KEEPING BRITAIN TRADING

IMMINGHAM EASTERN RO-RO TERMINAL

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Chapter 10: Commercial and Recreational Navigation
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Immingham Eastern Ro-Ro Terminal

Environmental Statement: Volume 1
Chapter 10: Commercial and Recreational Navigation

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Contents

Tables

10 Commercial and Recreational Navigation

10.1 Introduction

10.1.1 This chapter provides an assessment of the potential significant effects of the proposed Immingham Eastern Ro-Ro Terminal (IERRT) on commercial and recreational navigation. The principal marine elements of the proposed development are shown on Figure 1.2 in Volume 2 of this Environmental Statement (ES). This chapter has been prepared by ABPmer.

10.1.2 A number of figures support the description of the existing environment (baseline) and are provided in Volume 2 of this ES (Application Document Reference number 8.3). Figure 10.1 shows the study area and the relevant elements of the IERRT, and Figure 10.2 provides a density grid of vessel movements derived from AIS data. This chapter has also been informed by the Navigational Risk Assessment (NRA) which is provided at Appendix 10.1 in Volume 3 of this ES (Application Document Reference number 8.4).

10.1.3 HR Wallingford has also conducted a series of desk studies and real time navigation simulations to support the design and orientation of the berths for the IERRT project. The navigation simulation study that considers the orientation of the berths is described in Chapter 2 of this ES and is included at Appendix 10.2 to this ES. Further vessel simulations were also conducted between 28 and 30 November to inform operational berthing procedures and are provided at Appendix 10.3.

10.2 Definition of the study area

10.2.1 The study area for this assessment is the area over which potential direct and indirect effects of the IERRT project are predicted to occur. The study area comprises a section of the Humber Estuary from the Humber Sea Terminal in the north to Burcom Shoal in the south. The area selected covers marine traffic patterns and activities associated with the wider area that impact on the facility and planned works. The study area therefore also encompasses the dredge disposal site in proximity to Holme Channel and Clay Huts on the northern side of the main channel.

10.2.2 This study area has been selected so as to incorporate typical traffic and marine activities which take place within the Humber Estuary that may be of relevance to both the construction and operation of the IERRT project. Figure 10.1 shows the study area and identifies Clay Huts, Holme Channel, Immingham Dock, Immingham Oil Terminal (IOT) and Immingham Outer Harbour (IOH).

10.3 Assessment methodology

Data and information sources

10.3.1 Current baseline conditions have been determined by a desk-based review of available information. The main desk-based sources of information that have been reviewed to inform the current baseline description within the vicinity of the proposed development include:

- Automatic Identification System (AIS) data;
- Marine accident/incident data; and
- Information from nautical charts.

10.3.2 The following sections detail each of the data sources and the time period that they cover.

Automatic Identification System data

10.3.3 The NRA has used Automatic Identification System (AIS) data for the dates 1 September 2021 to 31 August 2022. This has been sourced from an AIS database provided by Anatec Limited.

10.3.4 AIS signals are broadly classified as 'Class A' and 'Class B', where AIS-A is carried by international voyaging ships with Gross Tonnage (GT) of 300 or more tonnes, all passenger ships regardless of size, fishing vessels 15 m or more in length overall (operating within UK waters) and certain categories of workboats. The use of AIS-B is not compulsory but may be carried by other vessels, including smaller commercial craft, the fishing sector, and recreational vessels.

10.3.5 Both AIS-A and AIS-B data have been used within this study. The AIS data has been analysed and classified into the following vessel categories, which are taken directly from the AIS data transmissions:

- Non-Port service craft;
- Port service craft;
- Vessels engaged in dredging or underwater operations;
- High Speed Craft;
- Military or law enforcement vessels;
- Passenger vessels;
- Cargo vessels;
- Tankers;
- Fishing;
- Recreational; and
- Unknown.

10.3.6 The 'unknown' category includes craft that are using AIS to identify their location but have not set their AIS to confirm their craft type. Typically, these are workboats (which may carry out a number of roles), fishing vessels and other smaller craft operating commercially. This category also

includes craft that have incorrectly set their AIS transceivers or not changed the factory default settings.

Recreational activity

10.3.7 Information on recreational activity in the study area has been collated using a variety of methods. Quantitative data has been derived from AIS-B records although it is recognised that not all recreational craft carry AIS transceivers, since the use of AIS-B is not mandatory. As a consequence, patterns of activity related to recreational craft have also been collected from anecdotal sources, including port staff, recreational users, and yachting guides.

Port freight and movement statistics

10.3.8 Statistics for port freight and vessel movements at major ports is recorded by the Department for Transport (DfT). This data is collected by annual returns provided by the ports and made available online (DfT, 2021). The method used for collation of vessel movements at major ports was, however, altered in 2017, resulting in comparison with years previous to this becoming impracticable in terms of realistic analysis.

10.3.9 Vessel movement statistics have been collated from the Port and Vessel Information System (PAVIS) which is an in-house ABP database.

Maritime accidents/incidents

10.3.10 To characterise maritime incidents occurring within the study area, available data has been pooled from three sources. These include records held by the Royal National Lifeboat Institution (RNLI) call out data, records held by the Maritime Accident and investigation Branch (MAIB) and data from the local marine accident incident reporting database (MARNIS). Data from the RNLI callout database, the MAIB database and the MARNIS database has been considered from 01 January 2011 to 31 December 2020. This is the most recent available data for the same period across all three datasets.

Navigational features

10.3.11 Navigational features have been considered in this assessment and have been identified using information from UK Hydrographic Office (UKHO) Admiralty Charts 3497 and 1188. Charted information is used by mariners as part of the passage planning process and to plot progress during a passage and so contain all relevant navigational information.

Determining significance of effects

10.3.12 The methodology used in this chapter to determine the significance of effect draws upon the methodology employed in the NRA (Appendix 10.1 to this ES). The method for carrying out the NRA follows the guidance from the Port Marine Safety Code (PMSC) ‘A Guide to Good Practice on

Port Marine Operations' (DfT, 2018). Additionally, considerations from Marine Guidance Note (MGN) 654, Annex 1 'Methodology for assessing marine navigational safety and emergency response risks of OREIs' (MCA, 2021) and the underpinning International Maritime Organization (IMO) Formal Safety Assessment (FSA) (IMO, 2018) have been consulted for guidance on hazard categorisation and analysis stages.

10.3.13 It should be noted that whilst the environmental impact assessment within this chapter is informed by the NRA, the NRA provides a more detailed analysis and assessment of the risks.

10.3.14 ***Hazard –*** The IMO Guidelines for FSA defines a hazard as: *"A potential to threaten human life, health, property or the environment",* (IMO, 2018). The first stage in the assessment was the identification of hazards arising from the IERRT project, termed the 'Hazard Identification' (HAZID). This exercise included the holding of a number of workshops (29 October 2021, 7 April 2022 and 16-17 August 2022) with varied users of the Port such as Pilots and Pilotage Exemption Certificate (PEC) holders, commercial operators, tug operators, crew and other agencies (a detailed list of these stakeholders can be found in Appendix 10.1). Subject matter experts and local port users in attendance at the HAZID workshop(s) also contributed to the formation of hazard scenarios with descriptive and tailored 'worst credible' and 'most likely' events.

10.3.15 ***Risk –*** The HAZID workshops involved analysing each hazard scenario (both the 'most likely' and the 'worst credible') by determining an estimated consequence and frequency, based on the expert judgement of those in attendance. This combination of consequence and frequency is termed 'risk'. The analysis of each hazard scenario is completed against four receptors, namely:

- People (human life);
- Planet (environment);
- Port (reputation/business/amenity loss); and
- Property (port and shipping infrastructure damage).

Consequence descriptors

10.3.16 The consequence descriptors have been used to inform the assignment of values to the hazard scenarios. The associated descriptions detailed below in Table 10.1 ensure that outcomes are applied consistently in contemplation of the severity of the consequence should it come to fruition.

Table 10.1. Consequence descriptors

Descriptor	Consequence
Consequence Descriptors: People	
No injury	Negligible (1)
Minor injury(s)	Minor (2)
Serious injury(s) (MAIB/RIDDOR reportable injury)	Moderate (3)
Single fatality	Major (4)
Multiple fatalities	Extreme (5)
Consequence Descriptors: Property	
Negligible (£0 - £10,000)	Negligible (1)
Minor (£10,000 - £750,000)	Minor (2)
Moderate (£750,000 - £4M)	Moderate (3)
Serious (£4M - £8M)	Major (4)
Major (> £8M)	Extreme (5)
Consequence Descriptors: Planet	
None (No incident - or a potential incident/near miss)	Negligible (1)
No Measurable Impact (An incident or event occurred, but no discernible environmental impact - Tier 1 but no pollution control measures needed)	Minor (2)
Minor (Incident results in pollution with limited/local impact - Tier 1, Harbour Authority pollution control measures deployed)	Moderate (3)
Significant (Has the potential to cause significant damage and impact - Tier 2, pollution control measures from external organisations required)	Major (4)
Major (Potential to cause catastrophic and/or widespread damage - Tier 3, requires major external assistance)	Extreme (5)
Consequence Descriptors: Port (business/reputational)	
None	Negligible (1)
Minor (Little local publicity. Minor damage to reputation. Minor loss of revenue, £0 - £750,000)	Minor (2)
Moderate (Negative local publicity. Moderate damage to reputation. Moderate loss of revenue, £750,000 - £4M)	Moderate (3)
Serious (Negative national publicity. Serious damage to reputation. Serious loss of revenue, £4M - £8M)	Major (4)
Major (Negative national and international publicity. Major damage to reputation. Major loss of revenue, > £8M)	Extreme (5)

Frequency descriptors

10.3.17 The frequency descriptors have been used to inform the assignment of values to the hazard scenarios. The associated descriptors detailed in Table 10.2 ensure that values are applied consistently in contemplation of the frequency of the scenario for it to come to fruition.

Table 10.2. Frequency descriptors

Descriptor	Frequency
The impact of the hazard is realised but should very rarely occur (within the lifetime of the entity)	Rare (1)
The impact of the hazard might occur but is unlikely (within the lifetime of the entity)	Unlikely (2)
The impact of the hazard could very well occur, *but it also may not* (within the lifetime of the entity)	Possible (3)
It is quite likely that the impact of the hazard will occur (within the lifetime of the entity)	Likely (4)
The impact of the hazard will occur (within lifetime of entity)	Almost Certain (5)

Significance of effect/tolerability of risk

10.3.18 ***Tolerability and ALARP –*** The risk classification associated with each of the hazard scenarios was assessed in the NRA in accordance with a pre-defined scale. The outcome of the risk analysis was then compared with risk tolerability based on a defined position for each receptor (see Section 9.7 of the NRA at Appendix 10.1). In the context of marine safety, it must be remembered that the overriding objective identified in the PMSC is to reduce risk to a point which is 'as low as reasonably practical' (ALARP). Therefore, if a risk is intolerable, it is imperative that controls are applied until the risk is both ALARP and tolerable.

10.3.19 Any intolerable risk identified in the NRA is unacceptable and, in EIA terms, is considered significant. Risks considered tolerable and ALARP are considered insignificant in EIA terms.

Mitigation measures/risk controls

10.3.20 Following HAZID and risk analysis, the assessment process is then able to consider further mitigation or 'risk controls'. The preferred hierarchy of risk control principles, as stated in the Guide to Good Practise (GtGP), is:

- "Eliminate risks – by avoiding a hazardous procedure or substituting a less dangerous one;
- Combat risks – by taking protective measures to prevent risk;
- Minimise risk – by suitable systems of working. If a range of procedures is available, the relative costs need to be weighed against the degree of control provided, both in the short and long term" (DfT, 2018).

10.3.21 ***Embedded risk controls –*** The NRA considers embedded risk controls. These are controls that were identified and discussed in the HAZID workshop prior to determining the embedded consequence and frequency outcomes. Embedded controls are either controls which are already active and applied by the Harbour Authority within the Port of Immingham or by Humber Estuary Services (HES) in relation to marine operations in the study area or are incorporated in the design for the proposed IERRT

development. These might include, for example, international regulations (such as the International Regulations for Preventing Collisions at Sea (COLREGS)), training of personnel (such as the International Standards of Training, Certification and Watchkeeping for Seafarers (STCW)), or Marine Pollution response (Oil spill contingency plans). These embedded risk controls are captured and taken account of in the initial impact assessment (provided in Section 10.8).

10.3.22 ***Further applicable controls –*** Further applicable controls then have to be considered where risks are intolerable (i.e., significant in EIA terms) and/or are not ALARP following the initial assessment process. These controls will probably not currently exist either because the proposed development has not yet been constructed and the further controls not actually required or the further controls identified could simply be increases/additions to controls that currently exist but which will be specific to the development. A further applicable control could also be a control that is currently in effect but that was not considered during the analysis of the hazard with respect to the embedded controls.

10.3.23 The selection of further applicable controls that are applied to the IERRT project is undertaken through the presentation of risk assessment to the appropriate authority (Duty Holder) to consider/analyse the cost-benefit impacts of the potential further applicable controls with the aim to reduce each risk to a tolerable and ALARP state. That is, in EIA terms, reduction of the residual impacts, as far as possible, to environmentally acceptable levels (i.e., not significant). The (to be) applied risk control measures considered in the NRA and in this chapter are detailed in Section 10.8.118. This in turn requires the risks to be re-assessed in contemplation of the applied controls and their perceived mitigation, thus identifying the residual impact with further risk controls/mitigation in place (provided in Section 10.11).

10.3.24 ***Confidence assessment*** - Following the risk assessment, a confidence assessment has been undertaken and is set out in this chapter (see Table 10.11) which recognises the degree of interpretation and expert judgement that has had to be applied. This is presented in the summary table contained within the conclusion section of each impact assessment. Confidence is assessed on a scale incorporating ‘Low’, ‘Medium’, or ‘High’ values.

10.4 Consultation

10.4.1 A comprehensive consultation exercise was undertaken with a view to establishing whether the IERRT development would be likely to have any commercial or recreational navigational impacts. The series of consultations, which followed industry best practice, began with a consultation with the Harbour Authorities (ABP Port of Immingham and Humber Estuary Services) in the first HAZID workshop and then again with the Harbour Authority and other stakeholders through facilitated HAZID workshops. The discussions during and subsequent to these HAZID

workshops have informed the NRA (Appendix 10.1 to this chapter of the ES). The outcomes of the formal scoping process, as well as any feedback received during the statutory consultation following the publication of the Preliminary Environmental Information Report (PEIR) and the later supplementary statutory consultation following the publication of the Supplementary Consultation Report, have also been taken into account to inform the assessment.

10.4.2 The results of all of these consultation exercises have been fully taken into account as part of the commercial and recreational navigation assessment and are presented in Table 10.3.

Table 10.3 Summary of consultation to date

Consultee	Reference, Date	Summary of Response	How Comments Have Been Addressed in this Chapter
Planning Inspectorate (PINS)	Scoping Opinion, October 2021 Table ID 4.5.2	The Scoping Report states that effects will be assessed using a combination of analytical methods and expert judgement. The Environmental Statement (ES) must clearly justify the choice of methods and explain why they provided a robust assessment of effects. Where expert judgement is being relied on, the ES should explain the reasoning and evidence used to support that judgement.	The NRA has been completed using guidance and methodology provided in the Port Marine Safety Code, its accompanying Guide to Good Practice on Port Marine operations and other relevant industry recognised documents. These documents have been listed in Section 10.5 of this chapter.
PINS	Scoping Opinion, October 2021 Table ID 4.5.3	The ES should describe how the Port Marine Safety Code and its Guide to Good Practice have been taken into account in the development of the mitigation measures.	The Port of Immingham (ABP) as the Harbour Authority and Humber Estuary Services (HES)) as the Statutory Harbour Authority (SHA) have committed to the standards laid down in the Port Marine Safety Code. The risk assessment process used follows the guidance given in the Guide to Good Practice on Port Marine Operations which leads to a set of mitigation measures that have been identified following the requirements of the Port Marine Safety Code.
MCA	Scoping Opinion, October 2021 Appendix 2 MCA response	The MCA will expect the project to carry out a Navigation Risk Assessment (NRA) on the impact of the works on shipping and navigation. This must be considered and agreed by ABP in its role	An NRA has been completed and is presented in Appendix 10.1 of this ES. ABP undertook Hazard Identification Workshops attended by representatives of the Port of

Consultee	Reference, Date	Summary of Response	How Comments Have Been Addressed in this Chapter
		as the SHA and in accordance with the Port Marine Safety Code and its Guide to Good Practice.	Immingham as Harbour Authority, HES as the adjacent SHA and Humber Pilots, which are summarised in the NRA (Appendix 10.1 to this ES).
MCA	Scoping Opinion, October 2021 Appendix 2 MCA response	To address the ongoing safe operation of the marine interface for this project, we would like to point the developers in the direction of the Port Marine Safety Code (PMSC) and its Guide to Good Practice. They will need to liaise and consult with the SHA and develop a robust Safety Management System (SMS) for the project under this code.	The Port of Immingham (ABP) as the Harbour Authority has been fully involved in the preparation of the NRA and has contributed to the identification of hazards associated with the IERRT and the relevant mitigation measures. These mitigation measures include the updating of the relevant parts of the Port's SMS and its associated documents.
ABP	Hazard Identification Workshop, 29 October 2021	Representatives from the Port of Immingham, Humber Estuary Services (HES) and pilots provided input into the potential hazards, consequences, and mitigation measures for marine operations during the construction and operational phases of the project.	The NRA which has been prepared and is included in Appendix 10.1 takes into account the comments from the hazard identification workshops.
RYA (PI9)	Statutory Consultation January 2022	No concerns to raise from a recreational boating perspective.	Noted.
DFDS (PI22, PI32, Ex19)	Statutory Consultation February 2022	Concerns over marine activity occupying a traffic lane that DFDS utilise ultimately disrupting arrivals and departure times.	The HAZID workshops, NRA, and vessel simulation study have not identified this as having a high likelihood of occurrence especially as the manoeuvres required do not extend further west than the Eastern Jetty. In

Consultee	Reference, Date	Summary of Response	How Comments Have Been Addressed in this Chapter
			addition, where congestion does not cause a risk or hazard it is outside the scope of the NRA. Congestion and effects on businesses from a socio-economic perspective is considered in Chapter 16 of this ES.
APT (EX17, PI30)	Statutory Consultation February 2022	Concerns raised over the impacts to the IOT during the construction and operation phase including if any allisions occurred with the Finger Pier.	The second and third HAZID workshops and vessel simulation study were attended by APT supported by NASH Maritime consultancy. Discussions at both sessions enabled concerns to be raised and mitigations adopted which are captured within the NRA itself, and summarised in Sections 10.8, 10.9 and 10.11 of this chapter of this ES.
MCA (PI31)	Statutory Consultation February 2022	No concerns to raise, pleased to see NRA supporting the DCO application.	Noted.
Trinity House (PI36)	Statutory Consultation February 2022	No concerns to raise at this stage, welcome further discussion in due course with respect to Aids to Navigation	Noted.
North Lincolnshire Council (PI38)	Statutory Consultation February 2022	No concerns to raise, although acknowledge they lack expertise in commercial and recreational navigation.	Noted.
ABP Harbour Master (PI17)	Statutory Consultation February 2022	Confirming interest as a statutory consultee.	Involved in discussions and HAZID workshops to ensure all concerns addressed.
Exolum (PI28)	Statutory Consultation February 2022	Concerns expressed over shipping operations that require further detail and	Exolum were involved in the third HAZID workshop to ensure all concerns addressed. Baseline traffic and future

Consultee	Reference, Date	Summary of Response	How Comments Have Been Addressed in this Chapter
		modelling to understand actual ferry movements.	baseline traffic analysis is available in Sections 10.6 and 10.7 of this chapter (as well as the NRA, provided at Appendix 10.1).
Maritime Skills Academy (Q92, Q93)	Statutory Consultation February 2022	Concern was raised over the artist's impression of the new berth not being sufficient to assess safe berthing in all weathers and that marine safety simulations should be undertaken.	Vessel simulations have been undertaken and are presented in Appendix 10.2 to this ES. Further simulations were undertaken between 28 and 30 November to inform operational berthing procedures (provided at Appendix 10.3).
Q47, Q65, Q74, Q88, Ex22	Statutory Consultation February 2022	Concern was raised regarding the proximity of the development to the adjacent oil facilities and the navigational risks, specifically of a collision between the ships, pipelines and infrastructure. A suggestion was made regarding the use of simulation training for all Masters and Pilots to prepare for development.	Specifically considered risks regarding the IOT at the second and third HAZID workshops with stakeholders representing the interests of the IOT present. Simulation training has been incorporated into risk assessments as a control, listed in Section 10.9 of this chapter.
JG Maritime Solutions (Q82)	Statutory Consultation February 2022	The following specific concerns were raised: 1. The scenarios proposed in Chapter 10 Commercial & Recreational Navigation paragraph 10.8.28 are incomplete. 2. The impact pathway "Ro-Ro collides with a berthed Ro-Ro vessel" has not been included. 3. The impact significance or consequence has been assessed as minor adverse or insignificant at paragraphs 10.8.32 /41/	The scenarios have been added at two subsequent HAZID workshops since publication of the PEIR. An allision has been considered between a Ro-Ro vessel and the IERRT terminal. Additionally, consideration has been given to a Ro-Ro vessel having an allision/collision with a berthed vessel (Tanker) at the HAZID workshops, to

Consultee	Reference, Date	Summary of Response	How Comments Have Been Addressed in this Chapter
		45&50 which appears optimistic over a 50 year timeframe. 4. The mitigation measures in paragraph 10.9.1 do not include "Vessel Simulation Study". 5. In Appendix 10.1 Preliminary Navigation Risk Assessment the embedded control of "Vessel Simulation Study" is not utilised within Appendix 10. 1, Appendix A Navigation Risk Assessment : Construction and 6. only during Appendix B Navigation Risk Assessment : Operation on two occasions in Assessments No 1 and 2. 7. There is only a very low and insufficient use of marine simulation in the NRA which is now readily available. 8. It would be prudent to include embedded control measure 129 "Vessel Simulation Study" in more of the assessments of the various scenarios in Appendix A & B.	which the perceived risk is greater than if a Ro-Ro was to strike another of its same type. A full assessment has been conducted since the PEIR was published, provided in the NRA (Appendix 10.1 of this ES) and in this chapter of the ES. A simulation study has subsequently taken place (following the outcome of the second HAZID workshop) and is available at Appendix 10.2. Further simulations were also undertaken between 28 and 30 November to inform operational berthing procedures, provided at Appendix 10.3.
CLdN (CRO) (PI41)	Statutory Consultation February 2022	Concerns were raised regarding the appropriateness of the baseline information and that CLdN have not been included in discussions, which so far have focused on ABP's existing operations and interest. Queries regarding necessary protection measures to ensure continuity of business and safe passage for operations and numbers of vessel	CLdN subsequently attended the second HAZID workshop to ensure their interests were captured. CLdN declined their invitation to the third HAZID workshop. Their specific queries (including those raised at the second HAZID workshop) are included within the NRA and are captured within the Hazard Logs in Annexes A to C to Appendix 10.1.

Consultee	Reference, Date	Summary of Response	How Comments Have Been Addressed in this Chapter
		movements during construction and operation were also raised.	
ABP, Humber Estuary Services (HES), pilots, DFDS, Stena Line, CLdN (CRO), APT and NASH	Hazard Identification Workshop, 7 April 2022	Representatives from the Port of Immingham, Humber Estuary Services (HES), pilots, DFDS, Stena Line, CRO, APT and NASH provided further input into the potential hazards, scenarios, controls, causes, and future mitigation measures for marine operations during the construction and operational phases of the IERRT project.	The completed NRA is included as Appendix 10.1 to this ES takes into account the comments from all Hazard Identification workshops. Comments have been captured and assessed in Annexes A, B, and C to the NRA (Appendix 10.1 to this ES).
APT	29 April 2022	Additional comments following Statutory Consultation. Concerns raised relating to methodology/risk assessment process, specifically the risk assessment matrices, risk control effectiveness, Port wide risk assessment, incident data, vessel traffic analysis, full bridge simulations, and the scheme design.	A subsequent HAZID workshop was held following these representations and the completed NRA at Appendix 10.1 to this ES addresses the concerns raised. Risk Assessment Matrices were explained and are detailed in Appendix 10.1. Risk control effectiveness was the subject of further consultation in the third HAZID workshop. The Marine Safety Management System (MSMS) was consulted as part of this risk assessment. Incident data is available in Section 10.6 of this chapter and in the baseline in Appendix 10.1 along with a full traffic analysis. Full bridge simulations have been undertaken and are available at

Consultee	Reference, Date	Summary of Response	How Comments Have Been Addressed in this Chapter
			Appendix 10.2. Further simulations were also undertaken between 28 and 30 November to inform operational berthing procedures (Appendix 10.3). The scheme design has been optimised since this correspondence.
	25 May 2022	Meeting between NASH acting on behalf of APT and ABPmer to discuss methodology.	The methodology is described fully within the NRA at Appendix 10.1 to this ES and summarised in Section 10.3 of this chapter.
	25 July 2022	Provided data and documents in order to support the NRA relating to the IOT and associated infrastructure. Specified certain mitigation measures which the IOT Operators considered necessary to make the IERRT Development acceptable.	This has been considered in the NRA process, presented at Appendix 10.1 to this ES and is summarised in this chapter of the ES. Mitigation/risk control measures are provided in Section 10.9 of this chapter.
CLdN (CRO)	12 August 2022	Raising concerns about HAZID Workshop process.	The methodology complies with the PMSC (DfT, 2016), described fully within the NRA at Appendix 10.1 to this ES and summarised in Section 10.3 of this chapter.
DFDS	29 April 2022	Queries relating to NRA risk sheet noting several inconsistencies, over-optimistic time scale, subjective analysis, lack of reasoning in risk discussion/conclusion, and new mitigation effectiveness inconclusive.	The methodology complies with the PMSC (DfT, 2016), described fully within the NRA at Appendix 10.1 to this ES and summarised in Section 10.3 of this chapter.

Consultee	Reference, Date	Summary of Response	How Comments Have Been Addressed in this Chapter
			Qualitative risk assessment is subjective as it is based on subject matter expertise. This follows the approach advised in the PMSC (DfT, 2016). Section 9 of the NRA provides a discussion on the navigational risk assessments (Appendix 10.1 to this ES).
	25 May 2022	Response to HAZID 3 invitation for 7-8 June 2022 being too short notice.	HAZID workshop 3 was moved to a later date and instead held on 16-17 August 2022.
	1 June 2022	Email exchange with ABP project team stating NRA is not fit for purpose.	The NRA process had not been completed at this stage and was informed by a subsequent HAZID workshop. The issues raised were also discussed at the third HAZID workshop and are recorded in the Annexes to the NRA (Appendix 10.1 to this ES).
	28 June 2022	Request for additional information prior to HAZID Workshop and for additional companies to be invited.	Additional information was provided prior to the HAZID workshop. The list of invitees was discussed with Humber Estuary Services (HES) as the Competent Harbour Authority (CHA) and all appropriate stakeholders were invited to the HAZID workshops.
	15 July 2022	Correspondence from BDB Pitmans confirming outstanding queries.	Outstanding queries were addressed at the third HAZID workshop, for which information was recorded in and

Consultee	Reference, Date	Summary of Response	How Comments Have Been Addressed in this Chapter
			presented at Annexes A,B and C to Appendix 10.1 to this ES.
	12 August 2022	Raising concerns regarding the risk assessment process.	The methodology complies with the PMSC (DfT, 2016), described fully within the NRA at Appendix 10.1 and summarised in Section 10.3 of this chapter.
ABP, Humber Estuary Services (HES), pilots, DFDS, Stena Line, CLdN (CRO), APT, NASH, Rix, Exolum, and Svitzer	Hazard Identification Workshop, 16-17 August 2022	A further workshop was held to discuss the potential hazards, scenarios, controls, causes, and future mitigation measures for marine operations during the construction and operational phases of the IERRT project.	The NRA which has been prepared and is included as Appendix 10.1 to this ES takes into account the comments from all Hazard Identification workshops. Comments from the third HAZID workshop have been captured and assessed in Annexes A, B, and C to the NRA at Appendix 10.1 to this ES.
Rix	18 August 2022	Comments on the HAZID workshop	Comments were assessed in relation to the risk analysis and amalgamated for the risk assessment and cost benefit analysis meetings as set out in the NRA at Appendix 10.1 to this ES.
	22 August 2022	Comments on Draft Hazard Log	Comments were assessed in relation to the risk analysis and amalgamated for the risk assessment and cost benefit analysis meetings as set out in the NRA at Appendix 10.1 to this ES.
APT	22 August 2022	Request for additional information in order to comment on Hazard Log	Information was provided to APT in the form of the presentation at the HAZID workshop, detailing the construction methodology.

Consultee	Reference, Date	Summary of Response	How Comments Have Been Addressed in this Chapter
	24 August 2022	Comment on HAZID workshop and requests for further information	Further information was provided as available. Comments were assessed in relation to the risk analysis and amalgamated for the risk assessment and cost benefit analysis meetings as set out in the NRA at Appendix 10.1 to this ES.
	26 August 2022	Letter outlining a number of concerns regarding the methodology employed for the IERRT development NRA, which came to light as a result of the information provided prior to, and during attendance at, the third Hazard Workshop.	The NRA methodology complies with the PMSC (DfT, 2016), described fully within the NRA at Appendix 10.1 to this ES and summarised in Section 10.3 of this chapter.
	31 August 2022	Comments on Hazard Log	Comments were assessed in relation to the risk analysis and amalgamated for the Risk Assessment and Cost Benefit Analysis meetings as set out in the NRA at Appendix 10.1 to this ES.
DFDS	23 August 2022	Comments on HAZID workshop	Comments were assessed in relation to the risk analysis and amalgamated for the risk assessment and cost benefit analysis meetings as set out in the NRA at Appendix 10.1 to this ES.
	29 and 30 August 2022	Further comments on HAZID workshop	Comments were assessed in relation to the risk analysis and amalgamated for the risk assessment and cost benefit analysis meetings as set out in the NRA at Appendix 10.1 to this ES.

Consultee	Reference, Date	Summary of Response	How Comments Have Been Addressed in this Chapter
	5 September 2022	Further comments on HAZID workshop and assessment approach	Comments were assessed in relation to the risk analysis and amalgamated for the risk assessment and cost benefit analysis meetings as set out in the NRA at Appendix 10.1 to this ES. The NRA methodology complies with the PMSC (DfT, 2016), described fully within the NRA at Appendix 10.1 to this ES and summarised in Section 10.3 of this chapter.
	5 October 2022	Clarifying outstanding concerns and feedback on recently circulated Hazard Log. DFDS raised points relating to relocation of IOT finger pier, Acoustic Wave and Current Profiler (AWAC) buoy information, wind data, simulations, methodology, risk assessment tool, duty holder role, changes to project, perceived overlooked risks relating to Eastern Jetty, towage, tidal changes, and Port of Immingham lock productivity.	Comments were assessed in relation to the risk analysis and amalgamated for the risk assessment and cost benefit analysis meetings as set out in the NRA at Appendix 10.1 to this ES. The relocation of the IOT finger pier was identified as a further applicable control but was not taken forward as an applied control – this is explained in Appendix 10.1 to this ES. AWAC buoy and wind data that was used in the navigation simulations is considered accurate and reliable. Navigation simulations are provided in Appendix 10.2 to this ES, and further simulations were also undertaken between 28 and 30 November to inform

Consultee	Reference, Date	Summary of Response	How Comments Have Been Addressed in this Chapter
			operational berthing procedures (provided in Appendix 10.3). Risk methodology and tools utilised in Appendix 10.1 to this ES are in line with PMSC (DfT, 2016) guidance. ABP is the Harbour Authority and the duty holder responsible for navigational safety. The IERRT project details have been explained in Chapter 2 of this ES and are reflected in Appendix 10.1 to this ES– changes to the scheme are summarised in the Supplementary Consultation Report. The risk associated with the Eastern Jetty have been appropriately considered in Appendix 10.1 to this ES. Tugs and towage and their availability will be managed by Humber VTS. Changes to tidal flows have been assessed and are presented in the physical processes chapter (Chapter 7) of this ES. Effects on lock productivity has been assessed to be insignificant within Appendix 10.1 to this ES based on the traffic analysis.
DFDS (PI 15)	Supplementary Statutory	DFDS' marine experts consider that the tidal data used in ABP's simulation exercises is not an accurate	The AWAC buoy data on tidal flows used in the model for the navigation simulations (Appendices 10.2 and 10.3)

Consultee	Reference, Date	Summary of Response	How Comments Have Been Addressed in this Chapter
	Consultation – 28 Oct – 27 Nov 2022	representation of the actual tidal flow in the area. With decades of experience on the Humber our highly experienced Captains find the tide as represented in the simulation reports is at odds with their day-to-day experience and contrary to the physical effects they witness in the Immingham area on a daily basis. This concern was echoed by numerous stakeholders at ABP's HAZID workshop events. Additionally tidal flow data used in the simulations has also relied upon data taken from a single location survey. It is highly irregular for any marine development to rely on a single current dataset and it is our belief that in doing so ABP has created the situation outlined above.	is considered representative of the study area and accurate. Further data has been subsequently collected by Acoustic Doppler Current Profiler (ADCP) survey to verify the tidal flows used in the model. The data collected corroborates the AWAC buoy data used in the navigation simulation model.
DFDS (PI 15)	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	ABP has chosen to rely on data from a single source for both wind and current data. The wind source data is provided from readings taken from the Immingham Marine Control Centre (MCC). It is widely accepted by mariners trading on the Humber and by local pilots that the anemometer at the MCC is in a sheltered location and therefore not truly representative of the wind flows experienced in the wider Immingham	Wind data that was used in the navigation simulations is considered accurate and reliable.

Consultee	Reference, Date	Summary of Response	How Comments Have Been Addressed in this Chapter
		area. Mariners commonly take data from both Immingham MCC and the unsheltered 'Stone Creek' gauge in order obtain a more accurate estimate of wind speed in the outer Immingham area and we are of the belief that ABP should have done the same.	
DFDS (PI 15)	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	The location of the proposed development combined with the size of vessels that will use the berth creates highly complex and unpredictable wind effects that will make manoeuvres to and from both the IERRT and especially the Immingham Oil Terminal Finger Pier highly challenging. Despite this ABP and their experts at HR Wallingford failed to incorporate the wind shadowing effect into any of the marine simulations again rendering them unreliable and the manoeuvres significantly easier than if they had been included.	Wind effects and considerations have been considered by HR Wallingford and are available within Appendix 10.3 which displays information from the vessel simulation studies. The simulations demonstrated that wind shielding caused no significant issues to manoeuvring vessels to and from the berths.
DFDS (PI 15)	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	To date, ABP has chosen to use the DFDS Jinling model in their simulation exercises despite the fact that such vessels will never operate from this terminal. The Jinling class are a highly manoeuvrable vessel constructed and equipped with enhanced machinery to cope with the specific challenges found in one of our other ports rather than for	Appendix 10.3 includes detail from the most recent simulation runs conducted with Stena Transporter vessel models as well as an indicative 237 m Ro-Ro vessel. ABP believe that they have modelled appropriate vessels to demonstrate that the berths can be operated safely with both existing and future vessels.

Consultee	Reference, Date	Summary of Response	How Comments Have Been Addressed in this Chapter
		the Humber. DFDS are of the opinion that given the complexity, location and associated surrounding dangers coupled with the significant potential financial investment in terminal construction that ABP should commission representative models of the vessels that will utilise the terminal to better understand the risks involved.	
DFDS (PI 15)	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	Whilst we appreciate that ABP have recently indicated they will be simulating a different vessel model (Stena T Class) in forthcoming simulations, at the time of this response no report has been made available. We also note that these vessels are significantly smaller than the Jinling class vessels, and smaller than the advertised vessel capacity of the berth.	These simulations have been undertaken and are included at Appendix 10.3. As expected, these vessels were shown to be even more manoeuvrable than the future vessel that has been modelled. The conclusions of these additional simulations are set out in Appendix 10.3
DFDS (PI 15)	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	Despite utilising what is arguably the 'best in class' Ro-Ro vessel model in the simulation exercises, the simulation reports indicate unrealistic levels of power were needed to achieve successful results in the exercises. In some exercises the bow thruster units were run continuously at 100% for 13 minutes. Our experienced Jinling Captains have confirmed such actions, whilst being impossible to achieve safely	Further simulations have been conducted with alternative Stena Transporter vessels and indicative 237 m Ro-Ro vessel models which utilised less power in their approaches. No issues arose; information on this can be found at Appendix 10.3.

Consultee	Reference, Date	Summary of Response	How Comments Have Been Addressed in this Chapter
		in reality, are not indicative of a 'safe manoeuvre' and instead suggest a vessel on the verge of being out of control. In addition to the unachievable nature of the simulations the effect of using such massive amounts of power would render the tugs used in the simulations effectively useless and quite likely to seriously compromise the safety of the tug and her crew. Given that the effect of the turbulent water (wash) was not accounted for in the simulations again made the results wholly unrepresentative of the navigational difficulties inherent in any use of the proposed development.	
DFDS (PI 15)	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	ABP will be unable to call upon their most experienced pilot to carry out every vessel manoeuvre to the new terminal and a variety of pilots of the appropriate rank should have been involved in the simulations to more realistically gauge the challenges posed by the new terminal. It is worth bearing in mind that despite utilising the most experienced pilot the simulations were far from straightforward.	ABP as the Harbour Authority, and HES in its overlapping capacity as the CHA will ensure that pilots and PECs are adequately trained and experienced to conduct berthing and departure manoeuvres. This is included as a risk control throughout the NRA (Appendix 10.1) and this chapter.
DFDS (PI 15)	Supplementary Statutory	The simulations also used the most capable tugs available on the Humber possessing both high power and	ABP as the Harbour Authority and HES, also in its overlapping capacity as the CHA will ensure that appropriate tugs

Consultee	Reference, Date	Summary of Response	How Comments Have Been Addressed in this Chapter
	Consultation – 28 Oct – 27 Nov 2022	compact dimensions which is essential for manoeuvring successfully to the inner berths where space is at a premium. The fact remains that only four tugs (from two different companies) of such design currently provide towage services on the Humber. Given that these companies do not work together this would leave the customer reliant on engaging the services of two specific tugs for each and every manoeuvre that requires towage. This situation is unrealistic and DFDS is of the opinion that ABP should have used a variety of tugs to appreciate the difficulties that lower powered or larger hull dimensions would cause to safe manoeuvring.	are available to attend manoeuvres as required. The relevant controls are identified throughout the NRA (Appendix 10.1) and this chapter. The utilisation of tugs that are provided by third parties is a commercial decision, with third parties likely to increase the size of their fleet to meet the possible opportunities that this new development provides.
DFDS (PI 15)	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	ABP's consultants, ABPmer, have chosen to mix two different methodologies for completing the Navigational Risk Assessment namely the International Maritime Organisations Formal Safety Assessment ("IMO FSA") model and the Maritime and Coastguard Agency's Offshore Renewable Energy Installation model. The use of two methodologies in a Risk Assessment is flawed. The former assesses risk quantitively and the latter qualitatively. By combining the two the whole process	The Port Marine Safety Code is in part based on the principles of the IMO FSA, however the methodology used is aligned with the PMSC (DfT, 2016) and its associated GtGP (DfT, 2018). The table of risk categories from MGN 654 has only been utilised to inform the full spectrum of navigational risk The methodology used in the NRA is set out clearly in Section 6 of Appendix 10.1. The risk outcomes have been informed through subject matter expertise and

Consultee	Reference, Date	Summary of Response	How Comments Have Been Addressed in this Chapter
		is muddled and it is the opinion of DFDS that by doing so ABP has been able to downplay the risk inherent in this proposed development. Given that the development falls wholly within a harbour area, has no connection with Offshore renewable energy and is purely for the purposes of maritime trade it is the opinion of DFDS that the IMO FSA methodology should have been solely used.	opinion, including DFDS, and thus have not been "downplayed".
DFDS (PI 15)	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	Collision protection for the IOT is now included but not currently proposed. The application should make sure it is clear what will trigger the installation of the protection. If it is an accident or near miss that will trigger it that is highly unsatisfactory – such events should be avoided in the first place. The protection should not be counted as environmental mitigation until it is clear when it would be installed.	Collision protection for the IOT jetty is under consideration as a potential adaptive procedure and is considered in the NRA accordingly (Appendix 10.1).
DFDS (PI 15)	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	ABP's recent, if somewhat late, attention to possible protection of IOT is understandable given the very significant risks to port wide operations and the environment which any contact with that existing facility would give rise to, however, no mention is made about potential impact with the Eastern Jetty.	Previous risk assessments by ABP in the SHA have not required the presence of impact protection on the IOT. The need for this control will be reviewed by HES as is detailed in Appendix 10.1 at the request of APT who are the operators of the terminal.

Consultee	Reference, Date	Summary of Response	How Comments Have Been Addressed in this Chapter
		Given the sensitive location of the proposed IERRT adjacent to both the IOT and the Eastern Jetty, both of which handle highly flammable, toxic and potentially polluting products, we would expect ABP would be carefully and rigorously scrutinising every element of the IERRT proposal before submitting its application.	No request for impact protection has been made by the operators of the Eastern Jetty. Appendix 10.1 does consider a hazard scenario where a vessel has an allision with the Eastern Jetty; during the subsequent consultation following the third HAZID workshop, no stakeholder identified impact protection as a further applicable control.
DFDS (PI 15)	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	The collision protection is welcome, but it is not protecting the most vulnerable part of the IOT affected by this project, which is the finger pier. Mitigation was suggested for this consisting of moving it to the other side of the main jetty, but that does not appear to be being proposed and in any event would now conflict with ABP's other proposed DCO, the Immingham Green Energy Terminal.	Appendix 10.1 assesses the further applicable controls considered and then the applied controls that ABP will implement to mitigate risks for the Finger Pier. These risks have been reduced to an ALARP state that are within tolerability.
DFDS (PI 15)	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	Given the latest configuration of the berths and jetties the previous simulations and hazard workshops, which were themselves inadequate, ought to be re-run. Stakeholders were not able to see or discuss this potential protection at any stage of the Navigational Risk Assessment. As an example, the register of risks and mitigations contained mitigations such	Further simulations have been undertaken details of which are provided at Appendix 10.3. The vessel simulations were initially included as a further applicable control as they had not been completed at the time of the third HAZID workshop. This control's intent was to inform ABP of the manoeuvres required, the probable limits, and specifically how to conduct

Consultee	Reference, Date	Summary of Response	How Comments Have Been Addressed in this Chapter
		as moving the finger pier that are not being taken forward, so cannot be taken into account. We understand that the simulations are being rerun, but after the end of this consultation. The results of these should be taken into account in the DCO application.	such manoeuvres safely. The simulations observed do not affect the Hazard Logs and assessment available within the NRA (Appendix 10.1).
MCA (PI 17)	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	The MCA has considered the proposed changes to the original plans as seen during the formal statutory consultation, which ran until Wednesday 23 February 2022. I can confirm that the proposed changes do not raise any significant concerns for the MCA, and our original response to the previous consultations still apply.	Noted.
APT (PI 19)	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	A draft IERRT NRA methodology was provided to the IOT Operators by ABP on 24 October 2022. It is not clear whether a revised NRA has now been prepared by ABP; if it has the IOT Operators ask that it is shared with them at the earliest opportunity, to inform their understanding of navigational risks.	The completed NRA is provided at Appendix 10.1 of this ES and is submitted as part of the DCO application.
APT (PI 19)	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	The IOT Operators consider that the finalised IERRT NRA should include: (a) the outcomes (e.g., the IOT Operators' agreed report) of the ship bridge simulations scheduled for week commencing 28 November 2022;	Details of the simulations conducted week commencing 28 November 2022 are provided at Appendix 10.3. Details of the Cost Benefit Analysis results are available in the Hazard Log

Consultee	Reference, Date	Summary of Response	How Comments Have Been Addressed in this Chapter
		(b) details of a comprehensive cost benefit analysis determination for any hazards defined as ALARP (as low as reasonably practicable); and (c) an explanation of why the IOT Operators' proposed risk control measures such as the impact protection has now been included in design drawing, but its construction is not proposed as part of the IERRT Development.	Annexes as 'Applied Controls' in the NRA (Appendix 10.1). The NRA (Appendix 10.1) explains the rationale for the inclusion of the impact protection measures in the DCO application.
APT (PI 19)	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	The IOT Operators do not consider that the draft IERRT NRA methodology meets either the 'UK Port Marine Safety Code', the 'Marine Guidance Note (MGN) 654 (M+F) Offshore Renewable Energy Installations (OREI) safety response' or the 'International Maritime Organization (IMO) Formal Safety Assessment' approach, as no standards of acceptability for hazards have been provided. The IOT Operators contend that if no standards of acceptability are provided as part of the IERRT NRA, based on UK Health and Safety Executive guidance, then the persons responsible for ensuring that ABP's duties are discharged (the "ABP Duty Holder") cannot make a judgement on	The NRA methodology is considered to meet the requirements of the Port Marine Safety Code. The Port Marine Safety Code is in part based on the principles of the IMO FSA, however the methodology used is aligned with the PMSC (DfT, 2016) and its associated GtGP (DfT, 2018). The table of risk categories from MGN 654 has been utilised to inform the full spectrum of navigational risk but has not been utilised as a primary reference. Acceptability is called 'tolerability' in this assessment and has been considered by ABP whilst in addition considering if risks are also ALARP. This is set out in the NRA (Appendix 10.1) which follows

Consultee	Reference, Date	Summary of Response	How Comments Have Been Addressed in this Chapter
		acceptability of hazards scored as 'As Low As Reasonably Practicable'. The IOT Operators welcome that a cost benefit analysis will be undertaken with a view to reducing the risk (for each hazard) to a tolerable level. However, the IOT Operators note that in the draft IERRT NRA methodology, no details on how this process will be undertaken is provided.	the process of Hazard Identification, Risk Analysis, Risk Assessment, Cost Benefit Analysis, and Decision Making.
APT (PI 19)	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	In drafting the IERRT NRA, the IOT Operators request that clear reference is made to which elements of the various guidance documents have been used in the assessment, as it is not clear to date where the different guidance is relied on (i.e., provision of a checklist in line with the 'MGN 654 Annex 6 Checklist for developers' is requested).	A checklist has not been provided as the Port Marine Safety Code has been used as the primary reference as described in Appendix 10.1. The table of risk categories from MGN 654 has been utilised to inform the full spectrum of navigational risk.
APT (PI 19)	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	The IOT Operators have previously requested the existing Port Marine Safety Code Formal NRA for the area encompassing the IERRT Development, which was undertaken by ABP, should be used as the basis for the IERRT NRA, with changes brought about by the IERRT Development mapped over this agreed baseline assessment.	The existing controls for marine risks within the IERRT area have been utilised to form the embedded controls within each of the Assessments in the IERRT HazLogs (Hazard Logs). This was discussed at the HAZID with relevant operational risks captured as part of the IERRT Navigational Risk Assessment.

Consultee	Reference, Date	Summary of Response	How Comments Have Been Addressed in this Chapter
APT (PI 19)	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	The IOT Operators consider that the explanation: "risk is determined through a count culmination of outcome categories in a risk tally ranking system" is simply not clear and the IOT Operators require clarification on how risk is determined. An example of how this would be determined would assist the IOT Operators.	The methodology is clearly explained in full within Section 6 of the NRA (Appendix 10.1).
APT (PI 19)	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	The IOT Operators also require clarification on how the 'consequence descriptors' have been defined and specifically how they relate to the IOT Operators' operations including confirmation of whether these are based on the existing ABP NRA for the area.	Consequence Descriptors have been drawn from and informed by ABP's MARNIS which is used as their MSMS software.
APT (PI 19)	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	As previously noted, the IOT Operators remain concerned over the use of qualitative 'frequency descriptors'. It is not clear how these frequency descriptors will change between the three phases of the IERRT Development (Construction: including capital dredging and installation of infrastructure; Construction and Operation: construction of the southern finger pier whilst operating the northern finger (with two berths); and Operation: change to the study area's vessel movements including any maintenance dredging).	The Port Marine Safety Code allows for qualitative assessment. The NRA (Appendix 10.1) defines how the different time periods can be considered within the word descriptors. ABPmer notes that the periods of operation, construction and construction-operation all vary and as a result the subsequent risks within each category are not compared to or ranked against one another.

Consultee	Reference, Date	Summary of Response	How Comments Have Been Addressed in this Chapter
APT (PI 19)	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	The IOT Operators remain concerned that the IERRT NRA methodology does not use empirical frequency descriptors (e.g., mathematical probabilities or return periods) which can be benchmarked to standards of acceptability (e.g., when likelihood of fatalities are considered) which in turn is necessary for the determination of ALARP classification for individual hazards. It is best practise, for marine risk assessment, especially of the complexity of the IERRT development, to define frequency empirically, which is in line with the Port Marine Safety Code Section 2.8 requirement that "Risks should be judged against objective criteria".	The Port Marine Safety Code makes allowances for qualitative risk assessment which is inherently subjective. Ultimately, risks within the NRA (Appendix 10.1) have been considered against objective criteria in addition to subjective criteria.
APT (PI 19)	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	The presented methodology considers risk classification in EIA 'significance' but does not explain how hazards or risks are scored. It is also not clear what the thresholds for the risk classification are and whether they are individually related to each assessment of risk for each hazard or whether aggregated risk scores are generated per hazard. The IOT Operators note that no detailed methodology or worked example is	Section 10.3 of this chapter of the ES explains how risk outcomes in the NRA are considered in the context of EIA. Section 6 of the NRA (Appendix 10.1) provides the full methodology used in the NRA.

Consultee	Reference, Date	Summary of Response	How Comments Have Been Addressed in this Chapter
		provided on assigning risk classification to individual hazards.	
APT (PI 19)	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	The IOT Operators do not agree an appropriate approach to 'Cost Benefit, ALARP or Tolerability' has been taken and seems to simply rely on the ABP Duty Holder to decide on the results of the whole assessment.	The meetings and processes detailed in Appendix 10.1 show a logical progression of thought at each stage by ABP and how they have decided to include or exclude controls to mitigate risk to an ALARP and tolerable state.
APT (PI 19)	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	The IOT Operators require a more detailed explanation and worked examples of the IERRT NRA methodology, using the risk scoring provided as part of the Hazard Workshop by the IOT Operators	The completed NRA is provided at Appendix 10.1 to this ES and is submitted as part of the DCO application.
APT (PI 19)	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	The IERRT Development has moved considerably closer to IOT infrastructure, including the IOT trunkway and IOT finger pier berths 6 and 8. This further impedes navigation of vessels bound to and from the IOT and increases the proximity of IERRT Development vessels navigating to IOT infrastructure, both of which lead to an increase in risk to the IOT Operators over the proposals presented in the Preliminary Environmental Information Report	Vessel simulation studies have informed the manoeuvres in vicinity of the IOT and the location of the proposed development. These are available at Appendix 10.2 and 10.3. The latest simulations were attended by APT, DFDS, Rix & Thames Fisher with a focus on vessels manoeuvring on and off the IOT Finger Pier. The simulations concluded (with all in agreement) that there is no adverse impact on operations on and off the finger pier berths.
APT (PI 19)	Supplementary Statutory	The IOT Operators are not able to provide comment on the detail of the statements in the Supplementary	The NRA is provided at Appendix 10.1 to this ES. Additional applied controls

Consultee	Reference, Date	Summary of Response	How Comments Have Been Addressed in this Chapter
	Consultation – 28 Oct – 27 Nov 2022	Consultation Report as the supporting assessment and analysis is not provided, although the IOT Operators, as previously indicated, do not agree that the IERRT Development as planned is safe and that additional controls are not necessary.	are set out in Section 10.9 of this ES chapter and in the NRA.
APT (PI 19)	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	The IOT Operators consider it likely that protective provisions would be required to address: (a) The relocation of the IOT finger pier, for the reasons described in paragraph 2.1(a) of our previous letter of 25 July 2022. The IOT Operators would also be prepared to consider a solution requiring the IERRT Development's outer-most berth (the northern berth of the northern pier) to be unused until such a time as alternative adequate arrangements have been put in place to reduce impacts on (safe) use by the IOT Operators of the finger pier; (b) The provision of adequate vessel impact protection during the construction and operational phase of the IERRT Development, as described in paragraph 2.1(b) of our previous letter of 25 July 2022; and	These risk controls have been considered within the NRA (Appendix 10.1) as they were raised during the HAZID workshops and are captured as 'further applicable controls'. As explained in the NRA (Appendix 10.1), vessel impact protective provisions will be implemented if HES considers them to be required.

Consultee	Reference, Date	Summary of Response	How Comments Have Been Addressed in this Chapter
		(c) A marine liaison plan of the sort detailed at paragraph 2.1(c) of our previous letter of 25 July 2022.	
CLdN (PI 21)	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	We have noted your intention to make a DCO application in late 2022 and so, given that publication of detailed EIA and other assessments is imminent, we will be able to provide a full response on the revised proposals as part of the relevant representation process unless you are able to provide additional environmental information prior to application, with time to consider that in detail. We consider that the short period between close of the supplementary consultation and the expected application date would make responding to consultation responses a challenge in any case; the lack of detailed environmental information on the revised proposals even more so.	Noted.
CLdN (PI 21)	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	The impacts of this revised project will be different to the development assessed in the PEIR; they will not necessarily be less significant. The summary table of impacts in the Supplementary Consultation Report (SCR) is not sufficient environmental information for consultees.	Noted. The full assessment of the significance of environmental impacts is provided in this ES. This takes account of the comments and feedback received during the two statutory consultations, the HAZID Workshops and the ongoing consultation/ discussions that have been undertaken since.

10.5 Implications of policy legislation and guidance

10.5.1 This section of the chapter outlines the practical effect of applicable legislation, regulation, policy and guidance in the context of commercial and recreational navigation both within the marine environs of the Port of Immingham and the Humber Estuary generally. It also outlines the role on the one hand, of ABP's Port of Immingham Dock Master and on the other, Humber Estuary Services, operating through the Humber Harbour Master. Both have specific powers and duties which can, on occasion, overlap.

Legislation

Port of Immingham statutory responsibilities and management procedures

10.5.2 ***The Dock Master and the Harbour Master –*** The IERRT will be developed entirely within the Port of Immingham's SHA Area – which for the purposes of this chapter and to avoid confusion is described at the "Port Authority Area". It is in this area – the boundary of which is set be statute as noted below – that ABP, as owner and operator of the Port of Immingham – and applicant for the IERRT project – is the "Port Authority". In this capacity, ABP is charged with a set of powers and duties which include the management and regulation of the safety of navigation and marine operations in its "Port Authority" area. Port operations within the Port Authority area are the responsibility of the ABP Dock Master.

10.5.3 There is no definitive statement as to the extent of the limits of ABP's powers and duties at the Port. Instead, the majority of the Acts that have over the years authorised new works have simply extended the geographical limits of the "Port Authority" area so as to encompass new port marine infrastructure. Thus section 47 of the Humber Commercial Railway and Dock Act 1904 states that the limits of the Dock Master's powers comprise "*the works and conveniences constructed under this Act and a distance of 200 yards riverwards from every part thereof*".

10.5.4 In terms of the IERRT development, the new Ro-Ro berths will be constructed inshore of the IOT berths and approach jetty (see Figures 1.2 and 1.3 to this ES). Construction of the IOT was authorised by the Immingham Dock Revision Order 1966, which at the time extended the geographical limits of the Dock Master's jurisdiction so as to take account of the new marine infrastructure.

10.5.5 The area of water beyond the Port Authority's boundary is also correctly termed the SHA area. The SHA for the Humber Estuary is HES, the successor organisation to the Humber Conservancy Commissioners, a creature of statute created by The River Humber Conservancy Act 1852. HES, through the Humber Harbour Master, has a range of duties and responsibilities for the Humber Estuary which, through a series of local Acts ranging from 1868 to 1987, extends in summary from the river Trent to the mouth of the Estuary.

10.5.6 Whilst the Dock Master regulates marine port activities as part of ABP, the owner and operator of the Port of Immingham, the Harbour Master, through HES, heads an entirely independent, self-governing body – created by statute.

10.5.7 In the context of this chapter, both the Dock Master and the Harbour Master are responsible for the safe navigation of vessels within their respective statutory jurisdictions.

10.5.8 ***Competent Harbour Authority –*** There is, however, in addition, an overlap of jurisdictions. HES is also the CHA with respect to pilotage for the Humber Estuary – which includes in terms of the Port of Immingham, the "Port Authority" area including the docks. As the CHA, the Harbour Master through HES has the power to issue Pilotage Directions that prescribe which vessels require a Pilot or Pilot Exemption Certificate (PEC) holder when navigating within the CHA area, as per the Pilotage Act (1987).

10.5.9 ***Vessel Traffic Services (VTS)*** – VTS is provided for the Humber Estuary which is established under the requirements of MGN 401[1]. The VTS maintains a vessel traffic picture through the use of AIS and radar providing information on weather, vessel movements and marine safety to vessels navigating in the VTS area. All sea-going vessels are required to report to Humber VTS when entering the VTS area and at designated reporting points identified on navigational charts.

10.5.10 ***Local Lighthouse Authority (LLA) –*** ABP for the Port of Immingham and HES for the Humber Estuary are the LLA for their respective areas of jurisdiction - by virtue of the Humber Conservancy Act 1907 and the successor Merchant Shipping Act 1995. As LLA, HES is responsible for the provision and maintenance of Aids to Navigation (AtoN) and both bodies are required to report any defects to and consult on any proposed changes, additions or removal of AtoN with Trinity House Lighthouse Authority as the General Lighthouse Authority for England and Wales.

10.5.11 ***Port Marine Safety Code (PMSC) –*** Both ABP Port of Immingham and HES have committed to meeting the requirements of the PMSC. The PMSC requires that ports operate a Marine Safety Management System (MSMS) which is based on comprehensive and continuously updated sets of risk assessments. The MSMS details how the ports fulfil their duties as SHAs and meet the marine safety requirements prescribed by the PMSC.

Pilotage Act

10.5.12 The Pilotage Act (UK Public General Acts, 1987) requires CHAs to keep under consideration the pilotage services that may be required to secure the safety of ships. This Act gives a CHA the powers to make pilotage compulsory within their pilotage district and levy charges for the use of a

[1] MGN 401 Amendment 3 Navigation: Vessel Traffic Services (VTS) and Local Port Services (LPS) in the United Kingdom (MCA, 2018)

pilot, grant pilotage exemption certificates and authorise pilots within their district. The Act also requires the Secretary of State to maintain a list of CHAs and empowers the Secretary of State to authorise other bodies to grant deep sea pilotage certificates in respect of such part of the sea falling outside the harbour of any CHA.

National policy

National Policy Statement for Ports (NPSfP)

10.5.13 The National Policy Statement for Ports (NPSfP) (DfT, 2012) provides the framework for decisions on nationally significant infrastructure projects for new port developments which meet the Planning Act 2008 thresholds. Whilst the NPSfP does not enter into great detail with matters such as an NRA, Section 5.4 does refer to the need for determining the impact of works on traffic and transport including marine transport and provides the overarching policy against which this project will be determined.

UK Marine Policy Statement (MPS)

10.5.14 Sea ports and harbours provide the interface between the land, near shore and open sea. Paragraph 3.4.7 of the UK Marine Policy Statement (MPS) (HM Government, 2011) identifies in relation to port developments and marine safety that: "*Marine plan authorities and decision* makers *should take into account and seek to minimise any negative impacts on shipping activity, freedom of navigation and navigational safety; and ensure that their decisions are in compliance with international maritime law*".

East Inshore and East Offshore Marine Plans

10.5.15 The IERRT lies within the area covered by the East Inshore Marine Plan, published in April 2014 by the Department for Environment, Food and Rural Affairs (Defra, 2014). The marine elements of the project are located within the East Inshore Marine Plan Area. The East Inshore Marine Plan sets out the approach to managing the East Inshore area, its resources and the activities and interactions that occur within the area. A policy conformance assessment has been produced to support the DCO application for this Project which is informed by the information provided in this ES and in the NRA.

Guidance

10.5.16 The UK National standard for the safe and efficient running of ports is the Department for Transport's 'Port Marine Safety Code' (DfT, 2016) and its accompanying document 'A Guide to Good Practice on Port Marine Operations' (DfT, 2018).

10.5.17 The following documents have also been considered in the preparation of the NRA for the proposed development. These documents provide

supplementary information that, when applicable, can assist the assessment of navigational risk and marine safety:

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

10.6 Description of the existing environment

10.6.1 The proposed IERRT will be constructed in a position lying between the IOT and the Eastern Jetty, as detailed in Chapter 2 and Chapter 3 of this ES. The IOT finger pier is located directly to the east of the proposed development and is regularly used by tankers and barges.

10.6.2 The material that has to be removed as a result of the capital dredge will be deposited at licensed disposal sites HU056 and HU060 (see Chapters 2 and 3 of this ES). These are both located to the north of the proposed IERRT and would be approached by crossing the main navigational route through the area. Foul Holme Channel is exposed to the moving sand banks which affect the channels depth and operations for vessels with deep draughts. Within Holme Ridge and Clay Huts are the two identified disposal sites. Figure 10.1 presents the location of the jetties, terminals, the secondary vessel channels and the Clay Huts, Holme Ridge sand/mud banks.

Commercial navigation

10.6.3 Figure 10.2 provides a density grid of vessel movements derived from AIS data. In the vicinity of the proposed development, there is regular use by port service craft (tugs, pilot boats, survey, line handling vessels etc.) and tankers. AIS data also shows a smaller number of high-speed craft and vessels engaged in dredging or underwater operations using the area which is to be anticipated bearing in mind that the area is currently free of marine infrastructure.

10.6.4 A moderate proportion of traffic density immediately to the north east of the proposed development shown on Figure 10.2 is due to tankers on passage to/from the IOT finger pier. This is further analysed in Appendix 10.1 to this ES.

10.6.5 The Eastern Jetty which is to the west of the proposed development's location is regularly used as a berth for tugs. These tugs are used to assist vessels manoeuvring into the lock and with berthing. The Eastern Jetty also has infrastructure for product tankers to load/discharge cargo.

The wider study area has high quantities of vessel movements transiting through Immingham Roads and Foul Holme Channel. This is the main route between the terminal and those ports located to the west of Immingham and the entrance to the Humber Estuary. Table 10.4 shows a count of the AIS transits by vessel type through the study area as per the in-house AIS data provided by Anatec Limited for dates 1 September 2021 to 31 August 2022.

10.6.6 Table 10.5 presents the vessel transits crossing a transect between the western extent of the IOT infrastructure and the eastern extent of the Eastern Jetty.

10.6.7 For the area in close proximity to the location of the proposed terminal, the AIS data shows that the majority of transits are from tankers – totalling some with 1,279 movements per year. Given the location of the transect, it is likely that all of these transits are to/from the IOT Finger Pier. Other notable transits are from port and non-port service craft which is likely to be associated with IOT berthing operations and the tug berths on the Eastern Jetty.

Table 10.4. Transits in the Study area

Vessel Type	Transit Count	Percentage
Non Port Service Craft	2,063	2%
Port Service Craft	23,697	20%
Dredging or Underwater Operations	4,136	3%
High Speed Craft	6,228	5%
Military or Law Enforcement	74	1%
Passenger	3,480	3%
Cargo	48,593	41%
Tanker	25,100	21%
Fishing	1,078	1%
Recreational	1,282	1%
Unknown	2,851	2%
Total	118,583	100%

Table 10.5. Transits between IOT and Eastern Jetty

Vessel Type	Transit Count	Percentage
Non-Port Service Craft	175	10%
Port Service Craft	291	16%
Dredging or Underwater Operations	75	4%
Cargo	2	<1%
Tanker	1,279	70%
Unknown	10	<1%
Total	1,832	100.0%

Recreational navigation

10.6.8 The Humber Estuary has approximately 1,000 permanent recreational berths and 120 visitors' berths for recreational craft. The majority of recreational activity occurs during the summer months and predominantly on the weekend. There are no recreational facilities at the Port of Immingham.

10.6.9 Established recreational vessel destinations in the Humber Estuary include Hull Marina which has accommodation for 310 boats and 20 visitors, Goole Boathouse which offers 140 moorings and South Ferriby marina which provides accommodation for 100 boats plus 20 visiting vessels. In addition, there are various creeks around the estuary providing further capacity through anchorages and moorings, including Tetney Haven (Humber Mouth Yacht Club), Stone Creek, Hessle Haven and, Barrow Haven. Additionally, the yacht havens of Brough and Winteringham (Humber Yawl Club) also provide limited mooring for small vessels (HES, 2022).

Maritime accidents/incidents

10.6.10 The RNLI national dataset, the MAIB national dataset and the MARNIS local dataset hold the details of all reported marine safety incidents and other occurrences which have potential significance to navigational safety. These datasets have been used to identify accidents/incidents for the study area from 2011 and 2020 inclusive.

10.6.11 Accident/incident reports within MARNIS are displayed in Table 10.6 and within the baseline assessment set out in the NRA (Appendix 10.1 to this ES). It can be seen that there were 1,834 incidents in the study area during the 10 year data period. This equates to an annual frequency of 183.4 incidents. The most frequent incident type was 'Equipment failure (vessel)' with a total frequency of 778. These events are generally reported to Humber VTS by the pilots and relate to any equipment including, navigational equipment and communications. The next most common accidents/incident category was 'Impact with Structure' which is commonly reported at locations where there is significant dock infrastructure due to the constraints when entering the lock. The majority of these accidents/incidents have minor consequences.

10.6.12 Ports, marine facilities, and vessels are required to report certain incidents to the MAIB. These tend to be incidents which are more serious in nature or had the potential to be more serious. Some ports and marine facilities will also choose to report incidents which are not classed as 'MAIB-reportable'. Table 10.7 shows that there were 153 incidents reported to the MAIB between 2011 and 2020. This equates to an average annual frequency of 15.3 reported incidents per year. The most frequently reported incident type was 'Impact with Structure' which occurred 59 times over the 10-year period. The next most frequently reported category was

'Equipment failure (vessel)' followed by 'Person in distress' with a total of 28 and 22 reports respectively.

10.6.13 Finally, it can be seen in Table 10.8 that there were 70 marine accidents/incidents in the study area during the 10-year period which were attended by the RNLI. The most frequent of these was 'Equipment failure (vessel)' and 'Grounding' which both occurred with an annual frequency of 2.2. The other most common accidents/incidents are categorised as 'Other nautical safety'.

10.6.14 It should be noted that there are some incidents which are duplicated across the three datasets but it has not been possible to remove duplicates definitively. This means that the true total incident rates will be less frequent than stated in this report, as some incidents classified as 'MAIB – optional report' have also been reported to the MAIB. For this reason, all datasets have been treated individually during the analysis.

Table 10.6 MARNIS Accident Incident for the study area 2011 to 2020

Incident Type	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
Collision ship - ship	2	5	3	2	4	3	4	3	5	1	**32**
Equipment failure (port)	3	7	3	10	9	3	16	7	3	3	**64**
Equipment failure (vessel)	52	72	84	84	88	77	132	81	45	63	**778**
Event Management	0	0	0	0	0	0	4	4	1	0	**9**
Fire/Explosion	3	1	3	2	3	2	4	0	0	2	**20**
Grounding	3	0	1	2	5	6	4	6	0	1	**28**
Heaving Lines	0	0	0	0	0	0	0	9	16	9	**34**
Impact with Structure	66	66	77	47	36	30	55	30	22	23	**452**
Other nautical safety	0	0	0	24	23	31	63	43	34	22	**240**
Other nautical safety hazard	11	25	28	0	0	0	0	0	0	0	**64**
Pilot boarding arrangements	0	0	0	0	0	0	0	0	0	1	**1**
Ranging	4	3	5	20	11	14	8	5	2	0	**72**
Sinking and capsizing	0	0	0	0	0	0	0	0	1	0	**1**
Striking with Floating Object	2	1	0	3	1	0	1	0	3	0	**11**
Striking with ship (moored)	3	6	5	4	0	3	4	0	2	1	**28**
Total	**149**	**186**	**209**	**198**	**180**	**169**	**295**	**188**	**134**	**126**	**1,834**

Table 10.7. MAIB Accident Incident for the study area 2011 to 2020

Incident Type	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
Collision	1	1	1	2	0	2	2	1	3	0	**13**
Equipment failure (vessel)	1	0	3	0	2	4	4	5	1	8	**28**
Fire/Explosion	1	0	1	1	3	0	1	0	1	2	**10**
Grounding	1	1	0	0	2	6	2	2	0	1	**15**
Impact with structure	3	1	3	4	12	9	8	5	6	8	**59**
Other nautical safety	0	0	0	0	0	1	0	0	1	3	**5**
Person in distress	0	1	4	0	1	3	1	3	5	4	**22**
Person(s) in the water	0	0	0	0	0	0	0	0	1	0	**1**
Total	**7**	**4**	**12**	**7**	**20**	**25**	**18**	**16**	**18**	**26**	**153**

Table 10.8. RNLI Accident Incident for the study area 2011 to 2020

Incident Type	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
Collision	0	0	0	0	0	2	0	0	0	0	**2**
Equipment failure (vessel)	5	1	4	1	2	3	1	1	4	0	**22**
Fire/Explosion	0	1	0	0	0	0	0	0	0	0	**1**
Grounding	3	0	9	4	0	3	1	2	0	0	**22**
Other nautical safety	1	2	0	1	0	1	2	3	5	2	**17**
Person in distress	1	0	0	0	1	0	0	2	0	1	**5**
Person(s) in the water	1	0	0	0	0	0	0	0	0	0	**1**
Total	**11**	**4**	**13**	**6**	**3**	**9**	**4**	**8**	**9**	**3**	**70**

10.7 Future baseline environment

10.7.1 Shipping volumes bear a direct relationship to the global economic market. As markets react to the changing financial situation, shipping lines respond with services to move goods and people. The future growth and development of ports and shipping on a global scale level is inherently linked to trade patterns and the economic climate and is reactive to changing economic circumstances. Economic growth and increases in world trade leads to higher levels of shipping and a consequential growth of port operations. Conversely, economic slowdown and recession result in lower levels of global trade and of shipping. Ultimately, 'economy' is a function of people and as global and local populations continue to rise, the economy is expected to grow to facilitate this.

10.7.2 The timeframe for the future baseline for the IERRT project has been assessed as 50 years although IERRT infrastructure will continue to be used beyond that period in that the marine infrastructure has been designed to become an integral part of the existing port infrastructure, via a process of careful maintenance, replacement and renewal (see Chapter 3 of this ES).

10.7.3 Potential changes in shipping over the period can be assessed by looking at vessel trends at other ports in the general area and analysing that data in the context of national shipping trends. This can then be set against the global change in the economy by considering population change both locally and internationally. Moreover, the future baseline can be further anticipated by considering if any local (estuary) geomorphological constraints prevent maximum vessel size increasing above a certain threshold.

10.7.4 The global population is modelled to increase from 7.95 billion in 2022 to 10.5 billion in 2072 based on the current average cumulative population increase of ~1-2% per annum (Roser, M. and Rodés-Guirao, 2019). This growth is considerably less than the growth seen in the past 50 years (~2.1%) and as a result global economies are not expected to grow by the same factor as they did in the latter half of the 20th century. It is reasonable to assume that a growth in the economy will likely lead to a greater tonnage of freight moving through the Humber Estuary. A conservative metric for determining a potential future baseline has been adopted by projecting from 2019 at 1% cumulative growth.

10.8 Consideration of likely impacts and effects

10.8.1 This section identifies the potential likely effects on the commercial and recreational navigation receptors as a result of the construction or construction and operation (in the case of a sequenced construction, see Chapter 3 of this ES) and subsequent operation of the IERRT project.

10.8.2 The effects that are considered in this assessment are drawn from the NRA (Appendix 10.1 to this ES). The NRA has considered all potential hazards associated with the construction or construction and operation and operation of the proposed development that are likely to arise and has identified suitable mitigation measures with the aim of reducing the risk to a level considered to be tolerable and ALARP (i.e., not significant in EIA terms).

10.8.3 Cumulative impacts on commercial and recreational navigation that could arise as a result of other developments and activities in the Humber Estuary have been considered as part of the cumulative impacts and in-combination effects assessment (see Chapter 20 of this ES).

Construction

10.8.4 This section contains an assessment of the potential risks to commercial and recreational navigation as a result of the construction of the IERRT project. The assessment first sets out the assessment of the 'worst credible' scenario and the 'most likely' scenario. It should be noted that the NRA provides more complex and detailed assessments which have been simplified for the purposes of this ES chapter. The following impact pathways have been assessed (the alpha-numeric code preceding each risk/impact pathway relates to the risk identification number allocated in the NRA (Appendix 10.1 to this ES)):

- C.1 Person overboard during dredge and construction works;
- C.2 Allision of dredger/construction vessel with IOT infrastructure;
- C.3 Allision of commercial vessel with marine works;
- C.4 Collision of two craft associated with marine works;
- C.5 Collision/allision of commercial vessel entering construction area;
- C.6 Collision of dredger or barge with vessel at 'F' anchorage when disposing of dredge material;
- C.7 Dredger grounding whilst engaged in operations;
- C.8 Hazardous chemical spill from construction vessels;
- C.9 Construction vessel mooring failure;
- C.10 Component (equipment, material) dropped during construction;
- C.11 Construction vessel takes on water from excessive wash; and
- C.12 Payload related incidents.

10.8.5 It is anticipated that the vessel traffic generated during construction will create marine works traffic for a time period of approximately one and half years (for single stage construction) or approximately three years (for a sequenced construction scenario) which will include work boats, barges, tugs, and other works craft. It is estimated that for the capital works, up to five split bottom barges will be used to transport material to the disposal site. During the construction phase, up to four floating jack-up barges with associated small tugs will be used. In addition, a safety/crew transfer vessel will be present throughout. Other than the transit of vessels to the site, the construction activity for the marine works will be contained within the IERRT redline boundary.

C.1 Person overboard during dredge and construction works

10.8.6 The identified worst credible and most likely scenarios for this hazard scenario are respectively:

- Person falls overboard, isn't detected and drowns, no pollution, no property damage and negative local publicity; and
- Person falls overboard and is recovered from the water, suffering serious injuries.

10.8.7 Assessed at the embedded risk control stage, the worst credible scenario was deemed to be possible with consequences of major (people), negligible (property), negligible (planet) and, moderate (port).

10.8.8 Assessed at the embedded risk control stage, the most likely scenario was deemed to be possible with consequences of moderate (people), negligible (property), negligible (planet) and, minor (port).

10.8.9 Based on the above and the defined tolerability in Appendix 10.1 to this ES, this risk at the embedded controls stage is considered intolerable due to the worst credible scenario's frequency and people receptor, and therefore potentially significant in EIA terms without further mitigation.

C.2 Allision of dredger/construction vessel with IOT infrastructure

10.8.10 The identified worst credible and most likely scenarios for this hazard scenario are respectively:

- Dredge/construction vessel makes heavy contact with trunk way, causing a tier 3 pollution and significant damage to property. Multiple deaths to personnel working on the trunk way and negative international damage to port reputation; and
- Loss of control causes the flat top barge to contact the piles of trunk way. Minor pollution and injuries to personnel occur. Stop to operations while inspections are carried out on the IOT piles, minor interruptions to IOT operations.

10.8.11 Assessed at the embedded risk control stage, the worst credible scenario was deemed to be unlikely with consequences of extreme (people), extreme (property), extreme (planet) and, extreme (port).

10.8.12 Assessed at the embedded risk control stage the most likely scenario was deemed to be possible with consequences of minor (people), minor (property), negligible (planet) and, minor (port).

10.8.13 Based on the above and the defined tolerability in Appendix 10.1 to this ES, this risk at the embedded controls stage is considered tolerable. However, the risk is not yet considered ALARP, and therefore it is potentially significant in EIA terms without further mitigation.

C.3 Allision of commercial vessel with marine works

10.8.14 The identified worst credible and most likely scenarios for this hazard scenario are respectively:

- Tanker proceeding to IOT Finger Pier makes contact with marine works resulting in damage to hull and loss of cargo. Incident results in a single fatality from impact, tier 3 pollution, and international reputation damage. Delay to marine works and operations at IOT during response and following investigation; and
- Tanker transiting to berth makes contact with infrastructure at slow speed, leading to minor damage to vessel, no loss of cargo, minor injuries to crew and minor delays to marine works caused by investigations and ship survey.

10.8.15 Assessed at the embedded risk control stage the worst credible scenario was deemed to be unlikely with consequences of major (people), major (property), extreme (planet), and extreme (port).

10.8.16 Assessed at the embedded risk control stage the most likely scenario was deemed to be almost certain with consequences of minor (people), minor (property), negligible (planet) and minor (port).

10.8.17 Based on the above and the defined tolerability in Appendix 10.1 to this ES, this risk at the embedded controls stage is considered tolerable. However, the risk is not yet considered ALARP, and therefore it is potentially significant in EIA terms without further mitigation.

C.4 Collision of two craft associated with marine works

10.8.18 The identified worst credible and most likely scenarios for this hazard scenario are taken from the HES MSMS. This risk was identified in the third HAZID workshop to be effectively the same as one that would already exist in the MSMS and was therefore included here for context. The worst credible and most likely scenarios are respectively:

- One marine works craft sinks, causing multiple fatalities, moderate damage to the vessels involved (£750,000 - 4 million). Tier 2 pollution from bunker tank and hazardous cargo. Major impact on Port Business and reputation; and
- Minor damage to both vessels. No measurable pollution from bunkers or cargo. Minor injuries to personnel. Minor disruption to Port Business and reputation.

10.8.19 Assessed at the embedded risk control stage the worst credible scenario was deemed to be unlikely with consequences of extreme (people), moderate (property), moderate (planet), and major (port).

10.8.20 Assessed at the embedded risk control stage the most likely scenario was deemed to be likely with consequences of minor (people), minor (property), negligible (planet), and minor (port).

10.8.21 Based on the above and the defined tolerability in Appendix 10.1 to this ES, this risk at the embedded controls stage is considered tolerable. However, the risk is not yet considered ALARP, and therefore it is potentially significant in EIA terms without further mitigation.

C.5 Collision/allision of commercial vessel entering construction area

10.8.22 The identified worst credible and most likely scenarios for this hazard scenario are respectively:

- Tanker enters construction area and collides with a jack-up barge which flips the jack up causing multiple fatalities to personnel. The tanker struck the barge on the fore peak causing damage forward of the collision bulkhead, moderate pollution from jack-up barge. Major damage to property and international publicity; and
- Tanker or barge has an allision with constructed infrastructure resulting in a glancing blow with minor damage to barge, no pollution, minor injuries to personnel and little local publicity.

10.8.23 Assessed at the embedded risk control stage the worst credible scenario was deemed to be unlikely with consequences of extreme (people), major (property), minor (planet), and extreme (port).

10.8.24 Assessed at the embedded risk control stage the most likely scenario was deemed to be possible with consequences of minor (people), minor (property), negligible (planet), and minor (port).

10.8.25 Based on the above and the defined tolerability in Appendix 10.1 to this ES, this risk at the embedded controls stage is considered tolerable. However, the risk is not yet considered ALARP, and therefore it is potentially significant in EIA terms without further mitigation.

C.6 Collision of dredger or barge with vessel at 'F' anchorage when disposing of dredge material

10.8.26 The identified worst credible and most likely scenarios for this hazard scenario are respectively:

- Collision between dredger and bunker vessel whilst it is at anchor in 'F' anchorage. Damage to both vessels hull resulting in loss of cargo from bunker vessel, a single fatality, tier 3 pollution. Disruption to all operations on the Humber during pollution response, international negative publicity; and
- Collision at slow speed whilst dredger depositing dredge material. Minor contact damage, minor damage to dredger or construction plant. Minor injuries or pollution, minor delay to marine works.

10.8.27 Assessed at the embedded risk control stage the worst credible scenario was deemed to be unlikely with consequences of moderate (people), extreme (property), extreme (planet), and extreme (port).

10.8.28 Assessed at the embedded risk control stage the most likely scenario was deemed to be possible with consequences of minor (people), minor (property), negligible (planet), and minor (port).

10.8.29 Based on the above and the defined tolerability in Appendix 10.1 to this ES, this risk at the embedded controls stage is considered tolerable. However, the risk is not yet considered ALARP, and therefore it is potentially significant in EIA terms without further mitigation.

C.7 Dredger grounding whilst engaged in operations

10.8.30 The identified worst credible and most likely scenarios for this hazard scenario are respectively:

- Dredger grounds whilst engaged in dredging operations resulting in damage to dredge equipment and vessel becoming stranded. Potential of serious injuries to personnel during the vessel grounding. Towage required to refloat dredger and £750,000 to £4 million of damage to dredger which requires survey and inspection. Significant delays to marine works and negative local publicity, no pollution; and
- Dredger grounds but is able to refloat under its own power. Minor delay to operations whilst dredge equipment checked for damage, no injuries, no pollution.

10.8.31 Assessed at the embedded risk control stage the worst credible scenario was deemed to be unlikely with consequences of moderate (people), moderate (property), negligible (planet), and major (port).

10.8.32 Assessed at the embedded risk control stage the most likely scenario was deemed to be likely with consequences of negligible (people), negligible (property), negligible (planet), and minor (port).

10.8.33 Based on the above and the defined tolerability in Appendix 10.1 to this ES, this risk at the embedded controls stage is considered tolerable. However, the risk is not yet considered ALARP, and therefore it is potentially significant in EIA terms without further mitigation.

C.8 Hazardous chemical spill from construction vessels

10.8.34 The identified worst credible and most likely scenarios for this hazard scenario are respectively:

- Damage to hydraulic systems result in oil entering the water. Minor injuries to personnel due to burns from hot hydraulic oil either during pollution response or from burst hose. Tier 2 oil pollution response required and negative publicity for the port, delay to works during pollution response; and

- Oil spill on deck from plant or refuelling results in a small amount of oil entering the water. Tier 1 response required. No injuries, minor impact to operation and no local publicity.

10.8.35 Assessed at the embedded risk control stage the worst credible scenario was deemed to be unlikely with consequences of moderate (people), minor (property), major (planet), and minor (port).

10.8.36 Assessed at the embedded risk control stage the most likely scenario was deemed to be likely with consequences of negligible (people), negligible (property), minor (planet), and negligible (port).

10.8.37 Based on the above and the defined tolerability in Appendix 10.1 to this ES, this risk at the embedded controls stage is considered tolerable. However, the risk is not yet considered ALARP, and therefore it is potentially significant in EIA terms without further mitigation.

C.9 Construction vessel mooring failure

10.8.38 The identified worst credible and most likely scenarios for this hazard scenario are respectively:

- Unmanned barge has mooring failure and drifts resulting in allision or grounding. Cargo (piles/construction materials) enter the water; major delay to operations whilst barge and cargo recovered. Negative local publicity, minor delays to construction works and no injuries; and
- Construction craft or barge has a single mooring line failure but does not result in a breakout. Additional mooring lines used to secure craft, no injuries, no pollution, minor delay to works.

10.8.39 Assessed at the embedded risk control stage the worst credible scenario was deemed to be possible with consequences of negligible (people), minor (property), negligible (planet), and moderate (port).

10.8.40 Assessed at the embedded risk control stage the most likely scenario was deemed to be almost certain with consequences of negligible (people), negligible (property), negligible (planet), and negligible (port).

10.8.41 Based on the above and the defined tolerability in Appendix 10.1 to this ES, this risk at the embedded controls stage is considered tolerable. However, the risk is not yet considered ALARP, and therefore it is potentially significant in EIA terms without further mitigation.

C.10 Component (equipment, material) dropped during construction

10.8.42 The identified worst credible and most likely scenarios for this hazard scenario are respectively:

- Component dropped in to water in the approach channel causing underwater obstruction, Harbour Authority not notified. Transiting tanker or barge, on passage to IOT, makes contact with the obstruction

causing damage to hull. This results in the puncturing of both hulls, tier 3 pollution, serious injuries, vessel out of service requiring survey and repair. Negative national port reputational damage; and
- Dropped component within construction area, reported to port and operations ceased until item is recovered. No injuries, minor damage, minor delay to works.

10.8.43 Assessed at the embedded risk control stage the worst credible scenario was deemed to be unlikely with consequences of moderate (people), major (property), extreme (planet), and major (port).

10.8.44 Assessed at the embedded risk control stage the most likely scenario was deemed to be likely with consequences of negligible (people), minor (property), negligible (planet), and minor (port).

10.8.45 Based on the above and the defined tolerability in Appendix 10.1 to this ES, this risk at the embedded controls stage is considered tolerable. However, the risk is not yet considered ALARP, and therefore it is potentially significant in EIA terms without further mitigation.

C.11 Construction vessel takes on water from excessive wash

10.8.46 The identified worst credible and most likely scenarios for this hazard scenario are respectively:

- Workboat with low freeboard takes on water from excessive wash caused by a tanker. The stability is affected, and the craft capsizes with multiple fatalities, tier 1 pollution and an extreme impact to port reputation and programme; and
- Workboat takes on a small amount of water during adverse weather conditions and operations are halted. Minor delay to works, no pollution or injuries.

10.8.47 Assessed at the embedded risk control stage the worst credible scenario was deemed to be rare with consequences of extreme (people), moderate (property), minor (planet), and extreme (port).

10.8.48 Assessed at the embedded risk control stage the most likely scenario was deemed to be almost certain with consequences of negligible (people), negligible (property), negligible (planet), and minor (port).

10.8.49 Based on the above and the defined tolerability in Appendix 10.1 to this ES, this risk at the embedded controls stage is considered tolerable. However, the risk is not yet considered ALARP, and therefore it is potentially significant in EIA terms without further mitigation.

C.12 Payload related incidents

10.8.50 The identified worst credible and most likely scenarios for this hazard scenario are respectively:

- Incorrect unloading/loading of barge results in stability being compromised. Barge develops significant list causing construction materials to enter the water, the barge to flood and sink causing tier 2 pollution. Materials and barge present a hazard to navigation until recovered. Major delay to works. Threat to personnel could result in a death in the worst credible scenario, either from rapid movement of the flat top barge or from exposure in the water; and
- Vessel takes on list whilst loading and operations cease. Cargo requires unloading causing delay to operations, no injury, damage, or pollution.

10.8.51 Assessed at the embedded risk control stage the worst credible scenario was deemed to be unlikely with consequences of major (people), major (property), major (planet), and major (port).

10.8.52 Assessed at the embedded risk stage the most likely scenario was deemed to be likely with consequences of negligible (people), negligible (property), negligible (planet), and minor (port).

10.8.53 Based on the above and the defined tolerability in Appendix 10.1 to this ES, this risk at the embedded controls stage is considered tolerable. However, the risk is not yet considered ALARP, and therefore it is potentially significant in EIA terms without further mitigation.

Construction-Operation

10.8.54 This section contains an assessment of the potential risks to commercial and recreational navigation as a result of the overlapping construction and operation of the IERRT project (see Chapter 3 of the ES). The assessment first sets out the assessment of the 'worst credible' scenario and the 'most likely' scenario. It should be noted that the NRA provides more complex and detailed assessments which have been simplified for the purposes of this ES chapter. The following impact pathways have been assessed (the alpha-numeric code preceding each risk/impact pathway relates to the risk identification number allocated in the NRA (Appendix 10.1 to this ES)):

- CO.1 Collision of construction vessel with Ro-Ro vessel;
- CO.2 Ro-Ro vessel mooring failure in vicinity of marine construction works;
- CO.3 Component (equipment, material) dropped during construction preventing Ro-Ro operations;
- CO.4 Construction vessel takes on water from excessive wash from Ro-Ro vessel;
- CO.5 Allision of Ro-Ro vessel with IERRT infrastructure;
- CO.6 Construction vessel mooring failure; and
- CO.7 Ro-Ro vessel arriving/departing IERRT berth 2 with a tanker berthed on Eastern Jetty.

CO.1 Collision of construction vessel with Ro-Ro vessel

10.8.55 The identified worst credible and most likely scenarios for this hazard scenario are respectively:

- Manoeuvring speed collision with no avoiding action leading to multiple fatalities for personnel on marine works boat. Potential for minor hull breach on Ro-Ro vessel, serious impact to property, significant consequence to the environment including a tier 2 pollution event, and serious consequence to the port business and reputation; and
- Low speed glancing collision that shunts/pushes marine works craft. Minor injuries from impact, moderate impact to property (£750,000- £4 million), no appreciable consequence to the environment and minor damage to the port's business/reputation.

10.8.56 Assessed at the embedded risk control stage the worst credible scenario was deemed to be unlikely with consequences of extreme (people), major (property), major (planet), and port (extreme).

10.8.57 Assessed at the embedded risk control stage the most likely scenario was deemed to be possible with consequences of minor (people), moderate (property), negligible (planet), and minor (port).

10.8.58 Based on the above and the defined tolerability in Appendix 10.1 to this ES, this risk at the embedded controls stage is considered tolerable. However, the risk is not yet considered ALARP, and therefore it is potentially significant in EIA terms without further mitigation.

CO.2 Ro-Ro vessel mooring failure in vicinity of marine construction works

10.8.59 The identified worst credible and most likely scenarios for this hazard scenario are respectively:

- Vessel breaks moorings, ramp holds stern on the berth and acts as a pivot point causing vessel to swing into marine works or marine works craft. This in turn creates significant damage to the marine works stopping construction and operation until repaired. Serious injuries caused by impact of Ro-Ro on the works or with a vessel, with the potential to cause a single death. Potential for a tier 1 pollution event caused by damage to the marine works craft; and
- Single mooring failure but vessel remains alongside. Further mooring lines used. Minor delay to operations while infrastructure is repaired minor cost to port, minor little local publicity, minor injury, respectively.

10.8.60 Assessed at the embedded risk control stage the worst credible scenario was deemed to be unlikely with consequences of major (people), extreme (property), moderate (planet), and extreme (port).

10.8.61 Assessed at the embedded risk control stage the most likely scenario was deemed to be almost certain with consequences of minor (people), minor (property), negligible (planet), and minor (port).

10.8.62 Based on the above and the defined tolerability in Appendix 10.1 to this ES, this risk at the embedded controls stage is considered tolerable. However, the risk is not yet considered ALARP, and therefore it is potentially significant in EIA terms without further mitigation.

CO.3 Component (equipment, material) dropped during construction preventing Ro-Ro operations

10.8.63 The identified worst credible and most likely scenarios for this hazard scenario are respectively:

- Component dropped in water causing semi-submerged obstruction that is not notified to the Harbour Authority. Ro-Ro vessel makes contact with the obstruction causing damage to hull, minor pollution, vessel out of service requiring survey and repair. Significant port reputational damage and interruption to construction and operation. Serious injuries as a result of impact on obstruction; and
- Dropped component (in water) reported, construction and operations cease until it is recovered. No injuries, no damage, minor delay to works.

10.8.64 Assessed at the embedded risk control stage the worst credible scenario was deemed to be unlikely with consequences of moderate (people), major (property), minor (planet), and major (port).

10.8.65 Assessed at the embedded risk control stage the most likely scenario was deemed to be likely with consequences of negligible (people), negligible (property), negligible (planet), and minor (port).

10.8.66 Based on the above and the defined tolerability in Appendix 10.1 to this ES, this risk at the embedded controls stage is considered tolerable. However, the risk is not yet considered ALARP, and therefore it is potentially significant in EIA terms without further mitigation.

CO.4 Construction vessel takes on water from excessive wash from Ro-Ro vessel

10.8.67 The identified worst credible and most likely scenarios for this hazard scenario are respectively:

- Workboat with low freeboard takes on water from excessive wash due to Ro-Ro operating in close proximity. The stability is affected, and the craft capsizes with multiple fatalities, tier 1 pollution and significant delay to operations and construction while incident is managed. Extreme reputational damage to the port; and
- Workboat takes on a small amount of water and operations are halted while minor swamping is addressed. Minor delay to works, no pollution

and minor injuries for any personnel falling/loosing balance due to the wash.

10.8.68 Assessed at the embedded risk control stage the worst credible scenario was deemed to be possible with consequences of extreme (people), major (property), minor (planet), and extreme (port).

10.8.69 Assessed at the embedded risk control stage the most likely scenario was deemed to be likely with consequences of minor (people), negligible (property), negligible (planet), and minor (port).

10.8.70 Based on the above and the defined tolerability in Appendix 10.1 to this ES, this risk at the embedded controls stage is considered intolerable due to the worst credible scenario's frequency and the people and port receptors, and therefore potentially significant in EIA terms without further mitigation.

CO.5 Allision of Ro-Ro vessel with IERRT infrastructure

10.8.71 The identified worst credible and most likely scenarios for this hazard scenario are respectively:

- Ro-Ro collides with the infrastructure, serious damage to vessel and pontoon, disrupting operation to berths 1 and 2 and delaying construction of 3 whilst repairs occur. Minor pollution from debris, serious injuries to personal from impact, greater than £8 million of damage, serious negative national publicity and closed for operations; and
- Ro-Ro has a slow speed impact with pier during berthing leading to minor damage to vessel and pier, minor injuries, no pollution, minor delay to operations and minor delay to construction whilst repairs occur.

10.8.72 Assessed at the embedded risk control stage the worst credible scenario was deemed to be possible with consequences of moderate (people), extreme (property), minor (planet), and major (port).

10.8.73 Assessed at the embedded risk control stage the most likely scenario was deemed to be likely with consequences of minor (people), minor (property), negligible (planet) and minor (port).

10.8.74 Based on the above and the defined tolerability in Appendix 10.1 to this ES, this risk at the embedded controls stage is considered intolerable due to the worst credible scenario's frequency and property receptor, and therefore potentially significant in EIA terms without further mitigation.

CO.6 Construction vessel mooring failure

10.8.75 The identified worst credible and most likely scenarios for this hazard scenario are respectively:

- Wash from a berthing Ro-Ro breaks the flat top barge free of its mooring whilst constructing berth 3 and drifts down towards the Eastern Jetty. The following allision with the jetty causes a tier 3 pollution event that substantially effects port reputation and delays operations of all port users. Serious injuries are incurred to those on the flat top barge and damage is likely to cost £4-8 million to repair; and
- Flat top-barge has a single mooring line failure but does not result in a breakout. Additional mooring lines used to secure craft, no injuries, no pollution, minor delay to works.

10.8.76 Assessed at the embedded risk control stage the worst credible scenario was deemed to be possible with consequences of moderate (people), major (property), extreme (planet), and major (port).

10.8.77 Assessed at the embedded risk control stage the most likely scenario was deemed to be likely with consequences of negligible (people), negligible (property), negligible (planet), and negligible (port).

10.8.78 Based on the above and the defined tolerability in Appendix 10.1 to this ES, this risk at the embedded controls stage is considered intolerable due to the worst credible scenario's frequency and planet receptor, and therefore potentially significant in EIA terms without further mitigation.

CO.7 Ro-Ro vessel arriving/departing IERRT berth 2 with a tanker berthed on Eastern Jetty

10.8.79 The identified worst credible and most likely scenarios for this hazard scenario are respectively:

- Ro-Ro makes contact with berthed tanker resulting in a significant allision that punctures the tanker's double hull leading to a tier 3 pollution event with release of toxic chemical. Causing major risk to life and environment both short and long term. Incident results in multiple fatalities, sever damages to both vessels and berth infrastructure for an amount greater than £8M. Negative international news that significantly affects the ports reputation and port operations; and
- An approaching Ro-Ro loses control and makes slow contact with berthed tanker resulting in an allision that damages cargo pipes, leading to a tier 3 pollution event with release of toxic chemical. Moderate damage to port infrastructure and vessel, serious injuries to personnel, and negative national port reputational damage.

10.8.80 Assessed at the embedded risk control stage the worst credible scenario was deemed to be unlikely with consequences of extreme (people), extreme (property), extreme (planet), and extreme (port).

10.8.81 Assessed at the embedded stage the most likely scenario was deemed to be possible with consequences of moderate (people), moderate (property), extreme (planet), and major (port).

10.8.82 Based on the above and the defined tolerability in Appendix 10.1 to this ES, this risk at the embedded controls stage is considered intolerable due to the most likely scenario's frequency and planet receptor, and therefore potentially significant in EIA terms without further mitigation.

Operation

10.8.83 This section contains an assessment of the potential risks to commercial and recreational navigation as a result of the operation of the IERRT project. The assessment first sets out the assessment of the 'worst credible' scenario and the 'most likely' scenario. It should be noted that the NRA provides more complex and detailed assessments which have been simplified for the purposes of this ES chapter. The following impact pathways have been assessed (the alpha-numeric code preceding each risk/impact pathway relates to the risk identification number allocated in the NRA (Appendix 10.1 to this ES)):

- O.1 Alisson of Ro-Ro vessel arriving/departing IERRT with tanker moored at IOT finger pier;
- O.2 Allision of tanker manoeuvring on/off IOT finger pier with IERRT on flood tide;
- O.3 Allision of barge manoeuvring on/off IOT finger pier with IERRT on flood tide;
- O.4 Allision of Ro-Ro vessel with IOT trunk way;
- O.5 Allision of Ro-Ro vessel with IERRT infrastructure;
- O.6 Collision of Ro-Ro vessel on passage to/from IERRT with another vessel;
- O.7 Ro-Ro vessel grounding whilst manoeuvring to IERRT berth 3;
- O.8 Ro-Ro vessel mooring failure; and
- O.9 Allision of Ro-Ro vessel arriving/departing IERRT berth 2/3 with a tanker berthed on Eastern Jetty.

10.8.84 The operational phase will see an increase in Ro-Ro vessel arrivals with a maximum of three vessels a day which is an additional six vessel movements. This equates to a maximum total of 2,190 additional movements per year. In addition, these vessels may occasionally require tugs (at a maximum estimate of two tugs for a vessel using the outer finger berth, representing, on a worst case basis, four additional tug movements per day) or 1,460 additional movements per year. There will also be an increase in line handling/mooring vessels as required.

10.8.85 In addition, maintenance dredger movements have been estimated based on estimated volumes of material from maintenance dredging. An estimated total annual maintenance dredge volume of 120,000 m³, assumed split over four dredge campaigns, gives four volumes of 30,000 m³ annually. Each campaign would require 32 hopper loads, giving a total dredge time per campaign of 144 hours total. Within this period, dredger and hopper would be moored onsite for 4 hours, then the hopper would transit to and from the disposal site over 0.5 hours, with the cycle repeating until the end. In terms of vessel movements, for one

campaign, 32 hopper loads equate to 64 movements, an additional increase of 256 movements per year.

O.1 Alisson of Ro-Ro vessel arriving/departing IERRT with tanker moored at IOT finger pier

10.8.86 The identified worst credible and most likely scenarios for this hazard scenario are respectively:

- Ro-Ro makes contact with berthed tanker resulting in a significant allision that punctures the tanker's double hull leading to a tier 3 pollution event with possible ignition of the petrochemical. That could cause a fire which significantly damages the vessel and/or infrastructure. Incident results in multiple fatalities, and negative international news that significantly affects the ports reputation and port operations; and
- An approaching Ro-Ro misses its berth and continues to the IOT Finger Pier which results in a low speed glancing collision, dislodging a tanker from its berth causing a tier 3 pollution event. Major damage to port infrastructure and vessel, serious injuries to personnel, and negative national port reputational damage.

10.8.87 Assessed at the embedded risk control stage the worst credible scenario was deemed to be unlikely with consequences of extreme (people), extreme (property), extreme (planet), and extreme (port).

10.8.88 Assessed at the embedded risk control stage the most likely scenario was deemed to be possible with consequences of moderate (people), major (property), extreme (planet), and major (port).

10.8.89 Based on the above and the defined tolerability in Appendix 10.1 to this ES, this risk at the embedded controls stage is considered intolerable due to the most likely scenario's frequency and planet receptor, and therefore potentially significant in EIA terms without further mitigation.

O.2 Allision of tanker manoeuvring on/off IOT finger pier with IERRT on flood tide

10.8.90 The identified worst credible and most likely scenarios for this hazard scenario are respectively:

- Tanker manoeuvres off finger pier and collides with Ro-Ro terminal. The allision has potential to cause a single fatality to a shoreman on the Ro-Ro infrastructure. The impact punctures both hulls of the tanker and causes a tier 3 pollution, serious damage to port reputation and negative national publicity. £4 - 8 million of property damages; and
- Tanker collides with another vessel or structure and does not puncture their hull resulting in little local publicity, moderate property damage (£750,000 - £4 million) and no injuries.

10.8.91 Assessed at the embedded risk control stage the worst credible scenario was deemed to be possible with consequences of major (people), major (property), extreme (planet), and major (port).

10.8.92 Assessed at the embedded risk control stage the most likely scenario was deemed to be likely with consequences of negligible (people), moderate (property), negligible (planet), and minor (port).

10.8.93 Based on the above and the defined tolerability in Appendix 10.1 to this ES, this risk at the embedded controls stage is considered intolerable due to the worst credible scenario's frequency and the people and planet receptors, and therefore potentially significant in EIA terms without further mitigation.

O.3 Allision of barge manoeuvring on/off IOT finger pier with IERRT on flood tide

10.8.94 The identified worst credible and most likely scenarios for this hazard scenario are respectively:

- Barge manoeuvres off finger pier and collides with Ro-Ro terminal. Possibility to cause a single fatality which punctures the barge's hull and causes a tier 3 pollution event. Major Impact on port reputation, serious national publicity and £4 - 8 million of damages to property; and
- Barge collides with another berthed vessel or structure and does not puncture the hull; minor little local publicity, minor property damages (£10,000-750,000) and no injuries.

10.8.95 Assessed at the embedded risk control stage the worst credible scenario was deemed to be possible with consequences of major (people), major (property), extreme (planet), and major (port).

10.8.96 Assessed at the embedded risk control stage the most likely scenario was deemed to be almost certain with consequences of negligible (people), minor (property), negligible (planet), and minor (port).

10.8.97 Based on the above and the defined tolerability in Appendix 10.1 to this ES, this risk at the embedded controls stage is considered intolerable due to the worst credible scenario's frequency and the people and planet receptors, and therefore potentially significant in EIA terms without further mitigation.

O.4 Allision of Ro-Ro vessel with IOT trunk way

10.8.98 The identified worst credible and most likely scenarios for this hazard scenario are respectively:

- Ro-Ro vessel collides with IOT trunk way, severing the charged pipeline causing a tier 3 pollution incident. Possibility of ignition and fire when the motor spirit pipeline is burst due to its flammability. Two refineries must be closed for a considerable time in order to repair the

pipeline. This causes significant impacts for multiple weeks and has national affect to petroleum production. Multiple fatalities, negative international publicity for port and greater than £8 million of damage to port infrastructure; and

- Ro-Ro has a slow speed impact with IOT trunk way leading to minor damage to vessel and distortion of pipe line on trunk way. Single fatality to personnel on the trunk way and tier 3 pollution, negative international publicity and greater than £8 million of damages to the port.

10.8.99 Assessed at the embedded risk control stage the worst credible scenario was deemed to be possible with consequences of extreme (people), extreme (property), extreme (planet), and extreme (port).

10.8.100 Assessed at the embedded risk control stage the most likely scenario was deemed to be possible with consequences of major (people), extreme (property), extreme (planet), and extreme (port).

10.8.101 Based on the above and the defined tolerability in Appendix 10.1 to this ES, this risk at the embedded controls stage is considered intolerable due to the worst credible and most likely scenario's frequencies and all receptors, and therefore potentially significant in EIA terms without further mitigation.

O.5 Allision of Ro-Ro vessel with IERRT infrastructure

10.8.102 The identified worst credible and most likely scenarios for this hazard scenario are respectively:

- Ro-Ro collides with the infrastructure causing serious damage to vessel but limited damage to pontoon. Disrupting operation to two of the three berths, no pollution, minor injuries to personnel, greater than £8 million of damage, serious negative national publicity, and delays to operation; and
- Ro-Ro has a slow speed impact with pier during berthing leading to minor damage to vessel and pier, no injuries, no pollution, minor delay to operations.

10.8.103 Assessed at the embedded risk control stage the worst credible scenario was deemed to be unlikely with consequences of minor (people), extreme (property), negligible (planet), and major (port).

10.8.104 Assessed at the embedded risk control stage the most likely scenario was deemed to be likely with consequences of negligible (people), negligible (property), negligible (planet), and minor (port).

10.8.105 Based on the above and the defined tolerability in Appendix 10.1 to this ES, this risk at the embedded controls stage is considered tolerable. However, the risk is not yet considered ALARP, and therefore it is potentially significant in EIA terms without further mitigation.

O.6 Collision of Ro-Ro vessel on passage to/from IERRT with another vessel

10.8.106 The identified worst credible and most likely scenarios for this hazard scenario are taken from the HES MSMS. This risk was identified in the third HAZID workshop to likely be the same as one that would already exist in the MSMS and was therefore included here for context. The worst credible and most likely scenarios are respectively:

- Manoeuvring speed collision with no avoiding action leading to multiple fatalities, hull breach, serious impact to property, significant consequence to the environment including a tier 2 pollution event, and serious consequence to the port business and reputation; and
- Low speed glancing collision with bridge crew taking avoiding action, minor injuries, minor impact to property, no appreciable consequence to the environment or to the port's business/reputation.

10.8.107 As this risk is in place it has already been deemed to be ALARP and tolerable and thus it was only assessed at the embedded risk control stage, the worst credible scenario is considered unlikely with consequences of extreme (people), major (property), major (planet), and major (port).

10.8.108 As this risk is in place it has already been deemed to be ALARP and tolerable and thus it was only assessed at the embedded risk control stage, the most likely scenario is considered possible with consequences of minor (people), minor (property), negligible (planet), and negligible (port).

10.8.109 Based on the above and the defined tolerability in Appendix 10.1 to this ES, this risk at the embedded controls stage is considered tolerable and ALARP, and, therefore, insignificant in EIA terms.

O.7 Ro-Ro vessel grounding whilst manoeuvring to IERRT berth 3

10.8.110 The identified worst credible and most likely scenarios for this hazard scenario are respectively:

- Ro-Ro proceeding to berthing at IERRT grounds on mud and is refloated on next tide, disruption to sailing timetable. The vessel grounded stern first resulting in damages to propulsion which requires survey and repair. Stops operation on berth 1 whilst vessel is aground. No pollution, minor injuries to crew and passengers, minor local publicity; and
- Vessel grounds briefly but able to refloat and continues to the berth. Minor delay to operations, minimal damage to vessel. Minor injuries, no pollution and little local port reputational damage.

10.8.111 Assessed at the embedded risk control stage the worst credible scenario was deemed to be unlikely with consequences of minor (people), moderate (property), negligible (planet), and minor (port).

10.8.112 Assessed at the embedded risk control stage the most likely scenario was deemed to be possible with consequences of minor (people), minor (property), negligible (planet), and minor (port).

10.8.113 Based on the above and the defined tolerability in Appendix 10.1 to this ES, this risk at the embedded controls stage is considered tolerable. However, the risk is not yet considered ALARP and, therefore, it is potentially significant in EIA terms without further mitigation.

O.8 Ro-Ro vessel mooring failure

10.8.114 The identified worst credible and most likely scenarios for this hazard scenario are respectively:

- Vessel breaks mooring, all lines break but ramp temporally holds stern on the pontoon acting as a pivot point causing vessel to swing towards the IOT Finger Pier. Subsequent allision causes damage to pier, and vessels rests on the end of the finger pier causing damage to the fenders. Potential that a multi death incident occurs as ramp dislodges from the IERRT pontoon. Significant damage to vessel from slow allision with infrastructure, possible minor pollution, significant delays to operations and major international reputational damage; and
- Single mooring line failure but vessel remains alongside, vessel puts out additional mooring lines. Minor delay to operations and/or minor cost to port. Minor little local publicity and minor injury.

10.8.115 Assessed at the embedded risk control stage the worst credible scenario was deemed to be rare with consequences of extreme (people), extreme (property), negligible (planet), and extreme (port).

10.8.116 Assessed at the embedded risk control stage the most likely scenario was deemed to be almost certain with consequences of minor (people), minor (property), negligible (planet), and minor (port).

10.8.117 Based on the above and the defined tolerability in Appendix 10.1 to this ES, this risk at the embedded controls stage the risk is considered tolerable. However, the risk is not yet considered ALARP and, therefore, it is potentially significant in EIA terms without further mitigation.

O.9 Allision of Ro-Ro vessel arriving/departing IERRT berth 2/3 with a tanker berthed on Eastern Jetty

10.8.118 The identified worst credible and most likely scenarios for this hazard scenario are respectively:

- Ro-Ro makes contact with berthed tanker resulting in a significant allision that punctures the tanker's double hull leading to a tier 3 pollution event with release of toxic chemical. Causing major risk to life and environment both short and long term. Incident results in multiple fatalities, sever damages to both vessels and berth infrastructure for an

amount greater than £8M. Negative international news that significantly affects the ports reputation and port operations; and

- An approaching Ro-Ro loses control and makes slow contact with berthed tanker resulting in an allision that damages cargo pipes, leading to a tier 3 pollution event with release of toxic chemical. Moderate damage to port infrastructure and vessel, serious injuries to personnel, and negative national port reputational damage.

10.8.119 Assessed at the embedded risk control stage the worst credible scenario was deemed to be unlikely with consequences of extreme (people), extreme (property), extreme (planet), and extreme (port).

10.8.120 Assessed at the embedded risk control stage the most likely scenario was deemed to be possible with consequences of moderate (people), moderate (property), extreme (planet), and major (port).

10.8.121 Based on the above and the defined tolerability in Appendix 10.1 to this ES, this risk at the embedded controls stage is considered intolerable due to the most likely scenario's frequency and planet receptor, and therefore potentially significant in EIA terms without further mitigation.

10.9 Mitigation measures

10.9.1 A number of mitigation/risk control measures were identified as part of the NRA process which reduce the risks associated with the construction, construction/operation and operation of the IERRT to ALARP. These mitigation measures include both actions that will be implemented by the construction contractor and practice and operational documentation that will require updating for the operational phase.

Embedded risk controls/mitigation are listed first in

10.9.2 Table 10.9, followed by a schedule of further applied controls that are required to reduce risks to tolerable and ALARP as provided in Table 10.10. Further detailed information on the risk controls, and the specific risks that the controls apply to are set out in the NRA (Appendix 10.1 to this ES – with specific reference to its Annexes).

Table 10.9. Embedded risk controls

Risk control	Details	Relevant Phase of Project		
		Construction	Construction-Operation	Operation
Vessel Traffic Services	Review VTS VHF safety broadcast procedure to ensure current two hourly regime is appropriate for the increased number of shipping movements to and from the IERRT	x	x	x
Communications equipment	All construction craft to carry a minimum of 2 operational VHF sets	x	x	x
Oil spill contingency plans	Construction contractors should have tier 1 oil spill response equipment to ensure any pollution events can be contained	x	x	x
Port Facility Emergency Plan	A prescribed plan for how the port will respond in different emergencies	x	x	x
Towage, available and appropriate	The availability of vessels capable of providing towage as required	x	x	x
Passage planning	A predefined passage required by the port that indicates a baseline for the safe navigation route to follow	x	x	x
Notices to mariners	Detailing impacts and directions for each stage of the marine works	x		
Local Port Service	An information service provided by the port	x	x	x
Byelaws	Regulations that are enforced in law by the port, can include aspects such as moving havens and speed limits	x	x	x
AIS/Radar coverage	All construction craft including barges to have AIS transmitters	x		
Aids to navigation - provision and maintenance of	The marine works should be appropriately lit as soon as there are items which pose a hazard to navigation. Once operational, aids to navigation will be required so that the structure and berths can be identified.	x	x	x

Risk control	Details	Relevant Phase of Project		
		Construction	Construction-Operation	Operation
International COLREGS 1972 (as amended)	Rules for the safe conduct and manoeuvre of ships and how they are to avoid collision in a range of circumstances	x		x
Vessel safety management system (ISM code)	The purpose of the ISM Code is to provide an international standard for the safe management and operation of ships and for pollution prevention	x	x	
Safety/Support Vessel	Ready and on standby during construction activities. The availability of a safety boat in the area of marine works provides for rapid response to emergency situations and an overview of the activity being conducted.	x	x	
Accurate tidal measurements	Accurate tidal information to aid safe navigation and prevent grounding	x	x	x
Harbour Authority requirements	Rules set out by the Harbour Authority indicating operating restrictions and guidelines within their applicable area (similar to byelaws)	x	x	x
Emergency services equipment - shore side	Equipment available to respond to emergencies, e.g., firefighting, pollution control	x		
Training of port marine/ operations personnel	Port's marine training policy for new terminal and impacts to IOT	x		x
Vessel maintenance	The requirement to operate vessels in a good state of repair	x		
Adequate berth fendering	Berths are designed and have fenders applied adequately so that ordinary berthing occurs without damage to ship or berth	x	x	x
Availability of latest hydrographic information	The current programme of survey at the Port of Immingham will need updating to include the proposed development. The results of	x	x	x

Risk control	Details	Relevant Phase of Project		
		Construction	Construction-Operation	Operation
	the survey will be provided to the UKHO for use in navigational charts and compared with previous surveys to inform potential requirements for maintenance dredging.			
CCTV coverage	Observable video coverage of an area	x		
Emergency plan exercises	Drills or exercises held semi-regularly to ensure that actions are practised ahead of an incident occurring	x		
Fatigue and Health monitoring	Monitoring staff fatigue and health to ensure that either is not the cause of an incident	x		
General directions	Some harbour authorities have powers, through their local enabling legislation, to give 'general directions' to enable a harbour authority, after due consultation, to lay down general rules for navigation (subject to certain constraints) and regulate the berthing and movements of ships.	x		
Harbour/Dock Masters powers (inc. special directions)	Power to issue directions in relation to individual ships in the harbour area for a specified purpose.	x		
Personal Locator Beacon	Beacon to aid search and rescue of a person	x		
Ship personnel - training	Training to ensures that regular occurring evolutions/activities are practised to reduce rate of incidents	x		
Standing Orders/SOPs	Standing procedures on how to conduct evolutions/activities to ensure repeatability and aid safety	x		
Tidal information - accurate	Accurate tidal depth and tidal stream measurements/information to aid safe navigation	x		

Risk control	Details	Relevant Phase of Project		
		Construction	Construction-Operation	Operation
Unusual vessels - specific risk assessments	Specific assessments conducted for when unusual vessels utilise the harbour or the terminal	x		
Vessel speed	Speed at which a vessel proceeds	x		
Vessel propulsion redundancies	Alternative modes of propulsion in case of an engine partial or complete engine failure		x	x
Monitoring of met ocean conditions	Monitoring of wind/wave conditions and monitoring of weather forecasts obtained and compared with the weather limit allows for reliable planning and assessment of risk regarding the weather operating limits for activities		x	x
Additional lines/increase mooring	Applying more than recommended mooring to reduce load on each line		x	
Arrival/Departure, advance notice of	Notifying the VTS of arrivals to aid the spacing of vessels within the harbour		x	x
Berthing procedures	Requirements on how to berth aligned with ports berthing requirements		x	x
Design criteria	IERRT built to withstand a collision to a certain level (set out in building design standards)		x	x
Mooring analysis	A mooring study should be completed for the proposed mooring arrangements at the berth to confirm that there is appropriate restraint available to restrain the vessel for the operational wind limits and the expected tidal flows		x	x
Towage guidelines	Updates to towage guidelines as informed by simulation studies as well as pilot and port operator experience		x	x

Risk control	Details	Relevant Phase of Project		
		Construction	Construction-Operation	Operation
Vessel simulation study	Further simulations to inform passage planning and Pilot/PEC training		x	x
Anchors cleared and ready for use	Anchor state meaning that they are ready to be released quickly to assist arresting a vessels movement in an emergency			x
Hydrographic Survey	Bathymetric survey to display charted depths			x
Joint emergency drills with VTS and Port staff	Drills held between VTS and port staff to refine emergency responses require when both systems need to work in tandem			x
Weather limits	The maximum weather limits for operations should be assessed and set for all activities. These can then be monitored against real time and forecasted weather conditions throughout the construction process. In addition, operational weather limits should also be considered for vessels using the terminal during the operational phase			x

Table 10.10. Applied risk controls

Risk control	Details	Relevant Phase of Project		
		Construction	Construction-Operation	Operation
Marking construction area (exclusion zone)	A vessel exclusion zone whilst construction is taking place	x		
Guard (support) vessel	Available as appropriate - able to prevent flat top barge from drifting onto the Eastern Jetty or is otherwise able to reduce the speed and impact of the resulting allision	x		
Designated safety craft	This control specifically considers a vessel being available and specifically designated for safety, in particular to respond to a 'Man Over-Board' recovery situation	x		
Incident Reporting - Dropped component	During the construction there is potential for items to be dropped in the water and cause a risk to navigation. The contractors should have a procedure agreed with the SHA for actions to be taken if large item is dropped during the construction phase.	x	x	
Loading/Unloading Plan	Equipment and materials being delivered by barge will require plans for the order and method of loading and unloading at the marine works site	x		
Personnel management during tanker berthing	Ensuring that personnel that are in vicinity of the Finger Pier are aware and alert whilst tankers are berthing	x		
Additional measures to ensure separation of marine works from	Consideration for VTS to move marine craft away from pier being berthed on prior to Ro-Ro arriving in the berth pocket		x	

Risk control	Details	Relevant Phase of Project		
		Construction	Construction-Operation	Operation
Ro-Ro vessels proceeding to or departing IERRT				
Berthing criteria specific to operation-construction	This control describes the potential inclusion of elements such as tidal limits, tug requirements, amidst other potential weather limits (e.g., high winds) that are specific to whilst operation and construction occur simultaneously.		x	
Special Instructions issued to Ro-Ro not to berth unless area is clear of marine works craft	The application of a special instruction for Ro-Ro's not to berth unless marine craft are clear		x	
Additional pilotage training/ familiarisation	Additional training and familiarisation for pilotage		x	x
Additional training to PEC and Pilots on manoeuvring during the operation-construction phase	Specifically for risk C.5 and C.7, for Pilots/PECs on all 3 berths		x	
Berth specific weather parameters	Having defined weather parameters for each berth, acknowledging their different operational limits		x	x
Charted safety area, berthing procedures	A charted exclusion zone for vessels to remain clear of berthing procedures		x	x
Barges cannot be moored in the vicinity of a berthing Ro-Ro	Eliminating the practise of a barge being moored whilst Ro-Ro berthing operations occur		x	
Closure of 'F' anchorage	Eliminating the use of Anchorage F during dredging operations	x	x	

Risk control	Details	Relevant Phase of Project		
		Construction	Construction-Operation	Operation
Contractor RAMS	Contractors would require RAMS covering all of the construction activities which will require review by the Harbour Authority prior to the commencement of activities	x	x	
Control of contractors through management	Control and management of contractor actions	x	x	
Harbour Master's consent of works	Harbour Masters assessment of safe working practise and then consent to conduct the works	x	x	
Port Liaison Officer	A Liaison Officer to coordinate between the port and contractors	x	x	
Post Construction Hydrographic Survey	A bathymetric survey specifically after construction to identify the existence of any dropped components	x	x	
Project specific adaptive procedures	Adaptive procedures during familiarisation period as operational experience gained (e.g., tugs, tidal restrictions, delayed start of use of berth 1 during familiarisation period, impact protection)		x	x
Site specific dredge plan	Dredge plan that considers operating in suitable relation of the prevalent tidal flows in the vicinity of the IOT trunk way	x	x	
Specific berthing criteria for each of the three berths	Specific criteria in terms of limitations for the utilisation of each of the three berths		x	x
Marking safe water with AtoN	An AtoN placed between the IERRT and the Eastern Jetty to provide a visual appreciation to support vessels of where the safe water limits are			x

Risk control	Details	Relevant Phase of Project		
		Construction	Construction-Operation	Operation
Notices to mariners	Detailing impacts and directions for each stage of the marine works (embedded control applied additionally to specific risk C11 in Appendix 10.1)	x		
Tidal Restrictions	Measure to restrict movements depending on tidal streams (can also be applied as part of project specific adaptive controls)	x		

10.10 Limitations and assumptions

10.10.1 This assessment has been undertaken based on the following assumptions:

- One arrival and one departure per vessel berth at the IERRT at any one time;
- Vessel movements from nearby marine infrastructure will be deconflicted from operational movements associated with IERRT; and
- Requirement for tankers to berth at IOT berths 6 and 8 on the flood tide is extant.

10.10.2 The commercial and recreational environmental impact assessment within this ES has been undertaken considering the worst-credible scenarios and most likely scenarios in respect of safety of navigation for commercial and recreational vessels. This has been informed through the analysis of quantitative data as well as utilising subject matter expertise and consulting to identify potential risks associated with the scheme. In addition, vessel simulations were undertaken to inform berthing parameters and confirm viability of the proposed development (provided at Appendix 10.2 to this ES), and further simulations were undertaken between 28 and 30 November to inform operational berthing procedures (see Appendix 10.3).

10.10.3 The confidence described in Table 10.11 has been assigned as medium to reflect the utilisation of quantitative and qualitative data to inform this assessment.

10.11 Residual effects and conclusions

10.11.1 The applied risk controls that are identified in Section 10.9 of this ES (Table 10.10) aim to reduce each risk to a tolerable and ALARP state. That is, in EIA terms, reduction of the residual effects, as far as possible, to environmentally acceptable levels. This section of the ES chapter presents the assessment of residual effects with the applied risk controls in place. Section 9 of the NRA provides a full discussion on the applied controls and the navigational risk assessment outcomes (Appendix 10.1 to this ES).

Construction

10.11.2 This section describes the assessed risk outcomes for construction following the risk assessment and cost-benefit analysis meetings on the risk controls.

C.1 Person overboard during dredge and construction works

10.11.3 Following the risk assessment and applied controls agreed at the cost benefit analysis meeting the worst credible frequency was deemed to be

possible with consequences of moderate (people), negligible (property), negligible (planet), and moderate (port).

10.11.4 In addition, following the risk assessment and applied controls discussed at the cost benefit analysis meeting the most likely frequency was deemed to be possible with consequences of minor (people), negligible (property), negligible (planet), and minor (port).

10.11.5 Based on the above, the risk at the applied controls stage is considered tolerable and ALARP and insignificant in EIA terms.

C.2 Allision of dredger/construction vessel with IOT infrastructure

10.11.6 Following the risk assessment and applied controls agreed at the cost benefit analysis meeting the worst credible frequency was deemed to be rare with consequences of extreme (people), extreme (property), extreme (planet), and extreme (port).

10.11.7 In addition, following the risk assessment and applied controls discussed at the cost benefit analysis meeting the most likely frequency was deemed to be unlikely with consequences of -minor (people), minor (property), negligible (planet), and minor (port).

10.11.8 Based on the above, the risk at the applied controls stage is considered tolerable and ALARP, and therefore insignificant in EIA terms.

C.3 Allision of commercial vessel with marine works

10.11.9 Following the risk assessment and applied controls agreed at the cost benefit analysis meeting the worst credible frequency was deemed to be rare with consequences of major (people), major (property), extreme (planet), and extreme (port).

10.11.10 In addition, following the risk assessment and applied controls agreed at the cost benefit analysis meeting the most likely frequency was deemed to be likely with consequences of minor (people), minor (property), negligible (planet), and minor (port).

10.11.11 Based on the above, the risk at the applied controls stage is considered tolerable and ALARP, and therefore insignificant in EIA terms.

C.4 Collision of two craft associated with marine works

10.11.12 Following the risk assessment and addition of further controls specific to the proposed development the consideration of this risk, within the existing MSMS, for the worst credible frequency was deemed to be unlikely with consequences of extreme (people), moderate (property), moderate (planet), and major (port).

10.11.13 In addition, following the risk assessment and addition of further controls specific to the proposed development the consideration of this risk, within

the existing MSMS, for the most likely frequency was deemed to be likely with consequences of minor (people), minor (property), negligible (planet), and minor (port).

10.11.14 Based on the above, the risk is considered tolerable and ALARP, and therefore insignificant in EIA terms.

C.5 Collision/allision of commercial vessel entering construction area

10.11.15 Following the risk assessment and applied controls agreed at the cost benefit analysis meeting the worst credible frequency was deemed to be unlikely with consequences of moderate (people), major (property), minor (planet), and moderate (port).

10.11.16 In addition, following the risk assessment and applied controls agreed at the cost benefit analysis meeting the most likely frequency was deemed to be unlikely with consequences of minor (people), negligible (property), negligible (planet), and minor (port).

10.11.17 Based on the above, the risk at the applied controls stage is considered tolerable and ALARP, and therefore insignificant in EIA terms.

C.6 Collision of dredger or barge with vessel at 'F' anchorage when disposing of dredge material

10.11.18 Following the risk assessment and applied controls agreed at the cost benefit analysis meeting the worst credible frequency was deemed to be rare with consequences of moderate (people), extreme (property), extreme (planet), and extreme (port).

10.11.19 In addition, following the risk assessment and applied controls agreed at the cost benefit analysis meeting the most likely frequency was deemed to be unlikely with consequences of minor (people), minor (property), negligible (planet), and minor (port).

10.11.20 Based on the above, the risk at the applied controls stage is considered tolerable and ALARP, and therefore insignificant in EIA terms.

C.7 Dredger grounding whilst engaged in operations

10.11.21 Following the risk assessment and applied controls agreed at the cost benefit analysis meeting the worst credible frequency was deemed to be rare with consequences of moderate (people), moderate (property), negligible (planet), and major (port).

10.11.22 In addition, following the risk assessment and applied controls agreed at the cost benefit analysis meeting the most likely frequency was deemed to be likely with consequences of negligible (people), negligible (property), negligible (planet), and minor (port).

10.11.23 Based on the above, the risk at the applied controls stage is considered tolerable and ALARP, and therefore insignificant in EIA terms.

C.8 Hazardous chemical spill from construction vessels

10.11.24 Following the risk assessment and applied controls agreed at the cost benefit analysis meeting the worst credible frequency was deemed to be unlikely with consequences of moderate (people), minor (property), major (planet), and minor (port).

10.11.25 In addition, following the risk assessment and applied controls agreed at the cost benefit analysis meeting the most likely frequency was deemed to be likely with consequences of negligible (people), negligible (property), minor (planet), and negligible (port).

10.11.26 Based on the above, the risk at the applied controls stage is considered tolerable and ALARP, and therefore insignificant in EIA terms.

C.9 Construction vessel mooring failure

10.11.27 Following the risk assessment and applied controls agreed at the cost benefit analysis meeting the worst credible frequency was deemed to be unlikely with consequences of negligible (people), minor (property), negligible (planet), and moderate (port).

10.11.28 In addition, following the risk assessment and applied controls agreed at the cost benefit analysis meeting the most likely frequency was deemed to be almost certain with consequences of negligible (people), negligible (property), negligible (planet), and negligible (port).

10.11.29 Based on the above, the risk at the applied controls stage is considered tolerable and ALARP, and therefore insignificant in EIA terms.

C.10 Component (equipment, material) dropped during construction

10.11.30 Following the risk assessment and applied controls agreed at the cost benefit analysis meeting the worst credible frequency was deemed to be rare with consequences of moderate (people), major (property), extreme (planet), and major (port).

10.11.31 In addition, following the risk assessment and applied controls agreed at the cost benefit analysis meeting the most likely frequency was deemed to be possible with consequences of negligible (people), minor (property), negligible (planet), and minor (port).

10.11.32 Based on the above, the risk at the applied controls stage is considered tolerable and ALARP, and therefore insignificant in EIA terms.

C.11 Construction vessel takes on water from excessive wash

10.11.33 Following the risk assessment and applied controls agreed at the cost benefit analysis meeting the worst credible frequency was deemed to be rare with consequences of extreme (people), moderate (property), minor (planet), and extreme (port).

10.11.34 In addition, following the risk assessment and applied controls agreed at the cost benefit analysis meeting the most likely frequency was deemed to be possible with consequences of negligible (people), negligible (property), negligible (planet), and minor (port).

10.11.35 Based on the above, the risk at the applied controls stage is considered tolerable and ALARP, and therefore insignificant in EIA terms.

C.12 Payload related incidents

10.11.36 Following the risk assessment and applied controls agreed at the cost benefit analysis meeting the worst credible frequency was deemed to be rare with consequences of major (people), major (property), major (planet), and major (port).

10.11.37 In addition, following the risk assessment and applied controls agreed at the cost benefit analysis meeting the most likely frequency was deemed to be unlikely with consequences of negligible (people), negligible (property), negligible (planet), and minor (port).

10.11.38 Based on the above, the risk at the applied controls stage is considered tolerable and ALARP, and therefore insignificant in EIA terms.

Construction-Operation

10.11.39 This section describes the assessed risk outcomes for construction-operation following the risk assessment and cost-benefit analysis meetings on the risk controls.

CO.1 Collision of construction vessel with Ro-Ro vessel

10.11.40 Following the risk assessment and applied controls agreed at the cost benefit analysis meeting the worst credible frequency was deemed to be rare with consequences of extreme (people), major (property), major (planet), and extreme (port).

10.11.41 In addition, following the risk assessment and applied controls agreed at the cost benefit analysis meeting the most likely frequency was deemed to be rare with consequences of minor (people), moderate (property), negligible (planet), and minor (port).

10.11.42 Based on the above, the risk at the applied controls stage is considered tolerable and ALARP, and therefore insignificant in EIA terms.

CO.2 Ro-Ro vessel mooring failure in vicinity of marine construction works

10.11.43 Following the risk assessment and applied controls agreed at the cost benefit analysis meeting the worst credible frequency was deemed to be rare with consequences of major (people), extreme (property), moderate (planet), and extreme (port).

10.11.44 In addition, following the risk assessment and applied controls agreed at the cost benefit analysis meeting the most likely frequency was deemed to be almost certain with consequences of minor (people), minor (property), negligible (planet), and minor (port).

10.11.45 Based on the above, the risk at the applied controls stage is considered tolerable and ALARP, and therefore insignificant in EIA terms.

CO.3 Component (equipment, material) dropped during construction preventing Ro-Ro operations

10.11.46 Following the risk assessment and applied controls agreed at the cost benefit analysis meeting the worst credible frequency was deemed to be rare with consequences of moderate (people), major (property), minor (planet), and major (port).

10.11.47 In addition, following the risk assessment and applied controls agreed at the cost benefit analysis meeting the most likely frequency was deemed to be possible with consequences of negligible (people), negligible (property), negligible (planet), and minor (port).

10.11.48 Based on the above, the risk at the applied controls stage is considered tolerable and ALARP, and therefore insignificant in EIA terms.

CO.4 Construction vessel takes on water from excessive wash from Ro-Ro vessel

10.11.49 Following the risk assessment and applied controls agreed at the cost benefit analysis meeting the worst credible frequency was deemed to be rare with consequences of extreme (people), major (property), minor (planet), and extreme (port).

10.11.50 In addition, following the risk assessment and applied controls agreed at the cost benefit analysis meeting the most likely frequency was deemed to be unlikely with consequences of minor (people), negligible (property), negligible (planet), and minor (port).

10.11.51 Based on the above, the risk at the applied controls stage is considered tolerable and ALARP, and therefore insignificant in EIA terms.

CO.5 Allision of Ro-Ro vessel with IERRT infrastructure

10.11.52 Following the risk assessment and applied controls agreed at the cost benefit analysis meeting the worst credible frequency was deemed to be

rare with consequences of minor (people), major (property), minor (planet), and moderate (port).

10.11.53 In addition, following the risk assessment and applied controls agreed at the cost benefit analysis meeting the most likely frequency was deemed to be possible with consequences of negligible (people), minor (property), negligible (planet), and negligible (port).

10.11.54 Based on the above, the risk at the applied controls stage is considered tolerable and ALARP, and therefore insignificant in EIA terms.

CO.6 Construction vessel mooring failure

10.11.55 Following the risk assessment and applied controls agreed at the cost benefit analysis meeting the worst credible frequency was deemed to be rare with consequences of moderate (people), minor (property), moderate (planet), and minor (port).

10.11.56 In addition, following the risk assessment and applied controls agreed at the cost benefit analysis meeting the most likely frequency was deemed to be likely with consequences of negligible (people), negligible (property), negligible (planet), and negligible (port).

10.11.57 Based on the above, the risk at the applied controls stage is considered tolerable and ALARP, and therefore insignificant in EIA terms.

CO.7 Ro-Ro vessel arriving/departing IERRT berth 2 with a tanker berthed on Eastern Jetty

10.11.58 Following the risk assessment and applied controls agreed at the cost benefit analysis meeting the worst credible frequency was deemed to be rare with consequences of extreme (people), extreme (property), extreme (planet), and extreme (port).

10.11.59 In addition, following the risk assessment and applied controls agreed at the cost benefit analysis meeting the most likely frequency was deemed to be unlikely with consequences of moderate (people), moderate (property), extreme (planet), and major (port).

10.11.60 Based on the above, the risk at the applied controls stage is considered tolerable and ALARP, and therefore insignificant in EIA terms.

Operation

10.11.61 This section describes the assessed risk outcomes for operation following the risk assessment and cost-benefit analysis meetings on the risk controls.

O.1 Alisson of Ro-Ro vessel arriving/departing IERRT with tanker moored at IOT finger pier

10.11.62 Following the risk assessment and applied controls agreed at the cost benefit analysis meeting the worst credible frequency was deemed to be rare with consequences of moderate (people), major (property), moderate (planet), and moderate (port).

10.11.63 In addition, following the risk assessment and applied controls agreed at the cost benefit analysis meeting the most likely frequency was deemed to be unlikely with consequences of minor (people), moderate (property), major (planet), and minor (port).

10.11.64 Based on the above, the risk at the applied controls stage is considered tolerable and ALARP, and therefore insignificant in EIA terms.

O.2 Allision of tanker manoeuvring on/off IOT finger pier with IERRT on flood tide

10.11.65 Following the risk assessment and applied controls agreed at the cost benefit analysis meeting the worst credible frequency was deemed to be unlikely with consequences of moderate (people), major (property), extreme (planet), and major (port).

10.11.66 In addition, following the risk assessment and applied controls agreed at the cost benefit analysis meeting the most likely frequency was deemed to be possible with consequences of negligible (people), moderate (property), negligible (planet), and minor (port).

10.11.67 Based on the above, the risk at the applied controls stage is considered tolerable and ALARP, and therefore insignificant in EIA terms.

O.3 Allision of barge manoeuvring on/off IOT finger pier with IERRT of flood tide

10.11.68 Following the risk assessment and applied controls agreed at the cost benefit analysis meeting the worst credible frequency was deemed to be unlikely with consequences of minor (people), moderate (property), extreme (planet), and moderate (port).

10.11.69 In addition, following the risk assessment and applied controls agreed at the cost benefit analysis meeting the most likely frequency was deemed to be possible with consequences of negligible (people), minor (property), negligible (planet), and minor (port).

10.11.70 Based on the above, the risk at the applied controls stage is considered tolerable and ALARP, and therefore insignificant in EIA terms.

O.4 Allision of Ro-Ro vessel with IOT trunk way

10.11.71 Following the risk assessment and applied controls agreed at the cost benefit analysis meeting the worst credible frequency was deemed to be

unlikely with consequences of extreme (people), extreme (property), extreme (planet), and extreme (port).

10.11.72 In addition, following the risk assessment and applied controls agreed at the cost benefit analysis meeting the most likely frequency was deemed to be unlikely with consequences of major (people), extreme (property), extreme (planet), and extreme (port).

10.11.73 Based on the above, the risk at the applied controls stage is considered tolerable and ALARP, and therefore insignificant in EIA terms.

O.5 Allision of Ro-Ro vessel with IERRT infrastructure

10.11.74 Following the risk assessment and applied controls agreed at the cost benefit analysis meeting the worst credible frequency was deemed to be rare with consequences of minor (people), major (property), negligible (planet), and moderate (port).

10.11.75 In addition, following the risk assessment and applied controls agreed at the cost benefit analysis meeting the most likely frequency was deemed to be possible with consequences of negligible (people), negligible (property), negligible (planet), and minor (port).

10.11.76 Based on the above, the risk at the applied controls stage is considered tolerable and ALARP, and therefore insignificant in EIA terms.

O.6 Collision of Ro-Ro vessel on passage to/from IERRT with another vessel

10.11.77 This established hazard scenario has already been deemed to be ALARP and tolerable at the embedded controls stage through the MSMS.

10.11.78 Therefore, the risk at the applied controls stage is still considered tolerable and ALARP, and therefore insignificant in EIA terms.

O.7 Ro-Ro vessel grounding whilst manoeuvring to IERRT berth 3

10.11.79 Following the risk assessment and applied controls agreed at the cost benefit analysis meeting the worst credible frequency was deemed to be unlikely with consequences of minor (people), moderate (property), negligible (planet), and minor (port).

10.11.80 In addition, following the risk assessment and applied controls agreed at the cost benefit analysis meeting the most likely frequency was deemed to be unlikely with consequences of minor (people), minor (property), negligible (planet), and minor (port).

10.11.81 Based on the above, the risk at the applied controls stage is considered tolerable and ALARP, and therefore insignificant in EIA terms.

O.8 Ro-Ro vessel mooring failure

10.11.82 Following the risk assessment and applied controls agreed at the cost benefit analysis meeting the worst credible frequency was deemed to be almost certain with consequences of minor (people), minor (property), negligible (planet), and minor (port).

10.11.83 In addition, following the risk assessment and applied controls agreed at the cost benefit analysis meeting the most likely frequency was deemed to be almost certain with consequences of minor (people), minor (property), negligible (planet), and minor (port).

10.11.84 Based on the above, the risk at the applied controls stage is considered tolerable and ALARP, and therefore insignificant in EIA terms.

O.9 Allision of Ro-Ro vessel arriving/departing IERRT berth 2/3 with a tanker berthed on Eastern Jetty

10.11.85 Following the risk assessment and applied controls agreed at the cost benefit analysis meeting the worst credible frequency was deemed to be rare with consequences of extreme (people), extreme (property), extreme planet), and extreme (port).

10.11.86 In addition, following the risk assessment and applied controls agreed at the cost benefit analysis meeting the most likely frequency was deemed to be unlikely with consequences of moderate (people), moderate (property), extreme (planet), and major (port).

10.11.87 Based on the above, the risk at the applied controls stage is considered tolerable and ALARP, and therefore insignificant in EIA terms.

Conclusions

10.11.88 A summary of the impact pathways that have been assessed, the identified residual impacts and level of confidence is presented in Table 10.11.

Table 10.11. Summary of potential impact, mitigation measures and residual impacts

Risk No.	Impact Pathway	Impact Significance	Mitigation Measures (Risk Assessment and Applied Controls)	Residual Significance	Confidence
Construction					
C.1	Person overboard during dredge and construction works	Significant	Designated safety craft Constructor RAMS	Insignificant	Medium
C.2	Allision of dredger/construction vessel with IOT infrastructure	Significant	Tidal restrictions Marking construction area (exclusion zone) Site specific dredge plan	Insignificant	Medium
C.3	Allision of commercial vessel with marine works	Significant	Guard (support) vessel Project specific adaptive procedures Marking construction area (exclusion zone)	Insignificant	Medium
C.4	Collision of two craft associated with marine works	Significant	Contractor RAMS Marking construction area (exclusion zone)	Insignificant	Medium
C.5	Collision/allision of commercial vessel entering construction area	Significant	Marking construction area (exclusion zone) Project specific adaptive procedures Personnel management during tanker berthing Guard (support) vessel	Insignificant	Medium
C.6	Collision of dredger or barge with vessel at 'F' anchorage when disposing of dredge material	Significant	Project specific adaptive procedures Closure of 'F' anchorage	Insignificant	Medium
C.7	Dredger grounding whilst engaged in operations	Significant	Project specific adaptive procedures	Insignificant	Medium
C.8	Hazardous chemical spill from construction vessels	Significant	Contractor RAMS Control of contractors through management	Insignificant	Medium

Risk No.	Impact Pathway	Impact Significance	Mitigation Measures (Risk Assessment and Applied Controls)	Residual Significance	Confidence
C.9	Construction vessel mooring failure	Significant	Guard (support) vessel	Insignificant	Medium
C.10	Component (equipment, material) dropped during construction	Significant	Incident Reporting - Dropped component Post Construction Hydrographic Survey	Insignificant	Medium
C.11	Construction vessel takes on water from excessive wash	Significant	Marking construction area (exclusion zone) Contractor RAMS Notices to mariners	Insignificant	Medium
C.12	Payload related incidents	Significant	Loading/Unloading Plan Contractor RAMS Harbour Master's consent of works	Insignificant	Medium
Construction and Operation					
CO.1	Collision of construction vessel with Ro-Ro vessel	Significant	Contractor RAMS Port Liaison Officer Special Instructions issued to Ro-Ro not to berth unless area is clear of marine works craft	Insignificant	Medium
CO.2	Ro-Ro vessel mooring failure in vicinity of marine construction works	Significant	Berth specific weather parameters	Insignificant	Medium
CO.3	Component (equipment, material) dropped during construction preventing Ro-Ro operations	Significant	Incident Reporting - Dropped component Post Construction Hydrographic Survey	Insignificant	Medium
CO.4	Construction vessel takes on water from excessive wash from Ro-Ro vessel	Significant	Additional measures to ensure separation of marine works from Ro-Ro vessels proceeding to or departing IERRT	Insignificant	Medium

Risk No.	Impact Pathway	Impact Significance	Mitigation Measures (Risk Assessment and Applied Controls)	Residual Significance	Confidence
			Special Instructions issued to Ro-Ro not to berth unless area is clear of marine works craft		
CO.5	Allision of Ro-Ro vessel with IERRT infrastructure	Significant	Additional training to PEC and Pilots on manoeuvring during the operation-construction phase Berthing criteria specific to operation-construction	Insignificant	Medium
CO.6	Construction vessel mooring failure	Significant	Guard Support Vessel Barges cannot be moored in the vicinity of a berthing Ro-Ro	Insignificant	Medium
CO.7	Ro-Ro vessel arriving/departing IERRT berth 2 with a tanker berthed on Eastern Jetty	Significant	Specific berthing criteria for each of the three berths Charted safety area, berthing procedures Additional pilotage training/ familiarisation	Insignificant	Medium
Operation					
O.1	Alisson of Ro-Ro vessel arriving/departing IERRT with tanker moored at IOT finger pier	Significant	Project specific adaptive procedures Charted safety area, berthing procedures Specific berthing criteria for each of the three berths	Insignificant	Medium
O.2	Allision of tanker manoeuvring on/off IOT finger pier with IERRT on flood tide	Significant	Project specific adaptive procedures	Insignificant	Medium
O.3	Allision of barge manoeuvring on/off IOT finger pier with IERRT of flood tide	Significant	Project specific adaptive procedures	Insignificant	Medium

Risk No.	Impact Pathway	Impact Significance	Mitigation Measures (Risk Assessment and Applied Controls)	Residual Significance	Confidence
O.4	Allision of Ro-Ro vessel with IOT trunk way	Significant	Specific berthing criteria for each of the three berths Project specific adaptive procedures	Insignificant	Medium
O.5	Allision of Ro-Ro vessel with IERRT infrastructure	Significant	Additional Training Specific berthing criteria for each of the three berths	Insignificant	Medium
O.6	Collision of Ro-Ro vessel on passage to/from IERRT with another vessel	Insignificant	Risk assessed against relevant MSMS' (HES/IMM) ALARP with embedded controls	Insignificant	Medium
O.7	Ro-Ro vessel grounding whilst manoeuvring to IERRT berth 3	Significant	Specific berthing criteria for each of the three berths Marking safe water with AtoN Additional Training	Insignificant	Medium
O.8	Ro-Ro vessel mooring failure	Significant	Berth specific weather parameters	Insignificant	Medium
O.9	Allision of Ro-Ro vessel arriving/departing IERRT berth 2/3 with a tanker berthed on Eastern Jetty	Significant	Specific berthing criteria for each of the three berths Charted safety area, berthing procedures Additional pilotage training/ familiarisation	Insignificant	Medium

10.12 References

Department for Environment, Food and Rural Affairs. (2014). East Inshore and East Offshore Marine Plans.

DfT. (2012). National Policy Statement for Ports. Department for Transport (DfT), published January 2012.

DfT. (2016). Port Marine Safety Code. Department for Transport (DfT), published November 2016.

Department for Transport (DfT), 2018. A Guide to Good Practice on Port Marine Operations Prepared in conjunction with the Port Marine Safety Code 2016. February 2018.

Department for Transport (DfT), 2021. Port and domestic waterborne freight statistics, Annual Statistics 2021. Department for Transport (DfT). [Available online at https://www.gov.uk/government/collections/maritime-and-shipping-statistics] [Accessed September 2022].

HES, 2022. Humber Estuary Services: Marinas & Clubs. Accessed October 2022. [redacted]

International Maritime Organization (IMO) 2018. Revised Guidelines For Formal Safety Assessment (FSA) For Use In The IMO Rule-Making Process. Revision 2, 09 April 2018.

HM Government. (2011). UK Marine Policy Statement, published March 2011.

MCA. (2018). MGN 401 Amendment 2 Navigation: Vessel Traffic Services (VTS) and Local Port Services (LPS) in the United Kingdom, published October 2018.

Maritime and Coastguard Agency (MCA), 2021. Marine Guidance Note (MGN) 654, Annex 1 'Methodology for Assessing Marine Navigational Safety & Emergency Response Risks of Offshore Renewable Energy Installations (OREI)'. April 2021.

Roser, M. and Rodés-Guirao, L. (2019). - "Future Population Growth". Published online at OurWorldInData.org. Retrieved from: [redacted]

10.13 Abbreviations/Acronyms

Acronym	Definition
ABP	Associated British Ports
ADCP	Acoustic Doppler Current Profiler
AIS	Automatic Identification System
ALARP	As Low As Reasonably Practicable
APT	Associated Petroleum Terminals (Immingham) Ltd
AtoN	Aids to Navigation
AWAC	Acoustic Wave and Current Profile
CCTV	Closed Circuit Television
CHA	Competent Harbour Authority
CLdN	CLdN Group
COLREGS	International Regulations for Preventing Collisions at Sea 1972
CRO	CLdN Group
DCO	Development Consent Order
Defra	Department for Environment, Food and Rural Affairs
DFDS	Det Forenede Dampskibs-Selskab
DfT	Department for Transport
EIA	Environmental Impact Assessment
ES	Environmental Statement
FSA	Formal Safety Assessment
GT	Gross Tonnage
GtGP	Guide to Good Practice
HAZID	Hazard Identification
HazLogs	Hazard Logs
HES	Humber Estuary Services
HM	His Majesty's
ID	Identity
IERRT	Immingham Eastern Ro-Ro Terminal
IMM	Immingham
IMO	International Maritime Organization
IOH	Immingham Outer Harbour
IOT	Immingham Oil Terminal
ISM	International Safety Management
LLA	Local Lighthouse Authority
LPS	Local Port Services

Acronym	Definition
M	Million (Sterling)
m	Meters
MAIB	Marine Accident Investigation Branch
MARNIS	Maritime Navigation and Information Services
MCA	Maritime and Coastguard Agency
MCC	Marine Control Centre
MGN	Marine Guidance Note
MPS	Marine Policy Statement
MSMS	Marine Safety Management System
NASH	NASH Maritime
NPSfP	National Policy Statement for Ports
NRA	Navigational Risk Assessment
OREI	Offshore Renewable Energy Installations
PAVIS	Port and Vessel Information System
PEC	Pilot Exemption Certificate
PEIR	Preliminary Environmental Information Report
PINS	Planning Inspectorate
PMSC	Port Marine Safety Code
RAMS	Risk Assessment Method Statement
RIDDOR	Reporting of Injuries, Diseases and Dangerous Occurrences Regulations
RNLI	Royal National Lifeboat Institution
Ro-Ro	Roll on - Roll off
RYA	Royal Yacht Association
SCR	Supplementary Consultation Report
SHA	Statutory Harbour Authority
SMS	Safety Management System
SOPs	Standard Operating Procedures
STCW	Standards of Training, Certification and Watchkeeping for Seafarers
UK	United Kingdom
UKHO	UK Hydrographic Office
VHF	Very High Frequency
VTS	Vessel Traffic Service

Cardinal points/directions are used unless otherwise stated.

SI units are used unless otherwise stated.

10.14 Glossary

Term	Definition
Baseline conditions	Existing conditions and past trends associated with the environment in which a proposed activity may take place
Competent Harbour Authority	Harbour authorities that have been given statutory powers relating to the provision of pilotage in their waters
Cumulative effects	Combined effects of multiple developments or the combined effect of individual impacts (e.g., where different project elements in different locations have a cumulative impact on a particular feature)
Hazard	A potential to threaten human life, health, property or the environment
Risk	The combined effect of the frequency and consequence of a hazard
Statutory Harbour Authority	Statutory Bodies responsible for the management and running of a harbour

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