The Great Grid Upgrade

Sea Link

Sea Link

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Contents

Table of Tables

7. Navigational Risk Assessment

Executive Summary

Ex1.0.1 This Navigational Risk Assessment (NRA) considers risks to shipping and navigation presented by the construction, operations and maintenance, and decommissioning of the Sea Link Project. Sea Link is a proposed subsea High Voltage Direct Current (HVDC) power cable between onshore terminals at Suffolk and Kent and is part of National Grid Electricity Transmission plc (National Grid) activities as part of reinforcement of the electricity transmission network. The assessment identifies hazards to shipping and navigation through desktop study, stakeholder consultations, and hazards workshops which form part of the wider Preliminary Hazards Analysis (PHA) process. As part of the Formal Safety Assessment (FSA), a risk matrix framework is used to determine requirements for risk reduction and to ultimately establish additional risk reduction measures to ensure that risks are as low as is reasonably practicable (ALARP).

Ex1.0.2 As a basis for the assessment, extensive navigational baseline data has been compiled via a study of historical shipping and navigation data using a range of sources and is presented via a series of map figures and analysis. The study area comprises a corridor of 10 nautical miles (NM) width encompassing the entire Offshore Scheme, passing through busy commercial shipping areas including the Sunk Traffic Separation Scheme (TSS) and in proximity to other navigational features including anchorage areas and pilot stations.

Ex1.0.3 Using the baseline data and applying the FSA methodology, the appraisal identified impacts which are ‘tolerable if ALARP’ and ‘Broadly Acceptable’ as according to the framework. The ‘tolerable if ‘ALARP’ and ‘Broadly Acceptable’ assessments are based principally upon the combination of existing legislation which establishes safe practices regarding navigation in general, and fishing and anchoring in the vicinity of subsea infrastructure, and the reduction of the seabed hazard through cable burial and protections where required. The risk assessment output is captured in a Hazard Log annexed to this document which serves to provide hazard management traceability.

Ex1.0.4 The study makes a number of recommendations to address the identified risks and in particular has recommended that communication plans be established with clear protocols to ensure effective communication and coordination between all stakeholders, including Statutory Harbour Authorities (SHAs), Competent Harbour Authority (CHAs), Vessel Traffic Service (VTS), and Traffic Separation Scheme (TSS) operators. This will maintain ongoing awareness and coordination of Offshore Scheme developments and the installation fleet activities along with their locations throughout the operations. Special attention should be given to the proximity of the installation operation to the Sunk TSS and its designated anchorages. Additionally, communication plans must address relevant stakeholders such as Harwich Haven and Sandwich Port and Haven authorities. Similarly, the assessment recommends that Temporary/Preliminary Notices should be issued to UK Hydrographic Office (UKHO), as well as relevant ports,

harbours and pilots and other appropriate parties prior to post-lay/as-built survey such that the basic positions of the cable are established and awareness among mariners can be raised immediately. Where necessary, areas of high potential magnetic compass deviations should be identified and reported to the UKHO. The report concludes that where these recommendations and others made in this assessment are implemented, the risks to shipping and navigation presented by the Offshore Scheme can be considered ALARP.

7.1 Introduction

7.1.1 This Navigational Risk Assessment (NRA) characterises the shipping and navigation surrounding activities and infrastructure of the Sea Link Project (hereafter referred to as the 'Proposed Project') and assesses associated changes in navigational risk.

7.1.2 This chapter is supported by the following figures:

- **Application Document 6.4.4.7.A Navigational Risk Assessment.**

Overview

7.1.3 The Sea Link Project (hereafter referred to as the 'Proposed Project') is a proposal by National Grid Electricity Transmission plc (hereafter referred to as National Grid) to reinforce the transmission network in the South East and East Anglia. The Proposed Project is required to accommodate additional power flows generated from renewable and low carbon generation, as well as an addition to new interconnection with mainland Europe.

7.1.4 National Grid owns, builds and maintains the electricity transmission network in England and Wales. Under the Electricity Act 1989, National Grid holds a transmission licence under which it is required to develop and maintain an efficient, coordinated, and economic electricity transmission system.

7.1.5 National Grid is also required, under Section 38 of the Electricity Act 1989, to comply with the provisions of Schedule 9 of the Act. Schedule 9 requires licence holders, in the formulation of proposals to transmit electricity, to:

Schedule 9(1)(a) '…have regard to the desirability of preserving natural beauty, of conserving flora, fauna and geological or physiographical features of special interest and of protecting sites, buildings and objects of architectural, historic or archaeological interest;' and

Schedule 9(1)(b) '…do what [it] reasonably can to mitigate any effect which the proposals would have on the natural beauty of the countryside or on any such flora, fauna, features, sites, buildings or objects'.

7.1.6 Full details of the Proposed Project can be found in **Application Document 6.2.1.4 Part 1 Introduction Chapter 4 Description of the Proposed Project**. Interactions between the Offshore Scheme and commercial fisheries and other sea users are covered in depth within specific chapters of the Environmental Statement, namely **Application Document 6.2.4.8 Part 4 Marine Chapter 8 Commercial Fisheries** and **Application Document 6.2.4.9 Part 4 Marine Chapter 9 Other Sea Users**, which should be read in conjunction with this NRA.

7.1.7 A description of the shipping and navigation receptor baseline, as understood through desk-based review, is presented in the 'Baseline Conditions' section of this NRA. Risks

to shipping and navigation associated with the Offshore Scheme are assessed in the FSA section of this document, to cover the construction (installation, commissioning and decommissioning) and normal operations (operational lifetime and maintenance activities) phases of the Offshore Scheme. Where appropriate, proportionate measures to avoid, mitigate or compensate for any identified adverse effects are proposed.

Legislative Context

7.1.8 The following legislation informs the approach of the appraisal in this NRA:

- International Regulations for Preventing Collisions at Sea (COLREGS) 1972/78 (International Maritime Organisation (IMO), 1972/77), as implemented in the UK through the Merchant Shipping (Distress and Prevention of Collisions) Regulations 1996 (Maritime and Coastguard Agency (MCA), 2004);
- United Nations Convention on the Law of the Sea (UNCLOS) (1982) (United Nations (UN), 1982);
- Submarine Telegraph Act (1885) (Submarine Telegraph Act, 1885);
- International Convention for the Safety of Life at Sea (SOLAS) Chapter V (SOLAS, 1974, as amended); and
- Marine and Coastal Access Act (2009), section 69 subsection (1)(c) (Marine and Coastal Access Act, 2009).

Policy

7.1.9 A number of policies and regulations aim to ensure that shipping and navigation are taken into account during planning and execution of projects within UK waters. These include the UK Marine Policy Statement (MPS) (HM Government, 2011) and the UK Marine Plans, specifically the South East Inshore Marine Plan (Department for Environment, Food and Rural Affairs, 2021) and the East Inshore and East Offshore Marine Plans (Department for Environment, Food and Rural Affairs, 2014). These marine plans specifically address a number of relevant policies to shipping and navigation, as shown in Table .

7.1.10 More broadly, national planning policies relevant to shipping and navigation include:

- Overarching National Policy Statement for Energy (EN-1) (Department for Energy Security & Net Zero, 2023); and
- National Policy Statement for Electricity Networks Infrastructure (EN-5) (2011) (Department for Energy & Net Zero, 2023) Section 2.13.21 to 2.13.23 which concerns coastal connections.

Table 7.1 Marine planning policies of relevance to shipping and navigation

Topic	Policy code	Policy text	How and where it is considered
South East Inshore Marine Plan			
Ports, harbour and shipping	SE-PS-1	In line with the National Policy Statement for Ports, sustainable port and harbour development should be supported. Only proposals demonstrating compatibility with current port and harbour activities will be supported. Proposals within statutory harbour authority areas or their approaches that detrimentally and materially affect safety of navigation, or the compliance by statutory harbour authorities with the Open Port Duty or the Port Marine Safety Code, will not be authorised unless there are exceptional circumstances. Proposals that may have a significant adverse impact upon future opportunity for sustainable expansion of port and harbour activities, must demonstrate that they will, in order of preference: a) avoid b) minimise c) mitigate -adverse impacts so they are no longer significant. If it is not possible to mitigate significant adverse impacts, proposals should state the case for proceeding.	Relevant ports and harbours are described in section 7.5. No permanent static sea surface infrastructure will be in place for the Offshore Scheme. However, operations will take place within a busy shipping area and risks associated with operations affecting ports and harbours have been considered at stakeholder consultation sessions (see section 7.4) and within the risk assessment and captured in assessment hazard log (see Annex 4.7.A.1).
Ports, harbour and shipping	SE-PS-2	Proposals that require static sea surface infrastructure or that significantly reduce under-keel clearance must not be authorised within or encroaching upon International Maritime Organization routeing systems unless there are exceptional circumstances.	IMO routeing systems are discussed in section 7.5. Under-keel clearance is identified as a potential hazard during stakeholder consultation (see section 7.4). The hazard is assessed in section 7.6. The assessment identifies potential minor reduction in under-keel clearance and recommends that the associated risk is suitably reduced if relevant harbour authorities and interested parties

Topic	Policy code	Policy text	How and where it is considered
			(including Harwich Haven Authority, Sandwich Port and Haven Authority and Sunk TSS users) are updated on any seabed changes as they develop (also see Recommendations section 7.7).
Ports, harbour and shipping	SE-PS-3	Proposals that require static sea surface infrastructure or that significantly reduce under-keel clearance which encroaches upon high density navigation routes, strategically important navigation routes, or that pose a risk to the viability of passenger services, must not be authorised unless there are exceptional circumstances.	As above, under-keel clearance is identified as a potential hazard during stakeholder consultation (see section 7.4). The hazard is assessed in section 7.6. The assessment identifies potential for subsurface hazard at Kent landfall and other minor reductions in under-keel clearance. The assessment recommends that the associated risk is suitably reduced if relevant harbour authorities and interested parties (including Harwich Haven Authority, Sandwich Port and Haven Authority and Sunk TSS users) are updated on any seabed changes as they develop (also see Recommendations section 7.7). Sandwich Port and Haven should also be informed of proposed exit pit locations at the earliest opportunity.
East Inshore and East Offshore Marine Plans			
Ports and Shipping	PS1	Proposals that require static sea surface infrastructure or that significantly reduce under-keel clearance should not be authorised in International Maritime Organization designated routes.	As above, under-keel-clearance is identified as a potential hazard during stakeholder consultation (see section 7.4). The hazard is assessed in section 7.6. The assessment identifies potential for subsurface hazard at Kent landfall and minor other reductions in under-keel clearance. The assessment recommends that the associated risk is suitably reduced if relevant harbour authorities and interested parties (including Harwich Haven Authority, Sandwich Port and Haven Authority and Sunk TSS users) are updated on any seabed changes as they develop (also see Recommendations section 7.7). Sandwich Port and Haven should also be informed of proposed exit pit locations at the earliest opportunity.

Topic	Policy code	Policy text	How and where it is considered
Ports and Shipping	PS2	Proposals that require static sea surface infrastructure that encroaches upon important navigation routes should not be authorised unless there are exceptional circumstances. Proposals should: a) be compatible with the need to maintain space for safe navigation, avoiding adverse economic impact b) anticipate and provide for future safe navigational requirements where evidence and/or stakeholder input allows and c) account for impacts upon navigation in-combination with other existing and proposed activities	No permanent static sea surface infrastructure will be in place for the Offshore Scheme however seabed hazards shall be appropriately marked.
Ports and Shipping	PS3	Proposals should demonstrate, in order of preference: a) that they will not interfere with current activity and future opportunity for expansion of ports and harbours b) how, if the proposal may interfere with current activity and future opportunities for expansion, they will minimise this c) how, if the interference cannot be minimised, it will be mitigated d) the case for proceeding if it is not possible to minimise or mitigate the interference[1]	No permanent static sea surface infrastructure will be in place for the Offshore Scheme. However, operations will take place within a busy shipping area and risks associated with the operations affecting ports and harbours have been considered at stakeholder consultation sessions (see section 7.4) and within the risk assessment and captured in assessment hazard log (see Annex 4.7.A.1). Only potentially minor interference with Harwich Haven dredging activity has been identified through consultation. The associated risk is considered suitably reduced if Harwich Haven Authority are updated on any seabed changes as they develop (also see Recommendations section 7.7)

Guidance

7.1.11 The appraisal methodology has been aligned to the following best practice guidance documents in so far as they are relevant to a cable project:

[1] PS3 applies to the Inshore Marine Plan area only.

- International Maritime Organisation (IMO) Revised Guidelines for Formal Safety Assessment (FSA) for Use in the Rule-Making Process (MSC-MEPC.2/Circ. 12/Rev.2) (IMO, 2018);
- Maritime and Coastguard Agency (MCA) MGN 654 (M+F) Offshore Renewable Energy Installations (OREI) safety response (MCA, 2021b);
- (International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) Recommendation R1039, Edition 3.0, The Marking of Man-Made Structures (IALA, 2021a) (IALA, 2021a);
- IALA Guideline G1162, Edition 1.1, The Marking of Offshore Man-Made Structures, Dec 2021 (IALA, 2021b); and
- Maritime and Coastguard Agency (MCA) MGN 661 (M+F) Navigation - safe and responsible anchoring and fishing practices (MCA, 2021a).

Study Area

7.1.12 The shipping and navigation study area comprises a 10 nautical mile (NM) buffer (equivalent to an 18.5 km buffer) around the Offshore Scheme Boundary, as shown in **Figure 6.4.4.7.A.1 Shipping and navigation study area**. This wide study area reflects the large potential Zone of Influence (ZoI) of the Offshore Scheme in respect to shipping and navigation receptors. The study area considers the Offshore Scheme only, from MHWS at the landfall in Suffolk, to MHWS at the landfall in Kent.

7.2 Approach to NRA

Methodology Overview

7.2.1 This NRA adheres to both MCA guidelines on NRA and IMO guidelines on FSA. Specific details of the approach adopted here are set out later in this section. The identification and appraisal of hazardous outcomes and mitigation measures are based on expert judgment following widely adopted risk appraisal frameworks and informed by consultation responses from a range of stakeholders.

7.2.2 A scoping report, submitted to and consulted on by the Planning Inspectorate (National Grid, 2022) identified aspects of the Offshore Scheme that have the potential to affect shipping and navigation during the construction phases, (covering installation and commissioning), normal operations covering the operational life and maintenance of the cable, and decommissioning activities. It is necessary to identify and assess the potential interactions, to understand the potential hazards, identify possible mitigation measures and ultimately demonstrate that the Offshore Scheme will not adversely affect vessel traffic.

7.2.3 In line with NRA methodology, this appraisal comprises three principal elements:

- Baseline Conditions – summarising navigational baseline characterisation work to establish densities and types of traffic in the marine environment;
- Stakeholder Consultation – a range of stakeholder consultation activities including hazards workshops; and
- Formal Safety Assessment – presenting the outcomes of risk assessment and the Hazard Log.

7.2.4 Navigational features and patterns of vessel activity within the study area were assessed to establish baseline conditions (section 7.5) and inform the subsequent FSA. Key features located outside of the study were also considered as required. Stakeholder consultation informed both the baseline understanding of shipping in the area and, through hazard workshops, the population and refinement of the hazard log. The FSA and hazard log (section 7.6 and Annex 4.7.A.1 respectively) have assessed hazards such as collision, snagging and disruption to shipping against risk categorisation, mitigation measures, and ultimately, acceptability, adhering to the FSA methodology. The outcome of these steps is the formulation of recommendations to inform decision-making for all relevant parties.

Baseline Conditions

7.2.5 The navigational baseline characterisation comprises the following four elements:

- Key navigational features;
- Emergency response overview;
- Maritime incident analysis; and
- Marine Traffic Study (MTS).

Key navigational features

7.2.6 The navigational baseline identifies key navigational features within the study area including ports, anchorage areas, IMO routeing, offshore pilot boarding and landing grounds, military practice areas and recreational features, as well as planned and existing offshore infrastructure.

Emergency response overview

7.2.7 An overview of the emergency response in the region is described, considering Royal National Lifeboat Institution (RNLI) and Search and Rescue by Helicopter (SARH) resources in proximity to the Offshore Scheme.

Maritime incident analysis

7.2.8 Maritime incidents recorded by RNLI, SARH and MAIB in the vicinity of the Offshore Scheme have been reviewed. The occurrence of maritime incidents can give an indication of the general level of marine incident risk in this region, which may be relevant during the construction of the Offshore Scheme.

Marine traffic study

7.2.9 The MTS uses vessel traffic data including Automatic Identification System (AIS) and Vessel Monitoring System (VMS) data to establish baseline vessel traffic conditions in the study area, analysing such aspects as vessel type, size and status, as well as a section focussing on fishing traffic. A full year of AIS data has been selected, from 1 March 2022 to 28 February 2023, to cover four contiguous seasons. The data used in this MTS will be discussed in detail in section 7.3.

Assessment of Hazards through FSA

7.2.10 The FSA process provides a systematic method for evaluating and controlling risk, within a structured framework. Baseline shipping patterns and navigational features along with stakeholder consultation provide the basis for establishing potential hazards and their relevant details. These hazards are then characterised in terms of their severity of consequence and likelihood, which ultimately provides for risk categorisation against a risk matrix, to determine an outcome of either 'Unacceptable', 'Tolerable if ALARP' or 'Broadly Acceptable'.

7.2.11 In the case of 'Unacceptable' outcomes, comprehensive changes to the design are required, as additional risk reduction, control or mitigation measures are considered likely to be insufficient to reduce the risk appropriately. Where a 'Broadly Acceptable' initial assessment is determined no further measures are required as these are considered unlikely to provide substantial risk benefit. Additional measures are however identified to provide a reduction in risk where a 'Tolerable if ALARP' assessment is made.

7.2.12 The residual risk, with additional mitigation measures considered, is subsequently assessed to determine risk acceptability in accordance with the principles of ALARP (As Low As Reasonably Practicable). Where necessary or appropriate, qualitative cost-benefit analysis of mitigation measures is undertaken to determine/justify a basic ALARP position.

7.2.13 Cumulative effects from neighbouring developments are also considered to ensure any interactions and future situations with potential hazardous outcomes are captured and suitable recommendations can be made. This is captured in **Application Document 6.2.4.11 Part 4 Marine Chapter 11 Inter-Project Cumulative Effects** and is not part of this document.

7.2.14 The FSA therefore comprises the following elements:

- Hazard identification;
- Initial risk assessment, considering existing or embedded mitigation measures;
- Identification of additional risk mitigation measures and resulting residual risk; and
- Cost-benefit analysis.

Hazard identification

7.2.15 Considering the activities of the Proposed Project, baseline information provided in the MTS, other consultation responses, professional judgement and industry experience, a list of hazards and their outcomes relevant to marine navigation was compiled and assessed through hazards workshop sessions with relevant stakeholders (see section 7.4) which form part of the wider Preliminary Hazards Analysis (PHA) process. The list was compiled considering all principal phases and elements of the Offshore Scheme. Note that the "worst credible" and "most likely" outcomes were established to provide a comprehensive understanding of the hazards. The list was captured in a table, to be retained as an auditable hazard log (see Annex 4.7.A.1).

7.2.16 In addition to hazards, the workshops identified mitigation measures considered as 'embedded' i.e. assumed to be existing, effective and therefore taken into consideration when determining risk. These were categorised as being specific to the project or otherwise statutory or good industry practise. Any further risk reduction considerations,

based on stakeholder expertise and local knowledge were also identified and captured in the sessions.

7.2.17 The potential consequences of the hazards and their likelihood were then assessed using a risk assessment matrix as part of a desktop exercise.

Risk assessment

7.2.18 The risk assessment process is based on a classic matrix approach. The risk assessment categorisations directly reflect the UK Health and Safety Executive principles of ALARP and align with NRA terminology. Additionally, the approach is consistent with relevant marine guidance from the International Maritime Organisation (IMO, 2018) and the UK Maritime Coastguard Agency (MCA, 2021a). Each hazard is individually evaluated against specific criteria and assigned categories for severity as presented in Table 7 and frequency/likelihood as presented in Table 7.3. The risk matrix which combines them is included in Table 7.4. Note that the potential consequence severities are applied to shipping and navigation generally rather than to specific vessels. The assessment is therefore focused on worst case personnel safety and operational outcomes rather than other categories such as environmental release or reputational consequences which vary more widely across the vessel categories. However environmental, and reputational consequences are perceived to be no greater in severity than worst case personnel safety outcomes and therefore conservatively addressed by the assessment and any further identified risk reduction measures.

Table 7.2 Severity of consequence of hazard criteria

Severity	Description
High	• Loss of a crew member, or multiple serious injuries • Major/Severe damage to infrastructure or vessel • Operations/activities halted indefinitely
Medium	• Serious injury to person • Notable damage to infrastructure or vessel • Protracted operational delays
Low	• Minor injury(s) to person • Minor/Local damage to equipment or vessel • Minor operational delays
Negligible	• No significant operational impacts

Table 7.3 Likelihood/frequency criteria

Likelihood/frequency	Criteria description
Remote	Never occurred during Company's activities but has been known to occur in the wider industry

Likelihood/frequency	Criteria description
Unlikely	Has occurred in Company's activities in the past but as an isolated incident under exceptional circumstance
Occasional	Has occurred on more than one occasion during Company's activities in the past
Likely	Occurs regularly during Company's activities

7.2.19 The likelihood and consequence categories are combined for each hazard using the risk matrix shown in Table 7.4 which is used to derive a risk tolerability level of either Unacceptable, Tolerable or Broadly Acceptable. Definitions of each risk tolerability level are provided in Table 7.5 below.

Table 7.4 Risk Matrix

Likelihood/frequency	Negligible	Low	Medium	High
Likely	Broadly Acceptable	Tolerable	Unacceptable	Unacceptable
Occasional	Broadly Acceptable	Tolerable	Tolerable	Unacceptable
Unlikely	Broadly Acceptable	Broadly Acceptable	Tolerable	Tolerable
Remote	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Tolerable

Severity of consequence

Table 7.5 Tolerability definitions

Tolerability	Definition
Broadly Acceptable (Low Risk - not significant)	Generally regarded as acceptable and adequately controlled. At these risk levels the opportunity for further reduction is limited.
Tolerable if ALARP (Moderate Risk - significant)	Typical of the risks from activities which people are prepared to tolerate to secure benefits. There is however an expectation that such risks are properly assessed, appropriate mitigation measures are in place, residual risks are as low as reasonably practicable (ALARP) and that risks are periodically reviewed to monitor if further controls are appropriate.

Tolerability	Definition
Unacceptable (High Risk - significant)	Generally regarded as unacceptable whatever the level of benefit associated with the activity. Significant risk mitigation or design modification required to reduce to tolerable (ALARP).

Identification of additional mitigation measures

7.2.20 Where risks are assessed as being unacceptable or tolerable (significant) after factoring in the embedded mitigation measures already identified, further additional risk mitigation measures are identified and considered.

Cost-benefit analysis

7.2.21 In order to formulate recommendations for decision-making, any additional risk mitigation measures identified are subjected to a qualitative cost-benefit comparison in order to justify the measure and establish a residual risk categorisation and basic ALARP position.

Risk assessment table

7.2.22 The risk assessment outputs have been captured in a table such that the hazards for each of the Offshore Scheme phases and the relevant embedded mitigation measures and any additional mitigation measures identified, are captured to provide an auditable hazard log.

Cumulative effects

7.2.23 The approach to Cumulative and In-Combination effects assessment is set out in **Application Document 6.3.1.5.A Appendix 1.5.A Cumulative Assessment Methodologies**.

7.2.24 The assessment is based on the best available data from other plans, projects and marine activities and associated information which is currently in the public domain or has been provided to the project team. The assessment assumes that publicly available information is accurate; the assessment is also reliant on collaboration with a range of statutory consultees to the deemed Marine Licensing process, neighbouring authorities and other developers to identify changes in information which may be pertinent to the assessment. Where there are specific limitations associated with data, they will be highlighted as the assessment progresses.

7.2.25 A list of potential cumulative projects and activities has been compiled and includes offshore industry activities in the Southern North Sea. Each hazard has been qualitatively reviewed against the potential direct and indirect cumulative effects from any of the projects listed as well as general increases in traffic density. Any issues have been captured, and further risk mitigation measures considered where deemed appropriate. This process is captured in **Application Document 6.2.4.11 Part 4 Marine Chapter 11 Inter-Project Cumulative Effects** and is not included as part of this NRA document.

7.3 Data Sources

7.3.1 Baseline conditions have been established by undertaking a desktop review of published information and through consultation with relevant organisations. An MTS has been undertaken and involved the acquisition of detailed AIS data for a 10 nautical mile (NM) wide corridor around the Offshore Scheme Boundary.

7.3.2 The data sources used to inform the baseline description and appraisal are set out in Table 7.6.

Table 7.6 Data sources

Title	Source	Year(s) analysed
Navigational features		
Royal Yachting Association (RYA) UK Coastal Atlas of Recreational Boating	RYA	2019
Marine Themes Administrative and Transport Themes	OceanWise	N/A
Admiralty charts	UKHO	N/A
Admiralty Sailing Directions Dover Strait Pilot (13th Edition) NP28	UKHO	2020
The Shell Channel Pilot (8th Edition)	IMRAY	2017
Admiralty Sailing Directions: North Sea (West) Pilot (11th Edition) NP54	UKHO	2018
Disposal sites	CEFAS	2021
UK wrecks and obstructions data	UKHO	2021
Oil and gas surface structures and pipelines data	NSTA	2023
Offshore renewables lease data	Crown Estate	2022
KIS-ORCA cables data	ESCA	2021
Emergency response & marine incidents		
RNLI lifeboat station locations and SARH base locations	RNLI, Department of Transport	2020
RNLI Return to Service and SARH taskings data	RNLI, Department of Transport	2008-2020 2016-2021
Marine Accident Investigation Branch (MAIB) incidents	MAIB	1992-2021
Marine Traffic Study		

Title	Source	Year(s) analysed
Automatic Identification System (AIS) data	Marine Traffic	2022-2023
Vessel Monitoring System data (VMS)	MMO	2017-2021 2016-2019 2011-2019
Sightings/surveillance data	MMO	2011-2019
Port and harbour authority websites and documentation	Various	2023-2024

AIS Data

7.3.3 The IMO requires that all ships of ≥ 300 gross tonnage engaged on international voyages, cargo vessels of ≥ 500 gross tonnage not engaged on international voyages, and all passenger ships built on or after 1st July 2002, regardless of size, are fitted with an AIS transponder. All European Union (EU) registered fishing vessels of length 15 m and above are required to carry AIS equipment by EU directive. Smaller fishing vessels (below 15 m) as well as recreational craft are not required to carry AIS although a proportion does so voluntarily smaller fishing vessels are likely to be under-represented in the AIS data.

7.3.4 AIS data has been used to assess the patterns and intensity of shipping activity in the vicinity of the Offshore Scheme. A full year of AIS data has been selected, from 1 March 2022 to 28 February 2023 to cover all seasons. The AIS records were supplied by Marine Traffic (industry standard commercial AIS data supplier) with all standard parameters (longitude, latitude, vessel Maritime Mobile Service Identity (MMSI) number, status, speed, course, heading and timestamp) and the following additional parameters:

- Deadweight tonnage (DWT);
- Vessel length;
- Vessel draught; and
- Vessel type.

7.3.5 The AIS data was provided in a raw, point-based format, as well as in a format converted into vessel tracks. The tracks were subsequently clipped to the 10 NM study area shown in **Figure 6.4.4.7.A.1 Shipping and navigation study area**. Vessel density grids for the wider area were produced by overlaying a 1 square kilometres (km2) hexagonal grid and determining the density of tracks within each cell. Vessel tracks were assumed to be wholly in the season or month in which the track started. Vessel speeds were calculated from the length of the track and the start and end times of that track.

VMS and Sightings Data

7.3.6 As mentioned above, AIS is only a requirement of larger vessels, or those carrying passengers, whereas fishing vessels <15 m length are exempt (although many carry AIS voluntarily for safety). As such, AIS data can underrepresent fishing activity. However, the EU requires that all EU, Faroese and Norwegian fishing vessels of 12 m and above are fitted with a VMS. Vessel positions are transmitted every two hours rather than every few minutes as for AIS data, so tracks cannot be readily reconstructed. Nevertheless, the data provides an informative overview of the distribution and density of fishing vessels over 12 m.

7.3.7 Two sets of VMS data were obtained:

- Anonymised VMS point data for the area of interest for 2017 - 2021 (no information on gear type or status, but vessel speeds can be used as a proxy for vessel fishing status, albeit with an inherent level of uncertainty); and
- MMO Fishing activity for UK vessels 15 m and over by International Council for the Exploration of the Sea (ICES) statistical rectangle (this includes data about time spent fishing and gear type; 2016 - 2019).

7.3.8 Additionally, MMO sightings data 2011 to 2019 representing vessels sighted on surveillance flights was sourced.

Additional Data Sources

7.3.9 Due to the likely under representation of small recreational vessels in the AIS data, additional data sources including the RYA Coastal Atlas have been used to validate the findings of the AIS analysis. From consultation with the RYA (see Table 4.8.A.8), they note that while not all craft have AIS equipment, there has been an increase in uptake in recent years and so the RYA considers that the RYA intensity dataset gives a good indication of the recreational boating activity in the region. Additional analysis considers key navigational features and fishing activity. Key navigational features were extracted from additional sources of data including Admiralty charts and Admiralty Pilot (Sailing Directions) books. Maritime incident data from the RNLI, SARH taskings data from the Department of Transport and MCA, and MAIB data have been utilised to assess the emergency response in the region.

Data Gaps and Limitations

7.3.10 As noted above in the ‘AIS data’ section (7.3.4), the temporal extent of the AIS data covered a full year from the beginning of March 2022 to the end of February 2023.

7.3.11 As also noted above in the ‘VMS and Sightings Data’ section (7.3.6), small fishing and recreation vessels are likely to be underestimated in AIS data. In order to mitigate this, analysis of VMS data has also been included in this chapter to capture a fuller picture of small fishing and recreation vessels. It should however be noted that VMS data does not cover vessels of < 12 m in length, and in the case of the MMO fishing activity by ICES rectangle data, does not include vessels of < 15 m in length. RYA Coastal Atlas data support the study of recreational activity in the region.

7.4 Consultations

7.4.1 In order to inform the shipping and navigation appraisal, consultation with key relevant maritime stakeholders was undertaken. Two dedicated consultation sessions were held via Microsoft Teams, each comprising the following elements:

- Introduction to team and summary of NRA process;
- Offshore Scheme overview;
- Navigational baseline summary; and
- Facilitated preliminary hazards assessment workshop.

7.4.2 A further recreational stakeholder session with the RYA was also undertaken, but held an open discussion rather than a hazards workshop. In addition, the Cruising Association (CA) was provided with project information and invited to comment on shipping and navigation considerations for the Proposed Project and attend the recreational session but did not attend.

7.4.3 Additionally, Sandwich Port and Haven has been identified as a relevant stakeholder for shipping and navigation and were invited to comment on the Proposed Project and to an additional consultation session which took place on the 30th June 2023.

7.4.4 It is also noted that consultation between the Proposed Project and shipping and navigation stakeholders has been ongoing throughout the EIA process for the Proposed Project and has helped to refine the routeing of the Offshore Scheme. This input has also been factored into the assessment in this NRA, and key stakeholder responses relevant to shipping and navigation captured in the following sections.

7.4.5 In addition, engagement with North Falls Offshore Windfarm has resulted in agreement to continue to engage during pre-construction and construction with other cable installation projects in the vicinity of the Sunk pilot boarding station, in order to coordinate marine activities to minimize the impact of shipping and the construction programmes of both the Proposed Project and North Falls.

Consultation Sessions

7.4.6 The NRA consultation meetings and consultees are summarised in Table 7.7.

7.4.7 Consultee input has been incorporated where appropriate into the NRA such that concerns and impacts are recorded and associated risks are addressed.

7.4.8 In addition to these NRA-specific meetings, the Project attended the Five Estuaries pilotage and cable installation workshop on 14 June 2024.

Table 7.7 Consultation meetings

Date	Meeting	Location	Attendees
24 April 2023	Statutory bodies	Remote meeting	Maritime and Coastguard Agency (MCA) UK Chamber of Shipping (CoS) Trinity House (TH)

Date	Meeting	Location	Attendees
28 April 2023	Port and harbour authorities	Remote meeting	Lowestoft and Ipswich (L&I) Harwich Haven Authority (HHA) Port of London Authority (PLA) Ramsgate (R) Port of Felixstowe (PoF)
8 June 2023	Recreation	Remote meeting	Royal Yachting Association (RYA)
30 June 2023	Sandwich Port and Haven	Remote meeting	Sandwich Port and Haven (SPH)
Planned December 2024	Port of London Authority	Remote meeting	Port of London Authority (PLA)

Consultation Summary

7.4.9 The issues raised during consultation with marine stakeholders and where these issues are considered is detailed in Table 7.8.

Table 7.8 Consultation summary

Consultee and type of response	Issue raised	Response to issue raised/where considered in NRA
CoS – consultation meeting	Request that Five Estuaries and North Falls wind farms and cable corridors are plotted on NRA map figure.	The NRA has included these two developments on **Figure 6.4.4.7.A.5 Other navigational features.**
CoS – consultation meeting	Have you investigated anchoring not within anchoring areas and the circumstances that resulted in them doing so.	This is addressed in section 7.6.
TH – consultation meeting	Noted that guidance IALA 0139 is now G1162, but asked to reference both in the NRA.	See section 7.1.11
CoS – consultation meeting	Would like to see consideration of risk to business/reputation included in the hazard log, as well as environmental impacts included e.g. of a collision causing an oil spill	The consequences of the identified hazards such as disruption, collision etc may be quite different for different vessels. Therefore, the assessment is focused on the worst-case personnel safety and general outcomes. However environmental, and reputational consequences are

Consultee and type of response	Issue raised	Response to issue raised/where considered in NRA
		perceived to be no greater in severity than worst case personnel safety outcomes and therefore conservatively addressed by the assessment and any further identified risk reduction measures. (Also see section 7.2.18). Further detailed study of potential environmental and business effects fall outside of the scope of this NRA.
PLA – consultation meeting	PLA need to know exactly where the cable installation vessel is at all times. Daily reports to specify which section you are working in?	Project team to agree communication protocol with TSS operators and build into mitigation commitments. Project team to consider mitigation measures, which is noted in section 7.6. Recommendation made (see section 7.7).
L&I – consultation meeting	No reference to pollution if a tank was breached and the clean-up. The clean-up would affect shipping.	This is captured under the worst credible outcome under possible disruptions and delays to shipping, see Hazard Log in Annex 4.7.A.1.
HHA – consultation meeting	HHA are deepening their deep-water channel at the moment – current vessels are 15.9m and are looking at vessels up to 17m draft. They are quite greatly restricted in their ability to manoeuvre. They will be having to use that deep water track as well. From a collision point of view, they are very much restricted in where they can go.	This is noted in section of the FSA. Recommendation made (see section 7.7).
HHA – consultation meeting	For the boarding of pilots, this usually occurs one mile east of the boarding station to give them enough sea room before the pilot gets on the bridge. There is a marked pilot boarding diamond, vessels do board approximately 1 mile east of that. (Sunk pilot station)	This has been noted in section 7.5.
HHA – consultation meeting	Frequency of large vessels: WCS is 4 a day but 6-8 a week at least. Also, it is a 3 hours transit for large vessels to get in over high water period.	This has been noted in section 7.6.
HHA and PLA – consultation meeting	HHA stated it is uncommon that vessels will anchor unexpectedly/	This has been noted in section 7.6.

Consultee and type of response	Issue raised	Response to issue raised/where considered in NRA
	outside designated anchorage, not a common practise. PLA echoed this.	
PLA and HHA - consultation meeting	Regarding fishing vessels, PLA noted that most fishing in this region happens further inland. HHA commented that fishing is an issue they have had at the Sunk, generally more with foreign fishing vessels, larger fishing vessels and the local fleets.	Section 7.6 notes consideration of foreign vessels.
PLA and HHA - consultation meeting	Re rock berms at cable crossings: PLA stated that they maintain a 20 m depth. PLA stated that future proofing is 20 m and that is what they are currently dredging to. HHA commented that rock berms were not previously raised, and anything that would affect the depth of vessels needs to be flagged with them. HHA stated that it's also a concern at the approach to their channel as well. Rock placement in the vicinity of the anchorage could also cause an issue for anchoring. This could create additional risk to vessels anchorage in this area.	Rock berms and cable crossings have been discussed in section 7.6.Recommendation made (see section 7.7).
PLA - consultation meeting	PLA expressed that they would want communication of when the Project is going to be doing the works and where (which section).	Recommendation made (see section 7.7)
RYA – consultation meeting	RYA stated that the RYA UK Coastal Atlas intensity dataset uses AIS data as its source, and that while not all craft have AIS equipment, there are more than was possible 5-6 years ago, so considers that this dataset gives a good indication of the recreational boating activity in the region.	The NRA uses the RYA UK Coastal Atlas in the assessment (see section 7.3).
RYA – consultation meeting	RYA stated that the main interest of RYA is the shallow waters along the coast at each landfall, and particularly the section along the Kent coast. Notes that draughts are going to be	Project team expanded on the method of assessing UKC, stating that the Project likely to cover potential reductions in UKC qualitatively in the NRA assessment, but that it doesn't

Consultee and type of response	Issue raised	Response to issue raised/where considered in NRA
	shallower in that location, and that this is a very busy area with lots of cable crossings because of connectors from the continent as well as windfarm activity. Key from RYA point of view is making sure that MCA methodology for UKC is used as a guide so impact on chart datum is kept to a minimum.	go into a full method as specified by the MCA for tidal energy devices. Project is aware of UKC issues and the need to properly chart the as-built structures. Measures including notification of UKHO is discussed in section 7.6. Recommendation made (see section 7.7).
RYA – consultation meeting	Stated that RYA key interest is on what is left behind after construction phase; due to planned HDD techniques would expect not a huge impact on coastal area, and would expect that the cable would then be sufficiently charted and marked.	Project is aware of UKC issues and the need to properly chart the as-built structures. Measures including notification of UKHO is discussed in section 7.6. Recommendation made (see section 7.7).
SPH – consultation meeting	SBH: Querying the 1.5 m burial below seabed level. The channel moves north by dozens of meters a year. It is expected to migrate northwards until it meets the cliffs. SPH: Sandwich Port and Haven doesn't do any dredging of the river mouth, only minor dredging within the River Stour. At the mouth of the river, we just buoy it accordingly, it can move 50 m over a winter. SPH: At low tide springs the water depth is 1 m of water at most.	Project responded that 1 m to 2.5 m is the base and then the survey data will inform us if we need to bury deeper. We can also look at River Stour migration to inform depth. We are very interested in information to inform depth. Project is aware of the movement of the river channel across Pegwell Bay, is looking to do a trenchless solution at Pegwell Bay to go under the saltmarsh, and would like to discuss further with SPH. Potential reduction in water depth and the movement of the River Stour approach channel over time is noted in section 7.6.
SPH – consultation meeting	SPH: Regarding anchorage, it is very rare for boats to anchor in the middle of Pegwell (where your route runs) as the water is so shallow, to the north of Pegwell bay, under the cliffs, people would anchor. People would also anchor in the channel around high tide to spot seals. Very few people spend overnight/low tide in this area.	This note on anchorage has been included in section 7.6.
SPH – consultation meeting	SPH: Regarding navigation, everyone that comes out the river goes around Shell Ness to the safe water mark and turn north to Ramsgate or south to	Project team confirmed that there would be guard vessels during cable laying. Communication is considered

Consultee and type of response	Issue raised	Response to issue raised/where considered in NRA
	Dover. The cable laying vessel may disrupt navigation in the Ramsgate channel as it will limit the area for boats to go. For Nemo there were guard vessels which worked quite well. There are quite a few boats without VHF so you will need to liaise with the harbour masters to update their customers in the boat yards. Ramsgate channel is regarded as open water navigation (not directly managed by Ramsgate VTS).	in section 7.6. Recommendation made (see section 7.7).
SPH – consultation meeting	SPH: Just to note last time (with the Nemo project), there were some minor incidents due to amateur boaters.	Project stated that we have designed in mitigation: Notice to mariners, navigation warnings will be sent to a distribution list which will include Port and Harbour Authorities. This is noted in section 7.6. Recommendation made (see section 7.7).
SPH – consultation meeting	SPH: Is there spoil being dumped offshore? One of our biggest concerns would be a bank across a shallow channel, but it doesn't sound like that is a risk here.	The spoil from trenchless solution is dealt with at the land end. If there is anything in the intertidal area, it will be very short-term e.g. soft trenches which backfill within days. We will be generally adopting the rule that we won't reduce depth by 5% but in Pegwell Bay we know water depths are very low. Potential reduction in water depth is discussed in section 7.6. Recommendation made (see section 7.7).

Statutory Consultation

7.4.10 Following the completion of the Preliminary Environmental Information Report (PEIR), Statutory consultation for the Proposed Project took place between 24 October and 18 December 2023. Key responses relevant to shipping and navigation are summarised in Table 7.9.

Table 7.9 Summary of statutory consultation and responses

Consultee	Consultee comment	Response/where addressed
MCA (email 18 December 2023)	We note in the documentation that “In line with MCA guidance, it is not planned to reduce the existing navigable water depth by more than 5% along any section of the cable (with respect to Chart Datum). It is therefore expected that under-keel clearance is only reduced at a very small number of locations, which are anticipated to be located close into shore”. The MCA would expect any locations where this is identified, such as at cable crossings or close in shore, to be discussed further with relevant stakeholders including the SHAs, CHAs and the MCA, as appropriate. We note there are several active, planned and out of services cables which will require crossings. The cable passes through key navigational routes and areas where vessels might be constrained in manoeuvrability because of available depth of navigable water. Any depth reduction of more than 5% must be discussed and agreed with the SHAs and MCA.	The issue of potential impact to under keel clearance and navigation is discussed in 7.6. National Grid welcomes this comment and notes the consultee's requirement. If post Design Freeze 3, the route and burial depth results in any depth reduction of more than 5%, ongoing stakeholder engagement will address this matter.
	Section 4.8.A.7.61 of the NRA states ‘……, as most of the bundled cable arrangement will be laid in water deep enough to minimise EMF effects and achieve the MMO criteria for less than 3% deviation over 95% of the route, the probability of disruption is assessed as ‘Remote. These combine to produce a ‘Broadly Acceptable’ risk rating and no requirement for further consideration’. The MCA would appreciate further discussion on the chosen option and the implications for the MMO and MCA’s requirements. Although we agree that there will be limited number of vessels solely relying on magnetic compass for navigation, it’s important to note that magnetic compasses are an essential navigation instrument required	Section 7.6 identifies the importance of magnetic compass as back up navigation devices. Information regarding compass deviations is presented in **Application Document 6.5 Electric and Magnetic Field Compliance Report**..

Consultee	Consultee comment	Response/where addressed
	under SOLAS Ch V and it is also a secondary device which is connected to vessels steering systems should the gyrocompass fail. Therefore, they should be given the equal weightage in terms of navigation safety.	
	We agree that the deviation may exceed our criteria regarding the compass deviation limits closer to the shore, and we are likely to be content with options 1,3 and 4 as detailed in the Appendix 4.8.B Electro Magnetic Deviation Study. We would be willing to discuss this in the post PEIR pre-submission period. Additionally, as this area falls within the SHA of Sandwich Port and Haven Authority, they are responsible for navigation in the area, and they should also be consulted on the EMF impact on vessel compasses.	Information regarding compass deviations is presented in the **Application Document 6.5 Electric and Magnetic Field Compliance Report**. These comments are noted. National Grid is maintaining a dialogue with the stakeholder and is progressing a SoCG (**Application Document 7.14 Statements of Common Ground**) Recommendation to consult with Sandwich Port and Haven Authority is also noted.
	The MCA would finally recommend ongoing engagement with the SUNK VTS User Group in particular to discuss and agree the approach for the risk mitigation measures as detailed in the NRA.	Communication with key stakeholders such as the Sunk VTS group is identified as a key recommendation of this NRA in section 7.7.
Harwich Haven Authority (email 15 December 2023)	2. Exclusion zone(s) must not be put in place in the Sunk area or channel that would restrict 24/7/365 vessel access requirements or pilot boarding operations etc.	Noted, National Grid confirms that no exclusion zones would be sought for either installation or operation of the HVDC cable system.
	3. Safety zone(s) will not be able to impede vessel traffic movements within the Sunk area or normal operations such as pilot boarding.	Rolling 500 m radius Recommended Restricted Zones (RRZs) promoting safe clearance distances will be in place around operation fleet vessels, to protect both operation fleet vessels (restricted in their ability to manoeuvre) and passing vessels from collision, as standard practise. This would not appear to impact the Pilot boarding station at the Sunk, as the Offshore Scheme

Consultee	Consultee comment	Response/where addressed
		is 2 km distant from the Sunk pilot station at all points along the Offshore Scheme Boundary. However, these will nonetheless be in force by guard vessel at all times during the operation including whilst passing through the Sunk TSS. RRZs would be established with communication to stakeholders and advanced notice to all and in liaison with Harwich and Sunk VTS. This is noted in section 7.6.
	4. We suggest that no cable joints to be in locations in the Sunk area, due to extra work required in this busy shipping area, leading to increased navigational safety risk.	This suggestion has been factored into routing, and noted in section 7.6.
	5. In the Sunk area, cable depth needs to consider that the world's largest vessels may anchor and dredge anchors in emergency scenario.	Noted, and this is stated in section 7.6. which identify that deep draught vessels are present, and considers the risk of anchoring in detail in the assessment process.
	6. The cable depth must take into account the draught of current and future vessels and future dredging. Consider a maximum draught of 20m plus 10% UKC, as such minimum depth required 22m below chart datum.	Consideration of this issue is given in section 7.6. **Application Document 6.2.1.4 Environmental Statement Part 1 Introduction Chapter 4 Description of the Proposed Project** should be referred to for specifications on burial depth for the Proposed Project.
	7. Suggest that no project vessels with restricted ability to manoeuvre (cable laying, UXO clearance, survey etc) are to operate in the wider Sunk area when visibility below nautical 2 miles.	This is included as an additional risk control measure in section 7.7.
	8. Due to the location of the Sunk Pilot station and the large vessel transiting the Sunk area, we require that the cable installation (and associated works) is north of both the Storm Buoy and the W1 buoy, and south of the charted Sunk deepwater anchorage. Moving	Through discussion with Harwich Haven Harbour Authority, the route has been refined to route north of the W1 buoy. This is discussed in section 7.6.

Consultee	Consultee comment	Response/where addressed
	south of the Storm or W1 buoys would not be considered safely achievable and would add an unacceptable level of navigational risk (not ALARP).	
Port of London Authority (PLA) (email 5 December 2023)	At the Sunk the route goes east of the pilot diamond in water deeper than 20m. The route then crosses the Long Sand Head two way route, again in deeper water. The PLA has no in principle concerns about this.	Noted.
	Any cable crossings should be avoided in the vicinity of the NE Spit Pilot Station to avoid disruption to this crucial service when laying the cable and there should be no reduction in water depths in this area. The Option Selection and Design Evolution Report lists the factors considered in determining the corridor in Section 4.5.5 the PLA is broadly content with the criteria but would suggest that they should also consider port facilities such as pilot stations which play a crucial role in the successful operation of a port.	National Grid's routing development has considered the requirements of Port Facilities and pilot stations. For example, the Proposed Project currently routes south of the Sunk Deepwater Anchorage and north of the Sunk Pilot station in accordance with engagement and requirements of HHA.
Port of Ramsgate (feedback form)	Will the cable pass to the east of RA buoy in the Ramsgate compulsory pilotage area?	As described in section 7.5, the Marine Scheme is planned to route to the east and south of the RA buoy. The planned route crosses through the southern section of the Ramsgate pilotage area.
	When is crosses the Thanet offshore windfarm will mats be used? If so will it lessen the depth of water there? Currently about 5.7m - 7.2 above Datum.	**Application Document 6.2.1.4 Environmental Statement Part 1 Introduction Chapter 4 Description of the Proposed Project** should be referred to for detail on cable protection. Recommendations regarding cable protections where necessary, and matters of under keel clearance, are considered within section 7.6.

Consultee	Consultee comment	Response/where addressed
	Currently Ramsgate has not commercial ferry operator. Please be aware that this might change. Will the cable laying effect the passage of ferries in & out of Ramsgate?	Any potential risk of disruption to passenger vessels is considered in section 7.6.

Targeted Consultation

7.4.11 Additional feedback was requested from key shipping and navigation stakeholders, during Q1-Q2 2024. Key comments are captured in Table 7.10.

Table 7.10 Summary of targeted consultation

Consultee	Comment	Response/where addressed
Trinity House (email 31 July 2024)	Trinity House (TH) provides Aids to Navigation (AtoN) within, or close to, the order limits and would request that the project formally discusses any planned interaction with these. We try to maintain a safe margin between any of our AtoN and cables to allow for them moving off of station due to weather or other reasons. Our main concerns are around the Sunk W1 buoy, Sunk Centre Buoy, and Gull Buoy, as these lie within the order limits and are significant marks in the area. We note the project identifies AtoN in Sec 4.8.7.12 of PEIR Vol1 Part4 Chapter 8.	This is addressed via ongoing stakeholder communications and the recommendation for enhanced communication planning which is intended to support coordination and alignment of activities and requirements as the project progresses (section 7.7).
	The proposed order limits in Pegwell Bay and approaches to Ramsgate may also contain AtoN provide by the Statutory Harbour Authorities or other parties such as Royal Thanet Yacht Club. If these are likely to be affected by the project the relevant authorities should be consulted so that they can fulfil their obligations to inform TH of any changes. Similarly, there are beacons in the vicinity of the proposed order limits to the North of Aldeburgh. If these are affected by the project the owners of the beacons and TH should be consulted. We especially note one charted beacon which is an Environment Agency asset.	This is addressed via ongoing stakeholder communications and the recommendation for enhanced communication planning which is intended to support coordination and alignment of activities and requirements as the project progresses (section 7.7).

Consultee	Comment	Response/where addressed
	TH also has concerns over any significant depth reduction created by the cable lay or any additional cable protection used along the route or where the cable crosses other infrastructure. Where there is a depth reduction which could affect safe navigation, we would request early discussions on the mitigation which, as the project notes, could include AtoN. In some parts of the project limits, the 5% reduction as per Maritime and Coastguard guidance may not be appropriate. We are grateful that the project is discussing this with all parties including the ports and harbours.	This is addressed via ongoing stakeholder communications and the recommendation for enhanced communication planning which is intended to support coordination and alignment of activities and requirements as the project progresses (section 7.7).
	The use of AtoN as mitigation for exposed cable is recognised in numerous places throughout the documentation and consultation with TH before any of these are deployed is also noted. TH do not always consider buoys suitable mitigation for exposed cables as they would need to be placed very close to the cable to be effective and could create an additional hazard for surface navigation so discussions on this matter, if identified, will be required.	TH approval shall be sought for the use of any AtoN as mitigation. See section 7.6.
	TH requests early dialogue on any interact the project anticipates with our AtoN within the order limits and the potential use of AtoN as mitigation during the project. The Sunk Precautionary Areas are extremely busy shipping routes. TH recommends that there is a coordinated plan for controlling the projects vessels during the surveying and construction periods. This should be devised in consultation with the Ports, Pilots and other parties with an interest in the area.	This is addressed via ongoing stakeholder communications and the recommendation for enhanced communication planning which is intended to support coordination and alignment of activities and requirements as the project progresses. See section 7.7.
Harwich Haven Authority (email 5 August 2024)	We request that no Restricted Ability to Manoeuvre (RAM) works conducted by the Sea Link project should run concurrently with RAM works already planned by the Five Estuaries and North Falls project developers in the Sunk area. It is our opinion that this would cause an unacceptable level of navigational risk. Therefore, we insist that the Sea Link project liaise with other planned project teams and ourselves to avoid this situation. This requirement for no RAM concurrent	This is addressed via ongoing stakeholder communications and the recommendation for enhanced communication planning which is intended to support coordination and alignment of activities and requirements as the project progresses. See section 7.7. Additionally,

Consultee	Comment	Response/where addressed
	works, operations or activity must be written into the DCO.	the Project has agreed with North Falls Offshore Wind to coordinate as far as practicable marine activities which may overlap in time, in order to minimise the impact on shipping and the North Falls construction programme and the construction programme for Five Estuaries Offshore Wind Farm and Sea Link. This will also include, where appropriate, joint engagement with relevant stakeholders (HHA, PLA, Sunk VTS) to help inform and plan construction activities.
	There are several other DCO projects that are proposed within the vicinity of the Sea Link project and the Haven. The DCO should therefore reflect the need for works to be coordinated by and with HHA to ensure that there are no risks to navigational safety, particularly when considered along with other projects. We are open to discussing the different mechanisms to achieve this.	This is addressed via ongoing stakeholder communications and the recommendation for enhanced communication planning which is intended to support coordination and alignment of activities and requirements as the project progresses. See section 7.7.
UK Chamber of Shipping (email 16 August 2024)	our primary concerns would relate to the following: • duration of construction period, in particular disruption to IMO Routeing Measures and increased collision risk • impact upon UKC and necessity to future proof to allow for 20m draft vessels to access Harwich • interaction and alignment with other cables in the area, eg FE, NF, etc. None of which are insurmountable.	These concerns have been noted and factored into the NRA.

Consultee	Comment	Response/where addressed
Trinity House (email 20 August 2024)	Q. *We note in your response you state a safe margin in necessary from any AtoN. Is there a distance you had in mind for this margin?* Normally we try to position our buoys about 200m from cables or pipelines to allow for them moving off of position due to weather or being dragged by fishermen. In the area of the Sunk there is likely to be more vessels reporting if the buoy has moved, and as the position is noted in the IMO Routeing Scheme, I would consider your DoL Route being 151m North to be acceptable. However, I would not wish to see it being any closer. This not only protects our asset but gives a margin where if the buoy and sinker move your cable is also safer.	This has been included in section 7.6.

7.5 Baseline Conditions

7.5.1 This section covers the shipping and navigation baseline for the Offshore Scheme. The navigational baseline characterisation comprises the following four elements:

- Identification of key navigational features;
- Emergency response overview;
- Maritime incident analysis; and
- Marine Traffic Study (MTS).

Overview

7.5.2 The Offshore Scheme is located off the east coast of England, between the proposed Friston substation in Suffolk to the existing Richborough to Canterbury overhead line in Kent. The Offshore Scheme will be approximately 122 km in length and located entirely within UK territorial waters, running parallel to the east coast. The Offshore Scheme passes the mouth of the Thames Estuary as well as a number of other busy port areas, (including Felixstowe, Ramsgate and Harwich Haven), and crosses the Sunk routing measures between approximately KP 35-66. The region experiences a high intensity of marine traffic including large vessels with restricted draughts, as noted by harbour authorities during consultation, and also hosts recreational vessel activity. The region is increasingly seeing its ports used as bases for existing offshore/marine renewables projects and for those currently under construction.

Key Navigational Features

Ports and harbours

7.5.3 An admiralty chart with the main ports and harbours in the vicinity of the study area, as well as key navigational features is presented in **Figure 6.4.4.7.A.2 Ports and navigation**.

7.5.4 As **Figure 6.4.4.7.A.2 Ports and navigation** shows, there are four ports and harbour authority areas which overlap with the shipping and navigation study area, these are:

- Harwich Haven Authority area;
- the Port of London Authority area;
- Ramsgate Port; and
- Sandwich Port and Haven harbour area.

7.5.5 The Harwich Haven Authority area lies approximately 2.2 km from the west of the Offshore Scheme Boundary at its closest point at KP 24. Harwich Haven (UK) is described by the Admiralty Sailing Directions as split between Harwich Navyard and Harwich International Port, both of which can handle Roll-on/Roll-off cargo (Ro-Ro) vessels, with Harwich International Port also containing a cruise terminal, berths for handling general and bulk cargoes (including grain), and a tanker berth (UKHO, 2020). The Harwich Deep Water Channel is dredged to 14.5 m and is located to the west of the Offshore Scheme, with the South West Shipwash buoy approximately 4.5 km from the Offshore Scheme Boundary at KP 32, and the South Shipwash buoy approximately 5 km from KP 35. Vessels with a maximum draught of 13.1 m may enter the harbour at any time, and up to 15 m draught at highwater (UKHO, 2020). Harwich Vessel Traffic Service (VTS) is operated from Harwich Operations Centre.

7.5.6 The eastern boundary of the Port of London Authority (PLA) lies approximately 9 km to the west of the Offshore Scheme Boundary at its closest point (KP 95) within the study area. The Port of London is the UK's largest port, handling more than 50 million tonnes of cargo each year (PLA, 2024). The PLA area spans the entirety of the Tidal River Thames, from Teddington Lock to the North Sea (UKHO, 2020).

7.5.7 Ramsgate Port is within the study area and its breakwaters are located 1.1 km to the north of the Offshore Scheme Boundary at KP 117. The Port of Ramsgate is a municipal port, owned and operated by the Thanet District Council. Ramsgate comprises a port and marina and can accommodate vessels up to 180 m in length and 6.5 m draught (Thanet District Council, n.d.). The Shell Chanel Pilot states that Ramsgate's importance often centres on the movement of ferries (IMRAY, 2017). It provides a cross-channel ferry service for passengers and freight and is also used by recreational vessel traffic. It also services offshore windfarms; in particular, it serves as the base for the London Array Offshore Wind Farm Project (UKHO, 2020). The approach channel has a maintained depth of 7.5 m, and dredging is carried out when necessary (UKHO, 2020).

7.5.8 The Kent landfall of the Offshore Scheme Boundary is located within the Sandwich Port and Haven harbour area, which encompasses the mouth of the River Stour in Pegwell Bay. Approximately 2.4 km of the Offshore Scheme crosses through the harbour area, from KP 118.5. Vessels of up to 25 m in length and 3 m draught can reach Sandwich (3 miles up the River Stour) at high water spring tides, and Sandwich is used mainly by recreational craft (UKHO, 2020). The Sandwich Port and Haven authority website states

that as a general rule the River Stour is accessible on every tide (springs and neaps) to vessels with a draft of less than 2 m (Sandwich Port and Haven, 2022). The Dover Strait Pilot (UKHO, 2020) also notes that the approach channel to the River Stour across Pegwell Bay dries, and depths in this area are liable to change. During consultation with Sandwich Port and Haven, it was stated that at low tide springs the water depth is 1 m of water at most in the approach channel. The charted approach channel is orientated WNW across Pegwell Bay and is approximately 35 m wide, overlapping with the Offshore Scheme between KP 118.5-120.5, close to the Kent landfall. The channel is known to fluctuate continually and is not guaranteed (IMRAY, 2017). Sandwich Port and Haven stated during consultation that they do not dredge the river mouth, but buoy it, and that it can move 50 m over a winter. The channel is expected to migrate northwards until it meets the cliffs.

7.5.9 In relation to the wider region (outside of the study area), the Offshore Scheme passes to the east of Harwich and Felixstowe ports, then passes the mouth of the Thames Estuary and ports within the River Thames and River Medway[2], before making landfall to the south of Ramsgate, and approximately 19 km to the north of the Dover harbour area. Much of the regional shipping traffic is likely to pass through the study area routeing to and from these ports and their facilities. As such, these are relevant port and harbour authorities for the Offshore Scheme. A brief description of other major port/harbour authorities in the region are provided below:

- London Medway: The ports of Sheerness and Chatham form the core terminals of Peel Ports' London Medway cluster (Peel Ports, 2023). The harbour area extends out into the mouth of the Thames Estuary which then becomes part of the PLA's jurisdiction.
- Port of Felixstowe: The Port of Felixstowe is the UK's biggest and busiest container port, with approximately 2,000 ships coming into the port each year. It is owned and operated by Hutchison Ports (Port of Felixstowe, 2023).
- Port of Dover: Dover is the busiest international roll-on roll-off ferry port in the UK, handling 33% of the UK's trade with the EU. Dover is also the UK's second busiest cruise port, and has a cargo business handling fresh produce, containers, project cargo, general cargo, grain and Ro-Ro traffic (Port of Dover, 2023). The Port of Dover harbour authority area is approximately 400 m outside of the study area.

Navigational features

7.5.10 The following navigational features have been considered and are presented in **Figure 6.4.4.7.A.2 Ports and navigation**:

- IMO routeing;
- Anchorage areas;
- Pilot boarding stations and grounds; and
- Navigational aids including buoys, beacons and navigation lines.

[2] Throughout this NRA the term 'ports within the River Thames and Medway' denotes all ports and harbours located within or in the approaches to the River Thames and River Medway.

IMO routing

7.5.11 The Sunk is a deep which forms a common access to Harwich Haven and the Thames Estuary. It is an extremely busy area for shipping, and therefore two Precautionary Areas (IMO designated areas where ships must navigate with particular caution) and a number of Traffic Separation Schemes (TSS) have been established across this region to control traffic and reduce the risk of collisions (UKHO, 2020).

7.5.12 The Sunk Vessel Traffic Service (VTS) covers the two Sunk Precautionary Areas (Inner and Outer), as well as the associated TSSs and approach routes (UKHO, 2020). Within the VTS area, all vessels of 300 gross tonnage (gt) and over are required to comply with the VTS rules, which include:

- All vessels equipped with VHF radio should monitor the designated VHF channel;
- Vessels of 300 gt and over shall report entering and leaving the VTS area and shall report when anchoring in a designated anchorage or elsewhere in the VTS area, as well as report when departing from an anchorage;
- Any incident affecting the safety of navigation of a vessel are to be reported to the VTS;
- Vessels navigating within Sunk Inner Precautionary Area shall avoid impeding the passage of a vessel constrained by draft and following a deep water route;
- All vessels engaged in fishing must report their intentions upon entering and leaving; and
- Dredging vessels working within the VTS area shall submit passage plans for approval by the VTS authority (UKHO, 2020).

7.5.13 The Offshore Scheme enters the region of Sunk routing measures at approximately KP 35 and exits at KP 66. The Offshore Scheme Boundary runs through five IMO routeing measures areas, all associated with the Sunk:

- Sunk Inner Precautionary Area (KP 35-38);
- Sunk Outer Precautionary Area (KP 38-59);
- Sunk Area to be Avoided (KP 45-47);
- Sunk Traffic Separation Zone (KP 59.5-60); and
- Long Sand Head Two-way Route (KP 60-66).

7.5.14 In addition to this, there are multiple further IMO Routeing Measures within the study area, associated either with Sunk, Northern Approaches to the Thames Estuary or Long Sand Head, as well as The Strait of Dover and Adjacent Waters TSS and an “Area to be Avoided” for the Dover Straits in the southern portion of the study area.

Anchorage

7.5.15 The two anchorages of particular relevance to the Offshore Scheme are the Sunk deep water anchorage area and the Tongue Deep Water Anchorage Area.

7.5.16 Not including 23 unnamed small craft mooring areas, which are all inshore, there are 11 charted anchorage areas located within the study area. These are (from north to south):

- Bawdsey anchorage;

- Cork anchorage;
- Platters anchorage;
- Sunk deep water anchorage
- Sunk Inner anchorage;
- An unnamed deep water anchorage;
- Tongue Hazardous anchorage;
- Tongue Deep Water anchorage;
- Q3 bunkering anchorage;
- Q2 bunkering anchorage; and
- Q1 bunkering anchorage.

7.5.17 The Offshore Scheme runs close to the Sunk deep water anchorage area along its south-western corner, remaining less than 500 m from it between KP 33-39. The Offshore Scheme avoids overlap with the anchorage area; the distance from the planned cable route to the Sunk deep water anchorage area is approximately 760 m at the closest point at KP 35.

7.5.18 The Tongue Deep Water and Tongue Hazardous anchorage areas are located to the west of the Offshore Scheme between KP 82-88 and are 1.4 km from the closest point to the Offshore Scheme at KP 87. The Tongue deep water anchorage was highlighted during consultation as a significant location by stakeholders. Depths within this anchorage as well as neighbouring the Tongue Hazardous Anchorage area are reported as mostly in excess of 15 m (UKHO, 2020).

7.5.19 There are additional charted anchorage points at the approach to Southwold Harbour (UKHO, 2018) (16.6 km north of the Offshore Scheme at KP 0), north of Harwich Haven Authority area (11.3 km west of KP 22), three anchorage points along the Kent coast between Whitstable and Ramsgate (9.5 km, 16.6 km and 22 km west of KP 97-99), and four anchorage points located in the South Downs area offshore from the town of Deal, between 6.4 and 12.1 km to the south of the Offshore Scheme between KP 111-117. It was noted during consultation with Sandwich Port and Harbour that it is very rare for boats to anchor in Pegwell Bay as the water is so shallow. Boats may anchor to the north of Pegwell Bay under the cliffs, or in the channel around high tide to spot seals, however very few people spend overnight or low tide in this area.

7.5.20 Attention is drawn in particular to the potential anchorage point south of Ramsgate Port which is under 670 m to the north of KP 116.5.

Aids to navigation

7.5.21 There are 271 Aids to Navigation (106 beacons, 162 buoys and three light vessels) located within the study area. There are 3 Aids to Navigation located within the Offshore Scheme (the Sunk W1 buoy, and two intermittent buoys). Additional lighted turbines were noted within the study area that designate the boundary of windfarms (Greater Gabbard, London Array and Thanet) (**Figure 6.4.4.7.A.2 Ports and navigation**).

7.5.22 There are 16 Aids to Navigation (4 beacons, 11 buoys and one light vessel) identified within 500 m of the Offshore Scheme (from north to south):

- Port beacon (less than 10 m from KP 1);
- Storm buoy (400 m from Offshore Scheme Boundary at KP 35.5);
- Sunk W1 buoy (falls within the Offshore Scheme at KP 38.5);
- Sunk Centre light vessel (less than 10 m from Offshore Scheme Boundary at KP 46);
- Gull buoy (2 m from the Offshore Scheme Boundary at KP 108.5);
- Gull Stream buoy (340 m from the Offshore Scheme Boundary at KP 111);
- Unnamed intermittent/seasonal Special buoy (falls within Offshore Scheme at KP 112.5);
- Unnamed intermittent/seasonal Special buoy (falls within Offshore Scheme at KP 114);
- Unnamed intermittent/seasonal Special buoy (380 m from KP 115.5)
- Unnamed intermittent/seasonal Special buoy (160 m from KP 116.5)
- West Quern buoy (350 m from KP 116.5);
- B2 buoy (500 m from Offshore Scheme Boundary at KP 118);
- Safe water buoy in Sandwich Port and Haven area (370 m from KP 118.5);
- No. 8 beacon (250 m from Offshore Scheme Boundary at KP 119.5); and
- Two beacons within the mouth of the River Stour.

7.5.23 Two “Navigation lines” and three “Routes” intersect the Offshore Scheme Boundary. They all lead to/from Ramsgate Port between KP 108-112.

Pilotage

7.5.24 In terms of pilotage, a number of pilot stations and boarding areas are present within the study area, some in close proximity to the Offshore Scheme.

7.5.25 The Haven Pilot Station lies within the Harwich Haven Authority area and is located approximately 5.5 km to the west of the Offshore Scheme Boundary at KP 27. There is a pilot station located within the Sunk Inner anchorage area to the west of the Offshore Scheme, approximately 9.8 km away at the closest point at KP 35.5. The Sunk pilot station associated with the Sunk TSS is located approximately 2 km to the south of the Offshore Scheme Boundary at approximately KP 37. Harwich Haven Authority noted at consultation that pilot boarding usually occurs approximately 1 mile east of the marked Sunk pilot station diamond to give them enough sea room before the pilot gets on the bridge. The Tongue pilot station is located approximately 80 m to the east of the Offshore Scheme at KP 90, and the NE Spit pilot station is located 3.9 km to the west at KP 97. The North East Goodwin pilot station is located 6.9 km to the south-east of the Offshore Scheme Boundary at KP 102. The Ramsgate pilot station is charted 1.7 km to the west of the Offshore Scheme at KP 107.

7.5.26 A pilot boarding area associated with the Port of Ramsgate (the Ramsgate Compulsory Pilotage Area) extends 3 miles from West Pier Light in Ramsgate Harbour (51° 19’.66N, 1° 25’.29E) between the bearings 065° and 145°, which overlaps with the Offshore Scheme Boundary from approximately KP 110-115. Pilotage at the Port of Ramsgate is

compulsory for all vessels over 80 m in overall length, passenger vessels and all vessels carrying hazardous or petroleum cargoes (UKHO, 2020).

Military practice areas

7.5.27 **Figure 6.4.4.7.A.3 Military practice areas** shows the military Practice and Exercise Areas (PEXAs), within the region and in proximity to the Offshore Scheme. Eight PEXAs intersect the study area, and one (X5119: Kentish Knock) intersects the Offshore Scheme Boundary covering an area of approximately 0.04 km^2 at KP 56.5 at its north-western boundary. Kentish Knock is listed as a practice and exercise area. Apart from PEXA X5123, which is listed as a firing danger area, the rest of the PEXAs in the study area are also practice and exercise areas.

Recreation

7.5.28 Recreational traffic can be seen routeing around the coastline close inshore, as well as to and from the Thames Estuary (**Figure 6.4.4.7.A.4 Recreation**). There are designated General Boating Areas (GBA) at the Suffolk and Kent landfalls of the Offshore Scheme. Generally, boating intensity is lower further offshore, although there is increased intensity around KP 52. There is a discernible area of increased intensity coming to/from the Port of Ramsgate from KP 85 onwards.

Other infrastructure and navigational features

7.5.29 **Figure 4.7.A-5 Other navigational features** shows other infrastructure and navigational features within the study area and wider region. There are a number of offshore windfarms in proximity to the Offshore Scheme. The Greater Gabbard (in operation), North Falls (DCO application), London Array (in operation), Galloper (in operation) and the Thanet offshore windfarm (in operation) overlap with the 10 NM study area, and a number of windfarm export cable agreement areas associated with Thanet and East Anglia Three and One also intersect the Offshore Scheme Boundary. Greater Gabbard is located 6.6 km east of the Offshore Scheme Boundary at KP 44, North Falls approximately 3.3 km east of the Offshore Scheme Boundary at KP 53, Galloper is 12 km to the east at KP 54, London Array is 1.2 km west at KP 79, and Thanet offshore windfarm is 740 m to the east at KP 94.5.

7.5.30 Ten active subsea power and telecom cables are identified as passing through the Offshore Scheme Boundary, associated both with offshore infrastructure and cross-channel links to mainland Europe. Those active cables which cross the Offshore Scheme Boundary (from north to south) are:

- Farland North (telecom);
- East Anglia One (two cables) (power);
- Borssele Interlink (also known as BritNed (power);
- Mercator (telecom);
- Pan European Crossing (PEC) (telecom);
- Tangerine (telecom);
- Thanet (two cables) (power); and
- Nemo interconnector (power).

7.5.31 CEFAS data indicates that there are four open licenced disposal sites which intersect with the Offshore Scheme Boundary. Three of the open disposal sites are associated with Thanet (at KP 92, KP 92-98, between KP 106.5-108 and again between KP 116.5-119) and one is associated with Gridlink West between KP 101-102. There is one additional open dumping ground associated with Harwich Haven that is less than 50 m from the Offshore Scheme Boundary between KP 33-34. There are various other closed and open disposal grounds that are located further away from the Offshore Scheme Boundary but within the study area (see **Figure 6.4.4.7.A.5 Other navigational features**). See also **Application Document 6.2.4.9 Part 4 Marine Chapter 9 Other Sea Users** for further details regarding disposal sites.

7.5.32 There are no aggregates, evaporites or mining site agreements located within the Offshore Scheme Boundary but there are 17 aggregates agreements within the wider shipping and navigation study area. Three of these run adjacent to the Offshore Scheme Boundary at a distance of under 1 km: Shipwash between KP 24-27.5, Longsand between KP 57.5-60.5, and Outer OTE between KP 68-83.

7.5.33 There are 34 charted wrecks identified from UKHO data within the Offshore Scheme Boundary, and over 1,500 identified within the shipping and navigation study area. Of those that are located within the Offshore Scheme Boundary, the UKHO notes that five have an unknown depth and the shallowest is recorded at a depth of 1.63 m, however this is close to the coast at the Kent landfall of the Offshore Scheme Boundary near Ramsgate. **Application Document 6.2.4.6 Part 4 Marine Chapter 6 Marine Archaeology** identifies 13 wrecks from geophysical survey, and notes that 21 further sites within the Offshore Scheme Boundary are identified from historic records. For a full study of marine archaeology refer **to Application Document 6.2.4.6 Part 4 Marine Chapter 6 Marine Archaeology**.

7.5.34 There is no oil and gas infrastructure identified within the study area.

Emergency Response Overview

7.5.35 This section considers the emergency response in the study area by the RNLI and by SARH including such data as:

- RNLI Stations; and
- SARH bases and radii of action.

RNLI

7.5.36 The RNLI has six regions; the study area overlaps with the ‘North and East’ and ‘South East’ regions. The RNLI has 238 stations and more than 400 lifeboats, which are either all-weather lifeboats (ALB) or inshore lifeboats (ILB) (RNLI, 2024). There are a number of RNLI lifeboat stations within close proximity to the study area, as presented in Table 7.11 and shown in **Figure 6.4.4.7.A.6 RNLI search and rescue.** There are five lifeboat stations within the study area: Southwold and Aldeburgh on the Suffolk coast and Margate, Ramsgate and Walmer on the Kent coast.

Table 7.11 RNLI lifeboat stations within 25 km of study area

Station	Lifeboats	County	Division
Great Yarmouth and Gorleston	ALB/ILB	Norfolk	East
Lowestoft	ALB	Suffolk	East
Southwold	ILB	Suffolk	East
Aldeburgh	ALB/ILB	Suffolk	East
Burnham-on-Crouch	ILB	Essex	South East
Clacton-on-Sea	ALB	Essex	East
Harwich	ALB/ILB	Essex	East
Walton and Frinton	ALB	Essex	East
Sheerness	ALB/ILB	Kent	South East
Margate	ILB	Kent	South East
Ramsgate	ALB/ILB	Kent	South East
Walmer	ILB	Kent	South East
Whitstable	ILB	Kent	South East
Dover	ALB	Kent	South East
Dungeness	ALB	Kent	South East
Littlestone-on-Sea	ILB	Kent	South East

SARH

7.5.37 As part of the MCA, HM Coastguard initiates and coordinates Search and Rescue (SAR) response around the UK. Since April 2015, Bristow Search and Rescue has provided the helicopter SAR service on behalf of HM Coastguard, operating 10 helicopter bases around the UK (Bristow Group, 2022).

7.5.38 The study area lies between the SARH bases of Humberside to the north (approximately 196 km away at the closest point), St Athan to the west (approximately 316 km away) and Lydd to the south (approximately 37 km away) (**Figure 6.4.4.7.A.7 Search and Rescue Helicopter**). The study area sits fully within the radii of action of three SARH bases (Lydd, Lee-on-Solent and Humberside).

Maritime Incidents

7.5.39 A review of previous marine incidents within the study area can give an indication of the general level of marine incident risk in this region, which may be relevant during the installation phase of the Offshore Scheme. This section considers such data as:

- RNLI Return to Service (launches in response to incidents);

- SARH taskings; and
- MAIB incidents.

RNLI

7.5.40 The RNLI keeps a record of call-outs to marine incidents. Those in the study area between 2008 and 2020, which were deemed not to be false alarms or hoaxes, are shown in **Figure 6.4.4.7.A.6 RNLI search and rescue**. A total of 2,392 unique incidents, were recorded between 2008 and 2020. Of those incidents, 22.2% were due to machinery failure, and 74.7% (1,788 incidents) were within 5 km of shore.

SARH

7.5.41 There were 103 SARH taskings in the study area between April 2016 and March 2021 (**Figure 6.4.4.7.A.7 Search and Rescue Helicopter**). One (1) incident occurred within the Offshore Scheme Boundary, near the Kent landfall, within 500 m of shore.

MAIB

7.5.42 The Marine Accident Investigation Branch works with the Department of Transport and investigates marine accidents involving all vessels within UK waters. The full dataset from 1992–2021 was analysed for this NRA. **Figure 6.4.4.7.A.8 MAIB events** shows that incidents have occurred across the study area, with a higher concentration of occurrences in the southern portion. There were 744 incidents recorded within the study area, the most frequent cause of which was collision with another vessel (35.6% of all incidents).

Marine Traffic Study

Automatic Identification System (AIS) overview and seasonality

7.5.43 A total of 85,106 AIS vessel tracks were recorded across the four-season study period within the study area. As shown in Table 7.12, there were 21,861 tracks in spring (March – May), 28,029 tracks in Summer (June – August), 19,364 tracks in autumn (September – November) and 15,852 tracks in winter (December – February). July 2022 was the busiest month with the most tracks at 9,784, while December was the month with the least tracks at 5,169 tracks. Most categories of vessel type remain relatively constant throughout the seasons, with the exception of recreational vessel activity which is significantly higher in the summer months (8,685 tracks) than in the other seasons (Plate 7.1). The predominant vessel type in the study area is “cargo/tanker”, which makes up 53.2% of vessel traffic across all seasons, and is split relatively evenly over the four seasons, with between 11,000 – 12,000 tracks per season. The reason for these vessel patterns is likely to be due to the year-round nature of international shipping activity, and due to the importance of clement weather conditions for recreational vessel activity.

7.5.44 Seasonal AIS vessel track densities are displayed in **Figure 6.4.4.7.A.9 Seasonal vessel track density**. The patterns of vessel traffic are similar across the seasons, with high intensities of traffic coming into/out of the ports of Felixstowe/Harwich and ports within the River Thames and Medway. There is an additional area of high density in the south-eastern portion of the study area associated with the Dover Straits. Summer vessel traffic out of the port of Ramsgate is also relatively high relative to other seasons.

Spring and summer vessel traffic density is higher across all vessel types than autumn and winter.

7.5.45 The day on which most vessels began a journey or crossed into the study area was 27 May 2022 (**Figure 6.4.4.7.A.10 Busiest day**), when 416 vessel tracks were recorded. Conversely, the quietest day was 25 December 2022 when only 94 vessel tracks were recorded within the study area.

Table 7.12 Vessel tracks per season

Season	Count	Average tracks per day
Spring	21,861	59.9
Summer	28,029	76.8
Autumn	19,364	53.1
Winter	15,852	43.4

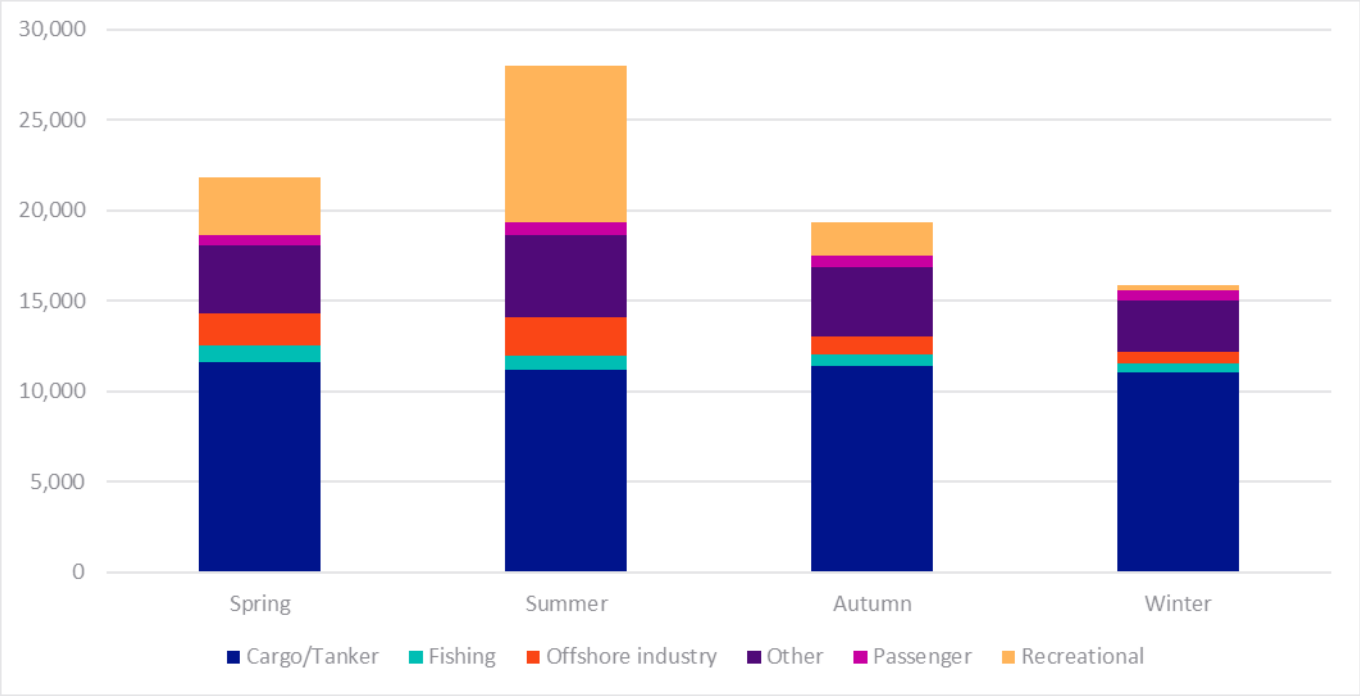

Plate 7.1 Distribution of AIS vessel tracks by season and vessel type

Vessel type

7.5.46 The most frequently recorded AIS vessel tracks in the study area were “cargo/tanker” vessels with 53.2% of all tracks within the year (Table 7.13, Plate 7.2) “Other” and “recreational” vessel tracks were the next most frequent vessel type with 17.6% and

16.4% of tracks respectively. “Fishing”, “offshore industry” and “passenger” tracks were relatively low, at 3.3%, 6.5% and 3% of all tracks, respectively.

7.5.47 **Figure 6.4.4.7.A.11 Seasonal vessel tracks by type** shows the spatial distribution of AIS vessel tracks classified by vessel type for the four seasons. Due to the nature of vessel activity in the region being predominantly linked to “cargo/tanker” traffic, seasonal variation in levels of activity are less defined than might be expected in other areas where vessels are more affected by changes in weather across the seasons. Across all seasons, “cargo/tanker” vessel traffic activity is relatively high from KP 30 onwards. There are defined routeing patterns discernible into/out of the major ports in the region (e.g. Felixstowe, Harwich, ports within the River Thames and Medway and Ramsgate). There are also areas in which “offshore industry (including renewables)” vessel traffic patterns coincide with the Offshore Scheme Boundary (particularly between KP 25-55, and between KP 95-105). It is possible to see increased “recreational” vessel activity during the summer period.

Table 7.13 AIS vessel tracks by type

Vessel type	No of vessel tracks	Percentage of total
Cargo/tanker	45,295	53.2
Fishing	2,783	3.3
Offshore industry (including renewables)	5,555	6.5
Other	14,973	17.6
Passenger	2,550	3.0
Recreational	13,950	16.4
Total	**85,106**	**100**

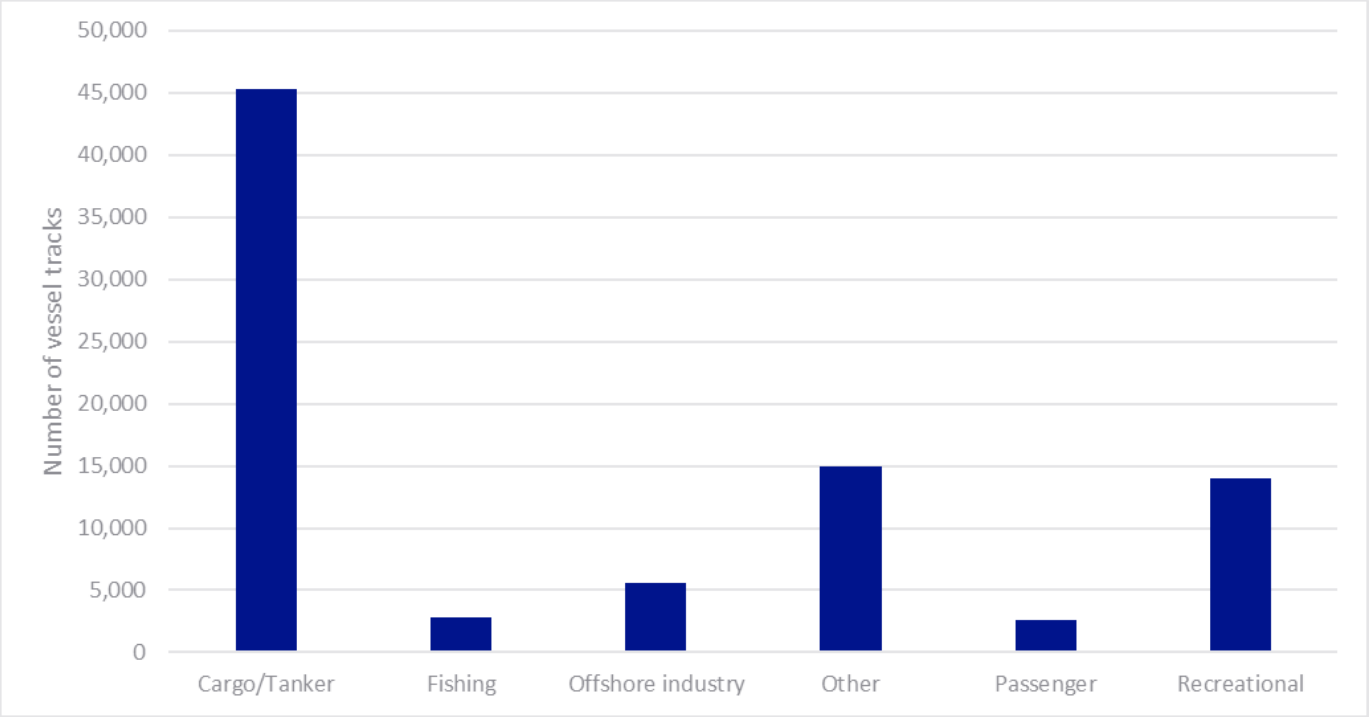

Plate 7.2 AIS vessel tracks by vessel type

7.5.48 The following sections describe the vessel activity across all seasons per vessel type. Fishing vessel traffic will be considered separately in the Fishing analysis section.

Cargo vessels and tankers

7.5.49 As shown in **Figure 6.4.4.7.A.12 Vessel tracks by vessel type**, high levels of cargo vessel and tanker traffic is present throughout the majority of the study area, using defined routes to/from ports in the wider region. Between KPs 10 and 105 the Offshore Scheme Boundary intersects with busy cargo/tanker traffic routes, leaving KP 20-35 and KP 65-80 relatively free of cargo and tanker traffic. Coastal portions of the study have low levels of cargo and tanker traffic in comparison with offshore areas.

Passenger vessels

7.5.50 Passenger vessel traffic is low in comparison to other vessel types within the study area, but it is present across the study area (**Figure 6.4.4.7.A.12 Vessel tracks by vessel type**). There are defined portions of the study area that experience more passenger vessel traffic than others, crossing the Offshore Scheme between KP 15-18, KP 46-51, and KP 86-103, likely associated with UK-Europe ferry services and ports in the wider region. Passenger vessel traffic between KP 15-50 is principally in association with a Stena Line service which runs four daily sailings between Harwich Haven and Hook of Holland (Stena Line, 2024). The passenger traffic activity between KP 86-103 is more varied in terms of port of origin/destination and appears to be associated mostly with cruise vessels coming to/from ports within the River Thames and Medway.

Recreational vessels

7.5.51 Recreational vessel traffic is also present across the study area. Intensity is higher in coastal areas, but there is also evidence of UK-Europe vessel traffic activity, and there are no stretches of the Offshore Scheme that could be said to show no activity. As shown in **Figure 6.4.4.7.A.12 Vessel tracks by vessel type**, it is possible however to say that recreational vessel activity tends to be mainly in the spring and summer months.

Offshore industry vessels

7.5.52 Offshore industry vessels can be seen coming to/from ports such as Harwich/Felixstowe and Ramsgate to offshore installations within the study area and wider region. There is distinct offshore industry vessel traffic routeing across the Offshore Scheme between KP 25-55 (likely associated with windfarms located to the east of the Offshore Scheme including Greater Gabbard, Galloper and North Falls), as well as relatively high levels between KP 90-110.

Other vessels

7.5.53 “Other” vessels could include vessels such as tugs, search and rescue vessels, military operations vessels, dredgers, research/survey vessels and unknown type vessels. “Other” vessel traffic is present across the study area, and while there are areas of lower vessel traffic activity, the only portions of the Offshore Scheme that experience relatively little “other” vessel traffic are between approximately KP 18-25 and KP 50-55.

Vessel size and status

Vessel length

7.5.54 AIS data contains information on vessel length. As shown in Table 7, of the most common length category is the 1 – 50 m length category, with 37.8% of tracks. Vessels between 50 – 200 m accounted for 46.5% of all other vessel traffic, while 14.9% of vessels were over 200 m. Plate 7.3 shows that while the single most frequent length category was 0 – 50 m (and was associated with categories other than “cargo/tanker” traffic), the higher length categories are all dominated by “cargo/tanker” vessel traffic.

7.5.55 Spatial patterns in vessel length are presented in **Figure 6.4.4.7.A.13 Vessel length**. The higher length categories tend to be associated with defined routeing patterns coming to/from ports on the English coast such as those observed for “cargo/tanker” traffic. Vessels under 50 m in length are present more widely across the study area.

Table 7.14 AIS vessel tracks distributed by vessel length

Length (m)	Vessel tracks	Percentage of total
1 – 50	32,163	37.8
50 - 100	14,005	16.5
100 - 150	11,558	13.6

Length (m)	Vessel tracks	Percentage of total
150 - 200	14,044	16.5
Over 200	12,641	14.9
Unknown	695	0.8
Total	**85,106**	**100**

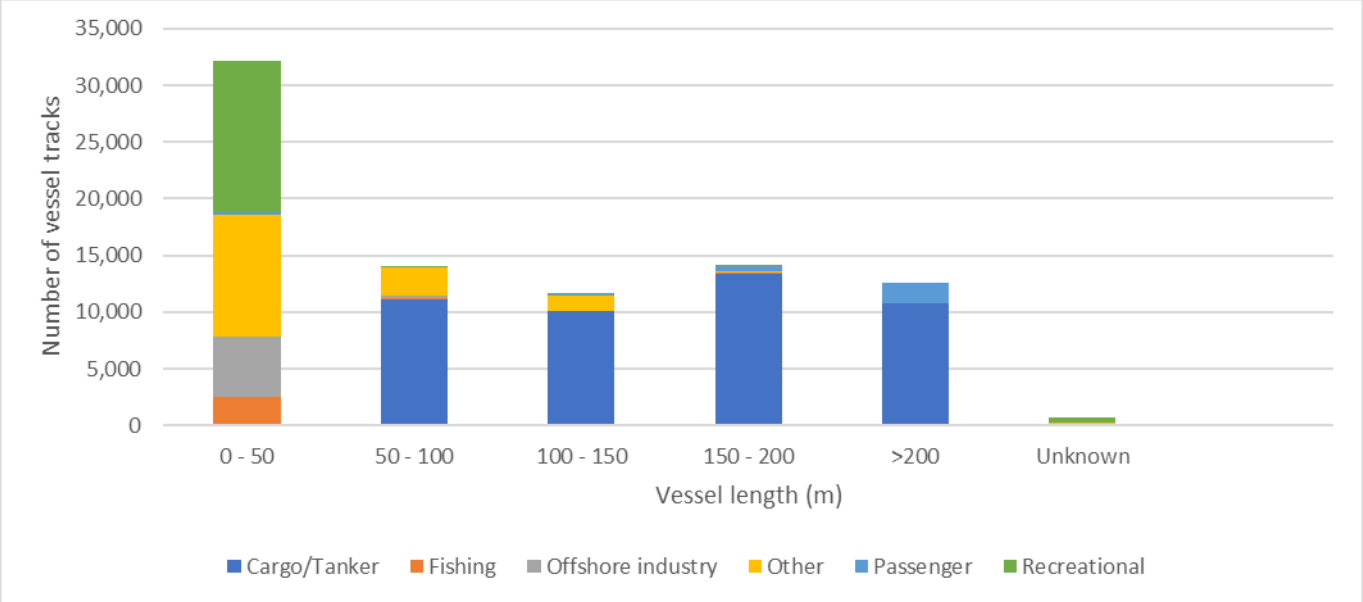

Plate 7.3 AIS vessel length by vessel type

Vessel Dead Weight Tonnage (DWT)

7.5.56 Dead Weight Tonnage (DWT) is an indication of vessel size as it refers to the carrying capacity of the vessel. There were 4,016 vessels missing DWT values in the AIS data for the study area, so a regression model was used based on the available data for each vessel type to calculate the missing values.

7.5.57 The distribution of AIS vessel DWT is presented in Table 7 and Plate 7.4 and shows that the most frequent DWT classes were 0 – 250 tonnes (37.4%) and 5,000 – 50,000 tonnes (38%). “Cargo/tanker” traffic makes up the majority of the heavier DWT categories (250 tonnes and over). Regarding vessels with the greatest DWT, 9.4% of vessel traffic was over 50,000 tonnes. As with vessel length, the smallest DWT category is made up of vessels other than “cargo/tanker” traffic.

7.5.58 In terms of the spatial distribution (**Figure 6.4.4.7.A.14 Vessel DWT**), the heavier DWT categories tend to be associated with more defined routeing patterns, while the smallest DWT category (0-250 tonnes) is more spatially dispersed across the study area than the heavier categories.

Table 7.15 AIS vessel tracks distributed by vessel DWT

DWT (tonnes)	Vessel tracks	Percentage of total
1 – 250	31,820	37.4
250 – 2,500	3,270	3.8
2,500 – 5,000	9,687	11.4
5,000 – 50,000	32,304	38.0
Over 50,000	8,025	9.4
Total	**85,106**	**100**

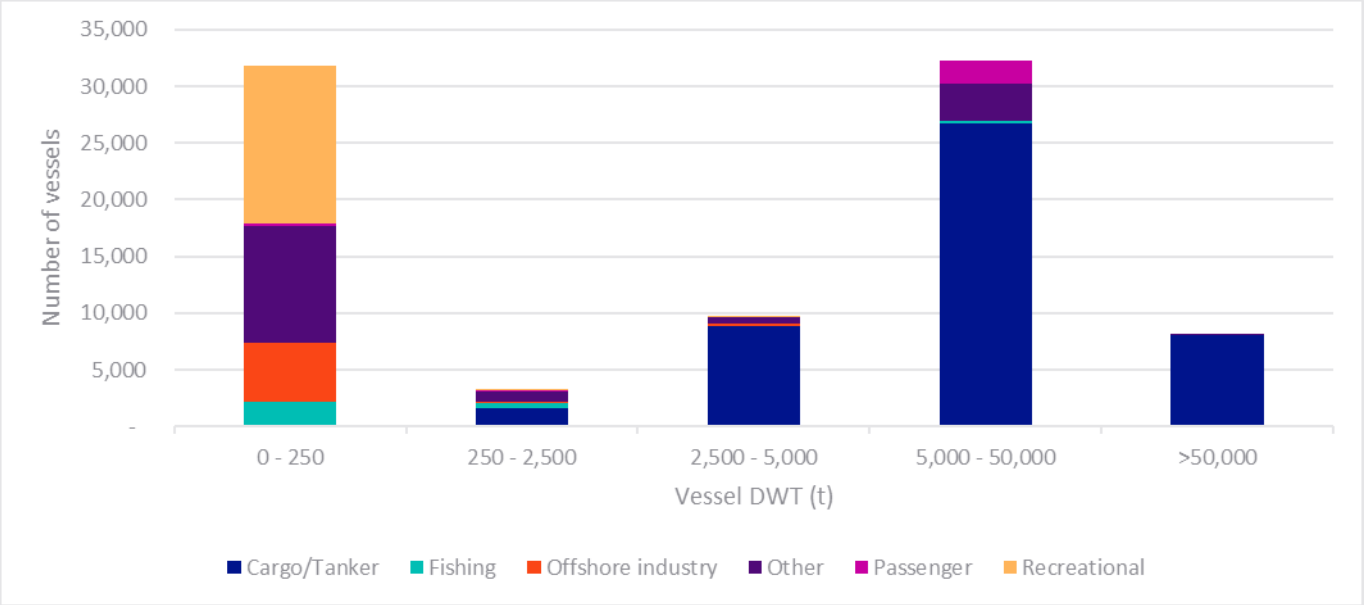

Plate 7.4 AIS vessel DWT by vessel type

Vessel draught

7.5.59 Vessel draught distribution within the study area is presented in Table 7. The most common vessel draught category is the 5 – 10 m category (42.9%), with the majority of those vessels being cargo/tanker vessels.

7.5.60 Plate 7.5 presents the vessel draught categories by vessel type and shows that taken together, 84.2% of vessels had a vessel draught of under 10 m, and that these categories incorporate nearly all “fishing”, “offshore industry”, “other”, “passenger” and “recreational” category vessels.

7.5.61 In terms of the spatial distribution of the draught categories (**Figure 6.4.4.7.A 15 Vessel draught**), the vessels with the largest draught show a tendency to be confined to defined routine patterns and appear to be routeing across the Offshore Scheme between KP 35-60. Elsewhere, there are vessels with a draught of between 10-15 m that transit the Offshore Scheme between KP 80-105, possibly associated with traffic coming to/from ports within the River Thames and River Medway. Vessels in the smaller

draught categories are widespread throughout the Offshore Scheme Boundary and wider study area.

Table 7.16 AIS vessel tracks distributed by vessel draught

Draught (m)	Vessel tracks	Percentage of total
0 - 2.5	14,115	16.6
2.5 - 5	20,994	24.7
5 - 10	36,543	42.9
10 - 15	10,909	12.8
>15	1,897	2.2
Unknown	648	0.8
Total	**85,106**	**100**

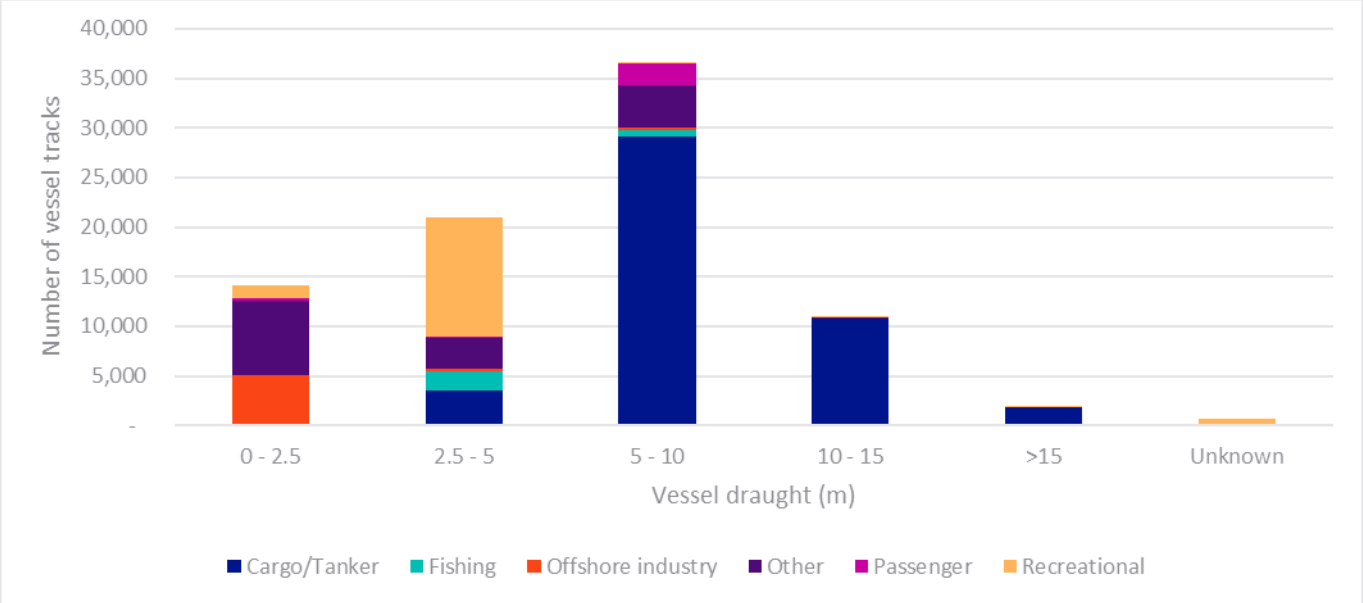

Plate 7.5 AIS vessel draught by vessel type

Vessels at anchor

7.5.62 AIS data points contain information on a vessel's status, including if it is 'at anchor'. This status is manually set by the crew and is acknowledged to be subject to human error but nonetheless can give an indication of the presence of anchoring vessels in the study area. Points with status set to 'at anchor' were filtered by speed, distinguishing between points which had a speed of <2 knots as likely to be anchoring, and points of speed >2 knots as more likely to have been erroneously set as 'at anchor'. **Figure 6.4.4.7.A.16 Vessels at anchor by season** shows the distribution of points of >2 knots in speed

arranged in lines which can be assumed to be when the status on vessels was erroneously set to ‘at anchor’, and so can be disregarded from this analysis.

7.5.63 The spatial distribution of vessels at anchor correlate broadly to charted anchorage areas, notably to the east and north of KP 25-45 (overlapping with the Sunk deep water anchorage area) and west of KP 80-90 (overlapping with the Tongue deep water anchorage area) (**Figure 6.4.4.7.A.16 Vessels at anchor by season**). There is also a region where vessels appear to anchor regularly around the Kent coast, west of KP 95-100. These anchorage areas show similar characteristics irrespective of the season.

Fishing analysis

7.5.64 This section presents an analysis of fishing vessels in the vicinity of the Offshore Scheme, based on both AIS and VMS data. It should be noted that the AIS data used in this NRA provides detailed information on the specific trajectories of the vessels, but is likely to under-represent fishing activity, since fishing vessels under 15 m length are not obliged to carry an AIS transponder, (though many do voluntarily for safety). VMS data is used to supplement the AIS data and provide a more comprehensive picture of fishing activity since vessels greater than 12 m are obliged to carry VMS equipment, however there are still some limitations of this approach as the VMS data are not publicly available in a format that allows reconstruction of trajectories, and vessels under 12 m will not be represented. It should be noted that fishing is considered from a broad navigational perspective here, and the following ES chapter should be consulted for detailed fishing analysis and from a commercial fisheries perspective: **Application Document 6.2.4.8 Part 4 Marine Chapter 8 Commercial Fisheries**.

7.5.65 Three types of AIS vessel data have been used to gain insight into fishing activity in the study area:

- AIS fishing vessel tracks categorised by length;
- AIS fishing vessel tracks categorised by vessel subtype; and
- AIS data points with status set to “actively fishing”.

7.5.66 As detailed in section 7.3, three additional data sources of VMS data have been used to supplement the AIS data:

- Anonymised VMS point data during 2019, which has been processed to provide density information for the study area. This data provides no information on gear type or fishing status, however vessel speed can be used as a proxy for fishing status. Vessels travelling at speeds of < 6 knots (kts) are considered likely to be fishing;
- MMO VMS sightings data 2011 to 2019 representing vessels sighted on surveillance flights; and
- Fishing activity by International Council for the Exploration of the Sea (ICES) statistical rectangle distributed by the MMO. This data includes details about time spent fishing and gear type over the period 2016 - 2019, but is aggregated within each ICES statistical rectangle, so local patterns of activity cannot readily be discerned.

7.5.67 Additionally, Sailing Directions Pilot books have been consulted to provide further context on the character of fishing activity in this region.

Fishing vessels in AIS data

7.5.68 Fishing vessel tracks classified by length and by fishing vessel subtype are shown in **Figure 6.4.4.7.A.17 Fishing vessels by vessel length and subtype**. As previously noted, vessels under 15 m in length are underrepresented in this data. Fishing vessels are present across the study area, however they are relatively sparse in relation to the Offshore Scheme until approximately KP 80. After this, there appears to be more fishing vessel activity, mainly by vessels in the smaller length classes (<30 m). There appears to be a pattern of transit or north-south routeing which intersects the Offshore Scheme at approximately KP 40-45 and again at KP 55-60.

7.5.69 Trawlers and fishing vessels are the principal subtype of fishing vessel recorded within the study area. The majority of fishing vessels appear to be coming into/from the port of Ramsgate, while trawlers may be coming into/out of other ports outside of the study area.

7.5.70 AIS points that are likely to represent fishing activity based on speed and/or AIS status are displayed in **Figure 6.4.4.7.A.18 AIS data points with status set to actively fishing by season**. Those points from vessels travelling at > 6 knots are assumed to be transiting rather than actively fishing. Actively fishing vessels are present mainly to the east of the study area, but for the year studied it appears that active fishing intersected portions of the Offshore Scheme during the spring season (approximately KP 80-90). There was a small area to the north of KP 45 which also experienced some active fishing during spring. Otherwise, the majority of active fishing seems to be confined to the south and eastern portions of the study area.

VMS and sightings data points supplement

7.5.71 This section utilised the point VMS and sightings data to supplement the use of AIS data in studying fishing activity, using anonymised VMS points from the MMO to explore density of slow-moving vessels, and 2019 vessel sightings points data from the MMO to study vessel types, as mentioned previously.

7.5.72 Vessel density of slow moving (< 6 kts) vessels is displayed in the left panel of **Figure 6.4.4.7.A.19 VMS density and sightings**, giving an indication of the presence of vessels which are actively fishing. It can be assumed that those vessels travelling at more than 6 kts are not fishing and are likely to be in transit, whilst those travelling at less than 6 kts may be fishing or engaged in other activities (Lee, South, & Jennings, 2010). Vessel density patterns shown in **Figure 6.4.4.7.A.19 VMS density and sightings** display similarities with some of the seasonal patterns in **Figure 6.4.4.7.A.18 AIS data points with status set to actively fishing by season**, namely the proportion of vessels likely to be actively fishing in eastern and southern portions of the study area. There is also an area to the west of the study area in the estuary downriver of the Thames and Medway Rivers. Between KP 20-60 there are also pockets of increased densities of fishing vessel likely to be engaged in active fishing. From KP 0-20 and from KP 95 onwards there is a very low density of slow-moving vessels.

7.5.73 The right panel of **Figure 6.4.4.7.A.19 VMS density and sightings** presents MMO VMS sightings data 2011 to 2019 representing vessels sighted on surveillance flights, classified by vessel type. The most common fishing vessel type sighted within the study area were recorded as a ‘null’ vessel type, which accounted for 60.1% of all sightings, followed by ‘potter/whelker’ vessels accounted for 13.4% of all sightings.

7.5.74 Potters and whelkers were sighted principally around the Kent coast around the Ramsgate area, while dredger and trawler sightings were more typically offshore.

VMS by ICES statistical sub-rectangle supplement

7.5.75 This section utilises fishing activity data available by ICES statistical sub-rectangle for four years over the period 2016 – 2019 obtained from the MMO. This data set provides summaries of fishing activity for UK commercial fishing vessels of 15 m and over in length that are deemed to have been fishing within a specified calendar year. This data has been aggregated to show the average annual time spent fishing by gear type from 2016 to 2019.

7.5.76 **Figure 6.4.4.7.A.20 VMS by ICES sub-rectangle – fishing time by gear type** shows mean time spent fishing by demersal, pelagic and dredge gear types. The study area sees low levels of time spent using dredges and pelagic trawl or seine, but higher levels of numbers of demersal trawl or seine, particularly in the south-eastern portion of the study area. Between KP 35 – 45 of the Offshore Scheme there are moderate levels of time spent fishing using demersal trawl or seine, but these levels remain relatively low (an average of 50 – 100 minutes) compared to further south offshore.

Fishing activity from sailing direction pilot books

7.5.77 The Dover Strait Pilot (UKHO, 2020) states that in this region along the south and east coasts of England, trawlers fishing singly or in small groups may be present at any time of year. Crab and lobster pots are laid during the summer in many locations.

Future Baseline

7.5.78 This NRA baseline has used current and existing information to form this appraisal. Due to uncertainties including the possible future effects of Brexit and the COVID-19 pandemic, it is difficult to predict how this current baseline may change in terms of the magnitude and spatial distribution of shipping activity, and in terms of different types of shipping activity such as fishing or recreation. Additionally, further development of the marine region in terms of future offshore infrastructure including wind farms and oil and gas infrastructure may affect the shipping and navigational baseline presented here. **Application Document 6.2.4.9 Part 4 Marine Chapter 9 Other Sea Users** should be referred to understand any potential future offshore developments which may be awarded and constructed in the region.

7.6 Formal Safety Assessment

Introduction

7.6.1 The following sections provide a risk assessment for identified shipping and navigation hazards, following the FSA framework as part of the wider NRA methodology. The assessment represents the development of the preliminary hazard identification conducted as part of stakeholder consultations (see section 7.4) providing a complete risk assessment and hazard log based on highly detailed baseline data, stakeholder expertise and local knowledge. The assessment therefore also includes relevant details or issues raised during the consultation process.

7.6.2 The risk associated with each hazard identified is assessed using the definitions of likelihood and consequence severity against the risk matrix in section 7.2 and assigned a risk ranking of ‘Broadly Acceptable’, ‘Tolerable’ or ‘Unacceptable’, considering existing or embedded mitigations which are either part of the existing design or otherwise

accepted industry practise. Where appropriate, additional risk reduction measures (RRMs) are identified, and a residual risk ranking is assigned. The assessments are summarised in a table in the relevant subsections and collated in Annex 4.8.A.1 Hazard log.

Assessment Basis

7.6.3 As detailed in section 7.2, the assessment follows an FSA approach. The approach is applied where appropriate using the details of the Offshore Scheme found in **Application Document 6.2.1.4 Part 1 Introduction Chapter 4 Description of the Proposed Project**. However, specific details are captured here to provide additional context to the subsequent assessment.

Project Phases

7.6.4 **Application Document 6.2.1.4 Part 1 Introduction Chapter 4 Description of the Proposed Project** details all aspects of the Proposed Project, which cover a range of activities or stages relevant to all physical elements of the Proposed Project including near shore surveys, pre-sweeping, seabed and crossing preparations, cable lay, rock placement, post-lay activities and surveys among other details.

7.6.5 In line with the preliminary hazard assessment approach each of the hazards are assessed against all elements of the Offshore Scheme with only two broad phases of the scheme activities being addressed separately. Construction phases (covering all preparation, installation and commissioning works) as well as all decommissioning works, are considered to be broadly similar to each other in terms of the nature of activities which will take place and the associated potential hazards. Therefore, construction and decommissioning phases are assessed together. The operational phase of the Offshore Scheme is assessed separately and also includes all foreseen maintenance activities.

Embedded Mitigation and Control and Management Measures

7.6.6 A range of existing risk mitigation measures and considerations have been established during preliminary hazard assessment. The risk associated with each identified hazard is assessed in consideration of their mitigation effects. Mitigation measures are captured in the Hazard Log in Annex 4.8.A.1.

7.6.7 Embedded mitigation measure as follows:

- Sensitive routeing and siting of infrastructure and temporary works.
- Commitments made within **Application Document 7.5.3.2 Appendix B CEMP Register of Environmental Actions and Commitments (REAC).**
- Early and continued stakeholder consultations.
- Route design refined to run to the north of the Sunk W1 buoy.
- Presence of Vessel Traffic Service (VTS) in region – Existing shore-side systems which range from the provision of simple information messages to ships, such as position of other traffic or meteorological hazard warnings, to extensive management of traffic within a port or waterway.

- Establishment of operations weather envelope limits for the construction operations. Installation operations should monitor weather conditions and evaluate critical minimum operational envelope for relevant activities.
- Issuance of Adverse Weather Guidelines as required - Issued by ports in response to forecast bad weather. Potentially limits collisions, disruption and sub-surface interactions by deterring vessels from navigating anchoring fishing etc near hazards in bad weather.
- Compliance with MGN661 Navigation - Safe and responsible anchoring and fishing practices - In line with guidance provided by the UKHO and International Convention for the Safety of Life at Sea (SOLAS) it is recommended that fishing vessels should avoid trawling over installed subsea infrastructure.
- Rolling 500 m radius Recommended Restricted Zones (RRZs) will be in place around construction vessels, to protect both construction vessels (restricted in their ability to manoeuvre) and passing vessels from collision, as is standard practise. Recommended Restricted Zones would be established with communication to stakeholders and advanced notice to all and in liaison with Harwich and Sunk VTS.
- Designing rock berms to reduce snagging risk.
- Cable burial depth and protection is of particular concern in Pegwell Bay with regards to reduction in under-keel clearance and subsequent effect on navigation, as this is a region of shallow water depths, a changing approach channel and challenging navigation. This therefore needs to be taken into account in design and construction, to ensure the project is minimising the risk of introducing seabed hazards in this region.
- The Proposed Project cable will not be routed any closer to the Sunk W1 buoy than the 151 m distance that is currently planned, in order to protect both the buoy and the cable, as agreed with Trinity House.
- As per the 'Relevant Representation of NGET in respect of the North Falls Offshore Windfarm DCO', the Proposed Project agrees that 'The parties will continue to engage during pre-construction and construction with other cable installation projects in the vicinity of the Sunk pilot boarding station. The purpose of this engagement will be to coordinate as far as practicable marine activities which may overlap in time, in order to minimise the impact on shipping and the North Falls construction programme and the construction programme for Five Estuaries Offshore Wind Farm and Sea Link. This will also include, where appropriate, joint engagement with relevant stakeholders (HHA, PLA, Sunk VTS) to help inform and plan construction activities.'
- If a cable repair joint in required during the operational lifetime of the cable, as far as practicable this will be avoided within the Sunk area, but if such a scenario is unavoidable, the Project shall consider potential collision risk and minimize time spent during maintenance in this region as much as possible.

7.6.8 Control and management measures are identified in Table 7.

Table 7.17 Control and management measures

Measure	Details
(LVS02) - All project vessels must comply with the International Regulations for Preventing Collisions at Sea (1972) (International Maritime Organisation (IMO), 1972/77), regulations relating to International Convention for the Prevention of Pollution from Ships (the MARPOL Convention 73/78) with the aim of preventing and minimising pollution from ships and the international Convention for the Safety of Life at Sea (SOLAS, 1974, as amended).	IRPCS are the international standards designed to ensure safe navigation of vessels at sea. All construction vessels are expected to adhere to these rules, including displaying appropriate lights and shapes. SOLAS is an international maritime treaty which sets minimum safety standards in the construction, equipment and operation of merchant ships. The convention requires signatory flag states to ensure that ships flagged by them comply with at least these standards. In relation to the Offshore Scheme its compliance will ensure navigational safety.
(SN02) - Relevant information will be communicated to other sea users via Notices to Mariners (NtM), Radio Navigation Warnings Navigational Telex (NAVTEX) and/or broadcast warnings.	Promotes navigational safety and minimises the risk of equipment snagging.
(SN03) - All Project vessels will display appropriate marks and lights and will always broadcast their status on AIS; (SN04) - Temporary aids to navigation will be used as required to guide vessels around areas of installation activity.	Promotes navigational safety.
(SN05) - A compass deviation report will be produced prior to installation.	The Compass Deviation report highlights predicted areas where compass deviation may occur.
(SN06) - Guard vessel(s), using RADAR with Automatic RADAR Plotting Aid (ARPA) to monitor vessel activity and predict possible interactions, will be employed to work alongside the installation vessel(s) during cable installation works.	A guard vessel, marshalling a 500 m Recommended Clearance Zone (RCZ) may be used during the construction campaign where a potential risk to the asset or danger to navigation has been identified.
(CF01) - A Fisheries Liaison Officer (FLO) and fisheries working group(s) will be maintained throughout installation to ensure project information is effectively disseminated, dialogue is maintained with the commercial fishing industry and access to home ports is maintained during the main fishing season.	The employment of a FLO is intended to ensure all commercial fisheries operators in the vicinity of the Offshore Scheme will be proactively and appropriately communicated with in terms of the proposed operations.

Measure	Details
(SN01) - A risk based burial approach will be used where cables will be buried to a minimum depth of lowering (DOL) of 0.5 m (in areas of bedrock), with a target DOL of 1 m to 2.5 m, assessing cable protection risk factors such as sediment type, shallow geology, sediment mobility, fishing activity, shipping movements and anchor deployment along the route. (MPE02) - The minimum depth of lowing (DOL) to the top of the cable is 0.5 m (in areas of bedrock), with a target DOL for the Proposed Project approximately 1 m to 2.5 m, to be achieved where possible dependant on the seabed geology. . (MPE03) - Cable protection features (e.g. rock placement, mattresses and grout bags) will be installed only where considered necessary for the safe operation of the Project.	The cable burial and appropriately considered protection measures minimises the risk of snagging with anchors and fishing gear.
(GM02) - As-built locations of cable and external protection will be supplied to UKHO (Admiralty) and Kingfisher (KIS-ORCA)	Ensure navigational safety and minimise the risk and equipment snagging.

Scenario Outcomes

7.6.9 As part of the preliminary hazard assessment the “worst-case” and “most likely” outcomes were recorded (see Annex 4.7.A.1 Hazard log). This provides a balanced sense of the hazardous outcome for the purposes of hazard identification. However, it should be noted that the desktop risk assessment is based upon the worst-case scenarios.

Risk Assessment

7.6.10 The following sections present the assessments of each of the hazards to navigation identified in the preliminary hazard analysis and developed as part of this desktop exercise. These correspond to the Hazard log in Annex 4.7.A.1. Each section presents a narrative summarising the analyses and capturing the most relevant aspects and considerations. The assessments are made according to two distinct phases. The construction phase includes activities covering installation, commissioning and decommissioning and normal operations and maintenance phase which covers the operational lifetime of the cable and any maintenance activities (excluding inspections). In addition, an accompanying summary table is included in each section for ease of use.

Construction and decommissioning phases

Vessel collision

7.6.11 The construction phases of the Offshore Scheme require the use of heavy construction vessels, barges or otherwise large slow-moving vessels that will be constrained by their operations and hence restricted in their ability to manoeuvre. The presence of stationary barges and vessels involved in the preparation of landfall arrangements, or vessels associated with the progressive cable installation will therefore present an obstacle to all passing traffic, and hence may increase the risk of collisions in the area. Vessel collisions can occur between passing vessels and the installation operation vessels or between two or more third party vessels due to, for example, the restriction in sea room caused by the operation.

7.6.12 Throughout the year, a large number and range of vessel types cross the Offshore Scheme in multiple locations, including the majority of the cable route and landfall areas. AIS data show that “cargo/tanker” vessels comprise the largest proportion of the traffic at over 53% of the total. However, the remaining categories also contribute substantially, in particular ‘Recreational’ and ‘Other’, which make up the majority of the remainder.

7.6.13 The collision risk is likely to be greater where traffic density is highest, particularly around KP 15-20, the Sunk TSS and approximately between KP 80 and Ramsgate landfall (see **Figure 6.4.4.7.A.9 Seasonal vessel track density**). Areas where sea room is reduced, such as near pilot stations and within the TSS itself may also suffer higher risk of collision. It is noted from consultation with port and harbour authorities that, due to their size, pilots board larger vessels at around approximately 1.5 km east of the charted location of the Sunk pilot station. Additionally, vessels restricted in their ability to manoeuvre or constrained by their draught also present potentially raised collision risk in some inshore or otherwise shallow areas, and particularly where there are high numbers of recreational vessels such as around KP 4, KP 18 and from KP 85 to landfall at Ramsgate (see **Figure 6.4.4.7.A.4 Recreation**). This includes the London arrival and departing arc west of approximately KP 92.

7.6.14 The Offshore Scheme crosses the Ramsgate Channel at approximately KP 117.5, which is a busy route for a range of vessels including amateur or inexperienced mariners entering or exiting Sandwich Port and Haven at Pegwell Bay. However, almost the entire length of the Offshore Scheme experiences some vessel activity, as illustrated in **Figure 6.4.4.7.A 9 Seasonal vessel track density** and is generally considered to be within a very busy shipping area. It is also noted that historic vessel to vessel collision incidents have been recorded along the Offshore Scheme (see **Figure 6.4.4.7.A.8 MAIB events**).

7.6.15 The Kent landfall passes through Sandwich Port and Haven Commissioners harbour area. Communication in advance of and during construction is key within this region of very shallow water, which can be exposed at low tide. This is an area of difficult navigation for vessels entering/exiting the River Stour, therefore vessels may be constrained in their movements and routes through the area. Recreational boaters have had incidents with cable installation activities here in the past (on Nemo project).

7.6.16 Mitigation measures such as Notice to Mariners (NtM), Notification of Regular Runners, guard vessel patrol, Sécurité broadcasts on VHF, stakeholder consultations, and communication efforts between harbour authorities and marine organizations, aim to increase awareness of the operations among vessels in the area. Mitigations are also in

place to minimise the time installation vessels spend in any given area or location via cable route design, installation optimisations and minimisation of required cable crossings particularly. For most vessels using the area, the risk of collision is unlikely to significantly increase when navigating past the installation vessels. This is because these vessel categories adhere to standard navigational practices, follow collision avoidance guidelines, and exercise good shipping practices, such as complying with the International Regulations for Preventing Collisions at Sea (IRPCS). Additionally, the Sunk Traffic Separation Scheme (TSS) contributes to a higher level of organization and traffic discipline in the area, while associated Vessel Traffic Services (VTS) communications further reduce risks. It is noted that, in line with stakeholder consultations, the Offshore Scheme passes through the Sunk north of W1 buoy, minimising collision risk with vessels engaged in pilot boarding activities at the Sunk pilot boarding station. It is also recommended that cable joints within the Sunk area should be minimised as far as practicable to further reduce the installation vessel time spent here during cable lay, and therefore reduce collision risk.

7.6.17 It cannot be assumed that all vessels using the locations will be aware of the presence of the installation vessels or their activity schedules. Consultation with Sandwich Port and Haven identified the possibility of inexperienced mariners being at risk of collision with installation vessels at the Ramsgate Channel due to the prevalence of leisure craft using the channel. Guard vessels were however identified as being very effective mitigation for this risk, based on past experience with other cable installation activities in Pegwell Bay.

7.6.18 Considering the limited spatial and temporal footprint of the installation operations at any given location along the Offshore Scheme, combined with various other mitigations in place such as increased awareness through notices and VTS communications, as well as the presence of guard vessels throughout the operations, the probability of vessel collision along the Offshore Scheme is considered to be "Remote". However, it is important to note that the severity of a collision with any vessel or surface obstacle could lead to significant consequences, including the loss of crew, among other outcomes in the worst-case scenario. Taking these factors into account, the initial risk ranking for this situation is categorized as "Tolerable if ALARP” meaning efforts should be made to reduce the risk further.

7.6.19 It is therefore necessary to consider potential risk reduction measures in addition to the embedded mitigation (Table 7.18). Stakeholder consultation identified that the Sunk VTS User Group should be included in all relevant communications. Enhanced operational communication protocols should also be developed to ensure the Sunk VTS User Group members as well as all other relevant parties including VTS operators, SHAs, CHAs and other relevant stakeholders are appropriately informed of the operation activities and aware of the installation positions and schedules. This will take the form of a Navigation Installation Plan (NIP).

7.6.20 North Falls (export cables), NeuConnect, and Five Estuaries projects are expected to intersect the Offshore Scheme including crossings. The Project will continue to engage with Five Estuaries in order to coordinate as far as practicable marine activities which may overlap in time. In the unlikely event that simultaneous operations occur during installation, maintenance or decommissioning activities for the Project and other subsea cable developments, the Project will have project vessel management procedures and planned protocols to minimize disruption to third-party vessels which may lead to increased collision risk, as well as, where appropriate, joint engagement with relevant stakeholders such as harbour authorities. Harwich Haven Authority identified the need to minimize concurrent Restricted Ability to Manoeuvre (RAM) operations with other

planned offshore projects within the Sunk area. This should be avoided where possible through communication and coordination with such projects.

7.6.21 Harwich Haven Authority has also recommended that no project vessels with Restricted Ability to Manoeuvre operate in the Sunk area when visibility is below 2 nautical miles, which should be implemented where practicable. Sandwich Port and Haven authority also identified the need to promulgate information to small craft operators and other small vessels using Sandwich Port and Haven, and other such harbour facilities via Harbour Masters. These elements should also form part of communication planning or protocols.

Table 7.18 Vessel collision risk assessment summary (construction)

Hazard	Likelihood	Consequence	Risk	Additional RRM	Residual risk
Vessel Collision	Remote	High	Tolerable if ALARP	Enhanced communication plans (including NIP) to include coms and coordination between VTS and TSS operators, Harbour Masters, SHAs and CHAs to ensure awareness of installation fleet locations among all relevant parties Coordination of operations involving vessels of restricted manoeuvrability within the Sunk, avoiding RAM concurrent operations with other projects in the Sunk where possible. RAM operations in the Sunk area should be avoided, where practicable, in visibilities predicted to be below 2 nautical miles.	ALARP

Disruption to established vessel routes and areas

7.6.22 Some disruption to routine vessel routeing and any other scheduled activity is expected during the construction phases. The vessels used during these phases potentially include stationary barges and other vessels that are restricted in their ability to manoeuvre. In particular, stationary vessels at landfall areas or slow-moving vessels across the Sunk TSS, for example, may present more disruptive deviations. As such, the operation will present temporary obstacles, and other vessels routinely operating in the area may be required to deviate from their planned routes or plan for longer transits in order to cross the cable installation path or otherwise avoid the obstruction. The Offshore Scheme also passes near to a number of pilot stations and Aids to Navigation (AtoN), as well as directly through the Ramsgate compulsory pilotage area, all of which may be at risk of potential disruption.

7.6.23 Due to the presence of Harwich, Felixstowe, Ramsgate, Port of London and other ports in the wider area, this region is a very busy shipping area. The slow moving (0.5 km to 5 km per day) cable installation operation passes directly through the Sunk TSS, Ramsgate Channel and compulsory pilot area, and nearby to the approach to the Dover TSS. Although the Offshore Scheme has been refined based on consultation with users of the Sunk TSS to minimise disruption, this still presents potential for disruption through restricting sea room in the TSS and the most densely trafficked areas, as well as through disruption to associated pilot boarding activities in these areas. Harwich Haven Authority noted that due to the slow speed of the installation vessel, the frequency of piloting large vessels, the limited sea room, and the depth requirements, it may be necessary to develop a three-hour transit plan for crossing the path of the installation vessel. It is also noted that pilots board the largest vessels at around a mile east of the Sunk pilot station, approximately 2 km south of the edge of the Offshore Scheme at KP 37.5 (see **Figure 6.4.4.7.A.2 Ports and navigation**) within the TSS, at one of the most densely trafficked locations in the area. The Offshore Scheme also passes very close to the Tongue pilot station at approximately KP 90 which is also a very busy location for the largest vessel classes using the area.

7.6.24 Throughout most of the Offshore Scheme, vessels making minor route deviation to avoid the installation operation will not suffer any significant operational impact. However, due to the pilotage requirements and vessel traffic density in and around the Sunk TSS, delays and disruption are considered possible for some vessel types at this and other potential locations in the Offshore Scheme. Additionally, passenger craft and smaller craft may also be significantly disrupted in the inshore areas due to the limited sea room and the potentially stationary obstacles required for activities associated with the landfalls. It is noted that the disruption may be particularly pronounced at the Kent landfall where the exit pit location is expected to be within very shallow water depths and potentially within the Sandwich Port and Haven Authority area. Disruption may also be expected in particular in the Ramsgate Channel east of the Kent landfall where sea room is restricted, as identified through consultation with Sandwich Port and Haven. Pilot activities at Tongue and North-East Spit pilot stations may also be disrupted.

7.6.25 This hazard is assessed therefore as ‘Likely’ however given the small footprint of the installation operation and the temporary impact at any given location a ‘Low’ consequence severity is determined (Table 7.19). It is also noted that Trinity House confirmed acceptability of the distance of W1 Buoy to the cable route (noting that this proximity of 151 m was the minimum acceptable distance). This results in a ‘Tolerable if ALARP’ assessment and thus the obligation to consider further risk reduction measures.

7.6.26 The Offshore Scheme was designed and optimised with involvement from stakeholders to minimise risk and disruptions via cable route design and installation optimisations. However, there may still be some residual disruption that needs to be addressed. The most effective way to handle this is through clear and enhanced communication of the operation details, schedule, and protocols to those who are likely to be affected. It is recommended to develop communication plans that inform the TSS and VTS operators, SHAs and CHAs among others, about the operational developments well in advance of the operation. Additionally, protocols should be established for communication between these parties and the installation vessels to ensure that the location of operations is always identified. This will enable better planning to help mitigate disruption and facilitate effective communication and management of the affected vessels during the construction phase. This will take the form of a Navigation Installation Plan (NIP).

7.6.27 North Falls (export cables), NeuConnect, and Five Estuaries projects are expected to intersect the Offshore Scheme including crossings. The Project will continue to engage with Five Estuaries in order to coordinate as far as practicable marine activities which may overlap in time. In the unlikely event that simultaneous operations occur during installation or decommissioning activities for the Project and other subsea cable developments, the Project should have project vessel management procedures and planned protocols to minimize disruption to third-party vessels.

7.6.28 To minimise disruption to small craft in the inshore areas, construction planning activities should assess the availability of small craft channels such that disruption might be minimised to this vessel class.

Table 7.19 Disruption risk assessment summary (construction)

Hazard	Likelihood	Consequence	Risk	Additional RRM	Residual risk
Disruption to established vessel routes and areas	Likely	Low	Tolerable if ALARP	Enhanced communication planning (including NIP) Assess availability of small craft channels in construction planning	ALARP

Interactions with vessel anchors

7.6.29 During the construction phase, there is a risk that a third-party vessel will drop anchor or lose its holding ground in adverse weather and subsequently drag its anchor over a section of exposed cable prior to any required protection being installed. In the case of an anchor snagging incident, it is possible, in the worst case, that smaller vessels could suffer a risk of foundering should they not be able to free themselves.

7.6.30 The Offshore Scheme passes very close to the designated Sunk deep water anchorage area at around KP 33-39, and 2 km from the Sunk pilot station at the closest point at KP

37 (see **Figure 6.4.4.7.A.2 Ports and navigation**). Vessel anchoring activities in the area of the Offshore Scheme are captured in **Figure 6.4.4.7.A.16 Vessels at anchor by season**. The figure shows some vessels with status set to ‘at anchor’ passing across the Offshore Scheme at speeds greater than 2 knots, which are suspected to be set to ‘at anchor’ in error. However, vessels ‘at anchor’ with slower speeds (more likely to be anchoring) are identified overlapping or in close proximity with the Offshore Scheme across all seasons between approximately KP 35-40, likely associated with the Sunk deep water anchorage area. The Cable Burial Risk Assessment (CBRA) for the Proposed Project identifies anchor dragging as being a key hazard to the cable based on the proximity to the Sunk designated anchorage area and to the Sunk pilot station.

7.6.31 After consultation with Harwich Haven Authority, the Offshore Scheme has been refined to pass north of the Sunk W1 buoy. This results in increased distance from the Sunk pilot station, reducing the risk of interactions between project construction vessels and vessels visiting the pilot station. However, the Offshore Scheme’s increased proximity to the Sunk deep water anchorage area represents an increase in risk of anchor dragging throughout the life of the Proposed Project.

7.6.32 The Offshore Scheme also passes close to the Tongue Deep Water and Tongue Hazardous anchorages at KP 82-88, and the Tongue pilot station is located approximately 80 m to the east of the Offshore Scheme at KP 90 (see **Figure 6.4.4.7.A.2 Ports and navigation**).

7.6.33 The close proximity of the Offshore Scheme to these locations presents an increased risk of damage by accidental anchor drop, anchoring outside of the anchorage area or dragging of anchors across the cable, due to bad weather and or poor anchor penetration (this being evidenced by scarring observed in seabed surveys in the CBRA). It should also be noted such incidents may include some of the largest vessels in the world.

7.6.34 However, the risk-based cable burial approach and route selection process serve to reduce risks to both the cable and shipping by minimising vulnerabilities which include pre-lay preparations and reducing the time between cable lay and burial. Raising awareness of the operation details and associated hazards among the harbours, ports and pilots will provide appropriate risk reduction. VTS and TSS operators and otherwise advice from vessel traffic operation management will provide guidance to sea users and deter vessels from anchoring in the vicinity of the cable. Additionally, consultation with ports and harbour authorities confirmed that unplanned anchoring around the Sunk is very rare and not normal practise, with no incidents in recent memory recalled. Sandwich Port and Haven also identified that anchoring in the middle of Pegwell Bay where the Offshore Scheme runs is very rare. NtMs and other communications increase awareness of the potential hazard and industry guidelines, in particular MGN 661, are in place to deter vessels from anchoring in the vicinity of cables and other seabed hazards.

7.6.35 Snagging is therefore considered to be ‘Unlikely’ (Table 7.20). However, a consequence severity of outcome of ‘High’ is selected in the worst-case scenario where foundering leads to loss of crew. These combine to present an initial risk of ‘Tolerable’ if ALARP and the need to consider further risk reduction measures.

7.6.36 Therefore, it is recommended that UKHO temporary or preliminary notices are issued to relevant parties such that the basic location of the cables is captured prior to post-lay/as-built survey. Awareness among mariners can therefore be further increased, and industry guidance on anchoring in the vicinity of cables can offer maximum effectiveness during the construction phase.

7.6.37 Additionally, the use of Aids to Navigation should be considered where sections of the cable are expected to be exposed for significant lengths of time prior to burial. Marking requirements should be according to recommendations and approvals from Trinity House.

Table 7.20 Interaction with vessel anchor risk assessment summary (construction)

Hazard	Likelihood	Consequence	Risk	Additional RRMs	Residual risk
Vessel drags anchor across exposed cable	Unlikely	High	Tolerable if ALARP	UKHO Temporary/Preliminary Notice to be issued prior to post-lay/as-built survey Enhanced communication planning Consideration of the use of temporary Aids to Navigation for exposed cable sections	ALARP

Interactions with fishing gear

7.6.38 Fishing vessels whose gear becomes snagged on the cable prior to burial or protection may sustain extensive damage or suffer foundering during the construction phases of the Offshore Scheme. Pre-lay preparation such as ploughing may also result in the creation of berms and rock displacement which presents additional seabed hazards to fishing gear.

7.6.39 A large number and variety of fishing vessels are seen throughout the Study Area in the baseline data. Significant levels of actively fishing vessels are seen to the southeast of the Offshore Scheme however much of the Offshore Scheme route is free from this kind of activity. AIS and VMS data show that fishing vessels are present over or near to a number of locations along the Offshore Scheme. AIS data shows that vessels spent some limited time in spring with status set to 'actively fishing' directly over the cable route between KP 40-50 within the Sunk TSS, and at approximately KP 80-90 and to the east of the Tongue anchoring designation (**Figure 6.4.4.7.A.18 AIS data points with status set to actively fishing by season**). VMS data of vessels travelling < 6 knots (2017-2021) shows a similar pattern, with moderate density of such vessels particularly between KP 25-60 through the Sunk TSS (**Figure 6.4.4.7.A.19 VMS density and sightings**). This potentially reflects a historical problem with foreign fishing vessels operating around the Sunk TSS, as identified during stakeholder consultation.

7.6.40 To mitigate the risk of fishing gear interactions during the construction phase, several measures have been implemented. These include the appointment of a Fisheries Liaison Officer (FLO) throughout the construction period, the issuance of Kingfisher

notifications and Notice to Mariners (NtMs), and the provision of other relevant marine warnings. These measures aim to effectively address the risk of fishing gear encountering potential seabed hazards prior to construction, ensuring that fishermen in the area are aware of these hazards. Additionally, the presence of a variety of vessels involved in cable laying and burial operations, with particular emphasis on guard vessels monitoring unprotected or unburied cable sections, significantly reduce the likelihood of such interactions. However, it should be noted that the frequency of these interactions is higher in areas where fishing activity is more concentrated, primarily between KP 40-50 and KP 80-105.

7.6.41 Given the limited recorded prevalence of fishing in the immediate vicinity of the Offshore Scheme, the risk of fishing gear interactions or snagging is considered to be low. With prior promulgation of information on the cable locations to fishermen, via the FLO, and other notices to mariners including the Kingfisher Bulletin, the probability of interactions with fishing gear is already considered to be suitably minimised. The presence of guard vessels also limits the likelihood of fishing gear interactions. Industry guidance on fishing in the vicinity of cables and subsea infrastructure further deters fishing in close proximity. The likelihood of gear snagging is therefore assessed as 'Unlikely' (Table 7.21). The consequences of such an outcome can be severe and are assessed as 'High' due to the potential loss of crew members or vessel in the worst case. This results in an overall 'Tolerable' if ALARP assessment and the need to consider further risk reduction measures.

7.6.42 Therefore, it is recommended that UKHO temporary or preliminary notices are issued to relevant parties such that the basic location of the cable is captured prior to post-lay/as-built survey so awareness among mariners is further increased and industry guidance on fishing in the vicinity of cables and other associated seabed hazards offers maximum effectiveness. Additionally, the use of aids to navigation should be considered where sections of the cable are expected to be exposed for significant lengths of time prior to burial, with the prior approval of Trinity House.

Table 7.21 Fishing gear interaction risk assessment summary (construction)

Hazard	Likelihood	Consequence	Risk	Additional RRM	Residual Risk
Fishing gear snagging	Unlikely	High	Tolerable if ALARP	UKHO Temporary/Preliminary Notice to be issued prior to post-lay/as-built survey Consideration of the use of temporary aids to navigation for exposed cable sections	ALARP

Normal Operations and Maintenance

Vessel collision

7.6.43 During the operational lifetime of the cable a number of inspections to examine integrity are foreseen. This is expected to take place annually via ROV/autonomous operated underwater vehicle in the early stages of the operation moving to every 2 – 5 years once suitable functional/operational stability is established. Such inspections and maintenance activities require slow-moving vessels, constrained by their operations, and hence restricted in their ability to manoeuvre. The presence of these vessels or any other required for maintenance activities associated with the cable, may present an obstacle to passing traffic and hence an incremental increase in the risk of collision.

7.6.44 Throughout the year, a large number and a large range of vessel types cross the Offshore Scheme in multiple locations. The collision risk is likely to be greater in higher density sections of the Offshore Scheme or areas of restricted searoom and therefore particularly in and around the Sunk TSS and the Ramsgate Channel.

7.6.45 Mitigation measures, including various promulgations and communications such as NtM, and Notification of Regular Runners, ensure that awareness of the operations among many of the vessels using the area will be suitably raised. However, guard vessel patrol may not be in place during inspection activities, and it cannot be presumed that all vessels using the locations will be aware of the presence of the maintenance vessels or their schedule of activities.

7.6.46 It is possible that during the operational lifetime of the cable it may require a cable repair joint. As far as practicable, this will be avoided within the Sunk area, but if such a scenario is unavoidable, the Project shall consider potential collision risk and minimize time spent during maintenance in this region as much as possible.

7.6.47 The time and number of vessels involved with inspection activities is likely to be significantly reduced compared to the construction phase, which in turn limits the risk of collision. However, the collision risk associated with maintenance activities is ultimately dependent upon details such as particular locations, durations and complexities of the associated operations.

7.6.48 The likelihood of vessel collision as a result of the maintenance activities associated with all elements of the Offshore Scheme and at any point along the Offshore Scheme is therefore considered to be ‘Remote’ (Table 7.22). The severity of a collision with any vessel or surface obstacle may again result in a ‘High’ Severity/Magnitude consequence outcome (loss of crew) among other consequences in the worst case. These combine to present an initial risk ranking of ‘Tolerable’ if ALARP.

7.6.49 It is therefore necessary to consider potential risk reduction measures in addition to the embedded mitigation. Suitable measures to raise awareness of the operations among sea users would already be in place. The maintenance activities are generally expected to present minimal collision hazard under normal circumstances (i.e. inspection activity). Therefore, given that proximity and crossing agreements are expected to be arranged with interacting infrastructure operators where appropriate, it is proposed that a case-by-case risk assessment is made where maintenance activities, in addition to inspection, are required. This will ensure that details of unforeseen maintenance activities are considered such that any substantial increase in collision risk can be addressed without undue restrictions on normal activities.

Table 7.22 Vessel collision risk assessment summary (normal operations and maintenance)

Hazard	Likelihood	Consequence	Risk	Additional RRM	Residual Risk
Vessel Collision	Remote	High	Tolerable	Case-by-Case Risk Assessment to address collision risk of maintenance activities excluding inspections	ALARP

Disruption to established vessel routes and areas

7.6.50 As described in section 7.6.43 above, during the operational lifetime of the cable a number of inspections to examine integrity are foreseen. The presence of these vessels, or any other required for maintenance activities associated with the cable, may present an obstacle to passing traffic and hence an incremental increase in the risk of disruption. Additionally, a section of unburied cable may be at the Kent landfall and may therefore present a seabed hazard in the Sandwich Flats and Sandwich Port and Haven authority area for the lifetime of the Offshore Scheme. Additionally, the location of the River Stour approach channel and available depth across Pegwell Bay changes significantly over time according to natural processes. This presents the potential for varying degrees of space for vessels using the area depending on the location or timing of any maintenance activities.

7.6.51 Throughout the year, a large number and a range of vessel types cross the Offshore Scheme in multiple locations. The risk of disruption is likely to be greater in higher density sections of the cable route or areas with restricted sea room, and therefore particularly in and around the Sunk TSS or the Ramsgate Channel.

7.6.52 Mitigation measures, including various promulgations and communications such as NtM, and Notification of Regular Runners, ensure that awareness of the operations among many of the vessels using the area will be suitably raised. Any seabed hazard at the Sandwich Flats should be appropriately marked, included in the appropriate navigational charts and managed by Sandwich Port and Haven authorities and their procedures. However, guard vessel patrol may not be in place during inspection activities, and it cannot be presumed that all vessels using the locations will necessarily be aware of the presence of the maintenance vessels or their schedule of activities, particularly in the Ramsgate Channel.

7.6.53 Nonetheless, most of this traffic is unlikely to experience significant disruption in the unlikely case where they are required to navigate around maintenance vessels or marked seabed hazards, this being standard navigational practise for most of these vessel categories. They are likely to be aware of the cable and any protection due to the UKHO charting and marking of the infrastructure elements and locations. They are also likely to be prepared to navigate clear of the maintenance vessels due to the mitigations communicating details of the operation (NtM, Notification of Regular Runners, port

communications) and are generally expected to apply good passage planning techniques and procedures.

7.6.54 Throughout most of the Offshore Scheme, vessels making minor route deviation to avoid any inspection and maintenance activities will not suffer any significant operational impact. Vessels required to navigate any marked unburied cable sections while using Sandwich Port and Haven will be aware of the hazard which will be marked and managed by the port authority and its procedures. In the worst-case scenario, delays are considered possible and are assessed as 'Remote' (Table 7.23). The consequence severity is assessed as minor or 'Low'. This results in a 'Broadly Acceptable' assessment and therefore no requirement to consider further risk reduction measures.

Table 7.23 Disruption risk assessment summary (normal operations and maintenance)

Hazard	Likelihood	Consequence	Risk	Additional RRM	Residual risk
Disruption to established vessel routes and areas	Remote	Low	Broadly Acceptable	NA	Broadly Acceptable

Interactions with vessel anchors

7.6.55 During the operational phase, there is a risk that a third-party vessel will drop anchor or lose its holding ground in adverse weather and subsequently drag its anchor over a section of cable and come into difficulty. In the case of such an anchor snagging incident, in the worst-case scenario it is possible that smaller vessels could suffer a risk of foundering should they not be able to free themselves.

7.6.56 Vessel anchoring activities in the area of the Offshore Scheme are captured in **Figure 4.7.A-16 Vessels at anchor**. A Cable Burial Risk Assessment for the Proposed Project identifies anchor dragging as being a key hazard to the cable based on the proximity to the Sunk designated anchorage area and to the Sunk pilot station. The Offshore Scheme also passes close to the Tongue Deep Water and Tongue Hazardous anchorages at KP 82-88, and the Tongue pilot station is located approximately 80 m to the east of the Offshore Scheme at KP 90 (see **Figure 6.4.4.7.A.2 Ports and navigation**).

7.6.57 After consultation with Harwich Haven Authority, the Offshore Scheme has been refined to pass north of the Sunk W1 buoy. This results in increased distance from the Sunk pilot station, reducing the risk of interactions between project maintenance vessels and vessels visiting the pilot station. However, the Offshore Scheme's increased proximity to the Sunk deep water anchorage area represents an increase in risk of anchor dragging throughout the life of the Proposed Project.

7.6.58 The close proximity of these four locations (the Sunk deep water anchorage area, Sunk pilot station, Tongue anchorage areas and Tongue pilot station) to the Offshore Scheme

presents an increased risk of damage by accidental anchor drop or dragging of anchors due to bad weather and or poor anchor penetration (evidenced by scarring observed in seabed surveys). It is noted that such incidents could include some of the largest vessels in the world.

7.6.59 However, the cable shall be buried and otherwise protected where necessary along the vast majority of its length. The target burial depth, protection measures and locations have been determined as far as practicable via risk-based cable burial approach. As such this hazard shall be appropriately minimised.

7.6.60 Additionally, industry guidance on safe anchor and fishing practices and provision of as-built locations of the cable and external protections to UKHO (Admiralty) and Kingfisher (KIS-ORCA), combine to reduce snagging risks significantly. VTS is also in place at ports to inform and deter vessels from anchoring near the cable. During the operational phase, cable locations will be marked on navigational charts and will be familiar to many regular users of the area.

7.6.61 Snagging is therefore considered to be 'Unlikely' rather than remote, due to the long duration of the operational phase (Table 7.24). A consequence severity of outcome of 'High' is selected in the worst-case scenario where foundering leads to loss of crew. These combine to present an initial risk of 'Tolerable' if ALARP and the need to consider further risk reduction measures. However, the risk-based cable burial approach comprises a detailed and comprehensive assessment of all factors affecting the burial and protection requirements across the operational lifetime of the cable, as well as detailed burial recommendations incorporating the route selection advice from relevant shipping and navigation stakeholders. As such, adherence with the recommendations in the CBRA and in particular those pertaining to maintaining the depth of lowering (DOL) of the cable for the full life cycle, combined with appropriate as-built charting, is considered to represent comprehensive risk reduction so as to be ALARP. No further risk reduction measures are therefore required in addition to those established in the CBRA.

Table 7.24 Interaction with vessel anchor risk assessment summary (normal operations and maintenance)

Hazard	Likelihood	Consequence	Risk	Additional RRM	Residual risk
Vessel drags anchor across exposed cable	Unlikely	High	Tolerable if ALARP	None Identified	ALARP

Interactions with fishing gear

7.6.62 Fishing vessels whose gear becomes snagged on the cable or protections may sustain extensive damage or suffer foundering during the installation, operational, and decommissioning phases of the Offshore Scheme. Cable lay activities may also result in

the creation of berms and rock displacement which presents additional seabed hazards to fishing gear.

7.6.63 A large number and variety of fishing vessels are seen throughout the area in the baseline data. Significant levels of actively fishing vessels are seen to the southeast of the Offshore Scheme however much of the route is free from this kind of activity. AIS and VMS data (**Figure 6.4.4.7.A.17 Fishing vessels by vessel length and subtype** and **Figure 6.4.4.7.A.20 VMS by ICES sub-rectangle – fishing time by gear type** respectively) indicates that active fishing may take place over or near to a number of locations on the Offshore Scheme. VMS data shows that vessels spent some limited time fishing directly over the Offshore Scheme between KP 35-45, within the Sunk TSS and also between approximately KP 75-95. This potentially reflects a historical problem with foreign fishing vessels operating around the Sunk TSS, as identified during stakeholder consultation. AIS data shows a similar but less pronounced pattern in the spring season.

7.6.64 The cable will be buried along the majority of the route. Further protection measures are also foreseen on a case-by-case basis as the design detail is developed. All external protection measures shall be designed to minimise the risk of snagging insofar as possible. Regular inspections and maintenance (as required) is intended to be conducted to ensure the cable remains in good condition and suitably protected throughout its operational life. Industry guidance recommends avoidance of demersal fishing over cables and other safe practises relating to seabed hazards. This embedded mitigation, combined with the provision of as-built locations of the cable and external protection to UKHO and Kingfisher (KIS-ORCA) represents substantial risk reduction. As such, the risk of snagging is considered to be suitably reduced, as with the risk of anchor snagging addressed in the previous section. In addition, the appointment of a FLO during the construction phase provides substantial assurance that fishermen will be aware of the cable locations following the installation.

7.6.65 Given the risk based burial approach, prior promulgation of information about the Offshore Scheme to fishermen via the FLO, and other notices to mariners including the Kingfisher Bulletin, the probability of interactions with fishing gear is already considered to be minimal. Industry guidance on fishing in the vicinity of cables and subsea hazards further advises against fishing in close proximity. The NRA baseline data shows that fishing activity is already currently limited and as-built charting and promulgation of the cable locations is likely to prevent an increase to fishing in the immediate vicinity of the cable in the future. CBRA survey also identifies a limited risk to the cable from fishing activity. The likelihood of gear snagging is therefore assessed as ‘Remote’ given the expected continued avoidance of fishing in the cable vicinity (Table 7.25). The consequences of such an outcome can be severe and are assessed as ‘High’ due to the potential loss of crew members or vessel. This results in an overall ‘Tolerable if ALARP’ risk, which warrants further risk reduction.

7.6.66 It is therefore necessary to consider potential RRMs in addition to those assumed to be in place to reduce the risk to ALARP. Industry guidance on safe fishing practises combined with trenching and protection where required, represents a comprehensive range of snagging risk reduction measures. It is nonetheless recommended that detailed cable protection measures are determined with due consideration of the fishing intensity VMS data compiled in the baseline study.

Table 7.25 Fishing gear interaction risk assessment summary (normal operations and maintenance)

Hazard	Likelihood	Consequence	Risk	Additional RRM	Residual risk
Fishing gear snagging	Remote	High	Tolerable	Further or detailed cable protection measures to consider areas of fishing activity in baseline data	ALARP

Reduced under-keel clearance

7.6.67 Cable burial protections, displacement of rocks and the creation of berms and other seabed disturbances during installation may present hazards due to reductions in under-keel clearance along the Offshore Scheme.

7.6.68 The HDVC cable shall be buried along the vast majority of the Offshore Scheme as informed by a detailed Cable Burial Risk Assessment, with a minimum depth of lowering (DOL) to the top of the cable of 0.5 m (in areas of bedrock), with a target DOL for the Proposed Project of approximately 1 m to 2.5 m, to be achieved where possible, dependant on the seabed geology. The cable route has been refined in consultation with the PLA, Harwich Haven Authority, Felixstowe, MCA and other key stakeholders, with the aim for the cable to be located in the deepest waters possible through the Sunk to avoid reduction to water depth. It is also the intention that regular inspections and maintenance activity will ensure that the cable remains buried or otherwise protected during its entire operational lifetime. In line with MCA guidance, it is not planned to reduce the existing navigable water depth by more than 5% along any section of the cable (with respect to Chart Datum). It is therefore expected that under-keel clearance is only reduced at a very small number of locations, which are anticipated to be located close into shore. Other mitigations such as post-lay survey and provision of the as-built locations of cable and external protection to UKHO and KIS-ORCA increase awareness of the locations for all vessels and minimise the risk substantially. Additionally, the use of Horizontal Directional Drilling to bring the cable to land from under the seabed limits the potential for reductions in under keel clearance to the exit pit locations. The potential hazard to vessels due to reductions in under-keel clearance are therefore appreciably limited.

7.6.69 Nonetheless, the route is within a generally shallow marine area which is frequented by a large number of vessels with large draughts. Stakeholder consultation identified that ongoing dredging activity at the Harwich deep water channel is increasing the size of vessel draught that can be accommodated. Any reductions in UKC or obstacles such as rock berms at the approaches could result in larger draught vessels missing their approach slots.

7.6.70 Cable burial depth and protection is of particular concern in Pegwell Bay with regards to reduction in under-keel clearance and subsequent effect on navigation, as the River Stour approach channel which crosses Pegwell Bay is dynamic and not guaranteed, has varying depth, and is migrating over time towards the northern cliffs of Pegwell Bay. This therefore needs to be taken into account in design and construction, to ensure the project is minimising the risk of introducing seabed hazards in this region.

7.6.71 It is noted that the exit pit at the Kent landfall is expected to be around 1 km from land with a small section of unburied cable protected cable in shallow water. This means that a cable protection structure or arrangement may be in place within the Sandwich Flats at Pegwell Bay, at the Kent landfall. This is an area of very shallow water depth which can be exposed at low tide (UKHO, 2020). The location of the unburied cable section may also be within the Sandwich Port and Haven Authority area. The protection structure may therefore present a hazard to vessels entering and exiting Sandwich Port and Haven Authority area and using the flats generally, which may be compounded by the depth variation and the migrating approach channel at the mouth of the River Stour.

7.6.72 Reductions in under-keel clearance increase the risk of grounding with a rock berm or other protection feature, which may result in injury and or major vessel damage consequences and is therefore assessed as being ‘High’ (Table 7.26). Vessels with deep draughts are expected to exercise particular diligence and care through the adoption of good passage planning techniques and procedures. However smaller vessels using Sandwich Port and Haven Authority and the Sandwich Flats at Pegwell Bay generally will be at increased risk of grounding or allision with any unburied cable sections and or protection measures close to the Kent landfall. Nonetheless, mitigations serving to notify mariners and marine authorities of the location of the cable and its protections will reduce the likelihood of grounding and other impacts. Additionally, subsurface hazards will be marked and relevant authorities informed. Therefore, the likelihood is assessed as ‘Unlikely’. These combine to produce an overall assessment of ‘Tolerable if ALARP’ and further risk reduction measures should be considered.

7.6.73 During stakeholder consultation, Harwich Haven Authority requested to be kept expressly informed of any reductions in depth and required protection measures which may affect the approaches to the Harwich deep water channel. Sandwich Port and Haven also identified potential under-keel clearance issues related to variable depths and the migrating River Stour mouth channel. It is therefore recommended that Harwich Haven Authority and Sandwich Port and Haven are kept informed of seabed hazards and changes as they develop. Communication with Sandwich Port and Haven Authority, Harwich Haven Authority, and the Sunk VTS User Group, should be generally maintained such that they can respond to the proposals and seabed changes and address the hazards appropriately. Similarly, anticipated reductions in water depth greater than 5%, especially near areas like cable crossings, shorelines, key navigation routes, or areas where ships have limited room to maneuver, should be discussed with relevant stakeholders (like Statutory Harbour Authorities (SHA), Competent Harbour Authorities (CHA), and the MCA).

Table 7.26 Reduction in under-keel clearance risk assessment summary (normal operations and maintenance)

Hazard	Likelihood	Consequence	Risk	Additional RRM	Residual risk
Reduction in Under-Keel Clearance	Unlikely	Medium	Tolerable if ALARP	Harwich Haven Authority, Sandwich Port and Haven and SHAs CHAs and the MCA to be kept informed of proposed seabed hazards and changes as they develop	ALARP

Interference with marine navigational equipment

7.6.74 Given the transmission characteristics of the Project Marine Scheme, it is feasible that a zone of potential magnetic compass deviation from electro-magnetic field (EMF) effects could persist along the Offshore Scheme. A worst case of more than 5 degrees compass deviation in shallow areas is possible as identified in the CBRA. This may present some disruption to navigation across the cable lifetime.

7.6.75 Most commercial vessels use a variety of navigational instruments, with gyrocompasses being a primary tool, which are unaffected by electromagnetic fields (EMFs). However, some vessels may still rely on magnetic compasses either as their primary means of navigation or as a critical backup in case of gyrocompass failure. Magnetic compasses remain essential navigation equipment, as mandated by SOLAS (Safety of Life at Sea) regulations. Therefore, vessels may be affected by compass deviation when navigating in the vicinity of the cable and where the interference is most pronounced i.e., in shallow water/inshore. Vessels relying solely on a magnetic compass for navigation are likely to navigate by visual landmarks in shallow water and inshore areas. However, poor visibility and challenging sea states may nonetheless result in misrouting towards otherwise obscured hazards or objects.

7.6.76 Mitigation such as optimising cable configuration, separation distances to minimise compass deviation and burial, as far as practicable, will reduce the likelihood and severity of compass deviation effects. Additionally, magnetic compass deviation effects are limited to the immediate vicinity of the of the Offshore Scheme, so effects on the limited number of vessels expected to rely solely on magnetic equipment will be short lived, and only likely to result in minor course deviations. The consequence severity is therefore assessed as ‘Medium’ due to the increased hazard prevalence at inshore locations along the Offshore Scheme, where more pronounced and persistent deviation could occur (Table 7). However, complete reliance on magnetic compass navigation is considered very unlikely for any vessel in a given situation and location. Additionally, as

most of the bundled cable arrangement will be laid in water deep enough to minimise EMF effects and achieve the MMO criteria for less than 3% deviation over 95% of the route, the probability of disruption is assessed as ‘Remote’. Nonetheless it is recommended to inform SHAs of identified compass deviations as part of on-going stakeholder communications.

Table 7.27 EMF interference with marine navigational equipment risk assessment summary (normal operations and maintenance)

Hazard	Likelihood	Consequence	Risk	Additional RRM	Residual risk
EMF Interference with marine navigational equipment	Remote	Medium	Broadly Acceptable	NA	Broadly Acceptable

Cumulative effects

7.6.77 A list of potential cumulative projects and activities has been compiled and addressed in **Application Document 6.2.4.11 Part 4 Marine Chapter 11 Inter-Project Cumulative Effects**. The following potential interacting projects were escalated to stage 4 of the process: NeuConnect, GridLink Interconnector, North Falls Offshore Windfarm, East Anglia ONE North Offshore Windfarm, East Anglia TWO Offshore Windfarm, East Anglia THREE Offshore Windfarm, Nautilus Offshore Interconnector, Five Estuaries Offshore Windfarm, NEMO Link, Thanet Offshore Windfarm and Hanson Aggregate Marine Ltd Area 528/2.

7.6.78 NEMO Link and Thanet Offshore Windfarm were assessed to have potential to result in a likely significant effect, while the other projects were assessed to be unlikely to have significant effect. With mitigation as proposed in this NRA and in the ES (**Application Document 6.2.4.7 Part 4 Marine Chapter 7 Shipping and Navigation**), the residual cumulative effect is considered to be of no significant cumulative effect. .

Cost Benefit Analysis

7.6.79 In accordance with the principles of ALARP, a cost benefit justification of recommended additional risk reduction measures is used to determine their requirement for implementation. The principle of gross disproportion is used to ensure that the risk reduction benefit is proportionate to the cost of implementing a given measure. This appraisal assesses the risk to navigation rather than the public, or individual workers, for example. Similarly, as risks to navigation generally are being assessed, numerical frequencies for consequence outcomes cannot be determined and therefore detailed or numerical cost benefit calculations cannot be made here. Nonetheless, each of the additional measures recommended in the section above is addressed in this section to provide a basic justification of their implementation, or otherwise. Table 7 therefore shows the identified hazards to navigation, additional risk reduction measures recommended and a qualitative justification to provide a basic ALARP position against each of the hazards. The outcomes are also captured with the Hazard Log in Annex 4.7.A.1.

Table 7.28 Cost benefit considerations of additional risk reduction measures (RRMs)

Hazard	Project phase	Additional RRMs	Justification/details
Vessel Collision (Passing vessel collides with installation vessel)	Construction	Enhanced communication plans to include coms and coordination between VTS and TSS operators, Harbour Masters, Statutory Harbour Authorities (SHAs) and Competent Harbour Authorities (CHAs) to ensure awareness of installation fleet locations among all relevant parties Coordination of operations with other offshore cables projects, in particular involving vessels of restricted manoeuvrability within the Sunk, and avoiding RAM concurrent operations with other projects in the Sunk where possible. RAM operations in the Sunk area should be avoided, where practicable, in visibilities predicted to be below 2 nautical miles.	The cost associated with procedural measures such as enhancing communication plans and restricting RAM operations during poor visibility are not considered grossly disproportionate and therefore the measure is justified.
Disruption to established vessel routes and areas	Construction	Enhanced communication planning	The cost associated with procedural measures such as enhancing communication plans is not considered grossly disproportionate and therefore the measure is justified.

Hazard	Project phase	Additional RRMs	Justification/details
Disruption to established vessel routes and areas	Construction	Assess availability of small craft channels in construction planning	The cost associated with procedural measures such as construction planning is not considered grossly disproportionate and therefore the measure is justified.
Vessel drags anchor across exposed cable	Construction	UKHO Temporary/Preliminary Notices to be issued prior to installation	The cost associated with administrative measures such as issuing data are not considered grossly disproportionate and therefore the measure is justified.
Vessel drags anchor across exposed cable	Construction	Consideration of the use of temporary aids to navigation for exposed cable sections	Determination of marking requirements is considered part of detailed design process and does not therefore imply grossly disproportionate cost. Measure justified.
Fishing gear snagging	Construction	UKHO Temporary/Preliminary Notices to be issued prior to post-lay/as-built survey	The cost associated with administrative measures such as issuing data are not considered grossly disproportionate and therefore the measure is justified.
Fishing gear snagging	Construction	Consideration of the use of temporary aids to navigation for exposed cable sections	Determination of marking requirements is considered part of detailed design process and does not therefore imply grossly disproportionate cost. Measure justified.
Vessel Collision (Passing third party vessel collisions)	Operation and Maintenance	Case-by-Case Risk Assessment to address collision risk of maintenance activities excluding inspections	The cost associated with risk assessment measures are not considered grossly disproportionate and

Hazard	Project phase	Additional RRMs	Justification/details
			therefore the measure is justified.
Fishing gear snagging	Operation and Maintenance	Further or detailed cable protection measures to consider areas of fishing activity in baseline data	Consideration of fishing activity as part of detailed design is not considered to imply significant additional cost in itself therefore the measure is justified.
Reduction in Under-keel Clearance	Normal Operations and Maintenance	Harwich Haven Authority and Sandwich Port and Haven to be kept informed of proposed seabed hazards and changes as they develop	The costs associated with communication and communication protocols are not considered to be grossly disproportionate to the risk benefit gained. Additionally, this aspect of communication can be captured as part of enhanced communication planning already recommended. Measure justified.

Residual Risk

7.6.80 Across all phases of the Offshore Scheme, all initial hazards were assessed to be 'Tolerable if ALARP' or 'Broadly Acceptable'. Following the implementation of the additional risk reduction measures identified in Table 7 above the residual risk from all phases of the scheme can be considered ALARP.

7.7 Recommendations for Additional Mitigation Measures

7.7.1 The following recommendations resulting from the NRA have been made. These recommendations should be implemented to ensure that hazards to shipping and navigation from the Offshore Scheme are reduced to ALARP. Where recommendations are not implemented, justification should made and captured appropriately.

- Notification of regular runners including ferry operators. Engagement with regular runners and specifically ferry operators ensures awareness of the installation details which minimises disruption.
- Communication plans, namely a Navigation Installation Plan (NIP), should be established with clear protocols to ensure effective communication and coordination between all relevant shipping and navigation stakeholders, including SHAs, CHAs, VTS, and TSS operators. This will maintain ongoing awareness and coordination of Offshore Scheme installation fleet activities and awareness of their locations during construction, among all relevant parties. Special attention should be given to the

routeing of the installation operation through the Sunk TSS and when in proximity to the Sunk deep water anchorage area and the Sunk pilot station, as well as when in proximity to the Tongue anchorages and pilot station. Communication plans must include key stakeholders such as Harwich Haven and Sandwich Port and Haven authorities, in particular on the topic of any expected change in under-keel clearance or anticipated introduction of seabed hazards.

- Communication plans should, where necessary, identify areas of high potential magnetic compass deviations to relevant stakeholders.
- Communication plans should pay particular focus to operations within Pegwell Bay as this is a region of very shallow water and challenging navigation for vessels entering and exiting the River Stour, and may also have a high presence of amateur or inexperienced recreational boaters.
- Simultaneous operations with other offshore projects will be avoided where possible. Where simultaneous operations do occur, the Project will have project vessel management procedures and planned protocols to minimize disruption and potential risks.
- Coordination of planned operations within the Sunk region, to avoid concurrent Restricted Ability to Manouevre (RAM) operations (such as cable lay and burial) with other projects in the Sunk area where possible, in particular regarding the North Falls and Five Estuaries Wind Farm projects.
- Restricted Ability to Manoeuvre operations in the Sunk area should be avoided where practicable in visibilities of below 2 nautical miles. .
- Construction planning for the landfall activities should take into account availability of small craft channels such that disruption to this vessel class is minimised as far as possible.
- UKHO Temporary/Preliminary Notices to be issued to ports, harbours and pilots, and any other appropriate parties prior to post-lay/as-built survey such that the basic positions of the cable are established and awareness among mariners can be raised immediately.
- The use of temporary Aids to Navigation for exposed cable sections should be considered to reduce the risk of interactions with fishing gear vessel anchors particularly near designated anchorages. Details, extent and requirements of the markers should be confirmed and established with Trinity House.
- Risk assessment of maintenance activities (excluding inspections) should be undertaken to determine the collision risk level and suitable controls on a case-by-case basis such that both collision risk and disruption to maintenance activities are minimised.
- Cable protection measures should take due consideration of fishing activity in the baseline data such that those sections of the cable buried or protected within fishing grounds will minimise risk to gear snagging.
- Minimising the amount of time the cable stays unprotected and exposed to potential interactions with anchoring vessels or fishing gear (anchor drag or gear snagging), during construction.

- Avoiding disruption to the Sunk anchorage area and Sunk pilot boarding area during construction by minimising time spent in this region during construction and avoiding cable joints in this areas where possible.
- Avoiding disruption to the Sunk anchorage area, Sunk pilot boarding station, Tongue anchorages and Tongue pilot station during operation by considering appropriate cable burial depth and protection measures, and aiming for minimal reduction in under keel clearance, as well as carefully considering the location of cable joints.
- Any seabed hazard at the Sandwich Flats will be appropriately marked, included in the appropriate navigational charts and managed by Sandwich Port and Haven authorities and their procedures.
- Anticipated reductions in water depth greater than 5% will be discussed with the MCA and other relevant stakeholders such as Statutory Harbour Authorities (SHA) and Competent Harbour Authorities (CHA).

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Annex 4.7.A.1 Hazard Log

7.8.1 This hazard log captures the assessment of hazards relevant to shipping and navigation resulting from the marine elements of the Proposed Project. The table includes all hazards identified as part of stakeholder hazard workshops and includes embedded and project specific mitigation identified during the sessions as well additional risk reduction measures identified as part of the desktop exercise, detailed in this report. Initial risk is captured based on embedded mitigation measures established during hazard identification sessions. A residual risk ranking is also captured based on the inclusion of any additional risk reduction measures. Finally, qualitative cost benefit analysis is included to support the residual risk ranking and the basic ALARP position. Detailed narratives supporting each assessment are captured in the main body of this report (section 7.6) however the table here provides a succinct and auditable record of the assessment outcome. Note that although both worst case and most likely outcomes are captured, the assessment is based on the worst case for each hazard.

Table 4.7.A.1: Hazard log

Phase	Hazards	Statutory mitigation	Industry practice mitigation	Project specific mitigation	Worst credible outcome	Most likely outcome	Worst case likelihood	Worst case severity	Risk	Additional RRMs	Residual risk	CBA	Consultation notes
Construction (Installation Commissioning & Decommissioning)	Vessel Collision Passing vessel collides with installation vessel (restricted in its manoeuvrability including construction vessels)	COLREGS /SOLAS Lights and Shapes Port Bylaws and General Directions VTS Communication /management relating to TSS Bridge team management & Passage planning NAVTEX NAVAREA Warnings	Route Selection MGNs (Marine Guidance Notes) NtM (Notice to Mariners) Safe clearance zone (500m) AIS Broadcasts Notification of RR's Op limits Broadcast of Sécurité messages on VHF	Guard Vessels with ARPA	Loss of a crew member, or multiple serious injuries Major/Severe damage to equipment or vessel Wreck/Cargo release causes hazard and disruption to shipping (including any environmental or other clean-up operations)	Minor injury(s) to person Minor/Local damage to equipment or vessel	Remote	High	Tolerable if ALARP	Enhanced communication plans to include comms between VTS and TSS operators to ensure awareness of installation fleet locations Coordination of operations involving RAM within the Sunk, avoiding concurrent operations with other projects in the Sunk where possible. Operations in the sunk area should be avoided, where practicable, in visibilities predicted to be below 2 nautical miles	ALARP	Measure Justified	Passing vessels may also be unable to deviate from their course due to being constrained by their draught in relation to the available depth of water and the width of the navigable channel. VTS communications around the Sunk TSS areas can be unreliable therefore this needs to be managed when controlling traffic during the operation. TSS operators should be included in relevant communications. High number of recreational vessels noted. Guard vessel will transmit notices and messages as per normal operation Proximity agreements will be part of normal project procedures. Enhanced communications protocols in proximity to TSS and Anchorages should be considered The project area is close to the London arrival and departing arc, therefore strict management of exactly where project vessels are needs to be specified by enhanced communications between VTS and TSS operators

Phase	Hazards	Statutory mitigation	Industry practice mitigation	Project specific mitigation	Worst credible outcome	Most likely outcome	Worst case likelihood	Worst case severity	Risk	Additional RRMs	Residual risk	CBA	Consultation notes
Construction (Installation Commissioning & Decommissioning)	Vessel Collision Passing third party vessels collisions	COLREGS /SOLAS Lights and Shapes Port Bylaws and General Directions VTS Communication /management relating to TSS Bridge team management & Passage planning NAVTEX NAVAREA Warnings	Route Selection MGNs NtM Safe clearance zone (500m) AIS Broadcasts Notification of RR's Op limits Broadcast of Sécurité messages on VHF	Guard Vessels with ARPA	Loss of a crew member, or multiple serious injuries Major/Severe damage to equipment or vessel Wreck/Cargo release causes hazard and disruption to shipping (including any environmental or other clean-up operations)	Minor injury(s) to person Minor/Local damage to equipment or vessel	Remote	High	Tolerable if ALARP	Enhanced communication plans to include comms between VTS and TSS operators to ensure awareness of installation fleet locations	ALARP	Measure Justified	Passing vessels may also be unable to deviate from their course due to being constrained by their draught in relation to the available depth of water and the width of the navigable channel VTS communications around the Sunk TSS areas can be unreliable therefore this needs to be managed when controlling traffic during the operation. TSS operators should be included in relevant communications High number of recreational vessels noted. Guard vessel will transmit notices and messages as per normal operation Proximity agreements will be part of normal project procedures. Enhanced communications protocols in proximity to TSS and Anchorages should be considered The project area is close to the London arrival and departing arc, therefore strict management of exactly where project vessels are needs to be specified by enhanced communications between VTS and TSS operators
Construction (Installation Commissioning & Decommissioning)	Disruption to established vessel routes, areas and activities Disruption to multiple vessels due to installation	VTS Communication /management relating to TSS	MGNs Route Selection Notice to Mariners Guard Vessels AIS Broadcast	FLO Consultations	Significant delays and disruption to shipping and ports activities	No significant operational impacts	Likely	Low	Tolerable if ALARP	Enhanced communication planning Assess availability of small craft channels in construction planning	ALARP	Measure Justified	Small craft can be displaced into the path of larger commercial vessels Routes of some larger vessels are very restricted by draft. Pilots require considerable sea room for large vessels; boarding up to a mile east of

Phase	Hazards	Statutory mitigation	Industry practice mitigation	Project specific mitigation	Worst credible outcome	Most likely outcome	Worst case likelihood	Worst case severity	Risk	Additional RRMs	Residual risk	CBA	Consultation notes
	activities using established routes		Notification of RR's										Sunk Pilot Station and up to 4 vessels per day The need to plan for up to 3-hour transits across the cable route for some vessels identified Construction activities particularly at landing areas close to shore should consider the availability of small craft channels Visual Intrusion and Noise disruption noted as not a concern
Construction (Installation Commissioning & Decommissioning)	Interactions with vessel anchors Vessel drags anchor across exposed cable	VTS Communication	Cable burial and Protection Measures (partial) NtM Guard Vessels Advice from VT Ops management MGN	Early stakeholder consultations	Loss of a crew member, or multiple serious injuries Major/Severe damage to infrastructure or vessel	Notable damage to infrastructure or vessel	Unlikely	High	Tolerable if ALARP	UKHO temporary or preliminary notices issued prior to post-lay/as-built survey Enhanced communication planning Consideration of the use of temporary aids to navigation for exposed cable sections	ALARP	Measure Justified	Option to put temporary Nav Aids versus Guard vessels while cable is exposed prior to burial. This will be minimised as far as possible Unplanned anchoring around the Sunk is a rare event/not normal practice. No immediately recallable events. Potential to use electronic navigation aids in future which are a developing technology CBRA Identifies Sunk anchorage as area of concern for anchor dragging
Construction (Installation Commissioning & Decommissioning)	Interactions with fishing gear Fishing activity conducted in vicinity of cable route leads to snagging	VTS Communication	Cable burial and Protection Measures (partial) NtM Guard Vessels MGN	FLO 500 m safe clearance zone for fishing vessels Kingfisher Bulletins	Loss of a crew member, or multiple serious injuries Major/Severe damage to equipment or vessel	Notable damage to infrastructure or vessel Damage or loss of fishing equipment	Unlikely	High	Tolerable if ALARP	UKHO temporary or preliminary notices issued prior to post-lay/as-built survey Consideration of the use of temporary aids to navigation for exposed cable sections	ALARP	Measure Justified	Option to put temporary Nav Aids versus Guard vessels while cable is exposed prior to burial. This will be minimised as far as possible. Potential to use electronic navigation aids which are a developing technology Most fishing activity is inland of project area - fishing vessels at Sunk has been an issue from foreign vessels historically
Normal Operations and Maintenance	Vessel to Vessel Collision	COLREGS /SOLAS	Route Selection MGNs		Loss of a crew member, or multiple serious	Minor injury(s) to person	Remote	High	Tolerable if ALARP	Case-by-Case Risk Assessment to	ALARP	Measure Justified	Passing vessels may also be unable to deviate from their course due to being

Phase	Hazards	Statutory mitigation	Industry practice mitigation	Project specific mitigation	Worst credible outcome	Most likely outcome	Worst case likelihood	Worst case severity	Risk	Additional RRMs	Residual risk	CBA	Consultation notes
		Lights and Shapes Port Bylaws and General Directions VTS Communication /management relating to TSS Bridge team management & Passage planning NAVTEX NAVAREA Warnings	NtM Safe clearance zone (500m) AIS Broadcasts Notification of RR's Op limits Broadcast of Sécurité messages on VHF		injuries Major/Severe damage to equipment or vessel Wreck/Cargo release causes hazard and disruption to shipping (including any environmental or other clean-up operations)	Minor/Local damage to equipment or vessel				address collision risk of maintenance activities excluding inspections			constrained by their draught in relation to the available depth of water and the width of the navigable channel VTS communications around the Sunk TSS areas can be unreliable therefore this needs to be managed when controlling traffic during the operation. TSS operators should be included in relevant communications High number of recreational vessels noted. Proximity agreements will be part of normal project procedures. Enhanced communications protocols in proximity to TSS and Anchorages should be considered The project area is close to the London arrival and departing arc therefore strict management of exactly where project vessels are needs to be specified by enhanced communications between VTS and TSS operators
Normal Operations and Maintenance	Disruption to established vessel routes, areas and activities Disruption to multiple vessels due to maintenance vessel activities using established routes Disruption from seabed hazard at Kent Landfall	VTS Communication /management relating to TSS Subsurface hazards marked and relevant authorities informed	MGNs Route Selection NtM Guard Vessels AIS Broadcast Notification of RR's		Delays	No significant operational impacts	Remote	Low	Broadly Acceptable	NA	Broadly Acceptable	NA	

Phase	Hazards	Statutory mitigation	Industry practice mitigation	Project specific mitigation	Worst credible outcome	Most likely outcome	Worst case likelihood	Worst case severity	Risk	Additional RRMs	Residual risk	CBA	Consultation notes
Normal Operations and Maintenance	Interactions with vessel anchors Vessel drags anchor across exposed cable	VTS Communication /Management relating to TSS	cable burial and Protection Measures Route Selection Notice to Mariners AIS Broadcast Notification of RR's As-Built Locations of cable and protections supplied to UKHO (Admiralty) Advice from VTS Ops management	Risk Based Burial Approach Target Cable Burial Depth	Loss of a crew member, or multiple serious injuries Major/Severe damage to infrastructure or vessel	Notable damage to infrastructure or vessel	Unlikely	High	Tolerable if ALARP	(None Identified)	ALARP	NA	MGN 661 Deters vessels from anchoring in vicinity of cables .
Normal Operations and Maintenance	Interactions with fishing gear Fishing activity conducted in vicinity of cable leads to snagging		cable burial and Protection Measures Notice to Mariners AIS Broadcast Notification of RR's As-Built Locations of cable and protections supplied to Kingfisher (KIS-ORCA)	Risk Based Burial Approach Target Cable Burial Depth	Loss of a crew member, or multiple serious injuries Major/Severe damage to infrastructure or vessel	Notable damage to infrastructure or vessel	Remote	High	Tolerable if ALARP	Further or detailed cable protection measures to consider areas of fishing activity in baseline data	ALARP	Measure Justified	CBRA Identifies low risk to cable from fishing interaction MGN 661 Deters vessels from fishing in vicinity of cables .
Normal Operations and Maintenance	Reduction in Under Keel Clearance	Subsurface hazards marked and relevant authorities informed	As-Built Locations of cable and external protections supplied to UKHO (Admiralty) and Kingfisher (KIS-ORCA)	Risk Based Burial Approach Target depth reduction of less than 5% Target Cable Burial Depth	Loss of a crew member, or multiple serious injuries Major/Severe damage to infrastructure or vessel	Major/Severe damage to infrastructure or vessel	Unlikely	High	Tolerable if ALARP	Harwich Haven Authority and Sandwich Port and Haven to be kept informed of seabed hazards and changes as they develop	ALARP	Measure Justified	Issue may be addressed as a separate risk following detailed design - 5% limitation is an area that has been subject of much discussion with authorities previously Harwich Haven Authority requests that project keeps open communication regarding all instances where rock berms maybe installed and other potential

Phase	Hazards	Statutory mitigation	Industry practice mitigation	Project specific mitigation	Worst credible outcome	Most likely outcome	Worst case likelihood	Worst case severity	Risk	Additional RRMs	Residual risk	CBA	Consultation notes
													reductions to draft. - Harwich deep water channel being dredged to accommodate 16m draught vessels and future proofing may require accommodating 20 m draughts going forward
Normal Operations and Maintenance	EMF Interference with marine navigational equipment	Magnetic compass deviation below 3 degrees for 95% of route	Range of Instruments used for navigation As-Built Locations of cable and external protections supplied to UKHO (Admiralty) and Kingfisher (KIS-ORCA)	Bundled Cable Design minimises deviations	Minor navigational impairments	No significant operational impacts	Remote	Medium	Broadly Acceptable	NA	Broadly Acceptable	NA	CBRA Identifies that 5 degrees deviation may be exceeded in shallow areas however this is thought to be unlikely now due to cable configuration chosen

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