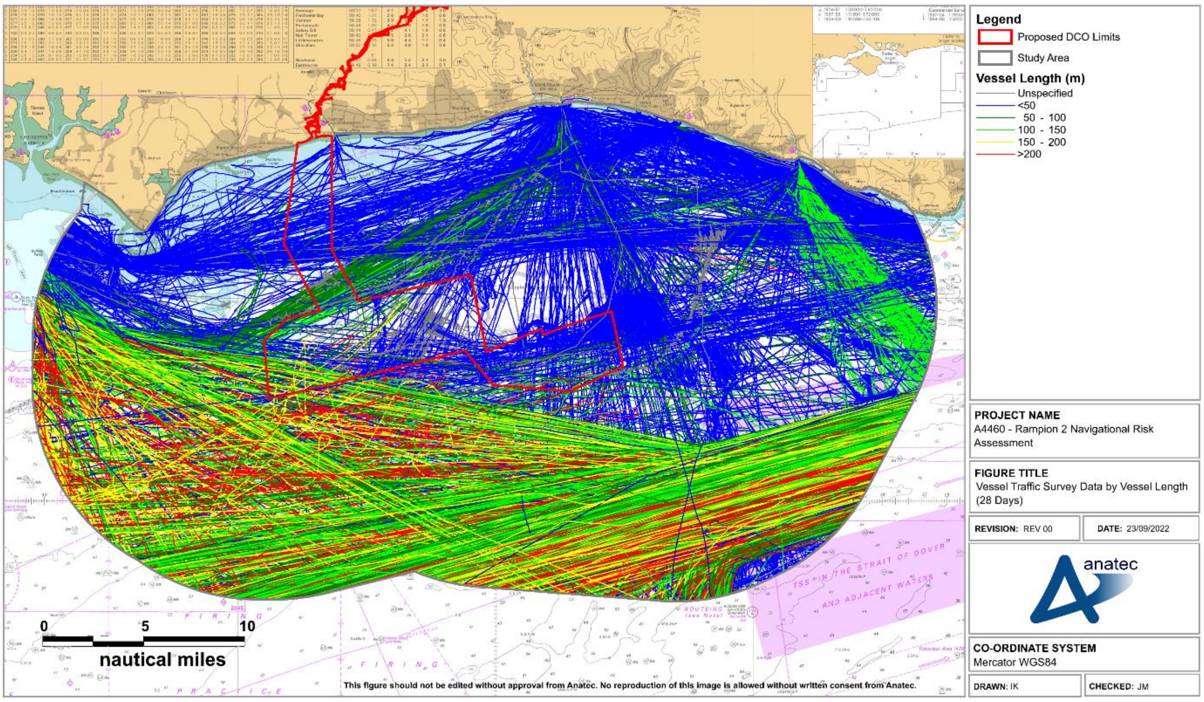

Figure 10.20 Vessel traffic survey data by vessel length (28 days)

10.3.2 Vessel Draught

214. Vessel draught was available for approximately 39% of vessels recorded throughout the two 14-day survey periods and ranged from 1.0m for a fishing vessel and pilot vessel to 21.2m for a crude oil tanker. Figure 10.21 illustrates the distribution of vessel draughts recorded throughout each survey period.

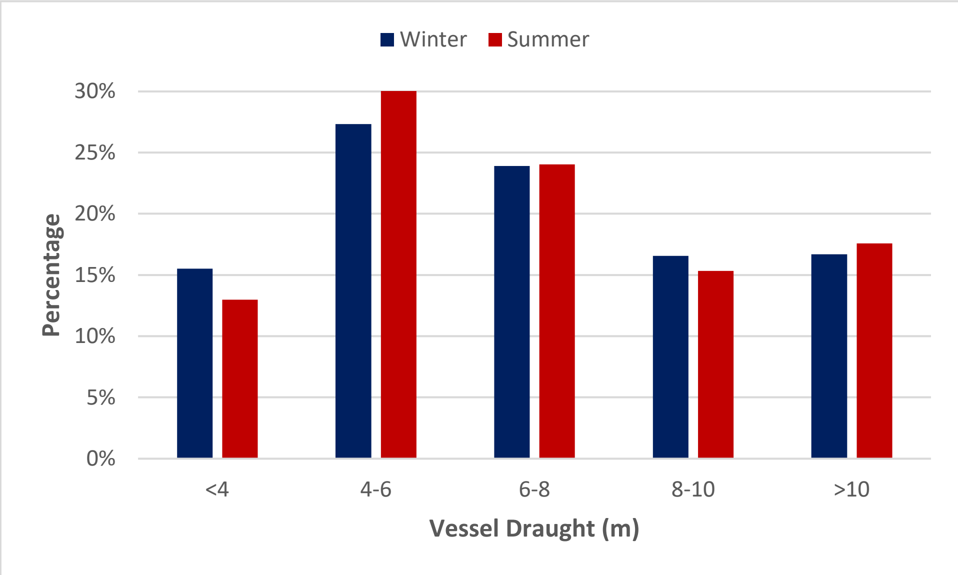

Figure 10.21 Vessel draught distribution (summer and winter 2020)

215. Excluding the proportion of vessels for which a draught was not available the average draught of vessels within the study area throughout the summer and winter survey periods was 7.1m and 7.0m, respectively.

216. Figure 10.22 presents a plot of the vessel tracks recorded throughout the two 14-day survey periods, colour-coded by vessel draught.

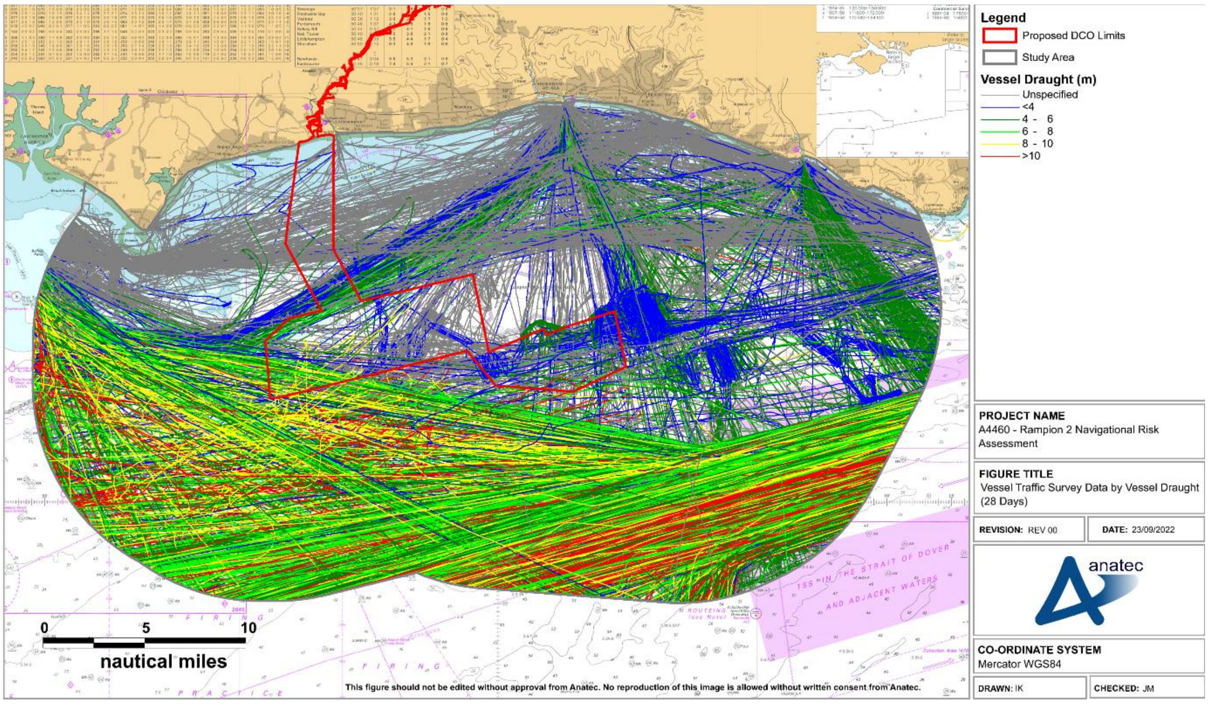

Figure 10.22 Vessel traffic survey data by vessel draught (28 days)

217. As with vessel LOA distribution, larger draught vessels were typically recorded out of the Dover Strait TSS, either continuing to make passage westbound within the English Channel or heading to ports in the Solent. Smaller vessels were typically recorded within the Proposed DCO Limits and inshore of the Proposed DCO Limits.

11 Base Case Vessel Routeing

11.1 Definition of a Main Commercial Route

218. Main commercial routes have been identified using the principles set out in MGN 654 (MCA, 2021). Vessel traffic data are assessed and vessels transiting at similar headings and locations are identified as a main route. To help identify main routes, vessel traffic data can also be interrogated to show vessels (by name and/or operator) that frequently transit those routes. The route width is then calculated using the 90th percentile rule from the median line of the potential shipping route as shown in Figure 11.1. Additionally, the outputs of consultation undertaken with local stakeholders has assisted in the identification of the main commercial routes.

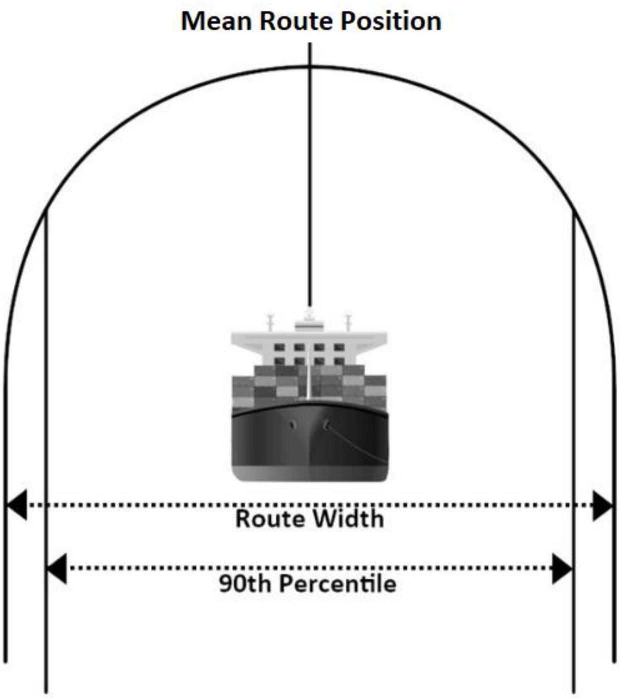

Figure 11.1 Illustration of main route calculation

11.2 Pre Wind Farm Main Commercial Routes

219. A total of 17 main commercial routes were identified from the vessel traffic survey data and consultation. These main commercial routes and corresponding 90th percentiles within the study area are shown relative to the Proposed DCO Limits in Figure 11.2. Following this, a description of each route is provided in Table 11-1, including the average number of vessels per day, start and end locations, main vessel types and details of commercial ferry routeing (where applicable). It is noted that the start and end locations are based on the most common destinations transmitted via AIS by vessels on those routes. In the case of routes where a TSS is provided as the start and/or

end location, this is due to there being a wide range of destinations transmitted via AIS by vessels on such routes.

220. To ensure all main commercial routes are captured, the long-term vessel traffic data has been used to validate the main commercial routes identified from the vessel traffic survey data.

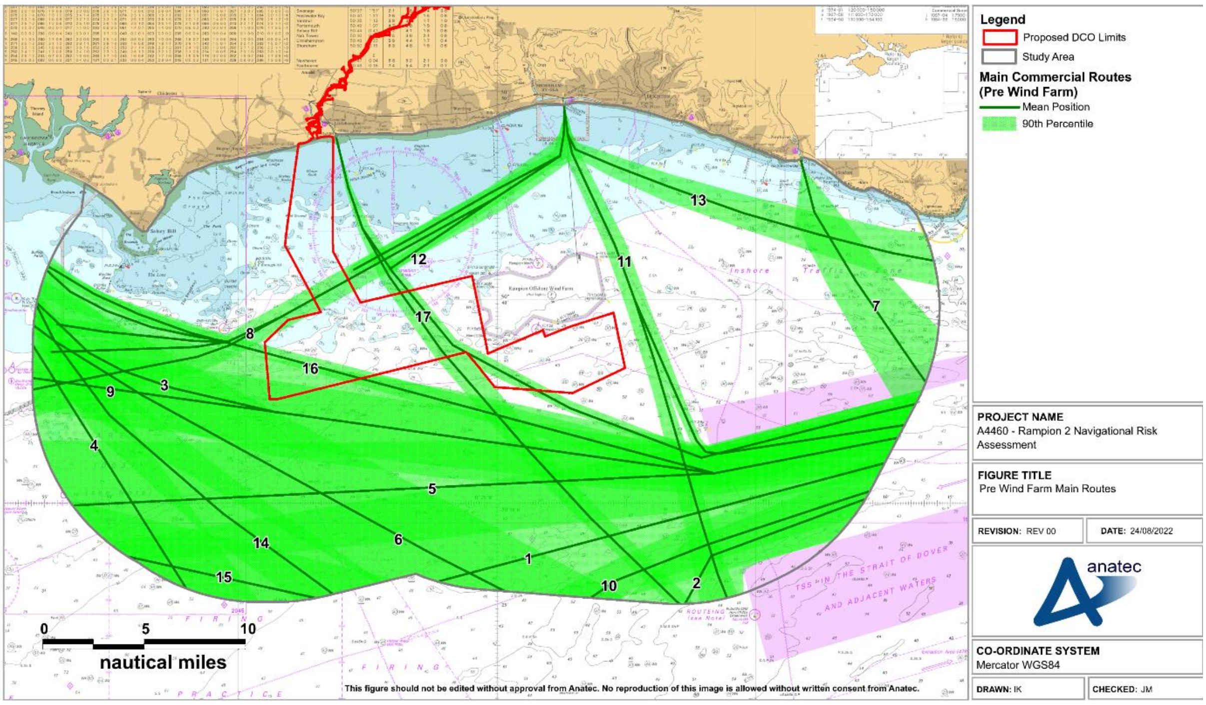

Figure 11.2 Main commercial routes and 90th percentiles within study area (pre wind farm)

Table 11-1 Description of main commercial routes

Route number	Average vessels per day	Description
1	74	**Westbound lane of Dover Strait TSS to westbound lane of Off Casquets TSS**. Generally used by cargo vessels (66%) and tankers (30%). Includes regular commercial ferry traffic operated by CLdN.
2	10	**Westbound lane of Dover Strait TSS to Le Havre (France)**. Generally used by cargo vessels (59%) and tankers (37%).
3	5	**Westbound lane of Dover Strait TSS to ports in the Solent (UK)**. Generally used by cargo vessels (62%), tankers (22%) and passenger vessels (12%).

Route number	Average vessels per day	Description
4	4 to 5	**Portsmouth Port (UK)–Le Havre (France)**. Generally used by passenger vessels (60%), cargo vessels (28%) and tankers (11%).
5	4 to 5	**Westbound lane of Dover Strait TSS to Dublin (Republic of Ireland)**. Generally used by cargo vessels (85%) and tankers (10%).
6	4 to 5	**Ports in the Solent (UK) to eastbound lane of Dover Strait TSS**. Generally used by cargo vessels (49%), tankers (31%) and passenger vessels (11%).
7	4	**Port of Newhaven (UK)–Dieppe (France)**. Used by passenger vessels (100%).
8	2	**Shoreham Port (UK)–marine aggregate dredging areas near Isle of Wight**. Generally used by marine aggregate dredgers (88%).
9	1 to 2	**Westbound lane of Dover Strait TSS to ports in the Solent (UK)**. Generally used by cargo vessels (42%), tankers (35%) and marine aggregate dredgers (16%).
10	1	**Westbound lane of Dover Strait TSS to Le Havre (France)**. Generally used by cargo vessels (58%), tankers (30%) and passenger vessels (11%).
11	1	**Shoreham Port (UK)–Dover Strait TSS**. Generally used by cargo vessels (80%) and marine aggregate dredgers (13%).
12	0 to 1	**Shoreham Port (UK)–marine aggregate dredging areas near Owers Bank**. Used by marine aggregate dredgers (100%).
13	0 to 1	**Shoreham Port (UK)–North Sea ports**. Generally used by cargo vessels (80%).
14	0 to 1	**Port of Southampton (UK) to eastbound lane of Dover Strait TSS**. Generally used by cargo vessels (63%), tankers (23%) and passenger vessels (12%).
15	0 to 1	**Poole (UK) to eastbound lane of Dover Strait TSS**. Generally used by cargo vessels (83%).
16	0 to 1	**Westbound lane of Dover Strait TSS to ports in the Solent (UK)**. Generally used by cargo vessels (42%), tankers (39%) and tugs (10%).

Route number	Average vessels per day	Description
17	Monthly*	**Littlehampton Harbour (UK)–Dover Strait TSS**. Generally used by cargo vessels. Includes small coaster traffic operated by Van Dam Shipping headed to/from Antwerp (Belgium) and Amsterdam (Netherlands).

(*) Vessel traffic on this route is not considered sufficient in volume to constitute a main commercial route but has been included given sensitivities raised during consultation (see 16 December 2020 entry in Table 4-1).

11.3 Local Port Related Traffic

221. As noted in Section 7.4, there are several ports and harbours located along the coast close to the Proposed DCO Limits. Although some of the vessel traffic associated with these ports (both entering and exiting) is characterised in the main commercial routes, there is additional commercial vessel traffic which did not constitute a main commercial route (due to volume) and non-commercial vessel traffic.

222. The following subsections consider each of the main ports within the study area and their associated vessel traffic.

11.3.1 Shoreham Port

223. A plot of the vessel tracks associated with Shoreham Port within the study area throughout the two 14-day survey periods is presented in Figure 11.3.

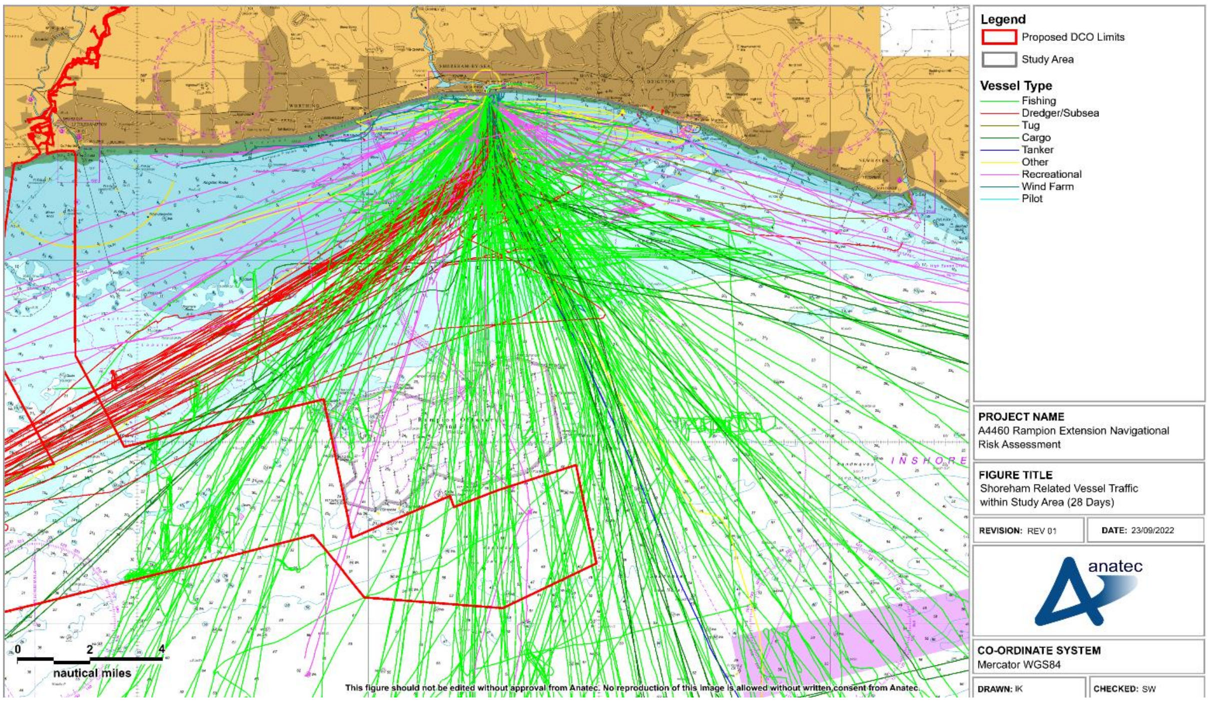

Figure 11.3 Shoreham Port related vessel traffic within study area (28 days)

224. As indicated in Section 10.2.6, fishing vessels are prominent out of Shoreham Port, with the majority transiting south and through the existing Rampion 1 and the array area to fishing grounds. Recreational vessel activity was also notable, with the majority of such traffic recorded in the nearshore area including transits to Brighton Marina and the Port of Newhaven. All recreational vessel and fishing vessel tracks related to Shoreham Port were recorded on AIS.

225. RNLI lifeboats for Shoreham were recorded undertaking operations in proximity to Shoreham Port. Anchoring activity was also observed at the pilot boarding station located approximately 2.1nm from the port, with the two pilot boats for Shoreham Port making multiple transits to the pilot boarding station.

226. Marine aggregate dredgers were recorded transiting to areas at the western extent of the study area. Other commercial vessel activity was limited but did include some routeing from cargo vessels to the Dover Strait TSS and through the ITZ (such traffic is characterised in Section 10.2.1). It is noted that during consultation, Shoreham Port indicated that the majority of commercial traffic out of Shoreham Port utilises the Dover Strait TSS (see 12 August 2020 entry in Table 4-1).

11.3.2 Port of Newhaven

227. A plot of the vessel tracks associated with the Port of Newhaven within the study area throughout the two 14-day survey periods is presented in Figure 11.4.

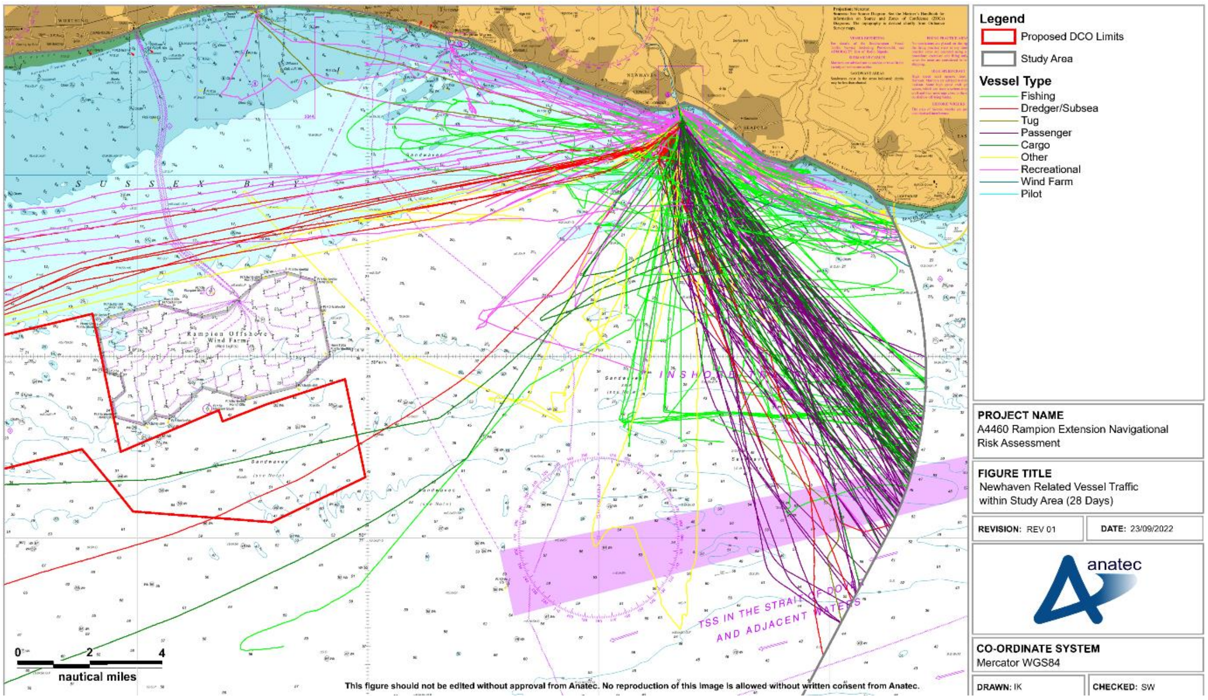

Figure 11.4 Port of Newhaven related vessel traffic within study area (28 days)

228. The most prominent vessel traffic out of the Port of Newhaven are two passenger ferries operated by DFDS Seaways which each operate a route between the Port of Newhaven and Dieppe twice per day. Other commercial traffic was much less frequent, with a small number of cargo vessels and marine aggregate dredgers observed making single transits. During consultation, Newhaven Port & Properties noted that the AIS data presented in the Scoping Report (which for commercial traffic shows good agreement with the vessel traffic survey data) was reflective of vessel traffic movements in the area (see 4 August 2020 entry in Table 4-1).

229. Recreational vessel activity was notable, with the majority of such traffic recorded in the nearshore area along the West Sussex coast including transits to/from Shoreham Port and Brighton Marina or headed directly to/from ports in the Solent. Fishing vessel activity was also notable, with the majority of such traffic recorded within 3nm of the port and characteristic of vessels engaged in fishing activity. It is noted that almost all fishing vessel tracks recorded were from one of four vessels. All recreational vessel and fishing vessel tracks related to the Port of Newhaven were recorded on AIS.

230. Anchoring activity was also observed at the charted anchorage areas, with the pilot boat for the Port of Newhaven recorded making multiple transits to the anchorage areas and pilot boarding station.

11.3.3 Brighton Marina

231. A plot of the vessel tracks associated with Brighton Marina within the study area throughout the two 14-day survey periods is presented in Figure 11.5.

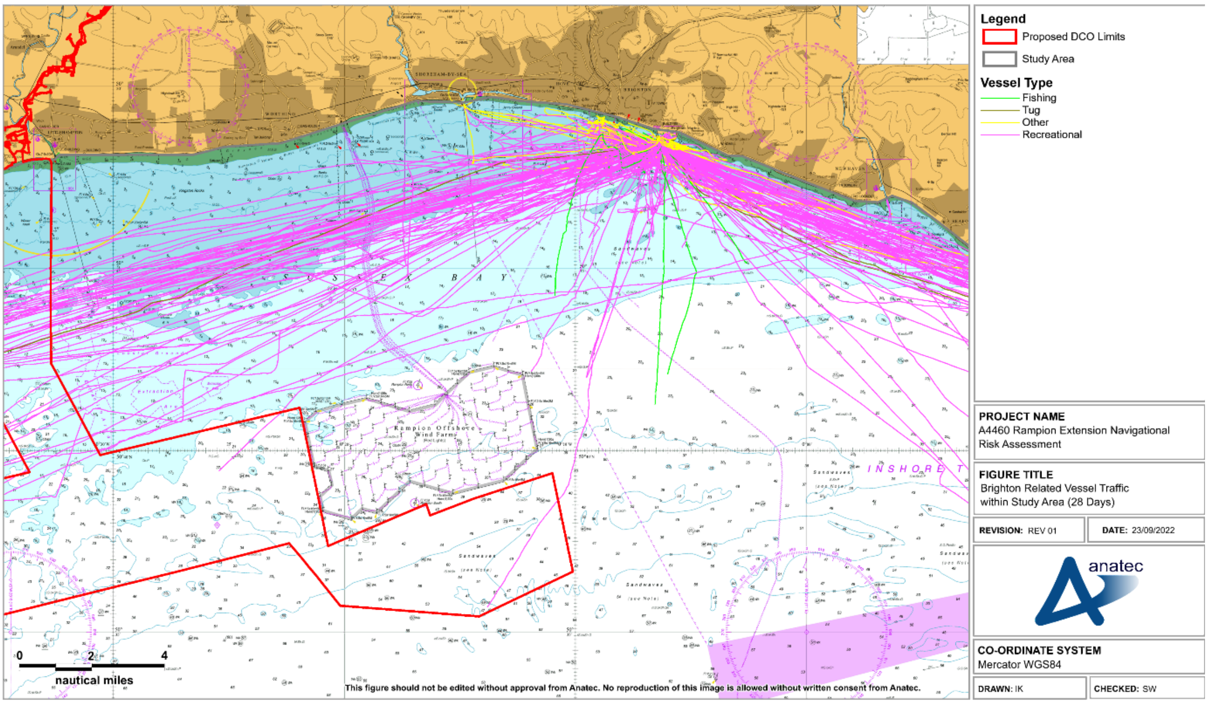

Figure 11.5 Brighton Marina related vessel traffic within study area (28 days)

232. Recreational vessels were most prominent out of Brighton Marina, with the majority of such traffic recorded in the nearshore area along the West Sussex coast including transits to/from Shoreham Port and Port of Newhaven or headed directly to/from ports in the Solent. There were also multiple visits to Rampion 1 recorded as well recreational dive charter vessels visiting numerous wrecks in the area.

233. Activity from other vessel types included a fishing vessel which transited to and from the port on multiple occasions and the RNLI lifeboat for Brighton undertaking operations in proximity to Brighton Marina. Commercial vessel activity including anchoring was minimal.

234. It is noted that all recreational vessel and fishing vessel tracks related to Brighton Marina were recorded on AIS.

11.3.4 Littlehampton Harbour

235. A plot of the vessel tracks associated with Littlehampton Harbour within the study area throughout the two 14-day survey periods is presented in Figure 11.6.

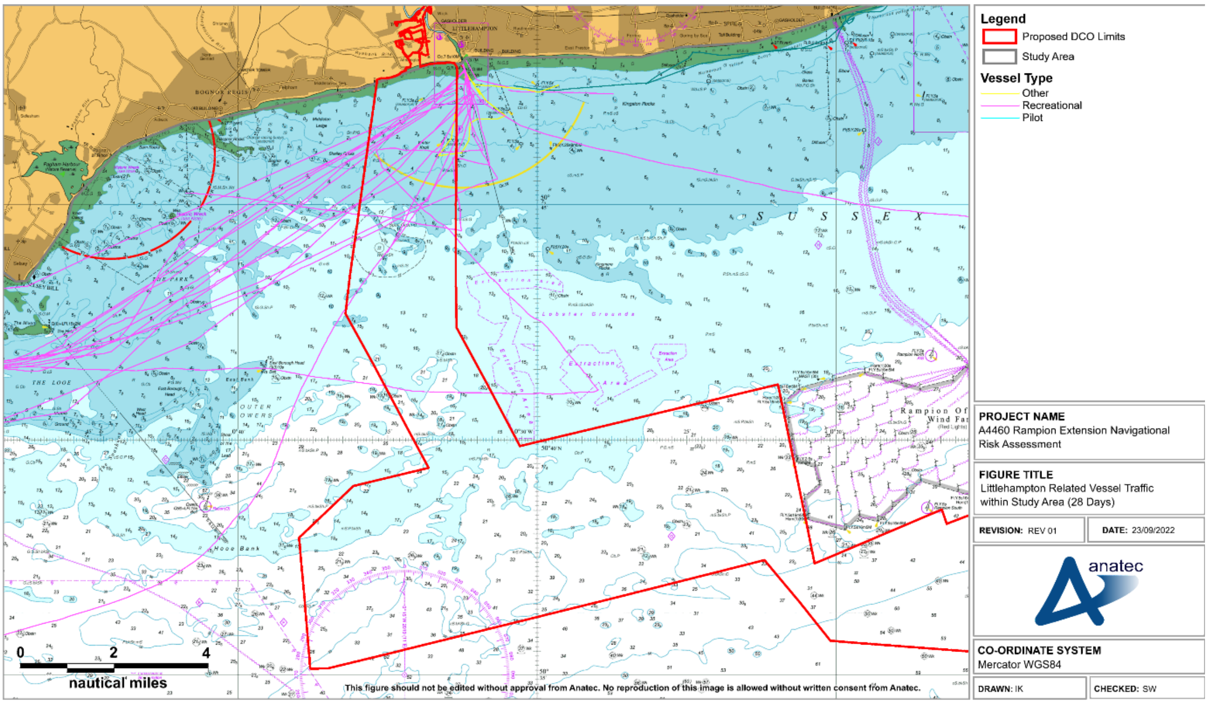

Figure 11.6 Littlehampton Harbour related vessel traffic within study area (28 days)

236. Recreational vessels were most prominent out of Littlehampton Harbour, with all recorded on AIS using a B class device. The RNLI lifeboat for Littlehampton was also recorded undertaking operations. Commercial vessel activity including anchoring was minimal.

237. From consultation with the Littlehampton Harbour Board, there are currently 10 commercial fishing vessels, seven active charter angling vessels and three active resident workboats operating out of Littlehampton Harbour with very few broadcasting on AIS. However, these vessels were on the whole not recorded during the vessel traffic surveys, noting that the survey included Radar data in addition to AIS.

238. Additionally, consultation with the Littlehampton Harbour Board indicated that three small coasters operated by Van Dam Shipping carry treated granite between Littlehampton Harbour and Antwerp/Amsterdam (see 16 December 2020 entry in Table 4-1). Although these vessels were not observed in the vessel traffic surveys, they were observed in the long-term vessel traffic data (see Appendix C).

12 Adverse Weather Routeing

239. Some vessels and vessel operators may operate alternative routes during periods of adverse weather. This section focuses on vessel movements in adverse weather given the implications if a commercial vessel is unable to make passage or a small craft is unable to access safe havens in adverse weather due to the presence of the development or activities associated with the development. Access to safe havens in particular was raised by the RYA during consultation as an issue which should be considered.

240. Adverse weather includes wind, wave and tidal conditions as well as reduced visibility due to fog that can hinder a vessel's standard route, speed of navigation and/or ability to enter the destination port. Adverse weather routes are assessed to be significant course adjustments to mitigate vessel motion in adverse weather conditions. When transiting in adverse weather conditions, a vessel is likely to encounter various types of weather and tidal phenomena, which may lead to severe roll motions, potentially causing damage to cargo, equipment and/or discomfort and danger to persons on board. The sensitivity of a vessel to these phenomena will depend upon the actual stability parameters, hull geometry, vessel type, vessel size and speed.

12.1 Identification of Periods of Adverse Weather

241. Historical weather information provided by the Met Office (Met Office, 2019) has been used to identify periods of adverse weather during 2019 (the year covered by the long-term vessel traffic data) when routes in proximity to the Proposed Development could be considered most likely to be altered or cancelled. The key weather events identified are detailed in Table 12-1.

Table 12-1 Key weather events during 2019 relevant to the Proposed Development (Met Office)

Weather event	Date(s)	Details
Storm Erik	8 to 9 February 2019	Deep Atlantic low pressure system which brought strong winds to the UK with much of the country recording gusts over 58kt.
Storm Freya	3 to 4 March 2019	Strong winds and heavy rain in England, Wales and southern Scotland.
Storm Gareth	10 to 16 March 2019	Turbulent week of very wet and windy weather.
Storm Hannah	26 to 27 April 2019	One of the most significant April storms in the last 50 years with exposed locations in west Wales recording gusts of over 60kt.
Storm Lorenzo	3 October 2019	Followed a spell of wet weather in late September.

Weather event	Date(s)	Details
Strong winds	2 November 2019	An area of low pressure brought very strong winds to south Wales and the south coast with a gust of 95kt at Needles Old Battery, Isle of Wight.

12.2 Commercial Routeing Changes

242. The long-term vessel traffic data has been used to identify potential commercial routeing activity related to adverse weather conditions in proximity to the Proposed Development, with the periods outlined in Table 12-1 and commercial ferries (which can be seen to make similar transits on a very regular basis) studied most closely.

243. No substantial alternative routeing was observed nor were any cancellations which could be traced to adverse weather. Additionally, as part of the Regular Operator consultation, Regular Operators identified from the 12-month AIS dataset (see Section 4.1 and Appendix D) were asked "*whether any aspect of the development poses any safety concern to your vessels, including any adverse weather routeing*". No feedback was received in relation to adverse weather routeing.

12.3 Small Craft Use of Safe Havens

244. Both the long-term vessel traffic data and the 28-day vessel traffic survey data have been used to identify potential small craft use of safe havens related to adverse weather conditions in proximity to the Proposed Development, with the periods outlined in Table 12-1 and fishing vessels and recreational vessels studied most closely. No substantial sheltering using safe havens was observed from the vessel traffic data considered. Additionally, during consultation the RYA noted that there are few safe havens in the area other than local harbours and those which are available are very tide dependent for access.

245. The final array layout will not be determined until post consent but small craft will be able to safely navigate within the array in the majority of conditions should they choose to do so. As per International Convention for the Safety of Life at Sea (SOLAS) Chapter V (IMO, 1974), all vessels at sea are required to passage plan and part of the passage planning process requires them to consider forecast weather conditions. It is anticipated that vessels would then take account of these forecasts prior to Embarking on a passage offshore of the array area.

246. Taking into account consultation on the final array layout and the requirements of SOLAS Chapter V, there are not considered to be any significant effect on access to safe havens due to the presence of activities associated with the Proposed Development.

13 Navigation, Communication and Position Fixing Equipment

247. This section discusses the potential effects on the use of navigation, communication and position fixing equipment of vessels that may arise due to the infrastructure associated with the Proposed Development.

13.1 Very High Frequency Communications (including Digital Selective Calling)

248. In 2004, trials were undertaken at the North Hoyle Offshore Wind Farm, located off the coast of North Wales. As part of these trials, tests were undertaken to evaluate the operational use of typical small vessel VHF transceivers (including Digital Selective Calling (DSC)) when operated close to WTGs.

249. The WTGs had no noticeable effect on voice communications within the array or ashore. It was noted that if small craft vessel to vessel and vessel to shore communications were not affected significantly by the presence of WTGs, then it is reasonable to assume that larger vessels with higher powered and more efficient systems would also be unaffected.

250. During this trial, a number of telephone calls were made from ashore, both within and offshore of the array area. No effects were recorded using any system provider (MCA and QinetiQ, 2004).

251. Furthermore, as part of SAR trials carried out at the North Hoyle Offshore Wind Farm in 2005, radio checks were undertaken between the Sea King helicopter and both Holyhead and Liverpool coastguards. The aircraft was positioned to offshore of the array area and communications were reported as very clear, with no apparent degradation of performance. Communications with the service vessel located within the array were also fully satisfactory throughout the trial (MCA, 2005).

252. In addition to the North Hoyle trials, a desk-based study was undertaken for the Horns Rev 3 Offshore Wind Farm in Denmark in 2014 and it was concluded that there were not expected to be any conflicts between point-to-point radio communications networks and no interference upon VHF communications (Energinet, 2014).

253. Following consideration of these reports, and noting that since the trials detailed above there have been no significant issues with regards to VHF observed or reported, the presence of the Proposed Development is anticipated to have no significant impact upon VHF communications.

13.2 Very High Frequency Direction Finding

254. During the North Hoyle Offshore Wind Farm trials in 2004, the VHF Direction Finding (DF) equipment carried in the trial boats did not function correctly

when very close to WTGs (within approximately 50m). This is deemed to be a relatively small-scale impact due to the limited use of VHF DF equipment and will not impact operational or SAR activities (MCA and QinetiQ, 2004).

255. Throughout the 2005 SAR trials carried out at North Hoyle, the Sea King radio homer system was tested. The Sea King radio homer system utilises the lateral displacement of a vertical bar on an instrument to indicate the sense of a target relative to the aircraft heading. With the aircraft and the target vessel within the array, at a range of approximately 1nm, the homer system operated as expected with no apparent degradation.

256. Since the trials detailed above, no significant issues with regards to VHF DF have been observed or reported, and therefore the presence of the Proposed Development is anticipated to have no significant impact upon VHF DF equipment.

13.3 Automatic Identification System

257. No significant issues with interference to AIS transmission from operational offshore wind farms have been observed or reported to date. Such interference was also absent in the trials carried out at the North Hoyle Offshore Wind Farm (MCA and QinetiQ, 2004).

258. In theory there could be interference when there is a structure located between the transmitting and receiving antennas (i.e., blocking line of sight) of the AIS. However, given no issues have been reported to date at operational developments or during trials, no significant impact is anticipated due to the presence of the Proposed Development.

13.4 Navigational Telex System

259. The Navigational Telex (NAVTEX) system is used for the automatic broadcast of localised Maritime Safety Information (MSI) and either prints it out in hard copy or displays it on a screen, depending upon the model.

260. There are two NAVTEX frequencies. All transmissions on NAVTEX 518 Kilohertz (kHz), the international channel, are in English. NAVTEX 518kHz provides the mariner (both recreational and commercial) with weather forecasts, severe weather warnings and navigation warnings such as obstructions or buoys off station. Depending on the user's location, other information options may be available such as ice warnings for high latitude sailing.

261. The 490kHz national NAVTEX service may be transmitted in the local language. In the UK full use is made of this secondary frequency including useful information for smaller craft, such as the inshore waters forecast and actual weather observations from weather stations around the coast.

262. Although no specific trials have been undertaken, no significant effect on NAVTEX has been reported to date at operational developments, and therefore no significant impact is anticipated due to the presence of the Proposed Development.

13.5 Global Positioning System

263. Global Positioning System (GPS) is a satellite based navigational system. GPS trials were also undertaken throughout the 2004 trials at North Hoyle Offshore Wind Farm and it was stated that "*no problems with basic GPS reception or positional accuracy were reported during the trials*".

264. The additional tests showed that "*even with a very close proximity of a wind turbine to the GPS antenna, there were always enough satellites elsewhere in the sky to cover for any that might be shadowed by the wind turbine tower*" (MCA and QinetiQ, 2004).

265. Therefore, there are not expected to be any significant impacts associated with the use of GPS systems within or in proximity to the Proposed Development, noting that there have been no reported issues relating to GPS within or in proximity to any operational offshore wind farms to date.

13.6 Electromagnetic Interference

266. A compass, magnetic compass or mariner's compass is a navigational instrument for determining direction relative to the earth's magnetic poles. It consists of a magnetised pointer (usually marked on the north end) free to align itself with the Earth's magnetic field. A compass can be used to calculate heading, used with a sextant to calculate latitude, and with a marine chronometer to calculate longitude.

267. Like any magnetic device, compasses are affected by nearby ferrous materials as well as by strong local electromagnetic forces, such as magnetic fields emitted from power cables. As the compass still serves as an essential means of navigation in the event of power loss or as a secondary source, it is important that potential impacts from Electromagnetic Field (EMF) are minimised to ensure continued safe navigation.

268. The vast majority of commercial traffic uses non-magnetic gyrocompasses as the primary means of navigation, which are unaffected by EMF. Therefore, it is considered highly unlikely that any interference from EMF as a result of the presence the Proposed Development will have a significant impact on vessel navigation. However, some smaller craft (fishing or leisure) may rely on it as their sole means of navigation.

13.6.1 Sub-Sea Cables

269. The sub-sea cables for the Proposed Development will be Alternating Current (AC), with studies indicating that AC does not emit an EMF significant enough to impact marine magnetic compasses (Convention for the Protection of the

Marine Environment of the North-East Atlantic (OSPAR), 2008). Therefore, electromagnetic interference due to cables associated with the Proposed Development are not considered any further.

13.6.2 Wind Turbine Generators

270. MGN 654 (MCA, 2021) notes that small vessels with simple magnetic steering and hand bearing compasses should be wary of using these close to WTGs as with any structure in which there is a large amount of ferrous material (MCA and QinetiQ, 2004). Potential effects are deemed to be within acceptable levels when considered alongside other mitigation such as the mariner being able to make visual observations (not wholly reliant on the magnetic compass), lighting, sound signals and identification marking in line with MGN 654.

13.6.3 Experience at Operational Offshore Wind Farms

271. No issues with respect to magnetic compasses have been reported to date in any of the trials (MCA and QinetiQ, 2004) undertaken (inclusive of SAR helicopters) nor in any published reports from operational offshore wind farms.

13.7 Marine Radar

272. This section summarises the results of trials and studies undertaken in relation to Radar effects from offshore wind farms in the UK. It is important to note that since the time of the trials and studies discussed, WTG technology has advanced significantly, most notably in terms of the size of WTGs available to be installed and utilised. The use of these larger WTGs allows for a greater spacing between WTGs than was achievable at the time of the studies being undertaken, which is beneficial in terms of Radar interference effects (and surface navigation in general) as detailed below.

13.7.1 Trials

273. During the early years of offshore renewables within the UK, maritime regulators undertook a number of trials (both shore-based and vessel-based) into the effects of WTGs on the use and effectiveness of marine Radar.

274. In 2004 trials undertaken at the North Hoyle Offshore Wind Farm (MCA, 2004) identified areas of concern regarding the potential impact on marine- and shore-based Radar systems due to the large vertical extents of the WTGs (based on the technology at that time). This resulted in Radar responses strong enough to produce interfering side lobes and reflected echoes (often referred to as false targets or ghosts).

275. Side lobe patterns are produced by small amounts of energy from the transmitted pulses that are radiated outside of the narrow main beam. The effects of side lobes are most noticeable within targets at short range (below 1.5nm) and with large objects. Side lobe echoes form either an arc on the

Radar screen similar to range rings, or a series of echoes forming a broken arc, as illustrated in Figure 13.1.

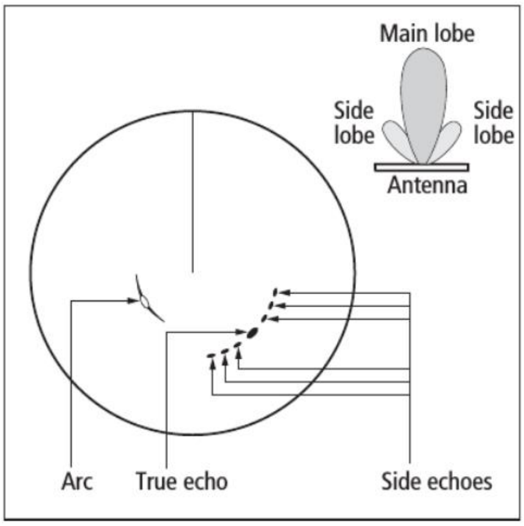

Figure 13.1 Illustration of side lobes on Radar screen

276. Multiple reflected echoes are returned from a real target by reflection from some object in the Radar beam. Indirect echoes or 'ghost' images have the appearance of true echoes but are usually intermittent or poorly defined; such echoes appear at a false bearing and false range, as illustrated in Figure 13.2.

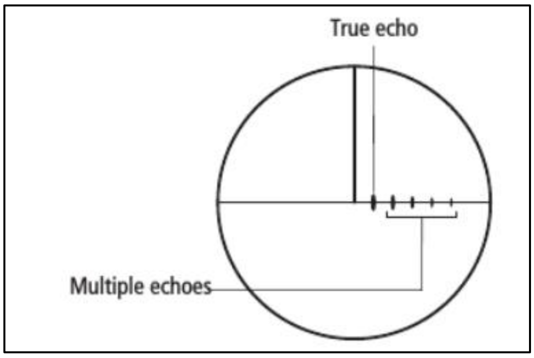

Figure 13.2 Illustration of multiple reflected echoes on Radar screen

277. Based on the results of the North Hoyle trials, the MCA produced a Shipping Route Template designed to give guidance to mariners on the distances which should be established between shipping routes and offshore wind farms. However, as experience of effects associated with use of marine Radar in proximity to offshore wind farms grew, the MCA refined their guidance, offering more flexibility within the most recent Shipping Route Template contained within MGN 654 (MCA, 2021).

278. A second set of trials conducted at Kentish Flats Offshore Wind Farm in 2006 on behalf of the British Wind Energy Association (BWEA) – now called RenewableUK (BWEA, 2007) – also found that Radar antennas which are

sited unfavourably with respect to components of the vessel's structure can exacerbate effects such as side lobes and reflected echoes. Careful adjustment of Radar controls suppressed these spurious Radar returns but mariners were warned that there is a consequent risk of losing targets with a small Radar cross section, which may include buoys or small craft, particularly yachts or Glass Reinforced Plastic (GRP) constructed craft; therefore due care should be taken in making such adjustments.

279. Theoretical modelling of the effects of the development of the proposed Atlantic Array Offshore Wind Farm, which was to be located off the south coast of Wales, on marine Radar systems was undertaken by the Atlantic Array project (Atlantic Array, 2012) and considered a wider spacing of WTGs than that considered within the early trials[3]. The main outcomes of the modelling were the following:

- Multiple and indirect echoes were detected under all modelled parameters;
- The main effects noticed were stretching of targets in azimuth (horizontal) and appearance of ghost targets;
- There was a significant amount of clear space amongst the returns to ensure recognition of vessels moving amongst the WTGs and safe navigation;
- Even in the worst case with Radar operator settings artificially set to be poor, there is significant clear space around each WTG that does not contain any multipath or side lobe ambiguities to ensure safe navigation and allow differentiation between false and real (both static and moving) targets;
- Overall it was concluded that the amount of shadowing observed was very little (noting that the model considered lattice-type foundations which are sufficiently sparse to allow Radar energy to pass through);
- The lower the density of WTGs the easier it is to interpret the Radar returns and fewer multipath ambiguities are present;
- In dense, target rich environments S-Band Radar scanners suffer more severely from multipath effects in comparison to X-Band Radar scanners;
- It is important for passing vessels to keep a reasonable separation distance between the WTGs in order to minimise the effect of multipath and other ambiguities;
- The Atlantic Array study undertaken in 2012 noted that the potential for Radar interference was mainly a problem during periods of reduced visibility when mariners may not be able to visually confirm the presence of other vessels in proximity (those without AIS installed which are usually fishing and recreational craft). It is noted that this situation would arise with or without WTGs in place; and
- There is potential for the performance of a vessel's ARPA to be affected when tracking targets in or near the array. Although greater vigilance is

[3] It is acknowledged that other theoretical analysis has been undertaken.

required, during the Kentish Flats trials it was shown that false targets were quickly identified as such by the mariners and then by the equipment itself.

280. In summary, experience in UK waters has shown that mariners have become increasingly aware of any Radar effects as more offshore wind farms become operational. Based on this experience, the mariner can interpret the effects correctly, noting that effects are the same as those experienced by mariners in other environments such as in close proximity to other vessels or structures. Effects can be effectively mitigated by "*careful adjustment of Radar controls*".

281. The MCA has also produced guidance to mariners operating in proximity to OREIs in the UK which highlights Radar issues amongst others to be taken into account when planning and undertaking voyages in proximity to OREIs (MCA, 2008). The interference buffers presented in Table 13-1 are based on MGN 654 (MCA, 2021), MGN 371 (MCA, 2008), MGN 543 (MCA, 2016) and MGN 372 (MCA, 2008).

Table 13-1 Distances at which impacts on marine Radar occur

Distance at Which Effect Occurs (nm)	Identified Effects
0.5	▪ Intolerable impacts can be experienced. ▪ X-Band Radar interference is intolerable under 0.25nm. ▪ Vessels may generate multiple echoes on shore-based Radars under 0.45nm.
1.5	▪ Under MGN 654, impacts on Radar are considered to be tolerable with mitigation between 0.5 and 3.5nm. ▪ S-band Radar interference starts at 1.5nm. ▪ Echoes develop at approximately 1.5nm, with progressive deterioration in the Radar display as the range closes. Where a main vessel route passes within this range considerable interference may be expected along a line of WTGs. ▪ The WTGs produce strong Radar echoes giving early warning of their presence. ▪ Target size of the WTG echo increases close to the WTG with a consequent degradation on both X and S-Band Radars.

282. As noted in Table 13-1, the onset range from the WTGs of false returns is approximately 1.5nm, with progressive deterioration in the Radar display as the range closes. If interfering echoes develop, the requirements of the Convention on International Regulations for Preventing Collisions at Sea (COLREGs) *Rule 6 Safe Speed* are particularly applicable and must be observed with due regard to the prevailing circumstances (IMO, 1972/77). In restricted visibility, *Rule 19 Conduct of Vessels in Restricted Visibility* applies

and compliance with *Rule 6* becomes especially relevant. In such conditions mariners are required, under *Rule 5 Look-out* to take into account information from other sources which may include sound signals and VHF information, for example from a VTS or AIS (MCA, 2016).

13.7.2 Experience from Operational Developments

283. The evidence from mariners operating in proximity to existing offshore wind farms is that they quickly learn to adapt to any effects. Figure 13.3 presents the example of the Galloper and Greater Gabbard Offshore Wind Farms, which are located in proximity to IMO routeing measures. Despite this proximity to heavily trafficked TSS lanes, there have been no reported incidents or issues raised by mariners who operate within the vicinity. The interference buffers presented in Figure 13.3 are as per Table 13-1.

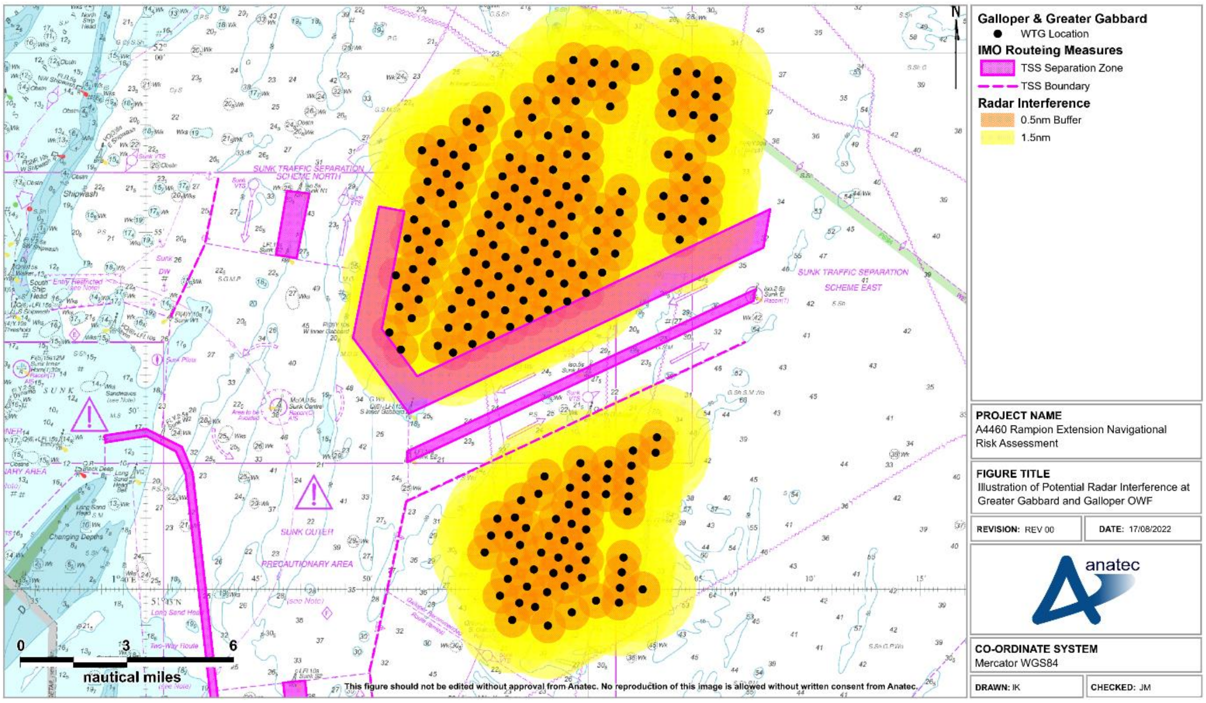

Figure 13.3 Illustration of potential Radar interference at Greater Gabbard and Galloper Offshore Wind Farms

284. As indicated by Figure 13.3, vessels utilising these TSS lanes will experience some Radar interference based on the available guidance. Both developments are operational, and each of the lanes is used by a minimum of five vessels per day on average. However, to date, there have been no incidents recorded (including any related to Radar use) or concerns raised by the users.

285. AIS information can also be used to verify the targets of larger vessels (generally vessels over 15m LOA – the minimum threshold for fishing vessel AIS carriage requirements). Approximately 36% of the vessel traffic recorded within the study area was under 15m LOA, although throughout the vessel

traffic surveys approximately 99% of vessel tracks were recorded on AIS, indicating a high level of AIS take-up among vessels for which AIS carriage is not mandatory.

286. For any smaller vessels, particularly fishing vessels and recreational vessels, AIS Class B devices are becoming increasingly popular and allow the position of these small craft to be verified when in proximity to an offshore wind farm.

13.7.3 Increased Radar Returns

287. Beam width is the angular width, horizontal or vertical, of the path taken by the Radar pulse. Horizontal beam width ranges from 0.75° to 5°, and vertical beam width from 20° to 25°. How well an object reflects energy back towards the Radar depends upon its size, shape and aspect angle.

288. Larger WTGs (either in height or width) will return greater target sizes and/or stronger false targets. However, there is a limit to which the vertical beam width would be affected (20° to 25°) dependent upon the distance from the target, and at closer distances this five degree width would be much further limited. Therefore, increased WTG height in the array will not create any effects in addition to those already identified from existing operational wind farms (interfering side lobes, multiple and reflected echoes). Additionally, the level and way Radar returns occur is not expected to differ significantly for different foundation types (i.e., monopiles and jacket foundations).

289. Again, when taking into consideration the potential options available to marine users (such as reducing gain to remove false returns) and feedback from operational experience, this shows that the effects of increased returns can be managed effectively.

13.7.4 Fixed Radar Antenna Use in proximity to an Operational Wind Farm

290. It is noted that there are multiple operational wind farms including Galloper that successfully operate fixed Radar antenna from locations on the periphery of the array. These antennas are able to provide accurate and useful information to onshore coordination centres.

13.7.5 Application to the Proposed Development

291. Upon development of the Proposed Development, some commercial vessels may pass within 1.5nm of the wind farm structures and therefore may be subject to a minor level of Radar interference. Trials, modelling and experience from existing developments note that any impact can be mitigated by adjustment of Radar controls.

292. Figure 13.4 presents an illustration of potential Radar interference due to the Proposed Development relative to the post wind farm routeing illustrated in Section 15.5.2. The Radar effects have been applied to the indicative array layout introduced in Section 6.2.1.

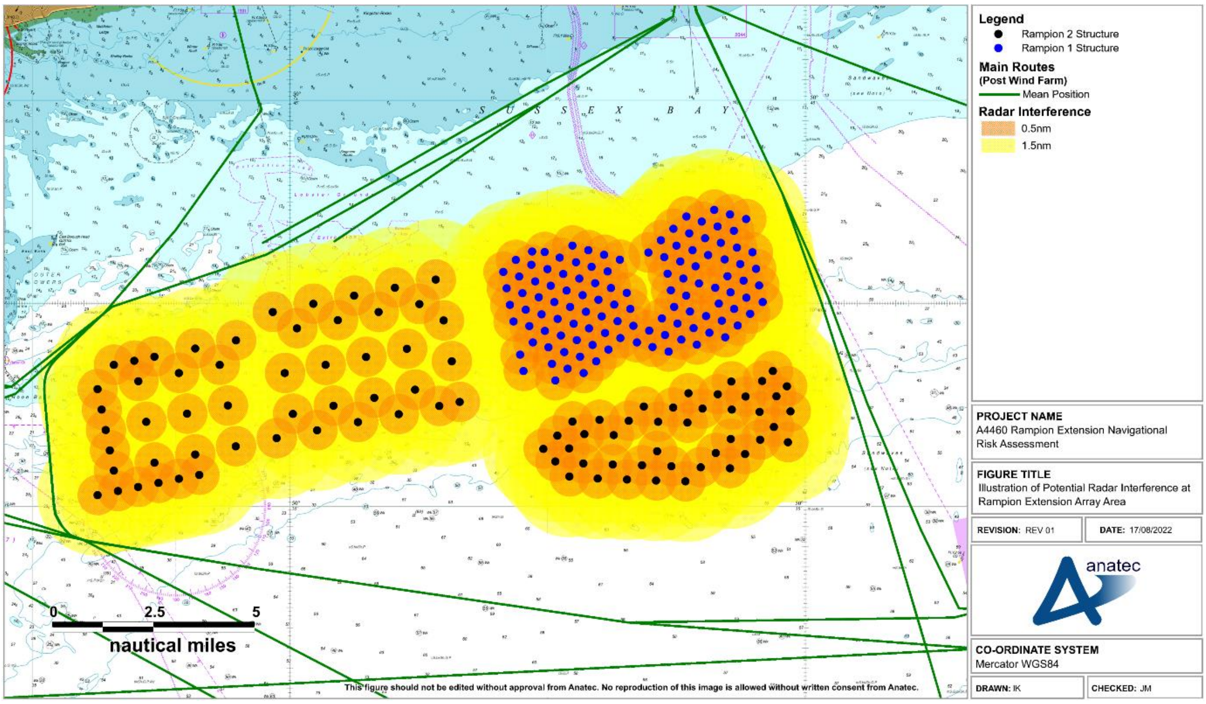

Figure 13.4 Illustration of potential Radar interference at the Proposed Development

293. Vessels passing within the array will be subject to a greater level of interference with impacts becoming more substantial in close proximity to WTGs. This will require additional mitigation by any vessels including consideration of the navigational conditions (visibility) when passage planning and compliance with the COLREGs (IMO, 1972/77) will be essential.

294. In particular, any vessel routeing through the structures exclusion zone located west of Rampion 1 (serving as a navigation corridor) will be exposed to this risk for a greater duration, although careful adjustment of Radar controls should ensure that potential consequences are minimised.

295. Overall, the impact on marine Radar is expected to be low and no further impact upon navigational safety is anticipated outside the parameters which can be mitigated by operational controls.

13.8 Sound Navigation Ranging Systems

296. No evidence has been found to date with regard to existing offshore wind farms to suggest that Sound Navigation Ranging (SONAR) systems produce any kind of SONAR interference which is detrimental to the fishing industry, or to military systems. No impact is therefore anticipated in relation to the presence of the Proposed Development.

13.9 Noise

297. No evidence has been found to date with regard to existing offshore wind farms to suggest that prescribed sound signals are in any way impacted by acoustic noise produced by the wind farm.

13.10 Summary of Potential Effects on Use

298. Based on the detailed technical assessment of the effects due to the presence of the Proposed Development on navigation, communication and position fixing equipment in the previous subsections, Figure 13.2 summarises the assessment of frequency and consequence and the resulting risk for each component of this impact.

Table 13-2 Summary of risk to navigation, communication and position fixing equipment

Topic	Frequency	Consequence	Significance of Risk
VHF	Negligible	Minor	Broadly Acceptable
VHF DF	Extremely Unlikely	Minor	Broadly Acceptable
AIS	Negligible	Minor	Broadly Acceptable
NAVTEX	Negligible	Minor	Broadly Acceptable
GPS	Negligible	Minor	Broadly Acceptable
EMF	Extremely Unlikely	Negligible	Broadly Acceptable
Marine Radar	Remote	Minor	Broadly Acceptable
SONAR	Negligible	Minor	Broadly Acceptable
Noise	Negligible	Minor	Broadly Acceptable

299. On the basis of these findings, associated risks are screened out of the risk assessment undertaken in Section 18, 20 and 21.

14 Cumulative and Transboundary Overview

300. Cumulative risks have been considered for activities in combination and cumulatively with the Proposed Development. This section provides an overview of the baseline used to inform the cumulative risk assessment including the pre wind farm vessel routeing and developments and proposed developments screened into the cumulative risk assessment based upon the criteria outlined in Section 3.3. Given the unique nature of shipping and navigation users the bespoke tiering system outlined in Section 3.3 has been applied.

301. It is noted that port developments (and specifically the subsequent changes in vessel traffic movements) are considered as part of the future case vessel traffic (see Section 15).

14.1 Screened in Other Developments

14.1.1 Other Offshore Wind Farms and Tidal Energy

302. Other offshore wind farms (operational or under construction) located within the English Channel include Rampion 1 as well as the Fécamp Offshore Wind Farm and Calvados Offshore Wind Farm, which each commenced construction in 2022 and is located off the French Normandy and Picardy coast. Both of these developments are therefore considered as part of the baseline.

303. As shown in Figure 14.1, there is also a consented offshore wind farm – Dieppe-Le Tréport – located south-east of the Proposed DCO Limits in French waters – which is expected to commence offshore construction in 2023. Additionally, an area of search is established for Contentin Centre Manche, located south of the Proposed DCO Limits in French waters.

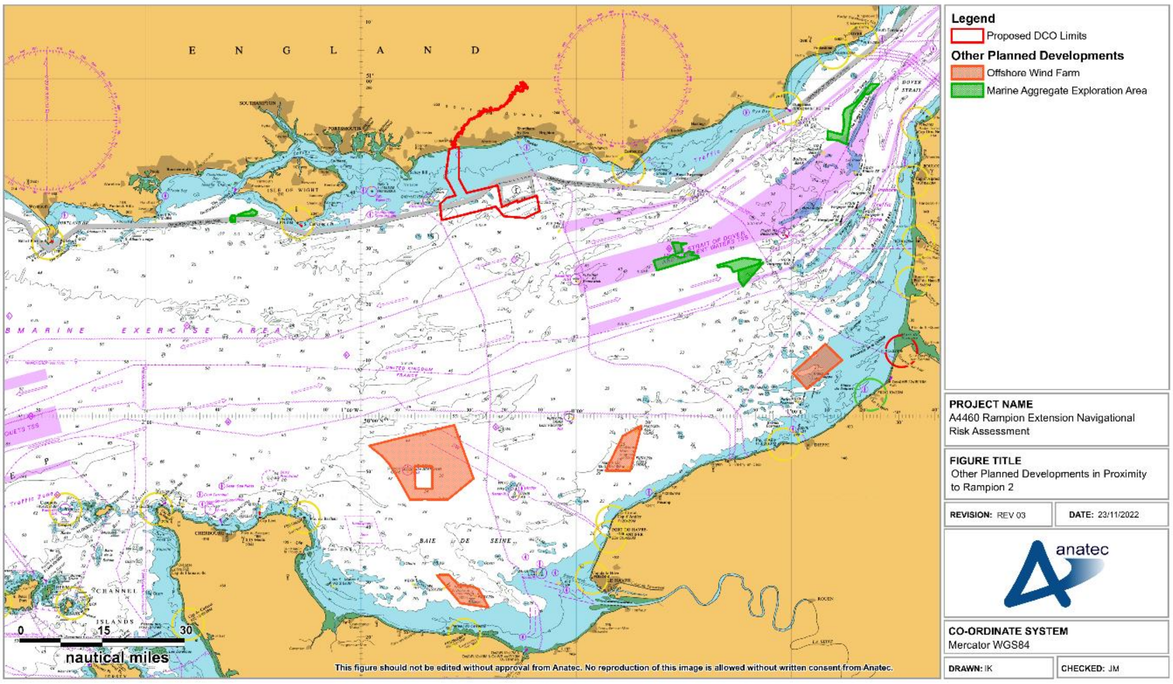

Figure 14.1 Other developments in proximity to the Proposed Development

304. Dieppe-Le Tréport and Contentin Centre Manche are located within 60nm of the Proposed DCO Limits. However, given the respective locations of these developments are clear of the main French destination ports detected in the main commercial routeing in proximity to the Proposed Development, there is likely to be limited interaction with traffic which may be displaced by the array area. Thus, these developments are screened out of the cumulative risk assessment.

305. Additionally, the Perpetuus Tidal Energy Centre (PTEC) is located approximately 26nm from the Proposed DCO Limits (not shown in Figure 14.1). However, as with the offshore wind farms discussed above, the location of this development is in nearshore waters off the south coast of the Isle of Wight where vessel traffic volumes are low and there is likely to be limited interaction with traffic which may be displaced by the array area. Thus, this development is screened out of the cumulative risk assessment.

306. Therefore, there are no offshore wind farms or tidal energy developments screened in to the cumulative risk assessment.

14.1.2 Oil and Gas Infrastructure

307. There is no existing or planned oil and gas infrastructure located within the English Channel.

308. Therefore, there is no oil and gas infrastructure screened into the cumulative risk assessment.

14.1.3 Marine Aggregate Dredging Areas

309. There are a number of existing or planned marine aggregate dredging areas located within the English Channel. The majority of these are production areas (including those located near the Owers Bank and south-east of the Isle of Wight) and are therefore considered as part of the baseline assessment (see Section 7.3).

310. There are two exploration areas located within the Dover Strait TSS which are between 15 and 30nm from the Proposed DCO Limits; however, since these areas are located within the separation zone of the TSS there is limited interaction with traffic which may be displaced by the array area and they are therefore screened out of the cumulative risk assessment.

311. There are a further three exploration areas located south-west of the Isle of Wight, within the Dover Strait TSS and within the ITZ; however, since these areas are greater than 30nm from the Proposed DCO Limits, they are screened out of the cumulative risk assessment.

312. Therefore, there are no marine aggregate dredging areas screened into the cumulative risk assessment.

14.2 Cumulative Routeing

313. Since no developments have been screened into the cumulative risk assessment, it is not necessary to consider routeing in a wider study area (than the 10nm buffer of the Proposed DCO Limits considered for routeing in proximity to the Proposed Development in isolation).

15 Future Case Vessel Traffic

15.1 Increases in Commercial Vessel Activity

314. During consultation, the Littlehampton Harbour Board noted that the upcoming construction of the A27 Arundel bypass and replacement of the harbour entrance breakwaters may lead to a significant increase in traffic volumes associated with Littlehampton Harbour. Noting that such activities would be short-term in duration and that commercial vessel activity out of Littlehampton Harbour is very low currently, it is not anticipated that overall vessel traffic levels in the area will be affected substantially by the construction works.

315. Given the uncertainty associated with long-term predictions of vessel traffic growth including the potential for any other new developments in UK or transboundary ports and the long-term effects of Brexit, two conservative and independent scenarios of potential growth in commercial vessel movements of 10% and 20% has been estimated throughout the lifetime of the Proposed Development.

15.2 Increases in Commercial Fishing Vessel and Recreational Vessel Activity

316. There is similar uncertainty associated with long-term predictions for commercial fishing vessel and recreational vessel transits given the limited reliable information on future trends upon which any firm assumption could be made. There are also no known major developments which would increase commercial fishing or recreational vessel activity in the region.

317. Therefore, a conservative potential growth in commercial fishing vessel and recreational vessel movements of 10% and 20% has been estimated throughout the lifetime of the Proposed Development. Changes in fishing activity are considered further in **Chapter 10**.

15.3 Increases in Traffic Associated with the Proposed Development Operations

318. During the construction phase up to 2,413 return trips will be made by vessels involved in the installation of the Proposed Development (see Section 6.5.1). During the operation and maintenance phase up to 1,126 return trips per year will be made by vessels involved in the operation and maintenance of the Proposed Development (see Section 6.5.3).

15.4 Changes in Marine Aggregate Dredging Activities

319. As indicated in Section 7.3, there are a number of marine aggregate dredging areas in proximity to the Proposed DCO Limits. All such areas are active and the current baseline indicates a substantial number of vessel traffic

movements directly associated with such areas. In the future these areas may be discontinued, thus reducing the number of associated vessel traffic movements. Likewise, new marine aggregate dredging areas may be designated (noting that no exploration areas currently exist with the next TCE marine aggregate tender round for England and Wales scheduled for during 2021/22 (TCE, 2020)).

320. Given the lack of publicly available information on future changes to the marine aggregate dredging environment, no changes are considered in the future baseline, noting that marine aggregate dredgers are included in the 10% and 20% growth of commercial vessel movements described above.

15.5 Commercial Traffic Routeing (the Proposed Development in Isolation)

15.5.1 Methodology

321. It is not possible to consider all potential alternative routeing options for commercial traffic and therefore worst-case alternatives have been considered where possible in consultation with operators. Assumptions for re-routeing include:

- All alternative routes maintain a minimum mean distance of 1nm from offshore installations and existing offshore wind farm boundaries in line with industry experience. This distance is considered for shipping and navigation from a safety perspective as explained below; and
- All mean routes take into account sandbanks, aids to navigation and known routeing preferences.

322. Annex 2 of MGN 654 defines a methodology for assessing passing distance from offshore wind farm boundaries (the Shipping Route Template) but states that it is "*not a prescriptive tool but needs intelligent application*".

323. To date, internal and external studies undertaken by Anatec on behalf of the UK Government and individual clients show that vessels do pass consistently and safely within 1nm of established offshore wind farms (including between distinct developments) and these distances vary depending upon the sea room available as well as the prevailing conditions. This evidence also demonstrates that the Mariner defines their own safe passing distance based upon the conditions and nature of the traffic at the time, but they are shown to frequently pass 1nm off established developments. Evidence also demonstrates that commercial vessels do not transit through arrays.

324. The NRA also aims to establish the MDS based on navigational safety parameters, and when considering this the most conservative realistic scenario for vessel routeing is considered to be when main commercial routes pass 1nm off developments. Evidence collected during numerous assessments at an industry level confirms that it is a safe and reasonable

distance for vessels to pass; however, it is likely that a large number of vessels would instead choose to pass at a greater distance depending upon their own passage plan and the current conditions.

15.5.2 Main Commercial Route Deviations

325. An illustration of the anticipated worst-case shift in the mean positions of the main commercial routes within the study area following the development of the Proposed Development is presented in Figure 15.1. These deviations are based on Anatec's assessment of the MDS including the indicative array layout presented in Section 6.2.1.

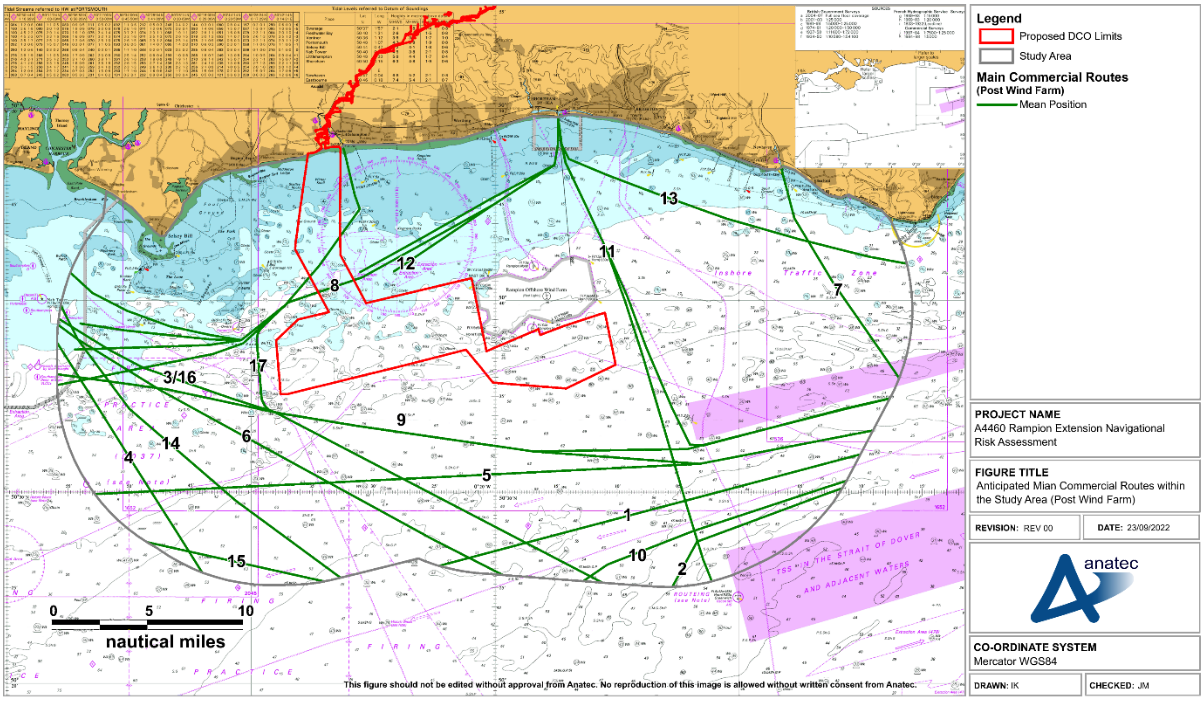

Figure 15.1 Anticipated main commercial routes within study area (post wind farm)

326. Deviations from the pre wind farm scenario would be required for five out of the 17 main commercial routes identified, with the level of deviation varying between an increase of less than 0.1nm for Route 9 and a 12.5nm increase for Route 17. For the displaced routes, the increase in distance from the pre wind farm scenario is presented in Table 15-1.

Table 15-1 Summary of post wind farm main commercial route deviations within study area

Route number	Average vessels per day	Change in route length (nm)
3	5	0.2
8	2	0.1

Route number	Average vessels per day	Change in route length (nm)
9	1 to 2	< 0.1
16	0 to 1	2.0
17	Monthly	12.5

15.6 Commercial Traffic Routeing (Cumulative)

327. Since no developments have been screened into the cumulative risk assessment, it is not necessary to consider additional main commercial route deviations at a cumulative level. In essence, the future case movement of commercial traffic for the cumulative scenario can be considered equivalent to that determined for the assessment of the Proposed Development in isolation.

16 Collision and Allision Risk Modelling

328. To inform the risk assessment, a quantitative assessment of some of the major hazards associated with the Proposed Development has been undertaken. The following subsections outline the inputs and methodology used for the collision and allision risk modelling.

16.1 Hazards Under Consideration

329. Hazards considered in the quantitative assessment are as follows:

- Increased vessel to vessel collision risk;
- Increased powered vessel to structure allision risk;
- Increased drifting vessel to structure allision risk; and
- Increased fishing vessel to structure allision risk.

330. The pre wind farm assessment has been informed by the vessel traffic survey data (see Section 10) in combination with the outputs of consultation (see Section 4) and other baseline data sources (such as Anatec's ShipRoutes database and the NRA for Rampion 1 (Anatec, 2012). Conservative assumptions have been made with regard to route deviations and future shipping growth over the lifetime of the Proposed Development.

16.2 Scenarios Under Consideration

331. For each element of the quantitative assessment both a pre and post wind farm scenario with base and future case vessel traffic levels have been considered. As a result, six distinct scenarios have been modelled:

- Pre wind farm with base case traffic levels;
- Pre wind farm with a 10% increase in future case traffic levels;
- Pre wind farm with a 20% increase in future case traffic levels;
- Post wind farm with base case traffic levels;
- Post wind farm with a 10% increase in future case traffic levels; and
- Post wind farm with a 20% increase in future case traffic levels.

332. The results of the base case scenarios are detailed in full in the following subsections with the equivalent results for the future case scenarios provided in Section 16.6.

16.3 Post Wind Farm Routeing

333. The methodology for determining the post wind farm routeing is outlined in Section 15.

16.4 Pre Wind Farm Modelling

16.4.1 Vessel to Vessel Encounters

334. An assessment of current vessel to vessel encounters has been undertaken by replaying at high speed the vessel traffic data collected as part of the vessel traffic surveys (see Section 7.1). The model defines an encounter as two vessels passing within 1nm of each other within the same minute. This helps to illustrate where existing shipping congestion is highest and therefore where offshore developments, such as an offshore wind farm, could potentially increase congestion and therefore also increase the risk of encounters and collisions. No account of whether encounters are head on or stern to head are given; only close proximity is accounted for.

335. Figure 16.1 presents a heat map based upon the geographical distribution of vessel encounter tracks within a density grid.

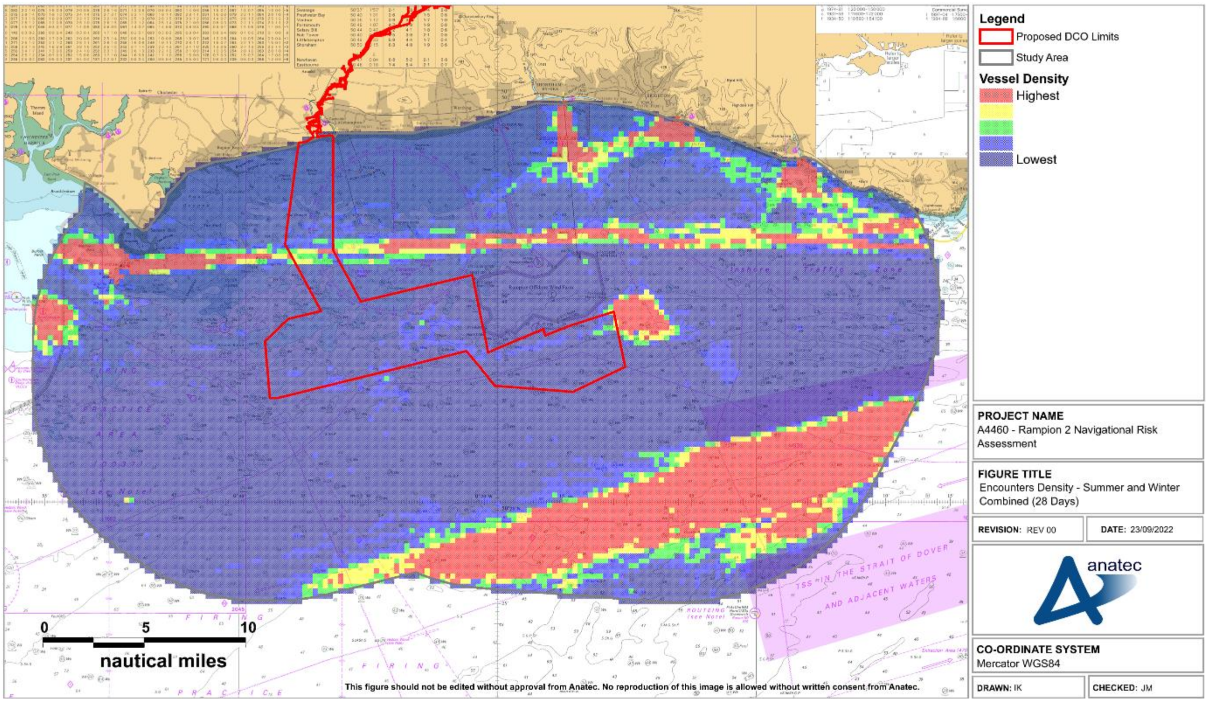

Figure 16.1 Encounters density – summer and winter combined (28 days)

336. There was on average 264 encounters per day within the study area throughout the survey periods, largely due to routeing within the Dover Strait TSS. The greatest number of encounters recorded on one day was 721, on 4 November 2020, on which a high number of recreational vessels were involved.

337. The most frequent vessel types involved in encounters during the survey period were recreational vessels (37%), fishing vessels (20%), and cargo vessels (19%), with the majority of cargo vessel encounters recorded within the Dover Strait TSS routes, while fishing vessel and recreational vessel

encounters were primarily recorded in near shore areas or in the vicinity of the array area.

16.4.2 Vessel to Vessel Collisions

338. Using the pre wind farm vessel routeing as input, Anatec's COLLRISK model has been run to estimate the existing vessel to vessel collision risk in proximity to the Proposed Development. The route positions and widths are based on the vessel traffic survey data and has validated with the long-term vessel traffic data and consultation with local stakeholders.

339. A heat map based upon the geographical distribution of collision risk within a 0.25×0.25nm grid for the base case is presented in Figure 16.2.

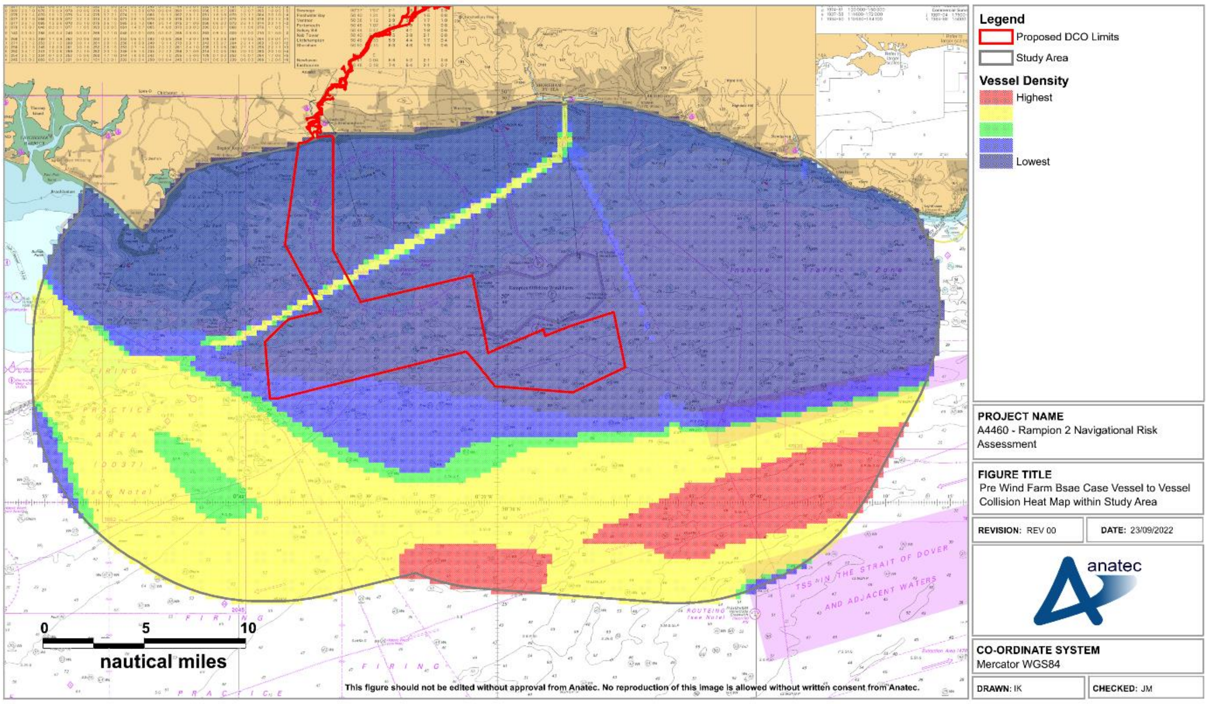

Figure 16.2 Pre wind farm base case vessel to vessel collision risk heat map within study area

340. Assuming base case vessel traffic levels, the annual collision frequency pre wind farm was estimated to be 1.03×10^{-1}, corresponding to a return period of approximately one in 9.7 years. This is a relatively high return period compared to that estimated in the pre wind farm scenario for other UK offshore wind farm developments and is reflective of the high volume of vessel traffic in the area, particularly within and out of the Dover Strait TSS and out of the Solent.

341. It is noted that the model is calibrated based upon major incident data at sea which allows for benchmarking but does not cover all incidents, such as minor impacts. Other incident data, which includes minor incidents, is presented in Section 9.

16.5 Post Wind Farm

16.5.1 Simulated Automatic Identification System

342. Anatec's AIS Simulator software was used to gain an insight into the potential re-routed commercial traffic following the installation of the wind farm structures within the array area. The AIS Simulator uses the mean positions of identified commercial main routes within the study area and the anticipated shift post wind farm, together with the standard deviations and average number of vessels on each commercial main route to simulate tracks.

343. A plot of 28 days of simulated AIS (to match the total duration of the vessel traffic surveys) within the study area based on the deviated main commercial routes is presented in Figure 16.3.

344. It is noted that the simulated AIS represents an MDS based on a mean 1nm passing distance from the array area for routes.

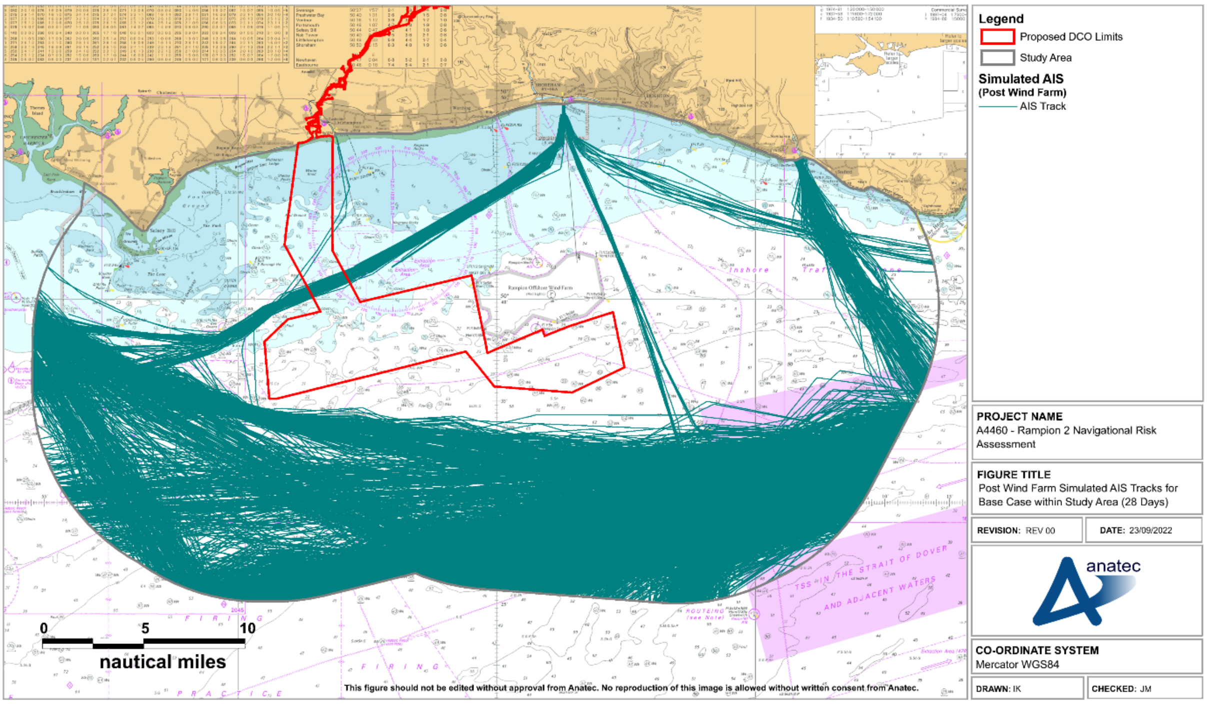

Figure 16.3 Post wind farm simulated AIS tracks for base case within study area (28 days)

16.5.2 Vessel to Vessel Collisions

345. Using the post wind farm routeing as input, Anatec's COLLRISK model has been run to estimate the anticipated vessel to vessel collision risk in proximity to the Proposed Development.

346. A heat map based upon the geographical distribution of collision risk within a 0.25×0.25nm grid for the base case is presented in Figure 16.2.

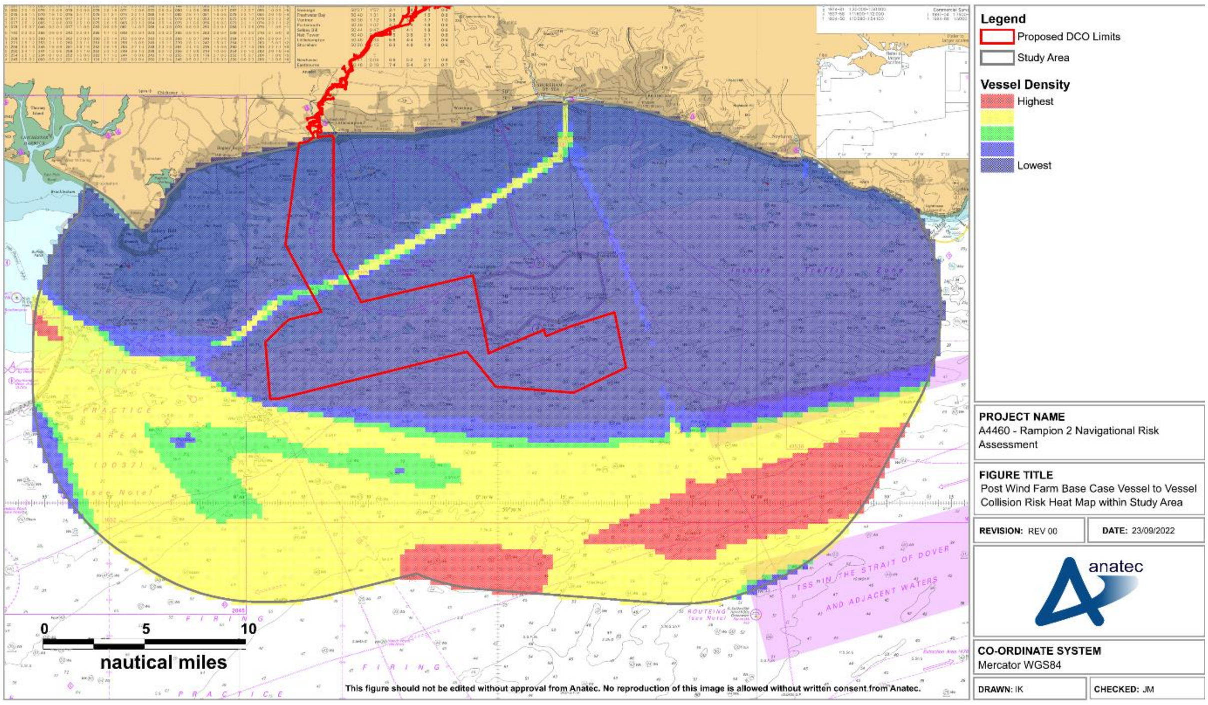

Figure 16.4 Post wind farm base case vessel to vessel collision risk heat map within study area

347. Assuming base case vessel traffic levels, the annual collision frequency post wind farm was estimated to be 1.04×10^{-1}, corresponding to a return period of approximately one in 9.6 years. This represents a 1% increase in collision frequency compared to the pre wind farm base case result.

348. The increase in vessel to vessel collision risk was greatest close to the western extent of the Proposed DCO Limits where several main commercial routes were deviated to pass around the array area, effectively extending the area within which the high collision risk out of the Solent applies. Changes in collision risk associated with the deviation of main commercial routes out of Shoreham Port passing around the eastern edge or west of the array area was relatively small given the much lower volume of traffic associated with these routes.

16.5.3 Powered Vessel to Structure Allision

349. Based upon the vessel routeing identified in the study area, the anticipated re-routeing as a result of the presence of the Proposed Development, and assumptions that relevant embedded mitigation measures are in place (see Section 24), the frequency of an errant vessel under power deviating from its route to the extent that it came into proximity with a wind farm structure associated with the Proposed Development is considered to be low.

350. From consultation with the shipping industry, it is also assumed that commercial vessels would be highly unlikely to navigate between wind farm structures due to the restricted sea room and will instead be directed by the

aids to navigation located in the region and those present at the Proposed Development. During the construction and decommissioning phases this will primarily consist of the buoyed construction area whilst during the operation and maintenance phase this will primarily consist of the lighting and marking of the wind farm structures themselves.

351. Using the post wind farm routeing as input, together with the worst-case indicative array layout and local meteorological ocean data, Anatec's COLLRISK model was run to estimate the likelihood of a commercial vessel alliding with one of the wind farm structures within the array area whilst under power. In order to maintain an MDS, the model did not consider one structure shielding another.

352. A plot of the annual powered allision frequency per structure for the base case is presented in Figure 16.5, with the chart background removed to increase the visibility of those structures with lower allision frequencies.

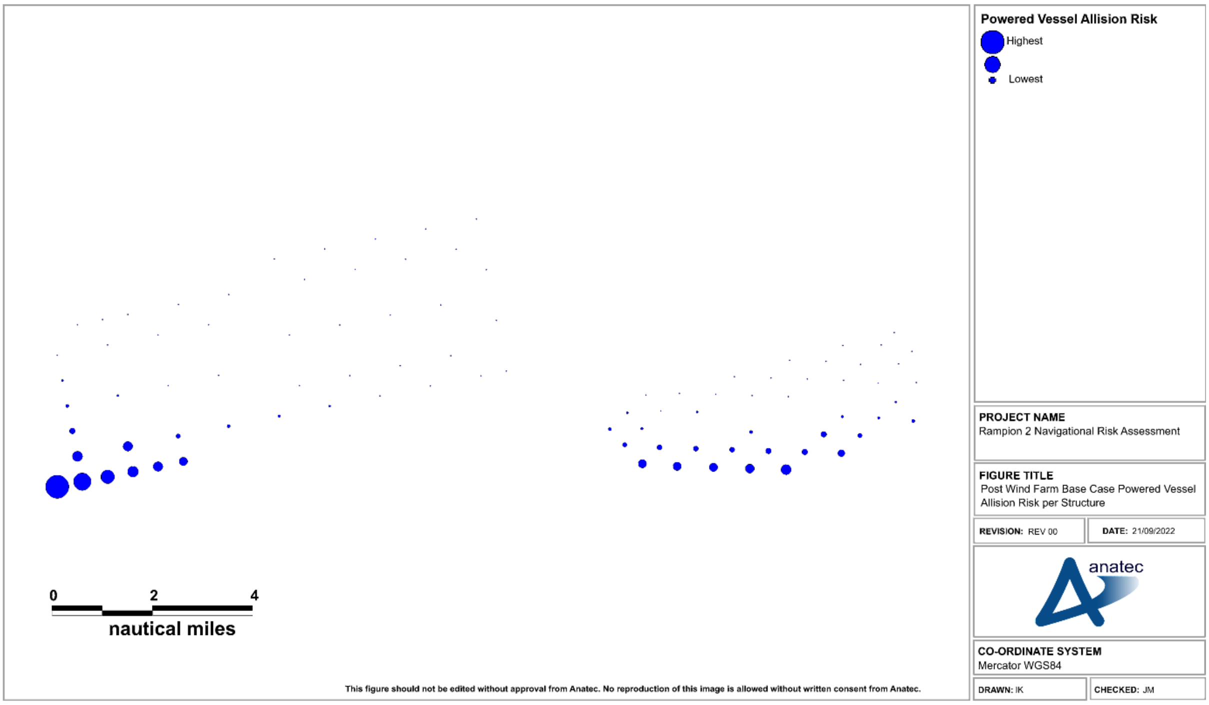

Figure 16.5 Base case powered allision risk per structure

353. Assuming base case vessel traffic levels, the annual powered allision frequency was estimated to be 2.17×10^{-3}, corresponding to a return period of approximately one in 460 years.

354. The greatest powered vessel to structure allision risk was associated with structures at the western extent of the array area where multiple main commercial routes pass at the minimum mean distance from the array area (1nm) headed into the Solent. The greatest individual allision risk was associated with the structure on the south-western edge of the array area (approximately 4.03×10^{-4} or one in 2,484 years).

16.5.4 Drifting Vessel to Structure Allision

355. Using the post wind farm routeing as input, together with the worst-case indicative array layout and local meteorological ocean data, Anatec's COLLRISK model was run to estimate the likelihood of a commercial vessel alliding with one of the wind farm structures within the array area. The model is based on the premise that propulsion on a vessel must fail before drifting will occur. The model takes account of the type and size of the vessel, the number of engines and the average time required to repair but does not consider navigational errors caused by human actions.

356. The exposure times for a drifting scenario are based upon the vessel hours spent in proximity to the array area (up to 10nm from the array area). These have been estimated based on the vessel traffic levels, speeds, and revised routeing patterns. The exposure is divided by vessel type and size to ensure that these specific factors, which based upon analysis of historical incident data have been shown to influence incident rates, are taken into account for the modelling.

357. Using this information, the overall rate of mechanical failure in proximity to the array area was estimated. The probability of a vessel drifting towards a wind farm structure and the drift speed are dependent on the prevailing wind, wave, and tidal conditions at the time of the incident. Therefore, three drift scenarios were modelled, each using the meteorological ocean data provided in Section 8:

- wind;
- peak spring flood tide; and
- peak spring ebb tide.

358. The probability of vessel recovery from drift is estimated based upon the speed of the drift and hence the time available before arriving at a wind farm structure. Vessels which do not recover within this time are assumed to allide. Conservatively, no account is made for another vessel (including a project vessel) rendering assistance.

359. After modelling the three drifting scenarios, it was established that the flood tide dominated scenario produced the worst-case results. A plot of the annual powered allision frequency per structure for the base case is presented in Figure 16.6, with the chart background removed to increase the visibility of those structures with a low allision frequency.

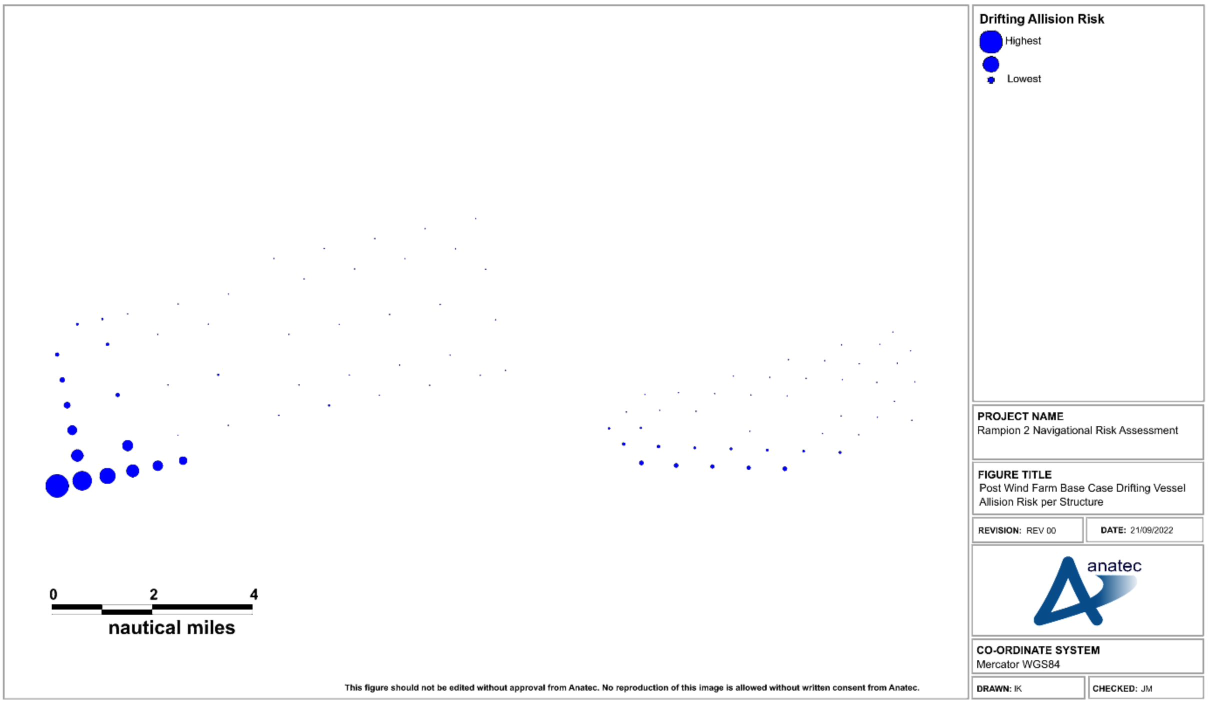

Figure 16.6 Base case drifting allision risk per structure

360. Assuming base case vessel traffic levels, the annual drifting allision frequency was estimated to be 8.64×10^{-4}, corresponding to a return period of approximately one in 1,157 years.

361. The greatest drifting vessel to structure allision risk was again associated with structures at the western extent of the array area where multiple main commercial routes pass at the minimum mean distance from the array area (1nm) headed into the Solent and on the flood tide would drift towards these structures. The greatest individual allision risk was associated with the structure on the south-western edge of the array area (approximately 1.79×10^{-4} or one in 5,580 years).

362. It is noted that historically there have been no reported drifting allision incidents with wind farm structures in the UK. Whilst drifting vessels do occur every year in UK waters, in most cases the vessel has been recovered prior to any allision incident occurring (such as by anchoring, restarting engines, or being taken in tow).

16.5.5 Fishing Vessel to Structure Allision

363. Using the vessel traffic survey data as input, Anatec's COLLRISK model was run to estimate the likelihood of a fishing vessel alliding with one of the wind farm structures within the array area.

364. A fishing vessel allision is classified separately from other allisions since, unlike in the case of the commercial traffic characterised using the main commercial routes, fishing vessels may be either in transit or actively fishing

within the study area. Moreover, fishing vessels could be observed internally within the array in addition to externally. Anatec's COLLRISK model uses vessel numbers, sizes (length and beam), array layout and structure dimensions. The likelihood of a major allision incident has been calibrated against historical maritime incident data and historical AIS vessel traffic data within operational offshore wind farm arrays. Given that not all fishing vessels broadcast on AIS, the vessel density observed is scaled up to account for non-AIS fishing vessels, with the scaling factor dependent on the distance of the array offshore.

365. A plot of the annual fishing vessel allision frequency per structure for the base case is presented in Figure 16.7.

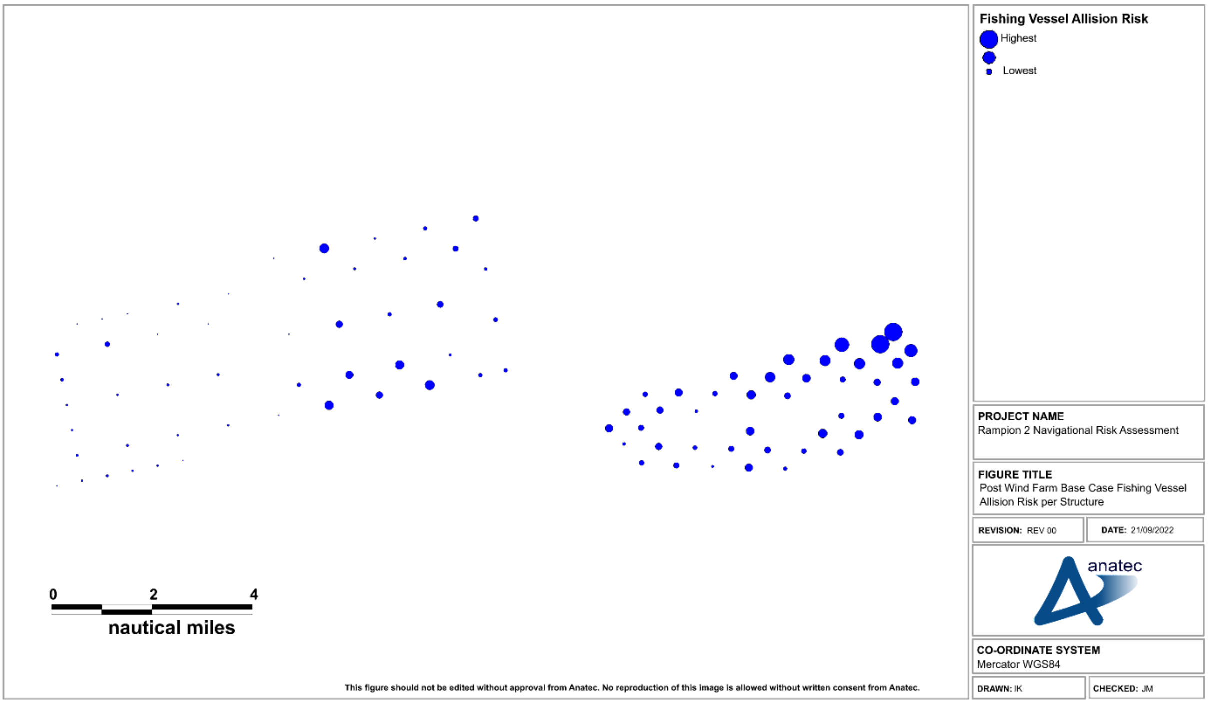

Figure 16.7 Base case fishing vessel allision risk per structure

366. Assuming base case vessel traffic levels, the annual fishing vessel to structure allision frequency was estimated to be 5.01×10^{-1}, corresponding to a return period of approximately one in 2.0 years.

367. The greatest fishing vessel to structure allision risk was associated with structures at the eastern extent of the array area where active fishing activity was observed and west of Rampion 1 where fishing vessels regularly transit north-east to south-west out of Shoreham Port. The greatest individual allision risk was associated with one of the structures on the eastern edge of the array area (approximately 3.37×10^{-2} or one in 30 years).

16.6 Risk Results Summary

368. The previous sections modelled two scenarios, namely the pre and post wind farm scenarios with base case traffic levels. In order to incorporate the potential for future traffic growth pre and post wind farm scenarios each with future case traffic levels have also been modelled. Table 16-1 summarises the results of all six scenarios.

Table 16-1 Risk results summary

Risk	Scenario	Annual Frequency		
		Pre wind farm	Post wind farm	Change
Vessel to vessel collision	Base case	1.03×10^{-1} (1 in 9.7 years)	1.04×10^{-1} (1 in 9.6 years)	1.01×10^{-3} (1 in 970 years)
	Future case (10%)	1.25×10^{-1} (1 in 8.0 years)	1.26×10^{-1} (1 in 7.9 years)	2.29×10^{-2} (1 in 44 years)
	Future case (20%)	1.48×10^{-1} (1 in 6.7 years)	1.50×10^{-1} (1 in 6.6 years)	4.70×10^{-2} (1 in 21 years)
Powered vessel to structure allision	Base case	N/A	2.17×10^{-3} (1 in 460 years)	2.17×10^{-3} (1 in 460 years)
	Future case (10%)	N/A	2.39×10^{-3} (1 in 418 years)	2.39×10^{-3} (1 in 418 years)
	Future case (20%)	N/A	2.61×10^{-3} (1 in 383 years)	2.61×10^{-3} (1 in 383 years)
Drifting vessel to structure allision	Base case	N/A	8.64×10^{-4} (1 in 1,157 years)	8.64×10^{-4} (1 in 1,157 years)
	Future case (10%)	N/A	9.50×10^{-4} (1 in 1,052 years)	9.50×10^{-4} (1 in 1,052 years)
	Future case (20%)	N/A	1.04×10^{-3} (1 in 962 years)	1.04×10^{-3} (1 in 962 years)
Fishing vessel to structure allision	Base case	N/A	5.01×10^{-1} (1 in 2.0 years)	5.01×10^{-1} (1 in 2.0 years)
	Future case (10%)	N/A	5.47×10^{-1} (1 in 1.8 years)	5.47×10^{-1} (1 in 1.8 years)
	Future case (20%)	N/A	5.93×10^{-1} (1 in 1.7 years)	5.93×10^{-1} (1 in 1.7 years)
Total	Base case	**1.03×10^{-1} (1 in 9.7 years)**	**6.08×10^{-1} (1 in 1.6 years)**	**5.05×10^{-1} (1 in 2.0 years)**

Risk	Scenario	Annual Frequency		
		Pre wind farm	**Post wind farm**	**Change**
	Future case (10%)	**1.25×10^{-1} (1 in 8.0 years)**	**6.76×10^{-1} (1 in 1.5 years)**	**5.73×10^{-1} (1 in 1.7 years)**
	Future case (20%)	**1.48×10^{-1} (1 in 6.7 years)**	**7.47×10^{-1} (1 in 1.3 years)**	**6.44×10^{-1} (1 in 1.6 years)**

369. Overall, the collision and allision frequency due to the presence of the Proposed Development was estimated to increase by approximately:

- 1.98×10^{-1} (one incident in 2.0 years) for the base case
- 1.74×10^{-1} (one incident in 1.7 years) for the 10% increase future case; and
- 1.55×10^{-1} (one incident every 1.6 years) for the 20% increase future case.

370. The majority of the risk is associated with fishing vessel to structure allision.

17 Navigation Corridor Safety Case

371. The structures exclusion zones (to be incorporated into the final layout agreed with the MCA and Trinity House) will, as with the rest of the array area, be open to navigation for all vessels. Although not formally designated as a navigation corridor, the structures exclusion zone located west of Rampion 2 may be regularly used by transiting vessels and therefore may be viewed as a navigation corridor for the purposes of this NRA.

372. This section provides a safety case for the navigation corridor based on, where appropriate, a review of the baseline environment, application of corridor related guidance in MGN 654 (MCA, 2021) and consultation feedback. It is noted that commercial risks resulting from the navigation corridor are not considered within the scope of the NRA and are instead discussed in **Chapter 13: Shipping and navigation, Volume 2** of the ES (Document Reference 6.2.13).

17.1 Overview of Navigation Corridor Located West of Rampion 1

373. Figure 17.1 presents an overview of the navigation corridor located west of Rampion 1. For the purposes of this subsection, the Rampion 1 layout is represented by the final array layout as charted and, where appropriate, measurements are given to a point 56m from the Rampion 1 peripheral structures (given the Rampion 1 blade length of 56m and the need to account for blade overfly). The navigation corridor takes a parallelogram shape and is approximately 3.6nm length. The width of the navigation corridor will be a minimum of 1.3nm[4].

[4] The width of the navigation corridor with the worst-case layout for shipping and navigation (introduced in Section 6.2.1) is approximately 1.7nm, this being the worst-case layout for overall vessel displacement, collision risk and allision risk. However, for the purposes of this safety case, the minimum 1.3nm is assumed since this represents the worst-case for use of the navigation corridor specifically.

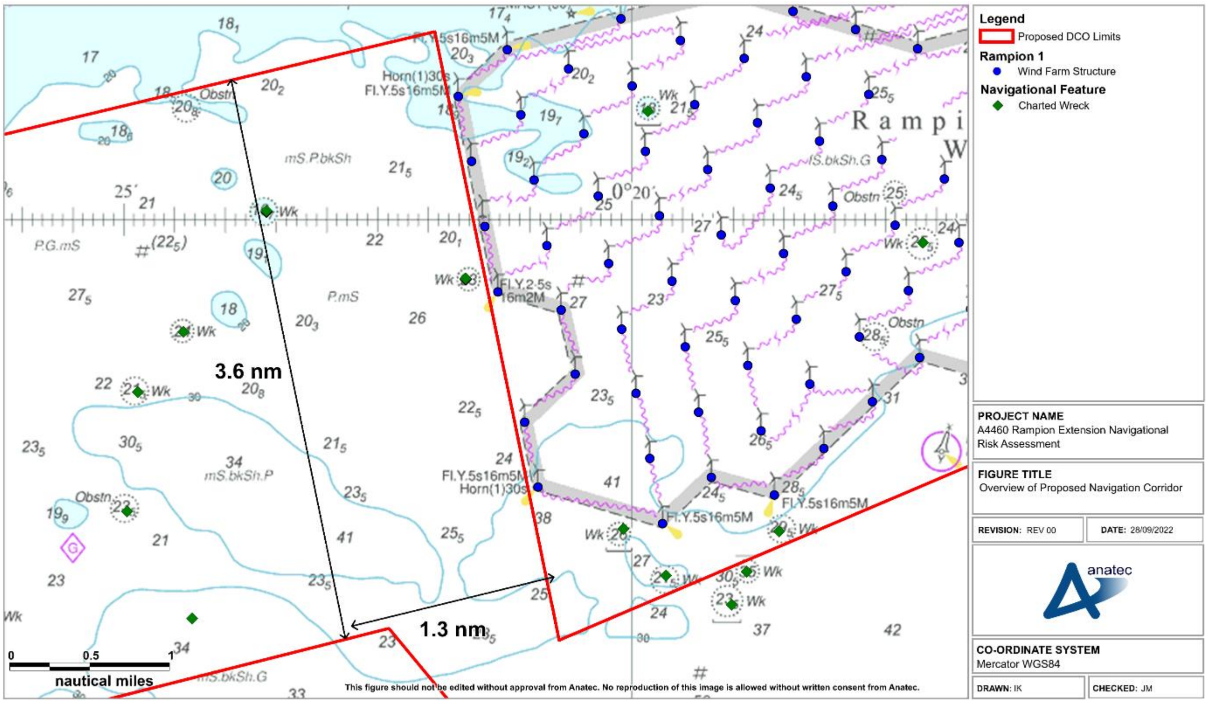

Figure 17.1 Overview of proposed navigation corridor

17.2 Navigational Features

374. The charted water depth below CD within the navigation corridor varies between 16 and 41m. As shown in Figure 17.1, there are two charted wrecks situated within the navigation corridor, at charted depths below CD of 16 and 23m, respectively. There are no sub-sea features (such as cables or pipelines) currently located within the navigation corridor.

375. There are several marine aggregate dredging areas located to the north-west of the navigation corridor, the closest of which is located approximately 1.2nm from the navigation corridor.

17.3 Potential Commercial Users

376. Based on the baseline vessel traffic data, one route (Route 17) has been identified as a potential candidate for regular use of the navigation corridor.

377. Overall, there may be on average one transit every month by potential corridor users on this commercial routes with the length of all vessels on this route being 80m. Conservatively accounting for potential increases in vessel length in the future, a 10% increase has been applied to this value to give a future case 90th percentile vessel length of 88m. This value is considered where appropriate in Section 17.4.

17.4 Application of Marine Guidance Note 654

378. Within MGN 654, various factors are outlined which should be considered when determining the width of a navigation corridor, including in relation to turning, overtaking, meeting and adverse conditions, other traffic, existing sub-sea cables and obstructions and Radar interference. These factors are considered where appropriate in this safety case, with this section focusing on two calculation based elements in particular.

17.4.1 Vessels Overtaking

379. MGN 654 states that:

> *The possibility of ships overtaking cannot be excluded and should be taken into consideration. Consequently, the assumption should be that four ships should safely be able to pass each other… Between overtaking and meeting vessels, a distance of two ship's lengths is normally maintained as a minimum passing distance.*

380. Therefore, based on the 90th percentile length of 88m, the overtaking width for the navigation corridor is 0.29nm (528m)[5], noting that the likelihood of four vessels side by side simultaneously within the corridor is extremely unlikely based on the anticipated traffic volume (see Section 17.3).

17.4.2 Vessels Passing

381. Similarly to vessels overtaking, MGN 654 states that:

> *Between overtaking and meeting vessels, a distance of two ship's lengths is normally maintained as a minimum passing distance.*

382. This represents a less extreme case than the vessels overtaking scenario in Section 17.4.1. Based on the 90th percentile length of 88m, the passing width for the navigation corridor is 176m (0.10nm).

17.4.3 Adverse Conditions

383. Additionally, MGN 654 states that:

> *Experience also shows that in heavy sea conditions it is much harder to turn the vessel around and [it] may not be possible to achieve a dead stop and deviations from track are common. Therefore 20° or more, are common and must be considered in developing corridors through OREIs.*

384. Applying this 20-degree rule to the navigation corridor length of 3.6nm gives a corresponding requirement of 1.3nm.

[5] Four vessels side by side requires three gaps between vessels, therefore a total of six times the 88m vessel length, giving a total overtaking width of 528m.

17.5 Application of International Regulations for Preventing Collisions at Sea

385. The COLREGs are the rules and regulations that help regulate vessel traffic movements throughout the world. It is therefore important that the navigation corridor does not prevent a vessel from being able to comply with these regulations. Although the COLREGs do not make specific provision for a separation between offshore wind farms such as a navigation corridor, they do lay down rules for navigating within a narrow channel which may be somewhat applicable.

386. Rule 9a states:

> *A vessel proceeding along the course of a narrow channel or fairway shall keep as near to the outer limit of the channel or fairway which lies on her starboard side as is safe and practicable.*

387. However, a vessel should not enter the navigation corridor unless it is confident that it can alter course and manoeuvre as required to comply with the collision regulations and avoid a collision.

388. Rule 9b states:

> *A vessel of less than 20m in length or a sailing vessel shall not impede the passage of a vessel which can safely navigate only within a narrow channel or fairway.*

389. Furthermore, Rule 9c states:

> *A vessel engaged in fishing shall not impede the passage of any other vessel navigation within a narrow channel or fairway.*

390. Although the COLREGs give priority to vessels navigating within a narrow channel it is still prudent for the purpose of minimising the navigational risk to consider any dense activity involving relevant small craft.

391. During consultation, Trinity House noted incoming traffic from the Dover Strait TSS to the Solent would have to give way to traffic exiting the navigation corridor under COLREGs Rule 15, thereby potentially increased its allision risk by turning toward the array. However, it was established in consultation with the MCA and Trinity House that the separation distance between the corridor and the TSS traffic provides sufficient sea room (4.7nm) to minimise the allision risk that could potentially arise from the right of way issue.

17.6 Potential Non-Commercial Users

17.6.1 Fishing Vessels

392. From analysis of non-commercial vessel traffic (see Section 10 and Appendix C), it can be seen that fishing vessel activity within and in proximity to the

navigation corridor is substantial and includes both transiting and active fishing, primarily out of Shoreham Port. There is also additional fishing vessel activity out of Littlehampton Harbour. It was noted during consultation that fishing vessels are not comfortable navigating internally within the Rampion 1 array in unfavourable conditions (see Table 4-1). Therefore, in unfavourable conditions, the navigation corridor could be viewed by fishing vessels as a suitable alternative means of navigation, resulting in an increase in vessel traffic within the navigation corridor. It should, be noted, however, that fishing vessels may be more comfortable navigating internally within the array area in unfavourable conditions due to the larger minimum spacing between turbines (830m compared to 750m for Rampion 1) and therefore could mitigate this effect.

393. Ongoing consultation with an appointed Fisheries Liaison Officer (FLO) will ensure that promulgation of information to fishing vessels will maximise awareness of fishing vessels with regard to the navigation corridor and any potential hazards located within (see Table 24-1).

17.6.2 Recreational Vessels

394. From analysis of non-commercial vessel traffic (see Section 10 and Appendix C), it can be seen that recreational vessel activity within and in proximity to the navigation corridor is notable (an average of two to three transits per day during the summer vessel traffic survey) and includes east-west recreational vessel activity passing perpendicular to the navigation corridor. During consultation with the RYA (see Table 4-1), concern was raised regarding the additional collision risk resulting from the need for corridor users to cross this recreational traffic. Given the volume of east-west recreational vessel activity and potential volume of vessels utilising the navigation corridor, there is a low likelihood of an encounter between vessels.

395. Regardless, in such circumstances Rule 9f of COLREGs is relevant:

> *A vessel nearing a bend or an area of narrow channel or fairway where other vessels may be obscured by an intervening obstruction shall navigate with particular alertness and caution and shall sound the appropriate signal prescribed in Rule 34e.*

396. With appropriate application of the COLREGs by both vessels exiting the navigation corridor and crossing recreational vessels, it is anticipated that in the unlikely event of an encounter between vessels it will not develop into a collision situation, particularly noting the large minimum spacing between structures (830m) which will minimise the likelihood of any visual impairment (this is assessed further for Rampion 2 as a whole as part of the risk assessment for collision risk in Section 19.1.3). Moreover, recreational users should have a high level of awareness when navigating in proximity to surface infrastructure such as the Rampion 1 and Rampion 2 structures.

17.7 Project Vessels

397. Project vessels may operate within or in proximity to the navigation corridor, including undertaking installation or maintenance activities for array cables. Such activities may involve project vessels being Restricted in their Ability to Manoeuvre (RAM). However, any project vessel movements or activities will be in line with the embedded mitigation measures including promulgation of information to maximise awareness of project vessel activities in the corridor relating to cable works. Additionally, compliance with the COLREGs by project vessels will further minimise the risk of third-party to project vessel collisions (see Section 24). As illustrated in Section 17.4, there is sufficient width available for vessels to safely pass or overtake within the navigation corridor, and this extends to the case where one of the vessels is a project vessel engaged in installation or maintenance operations.

398. With the mitigation measures in place, it is not anticipated that project vessels will have any detrimental effect on the ability of navigation corridor users to make passage safely.

17.8 Anchored Vessels

399. There is potential for array cables to be constructed within the navigation corridor connecting structures from Rampion 1 and Rampion 2.

400. The closest designated anchorage area to the navigation corridor is located approximately 7.4nm to the north. Based on AIS activity during the survey period, no anchoring activity was observed within the navigation corridor (Section 10.2.8). It is therefore assumed that anchoring would occur only in the unlikely event of an emergency; in such rare circumstances it is expected that vessel Masters will exhibit good seamanship by checking relevant nautical charts prior to dropping anchor.

401. Additionally, the undertaking of the cable burial risk assessment will minimise the likelihood of anchor interaction with a sub-sea cable by informing the burial of the array cables and the appropriate use of external cable protection, including within the navigation corridor.

17.9 Marine Aggregate Dredgers

402. From analysis of marine aggregate dredger traffic (see Section 10 and Appendix C), it can be seen that marine aggregate dredger activity within and in proximity to the navigation corridor is substantial and includes both transiting and active dredging. In particular, two main routes featuring predominantly marine aggregate dredgers (Routes 8 and 12 in Section 11.2) pass approximately 2.1nm north of the navigation corridor. This distance is considered sufficient to allow compliance with COLREGs, with sea room available for vessels to safely adjust to avoid an encounter situation.

403. From the vessel traffic data, active marine aggregate dredging activity at the marine aggregate dredging areas was limited to the areas further from the navigation corridor. However, the closest marine aggregate dredging area is active and therefore it remains feasible that activity could be undertaken, with the marine aggregate dredger RAM. The distance of approximately 1.2nm between this closest area and the navigation corridor provides sufficient sea room to avoid an encounter situation, noting that the marine aggregate dredger would have right of way under COLREGs Rule 18(b)(ii): "*a sailing vessel underway shall keep out of the way of a vessel restricted in her ability to manoeuvre*". Additionally, the minimum spacing of 830m between structures within the array is sufficient to ensure a vessel engaged in marine aggregate dredging activities is visible to a vessel navigating northbound through the corridor prior to reaching the exit of the corridor (this point is discussed further in Section 19.1.3). In adverse weather, vessels would take additional measures as per the requirements of the COLREGs.

17.10 Electromagnetic Interference

404. Sub-sea cables have the potential to increase electromagnetic interference effects; however, given that the Proposed Development will utilise AC array cables, it is not anticipated that such effects will be significant within the navigation corridor – this is considered fully in Section 13 as part of the wider assessment of risks associated with navigation, communication and position fixing equipment.

17.11 Radar Interference

405. For vessels transiting through the navigation corridor, there may be a potential for increased exposure to Radar interference. As with electromagnetic interference, such considerations are fully addressed in Section 13.7 as part of the wider assessment of risks associated with navigation, communication and position fixing equipment and is not considered to have a significant effect.

17.12 Consultation

406. Comments received relating to the proposed navigation corridor – which are provided in Table 4-1 – are summarised in the following subsections.

17.12.1 Maritime and Coastguard Agency and Trinity House

407. Trinity House and the MCA noted that if a navigation corridor was implemented, traffic routeing between the Dover Strait TSS and the Solent would be the give way vessel under COLREGs to any vessel exiting the corridor, forcing them to turn starboard toward the wind farm. Trinity House also stated that vessels on Dover Strait TSS to Solent routes may also have difficulty seeing vessels obstructed by wind farm infrastructure while exiting the corridor, with the MCA noting an emphasis should be placed on alignment between Rampion 1 and Rampion 2.

408. The MCA support the corridor provided if it has sufficient width, ensuring MGN 654 compliance, and the entry/exit of the southern end is unimpeded. A distance of 4.7nm between the navigation corridor and traffic out of the Dover Strait TSS gives sea room to minimise any rights of way issues associated with traffic exiting the Dover Strait TSS, with the possibility of using the Dover Strait ITZ as an escape channel.

17.12.2 Littlehampton Harbour Board

409. Littlehampton Harbour Board indicated that the navigation corridor would resolve issues relating to vessel displacement since the alternative routeing option involves navigating west of the Proposed Development. However, volumes of traffic requiring access to Littlehampton Harbour are relatively low and there are already existing waiting times for high water entry.

410. A navigation corridor may introduce new risks but Littlehampton Harbour Board defer to the MCA and Shoreham Port for further discussion on this matter.

411. Overall, the navigation corridor would be welcomed with benefits for fishing and recreational vessels out of Littlehampton Harbour as well as the low volume commercial activity. The corridor would be unlikely to be relevant for lifeboats since it is understood they are comfortable navigating between wind turbines in all conditions.

17.12.3 UK Chamber of Shipping

412. The UK Chamber of Shipping noted that the sufficiency of the anticipated distance of 4.7nm between the navigation corridor and traffic out of the Dover Strait TSS would be dependent upon the array layout and traffic volumes, with potential for an encounters pinch point at the southern exit of the corridor.

413. However, the navigation corridor appears to be of benefit to Littlehampton Harbour users since it would introduce an additional option for navigation depending upon the weather conditions.

17.12.4 Royal Yachting Association

414. The RYA suggested that a navigation channel should be provided between Rampion 1 and the Proposed Development based on indications that recreational users appear to be avoiding transits through Rampion 1.

415. The RYA stated that, based on membership feedback, they were open to the Assessment Boundary reduction and it was likely that RYA membership would be open to the navigation corridor. It was also stated that a north-south corridor would be useful; however, the additional collision risk created by the need for corridor users to cross east-west recreational traffic was raised as a concern.

17.12.5 Second Hazard Workshop

416. The DCO Limits as presented in this NRA, inclusive of the navigation corridor located west of Rampion 1, was presented to stakeholders at the second Hazard Workshop in September 2022 (see Section 4.3). Various stakeholders indicated that the DCO Limits represented a positive change including the UK Chamber of Shipping, RYA, CA, Shoreham Port Authority, Littlehampton Harbour Board, Cemex UK Marine and Tarmac Marine. The

17.13 Embedded Mitigation Measures

417. The following embedded mitigation measures (the majority of which are detailed fully in Table 24-1) will assist in ensuring that the navigational risk associated with the navigation corridor is ALARP:

- **C-41** and **C-45** – Cable protection will be utilised (preferably in the form of cable burial) and will be informed by the cable burial risk assessment and detailed within the Cable Specification and Installation Plan;
- **C-46** and **C-85** – Promulgation of information for vessel routes, timings and locations, Safety Zones and advisory passing distances as required via Kingfisher Bulletins;
- **C-47** – Promulgation of information to fishing vessels via an appointed FLO to minimise collision and allision risk;
- **C-56** – Layout plan will be agreed with the MMO following appropriate consultation with the MCA and Trinity House.
- **C-84** – Lighting and marking of the array area in agreement with Trinity House and in line with IALA Recommendation O-139 and G1162 (IALA, 2021) – additionally, the buoyed construction area size and location will consider the need to maintain safe navigation through the navigation corridor (noting that this will be determined post consent in agreement with Trinity House);
- **C-87** – Compliance with MGN 654 and its annexes where applicable as part of the Design Specification and Layout Plan; and
- **C-88** – Marine coordination and communication to manage vessel movements;
- Compliance of all vessels associated with the Proposed Development with international marine regulations as adopted by the Flag State, notably the COLREGs (IMO, 1972/77) ad SOLAS (IMO, 1974).

418. It is noted that no surface piercing wind farm structures will be located within the navigation corridor or in a location such that the southern entry/exit point is obstructed (i.e., in the portion of the array area directly south and aligned with the navigation corridor) as per consultation with the MCA.

17.14 Summary and Conclusion

419. This safety case has considered the following in relation to the navigation corridor between the Rampion 1 and Rampion 2 array areas:

- Relevant navigational features within or in proximity to the navigation corridor;
- Number, size and speed of potential navigation corridor users;
- Relevant MGN 654 guidance and legislation including the COLREGs;
- Non-transit users and activities including project vessels and anchored vessels;
- Potential for electromagnetic and Radar interference effects;
- Consultation undertaken with relevant stakeholders including Regular Operators; and
- Embedded mitigation measures.

420. On the basis of compliance with MGN 654 guidance and satisfying conditions based on consultation with the MCA, the navigation corridor located west of Rampion 1 can be considered broadly acceptable from a safety of navigation perspective, particularly noting the positive feedback received during consultation.

18 Introduction to Risk Assessment

421. Sections 19 to 21 provide a qualitative and quantitative risk assessment (using FSA) for the hazards identified due to the Proposed Development, based on baseline data, expert opinion, outputs of the Hazard Workshop, stakeholder concerns and lessons learnt from existing offshore developments. The hazards assessed are as follows:

- Vessel displacement;
- Adverse weather routeing;
- Increased third-party vessel to vessel collision risk;
- Increased vessel grounding risk;
- Third-party to project vessel collision risk;
- Reduced access to local ports and harbours;
- Creation of vessel to structure allision risk;
- Changes in under keel clearance;
- Increased interaction with sub-sea cables; and
- Reduction of emergency response provision including SAR capability.

422. The shipping and navigation users considered are as follows:

- Commercial vessels;
- Recreational vessels;
- Commercial fishing vessels in transit;
- Military vessels;
- Anchored vessels;
- Emergency responders; and
- Local ports and services including pilot vessels.

423. For each hazard, the full description of the hazard is provided in *italicised* text. This is followed by various subsections as appropriate to consider each component of the hazard, both qualitative and quantitatively. It is noted that commercial risk is not considered in this risk assessment since it lies outside the remit of the NRA; this is instead considered in **Chapter 13: Shipping and navigation, Volume 2** of the ES (Document Reference 6.2.13).

424. Within each component of an overarching hazard, embedded mitigation measures which have been identified as relevant to reducing risk are listed, with full descriptions provided in Section 24. This is followed by statements defining the frequency of occurrence and severity of consequence for each component of the hazard in **bold** text, as defined in Section 3.2.

425. At the end of the assessment of each hazard, these frequency of occurrence and severity of consequence rankings are summarised in tabular form (if there are multiple components), with the resulting significance of risk given in **blue highlighted bold** text, as defined in Section 3.2.

426. The risk control log (see Section 23) summarises the risk assessment and a concluding risk statement is provided (see Section 26.5).

19 Construction Phase Risk Assessment

19.1 Displacement of Vessels

427. *Construction activities associated with the installation of structures and cables may displace existing routes/activity, increase grounding risk, increase encounters and collision risk with other third-party vessels.*

428. The subject of vessel displacement and its potential consequences were raised by multiple stakeholders during consultation including CLdN, UECC, Britannia Aggregates, DEME, VDL, Cemex, and Hanson Marine.

429. Each element of this hazard is considered in turn in terms of frequency of occurrence and severity of consequence. The resulting significance of the residual risk across the various elements is summarised at the end of the assessment. The elements considered include:

- Vessel displacement;
- Adverse weather routeing;
- Increased third party to third-party vessel collision risk; and
- Grounding risk.

19.1.1 Vessel Displacement

19.1.1.1 Qualification of Risk

430. The volume of vessel traffic passing within or in proximity to the array area has been established using vessel traffic data collected during dedicated surveys (28 days over winter 2020 and summer 2022) and from coastal receivers (12 months, 2019), as well as Anatec's ShipRoutes database and a previous dedicated survey (14 days over summer 2020). These datasets were interrogated to identify main routes using the principles set out in MGN 654 (MCA, 2021).

431. There will be no restrictions on entry into the buoyed construction area, other than active construction or pre-commissioning safety zones. However, based on experience at previously under construction offshore wind farms (including at Rampion 1), it is anticipated that commercial vessels will choose not to navigate internally within the buoyed construction area. Therefore, some main route deviations will be required.

432. The full methodology for main route deviations is provided in Section 15.5.1, with deviations established in line with MGN 654 (MCA, 2021). A deviation will be required for five of the 17 main routes identified within the study area, with the level of deviation ranging from less than 0.1nm decrease for Route 9 (westbound lane of the Dover Strait TSS to ports in the Solent) to a 12.5nm increase for Route 17 (westbound lane of the Dover Strait TSS to Littlehampton Harbour), noting that vessel traffic levels on Route 17 are very low (around once a month). Table 15-1 presents the increase in distance from

the pre wind farm scenario for the displaced routes (see Figure 15.1 for an illustration of the anticipated worst-case shift in the mean positions of the main routes).

433. In the case of Route 17, the large deviation around the west of the array area represents a worst case for vessel displacement. An alternative routeing option exists which minimises the deviation, namely utilising the structures exclusion zone to the west of Rampion 1, which serves as a navigation corridor. A safety case has been undertaken for this MGN 654 compliant corridor and concluded that it is suitable for safe navigation (see Section 17.1).

434. Route 3 (westbound lane of the Dover Strait TSS to ports in the Solent) is the busiest main route identified within the study area for which a deviation will be required, with an average of five vessels per day. During consultation, ABP Southampton indicated that traffic in/out of the Solent will be compressed into a tighter space close to the Isle of Wight. However, the increase in route length (0.2nm) is minor and there is sufficient distance between the point where the route passes the array area and the NAB Deep Water Channel (approximately 13nm) to ensure that vessels are able to avoid any substantial changes to their approach.

435. Based on experience at previously under construction offshore wind farms (including at Rampion 1), it is anticipated that fishing vessels and recreational vessels will also choose not to routinely navigate internally within the buoyed construction area, with the RYA indicating that recreational users make early course corrections to minimise the distance travelled on passage along the east coast. There is sufficient sea room available (including at the eastern extent of the array in proximity to the Dover Strait TSS and at the western extent of the array area in proximity to the Owers Bank) for such vessels to be accommodated. However, marine aggregate dredging stakeholders did note during consultation that there may be a risk of displaced fishing vessels passing in proximity to current active extraction areas. Displacement of active commercial fishing is assessed separately in **Chapter 10: Commercial fisheries, Volume 2** of the ES (Document Reference 6.2.10), with separate consultation with marine aggregate dredging stakeholders undertaken as part of **Chapter 7: Other marine users, Volume 2** of the ES (Document Reference 6.2.7).

436. A concern was raised by the RYA in relation to larger recreational craft being displaced into inshore waters resulting in increased interaction with smaller craft. The increase in recreational traffic inshore of the array area is likely to be low given that the majority of recreational traffic is already located inshore of the array area. However, east-west recreational routeing currently passing offshore of Rampion 1 may be deviated inshore of Rampion 1, resulting in a slight increase in journey times and distances.

437. During consultation, the Ministry of Defence (MOD) raised a concern that any installation in Danger Area D037 will impact on freedom of movement for

military exercises. From the vessel traffic survey data, on average less than one unique military vessel per day was recorded within the entire study area, a volume validated by the long-term AIS data[6]. Additionally, Danger Area D037 is adjacent to the Proposed DCO Limits, and a substantially smaller portion of the total area covered by military Practice and Exercise Areas (PEXA) in the region as a whole. Therefore, the disruption to military exercises is likely to be very limited, generally relating only to where safety zones are present and overlap Danger Area D037 (noting that these are temporary in nature).

438. The main consequence of vessel displacement will be increased journey times and distances for affected third-party vessels, over a large spatial extent, particularly as it is assumed that the buoyed construction area will be deployed around the maximum extent of the array area. Vessels are expected to comply with international and flag state regulations (including the COLREGs and SOLAS) and will be able to passage plan in advance given the promulgation of information relating to the Proposed Development and relevant nautical charts (**C-46** and **C-85**, Table 24-1).

19.1.1.2 Relevant Embedded Mitigation Measures

439. The embedded mitigation measures which have been identified as relevant to reducing risk are as follows (further detail on embedded mitigation is included in Section 24):

- **C-46** and **C-85** – Promulgation of information (including charting of all infrastructure).

19.1.1.3 Frequency of Occurrence

440. The frequency of occurrence in relation to displacement of vessel traffic is considered **reasonably probable**.

19.1.1.4 Severity of Consequence

441. The severity of consequence in relation to displacement of vessel traffic is considered **negligible**.

19.1.2 Adverse Weather Routeing

442. The need to consider routeing in adverse weather conditions was highlighted by the MCA during consultation. However, since no substantial alternative routeing was observed (based on the 12-months of AIS data as well as the 28-day vessel traffic survey data) nor any transit cancellations which could be traced to adverse weather, no hazard relating to adverse weather routeing has been identified and, hence, assessed.

[6] During sensitive operations, military vessels are allowed to switch off their AIS transmitter.

19.1.3 Increased Third-Party Vessel to Vessel Collision Risk

19.1.3.1 Qualification and Quantification of Risk

443. It is anticipated that five of the 17 main routes identified will deviate as a result of the construction of the Proposed Development. This could lead to increased vessel densities within the area, which could in turn lead to an increase in vessel to vessel encounters and therefore increased collision risk.

444. Based on the pre wind farm modelling, the baseline collision risk levels within the study area are high, with an estimated vessel to vessel collision frequency of one every 9.7 years. The baseline assessment of MAIB incident data (see Section 9.5) indicated six collisions were recorded in the 10-year period between 2010 and 2019, all of which resulted in either no or minor damage. The high level of collision risk is due to the high volume of vessel traffic in the area, particularly within and out of the Dover Strait TSS and out of the Solent. However, for the post wind farm scenario, the collision frequency (one in 9.6 years) represents a 1% increase compared to the pre wind farm base case scenario indicating that the influence of the Proposed Development on the overall collision risk for commercial traffic is low.

445. During consultation, the MCA noted that the squeeze of small craft into the routes of larger commercial vessels should be considered. Given that recreational traffic is primarily based nearshore, the effect of the main commercial route deviations outlined on such traffic is expected to be low. In particular, the area where commercial vessel density is most likely to increase (at the south-western extent of the Proposed DCO Limits in proximity to the Owers Bank) is not a prominent location for recreational vessel transits, with small craft primarily navigating through the shallows of the Looe closer to shore. During consultation, the RYA indicated that the reduction in the PEIR Assessment Boundary (which has been further reduced for the DCO Application) addresses issues relating to navigational squeeze in this area.

446. Additionally, the eastern extent of the array area is closely aligned with the eastern boundary of Rampion 1. This ensures that that there is no spatial overlap with the ITZ, an area designed to protect local traffic including small craft. Subsequently, larger commercial vessels routeing in and out of Shoreham Port will be able to continue routeing as present, minimising interaction with the ITZ to the close approaches to the port, and thus minimising the likelihood of encounters with small craft navigating within the ITZ. During the second Hazard Workshop, various stakeholders indicated that the reduction to the Proposed DCO Limits at the eastern extent were a positive change, including Shoreham Port Authority.

447. East-west recreational routeing currently passing offshore of Rampion 1 and which may be deviated inshore of Rampion 1 may be subject to increased collision risk. However, large commercial vessels are not prominent in this area, with the only routine commercial traffic movements those of marine aggregate dredgers in/out of Shoreham Port. Therefore, a notable increase in

interaction between small craft and larger vessels is not anticipated. There is also potential for interaction between small craft but with the application of good seamanship including compliance with the fundamental principles of safe navigation such as COLREGs and SOLAS, the likelihood of an encounter between small craft developing into a collision situation is low.

448. There is potential for collision risk to be introduced where vessels utilising the structures exclusion zone located west of Rampion 1 meet with crossing traffic. However, as discussed in Section 17, with application of the COLREGs and the large minimum spacing between structures, the collision risk will be minimised.

449. With respect to all vessels, the risk will be present throughout the construction phase, but the promulgation of information (**C-46** and **C-85**, Table 24-1) relating to construction activities – including the deployment of the buoyed construction area – and charting of infrastructure will allow vessel Masters to passage plan in advance, minimising disruption from late changes to routeing. Additionally, information for fishing vessels will be promulgated through ongoing liaison with fishing fleets via an appointed FLO (**C-47**, Table 24-1). Experience from previous under construction offshore wind farms indicated that the extensive promulgation of information is an effective mitigation, with evidence suggesting that Masters regularly choose to transit farther than 1nm from construction works.

450. As an extension to this, RED will exhibit lights, marks, sounds, signals and other aids to navigation as required by Trinity House, MCA and Civil Aviation Authority (CAA), including the buoyed construction area (**C-84**, Table 24-1). These navigational aids will further maximise mariner awareness when in proximity, both in day and night conditions including in poor visibility.

451. The minimum spacing between any installed structures (830m) is sufficient to ensure the view of other vessels will not be blocked or hindered, again reducing the likelihood of an encounter occurring in proximity to the Proposed Development. As a high-level computation, a vessel in transit at 6kt would take approximately 26 seconds to travel 80m[7], the greatest foundation width considered in the MDS (for offshore substations, see Section 4.7). Using the conservative example of a small 10m recreational vessel travelling at 6kt, the view of the vessel may be entirely blocked by an offshore wind structure for a duration of approximately 3 seconds[8] for a WTG foundation (width 20m) or 23 seconds for an offshore substation foundation (width 80m), noting that the offshore substation will share the same foundation dimensions. This duration converges to zero as the vessel length increases to 20m in the WTG case or 80m in the offshore substation case, after which point no total blocking of the view would occur.

[7] 6kt ≈ 3.1 metres per second ⇒ over 80m a time of 25.8 seconds

[8] Where $x = foundation\ width$ and $l = vessel\ length$, $t = \frac{x-l}{v}$

452. In the event that an encounter does occur, it is likely to be very localised and occur for only a short duration, with collision avoidance action implemented by the vessels involved, in line with the COLREGs, thus ensuring that the situation does not develop into a collision incident. This is supported by experience at previous under construction wind farms, where no collision incidents involving two third-party vessels have been reported.

453. Historical collision incident data also indicates that the most likely consequences will be low should a collision occur, with minor contact between the vessels resulting in minor damage and no injuries to persons, with both vessels able to resume their respective passages and undertake a full inspection at the next port. As an unlikely worst case, one of the vessels could be foundered resulting in a Potential Loss of Life (PLL) and pollution.

454. It is noted that monitoring of vessel traffic will be undertaken for the duration of the construction phase (**C-48**, Table 24-1) to characterise vessel displacement relative to that predicted by the routeing deviations predicted in Section 15.5.2, with the embedded mitigation measures adjusted accordingly. If pollution were to occur in proximity to the Proposed Development, then the Marine Pollution Contingency Plan (MPCP) will be implemented (**C-53**, Table 24-1) to minimise the environmental risks.

19.1.3.2 Relevant Embedded Mitigation Measures

455. The embedded mitigation measures which have been identified as relevant to reducing risk are as follows (further detail on embedded mitigation is included in Section 24):

- **C-46** and **C-85**– Promulgation of information;
- **C-48** – Traffic monitoring;
- **C-53** – Pollution planning; and
- **C-84** – Lighting and marking.

19.1.3.3 Frequency of Occurrence

456. The frequency of occurrence in relation to encounters and collision risk is considered **extremely unlikely**.

19.1.3.4 Severity of Consequence

457. The severity of consequence in relation to encounters and collision risk is considered **moderate**.

19.1.4 Increased Vessel Grounding Risk

19.1.4.1 Qualification of Risk

458. Water depths within and in proximity to the array area are generally suitably deep (greater than 20m) to prevent any risk of grounding. In particular, the displacement associated with Routes 3, 9 and 16 does not result in vessels on these routes navigating in reduced water depths. The displacement

associated with Routes 8 and 17 involves passing west of the Proposed DCO Limits, with Shoreham Port raising during consultation that such deviations may result in vessels being at greater risk of grounding inshore of the site. Therefore, these two routes are assessed in further detail.

459. Route 8 (Shoreham Port-marine aggregate dredging areas near the Isle of Wight) is anticipated to pass closer to the Outer Owers where water depths drop considerably to less than 5m. However, the presence of the Owers Light Buoy, a south cardinal mark located approximately 2nm to the west of the array area, should serve its purpose of protecting vessels from the shallows of the Owers Bank by directing vessels to the south. There remains sufficient sea room for Route 8 to safely pass between the array area and the Owers Light Buoy (approximately 2.1nm), and thus the increase in grounding risk for vessels on Route 8 is not considered substantial.

460. Route 17 (Littlehampton Harbour – Dover Strait TSS) is also anticipated to pass close to the Outer Owers although did not do so in the pre wind farm scenario. Noting the water depths along the pre wind farm approach of the route to Littlehampton (as low as 12m) it is not considered that there will be any substantial reduction in water depth for vessels navigating on Route 17, particularly noting again the presence of the Owers Light Buoy to protect vessels from the shallows of the Owers Bank. Additionally, the vessels observed on Route 17 are small coasters which from the long-term vessel traffic data operate in this area with draughts of less than 5m. As with Route 8, there remains sufficient sea room for Route 17 to safely pass between the array area and the Owers Light Buoy (approximately 2nm), outside of areas where the water depth drops considerably (less than 5m inshore of the buoy), and thus the increase in grounding risk for vessels on Route 17 is not considered substantial. Additionally, it is also acknowledged that vessels on Route 17 may choose to utilise the structures exclusion zone located west of Rampion 1 as a navigation corridor.

461. In the case of both Routes 8 and 17, the Proposed DCO Limits represents a reduction in the total area covered compared to the Scoping Boundary including the western extent of the array area, and in the case of Route 17 also represents a reduction compared to the PEIR Assessment Boundary. This reduction assists in ensuring vessels on these routes have sufficient sea room to avoid the shallows of the Owers Bank.

462. For small craft operating in nearshore waters – particularly in proximity to the export cables – the likelihood of a grounding incident is greater. Although the risk will be present throughout the construction phase, in line with good seamanship it is also anticipated that any vessel navigating in the area will check relevant nautical charts, and thus ensure the vessel does not navigate into a location where there is a substantial likelihood of grounding.

463. Based on historical data for grounding incidents, the most likely consequences will be low should a grounding incident occur, with minor damage incurred and

no injuries to persons with the vessel able to resume passage and undertake a full inspection at the next port. As an unlikely worst case, the vessel could founder resulting in a PLL and pollution. Again, if pollution were to occur in proximity to the Proposed Development, then the MPCP will be implemented (**C-53**, Table 24-1) to minimise the environmental risks.

19.1.4.2 Relevant Embedded Mitigation Measures

464. The embedded mitigation measures which have been identified as relevant to reducing risk are as follows (further detail on embedded mitigation is included in Section 24):

- **C-53** – Pollution planning.

19.1.4.3 Frequency of Occurrence

465. The frequency of occurrence in relation to grounding risk is considered **remote**.

19.1.4.4 Severity of Consequence

466. The severity of consequence in relation to grounding risk are considered **moderate**.

19.1.5 Significance of Risk

467. Table 19-1 summarises the resulting significance of risk for each component of this hazard in relation to navigational safety.

Table 19-1 Summary of shipping and navigation risk rankings for vessel displacement during construction phase

Hazard Component	Frequency of Occurrence	Severity of Consequence	Significance of Risk
Vessel displacement	Reasonably Probable	Negligible	Broadly Acceptable
Third party vessel to vessel collision risk	Extremely Unlikely	Moderate	Broadly Acceptable
Grounding risk	Remote	Moderate	Tolerable

468. Overall, it is predicted that the significance of risk due to vessel displacement is of **Tolerable** significance (given that the worst case result is Tolerable for the grounding risk component of the hazard).

19.2 Third-Party to Project Vessel Collision Risk

469. *Vessels associated with construction activities may increase encounters and collision risk for other vessels already operating in the area.*

19.2.1 Qualification of Risk

470. Up to 2,413 return trips by construction vessels may be made throughout the construction phase, including RAM vessels. It is assumed that construction vessels will be on-site throughout the construction phase.

471. Encounter and collision risk involving a project vessel will be managed by marine coordination (**C-88**, Table 24-1) including the application of traffic management procedures such as the designation of entry and exit points to and from the array and routes to and from construction ports. Such procedures will take account of those areas where collision risk is assessed as greatest (where third-party vessels pass or undertake operational activities in proximity to the array area frequently such as marine aggregate dredgers). Additionally, experience from and procedures established for Rampion 1 will be taken into account, project vessels will carry AIS and be compliant with Flag State regulations including IMO conventions such as the COLREGs, and information for fishing vessels will also be promulgated through ongoing liaison with fishing fleets via an appointed FLO (**C-47**, Table 24-1).

472. Furthermore, an application for safety zones of 500m will be sought during the construction phase (**C-56**, Table 24-1). These will serve to protect project vessels engaged in construction activities. Minimum advisory passing distances, as defined by risk assessment, may also be applied, with advanced warning and accurate locations of both safety zones and any minimum advisory safe passing distances provided by Notifications to Mariners and Kingfisher Bulletins (**C-46** and **C-85**, Table 24-1).

473. Also, RED will exhibit lights, marks, sounds, signals and other aids to navigation as required by Trinity House and MCA, including the buoyed construction area (**C-84**, Table 24-1). These navigational aids will further maximise mariner awareness when in proximity, both in day and night conditions including in poor visibility.

474. Third-party vessels may experience restrictions on visually identifying project vessels entering and exiting the array during reduced visibility; however, this hazard will be mitigated by the application of the COLREGs (reduced speeds) in adverse weather conditions and project vessels mandatorily will carry AIS regardless of size.

475. The likelihood of a collision is likely to be greater in reduced visibility when the identification of project vessels entering and exiting the array may be encumbered. However, the COLREGs regulate vessel movements in adverse weather conditions and require all vessels operating in reduced visibility to reduce speed to allow more time for reacting to encounters, thus minimising the collision risk.

476. Based on historical incident data, there have been two instances of a third-party vessel colliding with a project vessel in the UK. In both incidents moderate vessel damage was reported with no harm to persons. It is noted

that the two incidents occurred in 2011 and 2012, respectively, and awareness of offshore wind developments and application of the measures outlined above has improved and been refined considerably in the interim, with no further collision incidents reported since.

477. Should an encounter occur between a third-party vessel and a project vessel, it is likely to be very localised and occur for only a short duration. With collision avoidance action implemented in line with the COLREGs, the vessels involved will likely be able to resume their respective passages and/or activities with no long-term consequences.

478. Should a collision occur, the most likely consequences will be similar to that outlined for the case of a collision between two third-party vessels, namely minor contact between the vessels resulting in minor damage and no injuries to persons with both vessels able safely make their next port to undertake a full inspection. As an unlikely worst case, one of the vessels could be foundered resulting in a PLL and pollution. If pollution were to occur in proximity to the Proposed Development or involving a project vessel, then the MPCP will be implemented (**C-53**, Table 24-1) to minimise the environmental risks.

19.2.2 Relevant Embedded Mitigation Measures

479. The embedded mitigation measures which have been identified as relevant to reducing risk are as follows (further detail on embedded mitigation is included in Section 24):

- **C-46** and **C-85** – Promulgation of information;
- **C-47** – Fishing liaison;
- **C-53** – Pollution planning;
- **C-56** – Safety Zones;
- **C-84** – Lighting and marking;
- **C-88** – Marine coordination.

19.2.3 Frequency of Occurrence

480. The frequency of occurrence is considered to be **extremely unlikely**.

19.2.4 Severity of Consequence

481. The severity of consequence is considered to be **moderate.**

19.2.5 Significance of Risk

482. Overall, it is predicted that the significance of risk due to increased third-party to project vessel collision risk is of **Broadly Acceptable** significance.

19.3 Reduced Access to Local Ports and Harbours

483. *Construction activities associated with the installation of structures and cables may displace existing routes/activity restricting access to ports/harbours.*

484. To ensure the risk to navigational safety is assessed in as much detail as possible overall, a number of ports and harbours in the area are considered individually, taking account of the vessel traffic movements associated with these ports, based on vessel traffic data and consultation feedback. These ports include:

- Shoreham Port;
- Port of Newhaven;
- Brighton Marina;
- Littlehampton Harbour; and
- Ports within the Solent.

485. Any considerations of the commercial risk to local port access are outside the scope of navigational safety and have therefore not been considered within this assessment (see **Chapter 13: Shipping and navigation, Volume 2** of the ES (Document Reference 6.2.13) for consideration of commercial risks to port access).

19.3.1 Shoreham Port

486. As described in Section 10.2.6, fishing vessel traffic is prominent out of Shoreham Port, with fishing vessels both in transit to fishing grounds located south of the array area and actively engaged in fishing within the eastern half of the array area. Therefore, access to Shoreham Port for fishing vessels may be compromised during the construction phase, assuming that fishing vessels choose not to pass through the buoyed construction area irrespective of the presence of construction safety zones. There is available sea room to the east of the array area for fishing vessels to alter their passage such that navigation will not be required in proximity to the end of the Dover Strait TSS. Moreover, these vessels have good familiarity with operating in proximity to the Dover Strait TSS anyway, have good manoeuvrability and are expected to display good seamanship and comply with the COLREGs.

487. Recreational vessel activity was also observed, although was mostly confined to the nearshore area and the summer period, and so disruption to recreational vessel movements out of Shoreham Port are not expected to be notable given the majority of vessel activity is a sufficient distance from the array area and the marine coordination for project vessels. For recreational traffic transiting east-west out of Shoreham Port and passing north of the array area, crossing of the offshore export cable corridor could be disrupted whilst export cable installation is ongoing. However, it is anticipated that given the nature of the export cable installation, only a section of the offshore export cable corridor will have a cable laying vessel (alongside other construction vessels) present at any one time and so recreational vessels will still be able to safely navigate to/from Shoreham Port with minimal disruption. Additionally, export cable installation is expected to last up to four months only.

488. Marine aggregate dredgers were principally observed on two main routes out of Shoreham Port (Routes 8 and 12), headed for marine aggregate dredging

areas near the Isle of Wight and the Owers Bank, constituting up to three vessels per day. Marine aggregate dredgers were also observed on Route 11 alongside cargo vessels, between Shoreham Port and North Sea ports, constituting less than one vessel per day. Vessels on these routes are unlikely to be disrupted, noting there is either no deviation or a low level of deviation anticipated (see the vessel displacement risk assessment – Section 19.1.1).

489. The other main route out of Shoreham Port (Route 13), which is generally used by cargo vessels, is not anticipated to require any deviation due to the under construction array area.

490. The pilot boarding station for Shoreham Port is located approximately 7.7nm north of the array area and 11nm west of the offshore export cable corridor. Therefore, the presence of the Proposed Development is not anticipated to have an impact on access to pilotage services, noting that no impact has been reported due to the presence of Rampion 1 (which is substantially closer). Additionally, given that the array area will be well clear of the ITZ, there will be limited accessibility risk for active pilot vessels, a concern raised by the MCA during consultation prior to the eastern extent of the array area being reduced. This is supported by the vessel traffic data collected during dedicated surveys (28 days, winter 2020 and summer 2022) and from coastal receivers (12 months, 2019) which indicates that pilot vessels operating in the area are largely located within 2nm of Shoreham Port (also applicable to the Port of Newhaven) and therefore the risk to pilotage operations of vessel displacement is anticipated to be minimal.

19.3.1.1 Frequency of Occurrence

491. The frequency of occurrence for Shoreham Port in relation to navigational safety is considered to be **reasonably probable**.

19.3.1.2 Consequence of Impact

492. The severity of consequence for Shoreham Port in relation to navigational safety is considered to be **minor**.

19.3.2 Port of Newhaven

493. Two passenger ferries operated by DFDS Seaways are prominent out of the Port of Newhaven, each making a cross-channel passage to Dieppe twice per day. Given the distance of this route from the array area (approximately 11nm at the closest point), the Proposed Development is not anticipated to have any impact on routeing with respect to vessel displacement.

494. Other non-wind farm related commercial vessel activity at the Port of Newhaven is limited, mostly consisting of occasional single transits by cargo vessels and marine aggregate dredgers.

495. As with Shoreham Port, recreational vessels were observed but mostly confined to the nearshore area and the summer period; however, some

recreational traffic was observed headed directly to/from ports in the Solent. Fishing vessel activity was also observed mostly within 3nm of the port. The effect on port access for fishing and recreational users operating nearshore is not anticipated to be substantial when considering the distance from the array area and the marine coordination that will be implemented for project vessels. Recreational traffic which transits east-west out of the Port of Newhaven passes north of the array area but crosses the offshore export cable corridor and therefore could be disrupted whilst export cable installation is ongoing. However, as noted in the assessment for Shoreham Port, it is anticipated that given the nature of the export cable installation, only a section of the offshore export cable corridor will have a cable laying vessel (alongside other construction vessels) present at any one time and so recreational vessels will still be able to safely navigate to/from the Port of Newhaven with minimal disruption. Additionally, export cable installation is expected to last up to four months only.

496. The pilot boarding station for the Port of Newhaven is located approximately 9nm north-east of the array area. Newhaven Port & Properties confirmed during consultation that there is not expected to be any risk to pilot operations given the distance from the Proposed DCO Limits. Also, as with Shoreham Port, the Port of Newhaven was a key base for the construction of Rampion 1 and no notable effects from this have been reported (including during consultation for the Proposed Development).

19.3.2.1 Frequency of Occurrence

497. The frequency of occurrence for the Port of Newhaven in relation to navigational safety is considered to be **reasonably probable**.

19.3.2.2 Severity of Consequence

498. The severity of consequence for the Port of Newhaven in relation to navigational safety is considered to be **negligible**.

19.3.3 Brighton Marina

499. As analysed in Section 10.2, recreational vessel traffic is the predominant activity associated with Brighton Marina. The majority of such traffic is located nearshore or headed directly to/from ports in the Solent, although some visits to Rampion 1 do occur (wind farm trips) as well as recreational dive charter visits to numerous wrecks in the area.

500. As with fishing and recreational users operating nearshore at the Port of Newhaven, the effect on port access for those vessels is not anticipated to be substantial when considering the marine coordination that will be implemented for project vessels (**C-88**, Table 24-1). Recreational traffic which transits east-west out of Brighton Marina passes north of the array area but crosses the offshore export cable corridor and therefore could be disrupted during export cable installation. However, as noted for Shoreham Port and the Port of Newhaven, it is anticipated that given the nature of the export cable

installation, only a section of the offshore export cable corridor will have a cable laying vessel (alongside other construction vessels) present at any one time and so recreational vessels will still be able to safely navigate to/from Brighton Marina with minimal disruption. Additionally, export cable installation is expected to last up to four months only.

501. Recreational vessels undertaking visits to Rampion 1 are unlikely to face any additional challenges to port access, noting again the marine coordination that will be implemented for project vessels.

502. Activity featuring other vessel types related to Brighton Marina including fishing vessels was sparse (noting that Radar data coverage in close proximity to Brighton Marina may not be comprehensive given its location relative to the Proposed DCO Limits) and therefore minimal disruption is expected for these other vessel types.

19.3.3.1 Frequency of Occurrence

503. The frequency of occurrence for Brighton Marina in relation to navigational safety is considered to be **remote**.

19.3.3.2 Severity of Consequence

504. The severity of consequence for Brighton Marina in relation to navigational safety is considered to be **negligible**.

19.3.4 Littlehampton Harbour

505. As analysed in Section 10.2, recreational vessel traffic is prominent out of Littlehampton Harbour, including angling charter vessels. However, traffic levels for recreational vessels are generally lower than that observed at Shoreham Port, the Port of Newhaven and Brighton Marina.

506. Additionally, three small coasters operate a route into Littlehampton Harbour from the Dover Strait TSS which, following consultation, has been designated as a main route (Route 17). This route is not used as frequently as other main routes, with transits occurring on a more monthly basis than daily basis on average across the year (on the spring tide).

507. Consultation also identified a limited volume of fishing vessel and resident workboat activity.

508. The worst case deviation for vessels accessing Littlehampton Harbour from the Dover Strait TSS (as per Route 17) is large in terms of additional distance and time required, and could have implications for accessing the harbour given the need to make berth on the spring tide. However, an alternative routeing option is available – use of the structures exclusion zone located west of Rampion 1 as a navigation corridor. This option was welcomed by Littlehampton Harbour Board during consultation and would minimise the additional distance and time requirements when re-routeing for the low volume

of commercial activity and fishing and recreational vessels out of Littlehampton Harbour.

509. Access to the port itself should be mitigated by the implementation of marine coordination for project vessels (**C-88**, Table 24-1) including the application of traffic management procedures such as the designation of routes to and from port.

510. Activities relating to the installation of the export cables could cause disruption given the proximity of the offshore export cable corridor to the port and the pilot boarding station (located approximately 120m to the east). As noted in relation to Shoreham Port, the Port of Newhaven and Brighton Marina, it is anticipated that given the nature of the export cable installation, only a section of the offshore export cable corridor will have a cable laying vessel (alongside other construction vessels) present at any one time and so the restrictions imposed on access will be much less severe than that associated with the buoyed construction area at the array area. Additionally, export cable installation is expected to be completed in up to four months only. Particular care will be required by project vessels in relation to the pilot boarding area but with marine coordination in place the hazard is considered suitably mitigated.

511. There are several racing marks used by the Arun Yacht Club located in proximity to Littlehampton Harbour, two of which are located within the offshore export cable corridor. Depending on the final location and timing of the export cable installation these seasonal racing marks may need to be temporarily moved in consultation with Arun Yacht Club, although it is anticipated that there would be sufficient sea room available to place these marks so as to retain their purpose of marking for recreational events.

512. It is noted that during consultation, Littlehampton Harbour Board indicated that upcoming construction works associated with the A27 Arundel bypass (scheduled to start in 2024/25 and be completed by 2030) may lead to a significant increase in vessel traffic volumes associated with Littlehampton Harbour. Should the construction phase of the Proposed Development coincide with these works then constraints on port access may be heightened but not to a level at which additional mitigation is required. Additional operations associated with replacement of the harbour entrance breakwaters at Littlehampton Harbour by 2025 are expected to have minimal temporal overlap with the offshore construction of the Proposed Development.

19.3.4.1 Frequency of Occurrence

513. The frequency of occurrence for Littlehampton Harbour in relation to navigational safety is considered to be **extremely unlikely**.

19.3.4.2 Severity of Consequence

514. The severity of consequence for Littlehampton Harbour in relation to navigational safety is considered to be **minor**.

19.3.5 Ports in the Solent

515. The characterisation of the main routes (see Section 11) indicated that a substantial volume of commercial traffic in and out of ports in the Solent pass in proximity to the Proposed Development. Specifically, Routes 3, 4, 6, 9, 14 and 16 all consist of transits to and from ports in the Solent, constituting up to 16 vessels per day. These routes either enter/exit the Dover Strait TSS or link up with ports in France and feature a passenger ferry route operated by Brittany Ferries between Portsmouth Port and Ouistreham (Caen).

516. In terms of non-commercial traffic, some fishing vessel activity was observed out of the Solent although was lower than that associated with Shoreham Port and Port of Newhaven. Recreational vessel activity was observed out of the Solent, mostly passing through the shallow waters of the Looe to and from Brighton Marina and ports/harbours further along the UK south coast.

517. Given the distance from the Proposed DCO Limits and the minor level of deviation required, it is not anticipated that on-site construction activities the displacement of routeing (further considered in Section 19.1.1) will have a substantial effect on port access. Similarly, numerous navigational features associated with access to the Solent (including pilot boarding stations, designated anchorage areas and the Nab Deep Water Channel) are located a great enough distance from the Proposed DCO Limits that any substantial effect on their use is not anticipated. This includes the St Helen's Road Anchorage located off the Isle of Wight which was raised as a possible concern by the UK Chamber of Shipping during consultation.

19.3.5.1 Frequency of Occurrence

518. The frequency of occurrence for ports in the Solent in relation to navigational safety is considered to be **frequent**.

19.3.5.2 Severity of Consequence

519. The severity of consequence for ports in the Solent in relation to navigational safety is considered to be **negligible**.

19.3.6 Relevant Embedded Mitigation Measures

520. The embedded mitigation measures which have been identified as relevant to reducing risk are as follows (further detail on embedded mitigation is included in Section 24):

- **C-88** – Marine coordination.

19.3.7 Significance of Risk

521. Table 19-2 summarises the resulting significance of risk for each user.

Table 19-2 Summary of risk rankings from reduced access to local ports during construction phase

User	Frequency of Occurrence	Severity of Consequence	Significance of Risk
Shoreham Port	Reasonably Probable	Minor	Tolerable
Port of Newhaven	Reasonably Probable	Negligible	Broadly Acceptable
Brighton Marina	Remote	Negligible	Broadly Acceptable
Littlehampton Harbour	Extremely Unlikely	Minor	Broadly Acceptable
Ports in the Solent	Frequent	Negligible	Tolerable

522. Overall, it is predicted that the significance of risk due to reduced access to local ports is of **Tolerable** significance (given that the worst case result is Tolerable for the Shoreham Port and ports in the Solent components of the hazard).

20 Operations and Maintenance Phase Risk Assessment

20.1 Displacement of Vessels

523. *Presence of structures may displace existing routes/activity, increase grounding risk, increase encounters and collision risk with other third-party vessels.*

524. As noted previously, the subject of vessel displacement and its potential consequences were raised by multiple stakeholders during consultation including CLdN, UECC, Britannia Aggregates, DEME, VDL, Cemex and Hanson Marine.

525. As with the construction phase version of this hazard, each element is considered in turn in terms of frequency of occurrence and severity of consequence, with the resulting significance of the residual risk across the various elements summarised at the end of the assessment. The elements considered include:

- Vessel displacement;
- Adverse weather routeing;
- Increased third-party to third-party vessel collision risk; and
- Grounding risk.

20.1.1 Vessel Displacement

20.1.1.1 Qualification of Risk

526. Based on experience at existing operational offshore wind farms (including at Rampion 1) it is anticipated that commercial vessels will choose not to navigate internally within the array and therefore the main route deviations established for the equivalent construction phase hazard in line with MGN 654 (MCA, 2021) are again considered (see Figure 15.1 and Table 15-1).

527. The busiest main route identified within the study area for which a deviation will be required is Route 3 (westbound lane of the Dover Strait TSS to ports in the Solent), with an average of five vessels per day. However, the deviation associated with this route is relatively small (0.2nm) and the distance to the NAB Deep Water Channel (13nm) is sufficient to ensure that vessels are able to avoid any substantial changes to their approach.

528. The largest main route deviation identified within the study area is Route 17 (Littlehampton Harbour–Dover Strait TSS), with a deviation of 12.5nm. However, the volume of vessel traffic associated with this route is very low (monthly). This large deviation around the west of the array area represents a worst case for vessel displacement. An alternative routeing option is proposed which minimises the deviation, namely utilising the structures exclusion zone to the west of Rampion 1, which serves as a navigation corridor. A safety case

has been undertaken for this MGN 654 compliant corridor and concluded that it is suitable for safe navigation (see Section 17.1).

529. Noting that there will be no restrictions on entry into the array area, other than active operation and maintenance safety zones, and based on experience at Rampion 1, it is anticipated that fishing vessels will navigate internally within the array during the summer months. Subsequently the displacement of such vessels in transit is not anticipated to be substantial in the summer months, although may be analogous with the level of displacement anticipated for the construction phase during the winter months, depending on the spacing between structures in the final array layout and usage of the MGN 654 compliant north-south navigation corridor (**C-87**, Table 24-1). This includes the potential for displacement of fishing vessels into current active extraction areas. Displacement of active commercial fishing is assessed separately in **Chapter 10: Commercial fisheries, Volume 2** of the ES (Document Reference 6.2.10), with separate consultation with marine aggregate dredging stakeholders undertaken as part of **Chapter 7: Other marine users, Volume 2** of the ES (Document Reference 6.2.7).

530. Additionally, from consultation with the RYA (see Table 4-1) and based on the baseline characterisation of recreational vessel movements (including the RYA Coastal Atlas – see Section 10.2.3), recreational vessels are unlikely to choose to navigate internally within the array; however, the minimum spacing between structures at the Proposed Development (830m) is greater than that at Rampion 1 (750m) which may increase the likelihood of recreational vessels choosing to navigate internally within the array and this minimum spacing is considered sufficient for safe internal navigation. Additionally, for north-south transits, the navigation corridor offers an alternative routeing option for recreational vessels.

531. Military vessels are less likely to choose to navigate internally within the array, and therefore the discussion relating to Danger Area D037 for the equivalent construction phase hazard is again applicable. In particular, given the low frequency of military traffic and the lack of any overlap between the military PEXA and the Proposed DCO Limits, the disruption to military activities is likely to be minimal.

532. With the main route deviations matching those established for the equivalent construction phase hazard, the main consequences of vessel displacement are considered to be the same, namely increased journey times and distances for affected third-party vessels, covering a large spatial extent.

533. As for the construction phase, promulgation of information relating to the Proposed Development and relevant nautical charts will allow vessels to effectively passage plan in advance (**C-46** and **C-85**, Table 24-1).

20.1.1.2 Relevant Embedded Mitigation Measures

534. The embedded mitigation measures which have been identified as relevant to reducing risk are as follows (further detail on embedded mitigation is included in Section 24):

- **C-46** and **C-85** – Promulgation of information (including charting of all infrastructure); and
- **C-87** – MGN 654 compliance.

20.1.1.3 Frequency of Occurrence

535. The frequency of occurrence in relation to displacement of vessel traffic is considered **reasonably probable**.

20.1.1.4 Severity of Consequence

536. The severity of consequence in relation to displacement of vessel traffic is considered **negligible.**

20.1.2 Adverse Weather Routeing

537. As per the construction phase, since no substantial alternative routeing was observed (based on the 12 months of AIS data as well as the 42 days of vessel traffic survey data) nor any transit cancellations which could be traced to adverse weather, no impact on adverse weather routeing has been identified or assessed.

20.1.3 Increased Third-Party to Third-Party Vessel Collision

20.1.3.1 Qualification of Risk

538. Since the main route deviations mirror those established for the equivalent construction phase hazard, the likelihood of an encounter occurring is the same. In particular, the annual collision frequency for the post wind farm scenario (one in 9.6 years) represents a 1% increase compared to the pre wind farm base scenario indicating that the influence of the Proposed Development on the overall collision risk for commercial traffic is low. Additionally, the change in collision risk to small craft due to the main route deviations is expected to be low, noting the sea room available at the western extent (prior to reaching the Owers Bank) and the eastern extent (prior to reaching the Dover Strait TSS including the ITZ).

539. During post PEIR consultation, the portion of the PEIR Assessment Boundary overlapping the ITZ was pulled back from the east to create sea room between the Proposed DCO Limits and the ITZ, thus reducing the collision risk relating to traffic to/from Shoreham Port; it was noted in consultation with Shoreham Port Authority that the main issue from Rampion 1 was the lack of sea room in the ITZ. Furthermore, the MGN 654 compliant navigation corridor located west of Rampion 1 (**C-87**, Table 24-1) offers an additional routeing option for vessels in/out of Shoreham Port, particularly in the event of adverse weather

when fishing vessels may wish to avoid navigating internally within the Rampion 1 and Rampion 2 arrays. During consultation, the MCA have acknowledged that the corridor will be beneficial and further reduce collision risk associated with traffic transiting around the eastern and southern boundaries of the array area.

540. Concern was also raised as part of the first Hazard Workshop in relation to the western extent of the array area, although most felt that the increased sea room available (post scoping) was sufficient and additional mitigation such as buoyage may be required to fully reduce the risk to acceptable levels. Further refinement to the Proposed DCO Limits (post PEIR) has further increased sea room available.

541. Increased collision risk due to wind farm structures visually obstructing vessels may be created in the following scenarios:

- A fishing vessel or recreational vessel navigating within the array area including crossing the navigation corridor or utilising the structures exclusion zone located south of Rampion 1;
- A third-party vessel approaching a corner of the array area; and
- A third-party vessel entering/exiting the navigation corridor.

542. As per the vessel obstruction calculation in Section 19.1.3.1, total blocking of a vessel in transit behind a structure will, as a worst case, last for three seconds behind a WTG and 23 seconds behind an offshore substation. Additionally, taking into account the expectation of good seamanship, the risk is not anticipated to be substantial, including where a vessel passes east-west at the southern entry/exit of the navigation corridor, i.e., the east-west recreational routeing highlighted during consultation by the RYA.

543. In the event that an encounter or collision does occur, the consequences are expected to be the same as for the equivalent construction phase hazard, with the most likely consequences being minor damage incurred and no injuries to persons. The worst case consequences could include the foundering of one of the vessels resulting in a PLL and pollution, with the environmental risk of the latter minimised by the implementation of the MPCP (**C-53**, Table 24-1).

544. As with the equivalent construction phase hazard, for all vessels the risk will be present throughout the operation and maintenance phase, but the promulgation of information (**C-46** and **C-85**, Table 24-1) relating to maintenance activities and charting of infrastructure will allow vessel Masters to passage plan in advance, minimising disruption resulting from late changes to routeing. Additionally, as with the construction phase, mariner awareness will be further maximised by promulgation of information to fishing vessels via an FLO (**C-47**, Table 24-1) and deployment of lighting and marking (**C-84**, Table 24-1).

545. With regard to the navigation corridor, the UK Chamber of Shipping noted that the exit from the corridor could be a pinch point for vessel traffic in the English

Channel, potentially increasing collision risk (see Section 17.12.3). Taking into account the low visual blocking risk, expected good seamanship in line with the COLREGs and the 4.7nm distance between the corridor and traffic out of the Dover Strait TSS, the collision risk associated with exiting the corridor is low. This is in line with the MCA's support of the corridor which highlighted that the 4.7nm distance provided sea room to minimise rights of way issues.

20.1.3.2 Embedded Mitigation Measures

546. The embedded mitigation measures which have been identified as relevant to reducing risk are as follows (further detail on embedded mitigation is included in Section 24):

- **C-46** and **C-85**– Promulgation of information (including charting of all infrastructure);
- **C-47** – Fishing liaison;
- **C-53** – Pollution planning;
- **C-84** – Lighting and marking; and
- **C-87** – MGN 654 compliance.

20.1.3.3 Frequency of Occurrence

547. The frequency of occurrence in relation to displacement of vessel traffic is considered **reasonably probable**.

20.1.3.4 Severity of Consequence

548. The severity of consequence in relation to displacement of vessel traffic is considered **moderate**.

20.1.4 Increased Vessel Grounding Risk

20.1.4.1 Qualification of Risk

549. Since the main route deviations mirror those established for the equivalent construction phase hazard, the likelihood of a grounding incident for a commercial vessel occurring is the same. In particular, for Routes 8 and 17 there is an increased risk due to the proximity of these routes to the Outer Owers where water depths drop considerably (less than 5m), but the presence of the Owers Light Buoy will assist in protecting vessels from the shallows of the Owers Bank and there is sufficient sea room available for vessels to pass safely between the array area and Owers Light Buoy, particularly given the reduction in the area covered by the Proposed DCO Limits compared to the Scoping and PEIR Assessment Boundaries.

550. In the event that a grounding incident does occur, the consequences are expected to be the same as for the equivalent construction phase hazard, with minor damage incurred and no injuries to persons the most likely consequence and the foundering of the vessel resulting in a PLL and pollution the unlikely worst case consequences, with the environmental risk of the latter minimised by the implementation of the MPCP (**C-53**, Table 24-1).

20.1.4.2 Relevant Embedded Mitigation Measures

551. The embedded mitigation measures which have been identified as relevant to reducing risk are as follows (further detail on embedded mitigation is included in Section 24):

- **C-53** – Pollution planning.

20.1.4.3 Frequency of Occurrence

552. The frequency of occurrence in relation to increased grounding risk is considered to be **extremely unlikely**.

20.1.4.4 Severity of Consequence

553. The severity of consequence in relation to increased grounding risk is considered to be **moderate**.

20.1.5 Significance of Risk

554. Table 20-1 summarises the resulting significance of risk for each component of this hazard in relation to navigational safety.

Table 20-1 Summary of shipping and navigation risk rankings for vessel displacement during operation and maintenance phase

Hazard Component	Frequency of Occurrence	Severity of Consequence	Significance of Risk
Vessel displacement	Reasonably Probable	Negligible	Broadly Acceptable
Third party vessel to vessel collision risk	Reasonably Probable	Moderate	Tolerable
Grounding risk	Extremely Unlikely	Moderate	Broadly Acceptable

555. Overall, it is predicted that the significance risk due to vessel displacement is of **Tolerable** significance (given that the worst case result is Tolerable for the third party vessel to vessel collision risk component of the hazard).

20.2 Third-Party to Project Vessel Collision Risk

556. *Vessels associated with operation and maintenance activities may increase encounters and collision risk for other vessels already operating in the area.*

20.2.1 Qualification of Risk

557. Up to 869 return trips per year by operation and maintenance vessels may be made throughout the operation and maintenance phase, including RAM vessels. It is assumed that operation and maintenance vessels will be on-site

throughout the operation and maintenance phase. It is noted that the movement of project vessels during the operation and maintenance phase represents a decrease in movements in comparison to the construction phase.

558. As with the equivalent construction phase hazard, encounter and collision risk involving a project vessel will be well mitigated, including through marine coordination (**C-88**, Table 24-1), carriage of AIS and compliance with Flag State regulations by project vessels, and promulgation of information to fishing fleets via an appointed FLO (**C-47**, Table 24-1).

559. Furthermore, an application for safety zones of 500m radius will be sought during the operation and maintenance phase (**C-56**, Table 24-1). These will serve to protect project vessels engaged in major maintenance activities. Minimum advisory passing distances, as defined by risk assessment, may also be applied, with advanced warning and accurate locations of both safety zones and any minimum advisory safe passing distances provided by Notifications to Mariners and Kingfisher Bulletins (**C-46** and **C-85**, Table 24-1).

560. As with the equivalent construction phase hazard, third party vessels may experience restrictions on visually identifying project vessels entering and exiting the array area during reduced visibility, including within the structures exclusion zone located west of Rampion 1; however, this hazard will be mitigated by the application of the COLREGs (reduced speeds) in adverse weather conditions and project vessels mandatorily will carry AIS regardless of size (**C-88**, Table 24-1). In the case of the structures exclusion zone located west of Rampion 1, designated entry and exit points to/from the array area for project vessels will be selected to ensure collision risk within the corridor is minimised.

561. As stated for the equivalent construction phase hazard, based on historical incident data, there have been two instances of a third-party vessel colliding with a wind farm vessel in the UK. In both incidents moderate vessel damage was reported with no harm to persons. It is noted that the two incidents occurred in 2011 and 2012, respectively, and awareness of offshore wind developments and application of the measures outlined above has improved and been refined considerably in the interim, with no further collision incidents reported since.

562. As for the equivalent construction risk, RED will exhibit lights, marks, sounds, signals and other aids to navigation as required by Trinity House and MCA (**C-84**, Table 24-1)**,** maximising mariner awareness when in proximity, both in day and night conditions including in poor visibility.

563. Should an encounter or collision occur between a third-party vessel and a project vessel, the consequences are expected to be the same as for the equivalent construction phase hazard, with the most likely consequences being minor damage incurred and no injuries to persons. The worst-case consequences could include the foundering of one of the vessels resulting in

a PLL and pollution, with the environmental risk of the latter minimised by the implementation of the MPCP (**C-53**, Table 24-1).

20.2.2 Relevant Embedded Mitigation Measures

564. The embedded mitigation measures which have been identified as relevant to reducing risk are as follows (further detail on embedded mitigation is included in Section 24):

- **C-46** and **C-85** – Promulgation of information;
- **C-47** – Fishing Liaison;
- **C-53** – Pollution planning;
- **C-56** – Safety zones;
- **C-84** – Lighting and marking; and
- **C-88** – Marine coordination.

20.2.3 Frequency of Occurrence

565. The frequency of occurrence in relation to increased third-party to project vessel collision risk is considered to be **extremely unlikely**.

20.2.4 Severity of Consequence

566. The severity of consequence in relation to increased third-party to project vessel collision risk is considered to be **moderate**.

20.2.5 Significance of Risk

567. Overall, it is predicted that the significance of risk due to increased third-party to project vessel collision risk is of **Broadly Acceptable** significance.

20.3 Creation of Vessel to Structure Allision Risk

568. *Presence of structures in the offshore environment may increase powered, drifting and internal allision risk for vessels.*

569. The spatial extent of the hazard is small given that a vessel must be in close proximity to a wind farm structure for an allision incident to occur. The forms of allision considered include:

- Powered allision risk;
- Drifting allision risk; and
- Internal allision risk.

570. Familiarity with offshore wind farms and navigating in their proximity will be high for vessels operating in proximity to the Proposed Development, primarily due to the existing presence of Rampion 1, but – in the case of the large volume of vessel traffic out of the Dover Strait TSS coming from North Sea ports – also due to the increasing number of offshore wind farms present in the North Sea across multiple states.

20.3.1 Powered Allision Risk

20.3.1.1 Qualification and Quantification of Risk

571. With the main commercial route deviations associated with the presence of the Proposed Development in place, the base case annual powered vessel to structure allision frequency is estimated to be 2.17×10^{-3}, corresponding to a return period of approximately one in 460 years. This is a moderate to high return period compared to that estimated for other UK offshore wind farm developments and is reflective of the high volume of vessel traffic in the area, particularly within and out of the Dover Strait TSS and out of the Solent. The greatest powered vessel to structure allision risk was associated with structures at the western extent of the array area where multiple main commercial routes pass at the minimum mean distance from the array area (1nm) headed into the Solent. The greatest individual allision risk was associated with the structure on the south-western edge of the array area (approximately 4.03×10^{-4} or one in 2,484 years). This aligns with UK Chamber of Shipping expectations during consultation.

572. Based on historical incident data, there have been two reported instances of a third-party vessel alliding with an operational wind farm structure in the UK (in the Irish Sea and Southern North Sea). Both of these incidents involved a fishing vessel, with an RNLI lifeboat attending on both occasions and a helicopter deployed in one case. Given the navigational measures which exist in proximity to the Proposed Development (such as the Dover Strait TSS and approaches to the Solent) and subsequent heightened alertness, it is unlikely that such an incident will occur in relation to the Proposed Development.

573. Should an allision occur, the consequences will depend on multiple factors including the energy of the impact, structural integrity of the vessel and sea state at the time of the impact. Fishing vessels and recreational vessels are considered most vulnerable to the impact given the potential for a non-steel construction and possible internal navigation within the array by such vessels. In such cases, the most likely consequences will be minor damage with the vessel able to resume passage and undertake a full inspection at the next port. As an unlikely worst case, the vessel could be foundered resulting in a PLL and pollution. If pollution were to occur, then the MPCP will be implemented (**C-53**, Table 24-1) to minimise the environmental risk.

574. Additionally, commercial vessels are expected to comply with international and flag state regulations (including the COLREGs and SOLAS) and will be able to passage plan in advance given the promulgation of information relating to the Proposed Development (**C-46** and **C-85**, Table 24-1).

575. The offshore substations carry increased powered allision risk and consequences due to their greater size and resistant force. However, the increase is not considered substantial and may be mitigated by the effective use of operational lighting and marking in accordance with requirements from Trinity House and MCA (**C-84**, Table 24-1). Moreover, the offshore substations

will not be located on the perimeter of the array area, greatly reducing their exposure, including in relation to marine aggregate dredgers operating in the region.

576. With regard to the structures exclusion zone located west of Rampion 1 (serving as a navigation corridor), the MCA stated during consultation that under COLREGs traffic exiting the Dover Strait TSS to the Solent would give way to traffic exiting the navigation corridor, forcing a starboard turn towards the wind farm. However, it was noted by the MCA that the 4.7nm separation between the mean route position and the navigation corridor provides sufficient sea room such that there is no significant additional allision risk as a result of such a manoeuvre (see Section 17.12.1). Specific lighting and marking requirements to minimise allision risk associated with routeing through the navigation corridor itself will be minimised by the corridor being MGN 654 compliant (**C-87**, Table 24-1). Moreover, any need for specialised aids to navigation relating to the navigation corridor will be agreed post-consent with Trinity House, the MCA and the CAA as part of the lighting and marking sign-off process and the Proposed Development will ensure ongoing liaison with an FLO (**C-47**, Table 24-1).

20.3.1.2 Relevant Embedded Mitigation Measures

577. The embedded mitigation measures which have been identified as relevant to reducing risk are as follows (further detail on embedded mitigation is included in Section 24):

- **C-46** and **C-85** – Promulgation of information;
- **C-47** – Fishing liaison;
- **C-53** – Pollution planning;
- **C-84** – Lighting and marking;
- **C-87** – Compliance with MGN 654; and
- **C-88** – Marine coordination.

20.3.1.3 Frequency of Occurrence

578. The frequency of occurrence in relation to powered allision risk is considered to be **extremely unlikely**.

20.3.1.4 Severity of Consequence

579. The severity of consequence in relation to powered allision risk is considered to be **moderate**.

20.3.2 Drifting Allision Risk

20.3.2.1 Qualification and Quantification of Risk

580. With the main commercial route deviations associated with the presence of the Proposed Development in place, the base case annual drifting vessel to structure allision frequency is estimated to be 8.64×10^{-4}, corresponding to a return period of approximately one in 1,157 years. This is a moderate return

period compared to that estimated for other UK offshore wind farm developments and is reflective of the high volume of vessel traffic in the area, particularly within and out of the Dover Strait TSS and out of the Solent. The greatest drifting vessel to structure allision risk is associated with structures at the western extent of the array area where multiple main commercial routes pass at the minimum mean distance from the array area (1nm) headed into the Solent and on the flood tide may drift towards these structures. The greatest individual allision risk is associated with the structure on the south-western edge of the array area (approximately 1.79×10^{-4} or one in 5,580 years).

581. Based on historical incident data, there have been no instances of a third-party vessel alliding with an operational wind farm structure whilst Not Under Command (NUC). However, there is higher potential for a vessel to be adrift; this is reflected in the MAIB incident data reviewed in proximity to the Proposed Development which indicates that machinery failure is the most common incident type (approximately 29%).

582. A vessel adrift may only develop into an allision situation if in proximity to a wind farm structure. This is only the case where the adrift vessel is located internally within or in close proximity to the array (including within the structures exclusion zones) and the direction of the wind and/or tide directs the vessel towards a structure.

583. Given the high volume of traffic, the westbound lane of the Dover Strait TSS may be considered the most likely source for a drifting incident to originate. However, taking into account the distance to the array area (approximately 4.3nm from the end of the westbound lane of the TSS), it is very unlikely that the drifting incident (for a powered vessel) will develop into an allision situation since the vessel could potentially regain power prior to reaching the array or initiate its emergency response procedures to avoid an allision occurring should one develop. This may include an emergency anchoring event which would involve checking relevant nautical charts to ensure that deployment of the anchor will not lead to other risks (such as anchor snagging on a sub-sea cable) in line with emergency procedures. It is noted that there are limited seabed features located between routeing out of the westbound lane of the Dover Strait TSS and the array area.

584. During consultation the RYA raised concerns regarding the likelihood of a recreational craft's ability to anchor during a drifting incident. However, while it is recognised that it may be unlikely for recreational craft to prevent a drifting allision by anchoring, the proposed structures exclusion zones will assist with facilitating SAR access in the event of such an incident. Furthermore, project vessels may be able to swiftly render assistance including under SOLAS obligations (IMO, 1974) and will be managed via marine coordination (**C-88**, Table 24-1).

585. Meteorological data suggest that prevailing north and north-westerly winds (which would be required to direct a vessel out of the Dover Strait TSS towards a structure) constitute only a minor proportion of winds in the area. CLdN – a regular operator in the Dover Strait TSS – noted the drifting risk from the Dover Strait TSS during consultation but acknowledged that the issue was no different from that at any existing offshore wind farm.

586. Another possible source for a drifting incident is a recreational vessel under sail in unfavourable weather conditions, particularly at the western extent of the Proposed DCO Limits if sailing westwards into a prevailing south-westerly wind, a scenario highlighted by the RYA during consultation. The recreational vessel would have limited options in terms of emergency action if an allision situation were to develop. However, one option would be to lower the sails, hove to or deploying a drogue depending on the design of the vessel. Additionally, given the high level of emergency response resources in the region (including RNLI, SAR helicopter services, project vessels and third-party vessels), it is anticipated that the response time to assist the adrift vessel would be reasonable. This response time is also relevant to recreational vessels unable to anchor in the case of an emergency, including when navigating within the structures exclusion zone located south of Rampion 1.

587. Should an allision occur, the consequences will be similar to those noted for the case of a powered allision including the unlikely worst-case of foundering and pollution; in the highly unlikely scenario of a drifting allision incident resulting in pollution, the implementation of the MPCP (**C-53**, Table 24-1) will minimise the environmental risk. Additionally, a drifting vessel is likely to transit at a reduced speed compared to a powered vessel, thus reducing the energy of the impact, including in the case of a recreational vessel under sail.

588. The offshore substations again carry increased allision risk and consequences due to their greater size and resistant force, although this may again be mitigated by effective use of operational lighting and marking in accordance with requirements from Trinity House and MCA. During consultation, Tarmac Marine indicated that the offshore substations posed a particular concern in relation to drifting allision risk when sited on the perimeter of the array (at PEIR); however, the worst-case layout for the ES places the offshore substations at internal locations, mitigating this concern.

20.3.2.2 Relevant Embedded Mitigation Measures

589. The embedded mitigation measures which have been identified as relevant to reducing risk are as follows (further detail on embedded mitigation is included in Section 24):

- **C-53** – Pollution planning; and
- **C-88** – Marine coordination.

20.3.2.3 Frequency of Occurrence

590. The frequency of occurrence in relation to drifting allision risk is considered to be **extremely unlikely**.

20.3.2.4 Severity of Consequence

591. The severity of consequence in relation to drifting allision risk are considered to be **moderate**.

20.3.3 Internal Allision Risk

20.3.3.1 Qualification and Quantification of Risk

592. As noted previously, based on experience at existing operational offshore wind farms (including at Rampion 1), it is anticipated that:

- Commercial vessels will choose not to navigate internally within the array;
- Fishing vessels may choose to navigate internally within the array, particularly in summer months;
- Recreational vessels are unlikely to choose to navigate internally within the array area.

593. Therefore, the likelihood of an internal allision involving a commercial vessel is anticipated to be negligible.

594. The base case annual fishing vessel to structure allision frequency is estimated to be 5.01×10^{-1}, corresponding to a return period of approximately one in 2.0 years. This is a high return period compared to that estimated for other UK offshore wind farm developments and is reflective of the high volume of fishing vessel traffic in the area, both in transit and engaged in fishing activities. The greatest fishing vessel to structure allision risk was associated with structures at the eastern extent of the array area where active fishing activity was observed and west of Rampion 1 where fishing vessels regularly transit north-east to south-west out of Shoreham Port. The greatest individual allision risk was associated with one of the structures on the eastern edge of the array area (approximately 3.37×10^{-2} or one in 30 years).

595. The minimum spacing between structures of 830m is considered sufficient for safe internal navigation, keeping clear of the wind farm structures. It is noted that this spacing is greater than that associated with many other offshore wind farms in the UK located near the coast and is slightly greater than the minimum spacing at Rampion 1 where evidence suggests that fishing vessels are comfortable operating internally in favourable conditions. A layout plan will be agreed with the MMO following appropriate consultation with Trinity House and the MCA (**C-86**, Table 24-1).

596. As with any passage, any vessel navigating within the array is expected to passage plan in accordance with SOLAS Chapter V (IMO, 1974) and promulgation of information (**C-46** and **C-85**, Table 24-1) including through ongoing liaison with fishing fleets via an appointed FLO (**C-47**, Table 24-1) will

ensure that such vessels have good awareness of any maintenance works being undertaken. This includes the placement of safety zones of 500m radius which will be applied for around major maintenance activities (**C-56**, Table 24-1) which itself will assist safe navigation internally within the array by guiding vessels on a safe passing distance.

597. RED will exhibit lights, marks, sounds, signals and other aids to navigation as required by Trinity House, MCA and CAA (**C-84**, Table 24-1). This will include unique identification marking of each wind farm structure in an easily understandable pattern to minimise the risk of a mariner navigating internally within the array becoming disoriented.

598. Should a recreational vessel under sail enter the proximity of a WTG, there is also potential for effects such as wind shear, masking and turbulence to occur. From previous studies of offshore wind developments, it has been concluded that WTGs do reduce wind velocity downwind of a WTG (MCA, 2008) but that no negative effects on recreational craft have been reported on the basis of the limited spatial extent of the effect and its similarity to that experienced when passing a large vessel or close to other large structures (such as bridges) or the coastline. In addition, no practical issues have been raised by recreational users to date when operating in proximity to existing offshore wind developments including at Rampion 1.

599. For recreational vessels with a mast there is an additional allision risk when navigating internally within the array associated with the WTG blades. However, the minimum blade tip clearance is 22m above Mean High Water Springs (MHWS) (**C-89**, Table 24-1) which is aligned with the minimum clearance the RYA recommend for minimising allision risk (RYA, 2019) and which is also noted in MGN 654 (**C-87**, Table 24-1).

20.3.3.2 Relevant Embedded Mitigation Measures

600. The embedded mitigation measures which have been identified as relevant to reducing risk are as follows (further detail on embedded mitigation is included in Section 24):

- **C-46** and **C-85** – Promulgation of information;
- **C-47** – Fishing liaison;
- **C-53** – Pollution planning;
- **C-56** – Safety Zones;
- **C-84** – Lighting and marking;
- **C-86** – Layout;
- **C-87** – MGN 654 compliance;
- **C-88** – Marine coordination; and
- **C-89** – Blade clearance.

20.3.3.3 Frequency of Occurrence

601. The frequency of occurrence in relation to internal allision risk is considered to be **remote**.

20.3.3.4 Severity of Consequence

602. The severity of consequence in relation to internal allision risk is considered to be **moderate**.

20.3.4 Significance of Risk

603. Table 20-2 summarises the resulting significance of risk for each component of this hazard.

Table 20-2 Summary of shipping and navigation risk rankings for vessel to structure allision risk during operation and maintenance phase

Hazard Component	Frequency of Occurrence	Severity of Consequence	Significance of Risk
Powered allision risk	Extremely Unlikely	Moderate	Broadly Acceptable
Drifting allision risk	Extremely Unlikely	Moderate	Broadly Acceptable
Internal allision risk	Remote	Moderate	Tolerable

604. Overall, it is predicted that the significance of risk due to creation of vessel to structure allision risk is of **Tolerable** significance (given that the worst case result is Tolerable for the internal allision risk component of the hazard).

20.4 Reduced Access to Local Ports and Harbours

605. *Presence of structures in the offshore environment may displace existing routes/activity restricting access to ports/harbours and prevent use of existing aids to navigation.*

606. To ensure the hazard is assessed in as much detail as possible overall, a number of ports and harbours in the area are considered individually, taking account of the vessel traffic movements associated with these ports, based on vessel traffic data and consultation feedback.

607. Any considerations of the commercial impact on local port access are outside the scope of navigational safety and have therefore not been considered within this assessment (see **Chapter 13: Shipping and navigation, Volume 2** of the ES (Document Reference 6.2.13) for consideration of commercial risks to port access).

20.4.1 Shoreham Port

608. Since the main route deviations established for the construction phase also apply to the operation and maintenance phase, the hazard is considered broadly similar for commercial vessels. In particular, routes used by marine aggregate dredgers are unlikely to be disrupted, noting that the level of deviation for such routes is low (see the vessel displacement hazard).

609. Unlike during the construction phase, fishing vessels are anticipated to transit internally within the array, particularly during the summer months, based on experience at Rampion 1. Therefore, access to Shoreham Port for fishing vessels is unlikely to be compromised for the operation and maintenance phase during the summer months, although may be analogous with the level of displacement anticipated for the construction phase during the winter months, depending on the spacing between structures in the final array layout. Active commercial fishing is assessed separately in **Chapter 10: Commercial fisheries, Volume 2** of the ES (Document Reference 6.2.10) where consultation on spacing between structures is considered post PEIR.

610. Additionally, the structures exclusion zone located west of Rampion 1 (serving as a navigation corridor) provides an alternative option for access to/from Shoreham Port for commercial vessels and fishing vessels (particularly in the winter months), noting that the corridor is MGN 654 compliant. During consultation, Shoreham Port Authority indicated that should the navigation corridor be of suitable width, traffic to/from Shoreham Port may use the navigation corridor, noting that vessels will take the safest option in adverse weather conditions.

611. Recreational vessel activity is mostly confined to the nearshore area and the summer period, and so disruption to recreational vessel movements out of Shoreham Port are not expected to be notable.

612. As per the equivalent construction phase hazard, the pilot boarding station for Shoreham Port is located far enough away from the array area that the presence of the Proposed Development is not anticipated to have any impact on access to pilotage services, noting that no risk has been reported due to the presence of Rampion 1.

613. Similarly, the leading line for Shoreham Port ends approximately 7.0nm north of the array area and so the presence of the Proposed Development is not anticipated to encumber use of the leading lights (with 10nm nominal range) for the port for aiding approaches. Again, no issue has been raised regarding this matter due to the presence of Rampion 1.

20.4.1.1 Frequency of Occurrence

614. The frequency of occurrence for Shoreham Port in relation to navigational safety is considered to be **remote**.

20.4.1.2 Severity of Consequence

615. The severity of consequence for Shoreham Port in relation to navigational safety is considered to be **minor**.

20.4.2 Port of Newhaven

616. As discussed for the equivalent construction phase hazard, the passenger ferry service operated by DFDS Seaways out of the Port of Newhaven is not anticipated to be disrupted given that the route heads south-east out of the Port of Newhaven and crosses the Dover Strait TSS, staying well clear of the array area. Other commercial activity at the Port of Newhaven is limited.

617. Disruption to fishing and recreational users operating nearshore at the Port of Newhaven is again not anticipated to be substantial when considering the distance to the array area and the marine coordination that will be implemented for project vessels. Additionally, since the volume of project vessel movements will be lower during the operation and maintenance phase, the impact is less frequent than that considered in the equivalent hazard for the construction phase.

618. Likewise, disruption to recreational traffic which transits east-west out of the Port of Newhaven and crosses the offshore export cable corridor will be lower given that maintenance activities will be limited to surveys and remedial burial and repairs where required. This activity will be present throughout the operation and maintenance phase although the interval between surveys may increase over time as cables are proven to be stable.

619. As per the equivalent construction phase hazard, the pilot boarding station for the Port of Newhaven is located far enough away from the array area that the presence of the Proposed Development is not anticipated to have any impact on access to pilotage services.

620. There are no existing aids to navigation relating to the Port of Newhaven which may be encumbered by the presence of the Proposed Development.

20.4.2.1 Frequency of Occurrence

621. The frequency of occurrence for the Port of Newhaven in relation to navigational safety is considered to be **remote**.

20.4.2.2 Severity of Consequence

622. The severity of consequence for the Port of Newhaven in relation to navigational safety is considered to be **negligible**.

20.4.3 Brighton Marina

623. Disruption to recreational users operating nearshore at Brighton Marina is again not anticipated to be substantial when considering the distance to the array area and the marine coordination that will be implemented for project

vessels. Additionally, since the volume of project vessel movements will be lower during the operation and maintenance phase, the impact is less frequent than that considered in the equivalent hazard for the construction phase.

624. Likewise, disruption to recreational traffic which transits east-west out of the Port of Newhaven and crosses the offshore export cable corridor will be lower given that maintenance activities will be limited to surveys and remedial burial and repairs where required. This activity will be present throughout the operation and maintenance phase although the interval between surveys may increase over time as cables are proven to be stable.

625. Recreational vessels undertaking visits to Rampion 1 are again unlikely to face any additional challenges to port access, noting again the marine coordination that will be implemented for project vessels.

626. There are no existing aids to navigation relating to Brighton Marina which may be encumbered by the presence of the Proposed Development.

20.4.3.1 Frequency of Occurrence

627. The frequency of occurrence for Brighton Marina in relation to navigational safety is considered to be **extremely unlikely**.

20.4.3.2 Severity of Consequence

628. The severity of consequence for Brighton Marina in relation to navigational safety is considered to be **negligible**.

20.4.4 Littlehampton Harbour

629. Since the main route deviations established for the construction phase also apply to the operation and maintenance phase, the hazard is considered broadly similar for commercial vessels. In particular, the route used by three small coasters into Littlehampton Harbour from the Dover Strait TSS may be compromised, as assessed as part of vessel displacement. However, the navigation corridor provides an alternative option for access to/from Littlehampton Harbour and during consultation Littlehampton Harbour Board stated that it would benefit fishing and recreational vessels out of Littlehampton Harbour as well as the low volume commercial activity.

630. Access to the harbour itself should be mitigated by the implementation of marine coordination for project vessels (**C-88**, Table 24-1) including the application of traffic management procedures such as the designation of routes to and from port.

631. Disruption to the port and pilotage services due to maintenance activities relating to the offshore export cable corridor will be lower given that maintenance activities will be limited to surveys and remedial burial and repairs where required. This activity will be present throughout the operation

and maintenance phase although the interval between surveys may increase over time as cables are proven to be stable.

632. The leading line for Littlehampton Harbour ends approximately 4.0nm north of the array area and so the presence of the Proposed Development is not anticipated to encumber use of the leading lights (with 10nm nominal range) for the port for aiding approaches. It is noted that, as an unlikely worst case for vessel displacement, the post wind farm deviation for the small coaster route discussed above (Route 17) still aligns with the leading line on approach to Littlehampton Harbour despite this incurring a greater transit distance. Leading line alignment would also be maintained should these vessels utilise the navigation corridor.

633. There are several racing marks used by the Arun Yacht Club located in proximity to Littlehampton Harbour, two of which are located within the offshore export cable corridor. However, noting the distance of the array area from such aids to navigation and the limited maintenance activities which will be undertaken within the offshore export cable corridor as outlined above, there is not anticipated to be any impact on the use of these aids to navigation.

20.4.4.1 Frequency of Occurrence

634. The frequency of occurrence for Littlehampton Harbour in relation to navigational safety is considered to be **extremely unlikely**.

20.4.4.2 Severity of Consequence

635. The severity of consequence for Littlehampton Harbour in relation to navigational safety is considered to be **moderate**.

20.4.5 Ports in the Solent

636. As per the equivalent construction phase hazard, given the distance from the Proposed DCO Limits, it is not anticipated that on-site maintenance activities will have any substantial effect on port access and likewise use of numerous navigational features associated with access to the Solent (including pilot boarding stations, designated anchorage areas and the Nab Deep Water Channel) will not be encumbered by the presence of the Proposed Development. This includes the St Helen's Road Anchorage located off the Isle of Wight which was raised as a possible concern by the UK Chamber of Shipping during consultation.

637. Additionally, the NAB Tower (located adjacent to some of the pilot boarding stations and the NAB Deep Water Channel approximately 12nm west of the array area) with a nominal range of 12nm is located a sufficient distance from the array area that the presence of structures will not encumber use of this navigational aid by vessels approaching the Solent.

20.4.5.1 Frequency of Occurrence

638. The frequency of occurrence for ports in the Solent in relation to navigational safety is considered to be **frequent**.

20.4.5.2 Severity of Consequence

639. The severity of consequence for ports in the Solent in relation to navigational safety is considered to be **negligible**.

20.4.6 Prevention of Use of Other Aids to Navigation

640. Although many aids to navigation in the area are directly linked to local ports (as discussed for the relevant ports above), there are other aids to navigation in the area which are not directly linked to local ports.

641. These include at Rampion 1 where SPS are equipped with flashing yellow lights with a nominal range of 5nm. There are also two special marks where the Rampion 1 site has a concave shape. The presence of the Proposed Development will prevent the use of those Rampion 1 aids to navigation which are on the southern periphery. However, RED itself will exhibit lights, marks, sounds, signals and other aids to navigation as required by Trinity House, MCA and CAA (**C-84**, Table 24-1), thus ensuring that the purpose of the aids to navigation at Rampion 1 – to assist vessels with safe navigation in proximity to an offshore wind farm – is maintained. It is noted that the aids to navigation associated with Rampion 1 may be reviewed in consultation with Trinity House following the installation of the Proposed Development, including the potential removal of the southern special mark.

642. The previously mentioned Owers Light Buoy may be partially obscured to vessels approaching from the Dover Strait TSS with the intention of navigating around the array area. However, with suitable passage planning mariners should be aware of the shallows of the Owers Bank that it highlights and have a high level of awareness navigating in an area with shallow waters. The presence of the SPSs will also guide mariners around the array until they visually acquire the Owers Light Buoy, noting that the structures exclusion zone located west of Rampion 1 (serving as a navigation corridor) may limit the likelihood of vessels taking this course.

643. Another buoy in proximity to the array area is the CS1 light buoy, a special mark indicating the end of the Dover Strait TSS. However, noting the direction from which vessels making passage in proximity to this buoy transit and its distance from the array area (approximately 4.9nm), no effect on its use is anticipated.

20.4.6.1 Frequency of Occurrence

644. The frequency of occurrence for all vessels in relation to use of existing aids to navigation is considered to be **negligible**.

20.4.6.2 Severity of Consequence

645. The most likely consequences for all vessels in relation to use of existing aids to navigation are considered to be **minor**.

20.4.7 Relevant Embedded Mitigation Measures

646. The embedded mitigation measures which have been identified as relevant to reducing risk are as follows (further detail on embedded mitigation is included in Section 24):

- **C-84** – Lighting and marking; and
- **C-88** – Marine coordination.

20.4.8 Significance of Risk

647. Table 20-3 summarises the resulting significance of risk for each user.

Table 20-3 Summary of risk rankings from reduced access to local ports during operation and maintenance phase

User	Frequency of Occurrence	Severity of Consequence	Significance of Risk
Shoreham Port	Remote	Minor	Broadly Acceptable
Port of Newhaven	Remote	Negligible	Broadly Acceptable
Brighton Marina	Extremely Unlikely	Negligible	Broadly Acceptable
Littlehampton Harbour	Extremely Unlikely	Moderate	Broadly Acceptable
Ports in the Solent	Frequent	Negligible	Tolerable
All vessels (use of existing aids to navigation)	Negligible	Minor	Broadly Acceptable

648. Overall, it is predicted that the significance of risk due to reduced access to local ports is of **Tolerable** significance (given that the worst case result is Tolerable for the ports in the Solent component of the hazard).

20.5 Changes in Under Keel Clearance

649. *The presence of sub-sea cable protection in the offshore environment may reduce charted water depths leading to increased risk of under keel interaction for passing vessels.*

650. This hazard was highlighted by the RYA during consultation, noting that disruption to the seabed from construction methods could create coastal navigation problems.

651. For the array and offshore interconnector cables the target burial depth is 1.0m and for the export cables the target burial depth is between 1.0 and 1.5m (**C-41**, Table 24-1). Seabed burial will be the primary means of cable burial and the burial depth of any external cable protection will be determined by the cable burial risk assessment (**C-45**, Table 24-1).

652. It is acknowledged that array cables may be located within the structures exclusion zones; however, these will be subject to the same determination of cable protection type and burial depth as detailed above.

653. Where cable burial is not possible, alternative cable protection methods may be deployed which will again be determined within the cable burial risk assessment. It is noted that there are no cable crossings anticipated for the export cables and up to four cable crossings anticipated for the array cables. The Applicant intend to follow the guidance contained in MGN 654 in relation to cable protection (**C-83**, Table 24-1), namely cable protection will not change the charted water depth by more than 5%., including where cable crossings occur. This aligns with the RYA's recommendation that the "*minimum safe under keel clearance over submerged structures and associated infrastructure should be determined in accordance with the methodology set out in MGN 543 [since superseded by MGN 654]*" (RYA, 2019). With this guidance adhered to, the likelihood of an underwater allision is considered very low.

654. Should this percentage be exceeded, further assessment including consultation with the MCA and Trinity House may be required to determine whether any additional mitigation measures are necessary to ensure the safety of navigation.

655. Should an underwater allision occur, the consequences are akin to those identified for a grounding incident, with grounding considered one such possible outcome. Minor damage incurred is the most likely consequence, and foundering of the vessel resulting in a PLL and pollution the unlikely worst case consequences, with the environmental risks of the latter minimised by the implementation of the MPCP (**C-53**, Table 24-1).

20.5.1 Relevant Embedded Mitigation Measures

656. The embedded mitigation measures which have been identified as relevant to reducing risk are as follows (further detail on embedded mitigation is included in Section 24):

- **C-41** and **C-45** – Cable burial;
- **C-53** – Pollution planning; and
- **C-83** – Water depth change.

20.5.2 Frequency of Occurrence

657. The frequency of occurrence for changes in under keel clearance is considered to be **negligible**.

20.5.3 Severity of Consequence

658. The severity of consequence for changes in under keel clearance is considered to be **moderate**.

20.5.4 Significance of Risk

659. Overall, it is predicted that the significance of risk due to changes in under keel clearance is of **Broadly Acceptable** significance.

20.6 Increased Interaction with Sub-Sea Cables

20.6.1 Qualification of Risk

660. *Presence of export cables, array cables and interconnector cables in the offshore environment may increase the potential for interaction with sub-sea cables.*

661. The spatial extent of the hazard is small given that a vessel must be in close proximity to an export cable, array cable or interconnector cable for an interaction to occur, although a vessel could be present for a reasonable duration, with Littlehampton Harbour Board noting during consultation that vessels may spend anywhere between six hours and two days at anchor in the approaches to their harbour.

662. Additionally, marine aggregate dredging representatives noted during consultation that marine aggregate dredgers will likely operate in proximity to the offshore export cable corridor for extended periods, and should a marine aggregate dredger drift on the ebb tide this could lead to the vessel being directly over the export cables. Moreover, should a marine aggregate dredger anchor over the export cables then it is likely that the anchor will penetrate through 1.5m of seabed.

663. There are three anchoring scenarios which are considered for this hazard:

- planned anchoring – most likely as a vessel awaits a berth to enter port but may also result from adverse weather conditions, machinery failure or sub-sea operations;
- unplanned anchoring – generally resulting from an emergency situation where the vessel has experienced steering failure; and
- anchor dragging – caused by anchor failure.

664. Although the second of these scenarios may involve limited decision-making time if drifting towards a hazard, in all three scenarios it is anticipated that the charting of infrastructure including the sub-sea cables will inform the decision to anchor, as per Regulation 34 of SOLAS (IMO, 1974).

665. From the vessel traffic survey data, an average of two anchored vessels were identified per day. The closest anchoring activity to the Proposed DCO Limits was a cargo vessel approximately 0.25nm west of the offshore export cable corridor. Generally, the majority of anchoring activity was associated with designated anchorages at nearby ports and harbours including Shoreham Port, the Port of Newhaven, and within the Solent, with the closest such designated anchorage area located approximately 7.4nm from the array area. Only one anchored vessel was recorded in proximity to Littlehampton Harbour where the export cables make landfall.

666. The primary concern noted by Littlehampton Harbour Board during consultation was that of cable burial and anchoring vessels in proximity to the export cables potentially requiring anchorage relocation. This concern will be investigated further within the cable burial risk assessment undertaken post-consent (**C-45**, Table 24-1).

667. The likelihood of anchor interaction with a sub-sea cable is further minimised by the burial of the cables and use of external cable protection where required, which will be informed by the cable burial risk assessment and detailed within the Cable Specification and Installation Plan (**C-41** and **C-45**, Table 24-1). The target burial depth of between 1.0 and 1.5m for the export cables may be insufficient based on consultation feedback from marine aggregate dredgers and this will be further considered in the cable burial risk assessment.

668. It is acknowledged that array cables may be located within the structures exclusion zones. As per the description of anchoring activity above, no anchoring activity was observed within the structures exclusion zones; therefore, it is assumed that anchoring would occur only in the unlikely event of an emergency (see Section 17.8).

669. Should an anchor interaction incident occur, the most likely consequences will be low based on historical anchor interaction incidents, with no damage incurred to the cable or the vessel. As an unlikely worst case, a snagging incident could occur and the vessel's anchor and/or the cable could be damaged; however, with the mitigation measures above in place, this risk will be minimised. For commercial fishing vessels the consequences may also include compromised stability of the vessel.

20.6.2 Relevant Embedded Mitigation Measures

670. The embedded mitigation measures which have been identified as relevant to reducing risk are as follows (further detail on embedded mitigation is included in Section 24):

- **C-41** and **C-45** – Cable burial; and
- **C-46** and **C-85** – Promulgation of information.

20.6.3 Frequency of Occurrence

671. The frequency of occurrence is considered to be **negligible**.

20.6.4 Severity of Consequence

672. The severity of consequence is considered to be **minor**.

20.6.5 Significance of Risk

673. Overall, it is predicted that the significance of risk due to increased interaction with sub-sea cables is of **Broadly Acceptable** significance.

20.7 Reduction of Emergency Response Provision including SAR Capability

674. *Presence of structures in the offshore environment including increased vessel activity and personnel numbers may reduce emergency response capability by increasing the number of incidents, increasing consequences or reducing access for the responders.*

675. Given the distances that may be covered by air-based SAR support (the SAR helicopter base at Lee-on-Solent is located approximately 24nm from the Proposed DCO Limits), the spatial extent of this hazard is considered reasonably large. Additionally, the array area covers approximately 47nm^2 which represents a moderate area to search compared to other offshore wind farms. However, it is unlikely that a SAR operation will require the entire array area to be searched; it is much more likely that a search could be restricted to a smaller area within which a casualty is known to be located (inclusive of any assumptions on the drift of the casualty).

676. Up to 869 return trips per year by operation and maintenance vessels may be made throughout the operation and maintenance phase. It is assumed that operation and maintenance vessels will be on-site throughout the operation and maintenance phase. The presence of such vessels will increase the likelihood of an incident and subsequently increase the likelihood of multiple incidents occurring simultaneously, diminishing emergency response capability. As an unlikely worst case, the consequences of such a situation could include a failure of emergency response to an incident, resulting in a PLL and pollution.

677. However, with project vessels to be managed through marine coordination (**C-88**, Table 24-1) and compliant with Flag State regulations, the likelihood of an incident is minimised. Additionally, should an incident occur, project vessels will be well equipped to assist, either through self-help capability or – for an incident involving a nearby third-party vessel – through SOLAS obligations (IMO, 1974), all in liaison with the MCA. This is reflected in past experience, with 12 known instances of a vessel (or persons on a vessel) being assisted by an industry vessel from a nearby UK offshore wind farm. The MPCP (**C-53**, Table 24-1) will also be implemented to minimise the environmental risks of any incident involving pollution.

678. From recent SAR helicopter taskings data, the frequency of SAR operations in proximity to the Proposed Development is moderate to high, reflecting the MCA's stance during consultation that in this general area SAR access is particularly important. However, only a small proportion of SAR helicopter incidents occurred within the Proposed DCO Limits and the majority occurred inshore of the array area, and therefore any emergency response will not be directly obstructed by the presence of the Proposed Development. This pattern is replicated by MAIB and RNLI incident data. The frequency of SAR operations in proximity to the Proposed Development is not anticipated to change markedly from the current level given the measures noted above which will be in place.

679. As noted previously, the number of reported collision or allision incidents associated with UK offshore wind farms is low, with only 13 reported to date, corresponding to an average of one incident per 1,570 operational WTG years (as of September 2022). Although this data covers only collisions and allisions, it is nevertheless not anticipated that the presence of the Proposed Development will result in any substantial increase in the need for SAR operations.

680. In terms of SAR access, the minimum spacing between structures at the Proposed Development (830m) is greater than that at Rampion 1 (750m), noting that the MCA stated during consultation that the Rampion 1 array layout is considered a good layout for SAR access. Moreover, no SAR access issues have been reported at Rampion 1 (noting that Rampion 1 was fully commissioned in April 2018). Therefore, SAR assets (both marine and air based) will have the ability to access the array for SAR purposes in the event of an incident occurring within the array and have a high probability of detection when searching for a casualty.

681. Additionally, the two structures exclusion zones serve as HRAs, providing a break between the differing spacing (and potentially orientation) of structures across Rampion 1 and Rampion 2. This will facilitate the transition between Rampion 1 and Rampion 2 for SAR assets, noting that both HRAs are compliant with MGN 654 (minimum 1nm width measured tip-to-tip). It is noted that the final array layout (which will include the HRAs) will be agreed with the MCA and Trinity House post consent as required under the draft DCO with discussions to include SAR (**C-86**, Table 24-1).

682. Additionally, an Emergency Response Cooperation Plan (ERCoP) will be submitted to the MCA in line with the requirements of MGN 654 (MCA, 2021) (**C-87**, Table 24-1).

20.7.1 Relevant Embedded Mitigation Measures

683. The embedded mitigation measures which have been identified as relevant to reducing risk are as follows (further detail on embedded mitigation is included in Section 24):

- **C-53** – Pollution planning;
- **C-86** – Layout;
- **C-87** – MGN 654 compliance; and
- **C-88** – Marine coordination.

20.7.2 Frequency of Occurrence

684. The frequency of occurrence is considered **extremely unlikely**.

20.7.3 Severity of Consequence

685. The severity of consequence is considered **minor**.

20.7.4 Significance of Risk

686. Overall, it is predicted that the significance of risk due to reduction of emergency response provision including SAR capability is of **Broadly Acceptable** significance.

21 Decommissioning Phase Risk Assessment

21.1 Displacement of Vessels

687. *Decommissioning activities associated with the removal of structures and cables may displace existing routes/activity, increase grounding risk, increase encounters and collision risk with other third-party vessels.*

688. Since the methods used to remove structures and sub-sea cables are expected to be similar to those used to install them, this hazard is expected to be similar in nature to the equivalent construction phase hazard. It is noted that in the case of sub-sea cables it is expected that they will be left in situ, but for the purposes of this assessment (as an unlikely worst-case) it has been assumed that all sub-sea cables will be removed during decommissioning.

689. The use of a buoyed decommissioning area analogous to the buoyed construction area is assumed and will result in similar main route deviations to those established for the equivalent construction phase hazard.

21.1.1 Significance of Risk

690. Therefore, the frequency of occurrence and severity of consequence of the hazard in relation to all elements (vessel displacement, adverse weather routeing, encounters and collision risk and grounding risk) are considered to be equivalent to that determined for the equivalent construction phase hazard, as summarised in Table 19-1.

691. Overall, it is predicted that the significance of risk due to vessel displacement is of **Tolerable** significance.

21.2 Third-Party to Project Vessel Collision Risk

21.2.1 Qualification of Risk

692. *Vessels associated with decommissioning activities may increase encounters and collision risk for other vessels already operating in the area.*

693. Since the methods used to remove structures and sub-sea cables are expected to be similar to those used to install them, including the vessels involved, this hazard is expected to be similar in nature to the equivalent construction phase hazard, including the number of return trips by decommissioning vessels. It is noted that in the case of sub-sea cables it is expected that they will be left in situ but for the purposes of this assessment (as an unlikely worst-case) it has been assumed that all cables will be removed during decommissioning.

694. The use of a buoyed decommissioning area analogous to the buoyed construction area is assumed and will result in similar main route deviations to those established for the equivalent construction phase hazard.

21.2.2 Frequency of Occurrence

695. The frequency of occurrence is considered to be **extremely unlikely**.

21.2.3 Severity of Consequence

696. The severity of consequence is considered to be **moderate**.

21.2.4 Significance of Risk

697. Overall, it is predicted that the significance of risk due to increased third-party to project vessel collision risk is of **Broadly Acceptable** significance.

21.3 Reduced Access to Local Ports and Harbours

698. *Decommissioning activities associated with the removal of structures and cables may displace existing routes/activity restricting access to ports/harbours.*

699. Since the methods used to remove structures and sub-sea cables are expected to be similar to those used to install them, this hazard is expected to be similar in nature to the equivalent construction phase hazard, including the number of return trips by decommissioning vessels. It is noted that in the case of sub-sea cables it is expected that they will be left in situ but for the purposes of this assessment (as a worst-case) it has been assumed that all cables will be removed during decommissioning, with only cable protection will be left in situ.

700. As with the construction phase, it is not yet known from which port(s) decommissioning activity will be based for the Proposed Development.

21.3.1 Significance of Risk

701. Therefore, the frequency of occurrence and severity of consequence of the hazard in relation to all elements (Shoreham Port, Port of Newhaven, Brighton Marina, Littlehampton Harbour and ports within the Solent) are considered to be equivalent to that determined for the equivalent construction phase hazard, as summarised in Table 19-2.

702. Overall, it is predicted that the significance of risk due to reduced access to local ports is of **Tolerable** significance.

22 Cumulative Risk Assessment

703. As determined in Section 14.1, there are no other developments screened in to the cumulative risk assessment, noting that Rampion 1 and the active marine aggregate dredging areas (as described in Section 7) are considered as part of the baseline and therefore accounted for in the risk assessment for the Proposed Development in isolation. In particular:

- Offshore wind farms located in French waters are screened out given their respective locations clear of the main French destination ports detected in the main commercial routeing in proximity to the Proposed Development;
- There are no planned oil and gas infrastructure located within the English Channel; and
- Exploration areas for marine aggregate dredging are either located greater than 30nm from the Proposed DCO Limits or within the separation zone of the TSS and so have limited interaction with traffic which may be displaced by the array area.

704. Since no developments have been screened into the cumulative risk assessment, no main commercial route deviations have been considered at a cumulative level. In essence, the future case movement of commercial traffic for the cumulative scenario can be considered equivalent to that determined for the assessment of the Proposed Development in isolation and no further assessment has been undertaken.

23 Risk Control Log

705. Table 23-1 presents a summary of the assessment of shipping and navigation hazards scoped into the risk assessment. This includes the proposed embedded mitigation measures, frequency of occurrence, severity of consequence and significance of risk, per hazard. For risks where multiple components were assessed (e.g., powered, drifting and internal allision risk) the component(s) resulting in the worst-case risk is presented.

706. Given that no additional mitigation Is proposed in addition to the embedded mitigation measures, the significance of risk listed for each hazard in Table 23-1 also serves as the residual risk.

Table 23-1 Risk control log

Project Phase	Hazard	Mitigation Measure ID	Measure	Frequency of Occurrence	Severity of Consequence	Significance of Risk
Construction	Vessel displacement	**C-46** / **C-85**	Promulgation of Information	Reasonably Probable	Negligible	Broadly Acceptable
	Increased third-party to third-party vessel collision risk	**C-46** / **C-85**	Promulgation of Information	Extremely Unlikely	Moderate	Broadly Acceptable
		C-48	Traffic monitoring			
		C-53	Pollution planning			
		C-84	Lighting and marking			
	Increased vessel grounding risk	**C-53**	Pollution planning	Remote	Moderate	Tolerable
	Third party to project vessel collision risk	**C-46** / **C-85**	Promulgation of Information	Extremely Unlikely	Moderate	Broadly Acceptable
		C-47	Fishing liaison			
		C-53	Pollution planning			
		C-56	Safety Zones			
		C-84	Lighting and marking			
		C-88	Marine coordination			

Project Phase	Hazard	Mitigation Measure ID	Measure	Frequency of Occurrence	Severity of Consequence	Significance of Risk
	Reduced access to local ports and harbours	**C-88**	Marine coordination	Reasonably Probable	Minor	Tolerable
Operations and Maintenance	Vessel displacement	**C-46** / **C-85**	Promulgation of Information	Reasonably Probable	Negligible	Broadly Acceptable
		C-87	MGN 654 compliance			
	Increased third-party to third-party vessel collision risk	**C-46** / **C-85**	Promulgation of Information	Reasonably Probable	Moderate	Tolerable
		C-47	Fishing liaison			
		C-53	Pollution planning			
		C-84	Lighting and marking			
		C-87	MGN 654 compliance			
	Increased vessel grounding risk	**C-53**	Pollution planning	Extremely Unlikely	Moderate	Broadly Acceptable
	Third party to project vessel collision risk	**C-46** / **C-85**	Promulgation of Information	Extremely Unlikely	Moderate	Broadly Acceptable
		C-47	Fishing liaison			
		C-53	Pollution planning			

Project Phase	Hazard	Mitigation Measure ID	Measure	Frequency of Occurrence	Severity of Consequence	Significance of Risk
		C-56	Safety Zones			
		C-84	Lighting and marking			
		C-88	Marine coordination			
	Creation of vessel to structure powered allision risk	**C-46** / **C-85**	Promulgation of Information	Extremely Unlikely	Moderate	Broadly Acceptable
		C-47	Fishing liaison			
		C-53	Pollution planning			
		C-84	Lighting and marking			
		C-87	Compliance with MGN 654			
		C-88	Marine coordination			
	Creation of vessel to structure drifting allision risk	**C-53**	Pollution planning	Extremely Unlikely	Moderate	Broadly Acceptable
		C-88	Marine coordination			
	Creation of vessel to structure internal allision risk	**C-46** / **C-85**	Promulgation of Information	Remote	Moderate	Tolerable
		C-47	Fishing liaison			
		C-53	Pollution planning			
		C-56	Safety Zones			

Project Phase	Hazard	Mitigation Measure ID	Measure	Frequency of Occurrence	Severity of Consequence	Significance of Risk
		C-84	Lighting and marking			
		C-86	Layout			
		C-87	MGN 654 compliance			
		C-88	Marine coordination			
		C-89	Blade clearance			
	Reduced access to local ports and harbours	**C-84**	Lighting and marking	Frequent	Negligible	Tolerable
		C-88	Marine coordination			
	Changes in under keel clearance	**C-41** / **C-45**	Cable burial	Negligible	Moderate	Broadly Acceptable
		C-53	Pollution planning			
		C-83	Water depth change			
	Increased interaction with sub-sea cables	**C-41** / **C-45**	Cable burial	Negligible	Minor	Broadly Acceptable
		C-46 / **C-85**	Promulgation of Information			
	Reduction of emergency response	**C-53**	Pollution planning	Extremely Unlikely	Minor	Broadly Acceptable
		C-86	Layout			

Project Phase	Hazard	Mitigation Measure ID	Measure	Frequency of Occurrence	Severity of Consequence	Significance of Risk
	provision including SAR capability	**C-87**	MGN 654 compliance			
		C-88	Marine coordination			
Decommissioning	Vessel displacement	**C-46 / C-85**	Promulgation of Information	Reasonably Probable	Negligible	Broadly Acceptable
	Increased third-party to third-party vessel collision risk	**C-46 / C-85**	Promulgation of Information	Extremely Unlikely	Moderate	Broadly Acceptable
		C-53	Pollution planning			
		C-84	Lighting and marking			
	Increased vessel grounding risk	**C-53**	Pollution planning	Remote	Moderate	Tolerable
	Third-party to project vessel collision risk	**C-46 / C-85**	Promulgation of Information	Extremely Unlikely	Moderate	Broadly Acceptable
		C-47	Fishing liaison			
		C-53	Pollution planning			
		C-56	Safety Zones			
		C-84	Lighting and marking			
		C-88	Marine coordination			

Project Phase	Hazard	Mitigation Measure ID	Measure	Frequency of Occurrence	Severity of Consequence	Significance of Risk
	Reduced access to local ports and harbours	**C-88**	Marine coordination	Extremely Unlikely	Moderate	Tolerable

24 Embedded Mitigation Measures

707. As part of the Proposed Development design process, a number of embedded mitigation measures have been adopted to reduce the potential for risk to shipping and navigation. These measures have and will continue to evolve over the development process as the EIA progresses and in response to consultation.

708. These measures typically include those that have been identified as good or standard practice and include actions that would be undertaken to meet existing legislation requirements. As there is a commitment to implementing these measures, and also to various standard sectoral practices and procedures, they are considered inherently part of the design of the Proposed Development.

709. The embedded mitigation measures within the design relevant to shipping and navigation (together with their ID applied in the Commitments Register (see **Commitments register, Volume 7** of the ES (Document Reference 7.22))) are outlined in Table 24-1.

Table 24-1 Embedded mitigation measures relevant to shipping and navigation

ID	Subject matter	Details	How the embedded mitigation measures will be secured
C-41	Cable burial	The subsea interarray cables will typically be buried at a target burial depth of 1m below the seabed surface. The final depth of the cables will be dependent on the seabed geological conditions and the risks to the cable (e.g. from anchor drag damage).	DCO requirements or dML conditions.
C-45	Cable burial	Where possible, subsea cable burial will be the preferred option for cable protection. Cable burial will be informed by the cable burial risk assessment and detailed within the Cable Specification and Installation Plan[9].	DCO requirements or dML conditions.

[9] Littlehampton Harbour Board have requested to be a consultee for the preparation of these documents

ID	Subject matter	Details	How the embedded mitigation measures will be secured
C-46	Promulgation of information[10]	Advance warning and accurate location details of construction, maintenance and decommissioning operations, associated Safety Zones and advisory passing distances will be given via Notices to Mariners and Kingfisher Bulletins. The undertaker must ensure that a local Notice to Mariners (NtM) is issued at least 14 days prior to the commencement of the authorised Proposed Development or any part thereof advising of the start date of each activity and the expected vessel routes from the construction ports to the relevant location	DCO requirements or dML conditions.
C-47	Fishing liaison	Ongoing liaison with fishing fleets will be maintained during pre-construction, construction, maintenance and decommissioning operations via an appointed Fisheries Liaison Officer and Fishing Industry Representative to ensure that the fishing community are fully informed of any offshore activities and works.	DCO requirements or dML conditions.
C-48	Traffic monitoring	Monitoring of vessel traffic will be undertaken for the duration of the construction period.	DCO requirements or dML conditions.

[10] Promulgation of information will include the charting of all project infrastructure (including sub-sea cables) on appropriately scaled nautical charts.

ID	Subject matter	Details	How the embedded mitigation measures will be secured
C-53	Pollution planning	An Outline Marine Pollution Contingency Plan (MPCP) has been submitted with this Application as **Appendix A** of the **Outline Project Environmental Management Plan** (Application Document Reference 7.11). This Outline MPCP provides details of procedures to protect personnel working and to safeguard the marine environment and mitigation measures in the event of an accidental pollution event arising from offshore operations relating to Rampion 2. The Final MPCP will include relevant key emergency contact details.	DCO requirements or dML conditions.
C-56	Safety Zones	RED will apply for Safety Zones post consent. Safety Zones of up to 500m will be sought during construction, maintenance and decommissioning phases. Where appropriate, guard vessels will also be used to ensure adherence with Safety Zones or advisory passing distances, as defined by risk assessment, to mitigate any impact which poses a risk to surface navigation during construction, maintenance and decommissioning phases. Such impacts may include partially installed structures or cables, extinguished navigation lights or other unmarked hazards..	Electricity application procedures (Section 95 of Energy Act 2004).
C-83	Water depth change	Where scour protection is required for subsea cables, MGN 654 (Maritime & Coastguard Agency, 2021) (or latest relevant available guidance) will be adhered to with respect to changes greater than 5% to the under-keel clearance in consultation with the Maritime & Coastguard Agency (MCA) and Trinity House.	dML conditions.

ID	Subject matter	Details	How the embedded mitigation measures will be secured
C-84	Lighting and marking	RED will exhibit lights, marks, sounds, signals and other aids to navigation as required by Trinity House, MCA and Civil Aviation Authority (CAA). This will include a buoyed construction area around the Rampion 2 array.	dML conditions.
C-85	Promulgation of information	RED will ensure that the local notice to mariners (NtM) is updated and reissued at weekly intervals during construction activities and at least five days before any planned operations and maintenance works and supplemented with VHF (very high frequency) radio broadcasts agreed with the Maritime & Coastguard Agency (MCA) in accordance with the construction and monitoring programme approved under DML conditions.	dML conditions.
C-86	Layout	A layout plan (including cables) will be agreed with the MMO following appropriate consultation with Trinity House and the Maritime & Coastguard Agency (MCA) setting out proposed details of the authorised Proposed Development.	dML conditions.
C-87	MGN 654 compliance	No part of the authorised Proposed Development may commence until the MMO, in consultation with the Maritime & Coastguard Agency (MCA), has confirmed in writing that the undertaker has taken into account and, so far as is applicable to that stage of the Proposed Development, adequately addressed all MCA recommendations as appropriate to the authorised Proposed Development contained within MGN654 "Offshore Renewable Energy Installations (OREIs) – safety response" (Maritime & Coastguard Agency, 2021) and its annexes.	dML conditions.

ID	Subject matter	Details	How the embedded mitigation measures will be secured
C-88	Marine coordination	Marine coordination will be implemented to manage Rampion 2 vessels throughout construction and maintenance periods.	Secured in the description of the development.
C-89	Blade clearance	There will a minimum blade tip clearance of at least 22m above MHWS.	Secured in the description of the development.

24.1 Marine Aids to Navigation

710. Throughout all phases, aids to navigation will be provided in accordance with Trinity House and MCA requirements, with consideration being given to IALA Recommendation O-139 and G1162 (IALA, 2021) and MGN 654 (MCA, 2021).

24.1.1 Construction and Decommissioning Phases

711. During the construction and decommissioning phases, buoyed construction and decommissioning areas will be established and marked, where required, in accordance with Trinity House requirements based on the IALA Maritime Buoyage System. In addition, where advised by Trinity House, additional marking on structures may also be applied and may include use of leading lights/lines to highlight the lay of the export cables, as raised by Tarmac Marine during consultation.

24.1.2 Operation and Maintenance Phase

712. Marking during the operation and maintenance phase will be agreed in consultation with Trinity House once the final array layout has been selected post consent; however, the following subsections summarise likely requirements.

713. Of particular note, during consultation Tarmac Marine and Hanson Marine indicated that the presence of a lit buoy to clearly designate the gap between the array and the Owers Light Buoy at the western extent of the array area would preferable. This will be incorporated into discussions with Trinity House.

24.1.2.1 Marking of Individual Array Structures

714. As per IALA Guideline G1162, each surface structure within the array area will be painted yellow from the level of Highest Astronomical Tide (HAT) to 15m above HAT. Each structure will also be clearly marked with a unique alphanumeric identifier which will be clearly visible from all directions. The MCA will advise post consent on the specific requirements for the identifiers, but a logical pattern with potential for additional visual marks may be

considered by statutory stakeholders. Each identifier will be illuminated by a low-intensity light such that the sign is available from a vessel thus enabling the structure to be identified at a suitable distance to avoid an allision incident.

715. The identifiers will be situated such that under normal conditions of visibility and all known tidal conditions, they are clearly readable by an observer (with the naked eye), stationed 3m above sea level and at a distance of at least 150m from the WTG. The light will be either hooded or baffled so as to avoid unnecessary light pollution or confusion with navigational marks.

24.1.2.2 Marking of Array as a Whole

716. The marking of the array as a whole will be agreed with Trinity House once the final array layout has been selected and will be in line with IALA Recommendation O-139 and G1162. As per the IALA guidance, and in consultation with Trinity House, it will be ensured that:

- All corner structures will be marked as an SPS and where necessary, to satisfy the spacing requirements between SPSs, additional periphery structures may also be marked as SPSs;
- Structures designated as an SPS will exhibit a flashing yellow five second (flash yellow every five seconds) light of at least 5nm nominal range and omnidirectional fog signals as appropriate and where prescribed by Trinity House, and will be sounded at least when the visibility is 2nm or less;
- Further periphery structures may be marked as Intermediate Peripheral Structures (IPS) including a flashing yellow light with a distinctly different flash character from those displayed on the SPSs and at least 2nm nominal range;
- All lights will be visible to shipping through 360˚ and if more than one lantern is required on a structure to meet the all-round visibility requirement, then all the lanterns on that structure will be synchronised;
- All lights will be exhibited at the same height at least 6m above HAT and below the arc of the lowest WTG blades;
- All lights will be exhibited at least at night and when visibility is reduced to 2nm or less;
- Remote monitoring sensors using Supervisory Control and Data Acquisition (SCADA) will be included as part of the lighting and marking scope to ensure a high level of availability for all aids to navigation;
- Aviation lighting will be as per CAA requirements; however, will likely be synchronised Morse “W” at the request of Trinity House; and
- All lighting will be considered cumulatively with existing aids to navigation (including that associated with Rampion 1) to avoid the potential for light confusion to passing traffic.

717. Consideration will also be given to the use of marking via AIS, or other electronic means (such as Radar Beacons (Racon)) to assist safe navigation particularly in reduced visibility. AIS transmitters or virtual buoys could also be considered internally to assist with safe navigation within the array area.

Furthermore, given the proximity of the Proposed Development to shore, Intermediate Peripheral Structure (IPS) marking may be required. Any such marking will be agreed in consultation with Trinity House.

718. Additionally, consideration will be given to the cumulative lighting and marking of the Proposed Development alongside Rampion 1, again in consultation with Trinity House.

24.1.2.3 Marking of Export Cables

719. No lighting or physical marking will be required during the operation and maintenance phase for the export cables.

24.2 Design Specifications Noted in Marine Guidance Note 654

720. The individual WTGs and other structures will have functions and procedures in place for generator shut down in emergency situations, as per MGN 654 (MCA, 2021).

25 Through Life Safety Management

721. Quality, Health, Safety and Environment (QHSE) documentation including a Safety Management System (SMS) will be in place and continually updated throughout the development process. Table 25-1 provides an overview of various QHSE documentation and how it will be maintained and reviewed with reference, where required, to specific marine documentation.

722. Monitoring, reviewing and auditing will be carried out on all procedures and activities and feedback actively sought. Any designated person (identified in QHSE documentation), managers and supervisors are to maintain continuous monitoring of all marine operations and determine if all required procedures and processes are being correctly implemented.

Table 25-1 Summary of QHSE documentation

Documentation	Details
Incident reporting	An incident report will be completed following any incidents, including near misses. A review will then be undertaken to determine any possible need for operational changes. Where appropriate, the designated person (noted within the ERCoP) should inform the MCA of any exercise or incidents including any implications on emergency response, with the MCA invited to participate in debriefs.
Review of documentation	The Proposed Development will be responsible for reviewing and updating all documentation including the risk assessments, ERCoP, safety management system and, if required, will convene a review panel of stakeholders to quantify risk. A review of potential risks and response procedures will be undertaken annually.
Inspection of resources	All vessels, facilities and equipment necessary for marine operations will be subject to appropriate inspection and testing to determine fitness for purpose and availability in relation to their performance standards, including aids to navigation relative to the performance standards specified by Trinity House.
Audit of performance	Audits will be undertaken periodically to evaluate the efficiency of the marine safety documentation and possible corrective actions should be undertaken in accordance with standard procedures with audit results and reviews brought to the attention of responsible personnel.

Documentation	Details
Safety management system	An integrated safety management system will be established to ensure the safety and environmental impact of activities undertaken are ALARP. This includes the use of remote monitoring and switching for aids to navigation to ensure that a quick fix for a faulty light can be instigated, thus ensuring IALA availability requirements are satisfied.
Future monitoring of vessel traffic	The DCO is expected to include the requirement for construction traffic monitoring by AIS, including continual collection of data from a suitable location. An assessment of a minimum of 28 days and comparison against the results of the vessel traffic analysis (see Section 10) and anticipated future case routeing (see Section 15) will be submitted to the MCA annually throughout the construction phase and is likely to continue through the first year of the operation and maintenance phase to ensure measures implemented are effective.
Cable monitoring	The sub-sea cables will be subject to periodic inspection post construction to monitor cable burial depths and protection. If exposed cables or ineffective cable protection measures are identified, these would be promulgated to relevant sea users including via notifications to mariners and Kingfisher Bulletins and if there was deemed to be an immediate risk additional temporary measures may be deployed until such time as the risk is permanently mitigated.
Hydrographic surveys	As required by MGN 654, detailed and accurate hydrographic surveys will be undertaken periodically at intervals agreed with the MCA.
Decommissioning plan	A decommissioning plan will be developed. For shipping and navigation, this will include consideration of the scenario where upon decommissioning and completion of removal operations, an obstruction is left on-site which is considered a danger to safe navigation and has not been possible to remove.

26 Summary

723. Using baseline data, collision and allision risk modelling and the outputs of consultation, impacts relating to shipping and navigation have been identified for the Proposed Development for all phases of the development (construction, operation and maintenance and decommissioning). This has been fed into the FSA undertaken from Section 18.

26.1 Consultation

724. Throughout the NRA process, consultation has been undertaken with key shipping and navigation stakeholders including:

- MCA;
- Trinity House;
- UK Chamber of Shipping;
- RYA and member clubs;
- Local ports including Shoreham Port, Newhaven Port & Properties, Littlehampton Harbour Board and ABP Southampton;
- Regular Operators; and
- Marine aggregate dredging representatives including from Britannia Aggregates, Cemex UK Marine, DEME, Hanson Aggregate Marine, Tarmac Marine and VDL.

26.2 Baseline Characterisation

26.2.1 Navigational Features

725. Rampion 1, which was fully commissioned in November 2018, shares its eastern, southern and western boundaries with the Proposed DCO Limits for the Proposed Development and is the only existing UK offshore wind farm within the English Channel.

726. The Dover Strait TSS lies approximately 4.2nm from the Proposed DCO Limits at the closest point and an ITZ covers the sea area eastward of the line joining Shoreham and the CS1 light buoy marking the end of the westbound lane of the TSS.

727. Several marine aggregate dredging areas are located in proximity to the Proposed DCO Limits including immediately east of the offshore export cable corridor, to the west (near the Isle of Wight) and to the south-east (within and south of the Dover Strait TSS).

728. Several ports and harbours are located along the coast close to the Proposed DCO Limits with the closest to the array area being Shoreham Port (9.5nm) and the closest to the offshore export cable corridor being Littlehampton Harbour (immediately east). There are anchorage areas and pilotage services associated with Shoreham Port, Littlehampton Harbour and the Port of Newhaven.

26.2.2 Maritime Incidents

729. From MAIB incident data recorded between 2010 and 2019 within the study area, there were on average 14 to 15 incidents per year. Throughout the 10-year period, six incidents occurred within the array area and five within the offshore export cable corridor. The most common incident types were "*machinery failure*" (29%), "*accident to person*" (17%) and *"loss of control"* (11%). The main vessel types involved in incidents were fishing vessels (30%), "*other commercial*" vessels (17%) and dry cargo vessels (11%).

730. From RNLI incident data recorded between 2010 and 2019 within the study area, there was an average of 189 incidents per year, with the majority (93%) occurring within 5nm of the coast. Eight incidents were recorded within the array area and 49 within the offshore export cable corridor. The most common incident types recorded were *machinery failure* (37%) "*person in danger*" (24%). Excluding "*person in danger*" and non-vessel based incidents, the most common vessel types recorded were recreational vessels (48%) followed by personal craft (7%) and fishing vessels (7%).

26.2.3 Vessel Traffic Movements

731. From 14 days of vessel traffic survey data recorded in June 2022 (summer) within the study area, there was an average of 210 unique vessels per day. An average of 15 unique vessels per day was recorded intersecting the array area and 15 unique vessels per day intersecting the offshore export cable corridor.

732. Throughout the summer survey period, the main vessel types recorded within the study area were cargo vessels (37%), recreational vessels (26%), tankers (18%) and fishing vessels (8%).

733. From 14 days of vessel traffic survey data recorded in November 2020 (winter) within the study area, there was an average of 143 unique vessels per day. An average of 11 unique vessels per day was recorded intersecting the array area and three to four unique vessels per day intersecting the offshore export cable corridor.

734. Throughout the winter survey period, the main vessel types recorded within the study area were cargo vessels (49%), tankers (22%) and fishing vessels (13%).

735. A total of 17 main commercial routes were identified from the vessel traffic survey data. The highest use main commercial route was between the westbound lane of the Dover Strait TSS and the westbound lane of the Off Casquets TSS with an average of 74 unique vessels per day. A number of other routes were identified in and out of the Dover Strait TSS including routes to and from ports in the Solent and Shoreham Port.

26.3 Future Case Vessel Traffic

736. Indicative 10% and 20% increases in vessel traffic associated with commercial vessels, commercial fishing vessels and recreational vessels has been considered for the future case scenario. Additionally, transits made by vessels involved in the construction and operation and maintenance of the Proposed Development have been considered.

737. Deviations could be required for five out of the 17 main commercial routes identified, with the level of deviation varying between a less than 0.1nm increase for a route between the westbound lane of the Dover Strait TSS and ports in the Solent and a 12.5nm increase for a route between the westbound lane of the Dover Strait TSS and Littlehampton Harbour.

26.4 Collision and Allision Risk Modelling

738. The annual base case vessel to vessel collision risk in proximity to the Proposed Development was estimated to be 1.04×10^{-1}, corresponding to a collision return period of approximately one in 9.6 years. This represents a 1% increase in collision frequency compared to the pre wind farm result.

739. The annual base case powered vessel to structure allision risk following installation of the Proposed Development was estimated to be 2.17×10^{-3}, corresponding to a return period of approximately one in 460 years.

740. After modelling three drift scenarios it was established that the flood tide dominated scenario produced the worst-case results. The annual base case drifting vessel to structure allision risk following installation of the Proposed Development was estimated to be 8.64×10^{-4}, corresponding to a return period of approximately one in 1,157 years.

741. The annual base case fishing vessel to structure allision risk following installation of the Proposed Development was estimated to be 5.01×10^{-1}, corresponding to a return period of approximately one in 2.0 years.

26.5 Risk Statement

742. Using the baseline data, expert opinion, outputs of the Hazard Workshop, stakeholder concerns and lessons learnt from existing offshore developments, various shipping and navigation hazards have been risk assessed in line with the FSA approach. The full risk control log including details of hazards, proposed embedded mitigation measures and significance of risk is presented in Section 23.

743. The significance of risk has been determined as either **Broadly Acceptable** or **Tolerable** for all hazards assessed and no additional mitigation measures are proposed.

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Appendix A Marine Guidance Note 654 Checklist

744. The MGN 654 Checklist can be divided into two distinct checklists, one considering the main MGN 654 guidance document and one considering the Methodology for Assessing Marine Navigational Safety and Emergency Response Risks of OREIs (MCA, 2021) which serves as Annex 1 to MGN 654.

745. The checklist for the main MGN 654 guidance document is presented in Table A.1. Following this, the checklist for the MCA's methodology annex is presented in Table A.2. For both checklists, references to where the relevant information and/or assessment is provided in the NRA is given.

Table A.1 MGN 654 Checklist for main document

Issue	Compliance	Comments
Site and Installation Coordinates. Developers are responsible for ensuring that formally agreed coordinates and subsequent variations of site perimeters and individual OREI structures are made available, on request, to interested parties at relevant project stages, including application for consent, development, array variation, operation and decommissioning. This should be supplied as authoritative Geographical Information System (GIS) data, preferably in Environmental Systems Research Institute (ESRI) format. Metadata should facilitate the identification of the data creator, its date and purpose, and the geodetic datum used. For mariners' use, appropriate data should also be provided with latitude and longitude coordinates in WGS84 (European Terrestrial Reference System 1989 (ETRS89)) datum.		
Traffic Survey. Includes:		
All vessel types.	P	**Section 10: Vessel Traffic Movements** All vessel types are considered with specific breakdowns by vessel type given within the study area.
At least 28 days duration, within either 12 or 24 months prior to submission of the ES.	P	**Section 5: Data Sources** A total of 56 days of vessel traffic survey data has been collected and assessed within the study area across four separate 14-day periods, including two periods within 24 months of the DCO Application (summer and winter 2022).
Multiple data sources.	P	**Section 5: Data Sources** The vessel traffic survey data includes AIS, Radar and visual observations to maximise coverage of vessels not broadcasting on AIS. Geophysical survey data consisting of non-AIS visual observations and long-term vessel traffic data recorded on AIS have also been considered.

Issue	Compliance	Comments
Seasonal variations.	P	**Section 5: Data Sources** A total of 56 days of vessel traffic survey data has been collected and assessed within the study area across four separate 14-day periods, including two summer and two winter periods. **Appendix E: Long-Term Vessel Traffic Movements** To assist with the assessment of seasonal variation a long-term AIS dataset covering 12 months in 2019 has also been assessed.
MCA consultation.	P	**Section 4: Consultation** The MCA has been consulted as part of the NRA process including through the Hazard Workshops.
General Lighthouse Authority (GLA) consultation.	P	**Section 4: Consultation** Trinity House has been consulted as part of the NRA process including through the Hazard Workshops.
UK Chamber of Shipping consultation.	P	**Section 4: Consultation** The UK Chamber of Shipping has been consulted as part of the NRA process including through the Hazard Workshops.
Recreational and fishing vessel organisations consultation.	P	**Section 4: Consultation** The RYA, CA and NFFO has been consulted as part of the NRA process including through the Hazard Workshops (RYA and CA only).
Port and navigation authorities' consultation, as appropriate.	P	**Section 4: Consultation** Shoreham Port, Newhaven Port & Properties, Littlehampton Harbour Board and ABP Southampton have been consulted as part of the NRA process including through the Hazard Workshops.
Assessment of the cumulative and individual effects of (as appropriate):		

Issue	Compliance	Comments
i. Proposed OREI site relative to areas used by any type of marine craft.	P	**Section 10: Vessel Traffic Movements** Vessel traffic data in proximity to the Proposed Development has been analysed. **Section 18: Introduction to Risk Assessment** The hazards due to the Proposed Development have been assessed for each phase – Sections 19 to 21. **Section 22: Cumulative Risk Assessment** No cumulative risk assessment has been undertaken since no cumulative developments are screened in.
ii. Numbers, types and sizes of vessels presently using such areas.	P	**Section 10: Vessel Traffic Movements** Vessel traffic data in proximity to the Proposed Development has been analysed and includes breakdowns of daily vessel count, vessel type and vessel size.
iii. Non-transit uses of the areas, e.g., fishing, day cruising of leisure craft, racing, aggregate dredging, personal watercraft, etc.	P	**Section 7: Navigational Features** Non-transit uses of the areas in proximity to the Proposed Development have been identified, including marine aggregate dredging, pilotage and anchoring. **Section 10: Vessel Traffic Movements** Non-transit users were identified in the vessel traffic survey data and included fishing vessels engaged in fishing activities, marine aggregate dredgers engaged in dredging activities, pilotage activities and anchoring activities.
iv. Whether these areas contain transit routes used by coastal or deep-draught vessels on passage.	P	**Section 11: Base Case Vessel Routeing** Main commercial routes have been identified using the principles set out in MGN 654 in proximity to the Proposed Development, with these routes taking into account coastal, deep-draught and internationally scheduled vessels.
v. Alignment and proximity of the site relative to adjacent shipping lanes.	P	**Section 7: Navigational Features** Section 7.2 identifies IMO routeing measures in proximity to the Proposed Development.

Issue	Compliance	Comments
vi. Whether the nearby area contains prescribed routeing schemes or precautionary areas.	P	**Section 7: Navigational Features** Section 7.2 identifies the IMO routeing measures in proximity to the Proposed Development and Section 7.8 identifies military PEXAs in proximity to the Proposed Development.
vii. Proximity of the site to areas used for anchorage (charted or uncharted), safe haven, port approaches and pilot boarding or landing areas.	P	**Section 7: Navigational Features** Section 7.4 identifies port approaches and pilot boarding stations in proximity to the Proposed Development and Section 7.5 identifies anchorage areas in proximity to the Proposed Development. **Section 12: Adverse Weather Routeing** Section 12.3 identifies safe havens in proximity to the Proposed Development.
viii. Whether the site lies within the jurisdiction of a port and/or navigation authority.	P	**Section 7: Navigational Features** Section 7.4 identifies the locations of ports and harbours in proximity to the Proposed Development.
ix. Proximity of the site to existing fishing grounds, or to routes used by fishing vessels to such grounds.	P	**Section 10: Vessel Traffic Movements** Fishing vessel movements are considered within the study area. Detailed analysis of dedicated fishing vessel activities is undertaken in **Chapter 10**.
x. Proximity of the site to offshore firing/bombing ranges and areas used for any marine military purposes.	P	**Section 7: Navigational Features** Section 7.8 identifies military PEXAs in proximity to the Proposed Development.
xi. Proximity of the site to existing or proposed submarine cables or pipelines, offshore oil/gas platforms, marine aggregate dredging, marine archaeological sites or wrecks, Marine Protected Areas or other exploration/exploitation sites.	P	**Section 7: Navigational Features** Section 7.3 identifies the marine aggregate dredging areas in proximity to the Proposed Development and Section 7.9 identifies the charted wrecks in proximity to the Proposed Development. **Section 14: Cumulative and Transboundary Overview** Considers exploration/exploitation sites in proximity to the Proposed Development cumulatively.

Issue	Compliance	Comments
xii. Proximity of the site to existing or proposed OREI developments, in cooperation with other relevant developers, within each round of lease awards.	P	**Section 7: Navigational Features** Section 7.1 identifies other offshore wind farm developments in proximity to the Proposed Development. **Section 14: Cumulative and Transboundary Overview** Considers other OREI sites in proximity to the Proposed Development cumulatively.
xiii. Proximity of the site relative to any designated areas for the disposal of dredging spoil or other dumping ground.	P	**Section 7: Navigational Features** Identifies spoil and dumping grounds in proximity to the Proposed Development.
xiv. Proximity of the site to aids to navigation and/or VTS in or adjacent to the area and any impact thereon.	P	**Section 7: Navigational Features** Section 7.4 identifies VTS areas in proximity to the Proposed Development and Section 7.6 identifies key aids to navigation in proximity to the Proposed Development.
xv. Researched opinion using computer simulation techniques with respect to the displacement of traffic and, in particular, the creation of 'choke points' in areas of high traffic density and nearby or consented OREI sites not yet constructed.	P	**Section 16: Collision and Allision Risk Modelling** Provides quantification of collision and allision risk resulting from the Proposed Development including pinch (or choke) points in proximity to the Proposed Development.
xvi. With reference to xv. above, the number and type of incidents to vessels which have taken place in or near to the proposed site of the OREI to assess the likelihood of such events in the future and the potential impact of such a situation.	P	**Section 9: Emergency Response and Incident Overview** Historical vessel incident data published by DfT (Section 9.1), RNLI (Section 9.2) and MAIB (Section 9.5) in proximity to the Proposed Development has been considered alongside historical offshore wind farm incident data throughout the UK (Section 9.6).

Issue	Compliance	Comments
xvii. Proximity of the site to areas used for recreation which depend on specific features of the area.	**P**	**Section 10: Vessel Traffic Movements** Non-transit users were identified in the vessel traffic survey data and included recreational activities.
Predicted effect of OREI on traffic and interactive boundaries. Where appropriate, the following should be determined:		
a. The safe distance between a shipping route and OREI boundaries.	**P**	**Section 15: Future Case Vessel Traffic** A methodology for post wind farm routeing is outlined and includes a minimum distance of 1nm from offshore installations and existing offshore wind farm boundaries.
b. The width of a corridor between sites or OREIs to allow safe passage of shipping.	**P**	**Section 17: Navigation Corridor Safety Case** Provides a justification from a navigational safety perspective for the structures exclusion zone located west of Rampion 1 which may serve as a navigation corridor.
OREI Structures. The following should be determined:		
a. Whether any feature of the OREI, including auxiliary platforms outside the main generator site, mooring and anchoring systems, inter-device and export cabling could pose any type of difficulty or danger to vessels underway, performing normal operations, including fishing, anchoring and emergency response.	**P**	**Section 16: Collision and Allision Risk Modelling** Provides quantification of collision and allision risk resulting from the Proposed Development. **Section 18: Introduction to Risk Assessment** The hazards due to the Proposed Development have been assessed for each phase and include consideration of users such as commercial vessels, commercial fishing vessels in transit, recreational vessels, military vessels, anchored vessels and emergency responders – Sections 19 to 21.

Issue	Compliance	Comments
b. Clearances of fixed or floating WTG blades above the sea surface are not less than 22m (above Mean High Water Springs (MHWS) for fixed). Floating turbines allow for degrees of motion.	**P**	**Section 6: Project Description Relevant to Shipping and Navigation** Section 6.2 outlines the shipping and navigation MDS for WTGs including the minimum air gap above MHWS.
c. Underwater devices: i. Changes to charted depth; ii. Maximum height above seabed; and iii. Under keel clearance.	**P**	**Section 6: Project Description Relevant to Shipping and Navigation** Section 6.3 outlines the shipping and navigation MDS for sub-sea cables including the cable burial specifications.
d. Whether structures block or hinder the view of other vessels or other navigational features.	**P**	**Section 18: Introduction to Risk Assessment** The hazards due to the Proposed Development have been assessed for each phase and include consideration of the potential for vessels navigating in proximity to structures to be visually obscured or inhibit the use of existing aids to navigation – Sections 19 to 21.
The effect of tides, tidal streams and weather. It should be determined whether:		

<table>
<tr><th>Issue</th><th>Compliance</th><th>Comments</th></tr>
<tr><td>a. Current maritime traffic flows and operations in the general area are affected by the depth of water in which the proposed installation is situated at various states of the tide, i.e., whether the installation could pose problems at high water which do not exist at low water conditions, and vice versa.</td><td>P</td><td>Section 6: Project Description Relevant to Shipping and Navigation
Section 6.1 outlines the shipping and navigation for the Proposed DCO Limits and includes the range of existing water depths.

Section 8: Meteorological Ocean Data
Section 8.4 provides meteorological data in proximity to the Proposed Development relating to various states of the tide.

Section 10: Vessel Traffic Movements
Vessel traffic data in proximity to the Proposed Development has been analysed including vessel draught.

Section 16: Collision and Allision Risk Modelling
Provides quantification of collision and allision risk resulting from the Proposed Development including accounting for tidal conditions.</td></tr>
<tr><td>b. The set and rate of the tidal stream, at any state of the tide, has a significant effect on vessels in the area of the OREI site.</td><td>P</td><td rowspan="3">Section 8: Meteorological Ocean Data
Section 8.4 provides meteorological data in proximity to the Proposed Development relating to various states of the tide.

Section 16: Collision and Allision Risk Modelling
Provides quantification of collision and allision risk resulting from the Proposed Development including accounting for tidal conditions.</td></tr>
<tr><td>c. The maximum rate tidal stream runs parallel to the major axis of the proposed site layout, and, if so, its effect.</td><td>P</td></tr>
<tr><td>d. The set is across the major axis of the layout at any time, and, if so, at what rate.</td><td>P</td></tr>
</table>

Issue	Compliance	Comments
e. In general, whether engine failure or other circumstance could cause vessels to be set into danger by the tidal stream, including unpowered vessels and small, low speed craft.	P	**Section 8: Meteorological Ocean Data** Section 8.4 provides meteorological data in proximity to the Proposed Development relating to various states of the tide. **Section 16: Collision and Allision Risk Modelling** Provides quantification of collision and allision risk resulting from the Proposed Development including accounting for tidal conditions and assessment of whether machinery failure could cause vessels to be set into danger.
f. The structures themselves could cause changes in the set and rate of the tidal stream.	P	**Section 8: Meteorological Ocean Data** Section 8.4 provides meteorological data in proximity to the Proposed Development relating to various states of the tide and notes that no effects are anticipated.
g. The structures in the tidal stream could be such as to produce siltation, deposition of sediment or scouring, affecting navigable water depths in the wind farm area or adjacent to the area.	P	**Section 8: Meteorological Ocean Data** Section 8.4 provides meteorological data in proximity to the Proposed Development relating to various states of the tide. **Section 18: Introduction to Risk Assessment** The hazards due to the Proposed Development have been assessed for each phase and include consideration of the potential for reduction in under keel clearance – Sections 19 to 21.

Issue	Compliance	Comments
h. The site, in normal, bad weather, or restricted visibility conditions, could present difficulties or dangers to craft, including sailing vessels, which might pass in close proximity to it.	P	**Section 8: Meteorological Ocean Data** Provides meteorological data in proximity to the Proposed Development relating to weather and visibility. **Section 10: Vessel Traffic Movements** Vessel traffic data in proximity to the Proposed Development has been analysed including recreational vessels. **Section 12: Adverse Weather Routeing** Section 12.2 identifies alternative vessel routeing in proximity to the Proposed Development in adverse weather and Section 12.3 identifies safe havens in proximity to the Proposed Development. **Section 18: Introduction to Risk Assessment** The hazards due to the Proposed Development have been assessed for each phase and include consideration of adverse weather routeing – Sections 19 to 21.
i. The structures could create problems in the area for vessels under sail, such as wind masking, turbulence or sheer.	P	**Section 18: Introduction to Risk Assessment** The hazards due to the Proposed Development have been assessed for each phase and include consideration of internal allision risk for vessels under sail – Sections 19 to 21.

Issue	Compliance	Comments
j. In general, taking into account the prevailing winds for the area, whether engine failure or other circumstances could cause vessels to drift into danger, particularly if in conjunction with a tidal set such as referred to above.	P	**Section 8: Meteorological Ocean Data** Provides meteorological data in proximity to the Proposed Development relating to wind direction and various states of the tide. **Section 16: Collision and Allision Modelling** Provides quantification of collision and allision risk resulting from the Proposed Development including accounting for weather conditions and assessment of whether machinery failure could cause vessels to be set into danger. **Section 18: Introduction to Risk Assessment** The hazards due to the Proposed Development have been assessed for each phase and include consideration of drifting allision risk – Sections 19 to 21.
Assessment of access to and navigation within, or close to, an OREI. To determine the extent to which navigation would be feasible within the OREI site itself by assessing whether:		
a. Navigation within or close to the site would be safe:		
i. For all vessels.	P	**Section 4: Consultation** Section 4.1 outlines Regular Operator consultation undertaken following the vessel traffic surveys. **Section 12: Adverse Weather Routeing** Section 12.2 identifies alternative vessel routeing in proximity to the Proposed Development in adverse weather **Section 16: Collision and Allision Risk Modelling** Provides quantification of collision and allision risk resulting from the Proposed Development
ii. For specified vessel types, operations and/or sizes.		
iii. In all directions or areas.		
iv. In specified directions or areas.		

Issue	Compliance	Comments
v. In specified tidal, weather or other conditions.		including accounting for weather and tidal conditions. **Section 17: Navigation Corridor Safety Case** Provides a justification from a navigational safety perspective for the structures exclusion zone located west of Rampion 1 which may serve as a navigation corridor. **Section 18: Introduction to Risk Assessment** The hazards due to the Proposed Development have been assessed for each phase and include consideration of internal allision risk – Sections 19 to 21.
b. Navigation in and/or near the site should be prohibited or restricted:		
i. For specified vessel types, operations and/or sizes.	**P**	**Section 13: Navigation, Communication and Position Fixing Equipment** Assesses potential hazards on navigation of the different communications and position fixing devices used in and around offshore wind farms. **Section 15: Future Case Vessel Traffic** A methodology for post wind farm routeing is outlined and includes a minimum distance of
ii. In respect of specific activities.	**P**	
iii. In all areas or directions.	**P**	
iv. In specified areas or directions.	**P**	

Issue	Compliance	Comments
v. In specified tidal or weather conditions.	P	1nm from offshore installations and existing offshore wind farm boundaries, i.e., it is assumed that commercial vessels will avoid the array area. **Section 18: Introduction to Risk Assessment** The hazards due to the Proposed Development have been assessed for each phase and include consideration of vessel displacement – Sections 19 to 21. **Section 24: Embedded Mitigation Measures** Outlines the embedded mitigation measures to be implemented to reduce the significance of risk of shipping and navigation hazards including the application for Safety Zones.
c. Where it is not feasible for vessels to access or navigate through the site it could cause navigational, safety or routeing problems for vessels operating in the area, e.g., by preventing vessels from responding to calls for assistance from persons in distress.	P	**Section 17: Navigation Corridor Safety Case** Provides a justification from a navigational safety perspective for the structures exclusion zone located west of Rampion 1 which may serve as a navigation corridor. **Section 18: Introduction to Risk Assessment** The hazards due to the Proposed Development have been assessed for each phase and include consideration of vessel displacement and emergency response capability – Sections 19 to 21.
d. Guidance on the calculation of safe distance of OREI boundaries from shipping routes has been considered.	P	**Section 15: Future Case Vessel Traffic** A methodology for post wind farm routeing is outlined and includes consideration of the Shipping Route Template.
SAR, maritime assistance service, counter pollution and salvage incident response.		

Issue	Compliance	Comments
The MCA, through HM Coastguard, is required to provide SAR and emergency response within the sea area occupied by all OREIs in UK waters. To ensure that such operations can be safely and effectively conducted, certain requirements must be met by developers and operators.		
a. An ERCoP will be developed for the construction, operation and decommissioning phases of the OREI.	P	**Section 24: Embedded Mitigation Measures** Outlines the embedded mitigation measures to be implemented to reduce the significance of risk of shipping and navigation hazards including compliance with MGN 654 which includes the provision of an ERCoP.
b. The MCA's guidance document *Offshore Renewable Energy Installations: Requirements, Guidance and Operational Considerations for Search and Rescue and Emergency Response* (MCA, 2021) for the design, equipment and operation requirements will be followed.	P	**Section 2: Guidance and Legislation** Outlines the guidance and legislation used within the NRA including Annex 5 of MGN 654. **Section 24: Embedded Mitigation Measures** Outlines the embedded mitigation measures to be implemented to reduce the significance of risk of shipping and navigation hazards including compliance with MGN 654 and its annexes.
c. A SAR checklist will be completed to record discussions regarding the requirements, recommendations and considerations outlined in Annex 5 (to be agreed with MCA).	P	**Section 24: Embedded Mitigation Measures** Outlines the embedded mitigation measures to be implemented to reduce the significance of risk of shipping and navigation hazards including compliance with MGN 654 which includes the completion of the SAR checklist.
6. Hydrography. In order to establish a baseline, confirm the safe navigable depth, monitor seabed mobility and to identify underwater hazards, detailed and accurate hydrographic surveys are included or acknowledged for the following stages and to MCA specifications:		
i. Pre construction: The proposed generating assets area and proposed cable route.	P	**Section 25: Through Life Safety Management** Confirms that hydrographic surveys will be undertaken in agreement with the MCA.

Issue	Compliance	Comments
ii. On a pre-established periodicity during the life of the development.	**P**	
iii. Post construction: Cable route(s).	**P**	
iv. Post decommissioning of all or part of the development: the installed generating assets area and cable route.	**P**	
Communications, Radar and positioning systems. To provide researched opinion of a generic and, where appropriate, site specific nature concerning whether:		
a. The structures could produce radio interference such as shadowing, reflections or phase changes, and emissions with respect to any frequencies used for marine positioning, navigation and timing (PNT) or communications, including GMDSS and AIS, whether ship borne, ashore or fitted to any of the proposed structures, to:		
i. Vessels operating at a safe navigational distance.	**P**	**Section 13: Navigation, Communication and Position Fixing Equipment** Assesses the potential risks associated with the use of navigation, communication and position fixing equipment due to the Proposed Development including in relation to radio interference.
ii. Vessels by the nature of their work necessarily operating at less than the safe navigational distance to the OREI, e.g., support vessels, survey vessels, SAR assets.	**P**	
iii. Vessels by the nature of their work necessarily operating within the OREI.	**P**	
b. The structures could produce Radar reflections, blind spots, shadow areas or other adverse effects:		
i. Vessel to vessel.	**P**	**Section 13: Navigation, Communication and Position Fixing Equipment**
ii. Vessel to shore.	**P**	
iii. VTS Radar to vessel.	**P**	

Issue	Compliance	Comments
iv. Racon to/from vessel.	P	Assesses the potential risks associated with the use of navigation, communication and position fixing equipment due to the Proposed Development including in relation to marine Radar.
c. The structures and generators might produce SONAR interference affecting fishing, industrial or military systems used in the area.	P	**Section 13: Navigation, Communication and Position Fixing Equipment** Assesses the potential risks associated with the use of navigation, communication and position fixing equipment due to the Proposed Development including in relation to SONAR.
d. The site might produce acoustic noise which could mask prescribed sound signals.	P	**Section 13: Navigation, Communication and Position Fixing Equipment** Assesses the potential risks associated with the use of navigation, communication and position fixing equipment due to the Proposed Development including in relation to noise.
e. Generators and the seabed cabling within the site and onshore might produce EMFs affecting compasses and other navigation systems.	P	**Section 13: Navigation, Communication and Position Fixing Equipment** Assesses the potential risks associated with the use of navigation, communication and position fixing equipment due to the Proposed Development including in relation to electromagnetic interference.
Risk mitigation measures recommended for OREI during construction, operation and decommissioning.		
Mitigation and safety measures will be applied to the OREI development appropriate to the level and type of risk determined during the EIA. The specific measures to be employed will be selected in consultation with the MCA and will be listed in the developer's ES. These will be consistent with international standards contained in, for example, SOLAS Chapter V (IMO, 1974), and could include any or all of the following:		
i. Promulgation of information and warnings through notices to mariners and other appropriate MSI dissemination methods.	P	**Section 24: Embedded Mitigation Measures** Outlines the embedded mitigation measures to be implemented to reduce the significance of risk of shipping and navigation hazards including promulgation of information.

Issue	Compliance	Comments
ii. Continuous watch by multi-channel VHF, including DSC.	**P**	**Section 24: Embedded Mitigation Measures** Outlines the embedded mitigation measures to be implemented to reduce the significance of risk of shipping and navigation hazards including marine coordination.
iii. Safety zones of appropriate configuration, extent and application to specified vessels[11].	**P**	**Section 24: Embedded Mitigation Measures** Outlines the embedded mitigation measures to be implemented to reduce the significance of risk of shipping and navigation hazards including the application for Safety Zones.
iv. Designation of the site as an Area to be Avoided (ATBA).	**P**	There are no plans to designate the Proposed Development as an ATBA.
v. Provision of aids to navigation as determined by the GLA.	**P**	**Section 24: Embedded Mitigation Measures** Outlines the embedded mitigation measures to be implemented to reduce the significance of risk of shipping and navigation hazards including lighting and marking in accordance with Trinity House and MCA requirements.
vi. Implementation of routeing measures within or near to the development.	**P**	There are no plans to implement any new routeing measures in proximity to the Proposed Development.
vii. Monitoring by Radar, AIS, Closed Circuit Television (CCTV) or other agreed means.	**P**	**Section 24: Embedded Mitigation Measures** Outlines the embedded mitigation measures to be implemented to reduce the significance of risk of shipping and navigation hazards including traffic monitoring.

[11] As per SI 2007 No 1948 “The Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations 2007.

Issue	Compliance	Comments
viii. Appropriate means for OREI operators to notify, and provide evidence of, the infringement of Safety Zones.	P	**Section 24: Embedded Mitigation Measures** Outlines the embedded mitigation measures to be implemented to reduce the significance of risk of shipping and navigation hazards including the application for Safety Zones and use of guard vessels, which will be considered in further detail in the Safety Zone Application, submitted post consent.
ix. Creation of an ERCoP with the MCA's SAR Branch for the construction phase onwards.	P	**Section 24: Embedded Mitigation Measures** Outlines the embedded mitigation measures to be implemented to reduce the significance of risk of shipping and navigation hazards including compliance with MGN 654 which include the provision of an ERCoP.
x. Use of guard vessels, where appropriate.	P	**Section 24: Embedded Mitigation Measures** Outlines the embedded mitigation measures to be implemented to reduce the significance of risk of shipping and navigation hazards including the use of guard vessels.
xi. Update NRAs every two years, e.g., at testing sites.	P	Not applicable to the Proposed Development.
xii. Device-specific or array-specific NRAs.	P	**Section 6: Project Description Relevant to Shipping and Navigation** All offshore elements of the Proposed Development have been considered in this NRA including all infrastructure (surface and sub-sea) within the array area and offshore export cable corridor.
xiii. Design of OREI structures to minimise risk to contacting vessels or craft.	P	There is no additional risk posed to craft compared to previous offshore wind farms and so no additional measures are identified.

Issue	Compliance	Comments
xiv. Any other measures and procedures considered appropriate in consultation with other stakeholders.	P	**Section 24: Embedded Mitigation Measures** Outlines the embedded mitigation measures to be implemented to reduce the significance of risk of shipping and navigation hazards. **Section 25: Through Life Safety Management** Outlines how QHSE documentation will be maintained and reviewed.

Table A.2 MGN 654 Annex 1 checklist

Item	Compliance	Comments
A risk claim is included that is supported by a reasoned argument and evidence.	P	**Section 18: Introduction to Risk Assessment** The risk assessment provides a risk claim for a range of hazards based on a number of inputs including (but not limited to) baseline data, expert opinion, outputs of the Hazard Workshop, stakeholder concerns and lessons learnt from existing offshore developments – Section 19 to 21.

Item	Compliance	Comments
Description of the marine environment.	P	**Section 7: Navigational Features** Relevant navigational features in proximity to the Proposed Development have been described including (but not limited to) other offshore wind farm developments, IMO routeing measures, marine aggregate dredging areas, ports, harbours and related facilities, charted anchorage areas, aids to navigation, sub-sea cables, military PEXAs and charted wrecks. **Section 14: Cumulative and Transboundary Overview** Potential future developments have been screened in to the cumulative risk assessment where a cumulative or in combination activity has been identified based upon the location and distance from the Proposed Development, including consideration of other offshore wind farms, oil and gas infrastructure and marine aggregate dredging areas.
SAR overview and assessment.	P	**Section 9: Emergency Response and Incident Overview** Existing SAR resources in proximity to the Proposed Development are summarised including the UK SAR operations contract, RNLI stations and assets and HMCG stations. **Section 18: Introduction to Risk Assessment** The risk assessment includes an assessment of how activities associated with the Proposed Development may restrict emergency response capability of existing resources – Section 19 to 21.

Item	Compliance	Comments
Description of the OREI development and how it changes the marine environment.	P	**Section 6: Project Description Relevant to Shipping and Navigation** The maximum extent of the Proposed Development for which any shipping and navigation hazards are assessed is provided including a description of the Proposed DCO Limits, array area and export cable corridor infrastructure, construction phase programme and indicative vessel and helicopter numbers during the construction and operation and maintenance phases. **Section 15: Future Case Vessel Traffic** Worst case alternative routeing for commercial traffic has been considered.
Analysis of the vessel traffic, including base case and future traffic densities and types.	P	**Section 10: Vessel Traffic Movements** Vessel traffic data in proximity to the Proposed Development has been analysed and includes vessel density and breakdowns of vessel type. **Section 15: Future Case Vessel Traffic** Future vessel traffic levels have been considered, broken down as increases in commercial vessel activity, commercial fishing vessel and recreational vessel activity, increases in traffic associated with project operations and changes in marine aggregate dredging activities. Additionally, worst case alternative routeing for commercial traffic has been considered.

Item	Compliance	Comments
Status of the hazard log: ▪ Hazard identification; ▪ Risk assessment; ▪ Influences on level of risk; ▪ Tolerability of risk; and ▪ Risk matrix.	**P**	**Section 3: Navigational Risk Assessment Methodology** A tolerability matrix has been defined to determine the tolerability (significance) of risks. **Appendix B: Hazard Log** The complete hazard log is presented and includes a description of the hazards considered, possible causes, consequences (most likely and worst case) and relevant embedded mitigation measures. Using this information, each hazard is then ranked in terms of frequency of occurrence and severity of consequence to give a tolerability (significance) level.
NRA: ▪ Appropriate risk assessment; ▪ MCA acceptance for assessment techniques and tools; ▪ Demonstration of results; and ▪ Limitations.	**P**	**Section 2: Guidance and Legislation** MGN 654 and the IMO's FSA guidelines are the primary guidance documents used for the assessment. **Section 16: Collision and Allision Risk Modelling** Provides quantification of collision and allision risk resulting from the with the results outlined numerically and graphically, where appropriate.
Risk control log	**P**	**Section 23: Risk Control Log** Provides the risk control log which summarises the assessment of shipping and navigation hazards scoped into the risk assessment. This includes the proposed embedded mitigation measures, frequency of occurrence, severity of consequence and significance of risk, per hazard.

Appendix B Hazard Log

746. The complete hazard log – created following the first Hazard Workshop and updated following the second Hazard Workshop – is presented in Table B.1. The embedded mitigation measures listed for each hazard are described in full in Section 24.

Table B.1 Hazard log

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	Consequences					Risk		Frequency	Consequences					Risk	
							People	Environment	Property	Business	Average Consequence				People	Environment	Property	Business	Average Consequence		
Commercial vessels (excluding marine aggregate dredgers)																					

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	Consequences					Risk		Frequency	Consequences					Risk	
							People	Environment	Property	Business	Average Consequence				People	Environment	Property	Business	Average Consequence		
Displacement	Temporary displacement of commercial vessels from historical routes	C/D	Promulgation of information including of safety zones and advisory passing distances NtMs updated and reissued weekly Traffic monitoring Application for safety zones and use of a guard vessel as appropriate Any change in UKC greater than 5% consulted on with MCA and Trinity House Lighting and marking including a buoyed construction/ decommissioning area Compliance with the requirements of MGN 654	Buoyed construction/ area/ decommissioning area or advisory safe passing distances causing displacement UKC causing displacement Adverse weather	Increased encounters but does not impact on compliance with COLREGs Increased journey time/distance but does not impact on schedules	4	1	1	1	1	1.0	**Broadly Acceptable**	Increased encounters and impacts on compliance with COLREGs potentially leading to increased journey time, impacts on schedules	4	1	1	1	3	1.5	**Broadly Acceptable**	The placement of a system of buoyage for the export cable route during installation will be considered. Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1.

Restricted access to ports/ harbours	Temporary restrictions on a commercial vessel's access route to a port/harbour (expansion on vessel displacement hazard)	C/D	Promulgation of information including of safety zones and advisory passing distances Traffic monitoring Application for safety zones and use of a guard vessel as appropriate Any change in UKC greater than 5% consulted on with MCA and Trinity House Lighting and marking inc buoyed construction area NtMs updated and reissued weekly Compliance with the requirements of MGN 654 Marine coordination for project vessels	Buoyed construction/ area/ decommissioning area or advisory safe passing distances Project vessels	Increased journey time/distance but does not impact on schedules	4	1	1	1	1	1.0	**Broadly Acceptable**	Increased journey time, impacts on schedules	5	1	1	1	3	1.5	**Tolerable**	Commercial risk is considered separately in the ES chapter as not within the scope of the NRA. The placement of a system of buoyage for the export cable route during installation will be considered. Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1. Noted that vessel movements within Littlehampton harbour limits will require pilot or PEC.

Collision	Increased collision risk involving commercial vessels due to temporary displacement from historical routes and reduction in available sea room	C/D	Promulgation of information including of safety zones and advisory passing distances Traffic monitoring MPCP Lighting and marking including a buoyed construction/ decommissioning area NtMs updated and reissued weekly	Human error or navigational error Mechanical or technical failure (vessel) Adverse weather	Increased encounters between third party vessels that do not impact on compliance with COLREGS	3	1	1	1	1	1.0	**Broadly Accept able**	Increased encounters between third-party vessels that do impact on compliance with COLREGS and result in increased collisions	1	4	4	4	3	3.8	**Broadly Accept able**	The placement of a system of buoyage for the export cable route during installation will be considered. Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1. UK Chamber of Shipping noted during second Hazard Workshop that the separation between the Proposed DCO Limits and the ITZ is a positive change.

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	Consequences					Risk		Frequency	Consequences					Risk	
							People	Environment	Property	Business	Average Consequence				People	Environment	Property	Business	Average Consequence		
Collision with Projects Vessels	Increased collision risk between a commercial vessel and a project vessel due to the presence of project vessels associated with construction/ decommissioning	C/D	Promulgation of information including of safety zones and advisory passing distances Traffic monitoring MPCP Application for safety zones and use of a guard vessel as appropriate Lighting and marking including a buoyed construction/ decommissioning area NtMs updated and reissued weekly Marine coordination for project vessels	Presence of project vessels associated with construction/ decommissioning Third party users not aware project vessels are engaged in operations	Increased encounters between third party vessels and project vessels that do not impact on compliance with COLREGS	4	1	1	1	1	1.0	Broadly Acceptable	Increased encounters between third-party vessels and project vessels that do impact on compliance with COLREGS and result in increased collisions	2	4	4	4	3	3.8	Broadly Acceptable	The placement of a system of buoyage for the export cable route during installation will be considered. Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1.

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	Consequences					Risk		Frequency	Consequences					Risk	
							People	Environment	Property	Business	Average Consequence				People	Environment	Property	Business	Average Consequence		
Allision	New allision risk for commercial vessels due to presence of pre commissioned structures	C/D	Promulgation of information including of safety zones and advisory passing distances MPCP Application for safety zones and use of a guard vessel as appropriate Lighting and marking including a buoyed construction/ decommissioning area NtMs updated and reissued weekly Layout plan Compliance with the requirements of MGN 654	Presence of pre commissioned structures Human error or navigational error Mechanical or technical failure (vessel) Adverse weather Unfamiliarity with project Failure of Aid to Navigation	Vessel passes structure at an unsafe distance and has to make last minute adjustment to course/speed	3	1	1	1	1	1.0	**Broadly Acceptable**	Vessel allides with structure resulting in damage to vessel, injury and potentially pollution	1	4	4	3	4	3.8	**Broadly Acceptable**	Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1. UK Chamber of Shipping noted during second Hazard Workshop that the separation between the Proposed DCO Limits and the ITZ is a positive change.

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	Consequences					Risk		Frequency	Consequences					Risk	
							People	Environment	Property	Business	Average Consequence				People	Environment	Property	Business	Average Consequence		
Grounding	Increased risk of grounding for commercial vessels due to displacement from historical routes, cable protection or scour protection	C/D	Cable burial informed by the cable burial risk assessment Promulgation of information including of safety zones and advisory passing distances MPCP Any change in UKC greater than 5% consulted on with MCA and Trinity House NtMs updated and reissued weekly Compliance with the requirements of MGN 654	Deviation of vessels into waters not previously used Presence of cable protection reducing under keel clearance Human error or navigational error Mechanical or technical failure Adverse weather Unfamiliarity with cable locations	Vessel transits over an area of reduced clearance causing vibration etc. but does not make contact	4	1	1	1	1	1.0	**Broadly Acceptable**	Vessel makes contact with cable protection/ infrastructure resulting in damage to the vessel and potentially pollution	2	4	4	3	4	3.8	**Broadly Acceptable**	Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1.

Anchor interaction	Increased anchor snagging risk for commercial vessels due to sub-sea cables and cable protection	C/D	Target burial depth for cables of 1m Cable burial informed by the cable burial risk assessment Promulgation of information including operation details NtMs updated and reissued weekly Compliance with the requirements of MGN 654	Presence of sub-sea cables or cable protection Human error or navigational error Mechanical or technical failure Adverse weather	Vessel anchors on or drags anchor over an installed cable/protection but no interaction occurs.	3	1	1	1	1	1.0	**Broadly Acceptable**	Vessel anchors on or drags anchor over an installed cable/protection resulting in damage to the cable/protection and/or anchor	2	1	1	2	2	1.5	**Broadly Acceptable**	The placement of a system of buoyage for the export cable route during installation will be considered. Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1. Littlehampton Harbour Board noted that 1m cable burial depth may not be sufficient nearshore and permanent buoyage marking the cable is recommended.
Displacement	Displacement of commercial	O	Promulgation of information including of safety	Presence of structures Adverse weather	Increased encounters but does not impact	4	1	1	1	1	1.0	**Broadly Acceptable**	Increased journey time,	4	1	1	1	3	1.5	**Broadly Acceptable**	Noted during Hazard

	vessels from historical routes		zones and advisory passing distances Application for safety zones and use of a guard vessel as appropriate (maintenance only) Lighting and marking Compliance with the requirements of MGN 654		on compliance with COLREGs Increased journey time/distance but does not impact on schedules								impacts on schedules								Workshop that NtMs became somewhat excessive for Rampion 1. Littlehampton Harbour Board raised concern regarding commercial impact associated with route deviations although Proposed DCO Limits represent a positive change from those previously considered (at PEIR). Satisfied with the reduction to the extent of the DCO Limits to the east in line with Rampion 1 in relation to access for routeing to/from Shoreham.

Restricted access to ports/ harbours	Restrictions on a commercial vessel's access route to a port/harbour (expansion on vessel displacement hazard)	O	Promulgation of information including of safety zones and advisory passing distances Application for safety zones and use of a guard vessel as appropriate (maintenance only) Lighting and marking Compliance with the requirements of MGN 654 Marine coordination for project vessels	Presence of structures Project vessels	Increased journey time/distance but does not impact on schedules	5	1	1	1	1	1.0	**Tolerable**	Increased journey time, impacts on schedules	5	1	1	1	3	1.5	**Tolerable**	Commercial risk is considered separately in the ES chapter as not within the scope of the NRA. Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1. Noted that vessel movements within Littlehampton harbour limits will require pilot or PEC. Satisfied with the reduction to the extent of the DCO Limits to the east in line with Rampion 1 in relation to access for routeing to/from

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	Consequences: People	Environment	Property	Business	Average Consequence	Risk		Frequency	Consequences: People	Environment	Property	Business	Average Consequence	Risk	
																					Shoreham. ABP Southampton requested that reduction in sea room in proximity to the Nab Tower and Deep Water Channel is considered.

Collision	Increased collision risk involving commercial vessels due to displacement from historical routes and reduction in available sea room	O	Promulgation of information including of safety zones and advisory passing distances MPCP Lighting and marking	Human error or navigational error Mechanical or technical failure (vessel) Adverse weather	Increased encounters between third party vessels that do not impact on compliance with COLREGS	4	1	1	1	1	1.0	**Broadly Acceptable**	Increased encounters between third party vessels that do not impact on compliance with COLREGS	1	4	4	4	3	3.8	**Broadly Acceptable**	Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1. UK Chamber of Shipping noted during second Hazard Workshop that the separation between the Proposed DCO Limits and the ITZ is a positive change. RYA noted potential for crossing traffic between the structures exclusion zones.
Collision with Projects Vessels	Increased collision risk between a commercial vessel and a project vessel due to the	O	Promulgation of information including of safety zones and advisory passing	Presence of project vessels associated with operation and maintenance	Increased encounters between third party vessels and project	3	1	1	1	1	1.0	**Broadly Acceptable**	Increased encounters between third party vessels and project	1	4	4	4	3	3.8	**Broadly Acceptable**	Noted during Hazard Workshop that NtMs

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk		Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	
	presence of project vessels associated with operation and maintenance		distances MPCP Application for safety zones and use of a guard vessel as appropriate (maintenance only) Lighting and marking Marine coordination for project vessels	Third party users not aware project vessels are engaged in operations	vessels that do not impact on compliance with COLREGS								vessels that do impact on compliance with COLREGS and result in increased collisions								became somewhat excessive for Rampion 1.

Allision	New allision risk for commercial vessels due to presence of structures	O	Promulgation of information including of safety zones and advisory passing distances MPCP Application for safety zones and use of a guard vessel as appropriate (maintenance only) Lighting and marking Layout plan Compliance with the requirements of MGN 654	Presence of structures Human error or navigational error Mechanical or technical failure resulting in a vessel drifting Adverse weather	Vessel passes structure at an unsafe distance and has to make last minute adjustment to course/speed	4	1	1	1	1	1.0	**Broadly Acceptable**	Vessel allides with structure resulting in damage to vessel, injury and potentially pollution	2	4	4	3	4	3.8	**Tolerable**	Increased frequency related to proximity to Dover Strait TSS, further consultation required. Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1. UK Chamber of Shipping noted during second Hazard Workshop that the separation between the Proposed DCO Limits and the ITZ is a positive change.
Grounding	Increased risk of grounding for commercial vessels due to displacement from historical routes,	O	Cable burial informed by the cable burial risk assessment Promulgation of information	Deviation of vessels into waters not previously used Presence of cable protection	Vessel transits over an area of reduced clearance causing vibration etc.	2	1	1	1	1	1.0	**Broadly Acceptable**	Vessel makes contact with cable protection/ infrastructure resulting in	1	4	4	3	4	3.8	**Broadly Acceptable**	Noted during Hazard Workshop that NtMs became

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	People	Environment	Property	Business	Average Consequence	Risk		Frequency	People	Environment	Property	Business	Average Consequence	Risk	
	cable protection or scour protection		including of safety zones and advisory passing distances MPCP Any change in UKC greater than 5% consulted on with MCA and Trinity House Compliance with the requirements of MGN 654	reducing under keel clearance Human error or navigational error Mechanical or technical failure Adverse weather	but does not make contact								damage to the vessel and potentially pollution								somewhat excessive for Rampion 1.

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk		Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	
Anchor interaction	Increased anchor snagging risk for commercial vessels due to sub-sea cables and cable protection	O	Target burial depth for cables of 1m Cable burial informed by the cable burial risk assessment Promulgation of information including operation details Compliance with the requirements of MGN 654	Presence of sub-sea cables or cable protection Human error or navigational error Mechanical or technical failure Adverse weather	Vessel anchors on or drags anchor over an installed cable/protection but no interaction occurs.	2	1	1	1	1	1.0	**Broadly Acceptable**	Vessel anchors on or drags anchor over an installed cable/protection resulting in damage to the cable/protection and/or anchor	1	1	1	2	2	1.5	**Broadly Acceptable**	Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1. Littlehampton Harbour Board noted that 1m cable burial depth may not be sufficient nearshore and permanent buoyage marking the cable is recommended.

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	Consequences					Risk		Frequency	Consequences					Risk	
							People	Environment	Property	Business	Average Consequence				People	Environment	Property	Business	Average Consequence		
Marine aggregate dredgers (in transit)																					

Displacement	Temporary displacement of marine aggregate dredgers from historical routes	C/D	Promulgation of information including of safety zones and advisory passing distances Traffic monitoring Application for safety zones and use of a guard vessel as appropriate Any change in UKC greater than 5% consulted on with MCA and Trinity House Lighting and marking including a buoyed construction/ decommissioning area NtMs updated and reissued weekly Compliance with the requirements of MGN 654	Buoyed construction/ area/ decommissioning area or advisory safe passing distances causing displacement UKC causing displacement Adverse weather	Increased encounters but does not impact on compliance with COLREGs Increased journey time/distance but does not impact on schedules	3	1	1	1	1	1.0	**Broadly Acceptable**	Increased encounters and impacts on compliance with COLREGs potentially leading to increased journey time, impacts on schedules	3	1	1	1	3	1.5	**Broadly Acceptable**	Marine aggregate dredging representatives indicated at the Hazard Workshop that the impact applies to transits both to port and to aggregate areas. The placement of a system of buoyage for the export cable route during installation will be considered. Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1. Marine aggregate dredging representat

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	Consequences: People	Environment	Property	Business	Average Consequence	Risk		Frequency	Consequences: People	Environment	Property	Business	Average Consequence	Risk	
																					ives content with 1.9nm gap between Owers Light Buoy and array area but recommend use of a lit buoy marking the edge of the array area. Noted that this is within Trinity House's remit. Cemex noted reduction in sea room available for operations.

Restricted access to ports/ harbours	Temporary restrictions on a marine aggregate dredger's access route to a port/harbour (expansion on vessel displacement hazard)	C/D	Promulgation of information including of safety zones and advisory passing distances Traffic monitoring Application for safety zones and use of a guard vessel as appropriate Any change in UKC greater than 5% consulted on with MCA and Trinity House Lighting and marking including a buoyed construction/ decommissioning area NtMs updated and reissued weekly MGN 654 compliance Marine coordination for project vessels	Buoyed construction/ area/ decommissioning area or advisory safe passing distances Project vessels	Increased journey time/distance but does not impact on schedules	3	1	1	1	1	1.0	**Broadly Accept able**	Increased journey time, impacts on schedules	3	1	1	1	3	1.5	**Broadly Accept able**	Commercia l risk is considered separately in the ES chapter as not within the scope of the NRA. The placement of a system of buoyage for the export cable route during installation will be considered . Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1.
Collision	Increased collision risk involving marine aggregate dredgers due to temporary displacement from historical routes and reduction in available sea room	C/D	Promulgation of information including of safety zones and advisory passing distances Traffic monitoring MPCP Lighting and marking including	Human error or navigational error Mechanical or technical failure (vessel) Adverse weather	Increased encounters between third-party vessels that do not impact on compliance with COLREGS	2	1	1	1	1	1.0	**Broadly Accept able**	Increased encounters between third party vessels that do impact on compliance with COLREGS and result in increased collisions	1	4	4	4	3	3.8	**Broadly Accept able**	The placement of a system of buoyage for the export cable route during installation

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	Consequences: People	Environment	Property	Business	Average Consequence	Risk		Frequency	Consequences: People	Environment	Property	Business	Average Consequence	Risk	
			a buoyed construction/ decommissioning area NtMs updated and reissued weekly																		will be considered. Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1.

Collision with Projects Vessels	Increased collision risk between a marine aggregate dredger and a project vessel due to the presence of project vessels associated with construction/ decommissioning	C/D	Promulgation of information including of safety zones and advisory passing distances Traffic monitoring MPCP Application for safety zones and use of a guard vessel as appropriate Lighting and marking including a buoyed construction/ decommissioning area NtMs updated and reissued weekly Marine coordination for project vessels	Presence of project vessels associated with construction/ decommissioning Third party users not aware project vessels are engaged in operations	Increased encounters between third party vessels and project vessels that do not impact on compliance with COLREGS	3	1	1	1	1	1.0	**Broadly Acceptable**	Increased encounters between third party vessels and project vessels that do impact on compliance with COLREGS and result in increased collisions	2	4	4	4	3	3.8	**Broadly Acceptable**	The placement of a system of buoyage for the export cable route during installation will be considered. Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1. Hanson Marine noted concerns about conflicts with project vessels.
Allision	New allision risk for marine aggregate dredgers due to presence of pre commissioned structures	C/D	Promulgation of information including of safety zones and advisory passing distances MPCP Application for safety zones and use of a guard vessel as appropriate	Presence of pre commissioned structures Human error or navigational error Mechanical or technical failure (vessel) Adverse weather Unfamiliarity with project	Vessel passes structure at an unsafe distance and has to make last minute adjustment to course/speed	4	1	1	1	1	1.0	**Broadly Acceptable**	Vessel allides with structure resulting in damage to vessel, injury and potentially pollution	2	4	2	3	4	3.3	**Broadly Acceptable**	Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1. Noted

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk		Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	
			Lighting and marking including a buoyed construction/ decommissioning area NtMs updated and reissued weekly Layout plan Compliance with the requirements of MGN 654	Failure of Aid to Navigation																	during Hazard Workshop that there should be a suitable clearance from marine aggregate dredging areas, this will be discussed further as part of the Other Marine Users chapter (which includes dedicated consultation with marine aggregate dredging stakeholders).

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk		Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	
Grounding	Increased risk of grounding for marine aggregate dredgers due to vessel displacement from historical routes, cable protection or scour protection	C/D	Cable burial informed by the cable burial risk assessment Promulgation of information including of safety zones and advisory passing distances MPCP Any change in UKC greater than 5% consulted on with MCA and Trinity House NtMs updated and reissued weekly Compliance with the requirements of MGN 654	Deviation of vessels into waters not previously used Presence of cable protection reducing under keel clearance Human error or navigational error Mechanical or technical failure Adverse weather Unfamiliarity with cable locations	Vessel transits over an area of reduced clearance causing vibration etc. but does not make contact	5	1	1	1	1	1.0	**Tolerable**	Vessel makes contact with cable protection/ infrastructure resulting in damage to the vessel and potentially pollution	3	4	2	3	4	3.3	**Tolerable**	Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1.

Anchor interaction	Increased anchor snagging risk for marine aggregate dredgers due to sub-sea cables and cable protection	C/D	Target burial depth for cables of 1m Cable burial informed by the cable burial risk assessment NtMs updated and reissued weekly Compliance with the requirements of MGN 654	Presence of sub-sea cables or cable protection Human error or navigational error Mechanical or technical failure Adverse weather	Vessel anchors on or drags anchor over an installed cable/protection but no interaction occurs	3	1	1	1	1	1.0	**Broadly Accept able**	Vessel anchors on or drags anchor over an installed cable/protection resulting in damage to the cable/protection and/or anchor	2	1	1	2	2	1.5	**Broadly Accept able**	The placement of a system of buoyage for the export cable route during installation will be considered. Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1. Noted during Hazard Workshop that on an ebb tide a marine aggregate dredger may drift into the offshore export cable corridor.
Displaceme nt	Displacement of marine aggregate dredgers from historical routes	O	Promulgation of information including of safety zones and advisory passing	Presence of structures Adverse weather	Increased encounters but does not impact on compliance with COLREGs	3	1	1	1	1	1.0	**Broadly Accept able**	Increased encounters and impacts on compliance with COLREGs	3	1	1	1	3	1.5	**Broadly Accept able**	Marine aggregate dredging representat ives

			distances Application for safety zones and use of a guard vessel as appropriate (maintenance only) Lighting and marking NtMs updated and reissued weekly Compliance with the requirements of MGN 654		Increased journey time/distance but does not impact on schedules								potentially leading to increased journey time, impacts on schedules								indicated at the Hazard Workshop that the impact applies to transits both to port and to aggregate areas. Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1. Marine aggregate dredging representatives content with 1.9nm gap between Owers Light Buoy and array area but recommend use of a lit buoy marking the edge of the array area. Noted that this is

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	Consequences: People	Environment	Property	Business	Average Consequence	Risk		Frequency	Consequences: People	Environment	Property	Business	Average Consequence	Risk	
																					within Trinity House's remit. Cemex noted reduction in sea room available for operations.

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	Consequences					Risk		Frequency	Consequences					Risk	
							People	Environment	Property	Business	Average Consequence				People	Environment	Property	Business	Average Consequence		
Restricted access to ports/ harbours	Restrictions on a marine aggregate dredger's access route to a port/harbour (expansion on vessel displacement hazard)	O	Promulgation of information including of safety zones and advisory passing distances Application for safety zones and use of a guard vessel as appropriate (maintenance only) Lighting and marking Compliance with the requirements of MGN 654 Marine coordination for project vessels	Presence of structures Project vessels	Increased journey time/distance but does not impact on schedules	3	1	1	1	1	1.0	**Broadly Acceptable**	Increased journey time, impacts on schedules	3	1	1	1	3	1.5	**Broadly Acceptable**	Commercial risk is considered separately in the ES chapter as not within the scope of the NRA. Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1.

Collision	Increased collision risk involving marine aggregate dredgers due to displacement from historical routes and reduction in available sea room	O	Promulgation of information including of safety zones and advisory passing distances MPCP Lighting and marking	Human error or navigational error Mechanical or technical failure (vessel) Adverse weather	Increased encounters between third party vessels that do not impact on compliance with COLREGS	3	1	1	1	1	1.0	**Broadly Acceptable**	Increased encounters between third party vessels that do not impact on compliance with COLREGS	1	4	4	4	3	3.8	**Broadly Acceptable**	Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1. Cemex concerned by potential for squeeze at western extent of the array area. Hanson Marine and Cemex concerned over increased third party traffic within dredge areas especially recreational and fishing activity.
Collision with Projects Vessels	Increased collision risk between a marine aggregate dredger and a project vessel due to the presence of project vessels	O	Promulgation of information including of safety zones and advisory passing distances MPCP	Presence of project vessels associated with operation and maintenance Third party users not aware project	Increased encounters between third party vessels and project vessels that do not impact on	2	1	1	1	1	1.0	**Broadly Acceptable**	Increased encounters between third party vessels and project vessels that do impact on	1	4	4	4	3	3.8	**Broadly Acceptable**	Noted during Hazard Workshop that NtMs became somewhat

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk		Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	
	associated with operation and maintenance		Application for safety zones and use of a guard vessel as appropriate (maintenance only) Lighting and marking Marine coordination for project vessels	vessels are engaged in operations	compliance with COLREGS								compliance with COLREGS and result in increased collisions								excessive for Rampion 1. Hanson Marine noted concerns about conflicts with project vessels.

Allision	New allision risk for marine aggregate dredgers due to presence of structures	O	Promulgation of information including of safety zones and advisory passing distances MPCP Application for safety zones and use of a guard vessel as appropriate (maintenance only) Lighting and marking Layout plan Compliance with the requirements of MGN 654	Presence of structures Human error or navigational error Mechanical or technical failure resulting in a vessel drifting Adverse weather	Vessel passes structure at an unsafe distance and has to make last minute adjustment to course/speed	4	1	1	1	1	1.0	**Broadly Acceptable**	Vessel allides with structure resulting in damage to vessel, injury and potentially pollution	2	4	2	3	4	3.3	**Broadly Acceptable**

The table's last column:

Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1. Noted during Hazard Workshop that there should be a suitable clearance from marine aggregate dredging areas, this will be discussed further as part of the Other Marine Users chapter (which includes dedicated consultation with marine aggregate dredging stakeholders).

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk		Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	
Grounding	Increased risk of grounding for marine aggregate dredgers due to vessel displacement from historical routes, cable protection or scour protection	O	Cable burial informed by the cable burial risk assessment Promulgation of information including of safety zones and advisory passing distances MPCP Any change in UKC greater than 5% consulted on with MCA and Trinity House Compliance with the requirements of MGN 654	Deviation of vessels into waters not previously used Presence of cable protection reducing under keel clearance Human error or navigational error Mechanical or technical failure Adverse weather	Vessel transits over an area of reduced clearance causing vibration etc. but does not make contact	4	1	1	1	1	1.0	**Broadly Acceptable**	Vessel makes contact with cable protection / infrastructure resulting in damage to the vessel and potentially pollution	2	4	2	3	4	3.3	**Broadly Acceptable**	Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1.

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk		Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	
Anchor interaction	Increased anchor snagging risk for marine aggregate dredgers due to sub-sea cables and cable protection	O	Target burial depth for cables of 1m Cable burial informed by the cable burial risk assessment Compliance with the requirements of MGN 654	Presence of sub-sea cables or cable protection Human error or navigational error Mechanical or technical failure Adverse weather	Vessel anchors on or drags anchor over an installed cable/protection but no interaction occurs	2	1	1	1	1	1.0	**Broadly Acceptable**	Vessel anchors on or drags anchor over an installed cable/protection resulting in damage to the cable/protection and/or anchor	1	1	1	2	2	1.5	**Broadly Acceptable**	Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1. Noted during Hazard Workshop that on an ebb tide a marine aggregate dredger may drift into the Offshore Cable Corridor.
Commercial fishing vessels (in transit)																					

Displacement	Temporary displacement of commercial fishing vessels from historical transits to fishing grounds	C/D	Promulgation of information including of safety zones and advisory passing distances Fishing liaison FLO Traffic monitoring Application for safety zones and use of a guard vessel as appropriate Any change in UKC greater than 5% consulted on with MCA and Trinity House Lighting and marking including a buoyed construction/ decommissioning area NtMs updated and reissued weekly Compliance with the requirements of MGN 654	Buoyed construction/ area/ decommissioning area or advisory safe passing distances causing displacement UKC causing displacement Adverse weather	Increased encounters but does not impact on compliance with COLREGs Increased journey time/distance but does not impact journey time	4	1	1	1	1	1.0	**Broadly Acceptable**	Increased encounters and impacts on compliance with COLREGs potentially leading to increased journey time Could result in restricted movements associated with adverse weather	4	2	1	2	2	1.8	**Broadly Acceptable**	Noted in Hazard Workshop that fishing vessels in winter avoid navigating internally within Rampion 1. The placement of a system of buoyage for the export cable route during installation will be considered. Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1. Littlehampton Harbour Board noted that seven potting vessels not using AIS operate out

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk		Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	
																					of Littlehampton Harbour.

Restricted access to ports/ harbours	Temporary restrictions on a commercial fishing vessel's access route to a port/harbour (expansion on vessel displacement hazard)	C/D	Promulgation of information including of safety zones and advisory passing distances Fishing liaison FLO Traffic monitoring Application for safety zones and use of a guard vessel as appropriate Any change in UKC greater than 5% consulted on with MCA and Trinity House Lighting and marking including a buoyed construction/ decommissioning area NtMs updated and reissued weekly Compliance with the requirements of MGN 654 Marine coordination for project vessels	Buoyed construction/ area/ decommissioning area or advisory safe passing distances Project vessels	Increased journey time/distance but does not impact on routine	4	1	1	1	1	1.0	**Broadly Accept able**	Increased journey time, impacts on routine Could result in restricted movements associated with adverse weather	3	1	1	1	3	1.5	**Broadly Accept able**	The placement of a system of buoyage for the export cable route during installation will be considered. Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1.
Collision	Increased collision risk involving commercial fishing vessels due to temporary displacement from historical transits to fishing grounds and reduction in available sea room	C/D	Promulgation of information including of safety zones and advisory passing distances Fishing liaison FLO Traffic monitoring MPCP Lighting and	Human error or navigational error Mechanical or technical failure (vessel) Adverse weather	Increased encounters between third party vessels that do not impact on compliance with COLREGS	4	1	1	1	1	1.0	**Broadly Accept able**	Increased encounters between third party vessels that do impact on compliance with COLREGS and result in increased collisions	1	5	2	3	3	3.3	**Broadly Accept able**	The placement of a system of buoyage for the export cable route during installation will be

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk		Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	
			marking including a buoyed construction/ decommissioning area NtMs updated and reissued weekly																		considered. Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1.

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	Consequences					Risk		Frequency	Consequences					Risk	
							People	Environment	Property	Business	Average Consequence				People	Environment	Property	Business	Average Consequence		
Collision with Projects Vessels	Increased collision risk between a commercial fishing vessel and a project vessel due to the presence of project vessels associated with construction/ decommissioning	C/D	Promulgation of information including of safety zones and advisory passing distances Fishing liaison FLO Traffic monitoring MPCP Application for safety zones and use of a guard vessel as appropriate Lighting and marking including a buoyed construction/ decommissioning area NtMs updated and reissued weekly Marine coordination for project vessels	Presence of project vessels associated with construction/ decommissioning Third party users not aware project vessels are engaged in operations	Increased encounters between third party vessels and project vessels that do not impact on compliance with COLREGS	5	1	1	1	1	1.0	**Tolerable**	Increased encounters between third party vessels and project vessels that do impact on compliance with COLREGS and result in increased collisions	2	5	2	3	3	3.3	**Broadly Acceptable**	The placement of a system of buoyage for the export cable route during installation will be considered. Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1.

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	Consequences					Risk		Frequency	Consequences					Risk	
							People	Environment	Property	Business	Average Consequence				People	Environment	Property	Business	Average Consequence		
Allision	New allision risk for commercial fishing vessels due to presence of pre commissioned structures	C/D	Promulgation of information including of safety zones and advisory passing distances MPCP Application for safety zones and use of a guard vessel as appropriate Lighting and marking including a buoyed construction/ decommissioning area NtMs updated and reissued weekly Layout plan Compliance with the requirements of MGN 654	Presence of pre commissioned structures Human error or navigational error Mechanical or technical failure (vessel) Adverse weather Failure of Aid to Navigation Failure to take note of advisory safe passing distance	Vessel passes structure at an unsafe distance and has to make last minute adjustment to course/speed	4	1	1	1	1	1.0	**Broadly Acceptable**	Vessel allides with structure resulting in damage to vessel, injury and potentially pollution	2	4	2	4	3	3.3	**Broadly Acceptable**	Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1.

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	Consequences					Risk		Frequency	Consequences					Risk	
							People	Environment	Property	Business	Average Consequence				People	Environment	Property	Business	Average Consequence		
Grounding	Increased risk of grounding for commercial fishing vessels due to displacement from historical transits to fishing grounds, cable protection or scour protection	C/D	Cable burial informed by the cable burial risk assessment Promulgation of information including of safety zones and advisory passing distances MPCP Any change in UKC greater than 5% consulted on with MCA and Trinity House NtMs updated and reissued weekly Compliance with the requirements of MGN 654	Deviation of vessels into waters not previously used Presence of cable protection reducing under keel clearance Human error or navigational error Mechanical or technical failure Adverse weather Unfamiliarity with cable locations	Vessel transits over an area of reduced clearance causing vibration etc. but does not make contact	5	1	1	1	1	1.0	**Tolerable**	Vessel makes contact with cable protection/ infrastructure resulting in damage to the vessel and potentially pollution	3	4	2	4	3	3.3	**Tolerable**	Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1. Littlehampton Harbour Board noted a concern in relation to small craft including the use of marker buoys.

Anchor interaction	Increased anchor snagging risk for commercial fishing vessels due to sub-sea cables and cable protection *Note impacts associated with commercial fishing gear are outside of the scope of the NRA process, and will therefore be assessed separately.	C/D	Target burial depth for cables of 1m Cable burial informed by the cable burial risk assessment NtMs updated and reissued weekly Compliance with the requirements of MGN 654	Presence of sub-sea cables or cable protection Human error or navigational error Mechanical or technical failure Adverse weather	Vessel anchors on or drags anchor over an installed cable/protection but no interaction occurs	3	1	1	1	1	1.0	**Broadly Acceptable**	Vessel anchors on or drags anchor over an installed cable/protection resulting in damage to the cable/protection and/or anchor Risks to vessel stability	2	4	2	5	4	3.8	**Broadly Acceptable**	The placement of a system of buoyage for the export cable route during installation will be considered. Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1. Littlehampton Harbour Board noted that 1m cable burial depth may not be sufficient nearshore. Additionally small craft anchors are unlikely to penetrate the cable but this will be considered

																					as part of the cable burial risk assessment. Permanent buoyage marking the cable is recommended. Littlehampton Harbour Board indicated that the most likely consequence for smaller vessels would be anchor snagging with potential for the vessel having to dump its anchor. Littlehampton Harbour Board also requested additional mitigation of annual bathymetric surveys and a remedial action plan.

Displacement	Displacement of commercial fishing vessels from historical transits to fishing grounds	O	Promulgation of information including of safety zones and advisory passing distances FLO Application for safety zones and use of a guard vessel as appropriate (maintenance only) Lighting and marking Compliance with the requirements of MGN 654	Presence of structures Human error or navigational error Mechanical or technical failure Adverse weather	Increased encounters but does not impact on compliance with COLREGs increased journey time	4	1	1	1	1	1.0	**Broadly Acceptable**	Increased encounters and impacts on compliance with COLREGs potentially leading to increased journey time Could result in restricted movements associated with adverse weather	4	2	1	2	2	1.8	**Broadly Acceptable**	Further consultation required in relation to internal navigation and array layouts. Noted in Hazard Workshop that fishing vessels in winter avoid navigating internally within Rampion 1. Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1. Littlehampton Harbour Board noted that seven potting vessels not using AIS operate out of Littlehampton Harbour.

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	Consequences					Risk		Frequency	Consequences					Risk	
							People	Environment	Property	Business	Average Consequence				People	Environment	Property	Business	Average Consequence		
Restricted access to ports/ harbours	Restrictions on a commercial fishing vessel's access route to a port/harbour (expansion on vessel displacement hazard)	O	Promulgation of information including of safety zones and advisory passing distances Fishing liaison FLO Application for safety zones and use of a guard vessel as appropriate (maintenance only) Lighting and marking Compliance with the requirements of MGN 654 Marine coordination for project vessels	Presence of structures Project vessels	Increased journey time/distance but does not impact on routine	4	1	1	1	1	1.0	**Broadly Acceptable**	Increased journey time, impacts on routine Could result in restricted movements associated with adverse weather	5	1	1	1	3	1.5	**Broadly Acceptable**	Further consultation required in relation to internal navigation and array layouts. Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1.

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk		Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	
Collision	Increased collision risk involving commercial fishing vessels due to displacement from historical transits to fishing grounds and reduction in available sea room	O	Promulgation of information including of safety zones and advisory passing distances Fishing liaison FLO MPCP Lighting and marking	Human error or navigational error Mechanical or technical failure (vessel) Adverse weather	Increased encounters between third party vessels that do not impact on compliance with COLREGS	5	1	1	1	1	1.0	**Tolerable**	Increased encounters between third party vessels that do impact on compliance with COLREGS and result in increased collisions	1	5	2	3	3	3.3	**Broadly Acceptable**	Creation of a fisheries liaison plan. Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1.

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	Consequences					Risk		Frequency	Consequences					Risk	
							People	Environment	Property	Business	Average Consequence				People	Environment	Property	Business	Average Consequence		
Collision with Projects Vessels	Increased collision risk between a commercial fishing vessel and a project vessel due to the presence of project vessels associated with operation and maintenance	O	Promulgation of information including of safety zones and advisory passing distances Fishing liaison FLO MPCP Application for safety zones and use of a guard vessel as appropriate (maintenance only) Lighting and marking Marine coordination for project vessels	Presence of project vessels associated with operation and maintenance Third party users not aware project vessels are engaged in operations	Increased encounters between third party vessels and project vessels that do not impact on compliance with COLREGS	4	1	1	1	1	1.0	**Broadly Acceptable**	Increased encounters between third party vessels and project vessels that do impact on compliance with COLREGS and result in increased collisions	1	5	2	3	3	3.3	**Broadly Acceptable**	Creation of a fisheries liaison plan. Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1.

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	Consequences					Risk		Frequency	Consequences					Risk	
							People	Environment	Property	Business	Average Consequence				People	Environment	Property	Business	Average Consequence		
Allision	New allision risk for commercial fishing vessels due to presence of structures	O	Promulgation of information including of safety zones and advisory passing distances MPCP Application for safety zones and use of a guard vessel as appropriate (maintenance only) Lighting and marking Layout plan Compliance with the requirements of MGN 654	Presence of structures Human error or navigational error Mechanical or technical failure resulting in a vessel drifting Adverse weather	Vessel passes structure at an unsafe distance and has to make last minute adjustment to course/speed	5	1	1	1	1	1.0	**Tolerable**	Vessel allides with structure resulting in damage to vessel, injury and potentially pollution	2	4	2	4	3	3.3	**Broadly Acceptable**	Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1.

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk		Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	
Grounding	Increased risk of grounding for commercial fishing vessels due to displacement from historical transits to fishing grounds, cable protection or scour protection	O	Cable burial informed by the cable burial risk assessment Promulgation of information including of safety zones and advisory passing distances MPCP Any change in UKC greater than 5% consulted on with MCA and Trinity House Compliance with the requirements of MGN 654	Deviation of vessels into waters not previously used Presence of cable protection reducing under keel clearance Human error or navigational error Mechanical or technical failure Adverse weather	Vessel transits over an area of reduced clearance causing vibration etc. but does not make contact	3	1	1	1	1	1.0	**Broadly Acceptable**	Vessel makes contact with cable protection / infrastructure resulting in damage to the vessel and potentially pollution	2	4	2	4	3	3.3	**Broadly Acceptable**	Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1. Littlehampton Harbour Board noted a concern in relation to small craft including the use of marker buoys.

Anchor interaction	Increased anchor snagging risk for commercial fishing vessels due to sub-sea cables and cable protection *Note impacts associated with commercial fishing gear are outside of the scope of the NRA process, and will therefore be assessed separately.	O	Target burial depth for cables of 1m Cable burial informed by the cable burial risk assessment Compliance with the requirements of MGN 654	Presence of sub-sea cables or cable protection Human error or navigational error Mechanical or technical failure Adverse weather	Vessel anchors on or drags anchor over an installed cable/protection but no interaction occurs	2	1	1	1	1	1.0	**Broadly Acceptable**	Vessel anchors on or drags anchor over an installed cable/protection resulting in damage to the cable/protection and/or anchor Risks to vessel stability	1	4	2	5	4	3.8	**Broadly Acceptable**	Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1. Littlehampton Harbour Board noted that 1m cable burial depth may not be sufficient nearshore. Additionally small craft anchors are unlikely to penetrate the cable but this will be considered as part of the cable burial risk assessment. Permanent buoyage marking the cable is recommended. Littlehampton Harbour

																					Board indicated that the most likely consequence for smaller vessels would be anchor snagging with potential for the vessel having to dump its anchor. Littlehampton Harbour Board also requested additional mitigation of annual bathymetric surveys and a remedial action plan.
Recreational vessels (2.5 to 24m)																					
Displacement	Temporary displacement of recreational vessels from historical cruising routes	C/D	Promulgation of information including of safety zones and advisory passing distances Traffic monitoring Application for safety zones and use of a guard vessel as appropriate	Buoyed construction area/ decommissioning area or advisory safe passing distances causing displacement UKC causing displacement Adverse weather	Increased encounters but does not impact on compliance with COLREGs increased journey time/distance but does not impact journey time	4	1	1	1	1	1.0	**Broadly Acceptable**	Increased encounters and impacts on compliance with COLREGs potentially leading to increased journey time Could result in restricted movements	3	2	1	2	1	1.5	**Broadly Acceptable**	The placement of a system of buoyage for the export cable route during installation will be considered

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk		Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	
			Any change in UKC greater than 5% consulted with MCA and Trinity House Lighting and marking including a buoyed construction/ decommissioning area NtMs updated and reissued weekly Compliance with the requirements of MGN 654										associated with adverse weather								. Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1. RYA noted that the area has only a few safe havens.

Restricted access to safe havens	Temporary restrictions on a recreational vessel's access route to a safe haven including a port/harbour (expansion on vessel displacement hazard)	C/D	Promulgation of information including of safety zones and advisory passing distances Traffic monitoring Application for safety zones and use of a guard vessel as appropriate Any change in UKC greater than 5% consulted on with MCA and Trinity House Lighting and marking including a buoyed construction/ decommissioning area NtMs updated and reissued weekly Compliance with the requirements of MGN 654 Marine coordination for project vessels	Buoyed construction area/ decommissioning area or advisory safe passing distances Project vessels	Increased journey time/distance but does not impact on routine	4	1	1	1	1	1.0	**Broadly Accept able**	Increased journey time, impacts on routine Could result in restricted movements associated with adverse weather	3	3	1	2	1	1.8	**Broadly Accept able**	The placement of a system of buoyage for the export cable route during installation will be considered. Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1.
Collision	Increased collision risk involving recreational vessels due to temporary displacement from historical cruising routes and reduction in available sea room	C/D	Promulgation of information including of safety zones and advisory passing distances Traffic monitoring MPCP Lighting and marking including a buoyed construction/ decommissioning	Human error or navigational error Mechanical or technical failure (vessel) Adverse weather	Increased encounters between third party vessels that do not impact on compliance with COLREGS	4	1	1	1	1	1.0	**Broadly Accept able**	Increased encounters between third party vessels that do impact on compliance with COLREGS and result in increased collisions	1	5	2	3	2	3.0	**Broadly Accept able**	The placement of a system of buoyage for the export cable route during installation will be considered.

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	Consequences: People	Environment	Property	Business	Average Consequence	Risk		Frequency	Consequences: People	Environment	Property	Business	Average Consequence	Risk	
			area NtMs updated and reissued weekly																		Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1.

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	Consequences					Risk		Frequency	Consequences					Risk	
							People	Environment	Property	Business	Average Consequence				People	Environment	Property	Business	Average Consequence		
Collision with Projects Vessels	Increased collision risk between a recreational vessel and a project vessel due to the presence of project vessels associated with construction/ decommissioning	C/D	Promulgation of information including of safety zones and advisory passing distances Traffic monitoring MPCP Application for safety zones and use of a guard vessel as appropriate Lighting and marking including a buoyed construction/ decommissioning area NtMs updated and reissued weekly Marine coordination for project vessels	Presence of project vessels associated with construction/ decommissioning Third party users not aware project vessels are engaged in operations	Increased encounters between third party vessels and project vessels that do not impact on compliance with COLREGS	5	1	1	1	1	1.0	Tolerable	Increased encounters between third party vessels and project vessels that do impact on compliance with COLREGS and result in increased collisions	2	5	2	3	2	3.0	Broadly Acceptable	The placement of a system of buoyage for the export cable route during installation will be considered. Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1.

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	Consequences					Risk		Frequency	Consequences					Risk	
							People	Environment	Property	Business	Average Consequence				People	Environment	Property	Business	Average Consequence		
Allision	New allision risk for recreational vessels due to presence of pre commissioned structures	C/D	Promulgation of information including of safety zones and advisory passing distances MPCP Application for safety zones and use of a guard vessel as appropriate Lighting and marking including a buoyed construction/ decommissioning area NtMs updated and reissued weekly Layout plan Compliance with the requirements of MGN 654 Minimum blade clearance of 22m above MHWS	Presence of pre commissioned structures Human error or navigational error Mechanical or technical failure (vessel) Adverse weather Failure of Aid to Navigation Failure to take note of advisory safe passing distance	Vessel passes structure at an unsafe distance and has to make last minute adjustment to course/speed	4	1	1	1	1	1.0	**Broadly Acceptable**	Vessel allides with structure resulting in damage to vessel, injury and potentially pollution	2	4	1	4	3	3.0	**Broadly Acceptable**	Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1.

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	Consequences					Risk		Frequency	Consequences					Risk	
							People	Environment	Property	Business	Average Consequence				People	Environment	Property	Business	Average Consequence		
Grounding	Increased risk of grounding for recreational vessels due to displacement from historical cruising routes, cable protection or scour protection	C/D	Cable burial informed by the cable burial risk assessment Promulgation of information including of safety zones and advisory passing distances MPCP Any change in UKC greater than 5% consulted on with MCA and Trinity House NtMs updated and reissued weekly Compliance with the requirements of MGN 654	Deviation of vessels into waters not previously used Presence of cable protection reducing under keel clearance Human error or navigational error Mechanical or technical failure Adverse weather Unfamiliarity with cable locations	Vessel transits over an area of reduced clearance causing vibration etc. but does not make contact	5	1	1	1	1	1.0	**Tolerable**	Vessel makes contact with cable protection/ infrastructure resulting in damage to the vessel and potentially pollution	3	4	1	4	3	3.0	**Tolerable**	Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1.

Displacement	Displacement of recreational vessels from historical cruising routes	O	Promulgation of information including of safety zones and advisory passing distances Application for safety zones and use of a guard vessel as appropriate (maintenance only) Lighting and marking Compliance with the requirements of MGN 654	Presence of structures Adverse weather	Increased encounters but does not impact on compliance with COLREGs increased journey time/distance but does not impact journey time	4	1	1	1	1	1.0	**Broadly Acceptable**	Increased encounters and impacts on compliance with COLREGs potentially leading to increased journey time Could result in restricted movements associated with adverse weather	3	2	1	2	1	1.5	**Broadly Acceptable**	Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1. RYA noted that the area has only a few safe havens. CA noted that north-south structures exclusion zone provides an alternate route for Channel crossing by recreational craft.
Restricted access to safe havens	Restrictions on a recreational vessel's access route to a safe haven including a port/harbour (expansion on vessel displacement hazard)	O	Promulgation of information including of safety zones and advisory passing distances Application for safety zones and use of a guard vessel as appropriate (maintenance only)	Presence of structures Project vessels	Increased journey time/distance but does not impact on routine	4	1	1	1	1	1.0	**Broadly Acceptable**	Increased journey time, impacts on routine Could result in restricted movements associated with adverse weather	3	3	1	2	1	1.8	**Broadly Acceptable**	Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1.

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	Consequences: People	Environment	Property	Business	Average Consequence	Risk		Frequency	Consequences: People	Environment	Property	Business	Average Consequence	Risk	
			Lighting and marking Compliance with the requirements of MGN 654 Marine coordination for project vessels																		
Collision	Increased collision risk involving recreational vessels due to temporary displacement from historical cruising routes and reduction in available sea room	O	Promulgation of information including of safety zones and advisory passing distances MPCP Lighting and marking	Human error or navigational error Mechanical or technical failure (vessel) Adverse weather	Increased encounters that do not impact on compliance with COLREGS	4	1	1	1	1	1.0	**Broadly Acceptable**	Increased encounters that do impact on compliance with COLREGS and result in increased collisions	1	5	2	3	2	3.0	**Broadly Acceptable**	Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1. RYA noted potential for crossing traffic between the structures exclusion zones

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	Consequences					Risk		Frequency	Consequences					Risk	
							People	Environment	Property	Business	Average Consequence				People	Environment	Property	Business	Average Consequence		
Collision with Projects Vessels	Increased collision risk between a recreational vessel and a project vessel due to the presence of project vessels associated with operation and maintenance	O	Promulgation of information including of safety zones and advisory passing distances MPCP Application for safety zones and use of a guard vessel as appropriate (maintenance only) Lighting and marking Marine coordination for project vessels	Presence of project vessels associated with operation and maintenance Third party users not aware project vessels are engaged in operations	Increased encounters between third party vessels and project vessels that do not impact on compliance with COLREGS	4	1	1	1	1	1.0	**Broadly Acceptable**	Increased encounters between third party vessels and project vessels that do impact on compliance with COLREGS and result in increased collisions	1	5	2	3	2	3.0	**Broadly Acceptable**	Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1.

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	Consequences: People	Environment	Property	Business	Average Consequence	Risk		Frequency	Consequences: People	Environment	Property	Business	Average Consequence	Risk	
Allision	New allision risk for recreational vessels due to presence of structures	O	Promulgation of information including of safety zones and advisory passing distances MPCP Application for safety zones and use of a guard vessel as appropriate (maintenance only) Lighting and marking Compliance with the requirements of MGN 654 Minimum blade clearance of 22m above MHWS	Presence of structures Human error or navigational error Mechanical or technical failure resulting in a vessel drifting Adverse weather	Vessel passes structure at an unsafe distance and has to make last minute adjustment to course/speed	5	1	1	1	1	1.0	**Tolerable**	Vessel allides with structure resulting in damage to vessel, injury and potentially pollution	2	4	1	4	3	3.0	**Broadly Acceptable**	Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1.

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk		Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	
Grounding	Increased risk of grounding for recreational vessels due to displacement from historical cruising routes, cable protection or scour protection	O	Cable burial informed by the cable burial risk assessment Promulgation of information including of safety zones and advisory passing distances MPCP Any change in UKC greater than 5% consulted on with MCA and Trinity House Compliance with the requirements of MGN 654	Deviation of vessels into waters not previously used Presence of cable protection reducing under keel clearance Human error or navigational error Mechanical or technical failure Adverse weather	Vessel transits over an area of reduced clearance causing vibration etc. but does not make contact	4	1	1	1	1	1.0	**Broadly Acceptable**	Vessel makes contact with cable protection / infrastructure resulting in damage to the vessel and potentially pollution	2	4	1	4	3	3.0	**Broadly Acceptable**	Noted during Hazard Workshop that NtMs became somewhat excessive for Rampion 1.
Emergency response																					

Hazard type	Hazard title	Phase (C/O/D)	Embedded mitigation measures	Possible causes	Most likely consequences	Realistic most likely consequences							Worst-case consequences	Realistic worst-case consequences							Further mitigation and additional comments
						Frequency	Consequences					Risk		Frequency	Consequences					Risk	
							People	Environment	Property	Business	Average Consequence				People	Environment	Property	Business	Average Consequence		
Emergency response	Presence of structures may restrict access/response for existing emergency responders	C/O/D	Promulgation of information including of safety zones and advisory passing distances MPCP Lighting and marking including a buoyed construction/ decommissioning area NtMs updated and reissued weekly Layout plan Compliance with the requirements of MGN 654	Wind farm array not designed to facilitate responder access Adverse weather	Delay to response request	2	1	1	1	2	1.3	**Broadly Acceptable**	Delay to response request leading to loss of life	1	5	5	5	5	5.0	**Tolerable**	
All vessels																					

Interference with marine navigation, communications and position fixing equipment	Presence of structures, sub-sea cables may interfere with equipment used on board all vessels.	O	Target burial depth for cables of 1m	Human error relating to adjustment of Radar controls Presence of structures	Infrastructure has no effect upon the Radar, communications and navigation equipment on a vessel	5	1	1	1	1	1.0	**Tolerable**	Minor level of Radar interference due to the wind farm infrastructure	3	1	1	1	1	1.0	**Broadly Acceptable**	Hanson Marine noted concerns over VHF and Radar interference and requested that dedicated studies are used. The NRA will consider impacts on Radar associated with the relevant PDE noting the potential for different technology to be adopted for Rampion 2 from Rampion 1.
Use of aids to navigation	Presence of structures may prevent use of existing aids to navigation	O	MPCP Lighting and marking	Visual intrusion from wind farm structures	Short-term inability to utilise an aid to navigation but no effect on the vessel's transit	4	1	1	1	1	1.0	**Broadly Acceptable**	Short-term inability to utilise an aid to navigation resulting in an allision or grounding incident with damage to vessel, injury and potentially pollution	2	3	3	3	3	3.0	**Broadly Acceptable**	Tarmac Marine noted that the gap between the Owers Light Buoy and the array area is acceptable.

Appendix C Consequences Assessment

C.1 Introduction

747. This appendix presents an assessment of the consequences of collision and allision incidents, in terms of people and the environment, due to the presence of the Proposed Development.

748. The significance of the risk due to the presence of the Proposed Development is also assessed based on risk evaluation criteria and comparison with historical incident data in UK waters[12].

C.2 Risk Evaluation Criteria

C.2.1 Risk to People

749. Regarding the assessment of risk to people two measures are considered, namely:

- Individual risk; and
- Societal risk.

C.2.1.1 Individual Risk

750. Individual risk considers whether the risk from an incident to a particular individual changes significantly due to the presence of the Proposed Development. Individual risk considers not only the frequency of the incident and the consequences (e.g., likelihood of death), but also the individual's fractional exposure to that risk, i.e., the probability of the individual being in the given location at the time of the incident.

751. The purpose of estimating the individual risk is to ensure that individuals who may be affected by the presence of the Proposed Development are not exposed to excessive risks. This is achieved by considering the significance of the change in individual risk resulting from the presence of the Proposed Development relative to the UK background individual risk levels.

752. Annual risk levels to crew (the annual risk to an average crew member) for different vessel types are presented in Figure C.1, which also includes the upper and lower bounds for risk acceptance criteria as suggested in IMO Maritime Safety Committee 72/16 (IMO, 2001). The annual individual risk level to crew falls within the ALARP region for each of the vessel types presented.

[12] For the purposes of this assessment, UK waters is defined as the UK EEZ and UK territorial waters refers to the 12nm limit from the British Isles, excluding the Republic of Ireland.

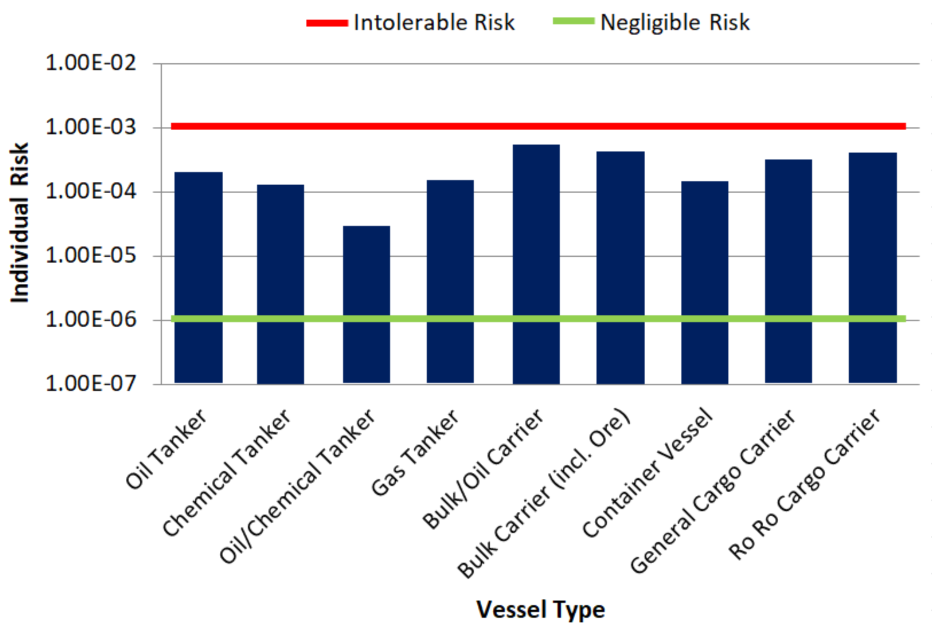

Figure C.1 Individual Risk Levels and Acceptance Criteria per Vessel Type

753. The typical bounds defining the ALARP regions for decision making within shipping are presented in Table C.1. For a new vessel, the target upper bound for ALARP is set lower since new vessels are expected to benefit (in terms of design) from changes in legislation and improved maritime safety.

Table C.1 Individual Risk ALARP Criteria

Individual	Lower Bound for ALARP	Upper Bound for ALARP
To crew member	10^{-6}	10^{-3}
To passenger	10^{-6}	10^{-4}
Third-party	10^{-6}	10^{-4}
New vessel target	10^{-6}	Above values reduced by one order of magnitude

754. On a UK basis, the MCA have presented individual risks for various UK industries based on HSE data from 1987 to 1991. The risks for different industries are presented in Figure C.2.

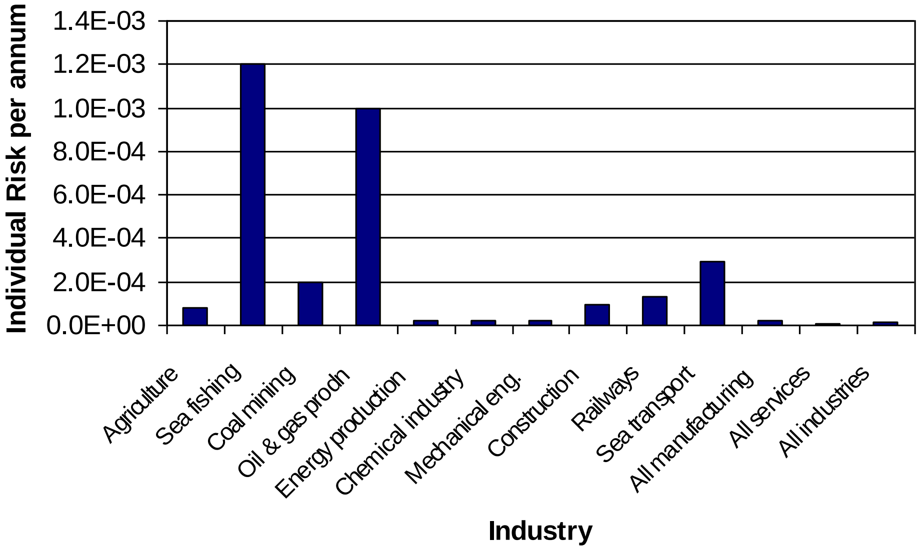

Figure C.2 Individual Risk per Year for Various UK Industries

755. The individual risk for sea transport of 2.9×10^{-4} per year is consistent with the worldwide data presented in Figure C.2, whilst the individual risk for sea fishing of 1.2×10^{-3} per year is the highest across all of the industries included.

C.2.1.2 Societal Risk

756. Societal risk is used to estimate risks of incidents affecting many persons (catastrophes) and acknowledging risk adverse or neutral attitudes. Societal risk includes the risk to every person, even if a person is only exposed to risk on one brief occasion. For assessing the risk to a large number of affected people, societal risk is desirable because individual risk is insufficient in evaluating risks imposed on large numbers of people.

757. Within this assessment, societal (navigation based) risk can be assessed for the Proposed Development, giving account to the change in risk associated with each incident scenario cause by the introduction of the wind farm structures. Societal risk may be expressed as:

- Annual fatality rate where frequency and fatality are combined into a convenient one-dimensional measure of societal risk (also known as PLL); and
- F-N diagrams showing explicitly the relationship between the cumulative frequency of an accident and the number of fatalities in a multi-dimensional diagram.

758. When assessing societal risk this study focuses on PLL, which accounts for the number of people likely to be involved in an incident (which is higher for certain vessel types) and assesses the significance of the change in risk compared to the UK background risk levels.

C.2.1.3 Risk to Environment

759. For risk to the environment the key criteria considered in terms of the risk due to the Proposed Development is the potential quantity of oil spilled from a vessel involved in an incident.

760. It is recognised that there will be other potential pollution, e.g., hazardous containerised cargoes; however, oil is considered the most likely pollutant and the extent of predicted oil spills will provide an indication of the significance of pollution risk due to the Proposed Development compared to UK background pollution risk levels.

C.3 Marine Accident Investigation Branch Incident Data

C.3.1 All Incidents in UK Waters

761. All British flagged commercial vessels are required to report incidents to the MAIB. Non-British flagged vessels do not have to report an incident to the MAIB unless located at a UK port or within 12nm territorial waters and carrying passengers to a UK port. There are no requirements for non-commercial recreational craft to report incidents to the MAIB; however, a significant proportion of such incidents are reported to and investigated by the MAIB.

762. The MCA, harbour authorities and inland waterway authorities also have a duty to report incidents to the MAIB. Therefore, whilst there may be a degree of underreporting of incidents with minor consequences, those resulting in more serious consequences, such as fatalities, are likely to be reported.

763. Only incidents occurring in UK waters have been considered within this assessment for which the MAIB data is most comprehensive. It is also noted that incidents occurring in ports/harbours and rivers/canals have been excluded since the causes and consequences may differ considerably from an incident occurring offshore, which is the location of most relevance to the Proposed Development.

764. Accounting for these criteria, a total of 12,093 accidents, injuries and hazardous incidents were reported to the MAIB in the 20-year period between 2000 and 2019 involving 13,965 vessels (some incidents, such as collisions, involved more than one vessel).

765. The location of all incidents in proximity to the UK are presented in Figure C.3, colour-coded by incident type[13]. The majority of incidents occur in coastal waters.

[13] The MAIB aim for 97% accuracy in reporting the location of incidents.

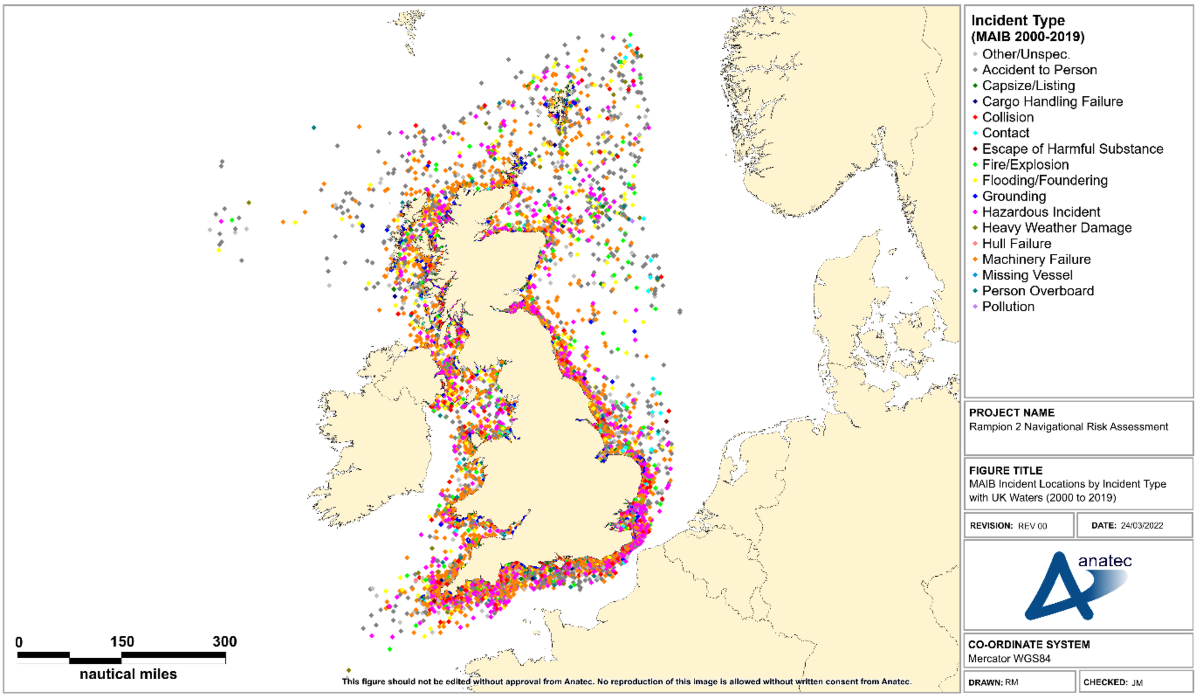

Figure C.3 MAIB Incident Locations by Incident Type within UK Waters (2000 to 2019)

766. The distribution of incidents by year in UK waters is presented in Figure C.4.

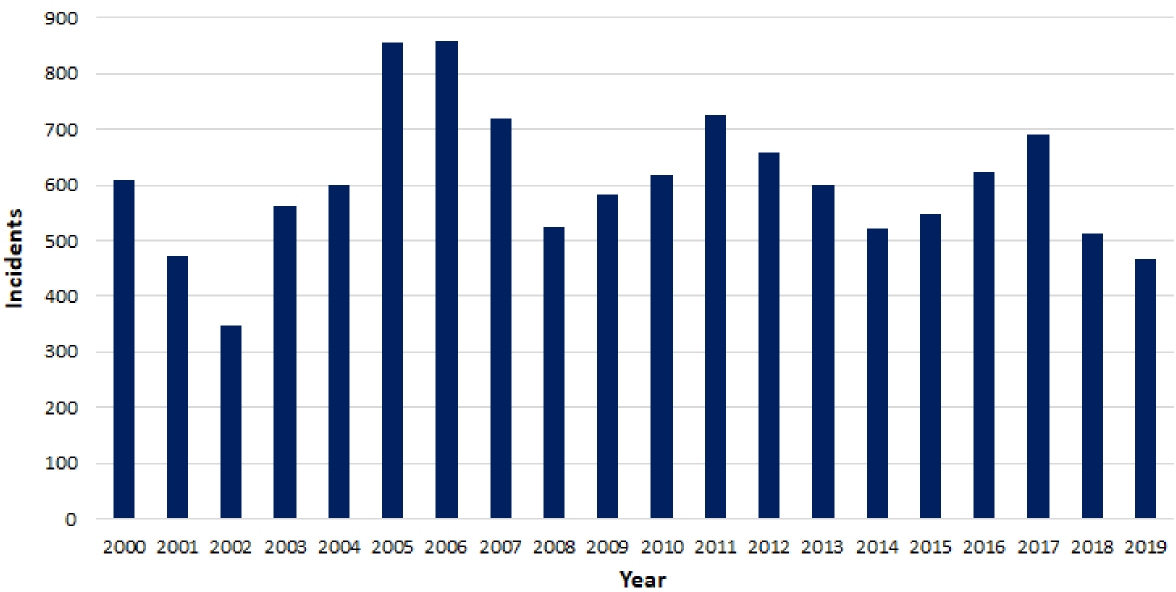

Figure C.4 MAIB Unique Incidents per Year within UK Waters (2000 to 2019)

767. The average number of unique incidents per year was 605. There has generally been a fluctuating trend in incidents over the 20-year period.

768. The distribution of incidents in UK waters by incident type is presented in Figure C.5.

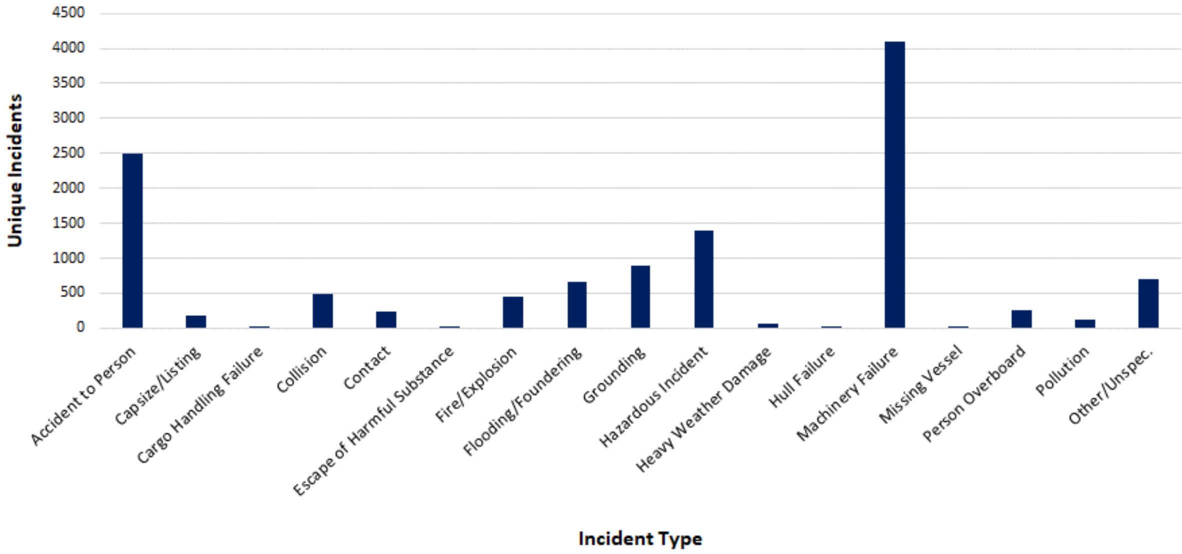

Figure C.5 MAIB Incident Types Breakdown within UK Waters (2000 to 2019)

769. The most frequent incident types were "*machinery failure*" (34%), "*accident to person*" (21%) and "*hazardous incident*" (12%). "*Collision*" and "*contact*" incidents represented 4% and 2% of total incidents, respectively.

770. The distribution of incidents in UK waters by vessel type is presented in Figure C.6.

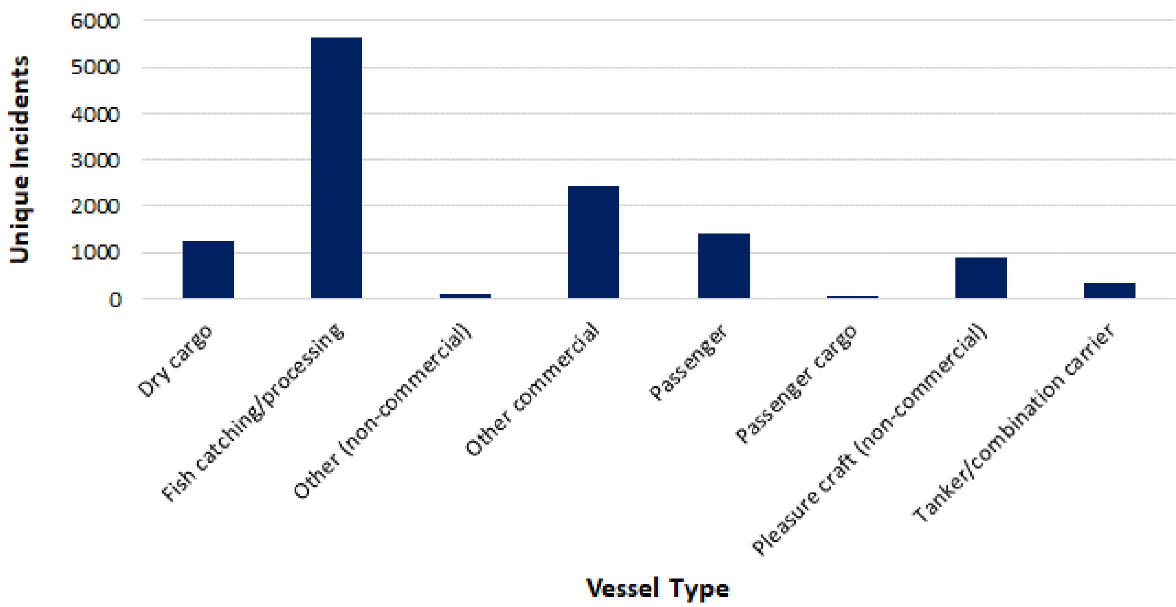

Figure C.6 MAIB Incident Types Breakdown within UK Waters (2000 to 2019)

771. The most frequent vessel types involved in incidents were fishing vessels (46%), other commercial vessels (20%) (including offshore industry vessels, tugs, workboats and pilot vessels) and dry cargo vessels (10%).

772. A total of 373 fatalities were reported in the MAIB incidents within UK waters between 2000 and 2019, corresponding to an average of 19 fatalities per year.

773. The distribution of fatalities in UK waters by vessel type and person category (crew, passenger and other) is presented in Figure C.7.

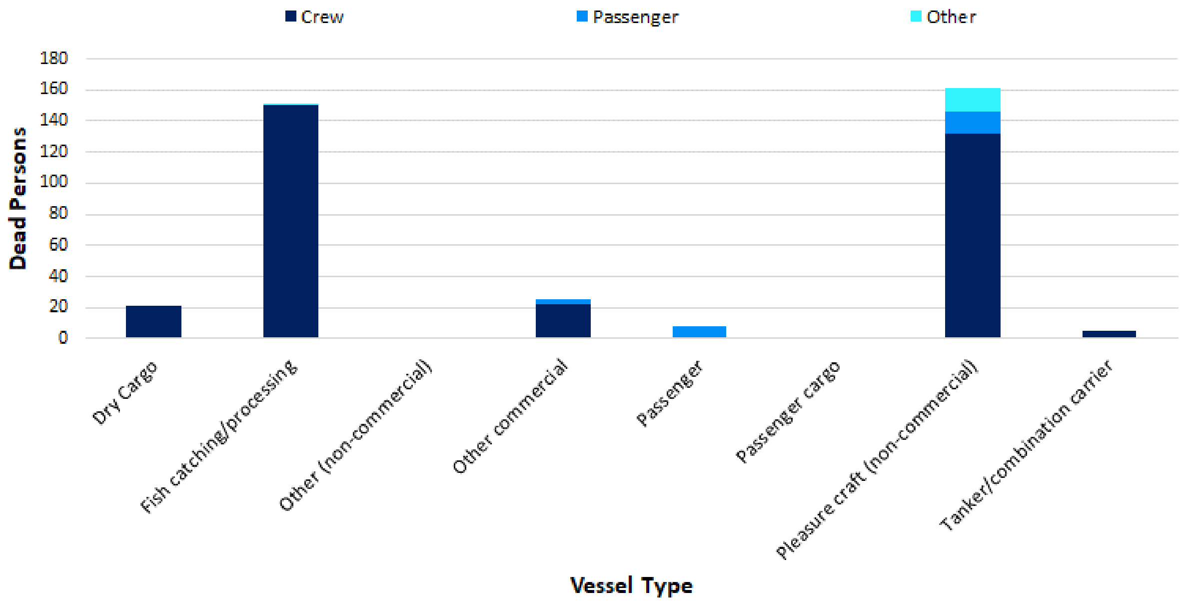

Figure C.7 MAIB Fatalities by Vessel Type within UK Waters (2000 to 2019)

774. The majority of fatalities occurred to pleasure craft (43%) and fishing vessels (40%), with crew members the main people involved (89%).

C.3.2 Collision Incidents

775. The MAIB define a collision incident as "*ships striking or being struck by another ship, regardless of whether the ships are underway, anchored or moored*" (MAIB, 2013).

776. A total of 481 collision incidents were reported to the MAIB in UK waters between 2000 and 2019 involving 1,090 vessels (in a small number of cases the other vessel involved was not logged).

777. The locations of collision incidents reported in proximity to the UK are presented in Figure C.8.

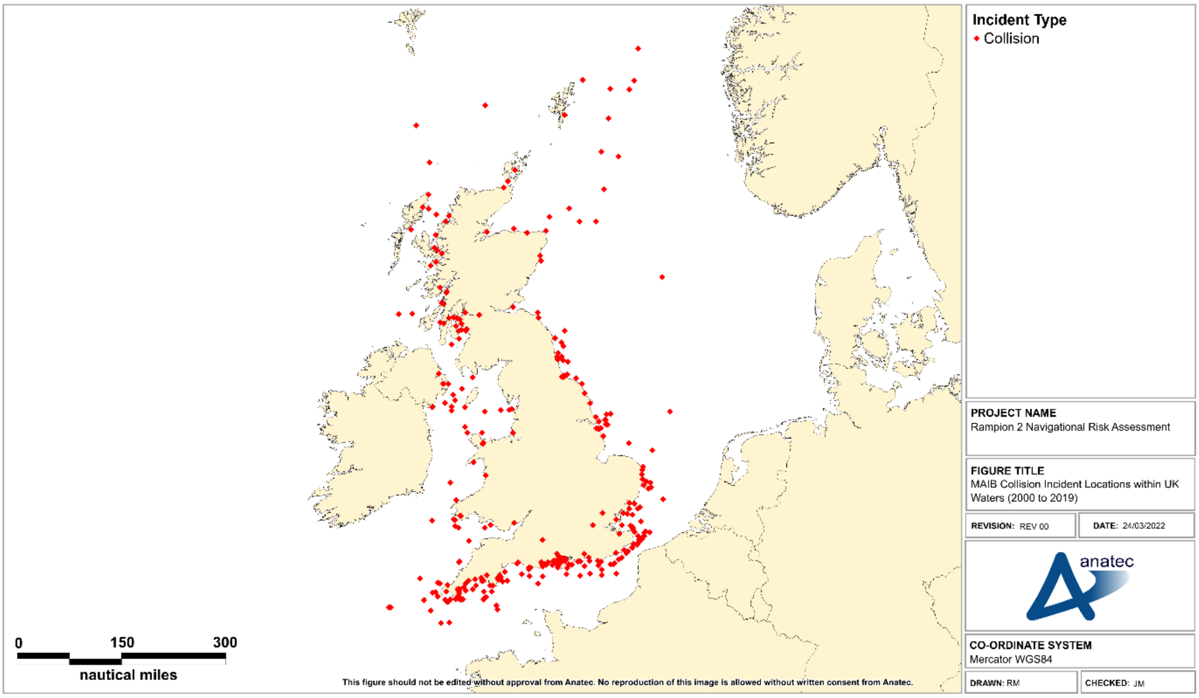

Figure C.8 MAIB Collision Incident Locations within UK Waters (2000 to 2019)

778. The distribution of collision incidents per year is presented in Figure C.9.

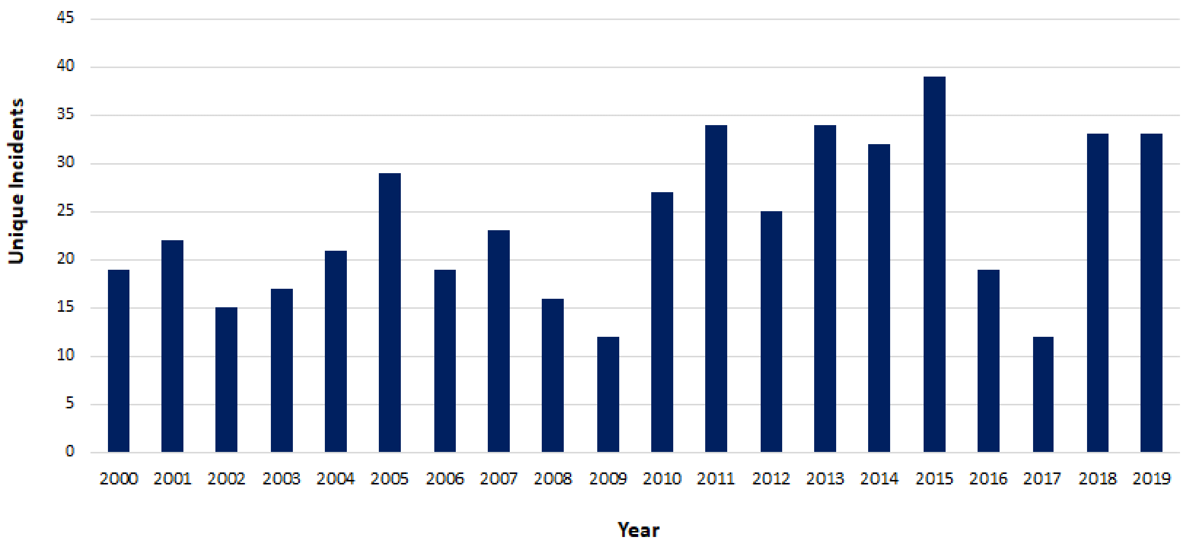

Figure C.9 MAIB Annual Collision Incidents within UK Water (2000 to 2019)

779. The average number of collision incidents per year was 14. There has been an overall slight increasing trend in collision incidents over the 20-year period, which may be due to better reporting of less serious incidents in recent years.

780. The most frequent vessel types involved in collision incidents were other commercial vessels (29%), fishing vessels (24%), non-commercial pleasure craft (23%) and dry cargo vessels (12%).

781. A total of six fatalities were reported in MAIB collision incidents within UK waters between 2000 and 2019. Details of each of these fatal incidents reported by the MAIB are presented in Table C.2.

Table C.2 Description of Fatal MAIB Collision Incidents (2000 to 2019)

Date	Description	Fatalities
October 2001	Collision between dry cargo vessel and chemical tanker following lateness by watchkeepers in taking effective action. Dry cargo vessel sank with five of the six crew members rescued.	1
July 2005	Collision between two powerboats at night. Both vessels were unlit and both helmsmen had consumed alcohol. One of the helmsmen died.	1
October 2007	Collision between fishing vessel and coastal general cargo vessel following failure to keep an effective lookout. Fishing vessel sank with three of the four crew members abandoning ship into a life raft but the fourth crew member was not recovered.	1
August 2010	Collision between passenger ferry and fishing vessel. Fishing vessel sank with one of the two crew members recovered from the sea but the other member was not recovered despite an extensive search.	1
June 2015	Collision between Rigid Inflatable Boat (RIB) and yacht. Believed that around a dozen persons were onboard the motorboat with the majority taken ashore by lifeboat. One person seriously injured and airlifted to hospital before being pronounced dead later.	1
June 2018	Collision between power boats during a race. One of the vessels overturned with the pilot pronounced dead at the scene.	1

C.3.3 Contact Incidents

782. The MAIB define a contact incident as "*ships striking or being struck by an external object. The objects can be: floating object (cargo, ice, other or unknown); fixed object, but not the sea bottom; or flying object*" (MAIB, 2013).

783. A total of 235 contact incidents were reported to the MAIB within UK waters between 2000 and 2019 involving 270 vessels (in a small number of cases the contact involved a moving vessel and a stationary vessel).

784. The locations of contact incidents reported in proximity to the UK are presented in Figure C.10.

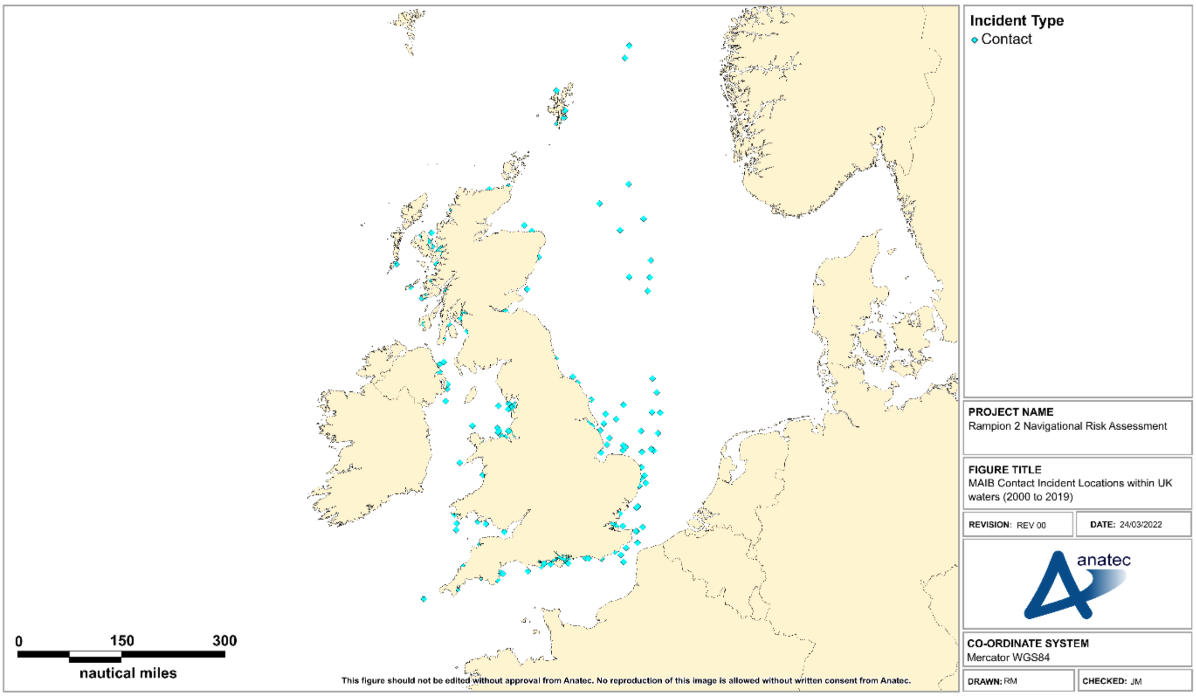

Figure C.10 MAIB Contact Incident Locations within UK waters (2000 to 2019)

785. The distribution of contact incidents per year is presented in Figure C.11.

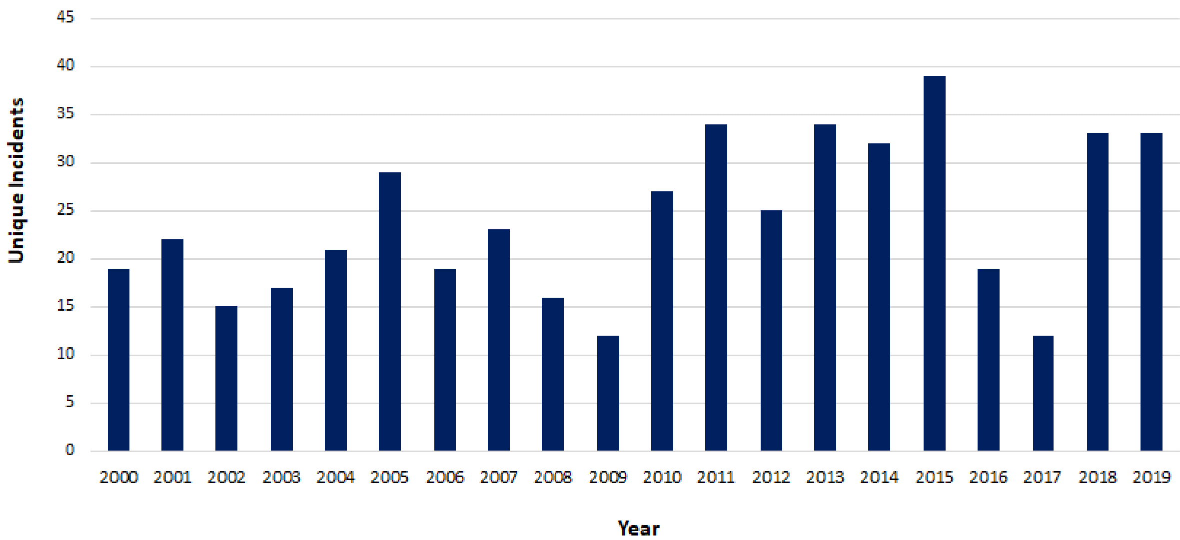

Figure C.11 MAIB Contact Incidents per Year within UK Waters (2000 to 2019)

786. The average number of contact incidents per year was 12. As with collision incidents, there has been an overall slight increasing trend over the 20-year period, which may be due to better reporting of less serious incidents in recent years.

787. The distribution of vessel types involved in contact incidents is presented in Figure C.12.

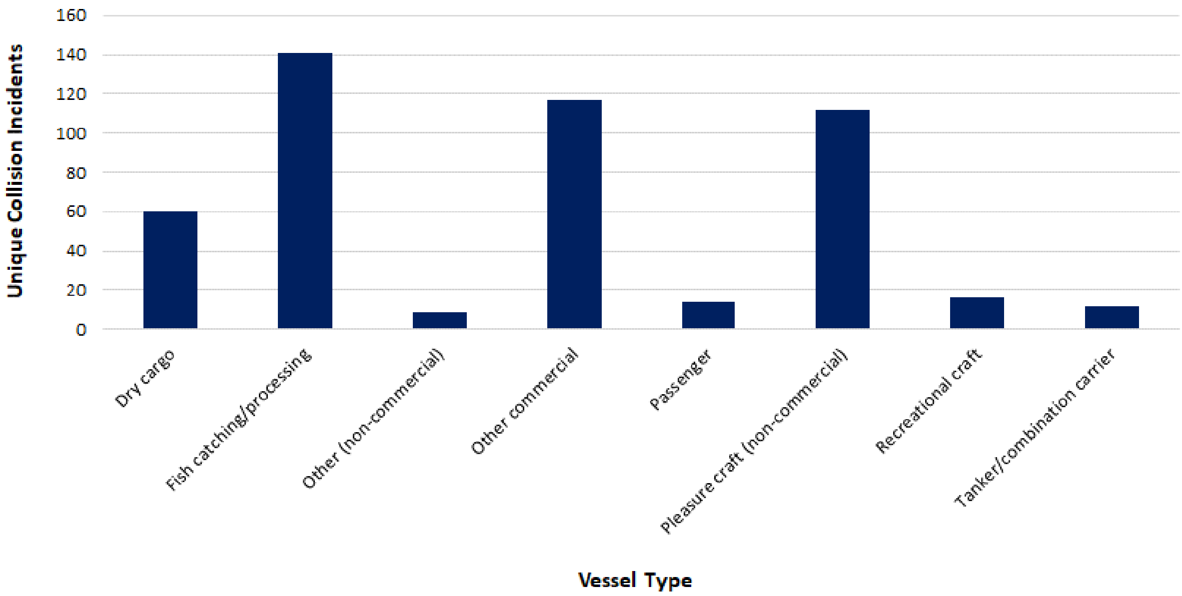

Figure C.12 MAIB Contact Incidents by Vessel Type within UK Waters (2000 to 2019)

788. The most frequent vessel types involved in contact incidents were other commercial vessels (43%), fishing vessels (15%) and non-commercial pleasure craft (13%).

789. A total of one fatality was reported in MAIB contact incidents within UK waters between 2000 and 2019. Details of this fatal incident reported by the MAIB are presented in Table C.3.

Table C.3 Description of Fatal MAIB Contact Incidents (2000 to 2019)

Date	Description	Fatalities
June 2012	Contact between RIB and jetty. RIB badly damaged around the bow and fenders on the jetty also damaged. The RIB owner had consumed alcohol and suffered fatal injuries following the impact.	1

C.4 Fatality Risk

C.4.1 Incident Data

790. This section uses the MAIB incident data along with information on average manning levels per vessel type to estimate the probability of a fatality in a maritime incident associated with the Proposed Development.

791. The project is assessed to have the potential to affect the following incidents:

- Vessel to vessel collision;

- Powered vessel to structure allision;
- Drifting vessel to structure allision; and
- Fishing vessel to structure allision.

792. Of these incident types, only vessel to vessel collisions match the MAIB definition of collisions and hence the fatality analysis presented in Section C.3.2 is considered directly applicable to these types of incidents.

793. The other scenarios of powered vessel to structure allision, drifting vessel to structure allision and fishing vessel to structure allision are technically contacts since they would involve a vessel striking an immobile object in the form of a WTG or offshore substation. From Section C.3.3, only one of the 235 contact incidents reported by the MAIB between 2000 and 2019 resulted in a fatality, with the contact occurring with a jetty in the approaches to a harbour.

794. As the mechanics involved in a vessel contacting a WTG may differ in severity from striking, for example, a buoy, quayside or moored vessel, the MAIB collision fatality risk rate has also been conservatively applied for the allision incident types.

C.4.2 Fatality Probability

795. Six of the 481 collision incidents reported by the MAIB within UK waters between 2000 and 2019 resulted in one or more fatalities. This gives a 1.2% probability that a collision incident will lead to a fatal accident.

796. To assess the fatality risk for personnel onboard a vessel (crew, passenger or other) the number of persons involved in the incidents needs to be estimated. Table C.4 presents the average number of POB estimated for each category of vessel navigating in proximity to the Proposed Development. For passenger vessels this is based upon information available for the specific vessels recorded in the vessel traffic survey data. For other vessel categories, this is based upon information available from the MAIB incident data.

Table C.4 Estimated Average POB by Vessel Category

Vessel Category	Sub Categories	Source of Estimated Average POB	Estimated Average POB
Cargo/freight	Dry cargo, other commercial, service ship, etc.	MAIB incident data	15
Tanker	Tanker/combination carrier	MAIB incident data	22
Passenger	RoRo passenger, cruise liner, etc.	Vessel traffic survey data / online information	1,530

Vessel Category	Sub Categories	Source of Estimated Average POB	Estimated Average POB
Fishing	Trawler, potter, dredger, etc.	MAIB incident data	3.3
Recreational	Yacht, small commercial motor yacht, etc.	MAIB incident data	3.3

797. It is recognised that these average POB numbers can be substantially higher or lower on an individual vessel basis depending upon the size, subtype, etc. but applying reasonable averages is considered sufficient for this analysis, particularly when noting that the average POB for the dominant vessel category (passenger) is based upon the vessel traffic survey data where possible.

798. Using the average POB, along with the vessel type information involved in collision incidents reported by the MAIB (see Section C.3.2), there was an estimated 17,848 POB the vessels involved in the collision incidents.

799. Based upon six fatalities, the overall fatality probability in a collision for any individual onboard is approximately 3.4×10^{-4} per collision.

800. It is considered inappropriate to apply this rate uniformly as the statistics indicate that the fatality probability associated with smaller craft, such as fishing vessels and recreational vessels, is higher. Therefore, the fatality probability has been subdivided into three categories of vessel as presented in Table C.5.

Table C.5 Collision Incident Fatality Probability by Vessel Category (2000 to 2019)

Vessel Category	Sub Categories	Fatalities	People Involved	Fatality Probability
Commercial	Dry cargo, passenger, tanker, etc.	1	16,256	6.2×10^{-5}
Fishing	Trawler, potter, dredger, etc.	2	880	2.3×10^{-3}
Recreational	Yacht, small commercial motor yacht, etc.	3	713	4.2×10^{-3}

801. The risk is higher by two orders of magnitude for POB small craft compared to larger commercial vessels.

C.4.3 Fatality Risk due to the Proposed Development

802. The base case and future case annual collision frequency levels pre and post wind farm for the Proposed Development are summarised in Table 16-1.

803. From the detailed results of the collision and allision risk modelling, the distribution of the predicted change in annual collision and allision frequency by vessel type due to the Proposed Development for the base case and future cases, are presented in Figure C.13.

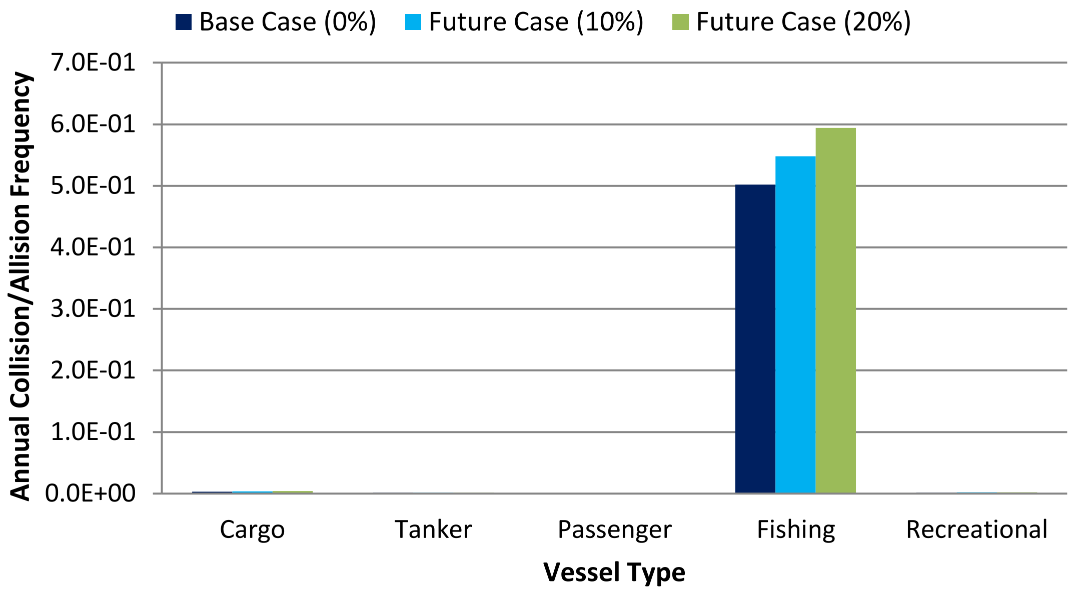

Figure C.13 Estimated Change in Annual Collision and Allision Frequency by Vessel Type

804. It can be seen that the change in collision and allision frequency is dominated by fishing vessels due to their prevalence within the study area in comparison to other vessel types, particularly from activity by vessels engaged in fishing activities and the high allision risk associated with fishing vessels navigating internally within the array area. The second greatest collision and allision frequency change was associated with cargo vessels, which was significantly lower than for fishing vessels.

805. Combining the annual collision and allision frequency, estimated number of POB for each vessel type and the estimated fatality probability for each vessel type category, the annual increase in PLL due to the presence of the Proposed Development for the base case is estimated to be 3.43×10^{-3}, equating to one additional fatality every 291 years.

806. The estimated incremental increases in PLL due to the Proposed Development, distributed by vessel type and for the base case and future cases, are presented in Figure C.14.

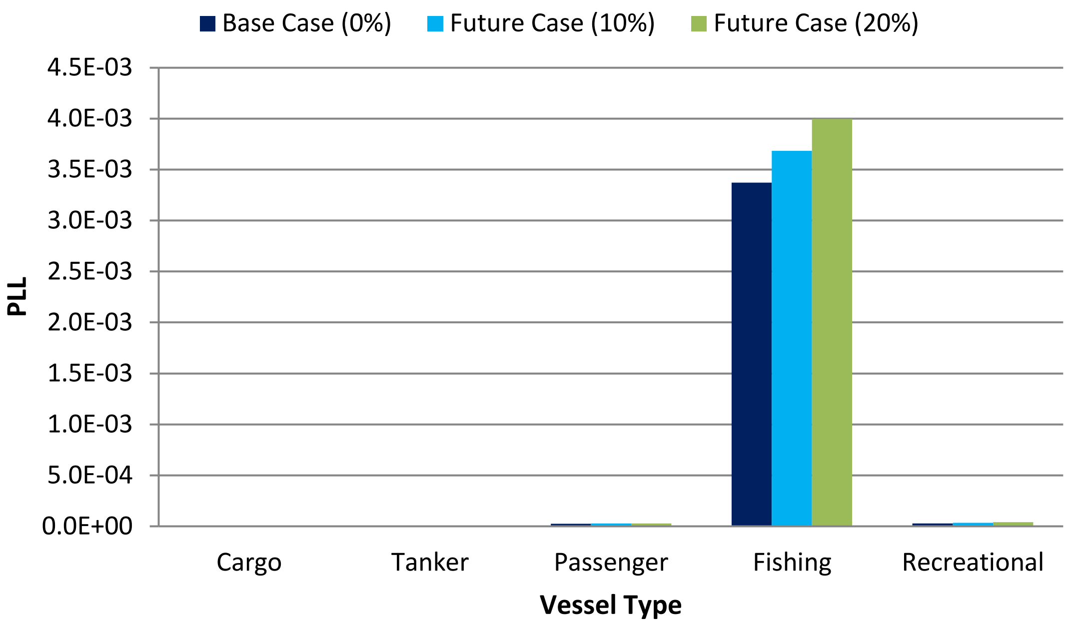

Figure C.14 Estimated Change in Annual PLL by Vessel Type

807. As with the change in collision and allision frequency, the change in annual PLL is dominated by fishing vessels which historically have a higher fatality probability than commercial vessels.

808. Converting the PLL to individual risk based upon the average number of people exposed by vessel type, the results are presented in Figure C.15.

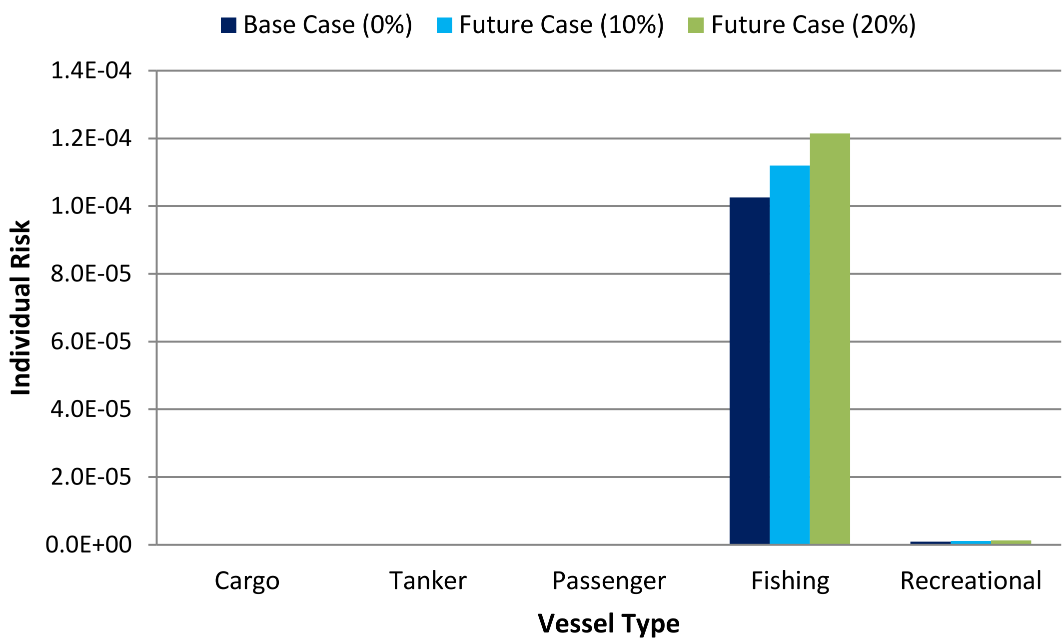

Figure C.15 Estimated Change in Individual Risk by Vessel Type

809. It can be seen that the individual risk to people is dominated by fishing vessels, reflecting the higher probability of a fatality occurring in the event of an incident involving a fishing vessel in comparison to other vessel types.

C.4.4 Significance of Increase in Fatality Risk

810. In comparison to MAIB statistics, which indicate an average of 20 fatalities per year in UK territorial waters, the overall increase for the base case in PLL of one additional fatality per 291 years represents a negligible change.

811. In terms of individual risk to people, the change for commercial vessels attributed to the Proposed Development (approximately 3.22×10^{-8} for the base case) is negligible compared to the background risk level for the UK sea transport industry of 2.9×10^{-4} per year.

812. For fishing vessels, the change in individual risk attributed to the Proposed Development (approximately 1.03×10^{-4} for the base case) is low compared to the background risk level for the UK sea fishing industry of 1.2×10^{-3} per year, noting that the background risk in the vicinity of the Proposed Development is likely to be higher than the national average given the levels of fishing activity in the region, particularly from fishing vessels engaged in fishing activity.

C.5 Pollution Risk

C.5.1 Historical Analysis

813. The pollution consequences of a collision in terms of oil spill depend upon the following criteria:

- Spill probability (i.e., the likelihood of outflow following an incident); and
- Spill size (quantity of oil).

814. Two types of oil spill are considered in this assessment:

- Fuel oil spills from bunkers (all vessel types); and
- Cargo oil spills (laden tankers).

815. The research undertaken as part of the DfT's MEHRAs project (DfT, 2001) has been used as it was comprehensive and based upon worldwide marine oil spill data analysis. From this research, the overall probability of a spill per incident was calculated based upon historical incident data for each incident type as presented in Figure C.16.

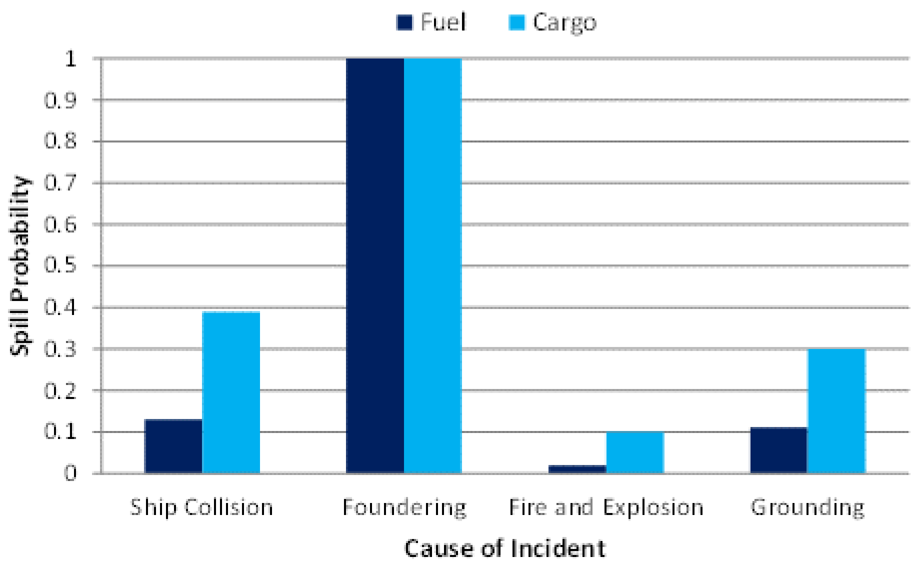

Figure C.16 Probability of an Oil Spill Resulting from an Accident

816. Therefore, it was estimated that 13% of vessel collisions result in a fuel oil spill and 39% of collisions involving a laden tanker result in a cargo oil spill.

817. In the event of a bunker spill, the potential outflow of oil depends upon the bunker capacity of the vessel. Historical bunker spills from vessel have generally been limited to a size below 50% of bunker capacity, and in most incidents much lower.

818. For the types and sizes of vessels exposed to the Proposed Development, an average spill size of 100 tonnes of fuel oil is considered a conservative assumption.

819. For cargo spills from laden tankers, the spill size can vary significantly. The ITOPF reported the following spill size distribution for tanker collisions between 1974 and 2004:

- 31% of spills below seven tonnes;
- 52% of spills between seven and 700 tonnes; and
- 17% of spills greater than 700 tonnes.

820. Based upon this data and the tankers transiting in proximity to the Proposed Development, an average spill size of 400 tonnes is considered a conservative assumption.

821. For fishing vessel collisions, comprehensive statistical data is not available. Consequently, it is conservatively assumed that 50% of all collisions involving fishing vessels will lead to oil spill with the quantity spilled being on average five tonnes. Similarly for recreational vessels, due to a lack of data 50% of collisions are conservatively assumed to lead to a spill with an average size of one tonne.

C.5.2 Pollution Risk due to the Proposed Development

822. Applying the above probabilities to the annual collision and allision frequency by vessel type and the average spill size per vessel, the amount of oil spilled per year due to the impact of the Proposed Development is estimated to be 1.49 tonnes per year for the base case. For the future case scenarios, this estimate increases to 1.64 and 1.80 tonnes per year for traffic increases of 10% and 20% respectively.

823. The estimated increase in tonnes of oil spilled, distributed by vessel type, for the base case and future cases, are presented in Figure C.17.

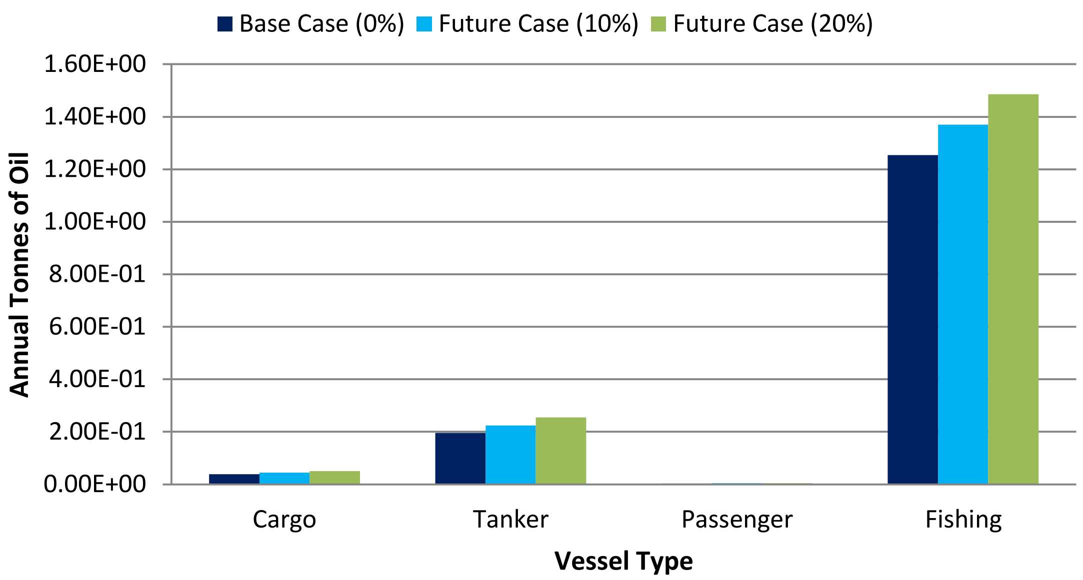

Figure C.17 Estimated Change in Pollution by Vessel Type

824. The annual oil spill results are dominated by fishing vessels due to their high associated annual collision and allision frequency. Tankers also contribute significantly to the annual oil spill estimate, which reflects the greater volume of oil spillage anticipated per incident involving tankers.

C.5.3 Significance of Increase in Pollution Risk

825. To assess the significance of the increased pollution risk from vessels caused by the Proposed Development, historical oil spill data for the UK has been used as a benchmark.

826. From the MEHRAs research, the annual average tonnes of oil spilled in UK waters due to maritime incidents in the 10-year period from 1989 to 1998 was 16,111. This is based upon a total of 146 reported oil pollution incidents of greater than one tonne (smaller spills are excluded as are incidents which occurred within port or harbour areas or resulting from operational errors or equipment failure). Commercial vessel spills accounted for approximately 99% of the total while fishing vessel incidents accounted for less than 1%.

827. The overall increase in pollution estimated due to the Proposed Development of 1.08 tonnes for the base case represents a 0.007% increase compared to the historical average pollution quantities from maritime incidents in UK waters.

C.6 Conclusion

828. This appendix has quantitively assessed the fatality and pollution risk associated with the Proposed Development in the event of a collision or

allision incident occurring. The assessment indicates that the fatality and pollution risk associated with fishing vessels is greatest.

829. Overall, the impact of the Proposed Development on people and the environment is relatively low compared to the existing background risk levels in UK waters. However, this is the localised impact of a single offshore wind farm development and there will be additional maritime risks associated with other offshore wind farm developments in the English Channel and the UK as a whole.

830. Discussion of relevant mitigation measures and monitoring is provided in Section 24 of the NRA.

Appendix D Regular Operator Consultation

831. As part of the consultation process for the Proposed Development, regular operators identified (from the vessel traffic survey data) that would be required to deviate their routes due to the array area were consulted via electronic mail. An example of the correspondence sent to the regular operators is presented below.

832. It is noted that the area of search shown in the accompanying figure was the area of search under consideration prior to submission of the PEIR (the Scoping Boundary – see Section 6.1). Additionally, the proposed timeframe for the Hazard Workshop was indicative only; the Hazard Workshop was eventually held in February 2021 (see Section 4.3) to allow the inclusion of the winter vessel traffic survey data in discussions.

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Date: 1st October 2020

Consultation on the Proposed Rampion 2 Offshore Wind Farm in Relation to Shipping and Navigation

Dear Sir/Madam,

As you may be aware, RWE Renewables is currently planning to submit an application for Rampion Extension ('Rampion 2'), an extension to the existing Rampion Offshore Wind Farm ('Rampion 1') which has been operational since 2018.

Following a Scoping Report for the development submitted to the Planning Inspectorate in July 2020, RWE Renewables are now in the process of completing the Preliminary Environmental Information Report (PEIR) including the Navigational Risk Assessment (NRA). The outputs from this process will feed into the subsequent Environmental Statement (ES) with the NRA updated as required.

An overview of the Rampion 2 area of search is provided in Figure 1. The offshore array area is located approximately 7.3 nautical miles (nm) off the West Sussex coast and covers an area of approximately 92 square nautical miles (nm^2). The offshore export cable route covers an area of approximately $22nm^2$ and makes landfall near Littlehampton Harbour.

Further information about the development can be found here.

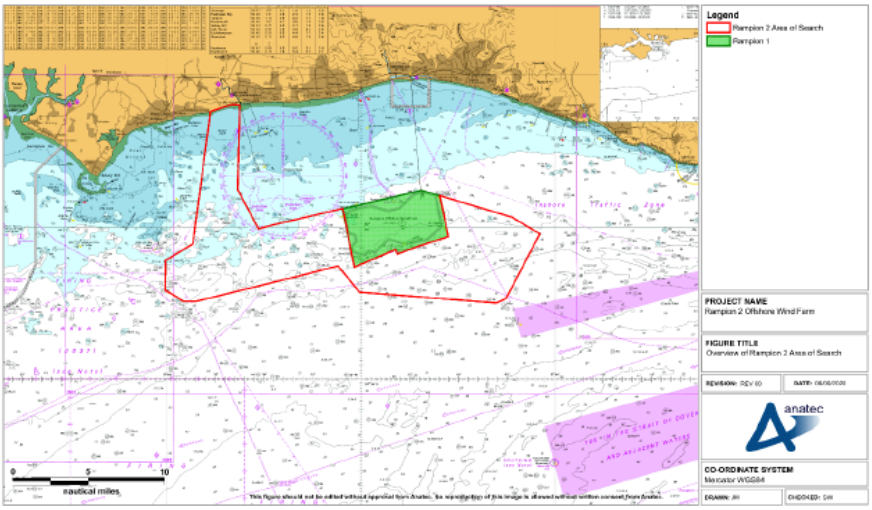

Figure 1 **Overview of Rampion 2 Area of Search**

Anatec has been contracted by RWE Renewables to provide technical support on shipping and navigation during the consenting process, and to coordinate consultation with relevant stakeholders. As part of the consultation process, Anatec has undertaken an assessment of 12 months of Automatic Identification System (AIS) data to identify regular commercial operators. Your company's vessel(s) has regularly navigated within and/or in proximity to the area of search and subsequently has been identified as a potential shipping and navigation stakeholder. We therefore invite your feedback on the development, including any impact it may have upon the navigation of vessels.

We would be grateful if you could provide us with any comments or feedback that you may have by the 30th October 2020. This will allow us to incorporate your input into the NRA currently being undertaken. We would also be grateful if you could forward a copy of this information to any other vessel operators/owners you feel may be interested in commenting.

As a guide, some of the points we would be particularly interested in any comments or feedback on are the following:

1. Whether the proposal to construct Rampion 2 is likely to impact the routeing of any specific vessels and/or route, including the nature of any change in regular passage.
2. Whether any aspect of the development poses any safety concern to your vessels, including any adverse weather routeing.
3. Whether you would choose to make passage internally through the array of structures.
4. Whether you are aware of any planned changes to routeing which may be relevant to Rampion 2.
5. Whether the presence of Rampion 1 has resulted in any navigational safety concerns.
6. Whether you wish to be retained on our list of shipping and navigation stakeholders and consulted throughout the NRA process.

Page 2

7. Whether you wish to attend a Hazard Workshop to discuss shipping and navigation impacts in October/November 2020.

Responses should be sent via email to [redacted] Should you have any queries about the published information or require any further information to support your review, please do hesitate to get in touch.

Yours sincerely,

[redacted]
Lead Risk Analyst
Anatec Ltd.

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Appendix E Long-Term Vessel Traffic Movements

E.1 Introduction

833. This appendix assesses additional long-term vessel traffic data for the Proposed Development. As required under MGN 654 (MCA, 2021), the NRA and **Chapter 13: Shipping and navigation, Volume 2** of the ES (Document Reference 6.2.13) consider 28 days of AIS, Radar and visual observation data as the primary vessel traffic data source. However, it should be considered that studying a 28-day period in isolation may exclude certain activities or periods of pertinence to shipping and navigation. Therefore, in line with good practice assessment procedures, this NRA has also considered a longer term dataset covering all of 2019 to ensure a comprehensive characterisation of vessel traffic movements can be established, including the capture of any seasonal variation.

834. This approach (i.e., the use of both short- and long-term data) has been agreed with the MCA and Trinity House.

E.2 Aims and Objectives

835. The key aims and objectives of this appendix are as follows:

- identify seasonal variations in vessel traffic via assessment of the long-term vessel traffic data;
- determine which variations are not reflected within the short-term vessel traffic survey data (and therefore should be fed into the NRA baseline);
- assess which dataset (long-term/survey or combination of both) should be utilised for each key NRA element that requires vessel traffic data input; and
- identify and account for any potential effects of the COVID-19 situation on the 2020 vessel traffic survey data (acknowledging the data limitation outlined in Section 5.4.2).

E.2.1 COVID-19 Situation

836. It is noted that while the primary purpose of the long-term dataset is to ensure a comprehensive baseline can be established by ensuring seasonal variations are captured, in the case of the Proposed Development, the consideration of long-term vessel traffic data also ensures that any tangible effects of the COVID-19 situation on the short-term 2020 vessel traffic survey data can be identified, for which some associated impact upon shipping levels or patterns may be present within the data. As per Section 5.2, the MCA and Trinity House were content with the vessel traffic surveys on the assumption that additional long-term vessel traffic data prior to COVID-19 was considered in tandem with appropriate consultation with the relevant stakeholders.

E.3 Methodology

E.3.1 Study Area

837. This appendix has assessed the long-term vessel traffic data within the same study area introduced in Section 3.4.

E.3.2 Data Period and Temporary Vessel Traffic

838. The long-term vessel traffic data was collected from coastal AIS receivers for the entirety of 2019 (1 January to 31 December). Approximately 7% downtime was observed throughout the data period.

839. As per the vessel traffic surveys, a number of vessel tracks recorded during the data period were classified as temporary (non-routine) and have been excluded from the characterisation of the vessel traffic baseline, including vessels performing wind farm duties associated with Rampion 1.

E.3.3 AIS Carriage

840. General limitations associated with the use of AIS data (for example, carriage requirements) are discussed in full within Section 5.4.1.

E.4 Long-Term Vessel Traffic Movements

841. A plot of the vessel tracks recorded within the study area during the data period, colour-coded by vessel type and excluding temporary traffic, is presented in Figure E.1.

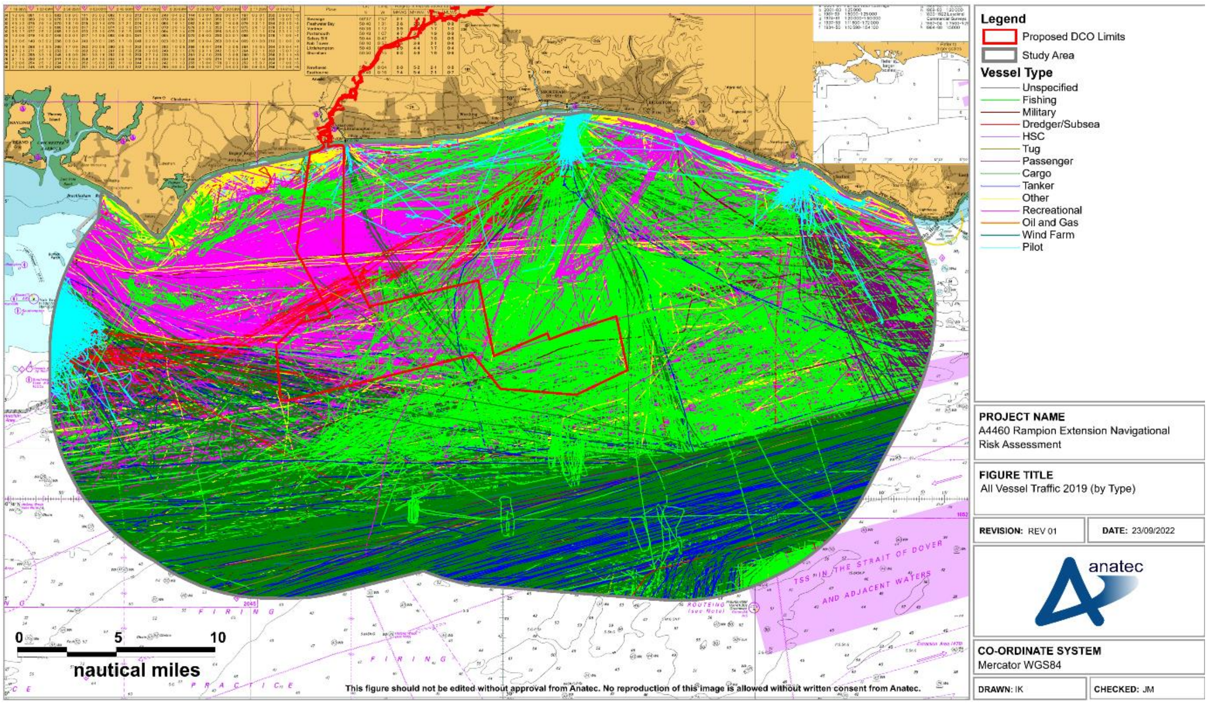

Figure E.1 **Long-term vessel traffic data by vessel type (12 months, 2019)**

E.4.2 Vessel Count

842. The average daily number of vessels within the study area for each month of 2019 are presented in Figure E.2. The downtime for each given month was accounted for when calculating the average daily vessels.

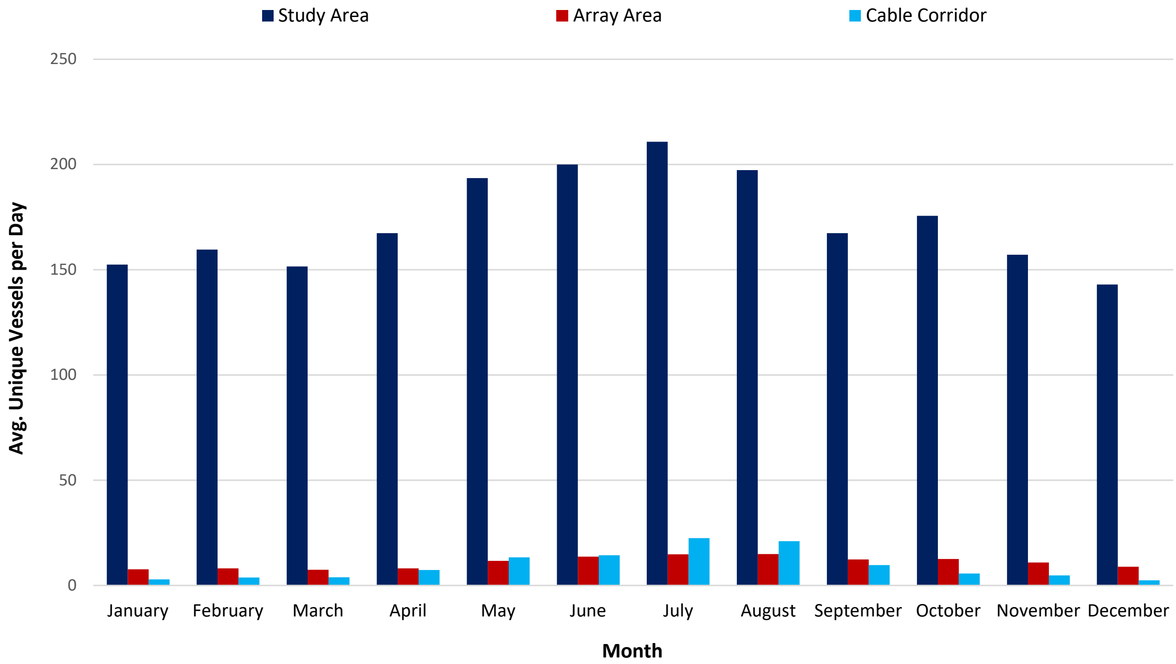

Figure E.2 Long-term daily counts by month within study area, array area and offshore export cable corridor (adjusted for downtime) (2019)

843. The busiest month recorded within the study area was July with approximately 211 unique vessels per day. The quietest month for the study area was December with an average of 143 unique vessels per day. Higher levels of vessel traffic were observed during the summer months, likely due to greater recreational activity given more favourable weather conditions.

E.4.3 Vessel Type

844. The distribution of the main vessel types recorded during the data period are presented in Figure E.3. Vessel types accounting for less than 1% of the overall activity during the data period (including military vessels, oil and gas vessels, unspecified vessels and high speed craft) have been excluded.

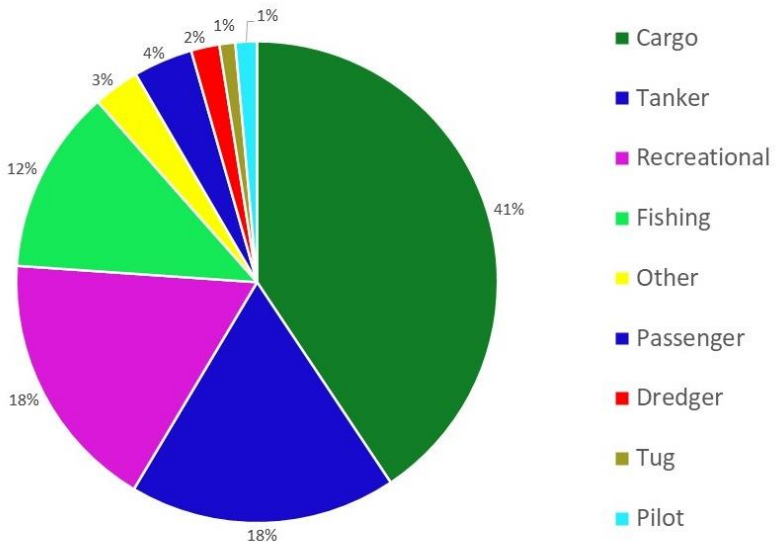

Figure E.3 Main vessel types distribution (12 months, 2019)

845. The most common vessel type recorded was cargo vessels, accounting for approximately 41% of all traffic recorded. Other common vessel types include tankers (18%), recreational vessels (18%) and fishing vessels (12%).

E.4.3.2 Commercial vessels

846. Figure E.4 presents the commercial vessels recorded within the study area during the data period, colour-coded by vessel type.

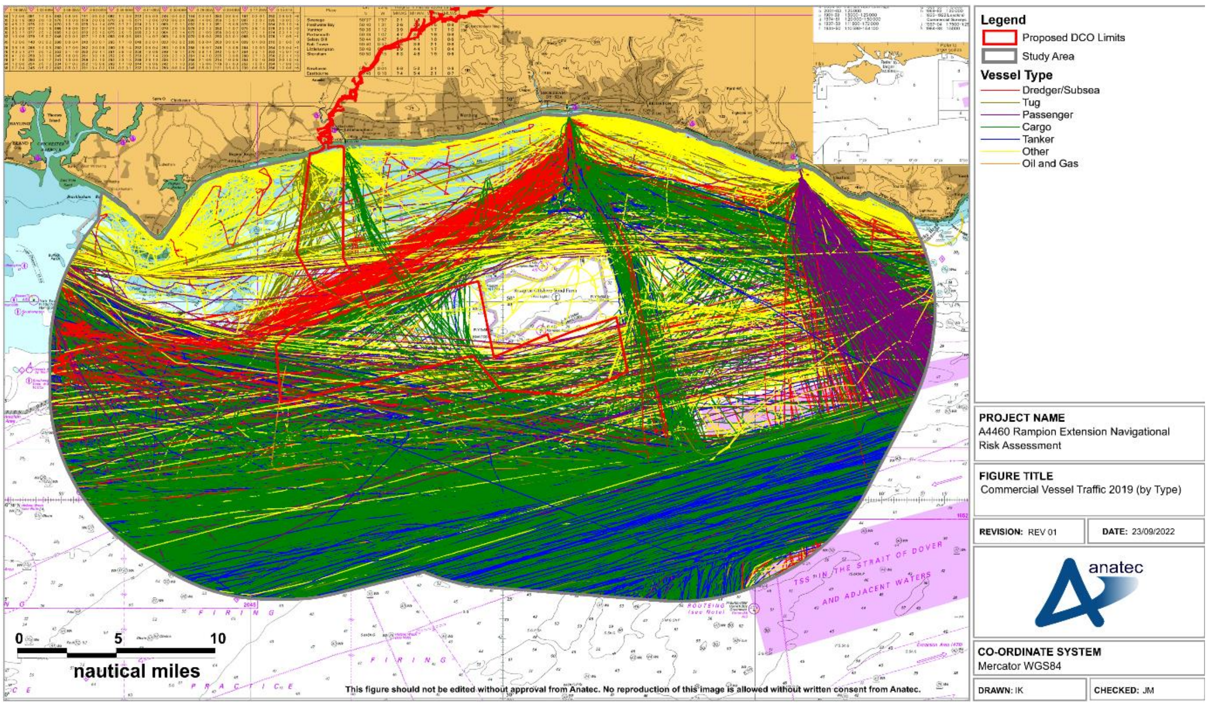

Figure E.4 Commercial vessels within study area by vessel type (12 months, 2019)

847. The majority of the commercial traffic within the study area is on well-defined routes with these primarily comprising the main commercial routes that have been identified from the vessel traffic survey data (see Section 11.2). Notably there was significant westbound traffic exiting the Dover Strait TSS, comprising primarily cargo vessels and tankers. After leaving the TSS, the majority of this traffic is observed continuing to transit westbound through the English Channel, head north-west towards the Solent (partially passing through the western extent of the array area) or north to Shoreham (passing through the eastern extent of the array area).

848. Additionally, a main passenger vessel route was observed at the eastern extent of the study area between the Port of Newhaven and Dieppe.

849. Marine aggregate dredging activity was recorded within the extraction areas located at the western extent of the study area, as well as the extraction areas immediately east of the offshore export cable corridor.

850. A breakdown of the average number of unique vessels per day for each commercial vessel type recorded within the study area, as well as intersecting the array area offshore export cable corridor, is presented in Figure E.5.

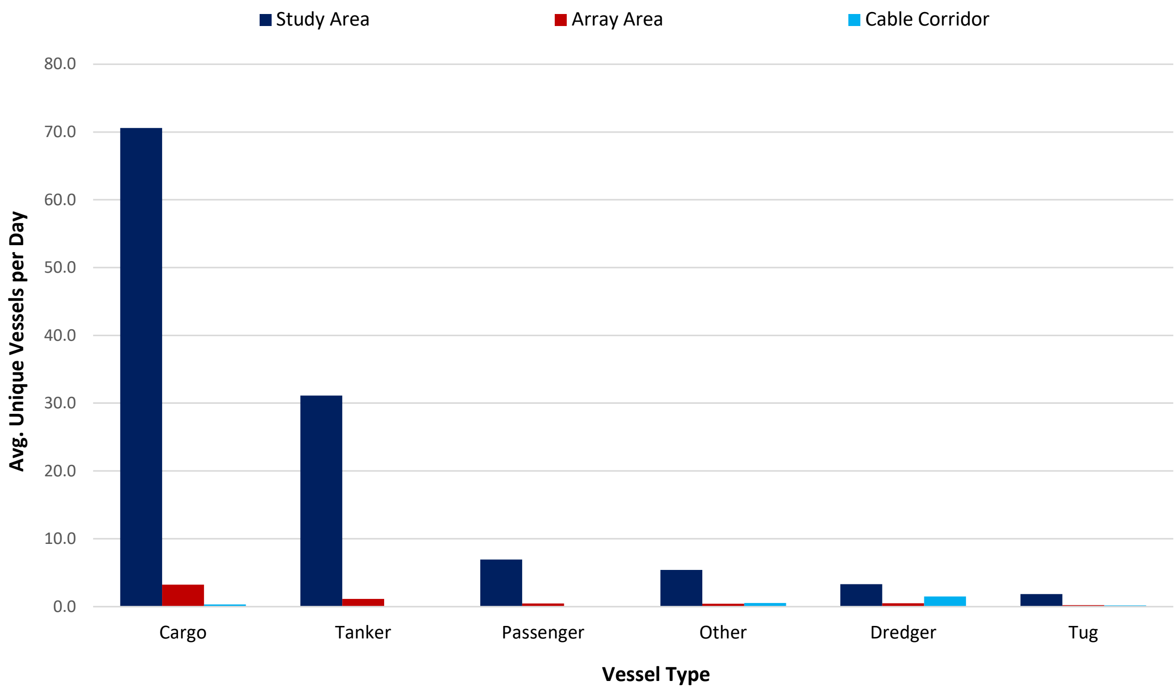

Figure E.5 Average daily commercial vessels (12 months, 2019)

851. On average throughout the data period there were 71 unique cargo vessels, 31 unique tankers and seven unique passenger vessels per day. Approximately 4% of commercial vessels were recorded intersecting the array area, the majority being cargo vessels. Approximately 4% of commercial vessels were recorded intersecting the offshore export cable corridor, the majority being marine aggregate dredgers.

852. Figure E.6, Figure E.7 and Figure E.8 present the daily average number of unique commercial vessels for each vessel type for the study area, array area and offshore export cable corridor, respectively.

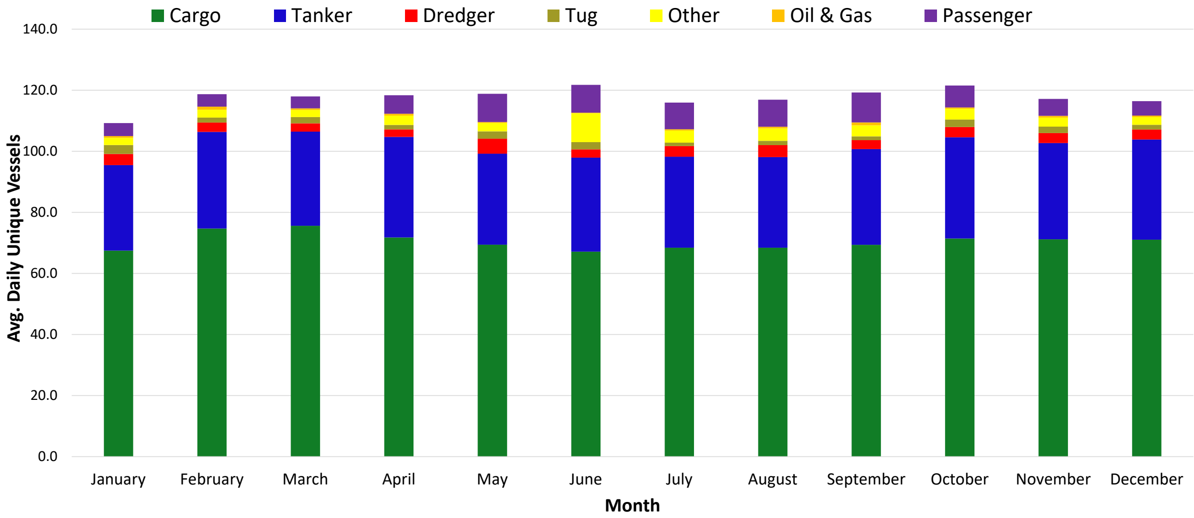

Figure E.6 Long-term average daily counts by month per type within study area (2019)

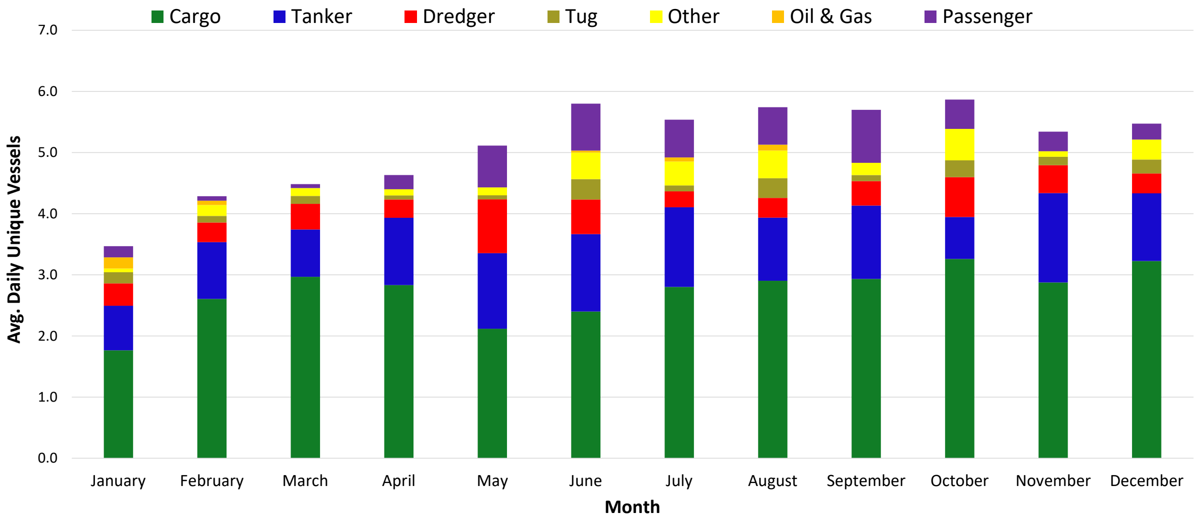

Figure E.7 Long-term average daily counts by month per type within array area (2019)

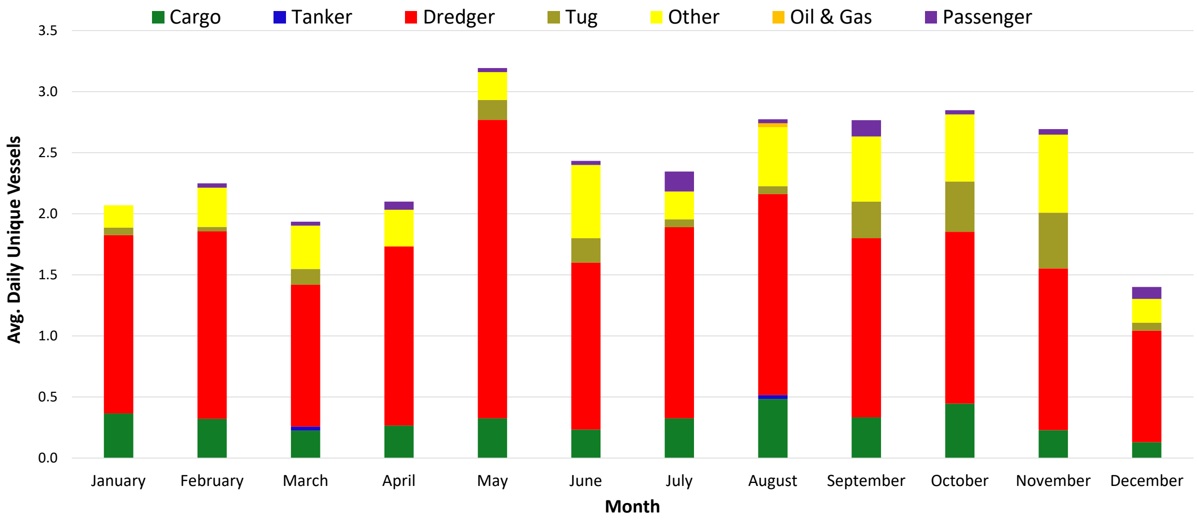

Figure E.8 Long-term average daily counts by month per type within offshore export cable corridor (2019)

853. Cargo vessels showed minimal seasonal variation with the busiest month within the study area being March with an average of 76 unique cargo vessels per day. The quietest month for cargo vessels was January with 68 unique cargo vessels per day.

854. Tankers similarly showed minimal seasonal variation with the busiest month within the study area being October with an average of 33 unique tankers per day. The quietest month for tankers was January with approximately 28 unique tankers per day.

855. Passenger vessels showed some seasonal variation, with a greater daily average of passenger vessels in the summer months. The busiest month within the study area was September with an average of nine unique passenger vessels per day. The quietest month was March with an average of four unique passenger vessels per day.

856. Table E.1 presents a summary of the average number of vessels within the study area during the busiest month, quietest month, and the average throughout the full data period.

Table E.1 Quietest month, busiest month and overall average daily count for commercial vessels (2019)

Vessel type	Quietest Month (Unique Vessels per Day)	Busiest Month (Unique Vessels per Day)	Average (Unique Vessels per Day)
Cargo	68	76	71
Tanker	28	33	31
Passenger	4	9	7

Vessel type	Quietest Month (Unique Vessels per Day)	Busiest Month (Unique Vessels per Day)	Average (Unique Vessels per Day)
Marine aggregate dredger	3	5	3
Other	2	4	3
Tug	1	3	2
Oil and gas	0	1	1

857. In summary, the most common type of commercial vessel recorded withing the study area was cargo vessels. Cargo vessels and tankers showed little, if any, seasonal variation whilst passenger vessel activity was greater in the summer months.

E.4.3.3 Commercial ferries

858. Figure E.9 presents the commercial ferries recorded within the study area during the data period, colour-coded by operator.

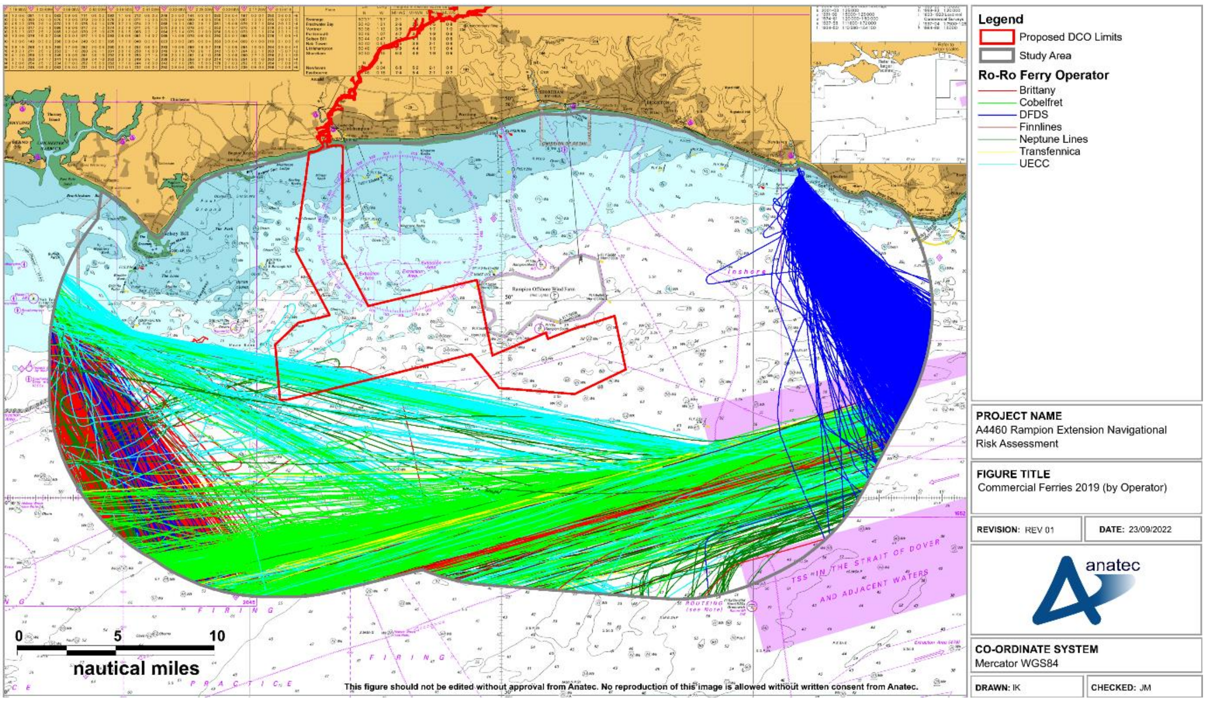

Figure E.9 Commercial ferries within study area by operator (12 months, 2019)

859. The most frequently recorded commercial ferry was the *Etretat*, a passenger ferry operated by Brittany Ferries between Portsmouth Port, Le Havre and Santander (Spain). Brittany Ferries was the most commonly recorded operator throughout the data period, followed by DFDS Seaways and CLdN.

860. The commercial ferry operators and their relative prominence within the study area is comparable with that observed during the vessel traffic surveys, although it is noted that the *Etretat* was not observed during the vessel traffic surveys, owing to COVID-19. The vessel has since been taken over by Stena Line and is now operating in the Baltic Sea. Brittany Ferries intend to resume the Portsmouth Port, Le Havre, Santander service in March 2023 (with a different vessel).

E.4.3.4 Pilot vessels

861. Figure E.10 presents the pilot vessels recorded within the study area during the data period, colour-coded by port.

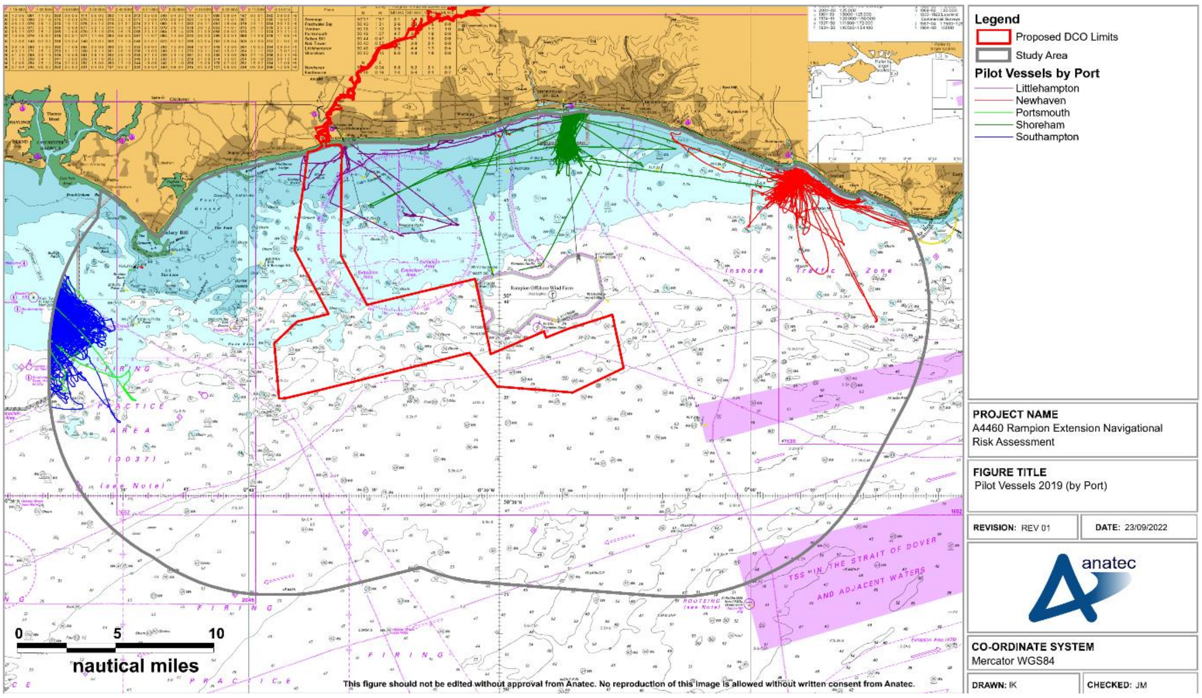

Figure E.10 Pilot vessels within study area by port (12 months, 2019)

862. Pilot vessels were recorded operating within the study area from Shoreham Port, the Port of Newhaven, Littlehampton Harbour, Portsmouth Port and the Port of Southampton. No pilot vessels were recorded within the array area. A low level of activity was recorded within the offshore export cable corridor associated with the pilot vessel for Littlehampton Harbour.

E.4.3.5 Fishing vessels

863. It should be considered that as this assessment considers AIS only, it is likely to be under representative of actual fishing vessel levels. Non-AIS fishing activity has been assessed within Section 10.2.6, and additional details are provided in **Chapter 10: Commercial fisheries, Volume 2** of the ES (Document reference 6.2.10).

864. Figure E.11 presents a density plot of the AIS fishing vessel tracks recorded within the study area during the data period.

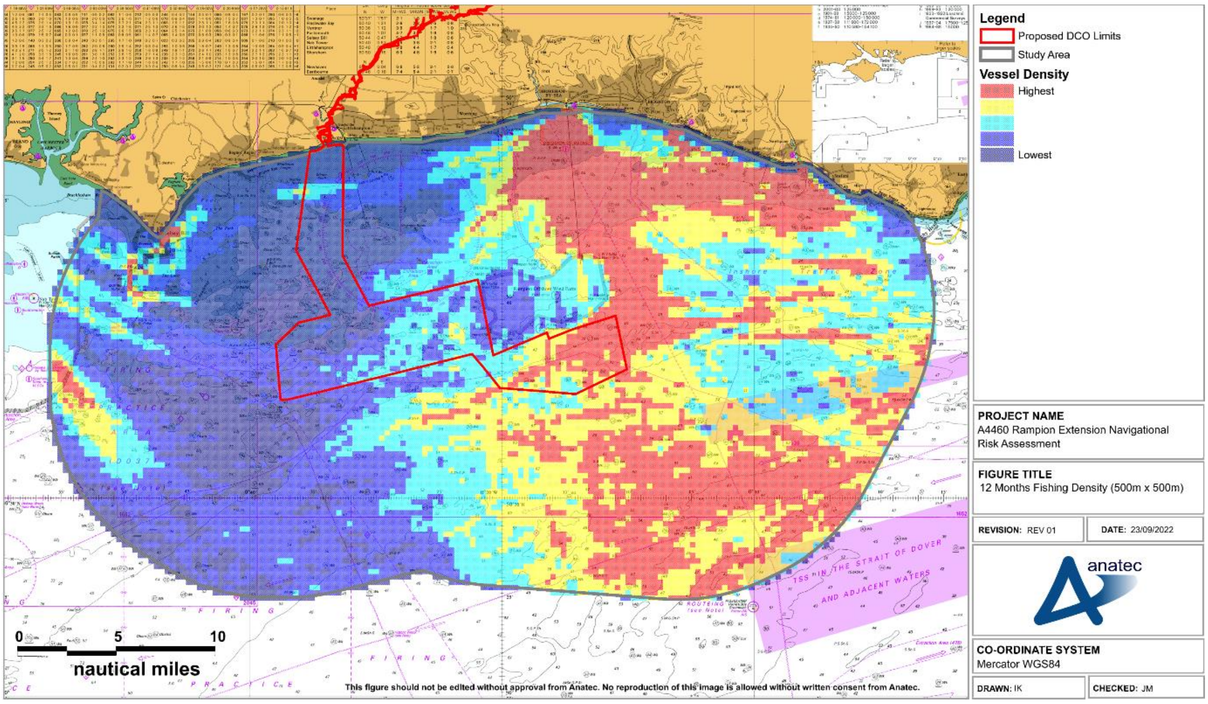

Figure E.11 Fishing vessel density heat map within study area (12 months, 2019)

865. Fishing vessels were most frequently recorded within the eastern half of the study area. Based on the behaviour of vessel tracks, a significant number of fishing vessels were actively engaged in fishing with the majority of fishing activity taking place further offshore within the south and south-east of the study area. Notable levels of transits through the array area to reach such areas are noted.

866. The daily average number of unique fishing vessels per day for each month recorded within the study area, as well as intersecting the array area and offshore export cable corridor is summarised in Figure E.12.

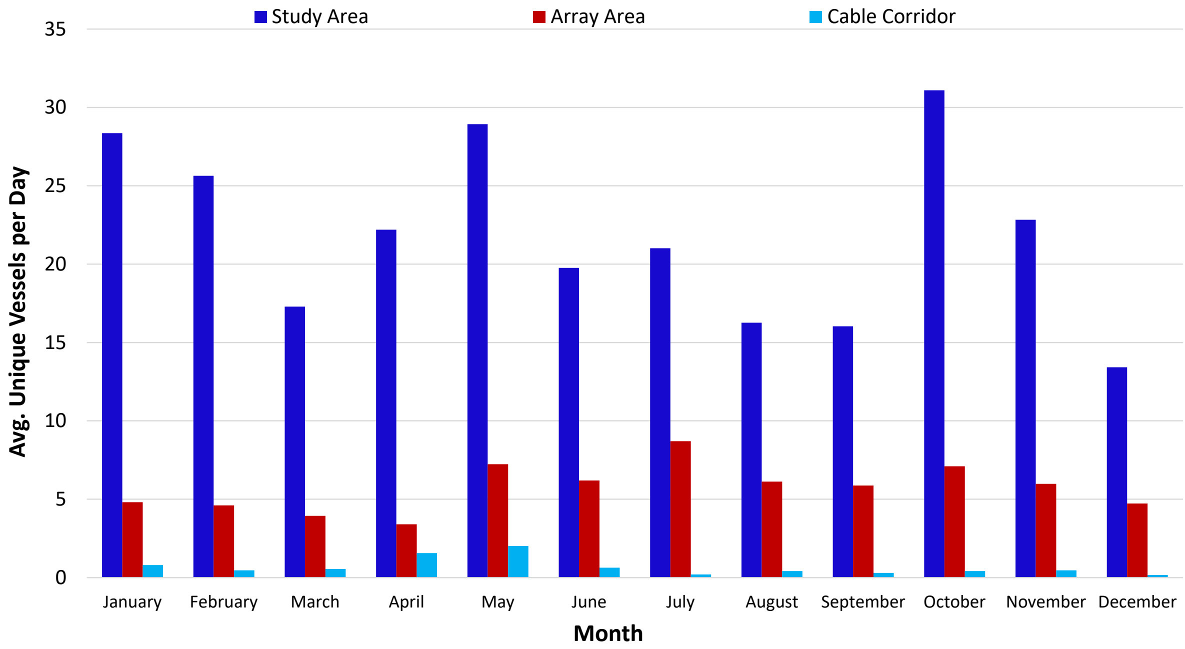

Figure E.12 Average daily fishing vessels (2019)

867. The busiest month for fishing activity was October, with an average of 31 unique fishing vessels per day withing the study area. The quietest month for fishing within the study area was December with an average of 13 unique fishing vessels per day. Throughout all of 2019, an average of 22 unique fishing vessels per day were recorded.

868. Approximately 27% of fishing vessels were recorded intersecting the array area and approximately 3% of fishing vessels were recorded intersecting the offshore export cable corridor.

E.4.3.6 Recreational vessels

869. Figure E.13 presents a density plot of the AIS recreational vessel tracks recorded within the study area during the data period.

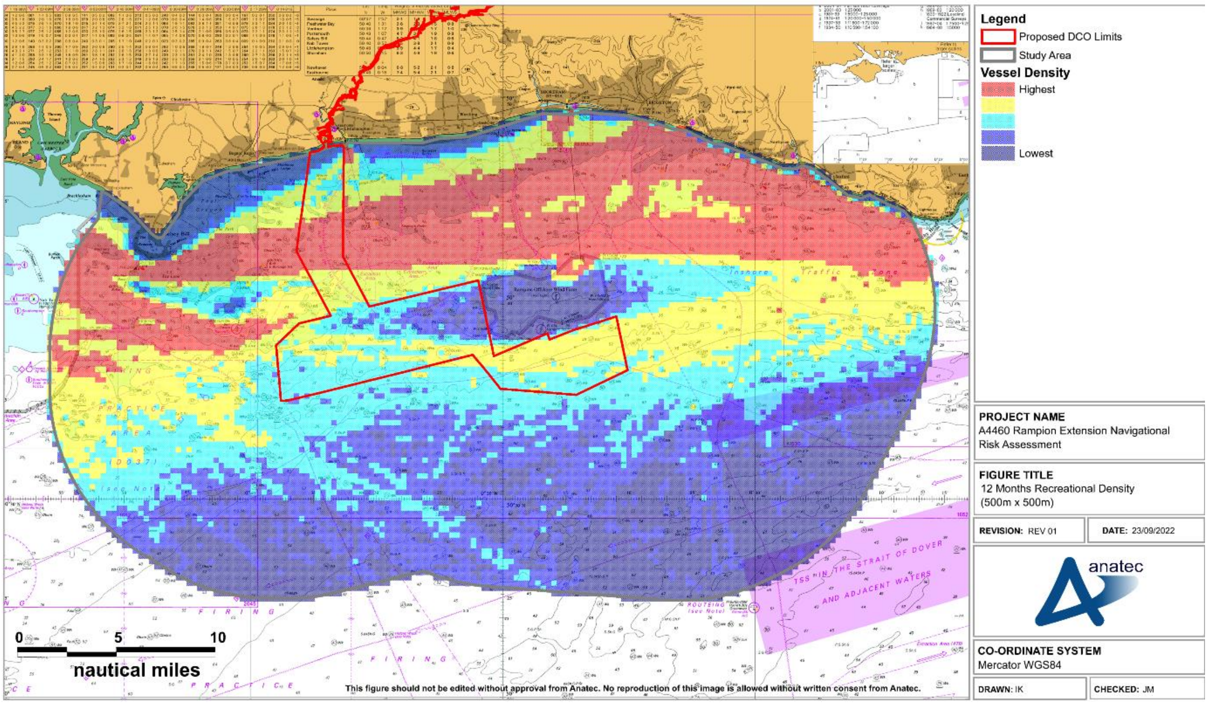

Figure E.13 Recreational vessel density heat map within study area (12 months, 2019)

870. Figure E.14 presents the average daily number of unique recreational vessels per month.

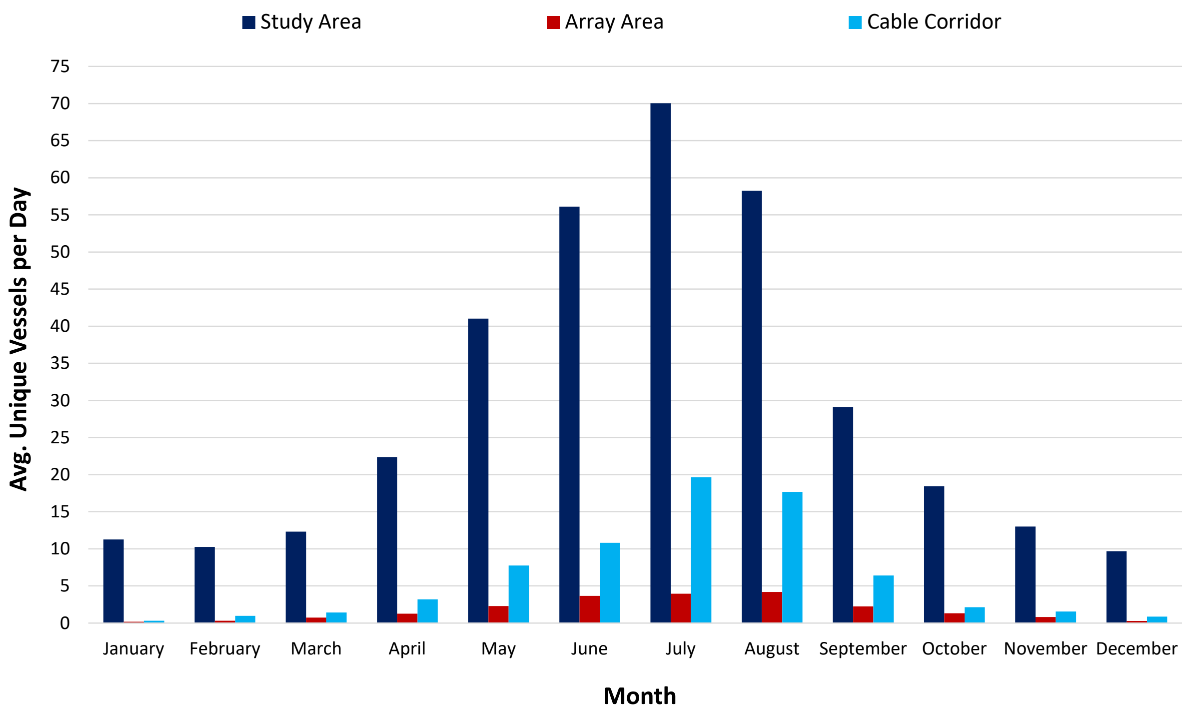

Figure E.14 Average daily recreational vessels (2019)

871. The summer months of 2019 (May to August) recorded the most recreational vessel activity within the study area. This is largely due to the favourable sailing conditions that the summer weather brings.

872. Throughout the whole of 2019, an average of 31 unique recreational vessels were recorded within the study area each day. The month with the most recreational activity was July, with an average of 70 unique recreational vessels recorded per day. The quietest month was December with an average of 10 unique recreational vessels per day.

873. Approximately 6% of recreational vessels were recorded intersecting the array area and approximately 21% of recreational vessels were recorded intersecting the offshore export cable corridor.

E.5 Survey Data Comparison

874. The routeing of vessels during the vessel traffic surveys was similar overall to the long-term vessel traffic survey data and comparable to the routes defined in the NRA (see Section 11.2). However, one route was identified from the long-term data that was raised during consultation and absent from the vessel surveys. This is a route used primarily by three coasters between the Dover Strait TSS and Littlehampton Harbour. The vessel tracks identified on this route from the long-term vessel traffic data are presented in Figure E.15.

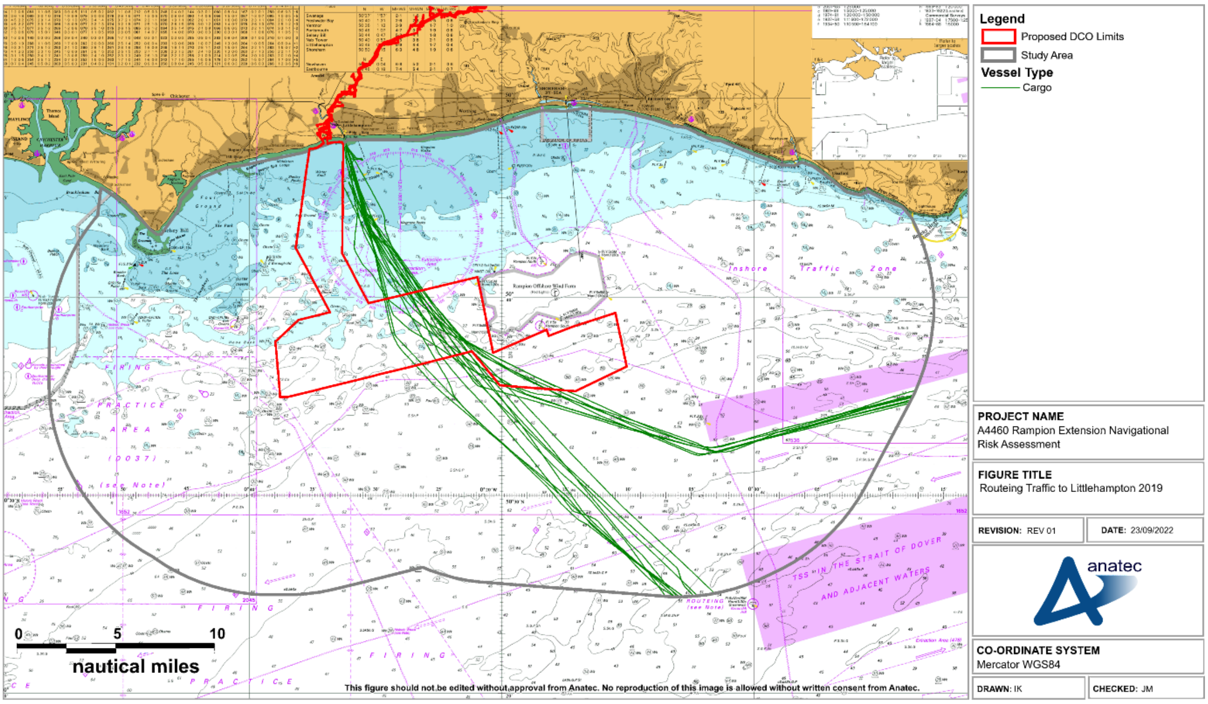

Figure E.15 Routeing traffic to Littlehampton Harbour within study area (12 months, 2019)

875. Fishing vessels were observed both transiting and engaged in fishing, notably within the east of the array area for the duration of both periods. The long-term

vessel traffic data analysis also highlighted active fishing within the western extent of the Proposed DCO Limits. Actively fishing vessel activity within the south and south-east of the study area was comparable for both periods.

876. Recreational vessel activity presence was high during the summer months of 2019, with little activity during the winter months. This is due to the favourable sailing conditions that summer provides. This was reflected in the difference in recreational traffic levels in the two vessel traffic surveys.

877. A comparison of the average number of each main vessel type analysed in the previous sections recorded throughout the 2019 data period against the average number of each vessel type recorded throughout the two vessel traffic surveys are presented in Table E.2.

Table E.2 Comparison of the number of each main vessel type detected during 2019 and the vessel traffic survey data

Vessel type	Long-term AIS data			Summer survey	Winter survey
	Busiest month	Quietest month	Average vessels per day	Average vessels per day	Average vessels per day
Cargo vessels	Mar	Jan	71	77	70
Tankers	Dec	Jan	31	37	31
Passenger vessels	Sep	Jan	7	7	4
Marine aggregate dredgers	May	Apr	3	3-4	2
Recreational vessels	Jul	Dec	31	53	5
Fishing vessels	Oct	Dec	22	16	20

878. The daily average vessels were broadly similar in all surveys, with the exception of recreational vessels. The slightly lower averages may be attributed to the effects of COVID-19. Whilst recreational vessel activity was higher in the summer survey, this is to be expected as August provides favourable sailing weather in comparison with the winter months. This is reflected in the long-term vessel traffic data since August was the second busiest month for recreational activity during 2019.

E.6 Conclusion

879. A year of 2019 AIS data has been analysed to validate the vessel traffic survey data recorded within the study area and forming the baseline for the characterisation of vessel traffic in Section 10.

880. The main type of vessels detected within the study area during 2019 were cargo vessels (41%), tankers (18%), and recreational vessels (18%). Similarly, the main type of vessels detected during the 2022 summer survey within the study area were cargo vessels (37%), recreational vessels (26%) and tankers (18%) and during the 2020 winter survey within the study area were cargo vessels (48%), tankers (21%) and fishing vessels (14%). Smaller but significant numbers of passenger vessels were also detected during both periods. Overall, the vessel types detected within the study area were similar between the vessel traffic survey data and long-term vessel traffic data.

881. The average number of vessels per day within the study area were similar between the two datasets as was the routeing of vessels within the study area, with the exception of the small coaster route between Littlehampton Harbour and the Dover Strait TSS, although it is noted that vessel traffic volumes on this route were very low.

Appendix F Visual Observations Log of Vessel Traffic Movements

882. During geophysical surveys undertaken on-site at the offshore export cable corridor in July and August 2020, visual observations of vessels not broadcasting on AIS and located within or in close proximity to the Proposed DCO Limits were collected.

883. The data collected consisted primarily of recreational vessels and fishing vessels and is illustrated in Section 10.2.3.3. This appendix provides full details of visual observations log.

884. The visual observations log is provided in Table F.1, with all times shown in Coordinated Universal Time (UTC).

Table F.1 Visual observations log

Date	Time (UTC)	Vessel description	Length (m)	Speed (kt)	Course (°)	Comments
10 Jul 2020	06:20	Small sailing vessel	8	6	270	Vessel emerged from Rampion 1
10 Jul 2020	06:34	Small sailing vessel	8	6	270	Vessel emerged from Rampion 1
10 Jul 2020	06:58	Small sailing vessel	8	6	270	Vessel emerged from Rampion 1
10 Jul 2020	07:57	Small fishing vessel w/ blue hull	12	2	71	Deploying gear
10 Jul 2020	08:10	Small fishing vessel w/ blue hull	12	2	71	Deploying gear
10 Jul 2020	08:20	Small fishing vessel w/ blue hull	12	2	71	Deploying gear
10 Jul 2020	08:12	Fishing vessel	10	1.6	228	–
10 Jul 2020	08:20	Fishing vessel	10	1.6	228	–
11 Jul 2020	04:52	Fishing vessel	10	4.4	50	–

Date	Time (UTC)	Vessel description	Length (m)	Speed (kt)	Course (°)	Comments
11 Jul 2020	05:03	Fishing vessel	10	4.4	50	–
11 Jul 2020	05:20	Fishing vessel	10	4.4	50	–
11 Jul 2020	05:38	Fishing vessel w/ turquoise hull	10	1.5	60	–
11 Jul 2020	05:55	Fishing vessel w/ turquoise hull	10	1.5	60	–
11 Jul 2020	09:50	Fishing vessel	10	1.4	45	–
11 Jul 2020	09:56	Fishing vessel	10	1.4	45	–
11 Jul 2020	09:55	Fishing vessel	10	1.9	30	–
11 Jul 2020	10:06	Fishing vessel	10	1.9	30	–
11 Jul 2020	10:15	Fishing vessel	10	7.6	310	–
11 Jul 2020	10:21	Fishing vessel	10	7.6	310	–

Date	Time (UTC)	Vessel description	Length (m)	Speed (kt)	Course (°)	Comments
11 Jul 2020	11:32	Fishing vessel	10	6	310	–
11 Jul 2020	11:35	Fishing vessel	10	6	310	–
11 Jul 2020	11:56	Angling boat	10	12	–	–
11 Jul 2020	12:04	Blue fishing boat	10	8	–	–
11 Jul 2020	12:05	Angling boat	10	–	–	At anchor
11 Jul 2020	15:53	Fishing vessel	10	–	–	–
12 Jul 2020	04:48	Fishing vessel	8	2.2	166	–
12 Jul 2020	05:20	Fishing vessel	8	2.2	166	–
12 Jul 2020	05:33	Fishing vessel	8	2.2	166	–
12 Jul 2020	11:05	Non-commercial fishing vessel	10	0.6	346	–

Date	Time (UTC)	Vessel description	Length (m)	Speed (kt)	Course (°)	Comments
12 Jul 2020	11:15	Non-commercial fishing vessel	10	0.6	346	–
12 Jul 2020	12:10	Angling boat	10	–	–	At anchor
12 Jul 2020	12:15	Angling boat	10	–	–	At anchor
12 Jul 2020	12:30	Angling boat	10	0	–	At anchor
12 Jul 2020	14:56	Angling boat, blue and white	12	10	320	–
13 Jul 2020	08:30	Fishing vessel	10	0.3	225	–
13 Jul 2020	08:36	Fishing vessel	10	0.3	225	–
13 Jul 2020	08:31	Sailing vessel under power	10	6.4	253	–
13 Jul 2020	08:37	Sailing vessel under power	10	6.4	253	–
13 Jul 2020	08:35	Fishing vessel	10	9.5	225	Bow cross at 0.3nm

Date	Time (UTC)	Vessel description	Length (m)	Speed (kt)	Course (°)	Comments
13 Jul 2020	08:41	Fishing vessel	10	9.5	225	Bow cross at 0.3nm
13 Jul 2020	09:53	Rigid Inflatable Boat (RIB) (diver)	8	6	283	Asked to move as over next port turn
13 Jul 2020	09:58	RIB (diver)	8	6	283	Asked to move as over next port turn
13 Jul 2020	15:34	Fishing vessel	10	0	–	Stopped and fishing
14 Jul 2020	11:20	Sailing vessel	10	6	259	–
14 Jul 2020	11:25	Fishing vessel, maroon hull	10	7.9	201	Called on VHF, no answer. Bow cross 0.2nm
14 Jul 2020	11:30	Fishing vessel, maroon hull	10	7.9	201	Called on VHF, no answer. Bow cross 0.2nm
15 Jul 2020	08:43	Fishing vessel - no AIS	10	6.4	136	Bow cross 0.4nm
15 Jul 2020	08:47	Fishing vessel - no AIS	10	6.4	136	Bow cross 0.4nm
15 Jul 2020	09:20	Fishing vessel	10	8.7	225	Bow no. L1.10

Date	Time (UTC)	Vessel description	Length (m)	Speed (kt)	Course (°)	Comments
15 Jul 2020	09:29	Angling boat	5	0	–	At anchor
15 Jul 2020	10:29	Non-commercial fishing vessel	10	0.1	260	No answer to VHF 10:29
16 Jul 2020	07:15	Commercial fishing vessel	10	2.9	251	–
16 Jul 2020	07:18	Commercial fishing vessel	10	2.9	251	–
16 Jul 2020	07:16	Commercial fishing vessel	10	5.6	177	–
16 Jul 2020	–	Fishing vessel	10	–	–	–
16 Jul 2020	10:30	Fishing vessel w/ blue hull and white w/house	10	5.7	335	Bow cross 0.2nm
16 Jul 2020	02:04	Fishing vessel w/ blue hull and white w/house	10	5.7	335	Bow cross 0.2nm
17 Jul 2020	08:48	Angling boat (catamaran)	10	8	–	–
17 Jul 2020	15:37	Commercial fishing vessel	10	4	32	Called to inform of pots potentially on our course, black flat buoys

Date	Time (UTC)	Vessel description	Length (m)	Speed (kt)	Course (°)	Comments
18 Jul 2020	06:20	Commercial fishing vessel	10	1	170	North-east of site, stopping by his pots
18 Jul 2020	07:37	Commercial fishing vessel	10	1	170	North-east of site, stopping by his pots
18 Jul 2020	07:00	Commercial fishing vessel	10	2	255	AIS appeared when closer to him
19 Jul 2020	09:01	Speed boat	10	9	70	Asked to pass astern on CH15
19 Jul 2020	13:50	Black fishing boat	10	9	24	–
20 Jul 2020	13:24	Fishing boat	10	6	0	–
21 Jul 2020	07:04	Commercial fishing vessel	12	1.2	78	Blue hull
21 Jul 2020	07:16	Commercial fishing vessel	12	1.2	78	Blue hull
25 Jul 2020	07:23	Commercial fishing vessel	30	5.2	300	–
27 Jul 2020	09:21	Fishing vessel	8	4.5	0	–

Date	Time (UTC)	Vessel description	Length (m)	Speed (kt)	Course (°)	Comments
29 Jul 2020	18:30	Fishing vessel	12		0	Red hull
6 Aug 2020	06:48	–	10	6	90	–
6 Aug 2020	07:00	Motor cruiser	8	15	270	–
8 Aug 2020	06:40	Fishing boat	10	4	90	–
8 Aug 2020	07:54	Small red fishing vessel	7	6	180	–
8 Aug 2020	11:48	White sailing vessel	8	4	270	–
8 Aug 2020	13:51	Orange RIB	3	15	90	–
8 Aug 2020	14:02	White sailing vessel	7	3	270	–
9 Aug 2020	11:22	Blue angling boat	10	0	–	At anchor
9 Aug 2020	14:28	White angling boat	11.2	15	0	–

Date	Time (UTC)	Vessel description	Length (m)	Speed (kt)	Course (°)	Comments
10 Aug 2020	13:32	Small fishing boat	6	10	S	–
11 Aug 2020	07:15	Angling boat	10	5	SW	–
11 Aug 2020	08:09	Sailing boat	8	6	E	–

Appendix G Summer 2020 Vessel Traffic Movements

885. Vessel traffic survey data covering a seasonal summer 2020 survey period comprising AIS, Radar, and visual observation data has been collected in addition to the main dataset assessed within the NRA. This appendix provides full assessment of the additional data and compares it to the findings of the NRA assessment.

886. On this basis the aims of this appendix are:

- Assess the summer 2020 survey data; and
- Compare the findings against the 2019 data used to inform the NRA.

887. It should be considered when viewing the analysis that COVID-19 may have impacted the 2020 data.

888. The AIS and Radar tracks from the summer 2020 survey period are presented in Figure G.1.

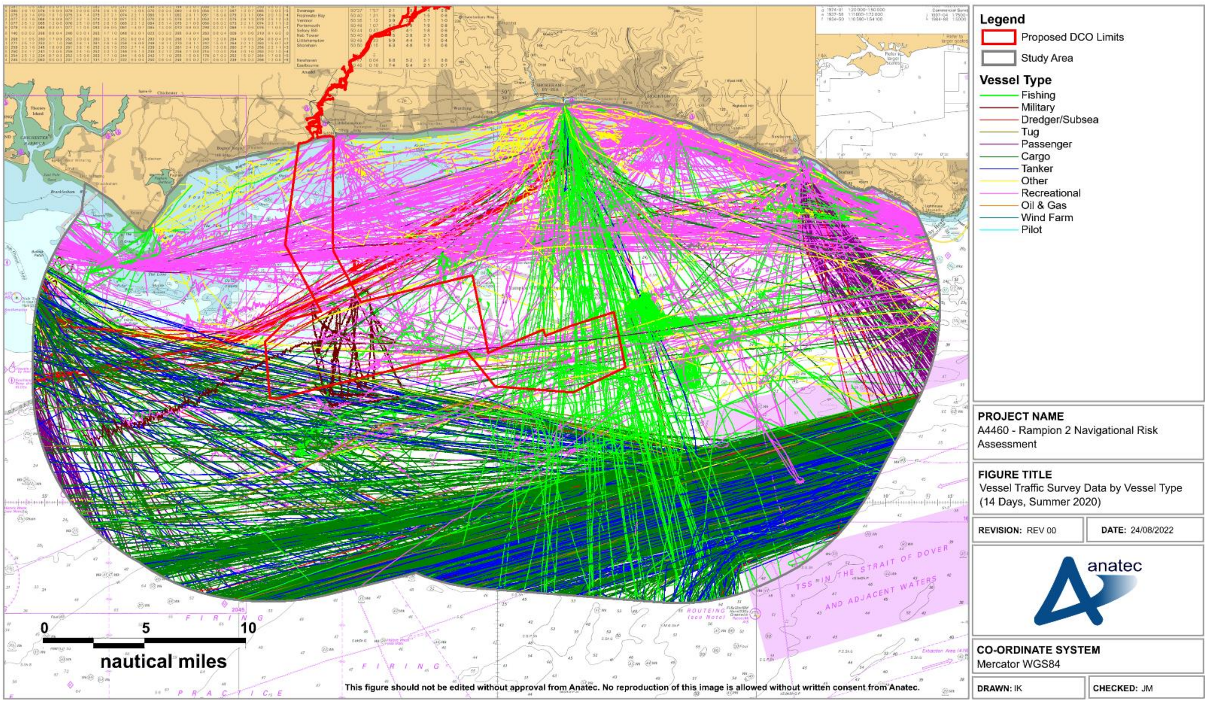

Figure G.1 Vessel traffic survey data by vessel type (14 days, summer 2020)

G.2 Vessel Count

889. For the 14 days analysed in the summer 2020 survey period, there was an average of 159 unique vessels per day recorded within the study area. In terms of vessels intersecting the array area itself, there was an average of 13 unique vessels per day. 12 unique vessels intersected the cable corridor per day.

890. The daily number of unique vessels recorded within the study area, array area, and cable corridor during the summer 2020 survey period are presented in Figure G.2. Since the survey commenced and concluded midway through the first and last days of the summer survey period, the first and last days are partial.

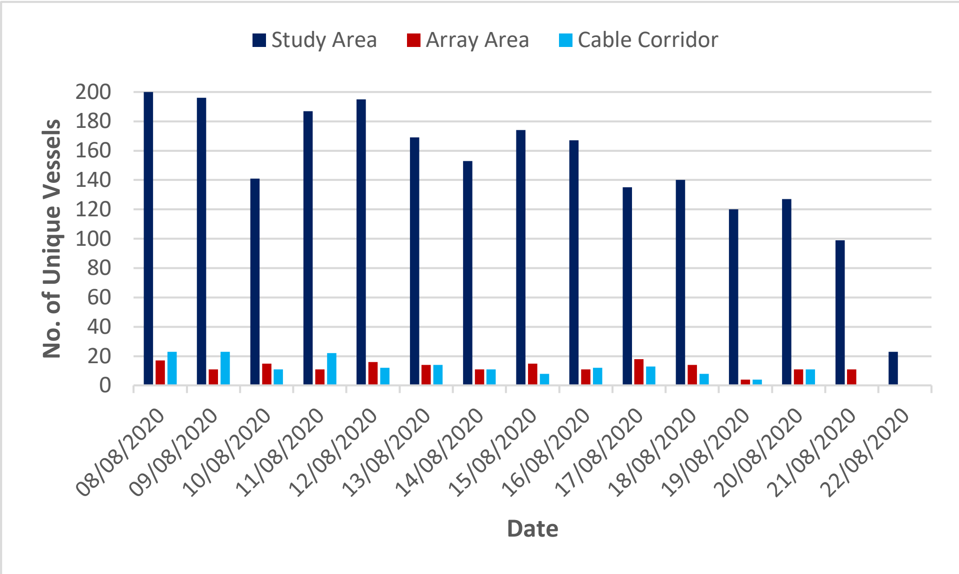

Figure G.2 Daily counts within study area, array area, and offshore export cable corridor (14 days, summer 2020)

891. Throughout the summer 2020 survey period, approximately 8% of unique vessel tracks recorded within the study area intersected the array area itself.

892. The busiest day recorded within the study area was 8 August 2020, when 200 unique vessels were recorded. The busiest day within the array area itself was 17 August 2020, when 18 unique vessels were recorded. The busiest days within the cable corridor were 8 and 9 of August 2020, when 23 unique vessels were recorded each.

893. The quietest full day recorded within the study area was 21 August 2020, when 99 unique vessels were recorded. The quietest full day within the array area itself was 19 August 2020, when four unique vessels were recorded. The quietest full day within the cable corridor was also 19 August 2020, when four unique vessels were recorded.

G.3 Vessel Type

894. The percentage distribution of the vessel types recorded within the study area, array area, and cable corridor during the summer 2020 survey period are presented in Figure G.3.

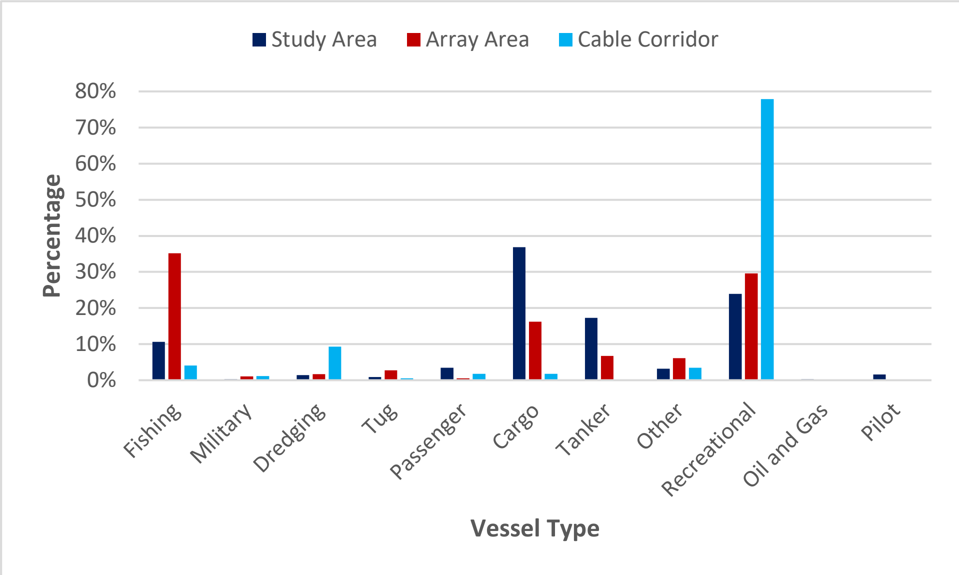

Figure G.3 Vessel type distribution (14 days, summer 2020)

895. Throughout the summer 2020 survey period, the most common vessel types in the study area were cargo vessels (37%), recreational vessels (24%), and tankers (17%). The most common vessel type recorded within the array area were fishing vessels (35%), recreational vessels (30%), and cargo vessels (16%); and in the cable corridor were recreational vessels (78%), marine aggregate dredgers (9%), and fishing vessels (4%).

G.3.2 Cargo Vessels

896. The tracks of cargo vessels recorded within the study area throughout the summer 2020 survey period are presented in Figure G.4.

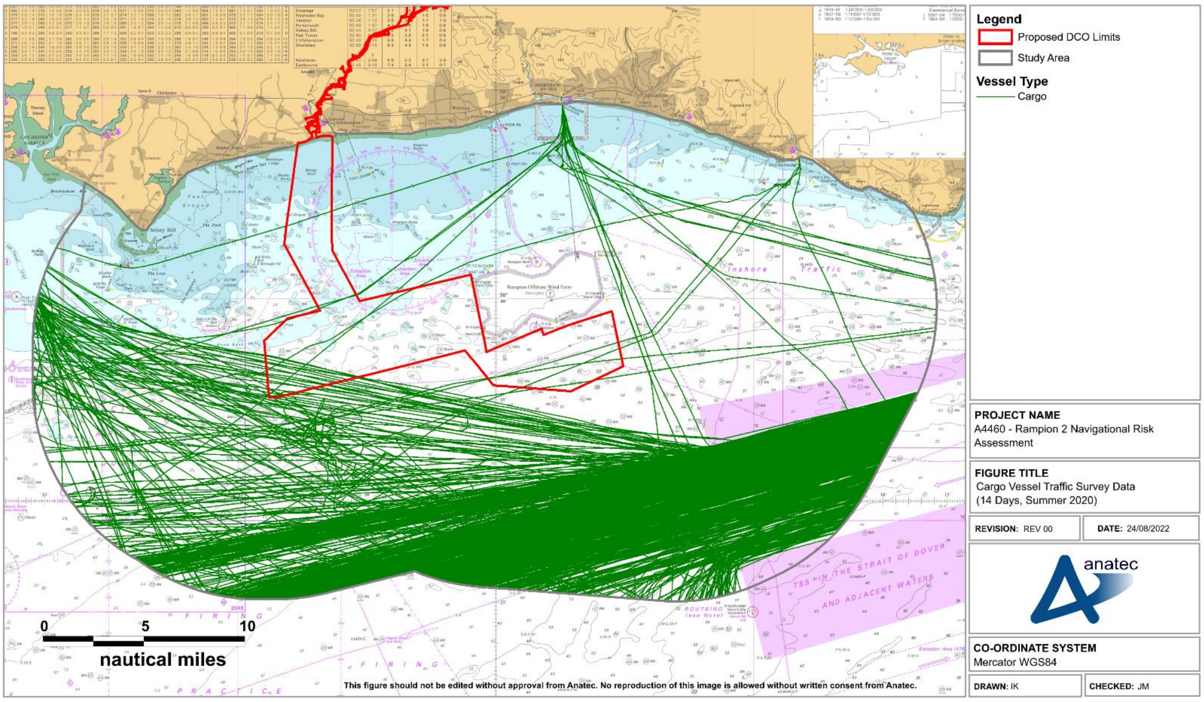

Figure G.4 Cargo vessel traffic survey data (14 days, summer 2020)

897. Throughout the summer 2020 survey period, an average of 59 unique cargo vessels per day were recorded within the study area.

G.3.3 Passenger Vessels

898. The tracks of passenger vessels recorded within the study area throughout the summer 2020 survey period are presented in Figure G.5.

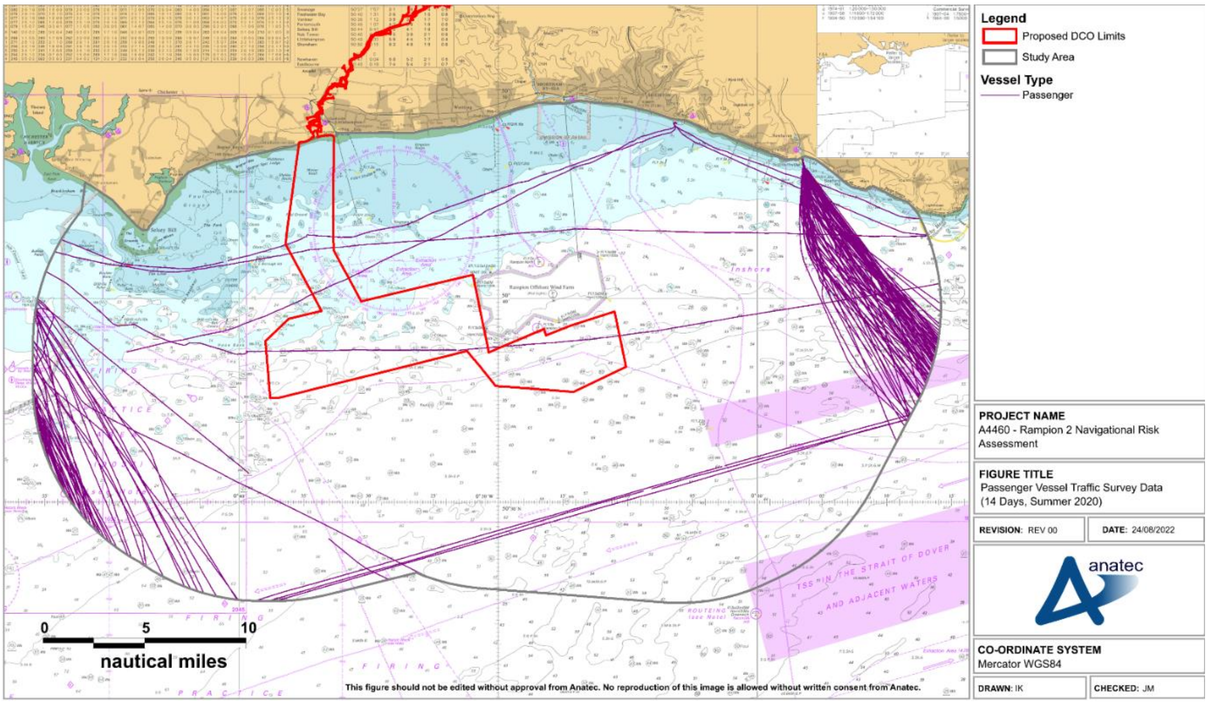

Figure G.5 Passenger vessel traffic survey data (14 days, summer 2020)

899. Throughout the summer 2020 survey period, an average of six unique passenger vessels per day were recorded within the study area.

G.3.4 Recreational Vessels

900. The tracks of recreational vessels recorded within the study area throughout the summer 2020 survey period are presented in Figure G.6.

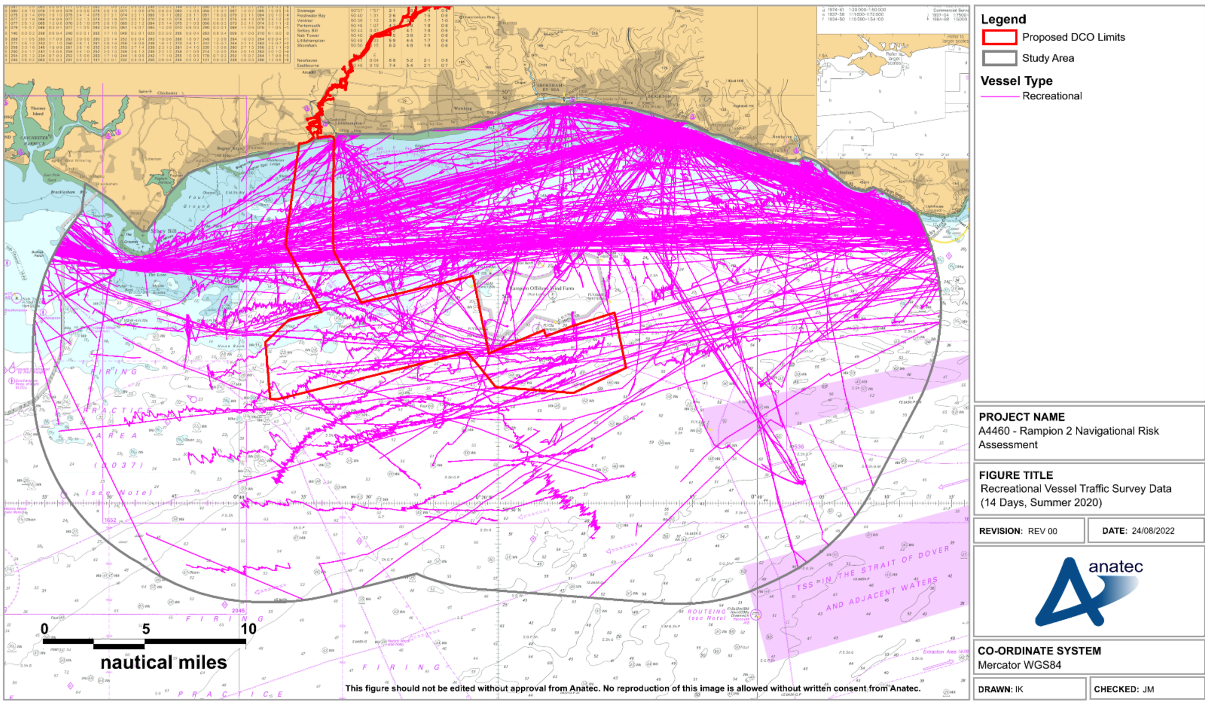

Figure G.6 Recreational vessel traffic survey data (14 days, summer 2020)

901. Throughout the summer 2020 survey period, an average of 38 unique recreational vessels per day were recorded within the study area.

G.3.5 Tankers

902. The tracks of tankers recorded within the study area throughout the summer 2020 survey period are presented in Figure G.7.

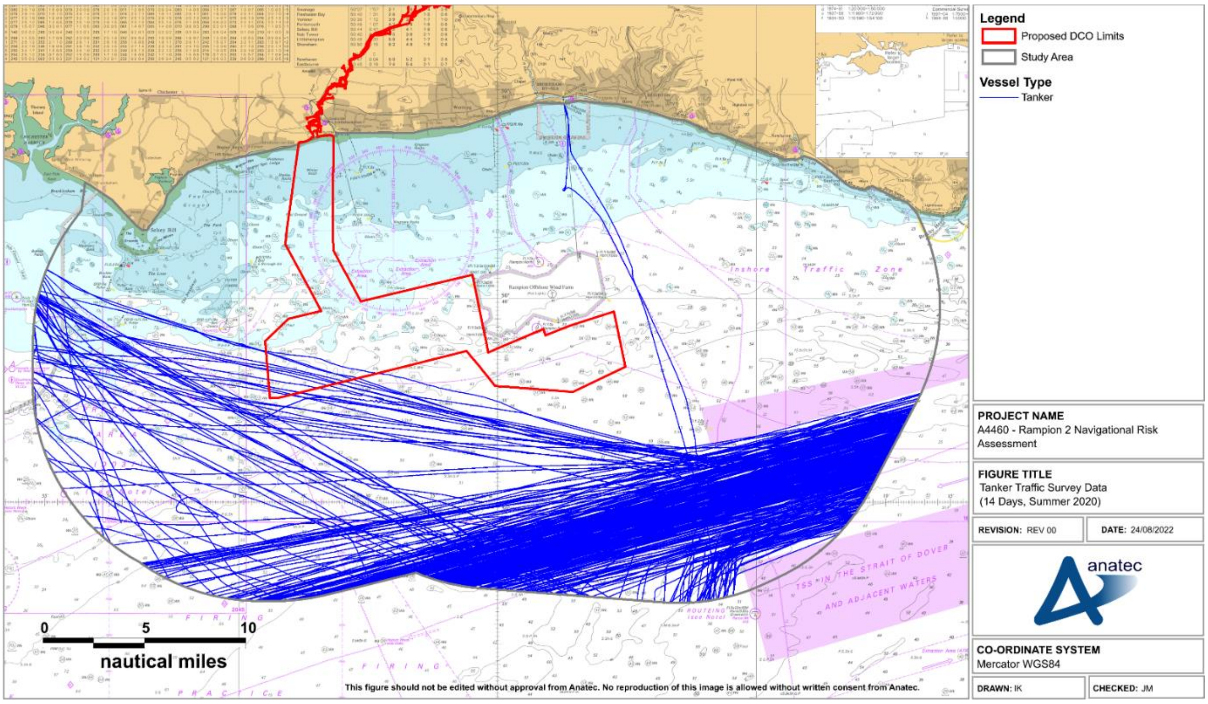

Figure G.7 Tanker traffic survey data (14 days, summer 2020)

903. Throughout the summer 2020 survey period, an average of 28 unique tankers per day were recorded within the study area.

G.3.6 Marine Aggregate Dredgers

904. The tracks of marine aggregate dredgers recorded within the study area throughout the summer 2020 survey period are presented in Figure G.8.

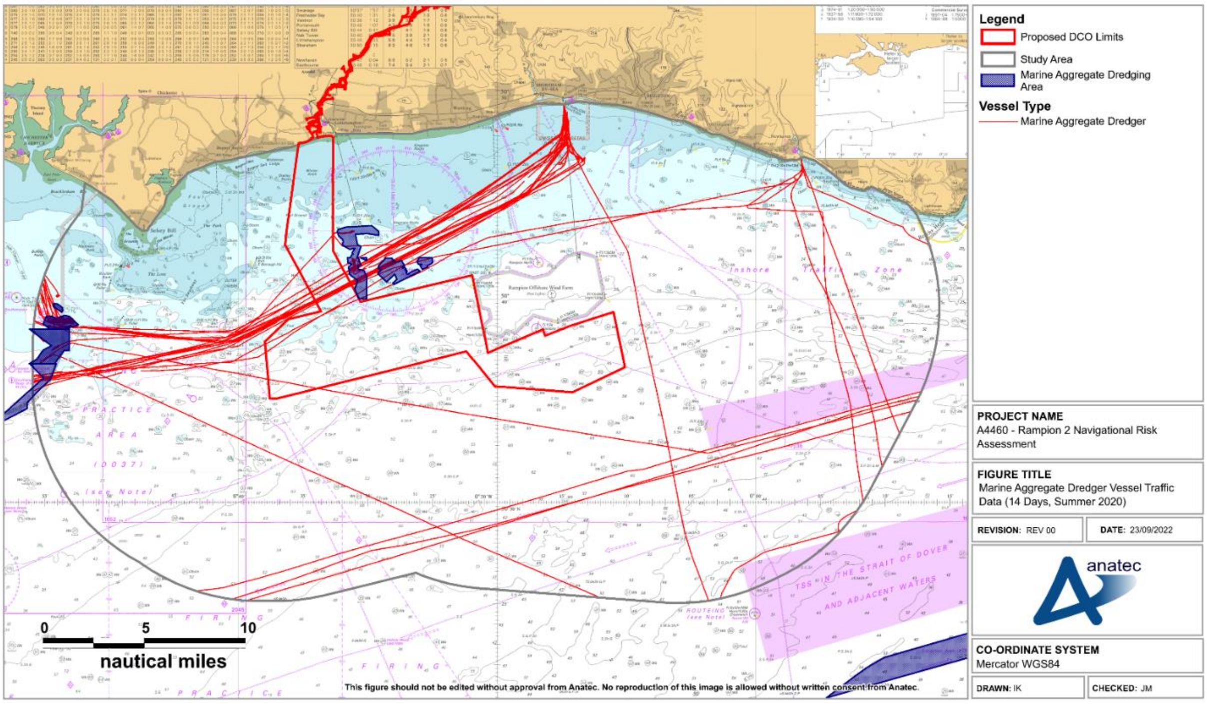

Figure G.8 Marine aggregate dredger traffic survey data (14 days, summer 2020)

905. Throughout the summer 2020 survey period, an average of two unique marine aggregate dredgers per day were recorded within the study area.

G.3.7 Fishing Vessels

906. The tracks of fishing vessels recorded within the study area throughout the summer 2020 survey period are presented in Figure G.9.

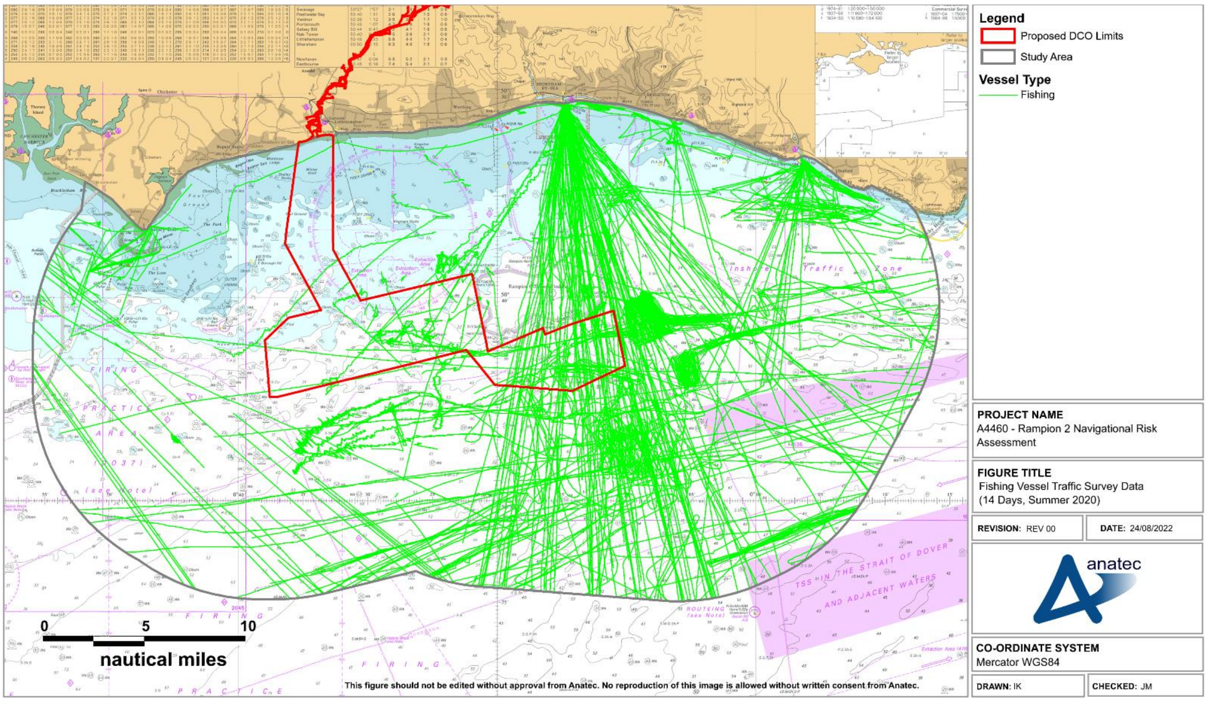

Figure G.9 Fishing vessel traffic survey data (14 days, summer 2020)

907. Throughout the summer 2020 survey period, an average of 17 unique fishing vessels per day were recorded within the study area.

G.3.8 Pilot Vessels

908. The tracks of pilot vessels recorded within the study area throughout the summer 2020 survey period are presented in Figure G.10.

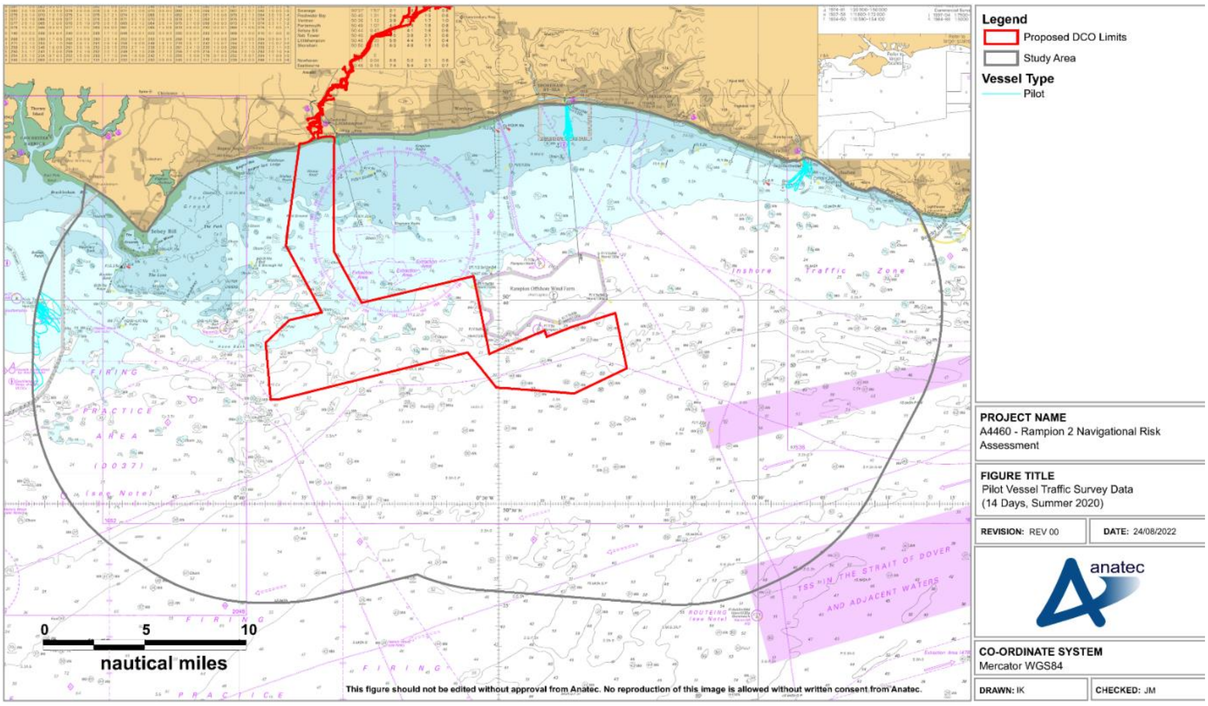

Figure G.10 Pilot vessel traffic survey data (14 days, summer 2020)

909. Throughout the summer 2020 survey period, an average of 2-3 unique pilot vessels per day were recorded within the study area.

G.4 Survey Data Comparison

910. Survey data recorded during 14-day periods in June 2022 and November 2020 were collected using a combination of AIS, radar, and visual observations. This subsection provides comparison of the 28-day survey period (summer and winter combined) against the summer 2020 survey data.

911. A comparison of the average number of each main vessel type recorded during the summer 2020 survey data period and the 14-day survey periods is presented in Table G.1.

Table G.2 Comparison of the number of each main vessel type detected during summer 2020 and the vessel traffic survey data

Vessel Type	Summer 2020	Winter 2021	Summer 2022
Cargo vessels	59	70	77
Passenger vessels	6	3-4	7
Recreational vessels	38	5-6	53
Tankers	28	31	37
Dredgers	2	4	3-4

Vessel Type	Summer 2020	Winter 2021	Summer 2022
Fishing vessels	17	18	16
Pilot vessels	2-3	3	2

912. The average daily vessel count within the summer 2020 survey data was consistently lower than the summer 2022 survey data, with similar daily average counts for passenger vessels, fishing vessels, and pilot vessels. The summer 2020 data was broadly similar to the winter 2020 survey data, albeit with fewer passenger and recreational vessel tracks.

G.5 Conclusion

913. 14 days of AIS, Radar, and visual observation data during summer 2020 has been analysed to validate the winter 2020 and summer 2022 vessel traffic survey data recorded within the study area.

914. Throughout the summer 2020 survey period, the most common vessel types in the study area were cargo vessels (37%), recreational vessels (24%), and tankers (17%). Similarly, the most common vessel types recorded in the study area during the summer 2022 survey period were cargo vessels (26%), recreational vessels (26%), and tankers (18%). The most common vessel types recorded within the study area throughout the winter 2020 survey period were cargo vessels (49%), tankers (22%), and fishing vessels (13%).

915. Overall, the vessel types detected within the study area were similar between the vessel traffic survey data and summer 2020 data.

Appendix H Winter 2022 Vessel Traffic Movements

916. This appendix presents analysis of the data collected during a 14-day dedicated vessel traffic survey undertaken from the survey vessel *Karima* at the array area during December 2022. The data was collected using AIS, Radar and visual sightings.

917. The purpose of this appendix is to:

- Assess the winter 2022 survey data; and
- Compare the findings against the previous winter vessel traffic survey (2020).

918. This appendix validates the baseline vessel traffic movements established in Section 10 based on the winter 2020 and summer 2022 datasets. Therefore, the baseline established for vessel traffic movements is compliant with the requirements of MGN 654 and in particular the need for data to have been collected within two years of the DCO Application.

H.1 Survey Methodology

919. The winter 2022 vessel traffic survey was undertaken by the guard vessel *Karima* (IMO number 7,427,403).

920. The survey commenced on 2 December 2022 at 12:30 (UTC) and concluded on 16 December 2022 at 12:30 (UTC), thus providing 14 full days of data with no downtime recorded during the survey period. Data was collected using the AIS receiver and ARPA, combined with visual observations.

921. The tracks of the survey vessel *Karima* recorded throughout the survey period are presented in Figure H.1. The survey vessel maintained a position mostly within the centre of the array area throughout the survey period to ensure a high level of data coverage throughout the study area.

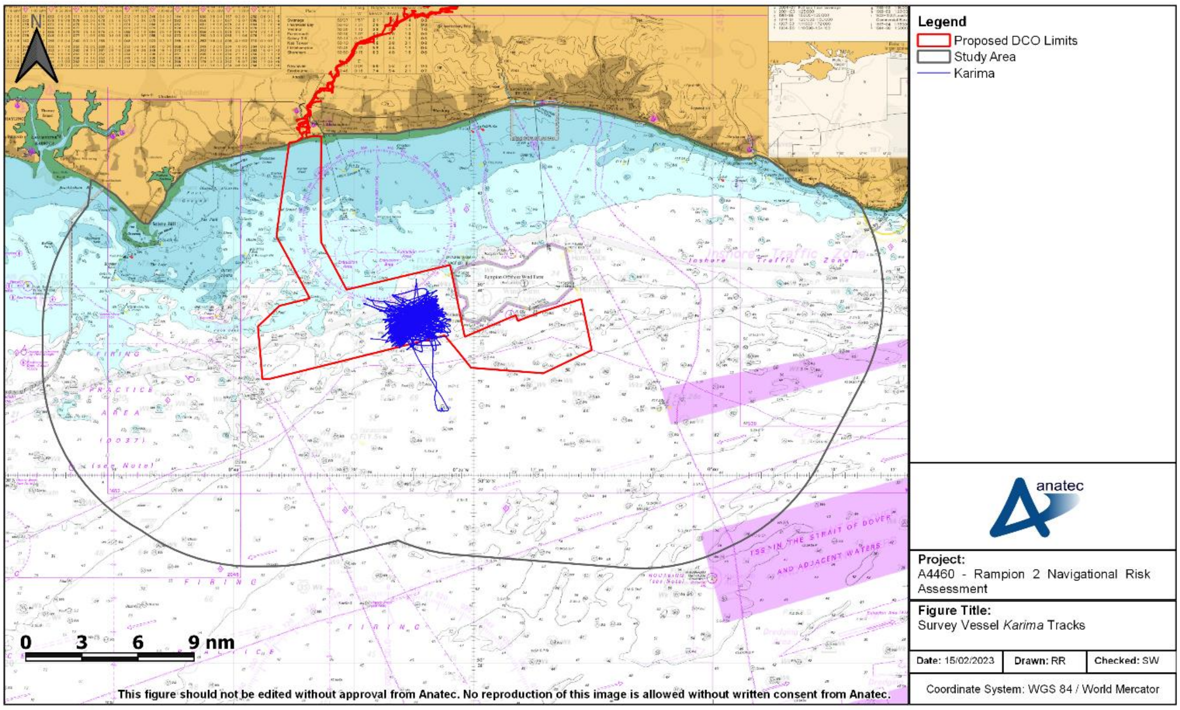

Figure H.1 Survey vessel tracks (14 days, winter 2022)

H.1.2 Equipment and Manning

The equipment used to undertake the vessel traffic survey is listed in Table H.1.

Table H.1 Equipment utilised in vessel traffic survey

Description	Quality	Purpose
JRC JHS-183	1	Receives and records data from vessels transmitting AIS data.
JRC JMA 5300Mk2	1	Tracks targets (both manually and automatically).
Laptops with Anatec AIS Tracker 8 and Data Logger	3	Record AIS and Radar data.
Opto-isolator cable	2	AIS/Radar to laptop connection.
USB memory stick	1	Storing daily survey data backup.
Logbook	1	Logging of Radar targets and weather data.

922. The AIS and Radar systems tracked targets for 24 hours per day throughout the survey period. The AIS unit automatically tracked all targets within the Study Area, and a member of the bridge crew was responsible for acquiring Radar targets via the ARPA. AIS coverage of the Study Area is considered

comprehensive. The Radar range varied due to size of targets and weather conditions, and it should be considered that the data is likely to be weighted towards areas surrounding the survey vessel (i.e., the data is not considered to be comprehensive of the Study Area as a whole). A visual lookout was also always maintained with visual observations also being subject to the prevailing visibility at all times (see Section H.2).

H.1.3 Automatic Identification System Description

923. Regulation 19 of SOLAS Chapter V - Carriage requirements for vessel borne navigational systems and equipment - sets out navigational equipment to be carried on board vessels, according to vessel type. In 2000, the IMO adopted a new requirement (as part of a revised new Chapter V) for vessels to carry AIS. AIS is a system by which vessels transmit data concerning their position, Mobile Maritime Service Identity (MMSI) etc., on two individual VHF channels to the shore and other vessels, at very frequent intervals. The data is transmitted automatically via VHF to other vessels and coastal stations/authorities.

924. The regulation requires AIS to be fitted aboard all vessels of 300GT and upwards, engaged on international voyages, cargo vessels of 500GT and upwards, not engaged on international voyages and passenger vessels irrespective of size, built on or after 1 July 2002. It also applies to vessels engaged on international voyages, constructed before 1 July 2002, according to the following timetable:

- Passenger vessels, not later than 1 July 2003;
- Tankers, not later than the first survey for safety equipment on or after 1 July 2003; and
- Vessels, other than passenger vessels and tankers, of 50,000GT and upwards, not later than 1 July 2004.

925. An amendment adopted by the Diplomatic Conference on Maritime Security in December 2002 states that vessels, other than passenger vessels and tankers, of 300GT and upwards but less than 50,000GT, will be required to fit AIS no later than the first safety equipment survey after 1 July 2004, or by 31 December 2004, whichever occurs earlier. Vessels fitted with AIS shall always maintain AIS in operation, except where international agreements, rules or standards provide for the protection of navigational information.

926. The regulation requires that AIS shall:

- Provide information – including the vessel's identity, type, position, course, speed, navigational status, and other safety-related information – automatically to appropriately equipped shore stations, other vessels and aircraft;
- Automatically receive such information from similarly fitted vessels; exchange data with shore-based facilities.

927. Fishing vessels of 15m length and over are also required to carry Class A AIS.

928. Recreational vessels within this report includes sailing and motor craft of between 2.4m and 24m length, with any such vessels over 24m or carrying more than 12 passengers classified as passenger vessels.

929. Both dynamic and static information are transmitted via AIS. Examples of such information is presented in Table H.2.

Table H.2 Vessel properties transmitted via AIS

Static	Dynamic
▪ MMSI ▪ IMO Number ▪ Call Sign ▪ Name ▪ Length and Beam ▪ Type of Vessel ▪ Type of Navigation Sensor	▪ Position (Latitude/Longitude) ▪ Time ▪ Course over ground ▪ Speed over ground ▪ Heading ▪ Navigational Status ▪ Rate of Turn ▪ Draught ▪ Hazardous Cargo (type) ▪ Destination ▪ Estimated Time of Arrival ▪ Route Plan

H.2 Weather Data

930. Weather data was recorded by crew on-board the survey vessel *Karima* throughout the survey period where possible and is presented in Table H.3.

Table H.3 Weather data recorded throughout the survey period

Date	Time	Wind (Direction and Speed (kt))	Sea State (Douglas Scale)	Visibility (nm)	Additional Comments
2 Dec 2022	12:00	North-east (NE) at 20	Moderate	4-6	-
	18:00	NE at 28	Moderate	6+	-
3 Dec 2022	00:00	NE 32	Moderate	4	Showers
	06:00	NE at 26	Moderate	4-6	Showers
	12:00	NE at 28	Moderate	4-6	-
	18:00	NE at 26	Moderate	4-6	-
4 Dec 2022	00:00	NE at 28-30	Moderate	5	-

Date	Time	Wind (Direction and Speed (kt))	Sea State (Douglas Scale)	Visibility (nm)	Additional Comments
	06:00	NE at 25-30	Moderate	5	Occ. Showers
	12:00	NE at 25-30	Moderate	6	-
	18:00	NE/East (E) at 20-25	Moderate	6	-
5 Dec 2022	00:00	NE/E at 20	Moderate	6	-
	06:00	NE/E at 10-15	Slight	6	-
	12:00	NE/E at 10-15	Slight	6	-
	18:00	15-20	Slight	6	-
6 Dec 2022	00:00	20-25	Slight-Moderate	6	-
	06:00	North (N) at 22-25	Moderate	Good	-
	12:00	N at 15	Slight	Good	-
	18:00	N at 15	Slight	Good	-
7 Dec 2022	00:00	N at 15	Slight	Good	-
	06:00	N at 15	Slight	Good	-
	12:00	N at 10-15	Slight	Good	-
	18:00	N at 10-15	Slight	Good	-
8 Dec 2022	00:00	N at 10-15	Slight	Good	-
	06:00	N at 10-15	Slight	Good	-
	12:00	N at 10-15	Slight	Good	-
	18:00	N at 10-15	Slight	Good	-
9 Dec 2022	00:00	N at 10-15	Slight	Good	-
	06:00	N at 10-15	Slight	Good	-
	12:00	N at 10-15	Slight	Moderate	-
	18:00	N at 10-15	Slight	Moderate	-
10 Dec 2022	00:00	N at 10-15	Slight	Good	-
	06:00	West (W) at 10-15	Slight	Good	-
	12:00	W at 10-15	Slight	Good	-
	18:00	W at 5-10	Calm	Good	-
	00:00	South (S) at 15-18	Moderate	Good	-

Date	Time	Wind (Direction and Speed (kt))	Sea State (Douglas Scale)	Visibility (nm)	Additional Comments
11 Dec 2022	06:00	South-west (SW) at 5-10	Slight	Moderate	Showers/Rain
	12:00	S at 5-10	Slight	Moderate/ Poor	Rain
	18:00	S at 10-15	Slight	Moderate/ Poor	Fog
12 Dec 2022	00:00	North-west (NW) at 10-15	Slight	Poor	Fog
	06:00	N at 3-5	Calm	Good	-
	12:00	NE at 5-10	Slight	Good	-
	18:00	SE at 10-15	Slight	Good	-
13 Dec 2022	00:00	E at 15-20	Moderate	Good	-
	06:00	E at 22-28	Moderate	Good	-
	12:00	E at 22-28	Moderate	6+	-
	18:00	E at 18-24	Moderate	6+	-
14 Dec 2022	00:00	E at 10-15	Slight	6+	-
	06:00	E at 15-20	Slight	6+	-
	12:00	N at 25	Moderate	6	-
	18:00	NE at 25-30	Moderate	4-5	-
15 Dec 2022	00:00	NE at 25-30	Moderate	4-5	-
	06:00	NE at 10-15	Slight	6+	-
	12:00	NE at 10-15	Slight	6	-
	18:00	NE at 25-30	Moderate	6	-
16 Dec 2022	00:00	NE at 20	Moderate	6	-
	06:00	N at 10-15	Slight	6	-

H.3 Vessel Traffic Survey Results

931. This section presents analysis of the vessel tracks recorded on AIS, Radar, and by visual observation within the study area during the 14-day survey period. The AIS receiver generally tracked a vessel over a greater range than the corresponding Radar track and provided more accurate information on position and vessel characteristics. Therefore, the AIS track has generally

been prioritised and used alone where the vessel was recorded by both systems in most instances.

932. Regarding visual observations of vessels, one visual sighting was recorded that had no corresponding AIS or Radar tracks and so has been included within the data set. Although no track is available for the sighting, any available information is included within the analysis where appropriate. This vessel was a small recreational angling vessel described by on-board survey crew.

933. Non-AIS and AIS data were combined to create a single dataset of all vessels. Overall, the majority of traffic was recorded via AIS (more than 99%).

H.3.1 Temporary Traffic

934. Temporary traffic, including non-routine survey and operations vessels recorded within the study area, were removed from the analysis in addition to the tracks of the survey vessel *Karima*. This ensured the focus of the analysis was on routine traffic and activities within the area. To ensure consistency with previous surveys and analysis for the vessel traffic baseline, vessels associated with Rampion 1 have been removed from the analysis.

935. Vessel tracks excluded from the analysis consist of the tracks of the *Karima* itself as well as wind farm support vessels supporting Rampion 1 and any other vessels clearly involved in temporary operations distinguished by track behaviour and information broadcast via AIS. These excluded tracks are shown in Figure H.2.

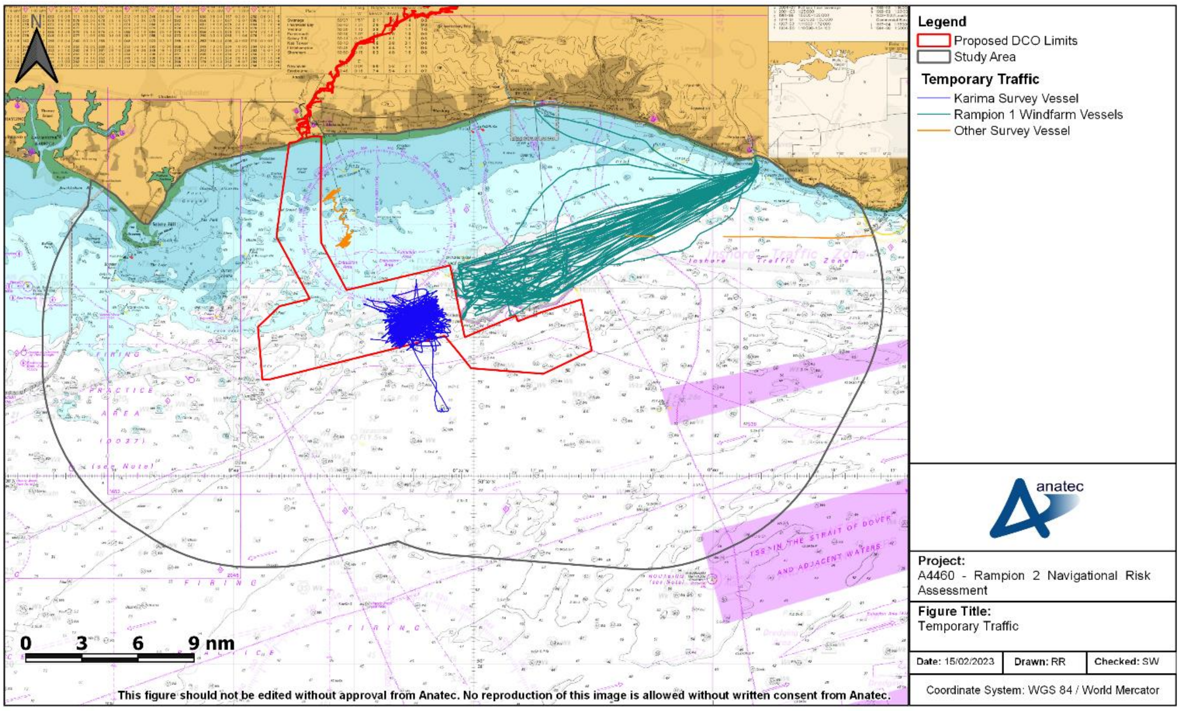

Figure H.2 Temporary traffic removed (14 days, winter 2022)

H.3.2 Vessel Type

936. An overview of the vessel data recorded within the study area throughout the survey period, colour-coded by vessel type, is presented in Figure H.3. Vessel type was able to be associated with the majority of vessels (more than 99%). Those vessels with no associated vessel type were all recorded via Radar.

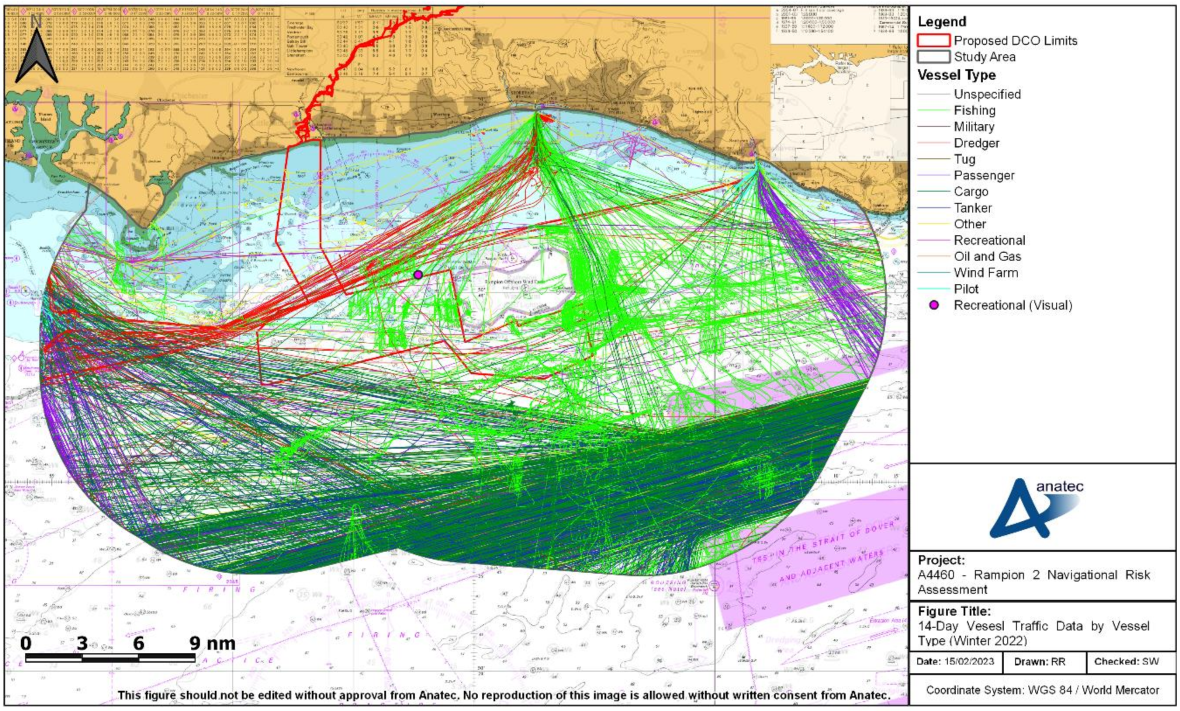

Figure H.3 Vessel traffic data by vessel type (14 days, winter 2022)

937. Within the study area, there were various distinct commercial routes (featuring cargo vessels, tankers, passenger vessels and marine aggregate dredgers). Fishing vessels and recreational vessels were also noted.

938. The distribution of the main vessel types recorded within the study area during the survey period is presented in Figure H.4. It is noted that for the distribution analysis, vessel types[14] detected in low numbers (less than 1%) have been incorporated into the 'all other' category.

[14] Includes unspecified vessels, military vessels, tugs, oil and gas vessels, wind farm vessels and other vessels.

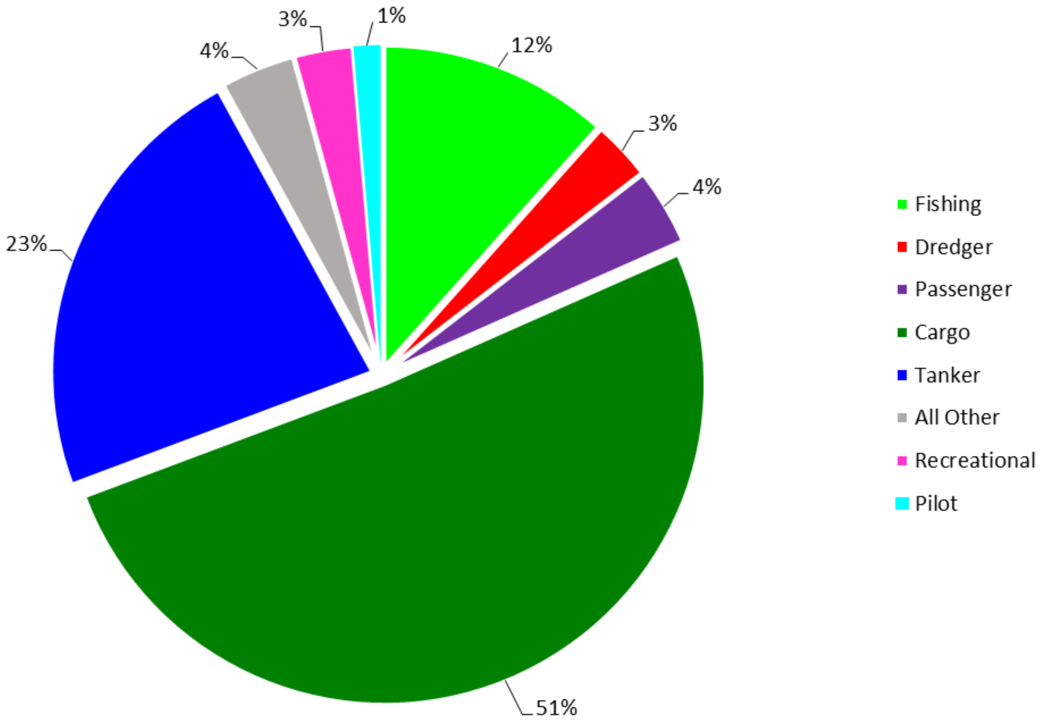

Figure H.4 Vessel type distribution (14 days, winter 2022)

939. The most common vessel type recorded during the survey period was cargo vessels (51%), followed by tankers (23%), fishing vessels (12%), and passenger vessels (4%).

940. Further analysis of each of the main vessel types is provided in the following subsections.

H.3.2.2 Cargo Vessels

941. Figure H.5 presents a plot of the cargo vessels recorded within the study area during the survey period.

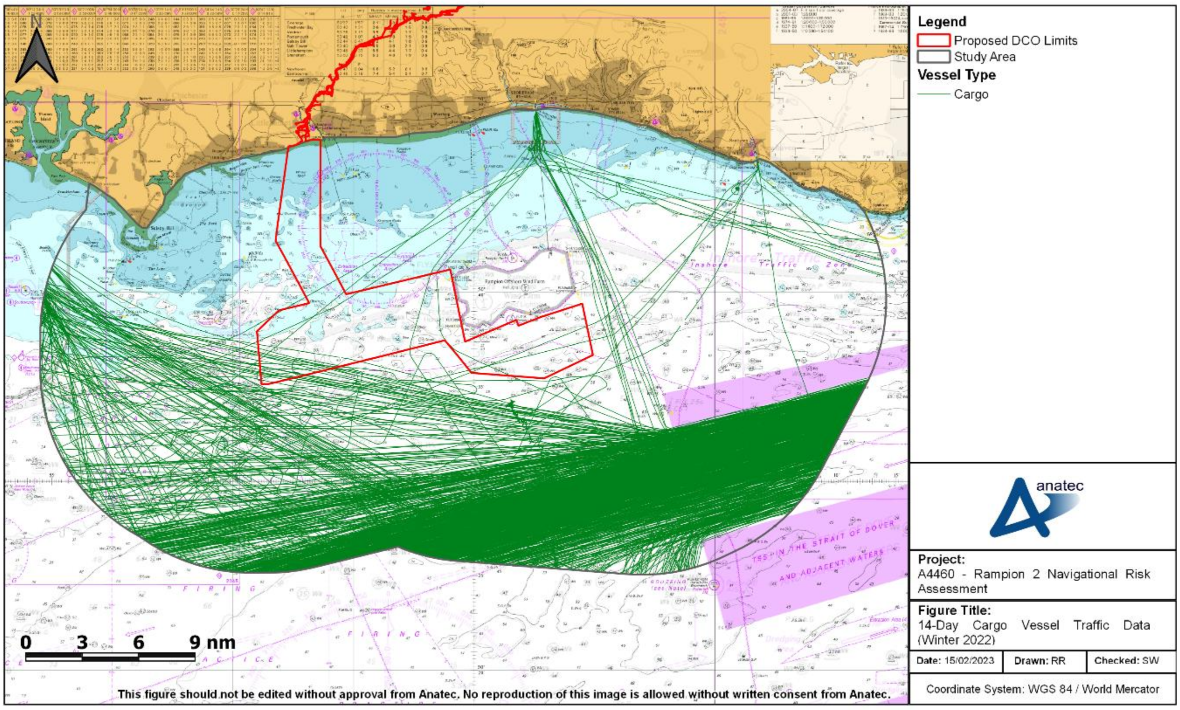

Figure H.5 **Cargo vessels (14 days, winter 2022)**

942. During the survey period, an average of 76 unique cargo vessels per day were recorded within the study area. The majority of cargo vessels were headed westbound after exiting the Dover Strait TSS at the southern extent of the Study Area. Larger cargo vessels were also noted transiting between the Dover Strait TSS and Solent ports.

943. Smaller cargo vessels make use of local ports such as Shoreham Port and Port of Newhaven with some of these vessels passing through the array area. Several cargo vessels were also recorded at anchor and/or waiting at designated anchorages and pilot boarding areas for both ports with one vessel also anchored south of the array area (ahead of approaching Port of Southampton based on AIS broadcast information).

944. Cargo vessels mainly intersected the south-west corner of the array area with most of this traffic headed to Southampton from the Dover Strait TSS.

945. The main cargo vessel subtypes were general cargo (32%), container cargo (24%), and bulk carriers (20%).

H.3.2.3 Tankers

946. Figure H.6 presents the tankers recorded within the study area during the survey period.

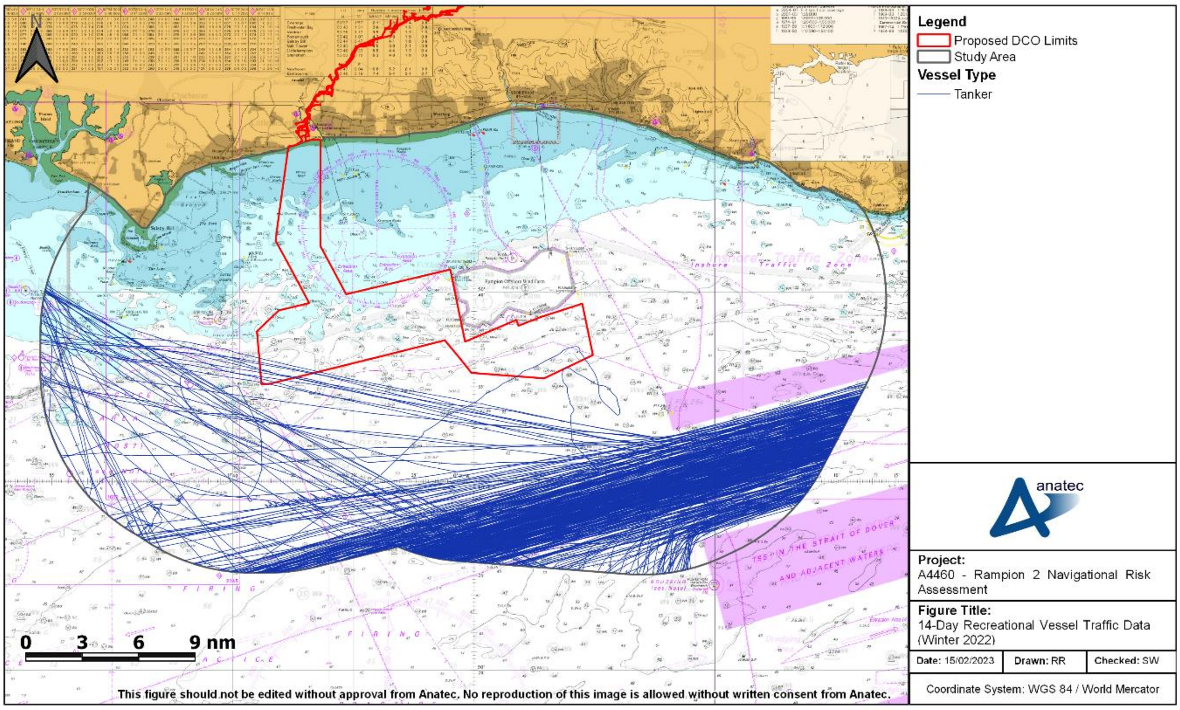

Figure H.6 Tankers by length (14 days, winter 2022)

947. An average of 35 unique tankers were recorded per day within the study area during the survey period. The majority were headed westbound after exiting the Dover Strait TSS at the southern extent of the study area. As with cargo vessels, tankers interesting the array area typically did so at the south-west corner headed to Fawley (UK) from the Dover Strait TSS. There was no tanker activity inshore of the array area.

948. The main tanker subtypes were combined oil/chemical (37%), crude oil (15%), and Liquid Petroleum Gas (LPG) (13%).

H.3.2.4 Passenger Vessels

949. Figure H.7 presents a plot of the passenger vessels recorded within the study area during the survey period.

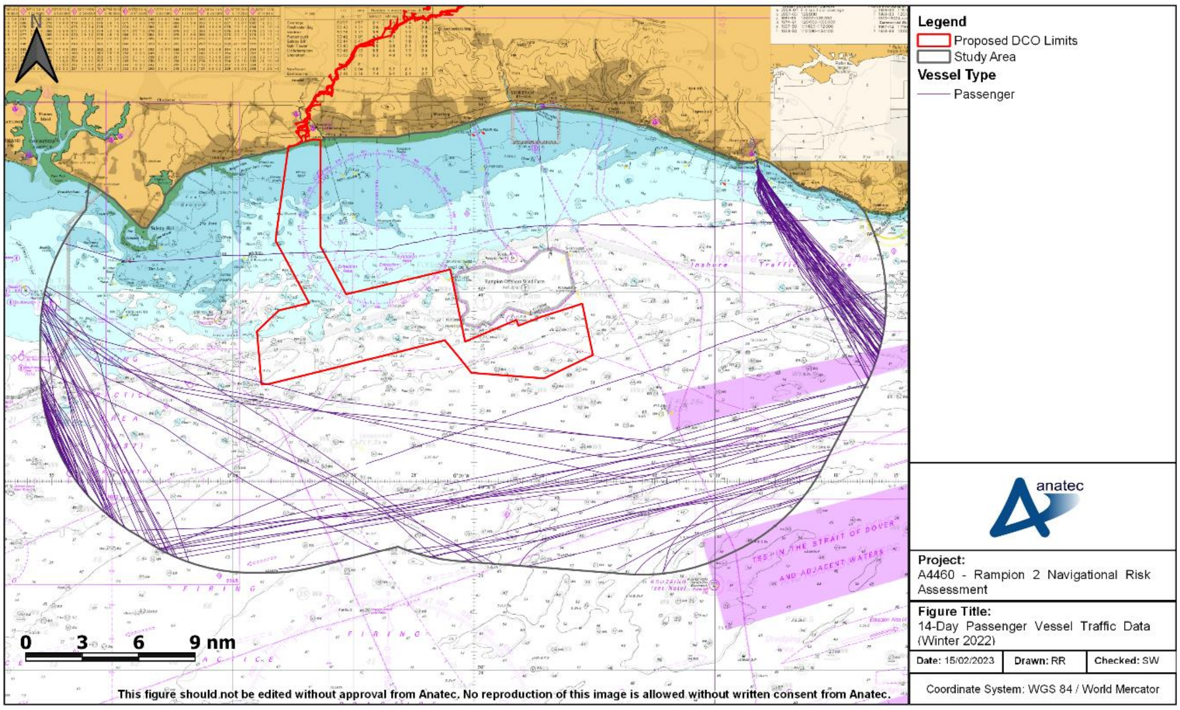

Figure H.7 Passenger vessels (14 days, winter 2022)

950. An average of six unique passenger vessels were recorded per day within the study area during the survey period. Passenger vessels were noted on two cross channel routes to the east and western extents of the study area. The eastern route between Newhaven and Dieppe (France) is a Ro-Ro passenger ferry route operated by DFDS Seaways. The western route between Portsmouth (UK) and Le Havre/Ouistreham (Caen) (France) is a Ro-Ro passenger ferry route operated by Brittany Ferries. Less frequent passenger vessel movements included transits west to Rosslare (Ireland) and north-west to Solent ports after exiting the Dover Strait TSS.

951. Only one passenger vessel intersected the south-west corner of the array area headed to Portsmouth from the Dover Strait TSS.

H.3.2.5 Fishing Vessels

952. Figure H.8 presents a plot of fishing vessels recorded within the study area during the survey period.

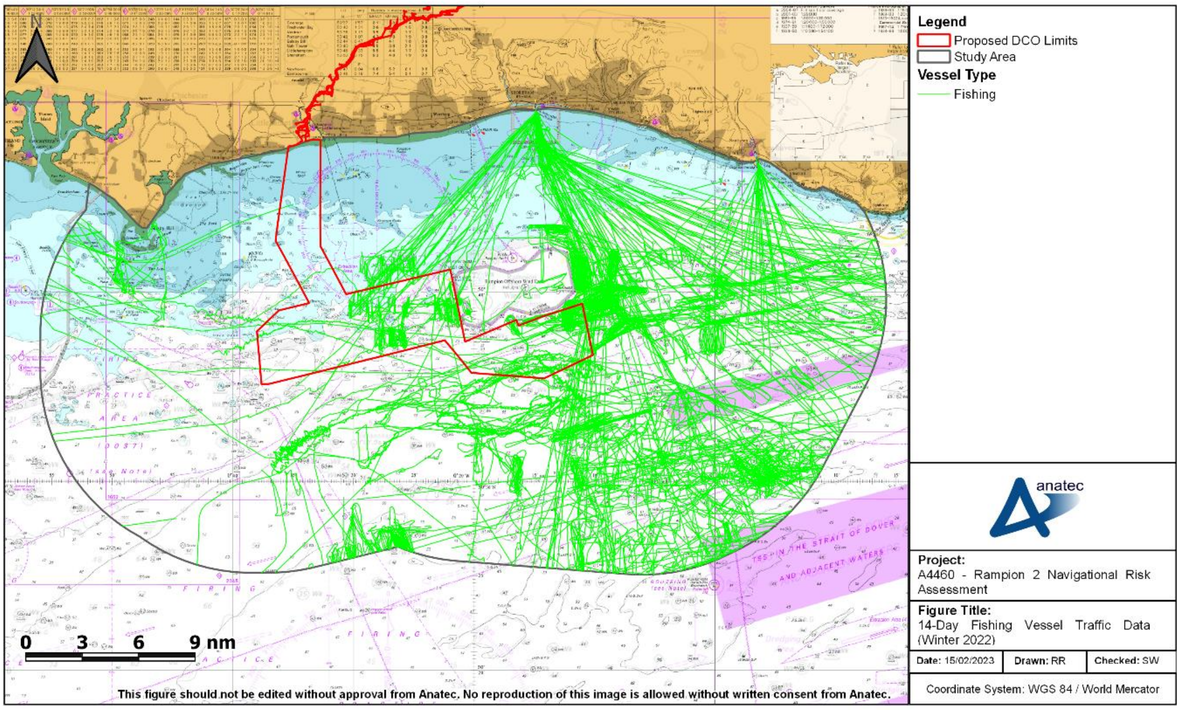

Figure H.8 Fishing vessels (14 days, winter 2022)

953. An average of 17 unique fishing vessels were recorded per day within the study area during the survey period. Fishing vessels were located primarily in the eastern half of the study area with a high proportion of vessels intersecting the array area. Based on the behaviour of vessel tracks, fishing vessels were both in transit and actively engaged in fishing, Those fishing vessels in transit were recorded transiting between Shoreham Port and Port of Newhaven Ports and fishing grounds. These ports were the main operating ports of fishing vessels in the study area. Likely active fishing was noted within the array area as well as to the immediate east and south of the array area.

954. Gear type was established for fishing vessels where possible (gear type is not broadcast on AIS but has been researched separately where vessel identification information was available). Gear type information was unspecified for 9% of vessels; these include all fishing vessels recorded via Radar. Dredging activity was noted mostly at the southern extent of the study area, including within the Dover Strait TSS. Seiners were also observed within the TSS to the south. Substantial beam trawling was observed to the east of and within the array area. This highest volume of fishing activity within the array area itself was undertaken by potters/whelkers.

H.3.2.6 Marine Aggregate Dredgers

955. Figure H.9 presents a plot of the marine aggregate dredgers recorded within the study area during the survey period.

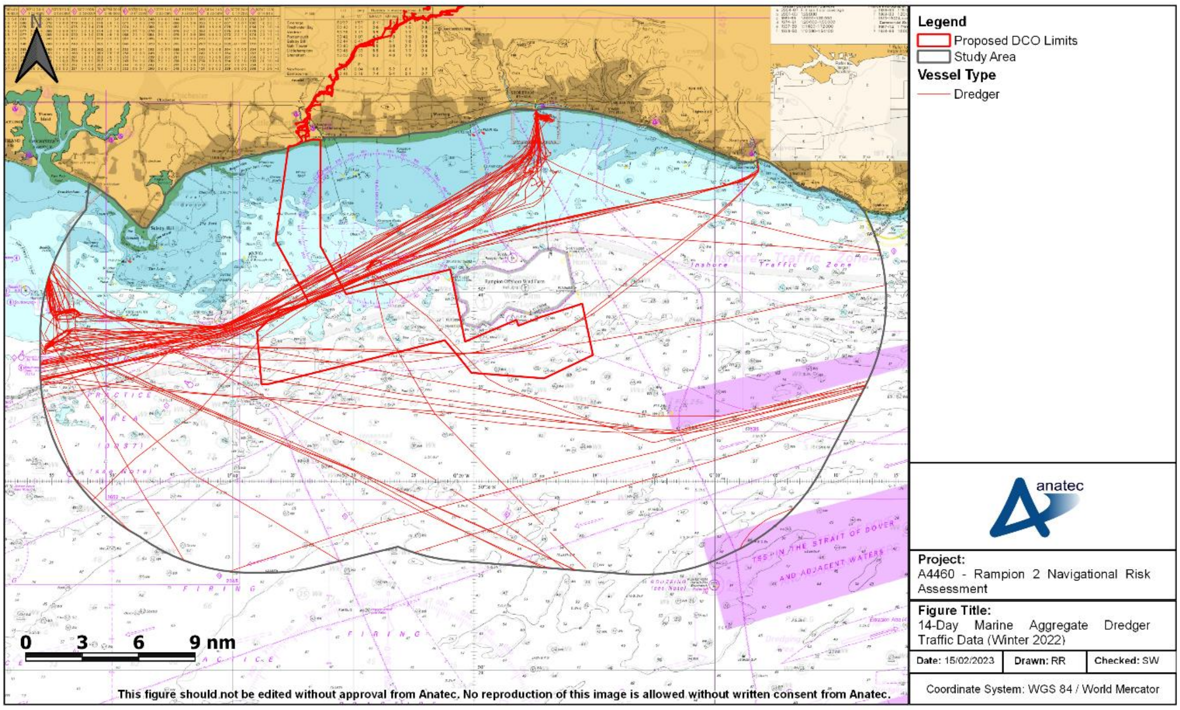

Figure H.9 Marine aggregate dredgers (14 days, winter 2022)

956. An average of between four and five unique marine aggregate dredgers were recorded per day within the study area during the survey period. The majority of marine aggregate dredgers were on a designated route between Shoreham Port and the dredging areas located at the western extent of the study area. Dredging activity was also observed within a small dredging area to the north of the array area.

H.3.2.7 Recreational Vessels

957. Figure H.10 presents a plot of the recreational vessels recorded within the study area during the survey period.

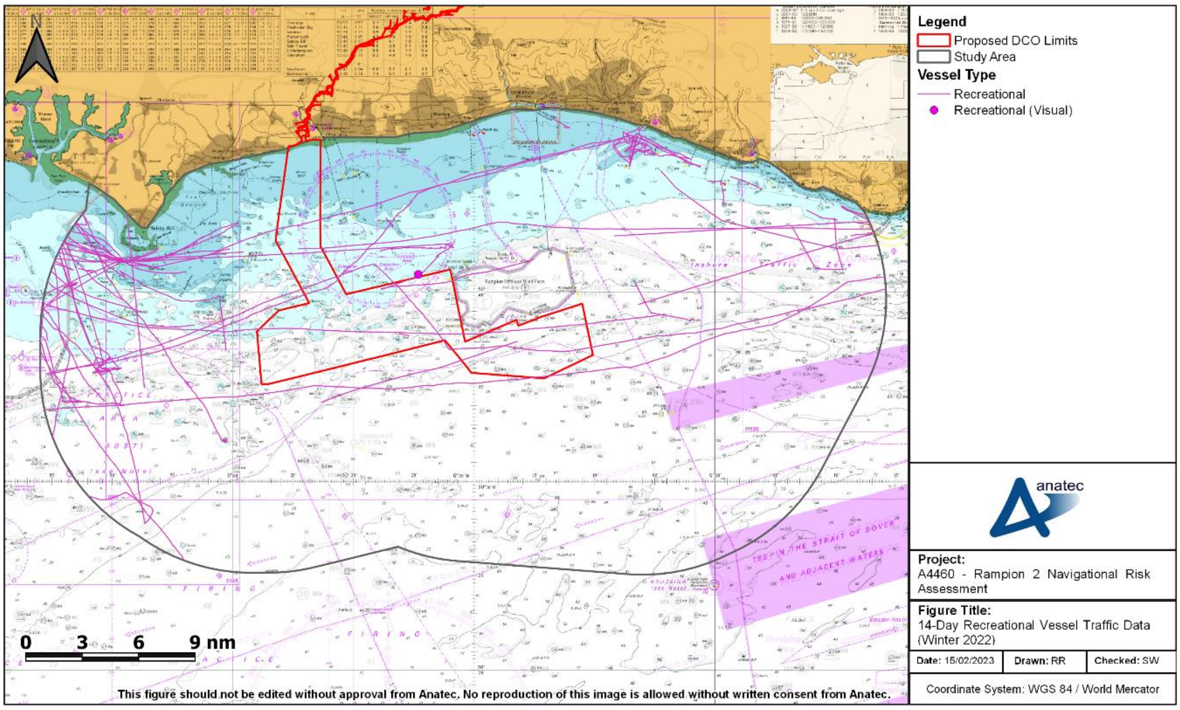

Figure H.10 Recreational vessels (14 days, winter 2022)

958. An average of four unique recreational vessels were recorded per day within the study area during the survey period. Of these unique vessels, 2% were recorded via Radar with the remaining 98% via AIS.

959. Recreational vessels remained closer to the coast with those further offshore located at the western extent of the study area. Most activity occurred in proximity to Brighton Marina and the Solent, with recreational vessels staying clear of the heavily trafficked commercial route out of the Dover Strait TSS. A small number of recreational vessels were recorded transiting through the array areas, generally on east-west passages.

H.3.3 Vessel Count

960. The daily unique vessel count within the study area and intersecting the array area during the survey period is presented in Figure H.11. It should be noted that the first and last days of the survey period were partial days.

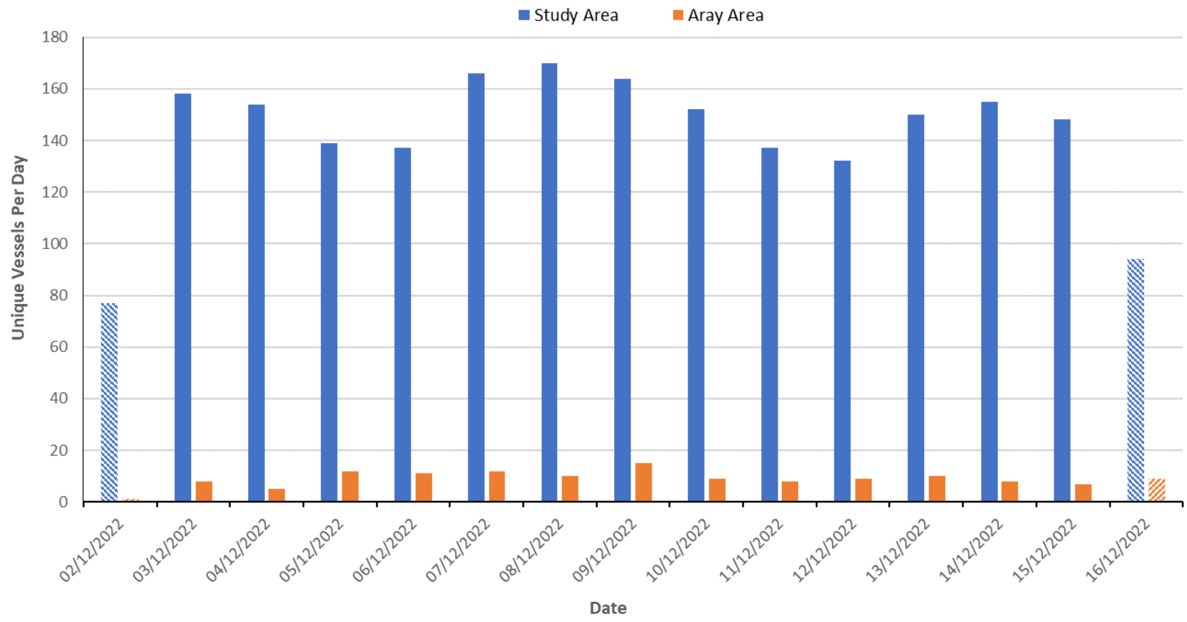

Figure H.11 Daily unique vessel count (14 days, winter 2022)

961. An average of 151 unique vessels per day were present within the study area during the survey period. The busiest full day was 8 December 2022, when 170 unique vessels were recorded. The quietest full day was 12 December 2022, when 132 unique vessels were recorded.

962. Overall, 6.5% of all unique vessels recorded during the survey period within the study area intersected the array area equating to an average of nine unique vessels per day. The main vessel type to intersect the array area was fishing vessels (43% of all interesting vessels).

H.3.4 Vessel Length

963. An overview of vessel tracks recorded during the survey period, colour-coded by vessel length, is presented in Figure H.12.

964. Vessel length was established for the majority of vessels (approximately 99%). Those vessels with unspecified lengths were primarily fishing vessels, recreational vessels and unspecified vessels. Of those with no recorded length, 50% were recorded via Radar and 50% via AIS. These vessels were removed from the length analysis.

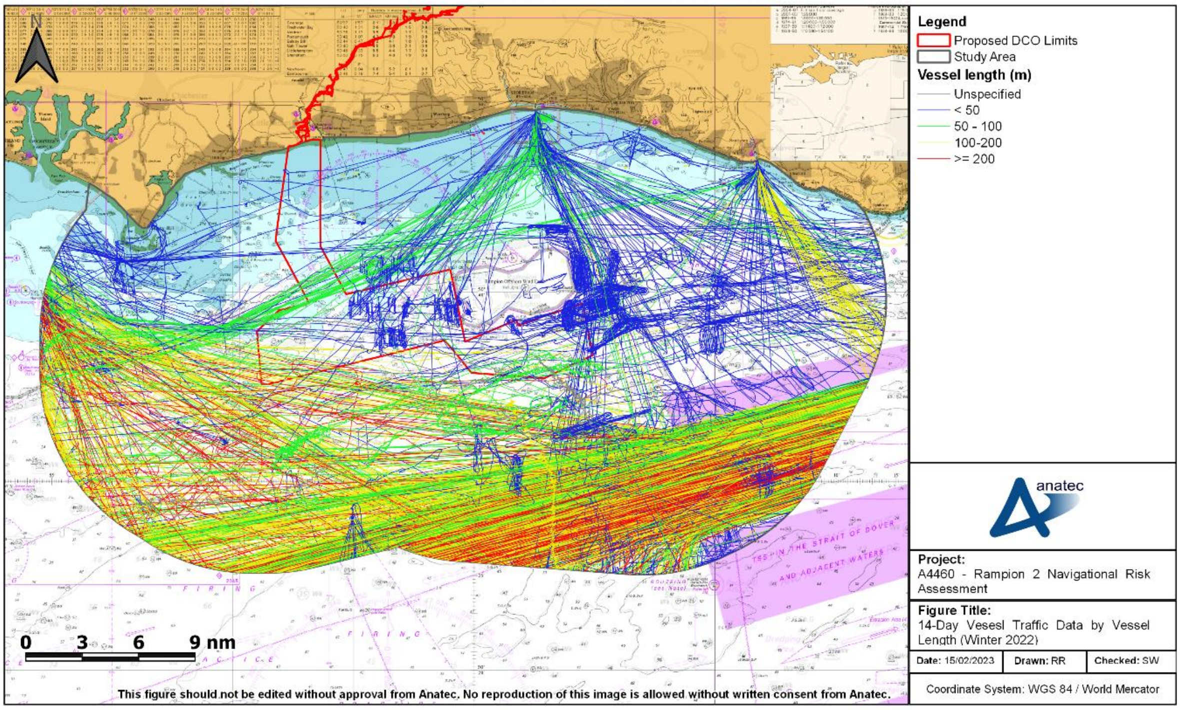

Figure H.12 Vessel traffic data by vessel length (14 days, winter 2022)

965. The average length of vessels within the study area during the survey period was 145m. The largest vessels recorded were 400m length, with these being 16 unique container vessels exiting the Dover Strait TSS and headed to the Off Casquet TSS. The majority of other larger vessels were also making passage on this route.

966. The smallest vessels, which were mostly fishing vessels and recreational vessels, were primarily observed inshore of the Dover Strait TSS including within the array area itself. Smaller vessels further offshore consisted only of fishing vessels engaged in fishing activities.

H.3.5 Vessel Speed

967. Figure H.13 presents the vessel tracks, colour-coded by average vessel speed, recorded within the study area during the survey period. A valid average vessel speed was established for the majority of vessels (more than 99%).

968. Those vessels with an unspecified average speed were excluded from the length analysis. The tracks excluded were all from the same unique recreational vessel recorded via AIS that was associated with mooring at Brighton Marina to the north-east of the study during the entire survey period.

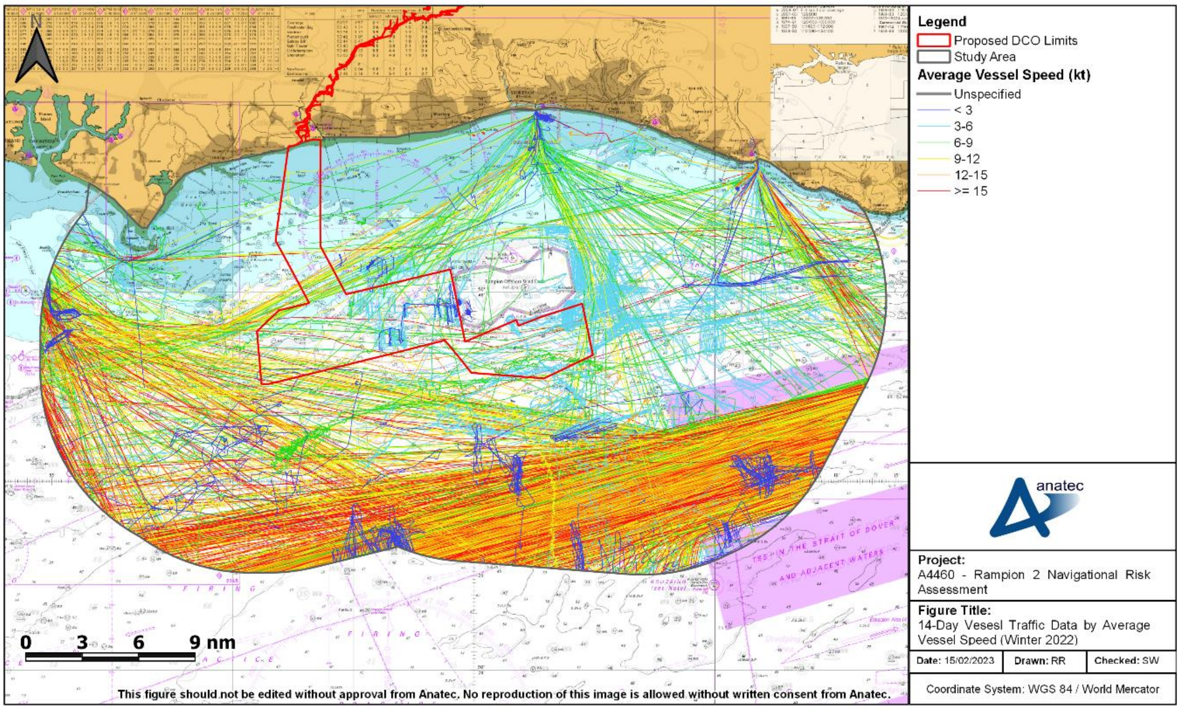

Figure H.13 Vessel traffic data by average vessel speed (14 days, winter 2022)

969. The average vessel speed within the study area during the survey period was 10.3kt, with a maximum average speed of 28.7kt associated with a recreational vessel to the west of the array area.

970. The fastest vessels recorded during the survey period were typically transiting further offshore at the southern extent of the study area, utilising the Dover Strait TSS. These vessels were primarily commercial vessels (cargo vessels, passenger vessels, and tankers) with recreational and military vessels also displaying higher average vessel speeds.

971. The vessels with lower average speeds were typically closer to shore; this included speeds of below 6kt for fishing vessels which is suggestive of active fishing activity. A high volume of these fishing vessels were also recorded to the east of Rampion 1. As well as fishing vessels, slower vessels were primarily small cargo vessels, marine aggregate dredgers and recreational vessels.

H.3.6 Vessel Draught

972. An overview of vessel tracks recorded during the survey period, colour-coded by vessel draught, is presented in Figure H.14.

973. Vessel draught was established for the majority of vessels (approximately 87%). Those vessels with unspecified draughts were primarily fishing vessels and recreational vessels. Of those vessels with no recorded draught, 6% were

recorded via Radar and 94% via AIS. These vessels were removed from the length analysis.

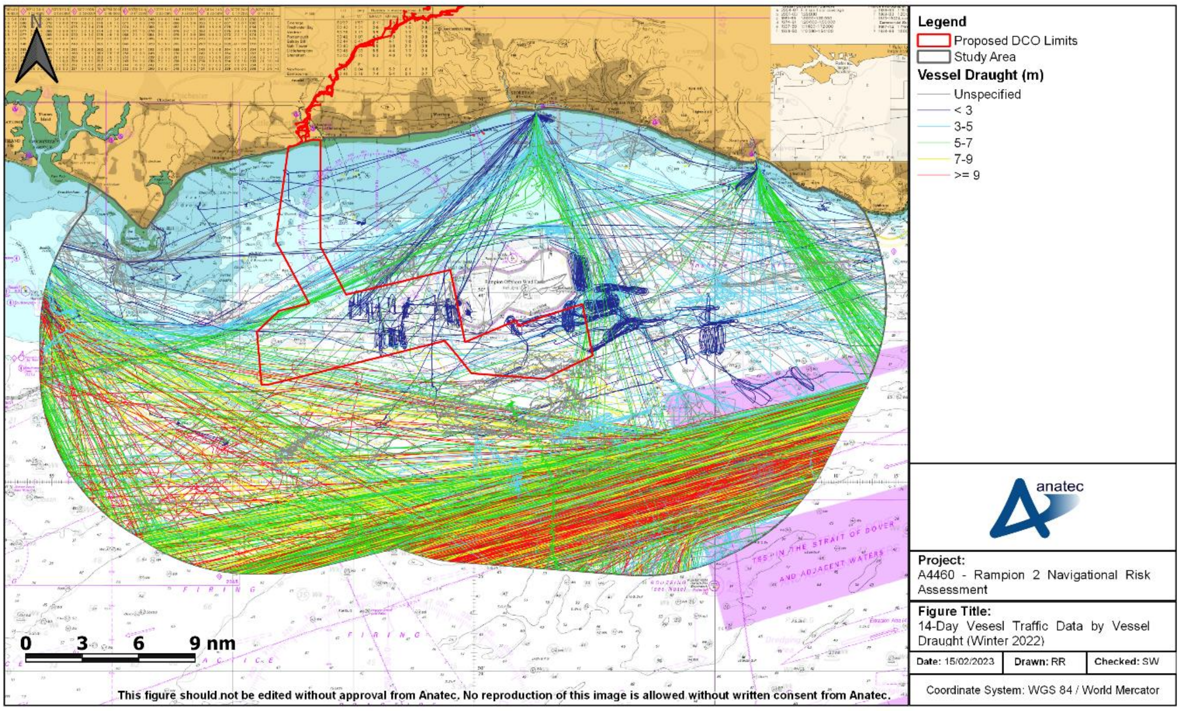

Figure H.14 Vessel traffic data by vessel draught (14 days, winter 2022)

974. The average draught of all vessels across the study area during the survey period was 6.8m, with a maximum average draught of 18m out of the Dover Strait TSS.

975. As with the vessel length analysis, the vessels with the deepest draughts were typically cargo vessels and tankers exiting the Dover Strait TSS and headed to the Off Casquet TSS.

976. The vessels with the shallowest draughts were generally closer to the coast including within the array area. These vessels were mainly fishing vessels and pilot vessels.

H.3.7 Vessel Destination

977. Figure H.15 presents a summary of the leading destinations broadcast by vessels recorded within the study area during the survey period. This is based on information transmitted via AIS and subsequently the Radar data is not included in the analysis. Vessels recorded via AIS that did not specify a valid destination (typically Class B AIS units) were not included in the analysis (approximately 11%).

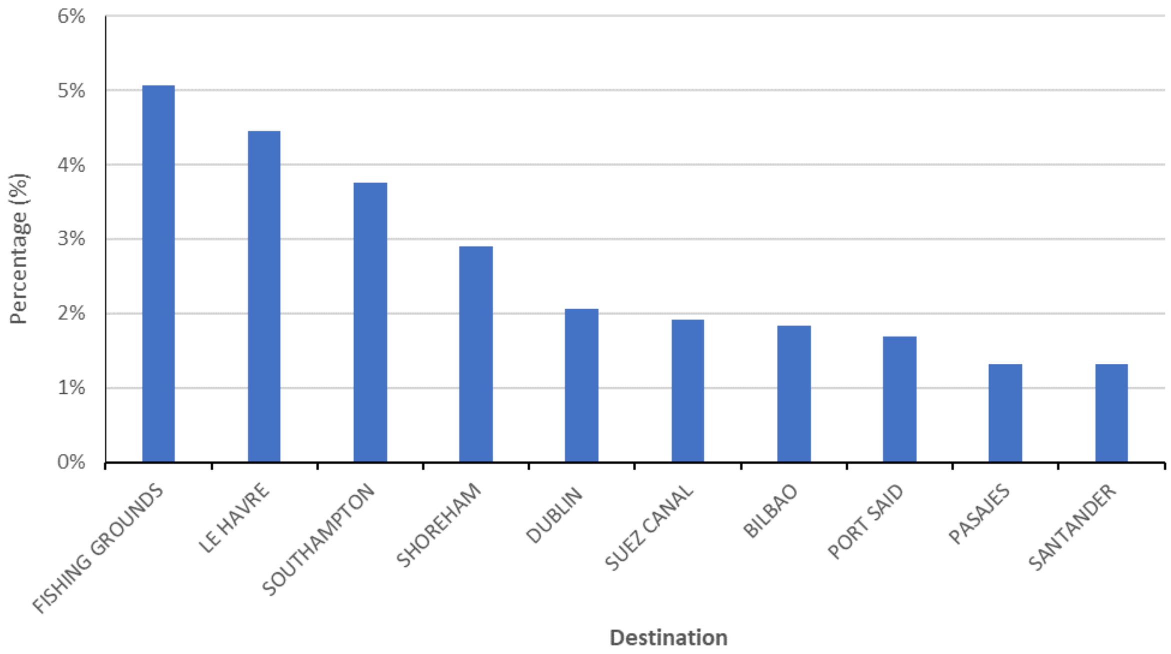

Figure H.15 Most frequent vessel destinations (14 days, winter 2022)

978. The leading vessel destinations broadcast during the survey period was for fishing grounds. The leading port destination was Le Havre (France) followed by Southampton (UK) and Shoreham (UK) with Dublin (Ireland) also a frequent destination. Various international destinations were prominent, highlighting the international nature of vessel movements in the English Channel.

H.4 Survey Data Comparison

979. Survey data recorded during the 14-day periods in November 2020 and June 2022 were collected using a combination of AIS, Radar, and visual observations. This subsection provides comparison of the December 2022 dataset with these previous datasets which have been used to inform the NRA.

980. A comparison of the average number of each main vessel type recorded across these 14-day survey periods is presented in Table H.4.

Table H.4 Comparison of the number of each main vessel type detected during winter 2022 and the vessel traffic survey data

Vessel Type	Winter 2020	Summer 2022	Winter 2022
Cargo vessels	70	77	76
Tankers	31	37	35
Fishing vessels	18	18	17
Passenger vessels	4-5	8	6

Vessel Type	Winter 2020	Summer 2022	Winter 2022
Recreational vessels	5	53	4
Marine aggregate dredgers	4	3-4	4-5

981. The average daily vessel counts for each recorded vessel type were broadly similar across the survey periods, particularly when comparing the same seasonal periods (i.e., winter 2020 and winter 2022).

982. Commercial vessel numbers were slightly lower in winter 2020 than the two 2022 datasets, with this likely related to the COVID-19 pandemic. However, the patterns of vessel movements remained similar.

983. Comparing the two 2022 datasets, commercial vessel numbers were broadly similar with the exception of recreational vessels for which numbers were substantially lower. This is characteristic of the seasonality of recreational vessels and the winter 2022 volumes are aligned with the winter 2020 volumes.

H.5 Conclusion

984. Fourteen days of AIS, Radar and visual observation data during the winter 2022 survey period has been analysed to validate the previous winter vessel traffic survey (2020).

985. The main vessel types detected within the study area during the winter 2022 survey period were cargo vessels (51%), tankers (23%), fishing vessels (12%) and passenger vessels (4%). A similar type distribution was record during the winter 2020 survey period: cargo vessels (48%), tankers (21%), fishing vessels (14%), and recreational vessels (4%).

986. The summer 2022 survey period exhibited similar trends alongside the expected levels of seasonal variation for recreational vessels.

987. Overall, the vessel types recorded within the study area for winter 2022 were similar to that recorded in the winter 2020 and summer 2022 datasets.

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Rampion 2
WIND FARM