

TEES VALLEY COMBINED AUTHORITY

TEES SOUTH BANK NAVIGATION RISK ASSESSMENT



Report Number: 20UK1650
Issue: Draft B
Date: 15 October 2020



British
Ports
Association



International
Harbour Masters
Association



TEES VALLEY COMBINED AUTHORITY

TEES SOUTH BANK NAVIGATION RISK ASSESSMENT

Prepared for: Tees Valley Combined Authority
Cavendish House
Teesdale Business Park
Stockton-on-Tees
Tees Valley
TS17 6QY

Author(s): Richard Marlow, Rebecca Worbey

Checked By: William Heaps

Date	Release	Prepared	Authorised	Notes
02-10-2020	Draft A	RM, RW	AC	Draft Issued for Comments
15-10-2020	Draft B	RM, RW	AC	Draft B Following Comments

Marine and Risk Consultants Ltd
Marico Marine
Bramshaw
Lyndhurst
Hampshire
SO43 7JB
United Kingdom

Tel. + 44 (0) 2380 811133

15/10/2020

EXECUTIVE SUMMARY

Tees Valley Combined Authority requested Marine and Risk Consultants Ltd (Marico Marine) undertake a Navigation Risk Assessment to assess the impact of the construction and operation of the South Tees development project to the existing navigation risk profile of the River Tees.

The proposed development will act as a staging and construction hub for offshore wind business to the River Tees, including servicing of the Dogger Bank zone. Once operational, the facility will accommodate an associated manufacturing facility for blades, steel structures, cables and nacelles¹. Although the current focus is on offshore wind energy, the quay will have a 50-year design life and will be adaptable to cater for alternative future uses.

PD Teesport is the Statutory Harbour Authority for the River Tees, with responsibility for vessel traffic management and ensuring safe navigation. The study area for assessment was determined to be the river risk area as established within the Port NRA², in order that direct comparisons could be made with the existing PD Ports risk assessment.

The NRA was undertaken in accordance with the International Maritime Organisation's Formal Safety Assessment methodology informed by; stakeholder consultation feedback, AIS data analysis and historical incident data. The assessment considered two distinct development phases which are as follows:

- The Construction Phase including:
 - Demolition of the existing wharf and construction of a new 1,035m long quay; and
 - Forty-one-week dredging campaign of the channel, turning area and berthing pockets.
- The Operation Phase including:
 - Additional vessel movements associated with operational site activities; and
 - Berthing of project vessels at proposed South Bank berths.

Both the construction and operation phases of the Project were assessed, and all hazards were scored to be 'As Low As Reasonably Practicable' or lower and therefore, acceptable in terms of risk, with the Project determined to have minimal effect on the existing navigation risk profile.

PD Teesport has effectively implemented a suite of embedded mitigation measures ensuring that the risk profile remains at acceptable levels. Compliance with embedded mitigation and regulations

¹ PC1084-RHD-SB-ZZ-RP-ME-1304_Value Engineering Assessment.pdf (Royal HaskoningDHV)

² 17UK1312_Teesport_NRA_Issue01

governing; movements, pilotage, towage, VTS and procedures should ensure activities are managed and risks contained.

Possible additional mitigation measures were identified to further reduce risk which are outlined below.

ID	Risk Control Measure	Phase	Description
1	Marking and lighting of overhanging blades	O	For example, via temporary special marks or flood lighting. Promulgated via Notice to Mariners (NtM) and VTS broadcasts.
2	High-air draught vessels / vessels carrying large cargoes to use downstream berth only.	O	To deconflict large vessels and cargoes with the overhead cables located to the south of the project site.
3	Introduction of a safety zone in vicinity of overhead cables.	O	Whereby vessels may not enter if they or their load exceeds the given height restrictions. Pylon minimum height is 93.2m plus additional 5.3m safety factor (referenced as 87m from Chart Datum on navigational chart).
4	Review of tug operations and towage requirements	C/O	For example: <ul style="list-style-type: none"> - Use of additional towage for high-air draught vessels / vessels carrying large cargoes navigating to and from berthing pocket - Use of additional tugs for turning on to Sabic berths Guidance to be determined by the port.

It is recommended that consideration is given to the implementation of the possible additional risk control measures to further reduce the hazards to which they apply.

CONTENTS

Executive Summary.....	ii
Contents	iv
Abbreviations.....	vii
1 Introduction.....	1
1.1 Reference Documents and Guidance.....	1
1.2 Guidance.....	3
2 Project Description	4
2.1 Study Area	4
2.2 Lifecycle and Phasing.....	6
2.2.1 Construction Phase	6
2.2.2 Operation Phase.....	7
3 Baseline Navigation Scenario.....	9
3.1 Data Gathering	10
3.2 Stakeholder Consultation	11
3.3 Vessel Traffic Analysis.....	11
3.3.1 Analysis by Vessel Type.....	12
3.3.2 Swept Path Analysis	17
3.3.3 Gate Analysis.....	20
3.4 Historic Incidents.....	25
4 Hazard Identification	29
4.1 Cumulative Impact Identification	30
5 Embedded Mitigation	32
6 Assumptions	32
7 Navigation Risk Assessment Methodology.....	34
7.1 Overview.....	34
7.1.1 Assessment of Frequency and Consequence.....	34
7.1.2 Risk Scores.....	34
8 Navigation Risk Assessment Results.....	36
8.1 Construction Phase – Baseline With Embedded Mitigation	36
8.2 Operation Phase - Baseline With Embedded Mitigation.....	38
8.3 Cumulative Impact Assessment	41
8.4 Possible Additional Risk Control Measures	42
9 Conclusions and Recommendations.....	47

FIGURES

Figure 1: South Tees Development Project Area.....	5
Figure 2: Tanker Density Analysis – Summer and Winter 2019.....	13
Figure 3: Cargo Vessel Density Analysis – Summer and Winter 2019	14
Figure 4: Tug Density Analysis – Summer and Winter 2019	15
Figure 5: Workboat / Service Vessel Density Analysis – Summer and Winter 2019	16
Figure 6: Example Tanker Swept Paths – Sabic Berths	18
Figure 7: Example Swept Paths – Tees Dock Turning Circle	19
Figure 8: Gate A – In Vicinity of South Tees Development Area – All Vessels – Summer and Winter 2019.	21
Figure 9: Gate B – In Vicinity of Tees Dock Turning Circle – All Vessels – Summer and Winter 2019. 22	
Figure 10: Gate A – Transits by Time of Day – All Vessel Types – Summer and Winter 2019.	23
Figure 11: Gate A – Transits by Vessel Type– Summer and Winter 2019.....	23
Figure 12: Gate A - Transits by Length Over-All (LOA)	24
Figure 13: Navigational Accidents and Incidents - 01/01/2010 and 01/09/2019.....	26
Figure 14: Navigational Accidents per Year by Accident and Vessel Type - 01/01/2010 and 01/09/2019	26
Figure 15: Navigational Accidents per Year by Accident Type - 01/01/2010 and 01/09/2019	27
Figure 16: Navigational Accidents by Vessel Type - 01/01/2010 and 01/09/2019.....	27
Figure 17: Navigationally Significant Accidents – Lower River Tees - 01/01/2010 and 01/09/2019 ...	28
Figure 18: Average Risk Score by Hazard Category – Construction Phase	36
Figure 19: Average Risk Score by Hazard Category – Operation Phase.....	38
Figure 20: Average Risk Score by Hazard Category.....	40
Figure 21: Average Risk Score by Vessel Category.....	41
Figure 22: Indicative Overhead Cables Safety Zone.....	45

TABLES

Table 1: Reference Documents.....	2
Table 2: Guidance	3
Table 3: Estimated Construction Vessel Movements and Dredge Volumes.....	6
Table 4: Estimated Deliveries.....	7
Table 5: Construction Phase Dredging Vessel Movements	8

Table 6: Indicative Tidal Heights – River Tees Entrance : 14 th –20 th September 2020 (Admiralty Total Tide)	10
Table 7: Stakeholder Consultation Meetings.....	11
Table 8: Vessel Categories	12
Table 9: Identified Hazard Categories.....	29
Table 10: Identified Cumulative Projects.....	31
Table 11: Cumulative Impact Identification.....	31
Table 12: Embedded Mitigation Measures.....	32
Table 13: Risk Scoring.	35
Table 14: Summary Ranked Hazard List – Construction Phase.....	37
Table 15: Summary Ranked Hazard List – Operation Phase.....	39
Table 16: Cumulative Impact Assessment	42
Table 17: Possible Additional Risk Control Measures.....	44
Table 18: Additional Risk Control Effectiveness	46

ANNEXES

Annex A	Navigation Risk Assessment Methodology	A-1
Annex B	Stakeholder Consultation Minutes.....	B-1
Annex C	Construction Phase Risk Assessment Hazard Log – Baseline with Embedded Mitigation C-1	
Annex D	Operation Phase Risk Assessment Hazard Log – Baseline with Embedded Mitigation .	D-1
Annex E	Construction Phase Risk Assessment Hazard Log – Residual with Possible Additional Mitigation	E-1
Annex F	Operation Phase Risk Assessment Hazard Log – Residual with Possible Additional Mitigation	F-1

ABBREVIATIONS

Abbreviation	Detail
AIS	Automatic Identification System
ALARP	As Low as Reasonably Practicable
BHD	Backhoe Dredger
COLREGs	Convention on the International Regulations for Preventing Collisions at Sea
COMAH	Control of Major Accident Hazards
EGD	Enclosed Grab Dredger
EIA	Environmental Impact Assessment
FSA	Formal Safety Assessment
HLV	Heavy Lift Vessel
HW	High Water
ICW	In Collision With
IMO	International Maritime Organisation
INS	Information Service
LOA	Length Over-All
m	Metre
Marico Marine	Marine and Risk Consultants Ltd
ML	Most Likely
NAS	Navigational Advice Service
nm	Nautical Mile
NRA	Navigation Risk Assessment
PMSC	Port Marine Safety Code
PWC	Personal Watercraft
RHIB	Ridged Hulled Inflatable Boat
SHA	Statutory Harbour Authority
SHB	Split Hopper Barge
SMS	Safety Management System
TOS	Traffic Organisation Service
TSHD	Trailing Suction Hopper Dredger
TVCA	Tees Valley Combined Authority
VTS	Vessel Traffic Service
WC	Worst Credible

1 INTRODUCTION

Tees Valley Combined Authority (TVCA) requested Marine and Risk Consultants Ltd (Marico Marine) undertake a Navigation Risk Assessment to assess the impact of the construction and operation of the South Tees development project to the existing navigation risk profile of the River Tees.

The proposed development will include the demolition of the existing wharf and the construction of a 1,035m long quay on the South Bank of the River Tees and will be completed in two phases:

- Phase 1: Partial demolition of the existing berth and construction of a new 450m berth; and
- Phase 2: Demolition of remaining berth and construction of an additional berth length of approximately 585m.

The construction phase requires dredging of the Tees Dock Turning Area the Navigable Channel adjacent to the proposed berths and the proposed Berth Area to enable the accommodation of vessels at the new facility.

The development aims to attract offshore wind business to the River Tees, including servicing of the Dogger Bank zone. Once operational as a staging hub, the facility will accommodate an associated manufacturing facility for associate infrastructure. Although the current focus is on offshore wind energy, the quay will have a 50-year design life and adaptable to cater for future uses.

1.1 REFERENCE DOCUMENTS AND GUIDANCE

The NRA has been undertaken drawing on the input data and documents outlined within **Table 1**.

Table 1: Reference Documents

Document Reference	Description
PC1084-RHD-SB-ZZ-RP-ME-1304_Value Engineering Assessment.pdf	A review of the value engineering opportunities that have been investigated for the South Bank site on the River Tees
PC1084-RHD-SB-ZZ-RP-Z-1303_DFS Basis of Design.pdf	Definitive Feasibility Study Basis of Design
PC1084-RHD-SB-DN-RP-ME-1353_P01_Dredging Study.pdf	Methodology and principal parameters adopted for the design development of the maritime elements related to the approach and accommodation of vessels at the proposed berth facility at South Bank
PC1084-RHD-SB-DN-DR-C-1381_P01 Dredging Plan.pdf	Concept Design Dredging Plan
PC1084-RHD-SB-ZZ-SH-PM-1513-P02-South Bank Quay Construction Schedule.pdf	Tees South Bank Construction Schedule
PC1084-RHD-SB-ZZ-LT-Z-1516_Construction Vessels P02.xlsx	Vessel movements associated with the construction phase including dredging and deliveries
PC1084-RHD-SB-ZZ-LT-Z-1515_Operational Vessels.xlsx	Vessel movements associated with the operational phase
17UK1312_Teesport_NRA_Issue01	PD Ports Navigation Risk Assessment

1.2 GUIDANCE

The NRA has been conducted based on the Formal Safety Assessment (FSA)³ approach to risk assessment utilising a combination of data analysis and stakeholder/expert judgement to determine risk levels.

Applicable guidance that has informed the assessment of risk is given within **Table 2**.

Table 2: Guidance

Guidance	Description
Port Licencing Procedures.	PD Ports works licencing procedures
IMO (2018) Revised Guidelines for Formal Safety Assessment (FSA) MSC-MEPC.2/Circ.12/Rev.2	Guidelines for undertaking International Maritime Organisation (IMO), Formal Safety Assessment compliant Navigation Risk Assessments
International Regulations for Preventing Collisions at Sea 1972 (as amended) (COLREGs)	Guidance to prevent collisions at sea
Marine Works EIA (Environmental Impact Assessment) Regulations 2007 No.1518	Regulations governing EIA's for marine works license consent.

³ IMO (2018) Revised Guidelines for Formal Safety Assessment (FSA) MSC-MEPC.2/Circ.12/Rev.2

2 PROJECT DESCRIPTION

2.1 STUDY AREA

The proposed South Tees development project and associated dredging areas are shown within **Figure 1**.

PD Ports maintains an up-to-date NRA as part of its Safety Management System (SMS) in compliance with Port Marine Safety Code (PMSC) requirements. The Port NRA considers three distinct risk areas; the river, Hartlepool and the offshore risk area and provides a risk baseline from which to assess the change in risk as a result of the construction and operation of the Project. The study area is, therefore, determined to be the river risk area as established within the Port NRA⁴. This approach was chosen, in order that direct comparisons could be made with the existing PD Ports risk assessment scores and the risks scores associated with the construction and operation of the Project.

⁴ 17UK1312_Teesport_NRA_Issue01

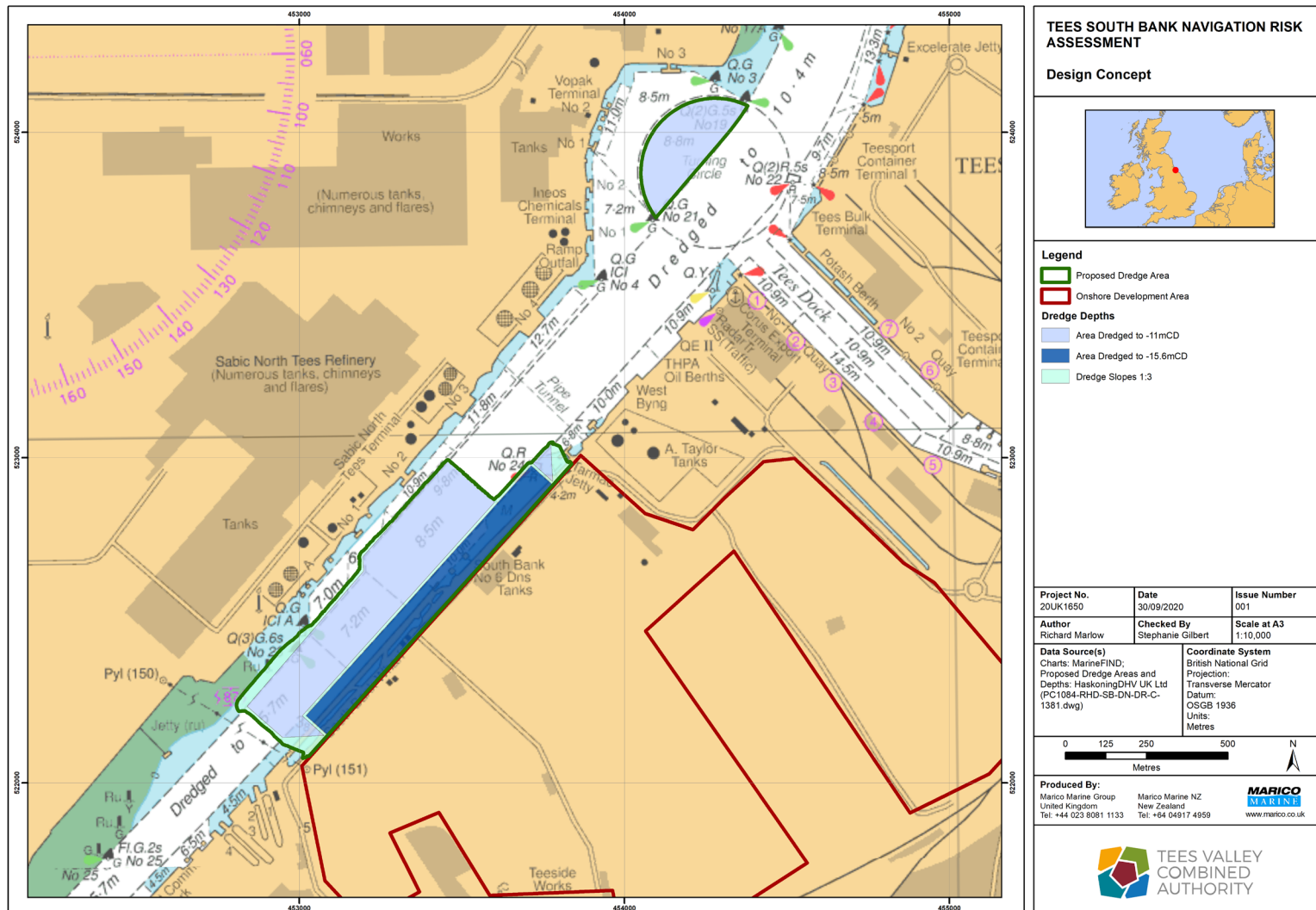


Figure 1: South Tees Development Project Area.

2.2 LIFECYCLE AND PHASING

The NRA has considered two distinct development phases:

- The Construction Phase (see **Chapter 2.2.1**), including:
 - Demolition of the existing wharf and construction of a new 1,035m long quay; and
 - Dredging of the; turning area, berthing pocket and adjacent approach channel (**Figure 1**).
- The Operation Phase (see **Chapter 2.2.2**), including:
 - Additional vessel movements associated with operational site activities; and
 - Berthing of project vessels at the proposed South Tees berth.

2.2.1 Construction Phase

The construction of the quay facility will be completed in two phases:

- Phase 1 (Downstream): Construction of a 450m berth; and
- Phase 2 (Upstream): Construction of an additional berth length of approximately 585m, to provide an overall facility length of 1,035m.

The primary activity associated with the construction phase is the dredge campaign which will include the dredging of a section of the River Tees approach channel and turning area to depths of -11m CD and a berthing pocket of -15.6m CD (see **Figure 1**). The dredge campaign will utilise an Enclosed Grab Dredger (EGD), a Backhoe Dredger (BHD) and a Trailing Suction Hopper Dredger (TSHD) each supported by two barges. The estimated duration, number of movements and dredge volumes are given in **Table 3**.

Table 3: Estimated Construction Vessel Movements and Dredge Volumes

Dredging	No. of Weeks		Movements		Total Dredge Volume (m ³)
	Phase	Phase	Average/Week	Max/Week	
	1	2			
EGD/BHD: 2 Barges (Contaminated Material)	6	6	16	21	180,000
BHD: 2 Barges (Soft Material)	1	3	77	102	1,090,000
TSHD (Soft Material)	5	7	66	88	
BHD: Barge (Hard Material)	6	7	30	40	330,000

Construction materials supplied to the facility by ship will be delivered to either an existing berth on the Tees and transported to site by truck or delivered direct to a completed section of the quay. A summary of the estimated deliveries is provided in **Table 4**.

Table 4: Estimated Deliveries

Materials	Vessel Type	No. of Deliveries	
		Phase 1	Phase 2
Piles to Stockyard	5000t Coaster	6	6
Rock Blanket Material	Sea-Going Barge	6	7
Fenders / Bollards	5000t Coaster	1	1
Tie Rods	5000t Coaster	1	1

Demolition of the existing infrastructure will last for approximately 56 weeks. On completion, the dredging campaign will commence which is scheduled to run for 41 weeks as shown in **Table 5** (Phase 1 for 18 weeks, Phase 2 for 23 weeks). Phase 2 dredging is scheduled to commence approximately 24 weeks after completion of Phase 1 dredging.

Soft and hard materials will be loaded into barges at the dredge site and then transported to licensed disposal site Tees Bay C and unloaded. Contaminated materials will be treated at a receiving facility for use across wider site or disposed to designated landfill sites.

2.2.2 Operation Phase

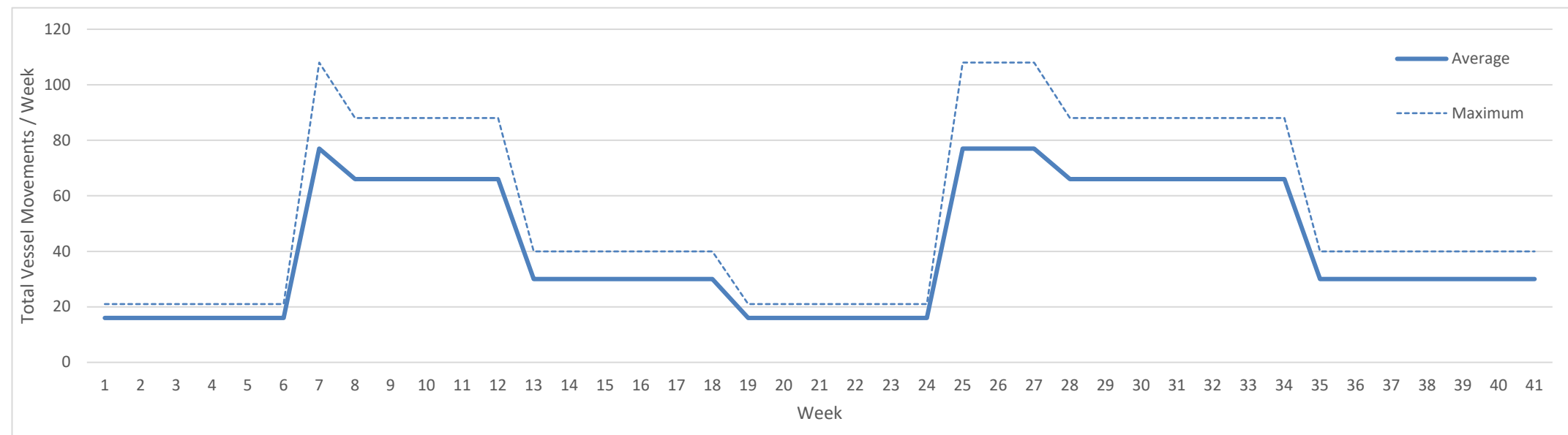
During the operation phase, offshore wind components will be transported via Heavy Lift Vessels (HLV) and jack-up installation vessels which are assumed to be loaded and unloaded using vessel cranes. General cargo may also utilise the berth for imports or exports when the berths are not occupied for renewable operations.

Turbine blades from installation vessels will protrude into the navigation channel. The design concept assumes a 5m standoff between the quayside and installation vessel and a 15m clearance between the end of the blades and passing vessels. The total protrusion into the channel would be 37m (approximately 25% of the navigable channel width) for a 107m long blade.

The estimated number of additional vessel movements during the operational phase is 8 movements per week. For each offshore wind development, overhanging blades on jack-up vessels would be present at the quay typically 1.5 days every 1-2 weeks over a 9-month period, at any time of year. Up to two developments may be served by the South Bank facility simultaneously, totalling 50 visits over 9 months.

Table 5: Construction Phase Dredging Vessel Movements

Equipment	Application	Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19*	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	
THSD	Dredging/Disposal	Average Daily Movements	0	0	0	0	0	0	0	66	66	66	66	66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	66	66	66	66	66	66	66	0	0	0	0	0	0	0	
BHD	Operating Onsite Only		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barge 1	Transport to Disposal		8	8	8	8	8	8	38	0	0	0	0	0	15	15	15	15	15	15	15	8	8	8	8	8	8	38	38	38	0	0	0	0	0	0	0	15	15	15	15	15	15	15
Barge 2	Transport to Disposal		8	8	8	8	8	8	39	0	0	0	0	0	15	15	15	15	15	15	15	8	8	8	8	8	8	39	39	39	0	0	0	0	0	0	0	15	15	15	15	15	15	15
Total Average Vessel Movements/Week			16	16	16	16	16	16	77	66	66	66	66	66	30	30	30	30	30	30	16	16	16	16	16	16	77	77	77	66	66	66	66	66	66	30	30	30	30	30	30	30		
Total Maximum Vessel Movements/Week			21	21	21	21	21	21	108	88	88	88	88	88	40	40	40	40	40	40	21	21	21	21	21	21	108	108	108	88	88	88	88	88	88	40	40	40	40	40	40	40		



*Phase 2 dredging to commence approximately 24 weeks after completion of Phase 1 dredging.

3 BASELINE NAVIGATION SCENARIO

PD Teesport is the Statutory Harbour Authority (SHA) for the River Tees, with responsibility for vessel traffic management and ensuring safe navigation on the River Tees. Vessel Traffic Service (VTS) provides 24/7 coverage for the port and provides an Information Service (INS), Traffic Organisation Service (TOS) and Navigational Advice Service (NAS) to all traffic using the port.

Teesport handles 28 million tonnes of goods per year⁵ including general cargo (bulks and unitised cargoes), offshore modules, heavy lift and project cargoes and hazardous liquid/gas cargoes. The Port currently serves 58% of the UK's chemical sector, subsequently, there are a number of high Control of Major Accident Hazards (COMAH) sites along the river. Pilotage is compulsory for all vessels carrying dangerous and polluting goods and for all other vessels of over 80m Length Over-All (LOA) in the upper reaches of the river.

The Port has seen a reduction in tonnage throughput in recent years from a peak of 40 million tonnes in 2014, owing primarily to the decline of the UK steel industry and the loss of coal and iron ore inputs and steel exports⁶.

The River Tees provides lock-free access to deep-water berths. Although there is a tidal influence, tidal stream rates are low, typically 1.5 knot ebb stream. Indicative tidal heights for September 2020 are shown in **Table 6**.

⁵ PD Teesport (<https://www.pdports.co.uk/locations/teesport/>)

⁶ Department for Transport: UK Port Freight Statistics: 2016

Table 6: Indicative Tidal Heights – River Tees Entrance: 14th–20th September 2020 (Admiralty Total Tide)

Date	High	Height (m)	Low	Height (m)
14/09/2020	00:38	4.4	07:12	1.7
	13:16	4.7	19:39	1.8
15/09/2020	01:34	4.8	08:05	1.2
	14:07	5.0	20:27	1.4
16/09/2020	02:20	5.2	08:52	0.8
	14:52	5.3	21:11	1.1
17/09/2020	03:03	5.5	09:36	0.5
	15:34	5.6	21:53	0.9
18/09/2020	03:43	5.8	10:19	0.2
	16:16	5.7	22:33	0.7
19/09/2020	04:24	5.9	11:00	0.1
	16:58	5.8	23:13	0.7
20/09/2020	05:06	6.0	11:42	0.2
	17:41	5.7	23:53	0.7

3.1 DATA GATHERING

Data gathering has been undertaken in order to inform the assessment of the baseline navigation profile and NRA. The following input data has been utilised for the assessment:

- Stakeholder consultation feedback;
- 4 weeks AIS (Automatic Identification System) Data: 2nd – 15th February 2019 & 03rd to 16th August 2019 (provided by PD Ports); and
- 17 years historical incident data (provided by PD Ports).

AIS data from 2019 was used to represent the existing traffic profile to account for any impact upon the traffic baseline as a result of COVID-19 in 2020.

3.2 STAKEHOLDER CONSULTATION

Information was gathered through remote consultation due to COVID-19 restrictions with key local stakeholders including the Harbour Master to establish the baseline risk profile and inform impact and hazard identification.

The stakeholders consulted are listed in **Table 7**. The minutes of the stakeholder meetings are contained within **Annex B**.

Table 7: Stakeholder Consultation Meetings

Date Response Received	Consultee
08 September 2020	Tees Bay Pilots
08 September 2020	Cleveland Emergency Planning Unit
16 September 2020	PD Ports
18 September 2020	Tees Licensed Foyboatmen
23 September 2020	Svitzer

Key impacts identified from stakeholder consultation are described in **Section 4**.

3.3 VESSEL TRAFFIC ANALYSIS

AIS data was provided by PD Ports, as detailed in **Section 3.1**, to enable the assessment of the current baseline traffic profile in vicinity of the Project and to undertake quantitative analysis to establish any potential impacts the Project may have upon the existing navigation profile.

The following was assessed through the analysis of AIS:

- Frequency, types and sizes of vessels presently passing the Project;
- Proximity of the Project to vessels operating to and from high COMAH sites and carrying hazardous cargoes;
- Vessel traffic density within the river risk area; and
- Swept paths of manoeuvring activities (e.g. berth swings).

Vessels were subdivided into categories befitting vessel operations within Teesport. The assessed vessel categories are identified within **Table 8**. It should be noted that, while recreational activities are rare within the River Tees, recreational vessels may be present in small numbers in the vicinity of

Bran Sands / South Gare towards the mouth of the estuary. For this purpose and for consistency with PD Port's existing NRA, recreational vessels have, therefore, been included within the NRA.

Table 8: Vessel Categories

Category	Description
Tankers	Including product tankers, crude oil tankers, gas carriers.
General Cargo Vessels	Including general cargo, containers, non-liquid bulk carriers, ferries.
Project Cargo Vessels	Including project cargo vessels, for example; oil rigs for hot / cold lay-up, wind farm construction vessels and project powered barges transporting wind farm infrastructure, for example; monopiles and jackets and vessels cold moved to dock.
Workboats	Including; project and port dredgers, tugs, pilot boats, workboats, PD Ports vessels, windfarm support vessels and fishing vessels (not engaged in fishing).
Recreational Vessels	Sailing yachts, motor yachts, sailing dinghies, Rigid Hull Inflatable Boats (RHIB), Personal Watercraft (PWC) etc.

3.3.1 Analysis by Vessel Type

Vessels have been analysed according to vessel type in **Figure 2** to **Figure 5** and **Figure 11**. Density analysis, a measure of the number of individual vessel transits through a localised area, was utilised to identify any local traffic hotspots.

A two-week representative data period from both summer and winter has been assessed (see **Section 3.1**) to ensure any seasonal variations are captured. The density analysis results are presented in **Figure 2** to **Figure 5**.

The most common vessel types to transit past the site are tugs and workboats. An increase in tug density is noted, particularly in summer, in the vicinity of Teesport Commercial Park, whereas, workboats show consistent seasonality and distribution, occupying a greater channel width due to their decreased draught.

Tankers and cargo vessels are evident passing the project site in comparatively low densities, with the majority berthing down river of the Project. Tankers are noted turning on to West Byng, the Sabic berths opposite to the Project site and to Teesport Commercial Park (see also **Figure 6**).

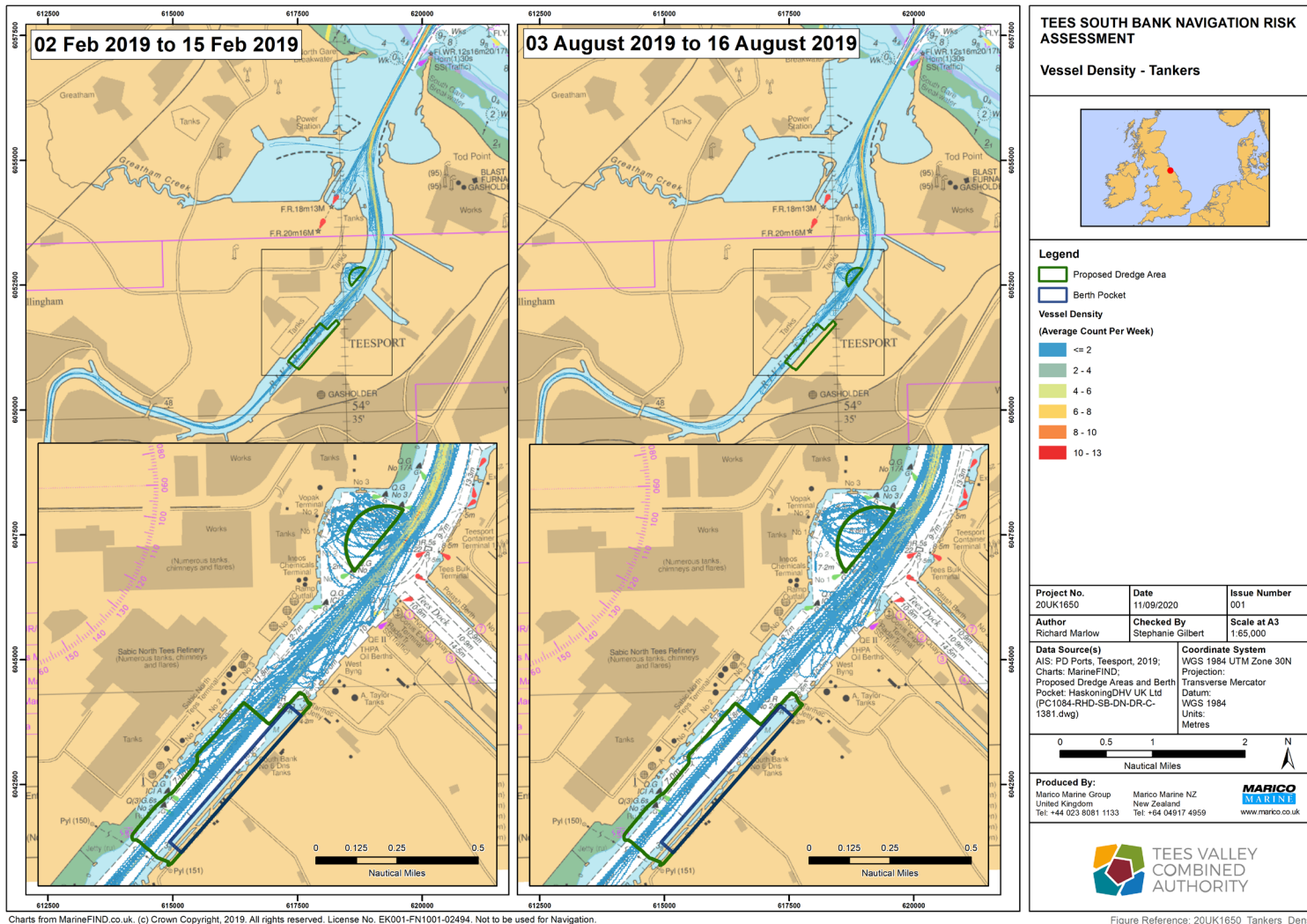
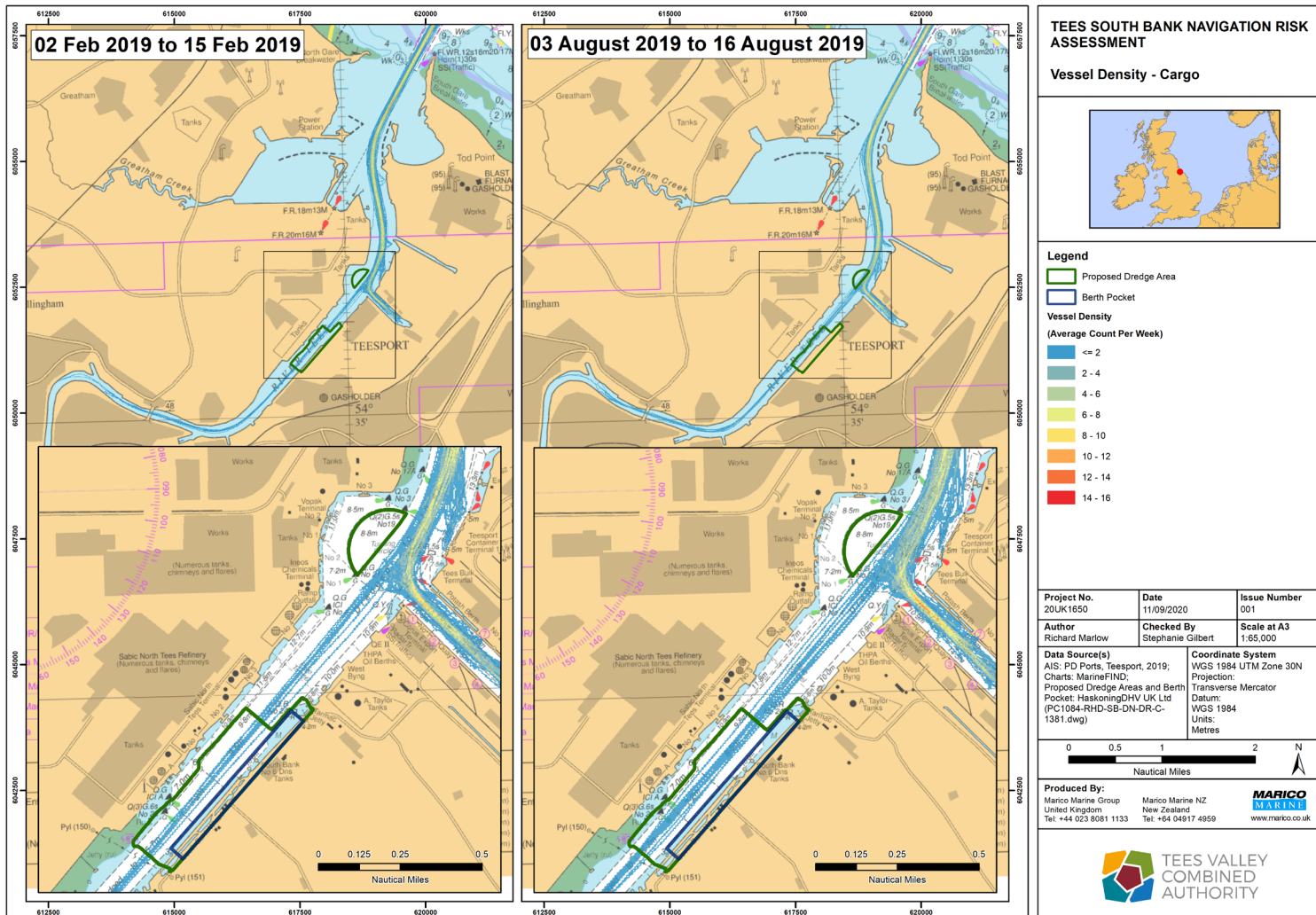


Figure Reference: 20UK1650_Tankers_Density

Figure 2: Tanker Density Analysis – Summer and Winter 2019



Charts from MarineFIND.co.uk. (c) Crown Copyright, 2019. All rights reserved. License No. EK001-FN1001-02494. Not to be used for Navigation.

Figure Reference: 20UK1650_Cargo_Density

Figure 3: Cargo Vessel Density Analysis – Summer and Winter 2019

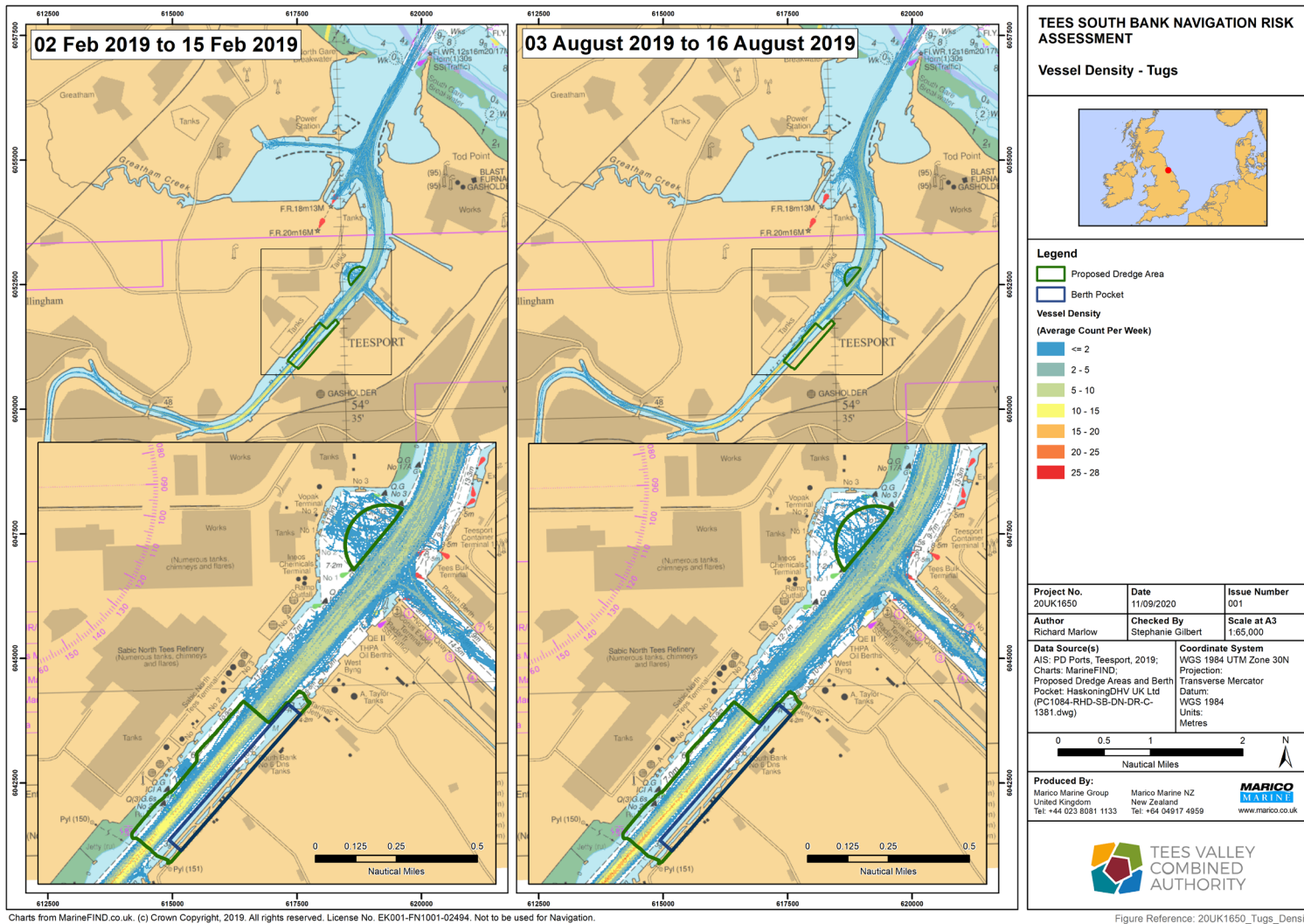
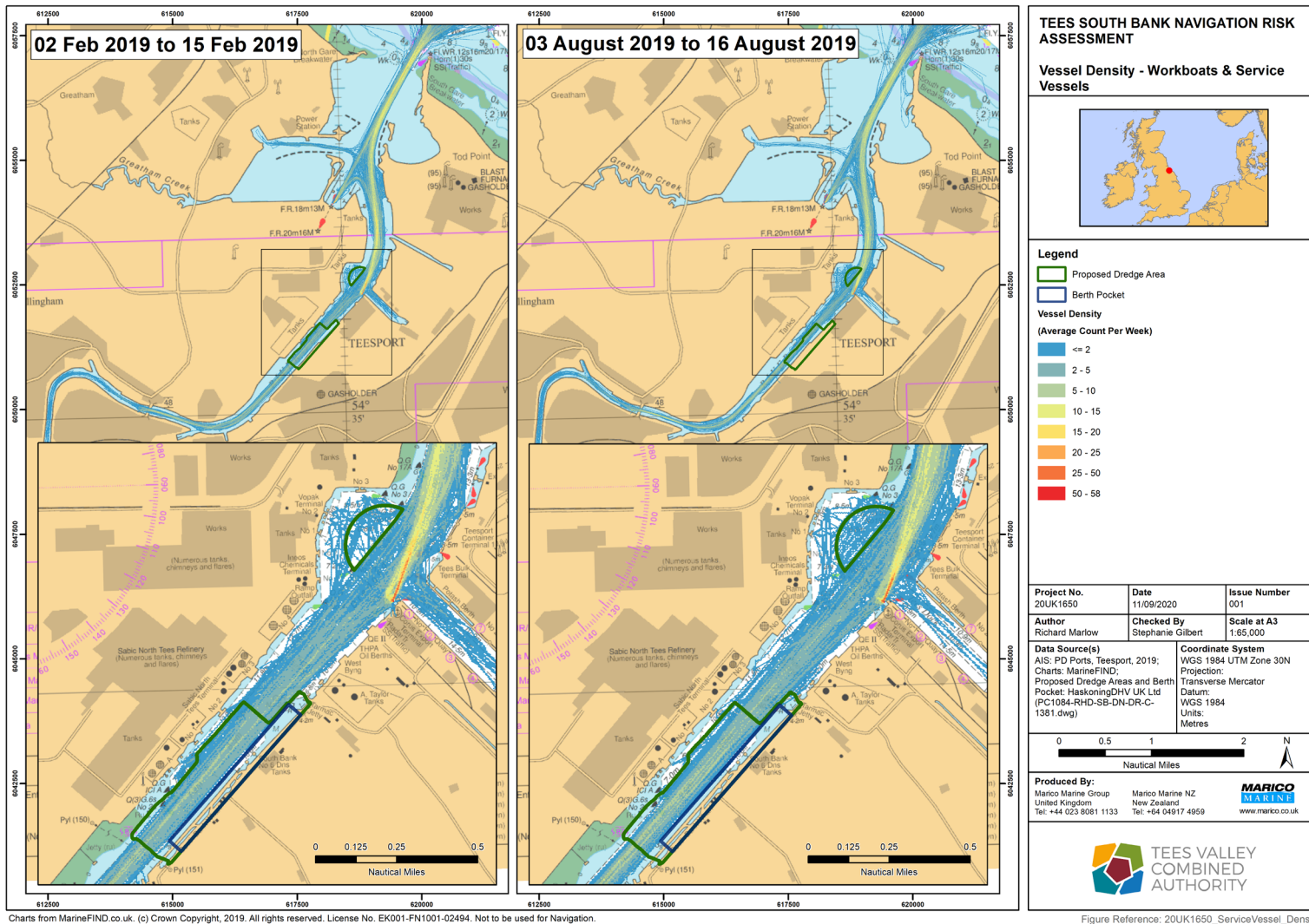


Figure Reference: 20UK1650_Tugs_Density

Figure 4: Tug Density Analysis – Summer and Winter 2019



Charts from MarineFIND.co.uk. (c) Crown Copyright, 2019. All rights reserved. License No. EK001-FN1001-02494. Not to be used for Navigation.

Figure Reference: 20UK1650_ServiceVessel_Density

Figure 5: Workboat / Service Vessel Density Analysis – Summer and Winter 2019

3.3.2 Swept Path Analysis

Owing to its proximity to the Project and the nature of cargoes utilising the berths, further analysis has been undertaken to assess activities at the Sabic berths. Swept path analysis was utilised to assess the swing patterns and manoeuvring of tankers on to the berths. Representative swept paths are shown in **Figure 6**. The largest tankers, for example, JUTLANDIA SWAN (148m LOA) and BENTLEY (176m LOA) were noted utilising the Sabic No.3 berth downstream of the Project, whereas, smaller tankers (between 100m and 108m LOA) which utilise the Sabic A berth immediately opposite to the proposed Project berths. All assessed tankers manoeuvred clear of the proposed Project berths, with the exception of 108m LOA KAPPAGAS which encroached upon the boundary of the proposed berth.

The swept paths of vessels utilising the Tees Dock turning circle were also modelled and are depicted within **Figure 7**. The majority of which are cargo vessels on route to Teesport Container Terminal 2 and the RoRo Terminals. All assessed vessels completed turning within the limits of the navigation channel dredged to 10.4m.

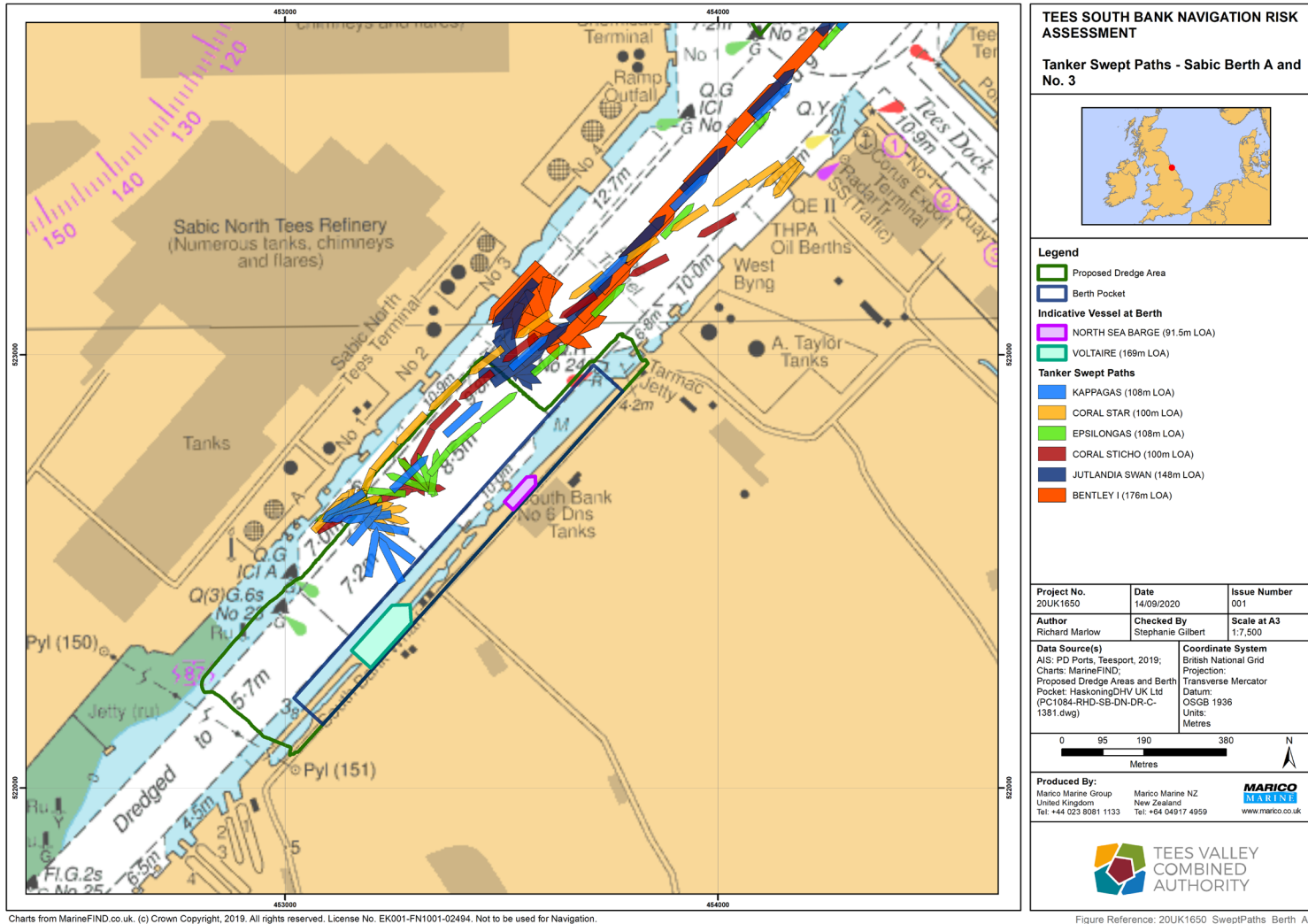


Figure 6: Example Tanker Swept Paths – Sabic Berths

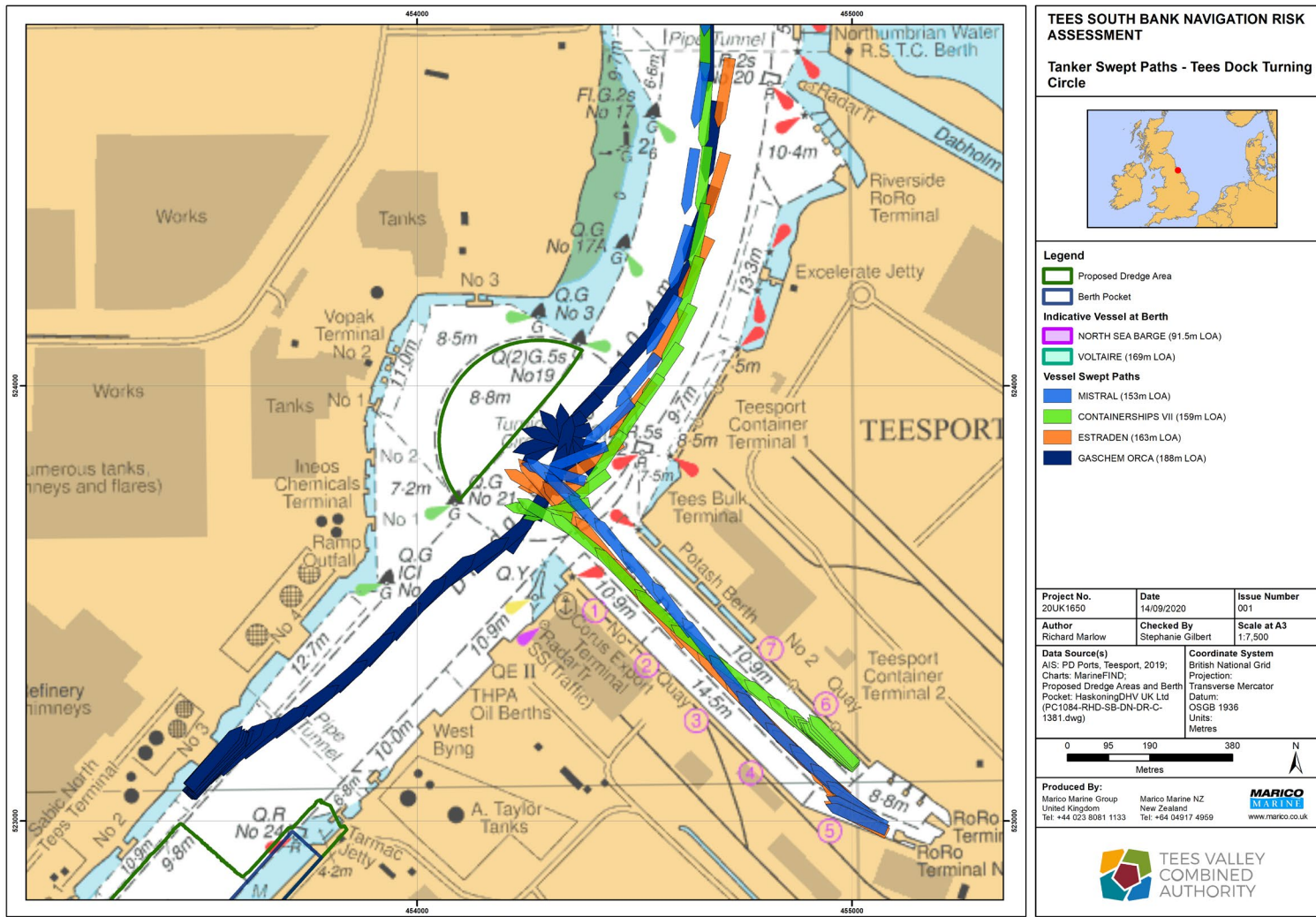


Figure 7: Example Swept Paths – Tees Dock Turning Circle

3.3.3 Gate Analysis

Gate analysis is a tool used by Marico Marine to examine the frequency and direction of vessel traffic through a linear channel. A transect is created perpendicular to the channel, through which the frequency and direction of intersecting vessel tracks are assessed.

Two transects were assessed, one immediately adjacent to the Project (Gate A) and the other on the downstream approach to the Tees Dock turning circle (Gate B), the results of which are shown in **Figure 8** and **Figure 9** respectively. As suggested by **Figure 7**, there is a noticeable reduction in frequency through Gate A with many vessels, particularly cargo vessels, transiting to berths downstream of the Project.

Transits through Gate A have been further analysed in **Figure 10** to **Figure 12** to establish the traffic profile in the immediate vicinity of the Project. A total of 382 transits occurred through the gate during the assessed 2-week winter period and 375 in the assessed two-week summer period, equating to approximately 27 transits per day.

Figure 10 indicates that during both summer and winter, peak movements occur between 06:00 and 12:00. This is likely schedule driven, with tidal influence not determined to be a contributory factor (See **Table 6**).

Over 90% of transits were by tugs and workboats, as shown in **Figure 11**, with tankers, the next most common vessel category, accounting for only 7% of transits in the sample winter data (or approximately 2 movements per day) and 3% (or less than one movement per day) in the sample summer data.

Vessels have been assessed by Length Over-All (LOA) in **Figure 12**. The most common vessels transiting past the Project, accounting for 58% of all transits are between 20 – 39m LOA. These lengths are consistent with tugs and workboats and corroborate the determination of **Figure 11** that tugs and workboat transits are dominant in this section of the River Tees.

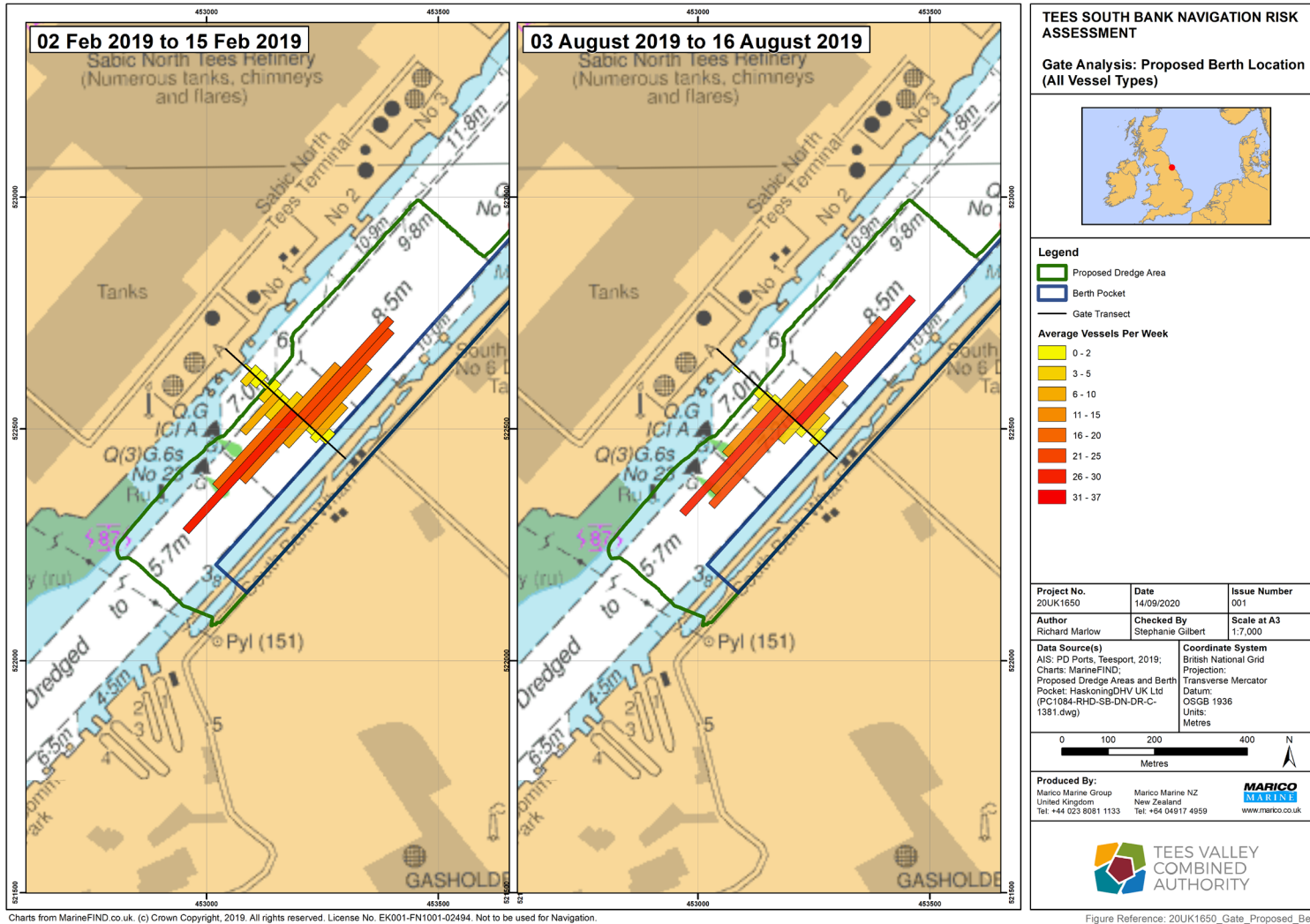
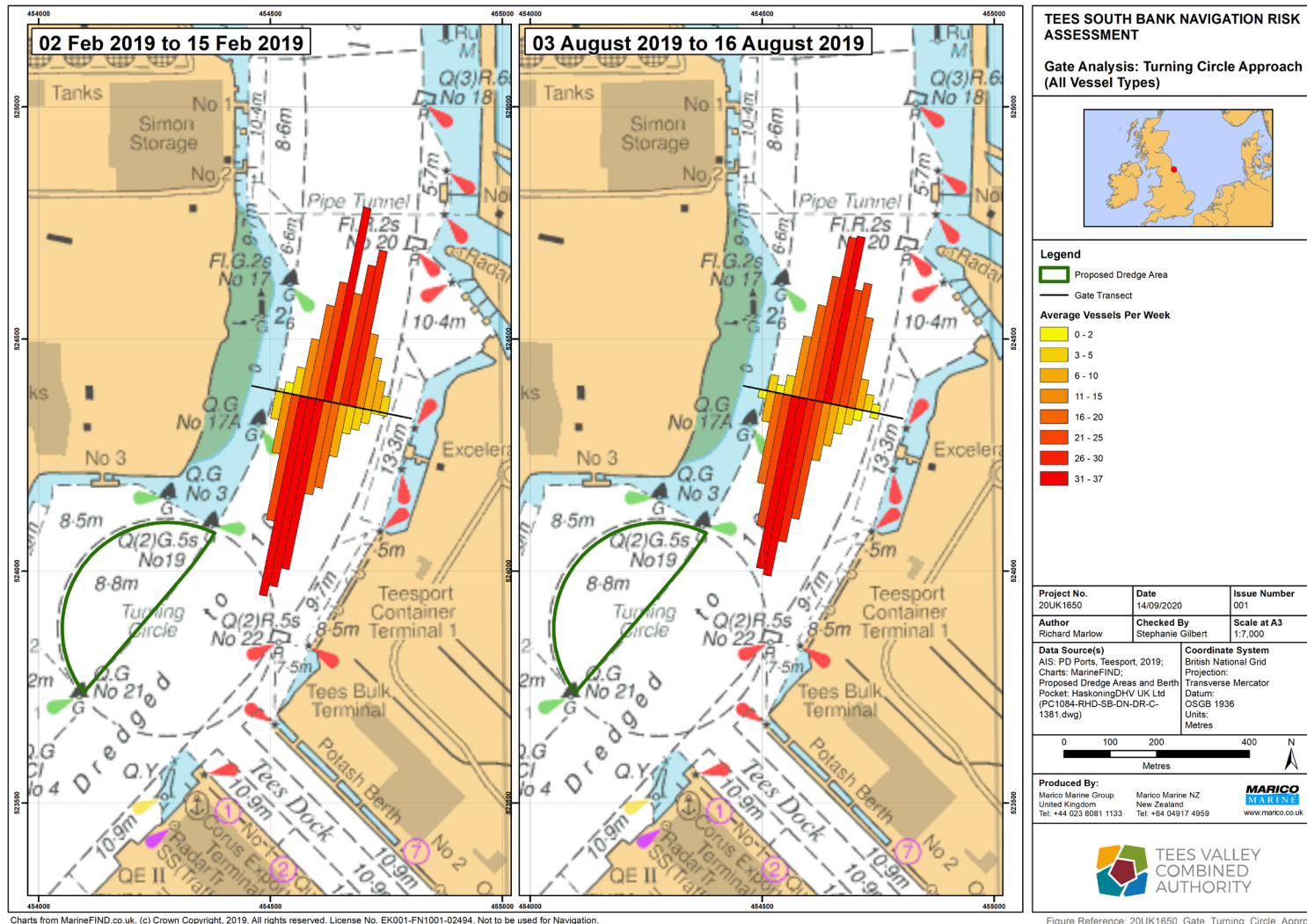


Figure 8: Gate A – In Vicinity of South Tees Development Area – All Vessels – Summer and Winter 2019.



Charts from MarineFIND.co.uk. (c) Crown Copyright, 2019. All rights reserved. License No. EK001-FN1001-02494. Not to be used for Navigation.

Figure Reference: 20UK1650_Gate_Turning_Circle_Approach

Figure 9: Gate B – In Vicinity of Tees Dock Turning Circle – All Vessels – Summer and Winter 2019.

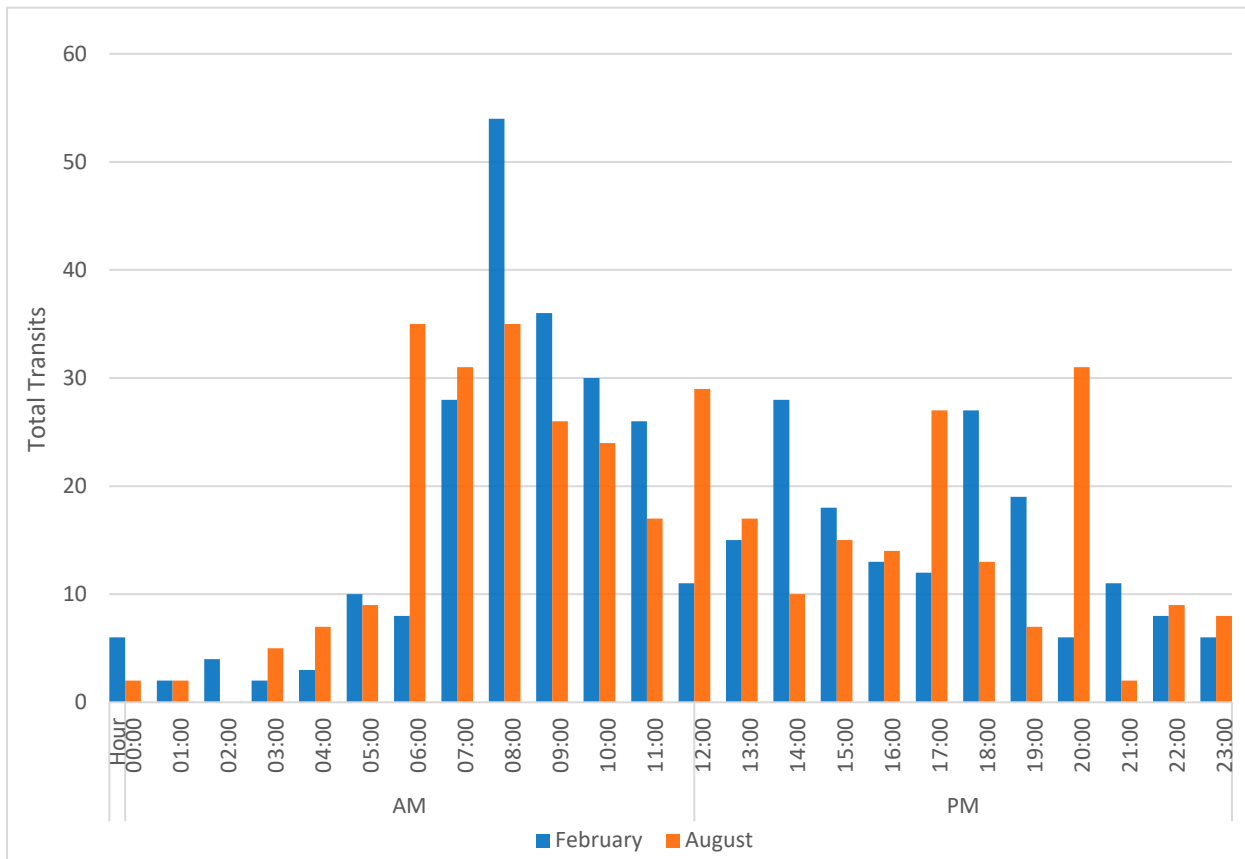


Figure 10: Gate A – Transits by Time of Day – All Vessel Types – Summer and Winter 2019.

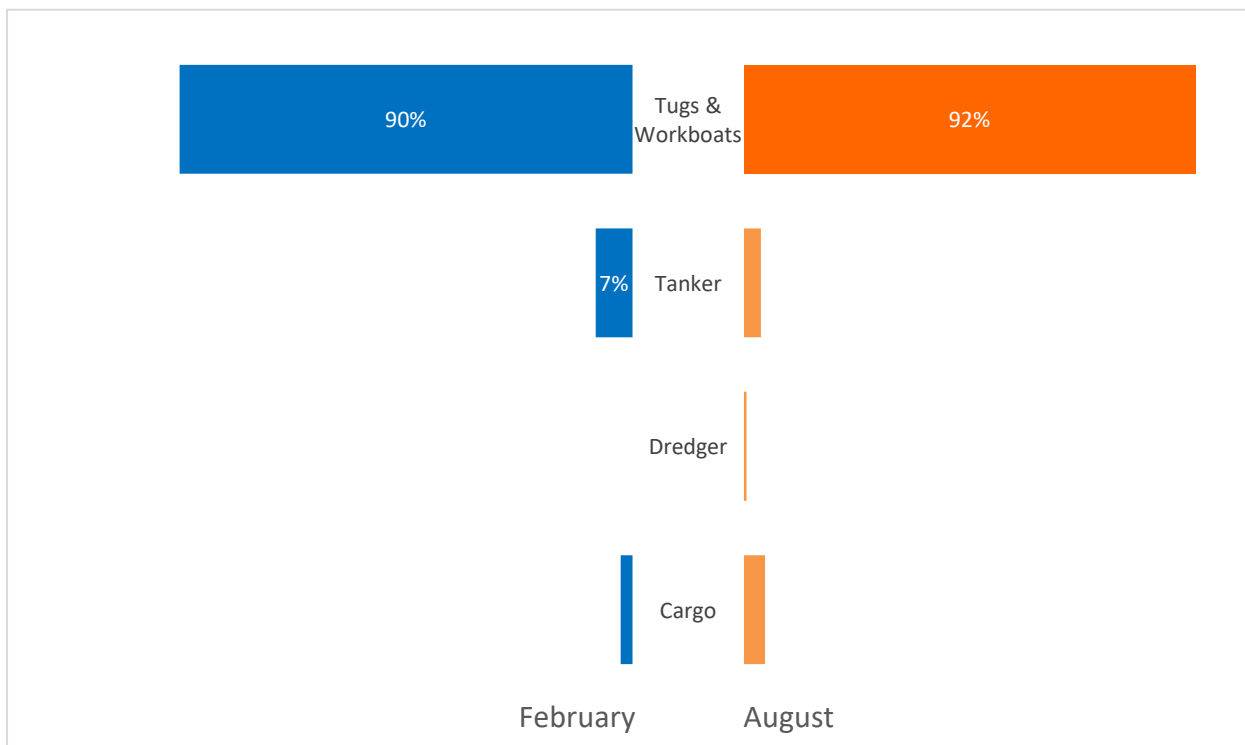


Figure 11: Gate A – Transits by Vessel Type– Summer and Winter 2019.

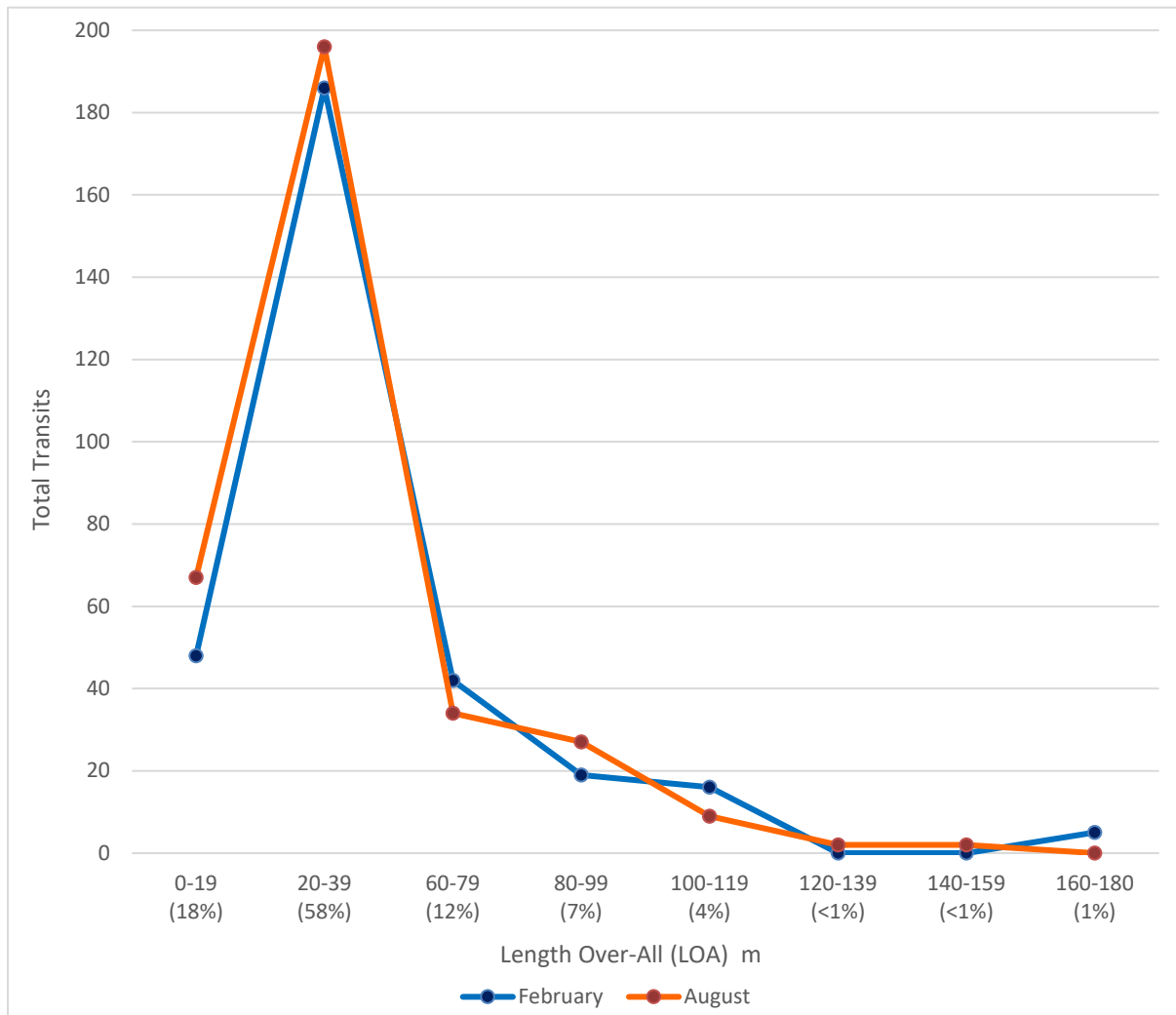


Figure 12: Gate A - Transits by Length Over-All (LOA)

3.4 HISTORIC INCIDENTS

PD Teesport maintains a database of reported accidents/incidents (collectively referred to as events). A summary of events was provided (See **Chapter 3.1**) upon which, quantitative analysis was undertaken to inform the assessment of the baseline risk profile on the River Tees.

Events were categorised as either accidents or incidents as follows:

- **Accident:** a navigational event involving one or more vessels that has adverse consequences including; collisions, contacts, groundings, foundering / swamping and mooring incidents.
- **Incident:** an event that is outside of accepted safe practice and has the potential to become a navigation accident.

Accidents were further classified by location and timestamp as evidenced in **Figure 17**, and as follows:

- **Location:** Accidents were divided into 12 locations, occurring in the lower river reaches between UK Docks / Teesport Commercial Park (upstream limit) and Numbers 5 and 6 Buoys (downstream limit).
- **Timestamp:** Occurring within the last 10 years between 01/01/2010 and 01/09/2019.

A total of 978 events were reported during the assessed period, of which 112 (<12 per year) were classified as navigationally significant accidents (11%) and 864 (89%) were classified as incidents (**Figure 13**). The highest number of total events and accidents occurred within 2018, and the highest number of incidents occurred within 2017.

Navigationally significant accidents were further analysed in **Figure 14** and **Figure 15**. The most common accident type was contact which accounted for 70% of all accidents, followed by mooring incident, which accounted for 27%. Few foundering / swamping and grounding incidents occurred accounting for less than 2% of all accidents respectively. **Figure 14** shows an increase in mooring incidents since 2014, likely due to increased event reporting.

Accidents by vessel type are shown in **Figure 16**. The most common recorded vessel type to be involved in an accident is tankers accounting for 49% of the total, of which 60% were contacts and 38% were mooring incidents. Next most common was cargo at 38% followed by workboats at 13%.

The locations of the assessed incidents are shown in **Figure 17**. The most common accident location was Tees Dock, which accounted for 29% of all accidents, followed by the area in the vicinity of the ConocoPhillips Inset Dock which accounted for 15%.

Eight Accidents were reported in the vicinity of the Sabic berths, directly opposite the Project, of which 5 were tanker mooring incidents, 2 were tanker contacts (one jetty contact in 2012 and one moored tanker contact in 2019) and 1 was a grounding by a workboat.

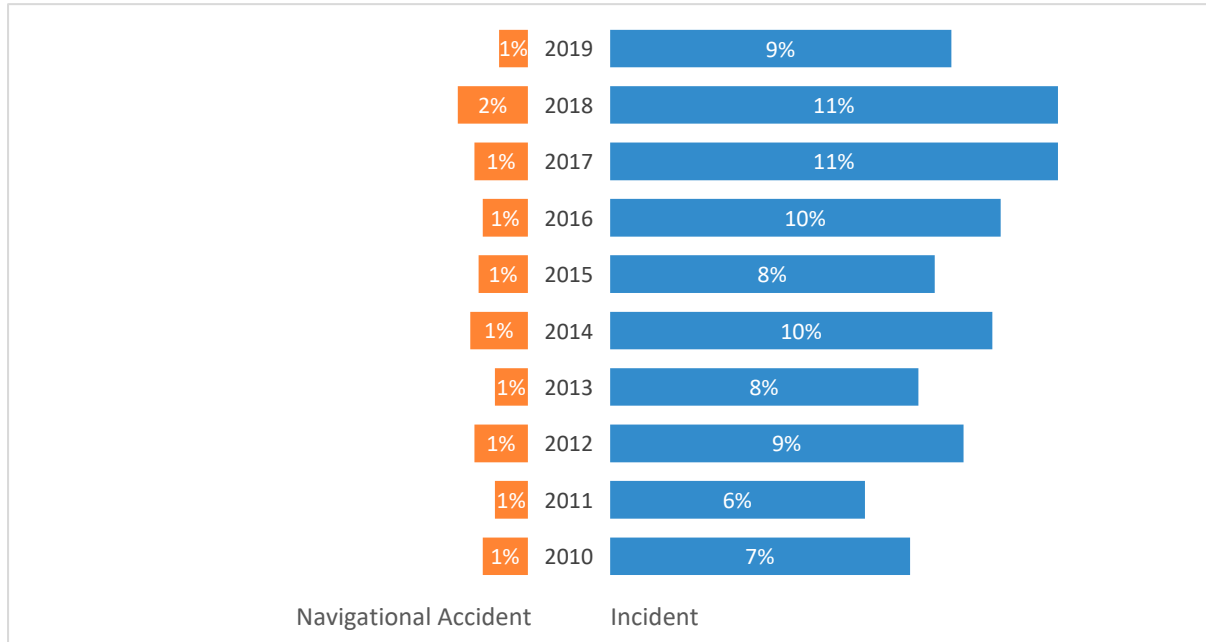


Figure 13: Navigational Accidents and Incidents - 01/01/2010 and 01/09/2019

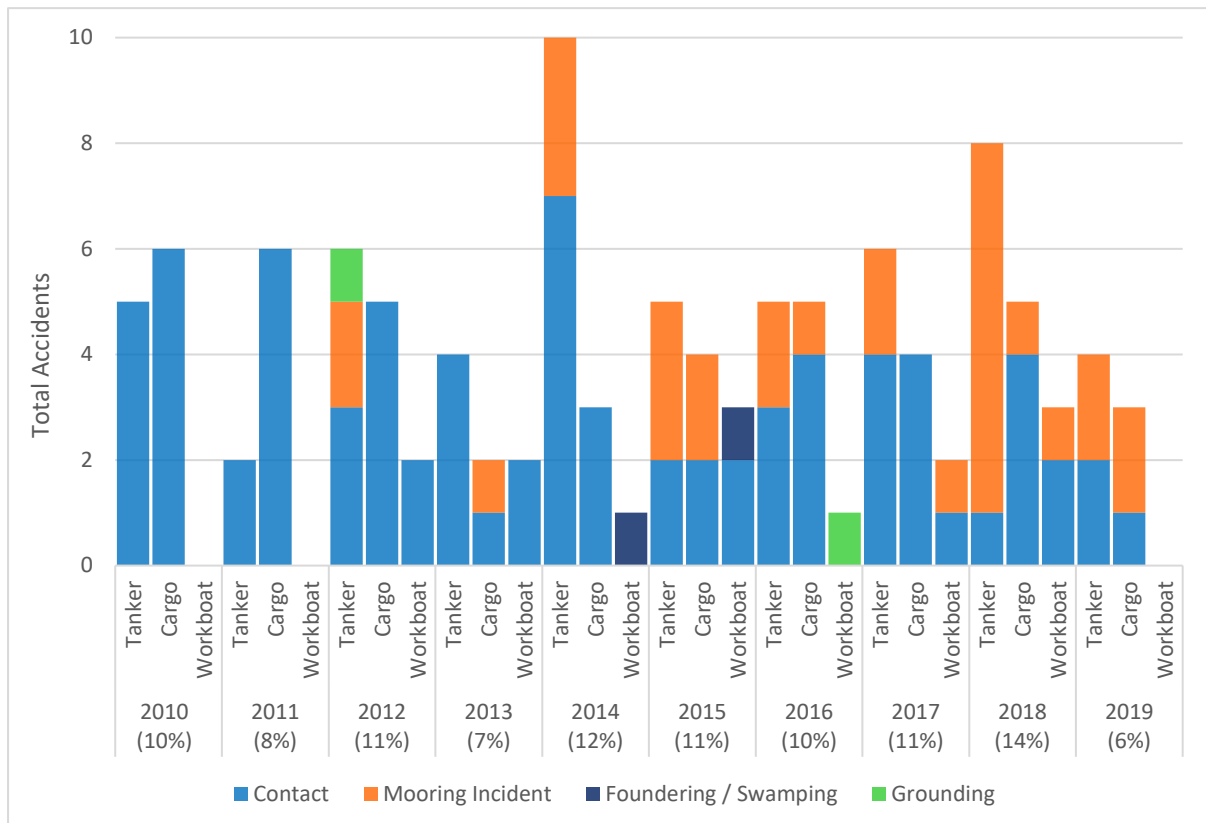


Figure 14: Navigational Accidents per Year by Accident and Vessel Type - 01/01/2010 and 01/09/2019

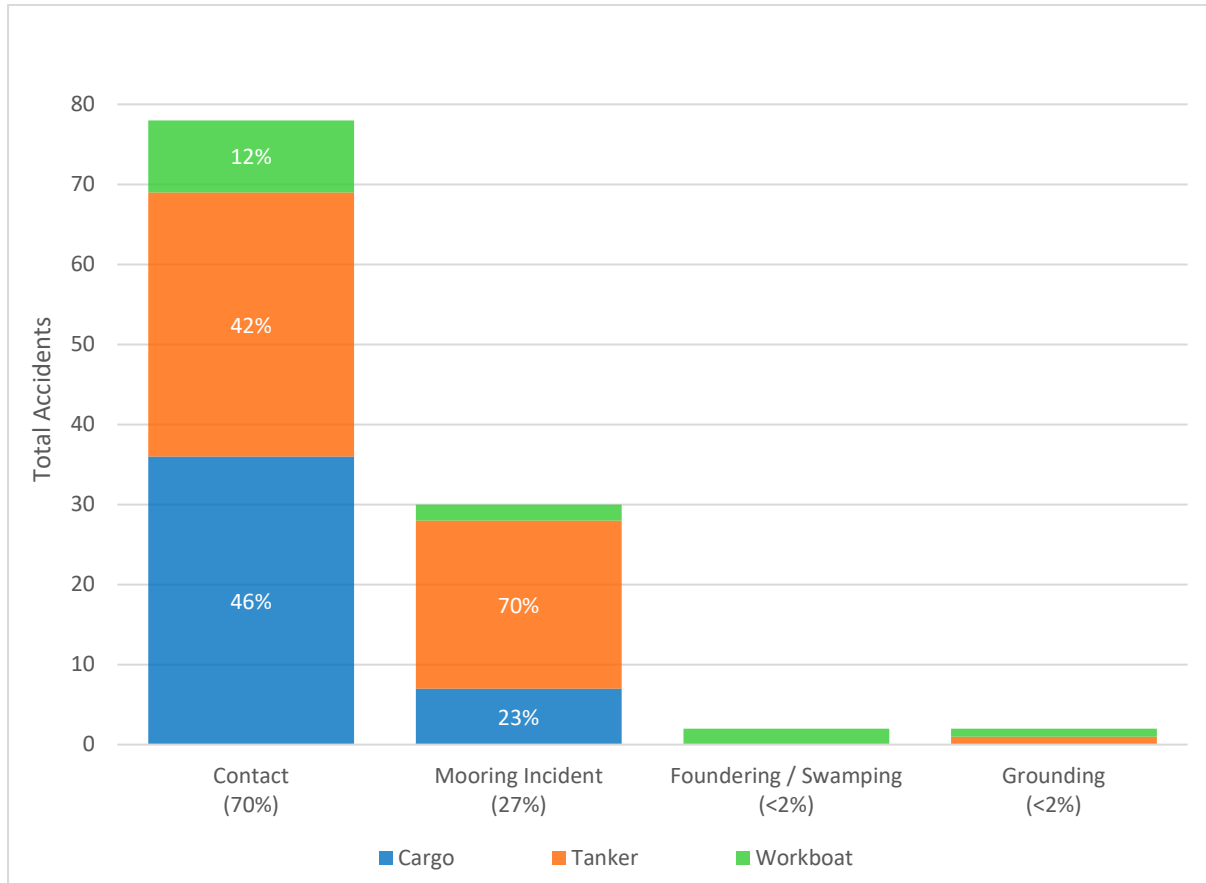


Figure 15: Navigational Accidents per Year by Accident Type - 01/01/2010 and 01/09/2019

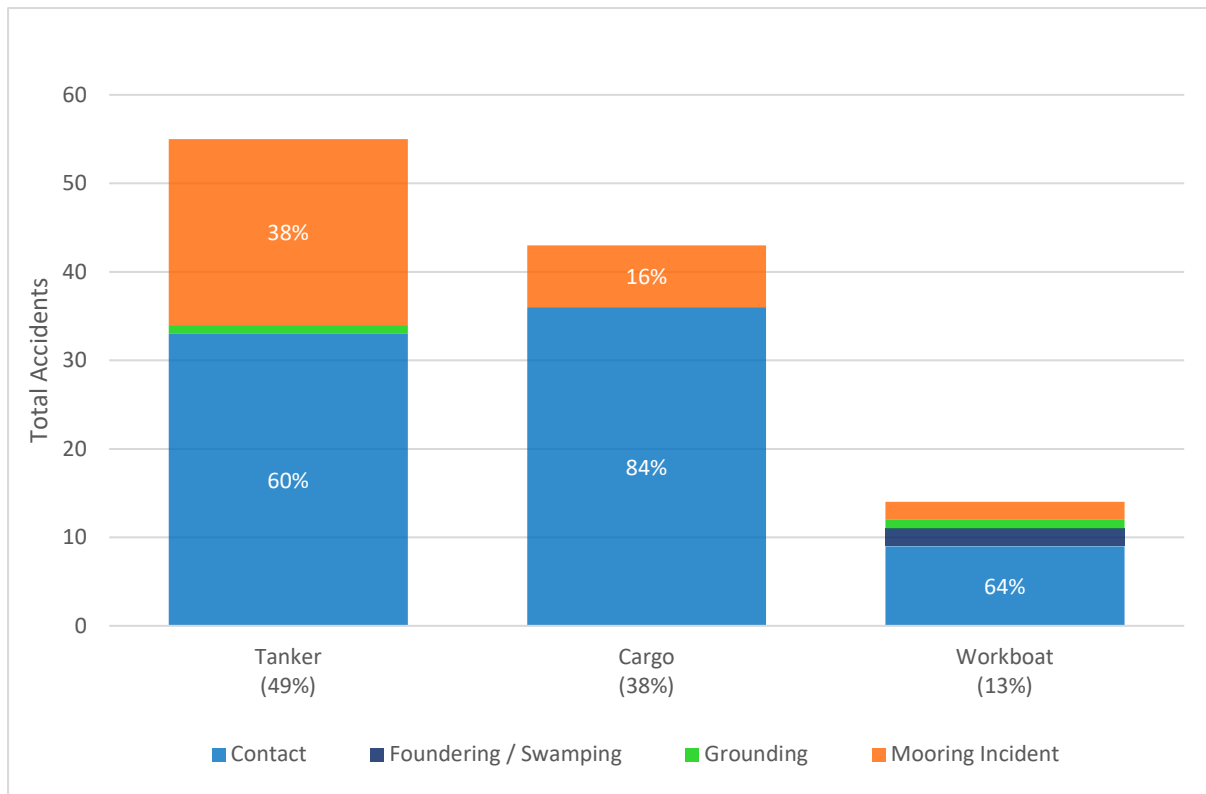
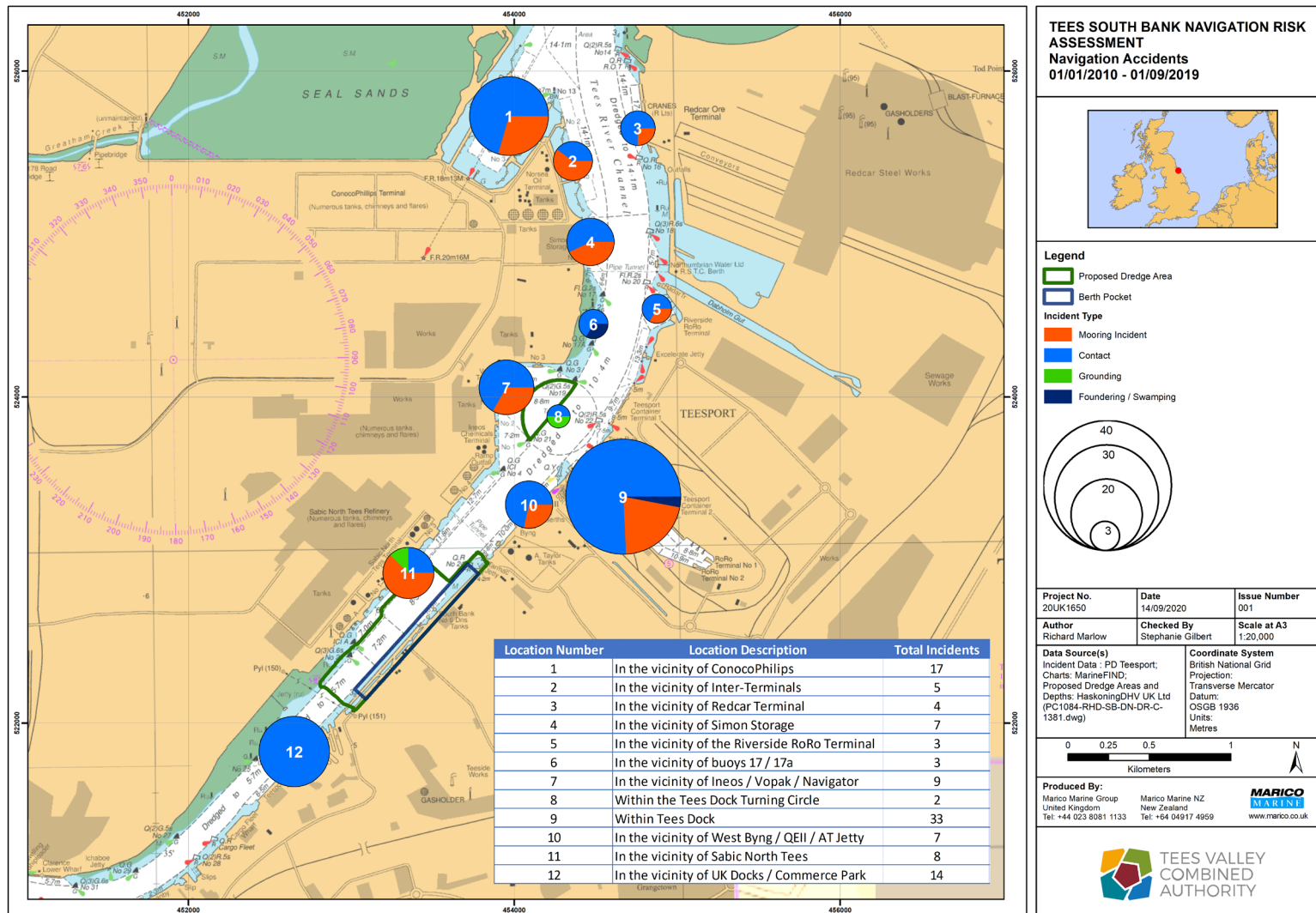


Figure 16: Navigational Accidents by Vessel Type - 01/01/2010 and 01/09/2019



Charts from MarineFIND.co.uk. (c) Crown Copyright, 2019. All rights reserved. License No. EK001-FN1001-02494. Not to be used for Navigation.

Figure Reference: 20UK1650_Incidents

Figure 17: Navigationally Significant Accidents – Lower River Tees - 01/01/2010 and 01/09/2019

4 HAZARD IDENTIFICATION

IMO Guidelines define a hazard as ‘something with the potential to cause harm, loss or injury’, the realisation of which results in an accident. Hazards relating to navigation were identified through stakeholder consultation meetings / workshops and informed by vessel traffic and incident analysis (Section 3.1).

A summary of the key impacts identified during stakeholder consultation are outlined in Annex B.

The hazard categories identified for assessment within the NRA are given in Table 9. Hazard categories were combined with the vessel categories identified in Table 8 to establish a list of individual hazards for risk assessment. In total, 48 hazards were identified for assessment in both the construction and operation phase, as detailed in Table 9.

Table 9: Identified Hazard Categories.

Ref	Hazard Category	Hazard Detail	Comments	Individual Assessed Hazards
1	Collision	All Vessel Types	Two or more vessels impact each other whilst manoeuvring.	14
2	Contact	Berth	One or more vessels makes contact with a berth, pier or jetty.	5
		Vessel Alongside Berth	One or more vessels makes contact with a stationary / berthed vessel. Also known as striking.	5
		Navigation Buoy	One or more vessels makes contact with a navigation buoy. Also known as striking.	5
		Overhead Power Cables ⁷	One or more vessels makes physical contact with the overhead power cables.	2
3	Grounding	All Vessel Types	A vessel unintentionally makes contact with the seabed.	5
4	Foundering / Swamping	All Vessel Types	A vessel fills with water for any reason including capsize, and when overwhelmed, sinks.	2
5	Mooring Incident / Breakout	All Vessel Types	A vessel ranges (moves excessively) whilst alongside the berth or when one or more mooring lines fail resulting in the vessel unintentionally breaking away from its moored position.	5
6	Tug Girting / Towing Incident	Tugs Only.	A tug in difficulty/girts during towage operations (for example during a project cargo operation).	1

⁷ New hazard. Introduced to for individual assessment due to nature of proposed Project activities.

4.1 CUMULATIVE IMPACT IDENTIFICATION

Cumulative effects refer to the effects upon receptors arising from the South Tees development project when considered alongside other proposed or in-construction projects. Projects of comparable effect upon the River Tees and its stakeholders have been considered which are detailed within **Table 10**.

In assessing the potential cumulative impacts, it is important to bear in mind that proposed projects may or may not actually be taken forward. For this reason, all identified relevant projects are considered to be operational for the purpose of risk assessment to represent worst case future development scenario.

Cumulative impacts for assessment have been identified within **Table 11**. The results of the cumulative assessment are detailed within **Section 8.3**.

Table 10: Identified Cumulative Projects

ID	Status	Project	Estimated additional project moves	Description
1	Proposed	Northern Gateway Project	Expecting one additional move per day, or 7 per week. Project currently on hold.	Initially conceived in 2000. Container terminal dredged to 15m berth pocket. 1,035m long berth (2 vessels) to handle medium sized (approximately 12,000 TEU) vessels. Planned commencement date unknown.
2	Proposed	York Potash	Approximately 200 moves per year, equating to an average of approximately 4 vessels per week.	Use of the old Redcar bulk terminal berth initially, before extending to the south. Panamax vessels 70-80,000 tonnes to be utilised transporting approximately 10 million tonnes per year. Planned commencement date unknown.
3	Under-Construction	MGT Power	2 vessels per week from Q2 2020.	Biomass plant at Number One berth, Tees Dock. Re-use of existing berth expected.

Table 11: Cumulative Impact Identification

ID	Impact	Impact Detail	Justification for Assessment
1	Cumulative Impact due to increased vessel movements.	Approximately 8 additional vessel movements estimated per week.	Potential for increase in collision risk due to potential for interaction of project vessels.
2	Cumulative Impact due to reduction in navigable channel.	Additional vessels to be moored along river wall at project sites.	Potential for increase in contact risk due to increased utilisation of the river wall and increase in in channel vessel manoeuvres.

5 EMBEDDED MITIGATION

Embedded mitigation measures describe those measures to which adherence is required by regulation / are already enforced by the local SHA. Embedded mitigation measures are assumed to be in place prior to assessment. **Table 12** lists embedded mitigation measures considered within this NRA. Following risk assessment, possible additional risk control measures may be identified with a view to further reducing residual risk (see **Section 8.4**).

Table 12: Embedded Mitigation Measures

ID	Risk Control Measure	Phase	Description
1	Adherence to risk control measures listed within the current Port Navigation Risk Assessment.	C & O	Including international, national and local regulations. As listed in PD TeesPort – River NRA.
2	TOS / VTS		This will be particularly important in construction phase if the dredgers are very large.
3	Movements associated with barges carrying windfarm cargos treated as project moves.	O	In accordance with PD Ports procedures.
4	Post dredge surveys and promulgation.	C & O	Charts to be updated to include new berths and berthing pockets and in-channel dredge depths.
5	Notice To Mariners and Communication.		Hold regular meetings with dredge contractors during dredging operations. Issue Notice To mariners prior to intended works commencing.
6	Review of marking and lighting.	O	Review navigation aids in vicinity of project berths as directed by PD Ports.
7	Blade safety zone	O	15m safety zone on riverside of stowed blades.

6 ASSUMPTIONS

The following assumptions are applicable to this NRA:

- All international, national and local regulations and procedures are adhered to.
- When considering risk control measures, it is assumed that embedded risk controls are in place (see **Section 5**) and they are effective in meeting their intended goal (i.e. the NRA does not take into consideration failure to comply with regulations).
- This NRA is concerned with navigation related hazards and does not consider other non-navigational hazards including those related to a health and safety of marine operations such

as slips, trips and falls, or those hazards which are not directly related to navigation, such as fire and explosion, except where they can be a consequence of a navigation hazard.

- This NRA treats the Phase 1 and Phase 2 developments as a single construction phase.

7 NAVIGATION RISK ASSESSMENT METHODOLOGY

The NRA process is based on Formal Safety Assessment (FSA) methodology as adopted by the International Maritime Organisation (IMO) and follows the guidance set out in International best practise. A detailed description of the methodology is provided in **Annex A**.

7.1 OVERVIEW

A standard 5x5 risk matrix was used and each hazard was assessed twice. Firstly, to determine the risk associated with the most likely outcome of the hazard and secondly to determine the risk associated with the worst credible outcome for each hazard. The results were then combined to give a total risk score for each hazard.

This approach provides a thorough assessment of risk, which reflects the reality that comparatively few accidents result in the worst credible outcome.

7.1.1 Assessment of Frequency and Consequence

The assessment of frequency was combined with assessments of typical consequences to people, property, environment and business. The frequency and consequence bands used for this NRA are shown in **Annex A**.

The frequency and consequence assessments were largely based on the data/information collected during Stage 1 of this NRA, and in particular:

- Stakeholder consultation meetings;
- Quantitative vessel traffic analysis; and
- Review of the incident database.

This information was supplemented by expert judgement and specialist knowledge provided by the assessment team, who have considerable experience in undertaking NRAs of this type in ports/harbours all around the world.

7.1.2 Risk Scores

The frequency and consequence scores were then assessed to give two distinct risk scores;

- The average risk score of the categories in the most likely set;
- The average risk score of the categories in the worst credible set;
- The maximum risk score of the four categories in the most likely set; and

- The maximum risk score of the four categories in the worst credible set.

These scores were then combined using a weighted average to produce a single numeric value representing the final risk score for each hazard, between 0 (negligible) and 10 (high) (see **Annex A**), following which, the final risk scores were sorted into a ranked hazard list.

Hazard risk scores were categorised as either negligible, low, As Low as Reasonably Practicable (ALARP), significant or high, as per **Table 13**, where ALARP represents a level of risk that is neither acceptable nor unacceptable and for which further investment of resources for risk reduction may or may not be justifiable – i.e. risks which fall within the ALARP band should be reduced unless there is a disproportionate cost to the benefits obtained.

Navigation hazards with a risk score of significant or high are deemed unacceptable and, as such, additional risk control measures must be implemented to reduce the risk to an acceptable level (see **Section 8.4**).

Table 13: Risk Scoring.

Risk Score	Risk Definition	Action Taken
0 - 1.99	Negligible	The risk is acceptable and at level where operational safety is unaffected.
2 - 3.99	Low	The risk is acceptable and at level where operational safety is assumed.
4 - 6.99	ALARP	The risk is neither acceptable nor unacceptable. Risks in the ALARP band are to be managed to a level which is “As Low As Reasonably Practicable”, based on the cost-effectiveness of implementing additional risk control measures. These hazards and associated risk control measures shall be regularly reviewed as part of the Safety Management System.
7 - 8.99	Significant	The risk is unacceptable and additional risk control measures shall be identified and implemented as soon as possible (or the activity / operation temporarily suspended). These hazards and associated risk control measures shall be regularly reviewed as part of the Safety Management System.
9 - 10	High	The risk is unacceptable and additional risk control measures shall be identified and implemented immediately (or the activity / operation permanently suspended). These hazards and associated risk control measures shall be regularly reviewed as part of the Safety Management System.

Each identified baseline hazard log was scored twice, once for the construction phase and again for the operational phase resulting in two separate risk assessments and hazard logs. Each log was then re-assessed applying proposed possible additional mitigation measures (**Section 8.4**) to assess the residual risk scores and their effectiveness should they be implemented.

8 NAVIGATION RISK ASSESSMENT RESULTS

8.1 CONSTRUCTION PHASE – BASELINE WITH EMBEDDED MITIGATION

A summary of the ranked hazard list for construction phase NRA is shown within **Table 14**. The full hazard log is provided in **Annex C**. The assessment assumes the implementation of all embedded risk control measures identified within **Section 5**.

All hazards were scored as ALARP or lower, with the highest scoring individual hazard assessed to be ‘Contact Berth: Tanker’ which scored 5.10: ALARP.

Figure 18 provides a summary of the average hazard category scores for the construction phase. The highest scoring overall hazard category was ‘Collision’ with an average risk score of 2.96 closely followed by ‘Contact Berth’ which scored 2.92. The lowest scoring overall hazard category in the construction phase was ‘Contact: Navigation Buoy’ which was scored as 0.72; negligible, driven by its low consequence.

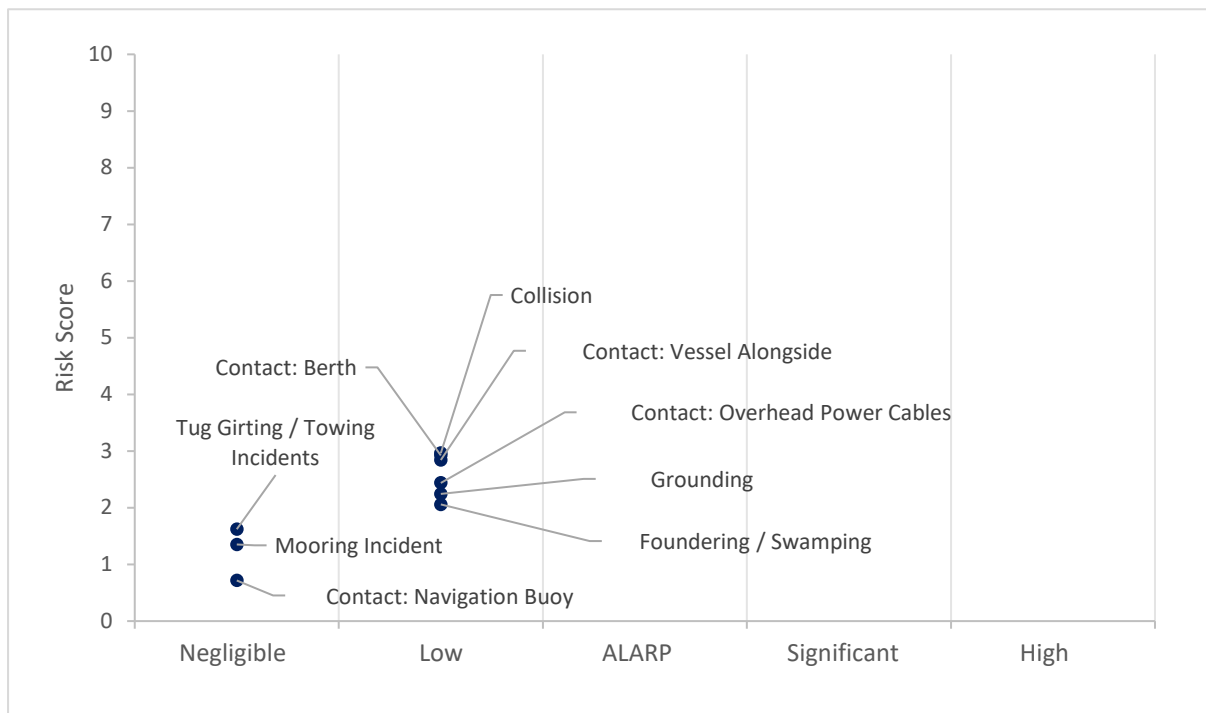


Figure 18: Average Risk Score by Hazard Category – Construction Phase

Table 14: Summary Ranked Hazard List – Construction Phase.

ID	Category	Hazard Title	Risk Score
21	Contact	Contact berth - Tanker	5.10
27	Contact	Contact vessel alongside berth - General Cargo Vessel	4.22
22	Contact	Contact berth - General Cargo Vessel	4.12
10	Collision	Collision - Workboat (Including Dredgers) ICW Workboat (Including Dredgers)	4.07
26	Contact	Contact vessel alongside berth - Tanker	3.92
2	Collision	Collision - Tanker ICW General Cargo Vessel	3.84
3	Collision	Collision - Tanker ICW Workboat (Including Dredgers)	3.79
7	Collision	Collision - General Cargo Vessel ICW Workboat (Including Dredgers)	3.79
28	Contact	Contact vessel alongside berth - Workboat (Including Dredgers)	3.53
11	Collision	Collision - Workboat (Including Dredgers) ICW Project Cargo	3.16
23	Contact	Contact berth - Workboat (Including Dredgers)	3.16
1	Collision	Collision - Tanker ICW Tanker	3.14
6	Collision	Collision - General Cargo Vessel ICW General Cargo Vessel	3.07
33	Grounding	Grounding - Tanker	3.00
4	Collision	Collision - Tanker ICW Project Cargo	2.91
8	Collision	Collision - General Cargo Vessel ICW Project Cargo	2.84
36	Grounding	Grounding - Project Cargo	2.78
34	Grounding	Grounding - General Cargo Vessel	2.68
31	Contact	Contact Overhead Power Cables- General Cargo vessel	2.52
43	Foundering	Foundering / Swamping - Workboat (Including Dredgers)	2.38
32	Contact	Contact Overhead Power Cables - Project Cargo	2.36
12	Collision	Collision - Workboat (Including Dredgers) ICW Recreational Vessel	2.24
5	Collision	Collision - Tanker ICW Recreational Vessel	2.21
9	Collision	Collision - General Cargo Vessel ICW Recreational Vessel	2.21
14	Collision	Collision - Recreational Vessel ICW Recreational Vessel	2.12

ID	Category	Hazard Title	Risk Score
13	Collision	Collision - Project Cargo ICW Recreational Vessel	2.10
35	Grounding	Grounding - Workboat (Including Dredgers)	2.07
29	Contact	Contact vessel alongside berth - Project Cargo Vessel	1.84
38	Mooring Incident	Mooring Incident - Tanker	1.81
39	Mooring Incident	Mooring Incident - General Cargo vessel	1.81
44	Foundering	Foundering / Swamping - Recreational Vessel	1.74
18	Contact	Contact - Workboat (Including Dredgers) with Navigation Buoy	1.67
15	Tug Girting	Tug Girting / Towing Incidents	1.62
24	Contact	Contact berth - Project Cargo Vessel	1.54
40	Mooring Incident	Mooring Incident - Workboat (Including Dredgers)	1.31
41	Mooring Incident	Mooring Incident - Project Cargo	1.26
19	Contact	Contact - Project Cargo with Navigation Buoy	0.76
25	Contact	Contact berth - Recreational Vessel	0.69
30	Contact	Contact vessel alongside berth - Recreational Vessel	0.69
37	Grounding	Grounding - Recreational Vessel	0.69
16	Contact	Contact - Tanker with Navigation Buoy	0.58
17	Contact	Contact - General Cargo Vessel with Navigation Buoy	0.58
42	Mooring Incident	Mooring Incident - Recreational Vessel	0.56
20	Contact	Contact - Recreational Vessel with Navigation Buoy	0.00

8.2 OPERATION PHASE - BASELINE WITH EMBEDDED MITIGATION

A summary of the ranked hazard list for operation phase NRA is shown within **Table 15**. The full ranked hazard list is provided in **Annex D**. The assessment assumes the implementation of all embedded risk control measures identified within **Section 5**.

All hazards were scored as ALARP or lower, with the highest scoring hazard assessed to be ‘Contact Berth: Tanker’ which scored 5.50: ALARP.

Figure 19 provides a summary of the average hazard category scores for the operation phase. The highest scoring overall hazard category was ‘Contact: Vessel Alongside’ with an average risk score of 3.76 driven by a high consequence. This was followed by ‘Contact Berth’ and ‘Contact: Overhead Power Cables’ which scored 3.30 and 3.27 respectively, driven by the introduction of additional vessels berthing at South Bank, the narrowing of the river for tankers turning on to the Sabic berths and the proximity of Project Cargo vessels to overhead cables upstream of the berth. The lowest scoring overall hazard category in the construction phase was ‘Contact: Navigation Buoy which was scored as 0.5; negligible, driven by its low consequence.

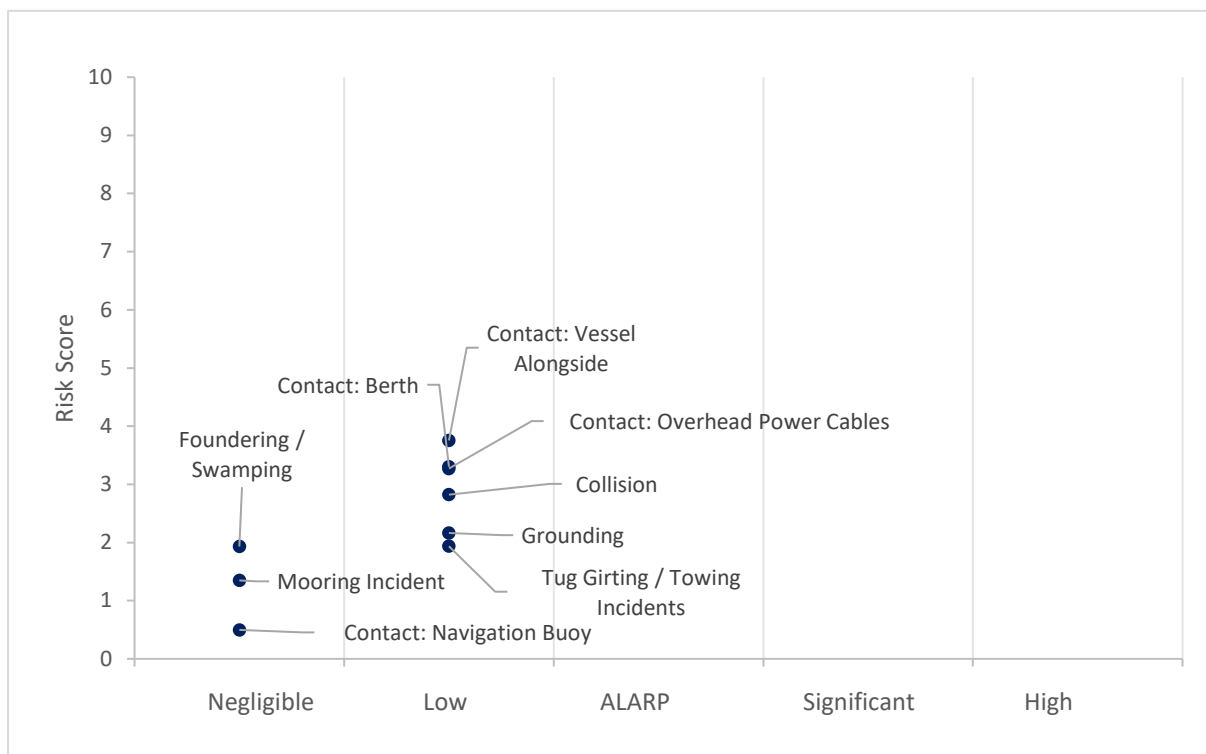


Figure 19: Average Risk Score by Hazard Category – Operation Phase

Table 15: Summary Ranked Hazard List – Operation Phase.

ID	Category	Hazard Title	Risk Score
21	Contact	Contact berth - Tanker	5.50
29	Contact	Contact vessel alongside berth - Project Cargo Vessel	5.18
26	Contact	Contact vessel alongside berth - Tanker	5.05
27	Contact	Contact vessel alongside berth - General Cargo Vessel	4.72
22	Contact	Contact berth - General Cargo Vessel	4.51
32	Contact	Contact Overhead Power Cables - Project Cargo	4.03
2	Collision	Collision - Tanker ICW General Cargo Vessel	3.67
3	Collision	Collision - Tanker ICW Workboat	3.50
7	Collision	Collision - General Cargo Vessel ICW Workboat	3.50
23	Contact	Contact berth - Workboat	3.16
28	Contact	Contact vessel alongside berth - Workboat	3.13
36	Grounding	Grounding - Project Cargo	3.13
6	Collision	Collision - General Cargo Vessel ICW General Cargo Vessel	3.07
1	Collision	Collision - Tanker ICW Tanker	3.05
4	Collision	Collision - Tanker ICW Project Cargo	3.05
8	Collision	Collision - General Cargo Vessel ICW Project Cargo	2.97
11	Collision	Collision - Workboat ICW Project Cargo	2.95
33	Grounding	Grounding - Tanker	2.86
10	Collision	Collision - Workboat ICW Workboat	2.76
24	Contact	Contact berth - Project Cargo Vessel	2.66
34	Grounding	Grounding - General Cargo Vessel	2.60
31	Contact	Contact Overhead Power Cables- General Cargo vessel	2.52
12	Collision	Collision - Workboat ICW Recreational Vessel	2.24
13	Collision	Collision - Project Cargo ICW Recreational Vessel	2.24
5	Collision	Collision - Tanker ICW Recreational Vessel	2.21
9	Collision	Collision - General Cargo Vessel ICW Recreational Vessel	2.21
43	Foundering	Foundering / Swamping - Workboat	2.13
14	Collision	Collision - Recreational Vessel ICW Recreational Vessel	2.12
15	Tug Girting	Tug Girting / Towing Incidents	1.94

ID	Category	Hazard Title	Risk Score
38	Mooring Incident	Mooring Incident - Tanker	1.81
39	Mooring Incident	Mooring Incident - General Cargo vessel	1.81
44	Foundering	Foundering / Swamping - Recreational Vessel	1.74
41	Mooring Incident	Mooring Incident - Project Cargo	1.65
35	Grounding	Grounding - Workboat	1.54
40	Mooring Incident	Mooring Incident - Workboat	0.91
19	Contact	Contact - Project Cargo with Navigation Buoy	0.76
25	Contact	Contact berth - Recreational Vessel	0.69
30	Contact	Contact vessel alongside berth - Recreational Vessel	0.69
37	Grounding	Grounding - Recreational Vessel	0.69
16	Contact	Contact - Tanker with Navigation Buoy	0.58
17	Contact	Contact - General Cargo Vessel with Navigation Buoy	0.58
18	Contact	Contact - Workboat with Navigation Buoy	0.58
42	Mooring Incident	Mooring Incident - Recreational Vessel	0.56
20	Contact	Contact - Recreational Vessel with Navigation Buoy	0.00

Little variation in hazard risk scores is noted between the construction and operation phase assessments for non-contact hazard categories, as demonstrated by **Figure 20**. However, with the exception of ‘Contact: Navigation buoy’, contacts show a higher level of variation. An overall increase in contact risk in the operation phase is noted owing mainly to the introduction of new third-party contact hazards introduced by the proposed development.

Average risk scores by vessel category are analysed in **Figure 21**. The highest scoring overall vessel category is tanker with an average risk score of 3.0. The lowest scoring vessel category was recreational, scoring 1.7 driven by frequency. The greatest variation in risk scores between the construction and operation phases is by project cargo vessels driven by increased frequency in the operation phase followed by workboats, driven by an increase in frequency of dredgers in the construction phase.

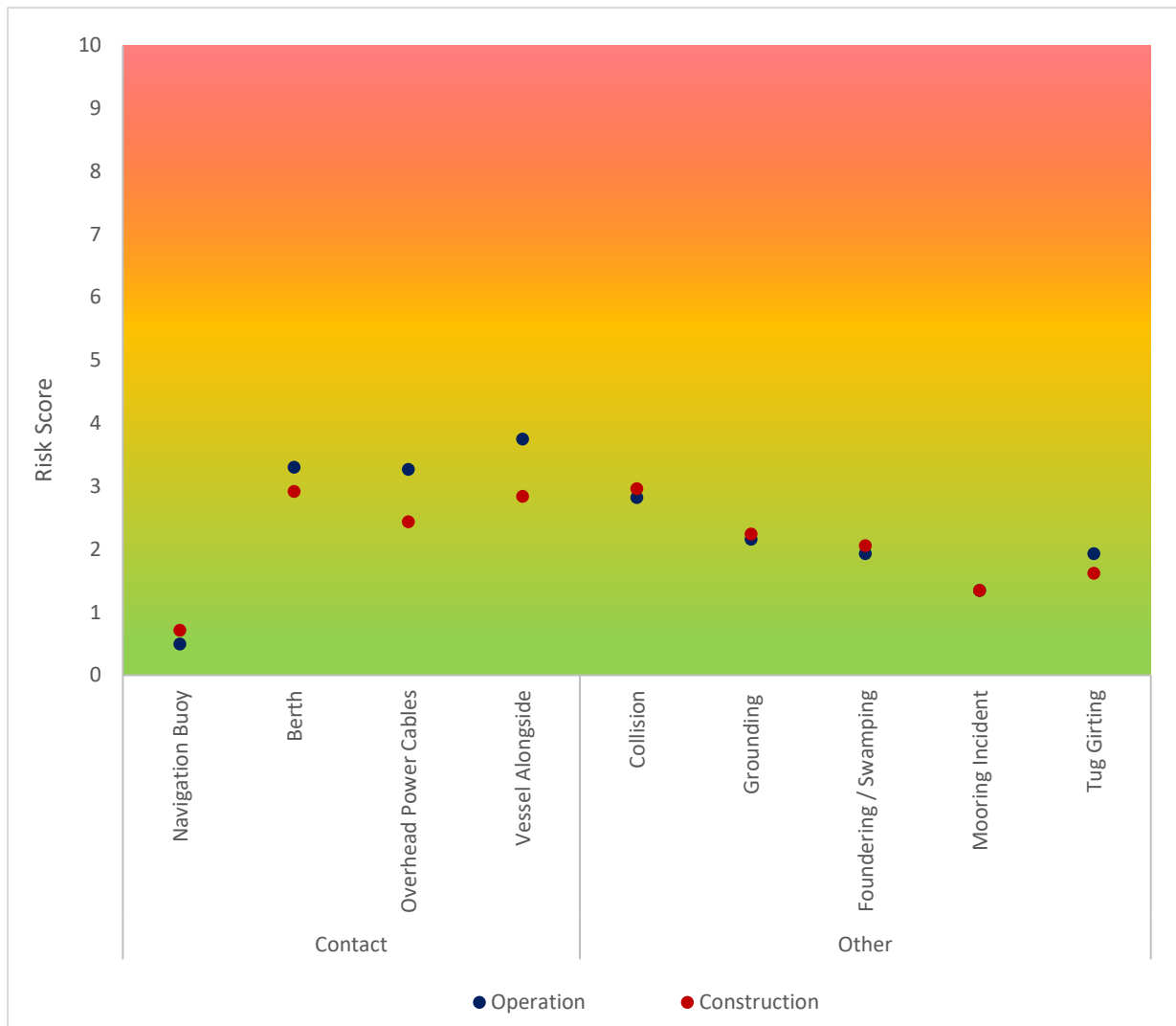


Figure 20: Average Risk Score by Hazard Category

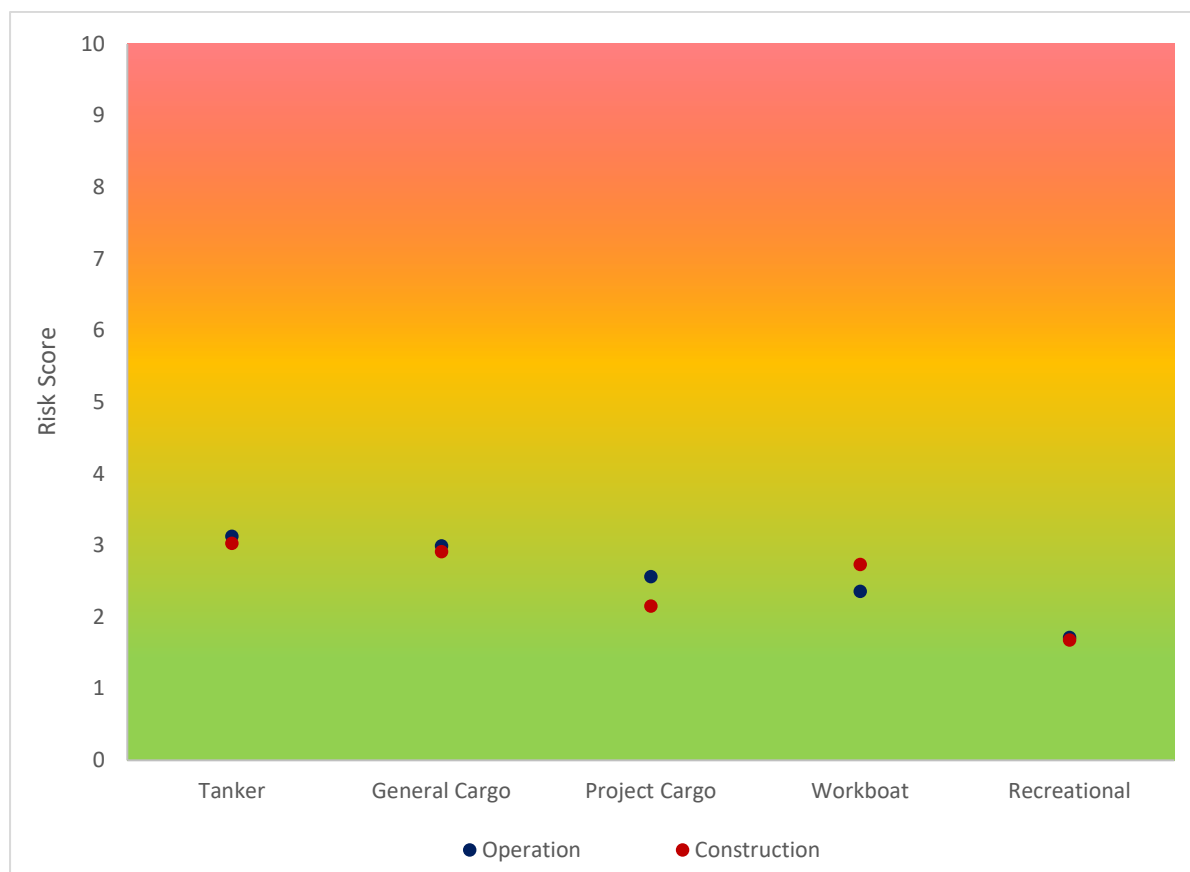


Figure 21: Average Risk Score by Vessel Category

8.3 CUMULATIVE IMPACT ASSESSMENT

The cumulative impact assessment was assessed to be a factor of the likelihood of the impact occurring and the consequence, should it occur. The assessment considered all cumulative projects, identified in **Section 4.1**. The criteria of frequency and consequence and risk score definitions are outlined within the risk assessment methodology (**Annex A**).

The results of the cumulative impact assessment are given in **Table 16**. All impacts were assessed to be acceptable with all scoring Negligible or Low, with the exception of the impact on ship contact risk, which was assessed to be ALARP, due to the reduction in overall channel width when vessels are alongside. This determination was driven by frequency due to the increased usage of berths in the lower reaches of the river by up to panamax sized vessels (**Table 10**) and informed by existing reported contact accident rates within the River Tees (**Section 3.4**).

Table 16: Cumulative Impact Assessment

Identified Impact	Hazard Description	Likelihood	Consequence	Impact
Cumulative Impact due to increased vessel movements.	Impact on ship collision risk;	Unlikely	Moderate	Low
	Impact on grounding risk;	Unlikely	Moderate	Low
	Impact on foundering / swamping risk.	Unlikely	Minor	Negligible
Cumulative Impact due to reduction in overall channel width when vessels alongside.	Impact on ship contact risk;	Possible	Moderate	ALARP
	Impact on grounding risk;	Unlikely	Moderate	Low
	Impact on mooring / breakout risk	Unlikely	Minor	Negligible

8.4 POSSIBLE ADDITIONAL RISK CONTROL MEASURES

A number of additional risk control measures were identified, informed by stakeholder consultation, aimed at further reducing the residual risk during the construction and operation phases of the Project.

Table 17 provides a description of each of the proposed mitigation measures. The individual hazards to which they apply are indicated within **Table 18** and the hazard logs in **Annex E** and **Annex F**. While all hazards have been assessed to be ALARP or lower, it is recommended that consideration is given to their implementation with a view to further reducing risk.

The hazards to which additional risk control measures apply and their effectiveness are shown in **Table 18**. Risk control measures showed a risk reduction effectiveness for 10 hazards in the operation phase and 2 in the construction phase.

The majority of risk controls are aimed at the protection third party property such as overhead cables and overhanging blades and, therefore, show little effectiveness on the majority of pre-existing hazards (which are carefully managed and mitigated through the implementation of embedded risk control measures and procedures by PD Ports), the recommended additional mitigation measures are

effective in the reduction of those hazards introduced to for individual assessment due to nature of proposed Project activities (See **Table 9**).

The hazard showing the greatest risk reduction in the construction phase was 'Contact berth – Tanker' with an effectiveness of 11% driven by risk control measure 4. The hazard showing the greatest risk reduction in the operation phase was 'Contact Overhead Power Cables - Project Cargo' with a reduction of 38% driven by the implementation of risk controls 2, 3 and 4.

Table 17: Possible Additional Risk Control Measures

ID	Risk Control Measure	Phase	Description
1	Marking and lighting of overhanging blades	O	For example, via temporary special marks or flood lighting. Promulgated via Notice to Mariners (NtM) and VTS broadcasts.
2	High-air draught vessels / vessels carrying large cargoes to use downstream berth only.	O	To deconflict large vessels and cargoes with the overhead cables located to the south of the project site.
3	Introduction of a safety zone in vicinity of overhead cables (Figure 22).	O	Whereby vessels may not enter if they or their load exceeds the given height restrictions. Pylon minimum height is 93.2m plus additional 5.3m safety factor (referenced as 87m from Chart Datum on navigational chart).
4	Review of tug operations and towage requirements	C/O	For example: <ul style="list-style-type: none"> - Use of additional towage for high-air draught vessels / vessels carrying large cargoes navigating to and from berthing pocket - Use of additional tugs for turning on to Sabic berths Guidance to be determined by the port.

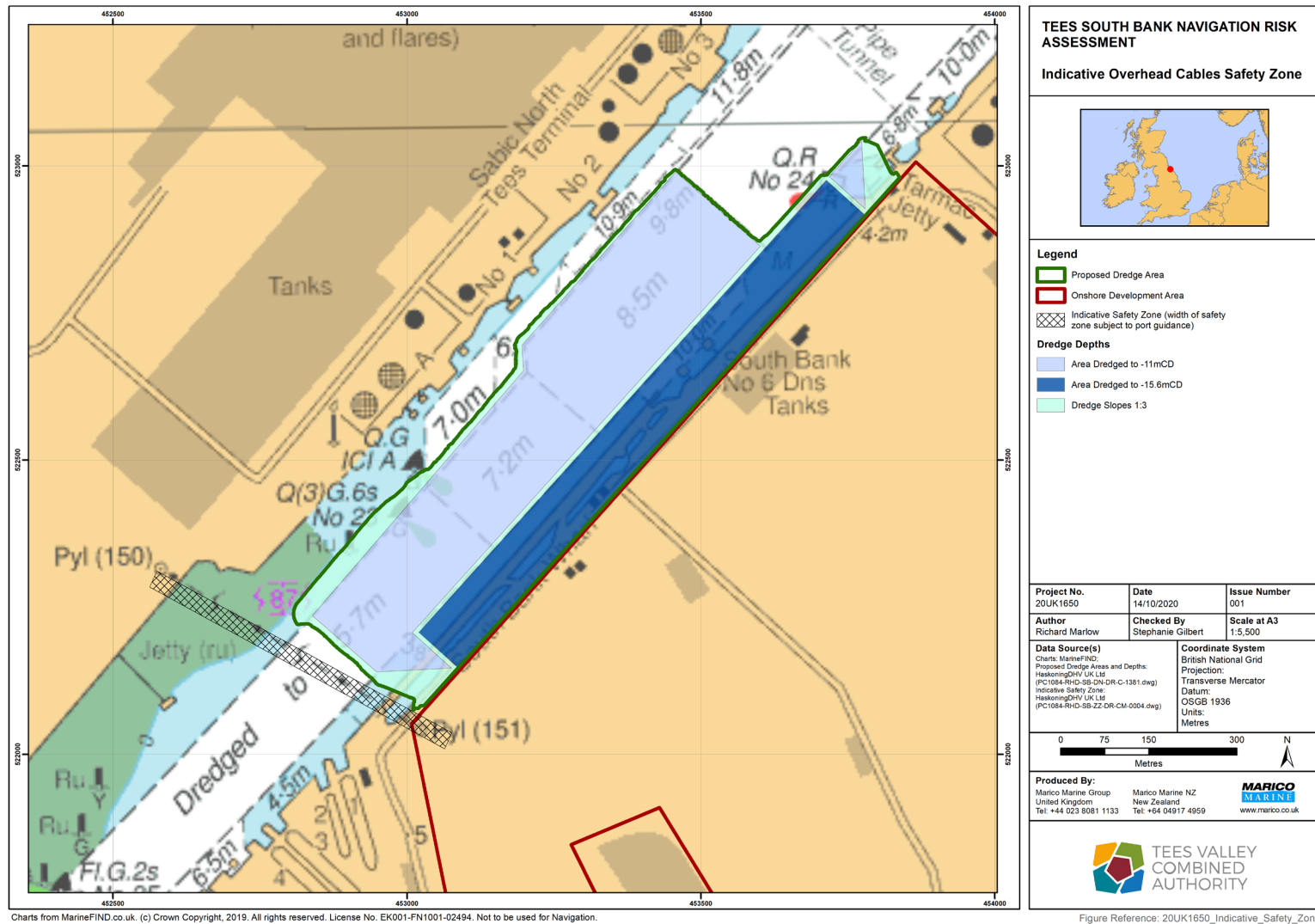


Figure 22: Indicative Overhead Cables Safety Zone

Table 18: Additional Risk Control Effectiveness

ID	Hazard Title	Phase	Risk Score	Risk Controls	Risk Score	Risk Reduction	Effectiveness
21	Contact berth - Tanker	Construction	5.10	4: Review of tug operations and towage requirements	4.54	0.56	-11%
		Operation	5.50	4: Review of tug operations and towage requirements	5.10	0.40	-7%
22	Contact berth - General Cargo Vessel	Operation	4.51	4: Review of tug operations and towage requirements	4.12	0.39	-9%
24	Contact berth - Project Cargo Vessel	Operation	2.66	4: Review of tug operations and towage requirements	2.27	0.39	-15%
26	Contact vessel alongside berth - Tanker	Construction	3.92	4: Review of tug operations and towage requirements	3.73	0.19	-5%
		Operation	5.05	1: Marking and lighting of overhanging blades 4: Review of tug operations and towage requirements	4.45	0.60	-12%
27	Contact vessel alongside berth - General Cargo Vessel	Operation	4.72	1: Marking and lighting of overhanging blades 4: Review of tug operations and towage requirements	4.45	0.27	-6%
28	Contact vessel alongside berth - Workboat	Operation	3.13	1: Marking and lighting of overhanging blades	2.00	1.13	-36%
29	Contact vessel alongside berth - Project Cargo Vessel	Operation	5.18	1: Marking and lighting of overhanging blades 4: Review of tug operations and towage requirements	4.90	0.28	-5%
30	Contact vessel alongside berth - Recreational Vessel	Operation	0.69	1: Marking and lighting of overhanging blades	0.69	0.00	0%
31	Contact Overhead Power Cables - General Cargo vessel	Operation	2.52	2: High-air draught vessels / vessels carrying large cargoes to use downstream deep-water berth only; 3: Introduction of Safety Zones in vicinity of overhead cables; 4: Review of tug operations and towage requirements.	2.43	0.09	-3%
32	Contact Overhead Power Cables - Project Cargo	Operation	4.03	2: High-air draught vessels / vessels carrying large cargoes to use downstream end of berth; 3: Introduction of Safety Zones in vicinity of overhead cables; 4: Review of tug operations and towage requirements.	2.52	1.51	-38%

9 CONCLUSIONS AND RECOMMENDATIONS

PD Port's Teesport is experienced in the handling of large and hazardous cargoes, and through its Marine Safety Management system (MSMS) has effectively implemented a suite of embedded mitigation measures ensuring that the risk profile remains at acceptable levels.

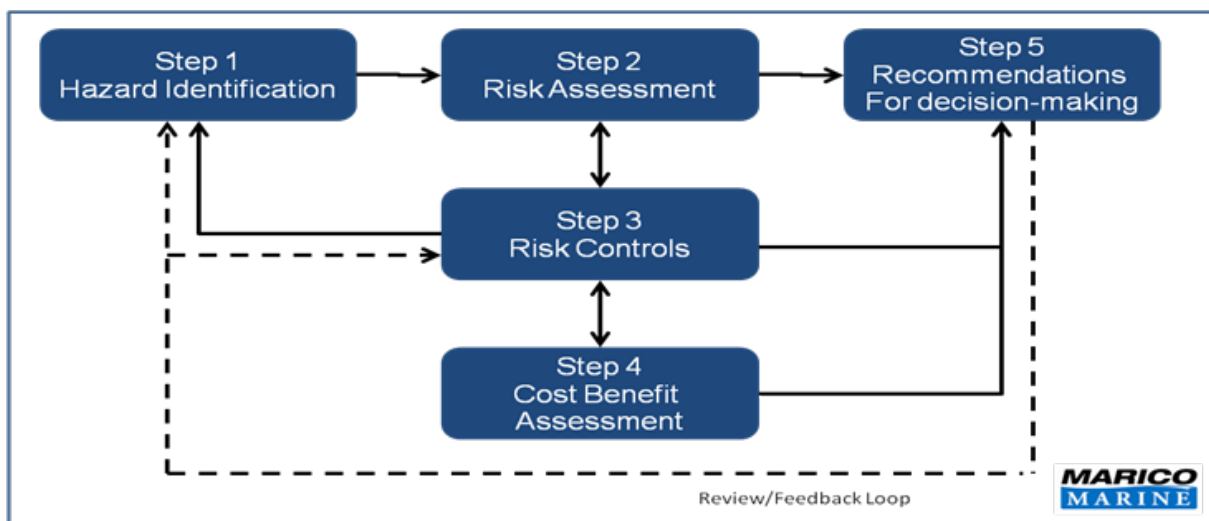
The proposed activities associated with the Project have been assessed and it has been concluded that the Project should have a minimal effect on the existing risk profile which would be managed and contained assuming compliance with embedded mitigation and regulations covering movements, pilotage, towage, VTS and procedures.

The possible additional mitigation measures identified are largely to protect third party property, for example; overhead power cables, other shipping and overhanging blades. Although all hazards were scored as ALARP or lower, it is recommended that consideration is given to the implementation of the recommended possible additional risk control measures to further reduce the hazards to which they apply, particularly those within the ALARP band which should be reduced unless there is a disproportionate cost to the benefits obtained.

Annex A Navigation Risk Assessment Methodology

RISK ASSESSMENT METHODOLOGY

The Navigation risk assessment methodology was based on the Formal Safety Assessment methodology as adopted by IMO. It also follows the guidance set out within the Port Marine Safety Code. Marico Marine uses a form of risk assessment that has been specifically adapted for navigational use. It is unique to Marico and is fundamentally based on concepts of “Most Likely” and “Worst Credible”, which reflect the range of outcomes arising from a shipping accident. This approach matches marine incident data that is customarily available. It is relevant that incident data often shows a high frequency of “Most Likely” events, separated from a much lower frequency of “Worst Credible” events.

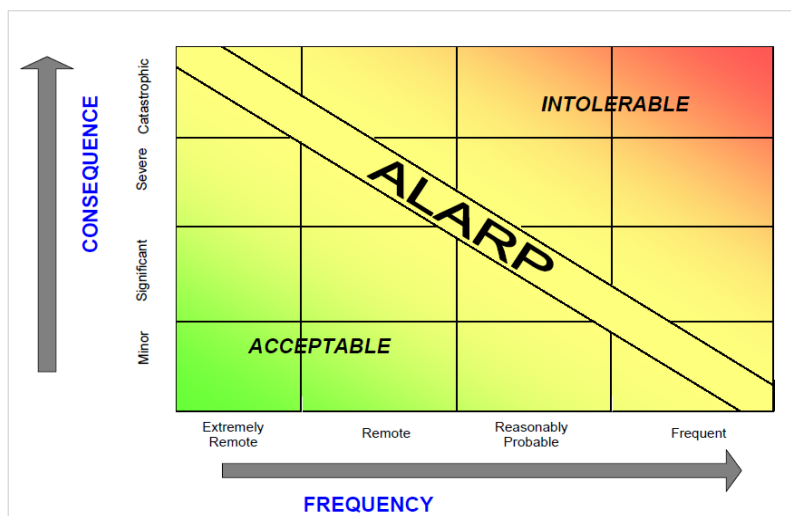


Formal Safety Assessment Risk Assessment Process.

IMO Guidelines define a hazard as “something with the potential to cause harm, loss or injury”, the realisation of which results in an accident. The potential for a hazard to be realised can be combined with an estimate or known consequence of outcome. This combination is termed “risk”. Risk is therefore a measure of the frequency and consequence of a particular hazard. One way to compare risk levels is to use a matrix approach as illustrated below. At the lowest end of the scale, frequency is extremely remote and consequence insignificant such that a risk can be said to be negligible. At the high end, where hazards are defined as frequent and the consequence catastrophic, then risk is termed intolerable. Between the two lies an area known “As Low As Reasonably Practicable” (ALARP).

The IMO guidelines allow the selection of definitions of frequency and consequence to be made by the organisation carrying out the risk assessment. This is important, as it allows risk to be applied in a qualitative and comparative way. To identify high risk levels in a purely mathematically quantitative way would require a large volume of casualty data, which is rarely available in the maritime context. ALARP can be accepted as being “Tolerable”, if the further reduction of the risk is impracticable, or if

the cost of such reduction would obviously be highly disproportionate to the improvement. It can also be considered “Tolerable”, if the cost of reducing the risk is greater than any improvement gained.



Frequency / Consequence Chart.

This NRA used accident categories to organise hazards for assessment. The hazard categories identified as relevant to this study were as follows

Hazard Categories

Ref	Hazard Category	Hazard Detail	Comments	Individual Assessed Hazards
1	Collision	All Vessel Types	Two or more vessels impact each other whilst manoeuvring.	14
2	Contact	Berth	One or more vessels makes contact with a berth, pier or jetty.	5
		Vessel Alongside Berth	One or more vessels makes contact with a stationary / berthed vessel. Also known as striking.	5
		Navigation Buoy	One or more vessels makes contact with a navigation buoy. Also known as striking.	5
		Overhead Power Cables ⁸	One or more vessels makes physical contact with the overhead power cables.	2
3	Grounding	All Vessel Types	A vessel unintentionally makes contact with the seabed.	5

⁸ New hazard. Introduced to for individual assessment due to nature of proposed Project activities.

Ref	Hazard Category	Hazard Detail	Comments	Individual Assessed Hazards
4	Foundering / Swamping	All Vessel Types	A vessel fills with water for any reason including capsizing, and when overwhelmed, sinks.	2
5	Mooring Incident / Breakout	All Vessel Types	A vessel ranges (moves excessively) whilst alongside the berth or when one or more mooring lines fail resulting in the vessel unintentionally breaking away from its moored position.	5
6	Tug Girting / Towing Incident	Tugs Only.	A tug in difficulty/girts during towage operations (for example during a project cargo operation).	1

Each hazard was reviewed with respect to cause and effect. Frequencies were then derived for notional “Most Likely” and “Worst Credible” hazard events in each case, using the frequency bands defined below.

Frequency Criteria.

Scale	Description	Definition
F1	Rare	An event that could happen or has happened beyond 10 years
F2	Unlikely	An event that could happen or has happened between 1 to 10 years.
F3	Possible	An event that could happen or has happened between 6 months to 1 year.
F4	Likely	An event that could happen or has happened between 1 and 6 months.
F5	Frequent	An event that could happen or has happened in 1 month.

Assessment of Consequence

Using the assessed notional frequency for the “most likely” and “worst credible” scenarios for each hazard, an assessment was made for the consequences to people, property, environment and business, using the criteria outlined below.

Consequence Criteria.

Cat	People	Property	Environment	Business
1	Negligible Possible very minor injury (e.g. bruising)	Negligible Costs <10k	Negligible No effect of note. Tier1 <u>may</u> be declared but criteria not necessarily met Costs <10k	Negligible Costs <10k
2	Minor (single minor injury)	Minor Minor damage Costs 10k –100k	Minor Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity CEAS Site warning Costs 10K–100k	Minor Bad local publicity and/or short-term loss of revenue Costs 10k – 100k
3	Moderate Multiple minor or single major injury	Moderate Moderate damage Costs 100k - 1M	Moderate Tier 2 spill criteria reached but capable of being limited to immediate area within site COMAH site evacuation Costs 100k -1M	Moderate Bad widespread publicity Temporary suspension of operations or prolonged restrictions Costs 100k - 1M
4	Major Multiple major injuries or single fatality	Major Major damage Costs 1M -10M	Major Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release COMAH local evacuation Costs 1M - 10M	Major National publicity, Temporary closure Costs 1M -10M
5	Catastrophic Multiple fatalities	Catastrophic Catastrophic damage Costs >10M	Catastrophic Tier 3 oil spill criteria reached. International support required. Widespread shoreline contamination. Serious chemical or gas release. Significant threat to environmental amenity. COMAH major area evacuation Costs >10M	Catastrophic International media publicity. Operations and revenue seriously disrupted for more than two days. Ensuing loss of revenue. Costs >10M

Note that the Oil Pollution Preparedness, Response Co-operation Convention⁹ defines the following response levels for oil spills in the United Kingdom:

- Tier 1 Local (within the capability of the operator on site): A Tier 1 response is the lowest response level and requires resources to be available locally. Depending on the characteristics of the oil this may or may not include the use of dispersants. By definition these resources must be at or near the incident site. It is expected that these resources will be deployed as quickly as operational circumstances allow.
- Tier 2 Regional (beyond the in-house capability of the operator): For larger pollution incidents, local resources may be insufficient to deliver a proper response. In these cases it may be that resources from a regional centre will be required. A key component of UK offshore Tier 2 response is that operators are expected to have this capability mobilised and applied within 2 to 6 hours of an oil pollution incident.
- Tier 3 National (requiring national resources): For very large pollution incidents, resources supplied from national and international sources may be required. A key component of UK offshore Tier 3 response is that operators are expected to have this capability mobilised and applied within 6 to 18 hours of an oil pollution incident.

Using the assessed notional frequency for the “Most Likely” and “Worst Credible” scenarios for each hazard, the probable consequences associated with each were assessed in terms of damage to:

- People - Personal injury, fatality etc.;
- Property – including third party;
- Environment - Oil pollution etc.; and
- Business - Reputation, financial loss, public relations etc.

The magnitude of each is then assessed using the consequence categories as shown in the table below. These have been set such that the consequences in respect of property, environment and business have similar monetary equivalent outcomes.

⁹ The Merchant Shipping (Oil Pollution Preparedness, Response Co-operation Convention) Regulations 1998, Statutory Instrument 1998 No. 1056

Project Risk Matrix.

Consequences	Cat 5	5.1	5.9	7.0	8.3	10.0
	Cat 4	4.1	4.9	5.9	7.4	9.4
	Cat 3	2.9	3.5	4.4	5.9	8.3
	Cat 2	1.5	1.8	2.4	3.5	5.9
	Cat 1	0	0	0	0	0
	Frequency	>10 years	1-10 years	6 months to 1 year	1 to 6 months	Within 1 month

Navigation hazards are identified by the project team and scored for “frequency” and “consequence” and in terms of a “Most Likely” and “Worst Credible” outcome, with results documented in a “Hazard Log”.

Risk bands

Matrix Outcome	Risk Definition	Action Taken
0 – 1.99	Negligible Risk	A level where operational safety is unaffected.
2 -3.99	Low risk	A level where operational safety is assumed.
4 – 5.99	As Low As Reasonably Practicable (ALARP)	A level defined by study at which risk control in place is reviewed. It should be kept under review in the ensuing SMS.
6 – 7.99	Significant Risk	A level where existing risk control is automatically reviewed and suggestions made where additional risk control could be applied if appropriate. Significant risk can occur in the average case or in individual categories. New risk controls identified should be introduced in a timescale of two years.
8 - 10	High Risk	A level requiring immediate mitigation.

The frequency and consequence scores are assessed to give two distinct risk scores;

- The average risk score of the categories in the “most likely” set;
- The average risk score of the categories in the “worst credible” set;]

These scores are combined using a weighted average to produce a single numeric value representing the final risk score for each hazard, between 0 (negligible) and 10 (high) following which, the final risk scores are sorted into a ranked hazard list.

Hazard risk scores are categorised as either negligible, low, As Low as Reasonably Practicable (ALARP), significant or high, where ALARP represents a level of risk is neither acceptable nor unacceptable and for which further investment of resources for risk reduction may or may not be justifiable – i.e. risks

which fall within the ALARP band should be reduced unless there is a disproportionate cost to the benefits obtained.

Navigation hazards with a risk score of significant or high are deemed unacceptable and, as such, additional risk control measures must be implemented to reduce the risk to an acceptable level.

Annex B Stakeholder Consultation Minutes

Minutes from Remote Consultation – Tees Bay Pilots

Project:	South Bank Development Project
Email Sent:	08/09/2020
Email Feedback Received on:	08/09/2020
From:	Richard Marlow (Marico Marine)
To:	Jonathan Nuttall (Tees Bay Pilots)

Item	Notes for the Record	Actions
1	Introduction	
	<p>MM introduced the project:</p> <ul style="list-style-type: none"> Project layout, navigation chart and vessel movement / dredge schedule reviewed. AIS vessel traffic plots reviewed. 	
2	General Observations	
	<p><u>Dredging</u></p> <ul style="list-style-type: none"> 3-week berth dredge will require pilotage. The vessels utilised for the rest of the dredging campaign will not require pilotage. Windfarm/ heavy lift vessels during the operational phase will require pilotage. Dredge to 23-buoy would allow 11m draught vessels to manoeuvre. The existing dredge plan would not allow deep draught vessels to manoeuvre in vicinity of the proposed berths. <p><u>Vessel Length Considerations</u></p> <ul style="list-style-type: none"> The project will impact SABIC's operations on the opposite side of the river. While a tanker is at one of SABIC's berths it would not be possible to swing a 200m barge end on. All vessels >200m would need to be swung in the turning circle. It was questioned whether the turning circle would be dredged? If the project is intending to turn large deep draught vessels here then it will need to be dredged. The turning circle is currently dredged to 8.8m. If the turning circle is not dredged the existing Teesport regulations will maintain navigation safety but may affect the arrival and departure times of deep draught vessel using the proposed berth. Vessels taken into North Tees Terminal 4 are limited to either side of High Water (HW) to obtain appropriate water depths (currently 8.5m). AV Dawson's, based upriver of the transporter bridge, currently has a 200m berth limit, however there is intention to take larger vessels in the future. Cable layers, barges and cargo ships are all successfully taken into this berth. 	
3	Hazard Identification	

<p>Generally, does not consider the project to add any additional risks that cannot be effectively mitigated through enforcement of existing procedures. The location is fitting to serve such a purpose.</p> <p><u>Construction Phase</u></p> <p><u>Collision</u></p> <ul style="list-style-type: none">Using TOS and traffic control will reduce the risk. This worked well during the previous dredging campaign undertaken within the river. It was sometimes difficult to get the hopper dredgers to move out of the way, as once the legs are down they are reluctant to move. This would be an issue particularly in the turning area which is considered to be the highest risk area. This will be particularly important if the dredgers are very large. <p><u>Contact</u></p> <ul style="list-style-type: none">The consequence of a contact will increase if there are multiple people on board the dredgers and construction vessels. <p><u>Grounding</u></p> <ul style="list-style-type: none">The risk of / resulting from grounding are not considered to increase as, within the channel dredging will increase water depths, and existing regulations would prevent turning large deep-draught vessels in the turning circle at its current dredge levels. <p><u>Breakout</u></p> <ul style="list-style-type: none">Break-out of a barge may lead to grounding.High-sided ships should be included within the risk assessment. <p><u>Operational Phase</u></p> <p><u>Collision</u></p> <ul style="list-style-type: none">No increase in risk. <p><u>Contact</u></p> <p>Narrower channel may increase contact risk.</p> <ul style="list-style-type: none">Currently management standards do not include swing instructions. Given the narrowing, it may be that additional tugs are required to swing on to the SABIC berths.Potential for contact with pylon over-head wires was discussed. It was suggested that a 'safety zone' should be enforced whereby vessels may not enter if they or their load exceeds the given height restrictions.Towage may also be utilised to prevent break-out into the overhead wires. – The closest (12m) berth should use additional towage. Building this into port regulation would ensure it is enacted, make it easier to enforce and prevent disputes (for example by vessels with DP).Review tug operations and towage requirements.Treating each windfarm vessel move as a 'project move', initially at least, would reduce the risk of contact. <p><u>Grounding</u></p> <ul style="list-style-type: none">No increased risk. <p><u>Snagging</u></p>	
---	--

	<ul style="list-style-type: none"> • The two pipelines within the project area were discussed. Vessels do not anchor in these areas. Vessels would use anchors further downstream. • NTM would prevent people using anchors near to the pipelines. Maintaining communication should mitigate this risk. • Vessels occasionally use anchors to assist manoeuvring in the river. 	
4	Other	
	<p><u>Marking and Lighting</u></p> <ul style="list-style-type: none"> • No additional lighting would be required. – LEDs are so bright they can hinder rather than aid navigation. • May be worth establishing a buoy marking the downstream approaches to the proposed berth. • Other berths have white stripes marking the limits. • 24 buoy could be relocated to up-river, as it occasionally can obstruct navigation, and a winker buoy could be used to mark the berths. 	
5	Actions	
	<ul style="list-style-type: none"> • Requested that the project drawings and project information be sent through for sharing internally. • Questioned the exact width of the berths. 	

Minutes from Remote Consultation – Cleveland Emergency Planning Unit

Project:	South Bank Development Project
Email Sent:	08/09/2020
Email Feedback Received on:	08/09/2020
From:	Richard Marlow (Marico Marine)
To:	Tim Shurmer (Cleveland Emergency Planning Unit)

Item	Notes for the Record	Actions
1	Introduction	
	<p>MM introduced the project:</p> <ul style="list-style-type: none"> Project layout, navigation chart and vessel movement / dredge schedule reviewed. AIS vessel traffic plots reviewed. 	
2	Hazards / Issues	
	<p>Immediately opposite the planned quay development are two high tier COMAH sites. Navigator marine terminals and SABIC. On the south side immediately adjacent is SABIC Teesport a lower tier COMAH site.</p> <ul style="list-style-type: none"> Tanker berths with vessel moored transporting goods to and from high level COMAH site. <p>There is a pipeline corridor (containing multiple major accident hazard pipelines), the South Tees Linklines, lies under the dredge area at the downstream end of the site. SM is unaware of the depth of the pipelines beneath the riverbed. Cembcorp maintains the Linkline corridor.</p> <p><u>Hazard Identification</u></p> <p><u>Construction Phase</u></p> <ul style="list-style-type: none"> Personal Safety for construction vessel crews in vicinity of COMAH sites in the event of a COMAH release (aware that Port does have some means of warn and inform but advised that there would be value in linking in reference relay of warnings / advice from sites to shelter etc). Potential for collision between construction vessels / dredgers with tankers carrying chemicals. Contact with tankers moored alongside at the berth opposite or with tanker jetty, particularly loading arms, potential leading to oil, chemical or gas release / spill. Barge break-out leading to potential contact. Risk of damaging pipeline during dredging operations. <p><u>Operational Phase</u></p> <ul style="list-style-type: none"> Personal Safety for construction vessel crews in vicinity of COMAH sites in the event of a COMAH release. 	

	<ul style="list-style-type: none"> • Potential for collision between project vessels with tankers carrying chemicals. • Contact with tankers moored alongside at the berth opposite or with tanker jetty, particularly loading arms, potential leading to oil, chemical or gas release / spill. • Barge break-out leading to potential contact. • Contact with the National Grid transmission lines at the upstream end of the site. Questioned the height of the transmission lines. Checked charts but it was noted that only the pylon height, which does not account for catenary, was specified. Marico to follow up with PD Ports to establish catenary / clearance height. 	
Other		
	<ul style="list-style-type: none"> • It was mentioned there was a positive tidal surge in 2013 which lead to flooding in the vicinity of the project development area. <p>Pipeline under river downstream of the turning area:</p> <ul style="list-style-type: none"> • Flagged as an additional consideration as proposed dredging in line with Tees Dock is closer to this tunnel than the Able project 	

Minutes from Remote Consultation – PD Ports, Teesport

Project:	South Bank Development Project
Email Sent:	08/09/2020
Feedback Received Via:	Teams Meeting
Date of Meeting:	16/09/2020
Marico Marine:	Richard Marlow, William Heaps
PD Port, Teesport:	Paul Brooks, Chris Stocks

Item	Notes for the Record	Actions
1	Introduction	
	<p>MM introduced the risk assessment methodology:</p> <ul style="list-style-type: none"> Dredging / construction phase and post-works operation phase to be assessed independently. Teesport requested that the final hazard logs be passed to Teesport on completion. 	
2	Project	
	<p>Dredging programme discussed.</p> <ul style="list-style-type: none"> Teesport – considered the extra 20 movements per day to be manageable. Recent experience of dredging showed that VTS (TOS) liaison and timing was effective. Training wall opposite upstream end of the South Bank development site is a SSSI and the dredge comes very close to the training wall. Channel dredge goes over the top of two pipeline tunnels, depth of upstream tunnel is around 6m (operated by SembCorp). <p>It is expected that hopper barges will be under the PEC limit. Pilotage is compulsory for all vessels greater than 95m LOA.</p> <p>Power cable height was discussed – Teesport confirmed that minimum height was 93.2m plus additional 5.3m safety factor. The effective safe height is, therefore, 87.9m. Agreed to add as new hazard to the log.</p> <p><u>COMAH Incidents</u></p> <ul style="list-style-type: none"> Covered in the PD Port’s Emergency plan, COMAH berth operators plan, including offsite plan. Vessels underway are warned by VTS. <p><u>Marking and Lighting</u></p> <ul style="list-style-type: none"> Nav aids are under review. Number 23 expected to remain in position. Number 24 buoy will be required at least for the first phase of the dredging. Lights on the berth yet to be decided. 	

	<p><u>In-Combination sites</u></p> <p><u>Northern Gateway (PD Ports)</u></p> <ul style="list-style-type: none"> Initially conceived in 2000. Container terminal dredged to 15m berth pocket. 1,000m long berth (2 vessels) to handle medium sized (approximately 12,000 TU) vessels. Expecting one move per day. Project currently on hold. <p><u>York Potash</u></p> <ul style="list-style-type: none"> Initially use the old Red Car bulk terminal berth, then extend to the south. Panamax vessels 70-80,000 tonnes. 10 million tonnes per year. Approximately 200 move per year. <p><u>MGT Power</u></p> <ul style="list-style-type: none"> Biomass plant at number one berth Tees Dock. Re-use of existing berth expecting 2 vessels per week from Q2 2020. 	
3	Hazard Identification	
	<p>Overall Teesport considered the hazard profile would increase slightly over the construction phase, before reverting back to similar risk profile during the established operational phase.</p> <p>It is considered that while the frequency of the identified hazards in the Teesport Navigation Risk Assessment may increase, the consequences will largely remain the same.</p> <p><u>Construction Phase</u></p> <ul style="list-style-type: none"> Collision risk highest in vicinity of Tees Dock and turning circle. Dredger should show RAM shapes / lights. Collision risk frequency increases with both the additional hopper traffic plus the manoeuvring in and around the barge. Contact increased frequency due to increase in traffic plus manoeuvring. Grounding unchanged. Break-out increase due to risk of hoppers breaking loose from dredger while loading. <p><u>Operational Phase</u></p> <ul style="list-style-type: none"> Hazard risk scores only marginally increased from current levels. Barge movements will initially be treated as project moves using PD Ports procedures. (PD Ports are experienced in handling large project moves). Current movements are 2/3 of those in 2005, therefore, increased level of movements should easily be contained (business as usual). Overhanging blades from vessels - Can be mitigated. Need some clarification on the number of ships per year 	
4	Risk Controls	
	<ul style="list-style-type: none"> Review regulations concerning using anchor to manoeuvre in river due to the reduction of river bed clearance over tunnels following dredging. 	

	<ul style="list-style-type: none"> • Hold regular meetings with dredge contractors during dredging operations. • No additional risk control measures anticipated at this stage as current RC's considered to be sufficient. 	
	Other	
	<ul style="list-style-type: none"> • Pilotage - Tees Bay Pilots requested clarification on whether pilotage would be required for the suction dredger works. Teesport confirmed that this would be the case • Downstream Tunnel – In their consultation response, Cleveland Emergency Planning Unit commented on the pipeline tunnel running under the river downstream of the turning area as an item to be considered. Teesport confirmed that there is no risk to this tunnel from this project as its proximity is away from the proposed works area. 	

Minutes from Remote Consultation – Tees Licensed Foyboatmen Association

Project:	South Bank Development Project
Email Sent:	08/09/2020
Email Feedback Received on:	18/09/2020
From:	Richard Marlow (Marico Marine)
To:	Lee Scott (Tees Licensed Foyboatmen Association)

Item	Notes for the Record	Actions
1	Introduction	
	<p>MM introduced the project</p> <ul style="list-style-type: none"> Project layout, navigation chart and vessel movement / dredge schedule reviewed. AIS vessel traffic plots reviewed. 	
2	TLFA Operations	
	<ul style="list-style-type: none"> TLFA operate both workboats and linesmen ashore with 42 staff in total – 21 per day, 14 on watch at any given time with a 06:00-14:00, 14:00-22:00, 22:00-06:00 shift pattern. TLFA vessels do not carry AIS. Some projects/ vessels past A-jetty require workboat assistance, however, TFLA rarely take workboats beyond A-jetty. TLFA shore crew will require workboats to run lines when mooring large vessels on the new quay. TLFA provides a complete mooring service for the majority of project ships and barges, although projects may utilise their own staff ashore. Taking jackets on and off the berth would be man-power heavy requiring 8-10 personnel for a wind-farm construction vessel. Lead times would be important if these services are required. 	
3	Hazard Identification	
	<ul style="list-style-type: none"> TLFA commented that the river is not busy and can easily handle additional traffic. TLFA does not consider there to be a significant increase in hazards. TLFA is unaware of any issues with the split barges during the 2-year dredging in the Tees dock. The biggest risk to TLFA would be if activities associated with the project (such as channel dredging) cause operational delays (for example at the opposite tanker berth), resulting in working time directive issues if staff run over their shift hours. 	

Minutes from Remote Consultation – Svitzer

Project:	South Bank Development Project
Email Sent:	08/09/2020
Feedback Received Via:	Teams Meeting
Date of Meeting:	23/09/2020
Marico Marine:	Richard Marlow, William Heaps
Svitzer:	Steve Hosie, Gavin Girling, Richard Spalding

Item	Notes for the Record	Actions
1	Introduction	
	<p>MM introduced the project:</p> <ul style="list-style-type: none"> Project layout, navigation chart and vessel movement / dredge schedule reviewed. AIS vessel traffic plots reviewed. 	
2	Svitzer Operations	
	<ul style="list-style-type: none"> Svitzer operate 5 tugs based on the Tees (2 x 65tpb, 3 x 40 tpb) plus 3 tugs (1 x70, 1 x 65 and 1 x 40) at the Tyne (allow 2.5 to 3 hours between ports). In poor weather, Svitzer provides towage to windfarm vessels, even though they are self-propelled. Svitzer commented that it is able to accommodate additional demand, however, lead times will be necessary to plan / schedule. 	
3	Hazard Identification	
	<ul style="list-style-type: none"> The busiest areas are downstream of the proposed berth. Svitzer commented that, even with the additional movements the port will still be less busy that when the steelworks were operational. SV operations decreased by 30% when the steelworks closed. <p>Construction Phase</p> <p><u>Collison</u></p> <ul style="list-style-type: none"> Slight increase in risk from current levels, however, can be effectively managed by NTM and VTS. <p><u>Contact</u></p> <ul style="list-style-type: none"> Slight increase due to increased traffic to South Bank and turning in river. <p><u>Grounding</u></p> <ul style="list-style-type: none"> No change (risk should decrease following dredging). <p>Operational Phase</p> <ul style="list-style-type: none"> Risk profile should remain similar to current profile. <p><u>Break-out</u></p>	

	<ul style="list-style-type: none"> Discussed impact of power cable/ pylons upstream of the site and high air draught cargoes. Use of deep-water downstream berth for high air-draught vessels and cargoes would help deconflict with pylons. Review of towage guidelines was recommended for high air draught vessels. Project move standard operating procedures should consider this hazard. A tug could be used to push barges while they are unloading to prevent them from breaking out and drifting towards wires. <p><u>Navigation Aids</u></p> <ul style="list-style-type: none"> No comments <p><u>Anchoring</u></p> <ul style="list-style-type: none"> The use of anchors to manoeuvre in the river is rare and only used in an emergency. 	
4	Risk Controls	
	<ul style="list-style-type: none"> Communication is considered to be key to prevent impacts to existing operations. NTM will ensure all river users are aware of the intended works. Existing mitigation measures enacted by the Tees Port should be sufficient to mitigate any risk increase. New berths should be charted. 	
5	Other	
	<ul style="list-style-type: none"> Svitzer questioned if any of the river would be shut -off during dredging operations - Marico explained that to its knowledge closure of the river was not being considered and that operations will be controlled through VTS. Continued access is Svitzer’s priority. Svitzer questioned if project vessels will utilise the turning circle? <p><u>Overhanging blade marking and lighting:</u></p> <ul style="list-style-type: none"> Svitzer - Will overhanging blades be lit during the night? Marico – Mitigation will be proposed during the assessment – lighting at night, marking during the day <p><u>Overhanging blade height:</u></p> <ul style="list-style-type: none"> Svitzer - Will tugs be able to navigate under the overhang? Marico – This should not be an issue due to the height of the jack-up <p><u>Vessel types:</u></p> <ul style="list-style-type: none"> Svitzer - What types/sizes of jack-up vessels are anticipated Marico - Example is Voltaire, 160m x 60m 	
6	Actions	
	<ul style="list-style-type: none"> SV requested to be kept up to date with project developments and the project schedule as it evolves. Svitzer requested to be sent project information to share with the wider team. 	

Annex C Construction Phase Risk Assessment Hazard Log – Baseline with Embedded Mitigation

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
1	River	Collision	Collision - Tanker ICW Tanker	Tanker collides with another Tanker	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Fire and explosion.	Tanker breaks away from berth and lies across river. Collides with Tanker on river passage. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Tanker breaks away from berth and lies across river. Collides with Tanker on river passage. Multiple major injuries or single fatality; Major damage to property; Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release (COMAH); Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	2.5	4	4	4	5	1.0	3.14	
2	River	Collision	Collision - Tanker ICW General Cargo Vessel	Tanker collides with a General Cargo Vessel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Fire and explosion.	Tanker or General Cargo Vessel breaks away from berth and lies across river or collides with Tanker or General Cargo Vessel on river passage. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Tanker or General Cargo Vessel breaks away from berth and lies across river or collides with Tanker or General Cargo Vessel on river passage. Multiple major injuries or single fatality; Major damage to property; Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release (COMAH); Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	3.5	4	4	4	5	2.0	3.84	
3	River	Collision	Collision - Tanker ICW Workboat (Including Dredgers)	Tanker collides with a Workboat (Including Dredgers)	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Pilot boarding and disembarkation operations. Tug ship towage operations. Fire and explosion.	Tanker collides with a ship assist tug or other Workboat on river passage. Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Tanker collides with a ship assist tug or other Workboat on river passage. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	2	1	1	1	4.5	4	3	1	3	3.0	3.79	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
4	River	Collision	Collision - Tanker ICW Project Cargo	Tanker collides with a Project Cargo move	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Fire and explosion.	Glancing blow. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on collision. Multiple major injuries or single fatality; Major damage to property; Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release (COMAH); Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	1.0	4	4	4	5	1.0	2.91	
5	River	Collision	Collision - Tanker ICW Recreational Vessel	Tanker collides with a Recreational Vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Recreational vessel most damaged. Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational vessel sunk. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	2	1	1	1	2.0	4	3	1	3	1.0	2.21	
6	River	Collision	Collision - General Cargo Vessel ICW General Cargo Vessel	General Cargo Vessel collides with another General Cargo Vessel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Fire and explosion.	Two General Cargo Vessels collide whilst passing in the river. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Two General Cargo Vessels collide whilst passing in the river. Multiple major injuries or single fatality; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	2.5	4	4	3	5	1.0	3.07	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
7	River	Collision	Collision - General Cargo Vessel ICW Workboat (Including Dredgers)	General Cargo Vessel collides with a Workboat (Including Dredgers)	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Pilot boarding and disembarkation operations. Tug ship towage operations. Fire and explosion.	General Cargo Vessel collides with a ship assist tug or other Workboat on river passage. Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	General Cargo Vessel collides with a ship assist tug or other Workboat on river passage. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	2	1	1	1	4.5	4	3	1	3	3.0	3.79	
8	River	Collision	Collision - General Cargo Vessel ICW Project Cargo	General Cargo Vessel collides with a Project Cargo move	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Fire and explosion.	Glancing blow. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on collision. Multiple major injuries or single fatality; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	1.0	4	4	3	5	1.0	2.84	
9	River	Collision	Collision - General Cargo Vessel ICW Recreational Vessel	General Cargo Vessel collides with a Recreational Vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Recreational vessel most damaged. Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel sunk. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	2	1	1	1	2.0	4	3	1	3	1.0	2.21	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
10	River	Collision	Collision - Workboat (Including Dredgers) ICW Workboat (Including Dredgers)	Workboat (Including Dredgers) collides with another Workboat (Including Dredgers)	Mechanical defect / failure. Master / Skipper error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Fire and explosion.	Glancing blow. Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	One of the Workboats sinks. Multiple minor or single major injury; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	2	1	1	1	5.0	3	3	1	1	4.0	4.07	
11	River	Collision	Collision - Workboat (Including Dredgers) ICW Project Cargo	Workboat (Including Dredgers) collides with a Project Cargo move	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Pilot boarding and disembarkation operations. Tug ship towage operations. Fire and explosion.	Glancing blow (in particular tug whilst towing). Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on collision or Workboat being overrun. Multiple major injuries or single fatality; Major damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	2	1	1	1	3.5	4	4	2	2	2.5	3.16	
12	River	Collision	Collision - Workboat (Including Dredgers) ICW Recreational Vessel	Workboat (Including Dredgers) collides with a Recreational Vessel	Mechanical defect / failure. Master / Skipper error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Recreational vessel most damaged. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel sunk. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	2	2	1	1	2.0	4	3	1	2	1.0	2.24	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
13	River	Collision	Collision - Project Cargo ICW Recreational Vessel	Project Cargo move collides with a Recreational Vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Recreational vessel most damaged. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel sunk. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	2	2	1	1	1.0	4	3	1	2	1.0	2.10	
14	River	Collision	Collision - Recreational Vessel ICW Recreational Vessel	Recreational Vessel collides with another Recreational Vessel	Mechanical defect / failure. Skipper error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Glancing blow (especially during racing). Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel sinks. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	2	1	1	1	2.0	4	3	1	2	1.0	2.12	
15	River	Tug Girting	Tug Girting / Towing Incidents	A tug in difficulty/girts during towage operations (for example during a project cargo operation)	Mechanical defect / failure (tug or vessel being assisted). Master / Skipper error (tug or vessel being assisted). Adverse weather. Fire and explosion.	Tug overrun during towage operation. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Tug girts. Multiple major injuries or single fatality; Major damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	1	1	4.0	4	4	1	2	1.0	1.62	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
16	River	Contact	Contact - Tanker with Navigation Buoy	A Tanker contacts a navigational buoy in the approach channel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Navigation buoy is sunk. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	1	2	1	1	2.0	0.58	
17	River	Contact	Contact - General Cargo Vessel with Navigation Buoy	A General Cargo Vessel contacts a navigational buoy in the approach channel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Navigation buoy is sunk. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	1	2	1	1	2.0	0.58	
18	River	Contact	Contact - Workboat (Including Dredgers) with Navigation Buoy	A Workboat (Including Dredgers) contacts a navigational buoy in the approach channel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Navigation buoy is sunk. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	2	1	1	1	4.0	1	2	1	1	2.0	1.67	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
19	River	Contact	Contact - Project Cargo with Navigation Buoy	A Project Cargo contacts a navigational buoy in the approach channel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Navigation buoy is sunk. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	4.0	1	2	1	1	3.0	0.76	
20	River	Contact	Contact - Recreational Vessel with Navigation Buoy	A Recreational Vessel contacts a navigational buoy in the approach channel	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel is most damaged. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	2.0	1	1	1	1	1.0	0.00	
21	River	Contact	Contact berth - Tanker	A Tanker contacts a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Minor damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing at speed. Single minor injury; Moderate damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse national publicity. Medium-term suspension of operations or prolonged restrictions, major disruption to commercial activities.	1	2	2	1	5.0	2	3	3	4	3.5	5.10	4: Review of Tug Operations and Towage Requirements

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
22	River	Contact	Contact berth - General Cargo Vessel	A General Cargo Vessel contacts a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing at speed. Single minor injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	1	2	1	1	5.0	2	3	2	3	3.5	4.12	
23	River	Contact	Contact berth - Workboat (Including Dredgers)	A Workboat (Including Dredgers) contacts a berth	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing at speed. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	2	1	1	5.0	2	2	1	1	4.0	3.16	
24	River	Contact	Contact berth - Project Cargo Vessel	A Project Cargo contacts a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing at speed. Multiple minor or single major injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	1	1	3.0	3	3	2	2	2.0	1.54	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
25	River	Contact	Contact berth - Recreational Vessel	A Recreational Vessel contacts a berth	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	2	2	1	1	2.0	0.69	
26	River	Contact	Contact vessel alongside berth - Tanker	A Tanker contacts a vessel alongside a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Very minor injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Single minor injury; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse national publicity. Medium-term suspension of operations or prolonged restrictions, major disruption to commercial activities.	1	3	2	1	3.5	2	4	3	4	2.0	3.92	4: Review of Tug Operations and Towage Requirements
27	River	Contact	Contact vessel alongside berth - General Cargo Vessel	A General Cargo Vessel contacts a vessel alongside a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Very minor injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Single minor injury; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse national publicity. Medium-term suspension of operations or prolonged restrictions, major disruption to commercial activities.	1	3	2	1	4.0	2	4	3	4	2.0	4.22	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
28	River	Contact	Contact vessel alongside berth - Workboat (Including Dredgers)	A Workboat (Including Dredgers) contacts a vessel alongside a berth	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	2	2	1	1	5.0	2	2	1	1	4.0	3.53	
29	River	Contact	Contact vessel alongside berth - Project Cargo Vessel	A Project Cargo contacts a vessel alongside a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Multiple minor or single major injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	2	1	2.0	3	3	2	2	1.0	1.84	
30	River	Contact	Contact vessel alongside berth - Recreational Vessel	A Recreational Vessel contacts a vessel alongside a berth	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	2	2	1	1	2.0	0.69	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
31	River	Contact	Contact Overhead Power Cables- General Cargo vessel	A General Cargo Vessel contacts the Overhead Power Cables.	Incorect assessment of air-draught. Incorrect assessment of HOT. Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations.	Light contact from upper-works (mast/aerial). Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Bad local publicity. Temporary power disruption during cable inspection.	Heavy contact with overhead wire downing cable. Multiple major injuries or single fatality; Moderate damage to vessel. Tier 1 may be declared but criteria not necessarily met; Adverse national publicity. Medium-term suspension of operations or prolonged impact to regional power supplies, major disruption to commercial activities.	2	2	1	2	2.0	4	3	1	4	1.0	2.52	
32	River	Contact	Contact Overhead Power Cables - Project Cargo	A Project Cargo contacts the Overhead Power Cables.	Incorect assessment of air-draught. Incorrect assessment of HOT. Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations.	Light contact from upper-works (mast/aerial). Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Bad local publicity. Temporary power disruption during cable inspection.	Heavy contact with overhead wire downing cable. Multiple major injuries or single fatality; Moderate damage to vessel. Tier 1 may be declared but criteria not necessarily met; Adverse national publicity. Medium-term suspension of operations or prolonged impact to regional power supplies, major disruption to commercial activities.	2	2	1	2	1.0	4	3	1	4	1.0	2.36	
33	River	Grounding	Grounding - Tanker	A Tanker runs aground	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Very minor injury; Major damage to property; Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release (COMAH); Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	1	2	1	1	3.5	1	4	4	5	1.0	3.00	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
34	River	Grounding	Grounding - General Cargo Vessel	A General Cargo Vessel runs aground	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Very minor injury; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	1	2	1	1	2.5	1	4	3	5	1.0	2.68	
35	River	Grounding	Grounding - Workboat (Including Dredgers)	A Workboat (Including Dredgers) runs aground	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Single minor injury; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	5.0	2	3	1	1	4.0	2.07	
36	River	Grounding	Grounding - Project Cargo	A Project Cargo runs aground	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Very minor injury; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	1	2	1	1	3.0	1	4	3	5	1.0	2.78	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
37	River	Grounding	Grounding - Recreational Vessel	A Recreational Vessel runs aground	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	2	2	1	1	2.0	0.69	
38	River	Mooring Incident	Mooring Incident - Tanker	A Tanker is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Multiple minor or single major injury; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	1	1	5.0	3	3	1	2	3.0	1.81	
39	River	Mooring Incident	Mooring Incident - General Cargo vessel	A General Cargo Vessel is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Multiple minor or single major injury; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	1	1	5.0	3	3	1	2	3.0	1.81	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
40	River	Mooring Incident	Mooring Incident - Workboat (Including Dredgers)	A Workboat (Including Dredgers) is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	5.0	2	2	1	1	4.0	1.31	
41	River	Mooring Incident	Mooring Incident - Project Cargo	A Project Cargo is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Multiple minor or single major injury; Moderate damage to property; Tier 1 to Tier 2 criteria reached; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	1	1	2.0	3	3	2	2	1.0	1.26	
42	River	Mooring Incident	Mooring Incident - Recreational Vessel	A Recreational Vessel is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	2.0	2	2	1	1	1.0	0.56	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
43	River	Foundering	Foundering / Swamping - Workboat (Including Dredgers)	A Workboat (Including Dredgers) founders or is swamped by a passing vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Excessive speed. Fire and explosion.	Vessel takes on water whilst unattended. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel founders or is swamped whilst in service. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	4.0	4	3	1	1	3.5	2.38	
44	River	Foundering	Foundering / Swamping - Recreational Vessel	A Recreational Vessel founders or is swamped by a passing vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Excessive speed. Fire and explosion.	Vessel takes on water whilst unattended. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel founders or is swamped whilst in service. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	4	3	1	1	2.0	1.74	

Annex D Operation Phase Risk Assessment Hazard Log – Baseline with Embedded Mitigation

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
1	River	Collision	Collision - Tanker ICW Tanker	Tanker collides with another Tanker	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Fire and explosion.	Tanker breaks away from berth and lies across river. Collides with Tanker on river passage. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Tanker breaks away from berth and lies across river. Collides with Tanker on river passage. Multiple major injuries or single fatality; Major damage to property; Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release (COMAH); Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	2.0	4	4	4	5	1.0	3.05	
2	River	Collision	Collision - Tanker ICW General Cargo Vessel	Tanker collides with a General Cargo Vessel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Fire and explosion.	Tanker or General Cargo Vessel breaks away from berth and lies across river or collides with Tanker or General Cargo Vessel on river passage. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Tanker or General Cargo Vessel breaks away from berth and lies across river or collides with Tanker or General Cargo Vessel on river passage. Multiple major injuries or single fatality; Major damage to property; Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release (COMAH); Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	3.0	4	4	4	5	2.0	3.67	
3	River	Collision	Collision - Tanker ICW Workboat	Tanker collides with a Workboat	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Pilot boarding and disembarkation operations. Tug ship towage operations. Fire and explosion.	Tanker collides with a ship assist tug or other Workboat on river passage. Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Tanker collides with a ship assist tug or other Workboat on river passage. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	2	1	1	1	4.0	4	3	1	3	3.0	3.50	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
4	River	Collision	Collision - Tanker ICW Project Cargo	Tanker collides with a Project Cargo move	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Fire and explosion.	Glancing blow. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on collision. Multiple major injuries or single fatality; Major damage to property; Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release (COMAH); Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	2.0	4	4	4	5	1.0	3.05	
5	River	Collision	Collision - Tanker ICW Recreational Vessel	Tanker collides with a Recreational Vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Recreational vessel most damaged. Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational vessel sunk. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	2	1	1	1	2.0	4	3	1	3	1.0	2.21	
6	River	Collision	Collision - General Cargo Vessel ICW General Cargo Vessel	General Cargo Vessel collides with another General Cargo Vessel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Fire and explosion.	Two General Cargo Vessels collide whilst passing in the river. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Two General Cargo Vessels collide whilst passing in the river. Multiple major injuries or single fatality; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	2.5	4	4	3	5	1.0	3.07	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
7	River	Collision	Collision - General Cargo Vessel ICW Workboat	General Cargo Vessel collides with a Workboat	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Pilot boarding and disembarkation operations. Tug ship towage operations. Fire and explosion.	General Cargo Vessel collides with a ship assist tug or other Workboat on river passage. Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	General Cargo Vessel collides with a ship assist tug or other Workboat on river passage. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	2	1	1	1	4.0	4	3	1	3	3.0	3.50	
8	River	Collision	Collision - General Cargo Vessel ICW Project Cargo	General Cargo Vessel collides with a Project Cargo move	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Fire and explosion.	Glancing blow. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on collision. Multiple major injuries or single fatality; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	2.0	4	4	3	5	1.0	2.97	
9	River	Collision	Collision - General Cargo Vessel ICW Recreational Vessel	General Cargo Vessel collides with a Recreational Vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Recreational vessel most damaged. Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel sunk. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	2	1	1	1	2.0	4	3	1	3	1.0	2.21	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
10	River	Collision	Collision - Workboat ICW Workboat	Workboat collides with another Workboat	Mechanical defect / failure. Master / Skipper error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Recreational vessel most damaged. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel sunk. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	2	1	1	1	4.0	3	3	1	1	3.0	2.76	
11	River	Collision	Collision - Workboat ICW Project Cargo	Workboat collides with a Project Cargo move	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Pilot boarding and disembarkation operations. Tug ship towage operations. Fire and explosion.	Glancing blow (in particular tug whilst towing). Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on collision or Workboat being overrun. Multiple major injuries or single fatality; Major damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	2	1	1	1	3.5	4	4	2	2	2.0	2.95	
12	River	Collision	Collision - Workboat ICW Recreational Vessel	Workboat collides with a Recreational Vessel	Mechanical defect / failure. Master / Skipper error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Recreational vessel most damaged. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel sunk. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	2	2	1	1	2.0	4	3	1	2	1.0	2.24	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
13	River	Collision	Collision - Project Cargo ICW Recreational Vessel	Project Cargo move collides with a Recreational Vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Recreational vessel most damaged. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel sunk. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	2	2	1	1	2.0	4	3	1	2	1.0	2.24	
14	River	Collision	Collision - Recreational Vessel ICW Recreational Vessel	Recreational Vessel collides with another Recreational Vessel	Mechanical defect / failure. Skipper error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Glancing blow (especially during racing). Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel sinks. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	2	1	1	1	2.0	4	3	1	2	1.0	2.12	
15	River	Tug Girting	Tug Girting / Towing Incidents	A tug in difficulty/girts during towage operations (for example during a project cargo operation)	Mechanical defect / failure (tug or vessel being assisted). Master / Skipper error (tug or vessel being assisted). Adverse weather. Fire and explosion.	Tug overrun during towage operation. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Tug girts. Multiple major injuries or single fatality; Major damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	1	1	4.0	4	4	1	2	2.0	1.94	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
16	River	Contact	Contact - Tanker with Navigation Buoy	A Tanker contacts a navigational buoy in the approach channel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Navigation buoy is sunk. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	1	2	1	1	2.0	0.58	
17	River	Contact	Contact - General Cargo Vessel with Navigation Buoy	A General Cargo Vessel contacts a navigational buoy in the approach channel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Navigation buoy is sunk. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	1	2	1	1	2.0	0.58	
18	River	Contact	Contact - Workboat with Navigation Buoy	A Workboat contacts a navigational buoy in the approach channel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Navigation buoy is sunk. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	1	2	1	1	2.0	0.58	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
19	River	Contact	Contact - Project Cargo with Navigation Buoy	A Project Cargo contacts a navigational buoy in the approach channel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Navigation buoy is sunk. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	4.0	1	2	1	1	3.0	0.76	
20	River	Contact	Contact - Recreational Vessel with Navigation Buoy	A Recreational Vessel contacts a navigational buoy in the approach channel	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel is most damaged. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	2.0	1	1	1	1	1.0	0.00	
21	River	Contact	Contact berth - Tanker	A Tanker contacts a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Minor damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing at speed. Single minor injury; Moderate damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse national publicity. Medium-term suspension of operations or prolonged restrictions, major disruption to commercial activities.	1	2	2	1	5.0	2	3	3	4	4.0	5.50	4: Review of tug operations and towage requirements

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
22	River	Contact	Contact berth - General Cargo Vessel	A General Cargo Vessel contacts a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing at speed. Single minor injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	1	2	1	1	5.0	2	3	2	3	4.0	4.51	4: Review of tug operations and towage requirements
23	River	Contact	Contact berth - Workboat	A Workboat contacts a berth	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing at speed. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	2	1	1	5.0	2	2	1	1	4.0	3.16	
24	River	Contact	Contact berth - Project Cargo Vessel	A Project Cargo Vessel contacts a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing at speed. Multiple minor or single major injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	1	1	5.0	3	3	2	2	4.0	2.66	4: Review of tug operations and towage requirements

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
25	River	Contact	Contact berth - Recreational Vessel	A Recreational Vessel contacts a berth	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	2	2	1	1	2.0	0.69	
26	River	Contact	Contact vessel alongside berth - Tanker	A Tanker contacts a vessel alongside a berth	Restriction of navigable channel by overhanging blades. Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Very minor injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Single minor injury; Catastrophic damage to property (e.g. blades); Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse national publicity. Medium-term suspension of operations or prolonged restrictions, major disruption to commercial activities.	1	3	2	1	4.0	2	5	3	4	3.0	5.05	1: Marking and lighting of overhanging blades 4: Review of tug operations and towage requirements
27	River	Contact	Contact vessel alongside berth - General Cargo Vessel	A General Cargo Vessel contacts a vessel alongside a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Very minor injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Single minor injury; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse national publicity. Medium-term suspension of operations or prolonged restrictions, major disruption to commercial activities.	1	3	2	1	4.0	2	4	3	4	3.0	4.72	1: Marking and lighting of overhanging blades 4: Review of tug operations and towage requirements

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
28	River	Contact	Contact vessel alongside berth - Workboat	A Workboat contacts a vessel alongside a berth	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	2	2	1	1	5.0	2	2	1	1	3.0	3.13	1: Marking and lighting of overhanging blades
29	River	Contact	Contact vessel alongside berth - Project Cargo Vessel	A Project Cargo contacts a vessel alongside a berth	Restriction of navigable channel by overhanging blades. Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Very minor injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Multiple minor injuries or a single major injury; Catastrophic damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse national publicity. Medium-term suspension of operations or prolonged restrictions, major disruption to commercial activities.	1	3	2	1	4.0	3	5	3	4	3.0	5.18	1: Marking and lighting of overhanging blades 4: Review of tug operations and towage requirements
30	River	Contact	Contact vessel alongside berth - Recreational Vessel	A Recreational Vessel contacts a vessel alongside a berth	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	2	2	1	1	2.0	0.69	1: Marking and lighting of overhanging blades

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
31	River	Contact	Contact Overhead Power Cables- General Cargo vessel	A General Cargo Vessel contacts the Overhead Power Cables.	Incorect assessment of air-draught. Incorect assessment of HOT. Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel.	Light contact from upper-works (mast/aerial). Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Bad local publicity. Temporary power disruption during cable inspection.	Heavy contact with overhead wire downing cable. Multiple major injuries or single fatality; Moderate damage to vessel. Tier 1 may be declared but criteria not necessarily met; Adverse national publicity. Medium-term suspension of operations or prolonged impact to regional power supplies, major disruption to commercial activities.	2	2	1	2	2.0	4	3	1	4	1.0	2.52	2: High-air draught vessels / vessels carrying large cargoes to use downstream deep-water berth only; 3: Introduction of Safety Zones in vicinity of overhead cables; 4: Review of tug operations and towage requirements.
32	River	Contact	Contact Overhead Power Cables - Project Cargo	A Project Cargo contacts the Overhead Power Cables.	Incorect assessment of air-draught. Incorect assessment of HOT. Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel.	Light contact from upper-works (mast/aerial). Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Bad local publicity. Temporary power disruption during cable inspection.	Heavy contact with overhead wire downing cable. Multiple major injuries or single fatality; Moderate damage to vessel. Tier 1 may be declared but criteria not necessarily met; Adverse national publicity. Medium-term suspension of operations or prolonged impact to regional power supplies, major disruption to commercial activities.	2	2	1	2	4.0	4	3	1	4	3.0	4.03	2: High-air draught vessels / vessels carrying large cargoes to use downstream end of berth; 3: Introduction of Safety Zones in vicinity of overhead cables; 4: Review of tug operations and towage requirements.
33	River	Grounding	Grounding - Tanker	A Tanker runs aground	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Very minor injury; Major damage to property; Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release (COMAH); Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	1	2	1	1	3.0	1	4	4	5	1.0	2.86	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
34	River	Grounding	Grounding - General Cargo Vessel	A General Cargo Vessel runs aground	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Very minor injury; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	1	2	1	1	2.0	1	4	3	5	1.0	2.60	
35	River	Grounding	Grounding - Workboat	A Workboat runs aground	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Single minor injury; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	4.0	2	3	1	1	3.0	1.54	
36	River	Grounding	Grounding - Project Cargo	A Project Cargo runs aground	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Very minor injury; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	1	2	1	1	3.0	1	4	3	5	2.0	3.13	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
37	River	Grounding	Grounding - Recreational Vessel	A Recreational Vessel runs aground	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	2	2	1	1	2.0	0.69	
38	River	Mooring Incident	Mooring Incident - Tanker	A Tanker is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Multiple minor or single major injury; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	1	1	5.0	3	3	1	2	3.0	1.81	
39	River	Mooring Incident	Mooring Incident - General Cargo vessel	A General Cargo Vessel is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Multiple minor or single major injury; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	1	1	5.0	3	3	1	2	3.0	1.81	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
40	River	Mooring Incident	Mooring Incident - Workboat	A Workboat is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	5.0	2	2	1	1	3.0	0.91	
41	River	Mooring Incident	Mooring Incident - Project Cargo	A Project Cargo is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Multiple minor or single major injury; Moderate damage to property; Minor impact on environment Tier 1 to Tier 2 criteria reached but capable to being limited to immediate area within site. Temporary suspension of operations or prolonged restrictions.	1	1	1	1	3.0	3	3	2	3	2.0	1.65	
42	River	Mooring Incident	Mooring Incident - Recreational Vessel	A Recreational Vessel is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	2.0	2	2	1	1	1.0	0.56	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
43	River	Foundering	Foundering / Swamping - Workboat	A Workboat founders or is swamped by a passing vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Excessive speed. Fire and explosion.	Vessel takes on water whilst unattended. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel founders or is swamped whilst in service. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	4.0	4	3	1	1	3.0	2.13	
44	River	Foundering	Foundering / Swamping - Recreational Vessel	A Recreational Vessel founders or is swamped by a passing vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Excessive speed. Fire and explosion.	Vessel takes on water whilst unattended. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel founders or is swamped whilst in service. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	4	3	1	1	2.0	1.74	

Annex E Construction Phase Risk Assessment Hazard Log – Residual with Possible Additional Mitigation

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
1	River	Collision	Collision - Tanker ICW Tanker	Tanker collides with another Tanker	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Fire and explosion.	Tanker breaks away from berth and lies across river. Collides with Tanker on river passage. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Tanker breaks away from berth and lies across river. Collides with Tanker on river passage. Multiple major injuries or single fatality; Major damage to property; Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release (COMAH); Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	3.0	4	4	4	5	1.0	3.14
2	River	Collision	Collision - Tanker ICW General Cargo Vessel	Tanker collides with a General Cargo Vessel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Fire and explosion.	Tanker or General Cargo Vessel breaks away from berth and lies across river or collides with Tanker or General Cargo Vessel on river passage. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Tanker or General Cargo Vessel breaks away from berth and lies across river or collides with Tanker or General Cargo Vessel on river passage. Multiple major injuries or single fatality; Major damage to property; Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release (COMAH); Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	3.5	4	4	4	5	2.0	3.84

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
3	River	Collision	Collision - Tanker ICW Workboat (Including Dredgers)	Tanker collides with a Workboat (Including Dredgers)	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations / dredging operations. Traffic control failure. Reduced visibility. Pilot boarding and disembarkation operations. Tug ship towage operations. Fire and explosion.	Tanker collides with a ship assist tug or other Workboat on river passage. Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Tanker collides with a ship assist tug or other Workboat on river passage. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	2	1	1	1	4.5	4	3	1	3	3.0	3.79
4	River	Collision	Collision - Tanker ICW Project Cargo	Tanker collides with a Project Cargo move	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Fire and explosion.	Glancing blow. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on collision. Multiple major injuries or single fatality; Major damage to property; Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release (COMAH); Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	1.0	4	4	4	5	1.0	2.91
5	River	Collision	Collision - Tanker ICW Recreational Vessel	Tanker collides with a Recreational Vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Recreational vessel most damaged. Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational vessel sunk. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	2	1	1	1	2.0	4	3	1	3	1.0	2.21

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
6	River	Collision	Collision - General Cargo Vessel ICW General Cargo Vessel	General Cargo Vessel collides with another General Cargo Vessel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Fire and explosion.	Two General Cargo Vessels collide whilst passing in the river. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Two General Cargo Vessels collide whilst passing in the river. Multiple major injuries or single fatality; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	2.5	4	4	3	5	1.0	3.07
7	River	Collision	Collision - General Cargo Vessel ICW Workboat (Including Dredgers)	General Cargo Vessel collides with a Workboat (Including Dredgers)	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Pilot boarding and disembarkation operations. Tug ship towage operations. Fire and explosion.	General Cargo Vessel collides with a ship assist tug or other Workboat on river passage. Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	General Cargo Vessel collides with a ship assist tug or other Workboat on river passage. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	2	1	1	1	4.5	4	3	1	3	3.0	3.79
8	River	Collision	Collision - General Cargo Vessel ICW Project Cargo	General Cargo Vessel collides with a Project Cargo move	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Fire and explosion.	Glancing blow. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on collision. Multiple major injuries or single fatality; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	1.0	4	4	3	5	1.0	2.84

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
9	River	Collision	Collision - General Cargo Vessel ICW Recreational Vessel	General Cargo Vessel collides with a Recreational Vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Recreational vessel most damaged. Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel sunk. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	2	1	1	1	2.0	4	3	1	3	1.0	2.21
10	River	Collision	Collision - Workboat (Including Dredgers) ICW Workboat (Including Dredgers)	Workboat (Including Dredgers) collides with another Workboat (Including Dredgers)	Mechanical defect / failure. Master / Skipper error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Fire and explosion.	Glancing blow. Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	One of the Workboats sinks. Multiple minor or single major injury; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	2	1	1	1	5.0	3	3	1	1	4.0	4.07
11	River	Collision	Collision - Workboat (Including Dredgers) ICW Project Cargo	Workboat (Including Dredgers) collides with a Project Cargo move	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Pilot boarding and disembarkation operations. Tug ship towage operations. Fire and explosion.	Glancing blow (in particular tug whilst towing). Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on collision or Workboat being overrun. Multiple major injuries or single fatality; Major damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	2	1	1	1	3.0	4	4	2	2	2.0	3.16

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
12	River	Collision	Collision - Workboat (Including Dredgers) ICW Recreational Vessel	Workboat (Including Dredgers) collides with a Recreational Vessel	Mechanical defect / failure. Master / Skipper error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Recreational vessel most damaged. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel sunk. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	2	2	1	1	2.0	4	3	1	2	1.0	2.24
13	River	Collision	Collision - Project Cargo ICW Recreational Vessel	Project Cargo move collides with a Recreational Vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Recreational vessel most damaged. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel sunk. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	2	2	1	1	1.0	4	3	1	2	1.0	2.10
14	River	Collision	Collision - Recreational Vessel ICW Recreational Vessel	Recreational Vessel collides with another Recreational Vessel	Mechanical defect / failure. Skipper error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Glancing blow (especially during racing). Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel sinks. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	2	1	1	1	2.0	4	3	1	2	1.0	2.12

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
15	River	Tug Girting	Tug Girting / Towing Incidents	A tug in difficulty/girts during towage operations (for example during a project cargo operation)	Mechanical defect / failure (tug or vessel being assisted). Master / Skipper error (tug or vessel being assisted). Adverse weather. Fire and explosion.	Tug overrun during towage operation. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Tug girts. Multiple major injuries or single fatality; Major damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	1	1	4.0	4	4	1	2	1.0	1.62
16	River	Contact	Contact - Tanker with Navigation Buoy	A Tanker contacts a navigational buoy in the approach channel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Navigation buoy is sunk. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.5	1	2	1	1	2.0	0.58
17	River	Contact	Contact - General Cargo Vessel with Navigation Buoy	A General Cargo Vessel contacts a navigational buoy in the approach channel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Navigation buoy is sunk. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.5	1	2	1	1	2.0	0.58
18	River	Contact	Contact - Workboat (Including Dredgers) with Navigation Buoy	A Workboat (Including Dredgers) contacts a navigational buoy in the approach channel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Navigation buoy is sunk. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	2	1	1	1	4.0	1	2	1	1	2.0	1.67

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
19	River	Contact	Contact - Project Cargo with Navigation Buoy	A Project Cargo contacts a navigational buoy in the approach channel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Navigation buoy is sunk. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	4.0	1	2	1	1	3.0	0.76
20	River	Contact	Contact - Recreational Vessel with Navigation Buoy	A Recreational Vessel contacts a navigational buoy in the approach channel	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel is most damaged. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	2.0	1	1	1	1	1.0	0.00
21	River	Contact	Contact berth - Tanker	A Tanker contacts a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Minor damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing at speed. Single minor injury; Moderate damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse national publicity. Medium-term suspension of operations or prolonged restrictions, major disruption to commercial activities.	1	2	2	1	4.5	2	3	3	4	3.5	4.54

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
22	River	Contact	Contact berth - General Cargo Vessel	A General Cargo Vessel contacts a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing at speed. Single minor injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	1	2	1	1	5.0	2	3	2	3	3.5	4.12
23	River	Contact	Contact berth - Workboat (Including Dredgers)	A Workboat (Including Dredgers) contacts a berth	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing at speed. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	2	1	1	5.0	2	2	1	1	4.0	3.16
24	River	Contact	Contact berth - Project Cargo Vessel	A Project Cargo contacts a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing at speed. Multiple minor or single major injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	1	1	3.0	3	3	2	2	2.0	1.54

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
25	River	Contact	Contact berth - Recreational Vessel	A Recreational Vessel contacts a berth	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	2	2	1	1	2.0	0.69
26	River	Contact	Contact vessel alongside berth - Tanker	A Tanker contacts a vessel alongside a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Very minor injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Single minor injury; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse national publicity. Medium-term suspension of operations or prolonged restrictions, major disruption to commercial activities.	1	3	2	1	3.5	2	4	3	4	1.5	3.73
27	River	Contact	Contact vessel alongside berth - General Cargo Vessel	A General Cargo Vessel contacts a vessel alongside a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Very minor injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Single minor injury; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse national publicity. Medium-term suspension of operations or prolonged restrictions, major disruption to commercial activities.	1	3	2	1	4.0	2	4	3	4	2.0	4.22

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
28	River	Contact	Contact vessel alongside berth - Workboat (Including Dredgers)	A Workboat (Including Dredgers) contacts a vessel alongside a berth	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	2	2	1	1	5.0	2	2	1	1	4.0	3.53
29	River	Contact	Contact vessel alongside berth - Project Cargo Vessel	A Project Cargo contacts a vessel alongside a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Multiple minor or single major injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	2	1	2.0	3	3	2	2	1.0	1.84
30	River	Contact	Contact vessel alongside berth - Recreational Vessel	A Recreational Vessel contacts a vessel alongside a berth	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	2	2	1	1	2.0	0.69

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
31	River	Contact	Contact Overhead Power Cables-General Cargo vessel	A General Cargo Vessel contacts the Overhead Power Cables.	Incorect assessment of air-draught. Incorrect assessment of HOT. Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations.	Light contact from upper-works (mast/aerial). Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Bad local publicity. Temporary power disruption during cable inspection.	Heavy contact with overhead wire downing cable. Multiple major injuries or single fatality; Moderate damage to vessel. Tier 1 may be declared but criteria not necessarily met; Adverse national publicity. Medium-term suspension of operations or prolonged impact to regional power supplies, major disruption to commercial activities.	2	2	1	2	2.0	4	3	1	4	1.0	2.52
32	River	Contact	Contact Overhead Power Cables - Project Cargo	A Project Cargo contacts the Overhead Power Cables.	Incorect assessment of air-draught. Incorrect assessment of HOT. Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations.	Light contact from upper-works (mast/aerial). Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Bad local publicity. Temporary power disruption during cable inspection.	Heavy contact with overhead wire downing cable. Multiple major injuries or single fatality; Moderate damage to vessel. Tier 1 may be declared but criteria not necessarily met; Adverse national publicity. Medium-term suspension of operations or prolonged impact to regional power supplies, major disruption to commercial activities.	2	2	1	2	1.0	4	3	1	4	1.0	2.36
33	River	Grounding	Grounding - Tanker	A Tanker runs aground	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Very minor injury; Major damage to property; Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release (COMAH); Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	1	2	1	1	3.5	1	4	4	5	1.0	3.00

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
34	River	Grounding	Grounding - General Cargo Vessel	A General Cargo Vessel runs aground	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Very minor injury; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	1	2	1	1	2.5	1	4	3	5	1.0	2.68
35	River	Grounding	Grounding - Workboat (Including Dredgers)	A Workboat (Including Dredgers) runs aground	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Single minor injury; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	5.0	2	3	1	1	4.0	2.07
36	River	Grounding	Grounding - Project Cargo	A Project Cargo runs aground	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Very minor injury; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	1	2	1	1	3.0	1	4	3	5	1.0	2.78

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
37	River	Grounding	Grounding - Recreational Vessel	A Recreational Vessel runs aground	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	2	2	1	1	2.0	0.69
38	River	Mooring Incident	Mooring Incident - Tanker	A Tanker is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Multiple minor or single major injury; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	1	1	5.0	3	3	1	2	3.0	1.81
39	River	Mooring Incident	Mooring Incident - General Cargo vessel	A General Cargo Vessel is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Multiple minor or single major injury; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	1	1	5.0	3	3	1	2	3.0	1.81

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
40	River	Mooring Incident	Mooring Incident - Workboat (Including Dredgers)	A Workboat (Including Dredgers) is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	5.0	2	2	1	1	4.0	1.31
41	River	Mooring Incident	Mooring Incident - Project Cargo	A Project Cargo is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Multiple minor or single major injury; Moderate damage to property; Tier 1 to Tier 2 criteria reached; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	1	1	2.0	3	3	2	2	1.0	1.26
42	River	Mooring Incident	Mooring Incident - Recreational Vessel	A Recreational Vessel is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	2.0	2	2	1	1	1.0	0.56

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
43	River	Foundering	Foundering / Swamping - Workboat (Including Dredgers)	A Workboat (Including Dredgers) founders or is swamped by a passing vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Excessive speed. Fire and explosion.	Vessel takes on water whilst unattended. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel founders or is swamped whilst in service. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	4.0	4	3	1	1	3.5	2.38
44	River	Foundering	Foundering / Swamping - Recreational Vessel	A Recreational Vessel founders or is swamped by a passing vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Excessive speed. Fire and explosion.	Vessel takes on water whilst unattended. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel founders or is swamped whilst in service. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	4	3	1	1	2.0	1.74

Annex F Operation Phase Risk Assessment Hazard Log – Residual with Possible Additional Mitigation

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
1	River	Collision	Collision - Tanker ICW Tanker	Tanker collides with another Tanker	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Fire and explosion.	Tanker breaks away from berth and lies across river. Collides with Tanker on river passage. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Tanker breaks away from berth and lies across river. Collides with Tanker on river passage. Multiple major injuries or single fatality; Major damage to property; Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release (COMAH); Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	2.0	4	4	4	5	1.0	3.05
2	River	Collision	Collision - Tanker ICW General Cargo Vessel	Tanker collides with a General Cargo Vessel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Fire and explosion.	Tanker or General Cargo Vessel breaks away from berth and lies across river or collides with Tanker or General Cargo Vessel on river passage. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Tanker or General Cargo Vessel breaks away from berth and lies across river or collides with Tanker or General Cargo Vessel on river passage. Multiple major injuries or single fatality; Major damage to property; Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release (COMAH); Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	3.0	4	4	4	5	2.0	3.67
3	River	Collision	Collision - Tanker ICW Workboat	Tanker collides with a Workboat	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Pilot boarding and disembarkation operations. Tug ship towage operations. Fire and explosion.	Tanker collides with a ship assist tug or other Workboat on river passage. Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Tanker collides with a ship assist tug or other Workboat on river passage. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	2	1	1	1	4.0	4	3	1	3	3.0	3.50
4	River	Collision	Collision - Tanker ICW Project Cargo	Tanker collides with a Project Cargo move	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Fire and explosion.	Glancing blow. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on collision. Multiple major injuries or single fatality; Major damage to property; Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release (COMAH); Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	2.0	4	4	4	5	1.0	3.05

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
5	River	Collision	Collision - Tanker ICW Recreational Vessel	Tanker collides with a Recreational Vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Recreational vessel most damaged. Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational vessel sunk. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	2	1	1	1	2.0	4	3	1	3	1.0	2.21
6	River	Collision	Collision - General Cargo Vessel ICW General Cargo Vessel	General Cargo Vessel collides with another General Cargo Vessel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Fire and explosion.	Two General Cargo Vessels collide whilst passing in the river. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Two General Cargo Vessels collide whilst passing in the river. Multiple major injuries or single fatality; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	2.5	4	4	3	5	1.0	3.07
7	River	Collision	Collision - General Cargo Vessel ICW Workboat	General Cargo Vessel collides with a Workboat	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Pilot boarding and disembarkation operations. Tug ship towage operations. Fire and explosion.	General Cargo Vessel collides with a ship assist tug or other Workboat on river passage. Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	General Cargo Vessel collides with a ship assist tug or other Workboat on river passage. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	2	1	1	1	4.0	4	3	1	3	3.0	3.50
8	River	Collision	Collision - General Cargo Vessel ICW Project Cargo	General Cargo Vessel collides with a Project Cargo move	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Fire and explosion.	Glancing blow. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on collision. Multiple major injuries or single fatality; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	2.0	4	4	3	5	1.0	2.97

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
9	River	Collision	Collision - General Cargo Vessel ICW Recreational Vessel	General Cargo Vessel collides with a Recreational Vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Recreational vessel most damaged. Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel sunk. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	2	1	1	1	2.0	4	3	1	3	1.0	2.21
10	River	Collision	Collision - Workboat ICW Workboat	Workboat collides with another Workboat	Mechanical defect / failure. Master / Skipper error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Recreational vessel most damaged. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel sunk. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	2	1	1	1	4.0	3	3	1	1	3.0	2.76
11	River	Collision	Collision - Workboat ICW Project Cargo	Workboat collides with a Project Cargo move	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Pilot boarding and disembarkation operations. Tug ship towage operations. Fire and explosion.	Glancing blow (in particular tug whilst towing). Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on collision or Workboat being overrun. Multiple major injuries or single fatality; Major damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	2	1	1	1	3.5	4	4	2	2	2.0	2.95
12	River	Collision	Collision - Workboat ICW Recreational Vessel	Workboat collides with a Recreational Vessel	Mechanical defect / failure. Master / Skipper error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Recreational vessel most damaged. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel sunk. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	2	2	1	1	2.0	4	3	1	2	1.0	2.24

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
13	River	Collision	Collision - Project Cargo ICW Recreational Vessel	Project Cargo move collides with a Recreational Vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Recreational vessel most damaged. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel sunk. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	2	2	1	1	2.0	4	3	1	2	1.0	2.24
14	River	Collision	Collision - Recreational Vessel ICW Recreational Vessel	Recreational Vessel collides with another Recreational Vessel	Mechanical defect / failure. Skipper error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Glancing blow (especially during racing). Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel sinks. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	2	1	1	1	2.0	4	3	1	2	1.0	2.12
15	River	Tug Girting	Tug Girting / Towing Incidents	A tug in difficulty/girts during towage operations (for example during a project cargo operation)	Mechanical defect / failure (tug or vessel being assisted). Master / Skipper error (tug or vessel being assisted). Adverse weather. Fire and explosion.	Tug overrun during towage operation. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Tug girts. Multiple major injuries or single fatality; Major damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	1	1	4.0	4	4	1	2	2.0	1.94
16	River	Contact	Contact - Tanker with Navigation Buoy	A Tanker contacts a navigational buoy in the approach channel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Navigation buoy is sunk. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	1	2	1	1	2.0	0.58

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
17	River	Contact	Contact - General Cargo Vessel with Navigation Buoy	A General Cargo Vessel contacts a navigational buoy in the approach channel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Navigation buoy is sunk. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	1	2	1	1	2.0	0.58
18	River	Contact	Contact - Workboat with Navigation Buoy	A Workboat contacts a navigational buoy in the approach channel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Navigation buoy is sunk. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	1	2	1	1	2.0	0.58
19	River	Contact	Contact - Project Cargo with Navigation Buoy	A Project Cargo contacts a navigational buoy in the approach channel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Navigation buoy is sunk. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	4.0	1	2	1	1	3.0	0.76
20	River	Contact	Contact - Recreational Vessel with Navigation Buoy	A Recreational Vessel contacts a navigational buoy in the approach channel	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel is most damaged. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	2.0	1	1	1	1	1.0	0.00

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
21	River	Contact	Contact berth - Tanker	A Tanker contacts a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Minor damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing at speed. Single minor injury; Moderate damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse national publicity. Medium-term suspension of operations or prolonged restrictions, major disruption to commercial activities.	1	2	2	1	5.0	2	3	3	4	3.5	5.10
22	River	Contact	Contact berth - General Cargo Vessel	A General Cargo Vessel contacts a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing at speed. Single minor injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	1	2	1	1	5.0	2	3	2	3	3.5	4.12
23	River	Contact	Contact berth - Workboat	A Workboat contacts a berth	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing at speed. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	2	1	1	5.0	2	2	1	1	4.0	3.16
24	River	Contact	Contact berth - Project Cargo Vessel	A Project Cargo Vessel contacts a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing at speed. Multiple minor or single major injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	1	1	5.0	3	3	2	2	3.5	2.27

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
25	River	Contact	Contact berth - Recreational Vessel	A Recreational Vessel contacts a berth	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	2	2	1	1	2.0	0.69
26	River	Contact	Contact vessel alongside berth - Tanker	A Tanker contacts a vessel alongside a berth	Restriction of navigable channel by overhanging blades. Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Very minor injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Single minor injury; Catastrophic damage to property (e.g. blades); Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse national publicity. Medium-term suspension of operations or prolonged restrictions, major disruption to commercial activities.	1	3	2	1	4.0	2	4	3	4	2.5	4.45
27	River	Contact	Contact vessel alongside berth - General Cargo Vessel	A General Cargo Vessel contacts a vessel alongside a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Very minor injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Single minor injury; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse national publicity. Medium-term suspension of operations or prolonged restrictions, major disruption to commercial activities.	1	3	2	1	4.0	2	4	3	4	2.5	4.45
28	River	Contact	Contact vessel alongside berth - Workboat	A Workboat contacts a vessel alongside a berth	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	2	2	1	1	4.0	2	2	1	1	2.0	2.00

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
29	River	Contact	Contact vessel alongside berth - Project Cargo Vessel	A Project Cargo contacts a vessel alongside a berth	Restriction of navigable channel by overhanging blades. Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Very minor injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Multiple minor injuries or a single major injury; Catastrophic damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse national publicity. Medium-term suspension of operations or prolonged restrictions, major disruption to commercial activities.	1	3	2	1	4.0	3	5	3	4	2.5	4.90
30	River	Contact	Contact vessel alongside berth - Recreational Vessel	A Recreational Vessel contacts a vessel alongside a berth	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	2	2	1	1	2.0	0.69
31	River	Contact	Contact Overhead Power Cables- General Cargo vessel	A General Cargo Vessel contacts the Overhead Power Cables.	Incorrect assessment of air-draught. Incorrect assessment of HOT. Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel.	Light contact from upper-works (mast/aerial). Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Bad local publicity. Temporary power disruption during cable inspection.	Heavy contact with overhead wire downing cable. Multiple major injuries or single fatality; Moderate damage to vessel. Tier 1 may be declared but criteria not necessarily met; Adverse national publicity. Medium-term suspension of operations or prolonged impact to regional power supplies, major disruption to commercial activities.	2	2	1	2	1.5	4	3	1	4	1.0	2.43
32	River	Contact	Contact Overhead Power Cables - Project Cargo	A Project Cargo contacts the Overhead Power Cables.	Incorrect assessment of air-draught. Incorrect assessment of HOT. Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel.	Light contact from upper-works (mast/aerial). Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Bad local publicity. Temporary power disruption during cable inspection.	Heavy contact with overhead wire downing cable. Multiple major injuries or single fatality; Moderate damage to vessel. Tier 1 may be declared but criteria not necessarily met; Adverse national publicity. Medium-term suspension of operations or prolonged impact to regional power supplies, major disruption to commercial activities.	2	2	1	2	2.0	4	3	1	4	1.0	2.52

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
33	River	Grounding	Grounding - Tanker	A Tanker runs aground	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Very minor injury; Major damage to property; Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release (COMAH); Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	1	2	1	1	3.0	1	4	4	5	1.0	2.86
34	River	Grounding	Grounding - General Cargo Vessel	A General Cargo Vessel runs aground	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Very minor injury; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	1	2	1	1	2.0	1	4	3	5	1.0	2.60
35	River	Grounding	Grounding - Workboat	A Workboat runs aground	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Single minor injury; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	4.0	2	3	1	1	3.0	1.54
36	River	Grounding	Grounding - Project Cargo	A Project Cargo runs aground	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Very minor injury; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	1	2	1	1	3.0	1	4	3	5	2.0	3.13

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
37	River	Grounding	Grounding - Recreational Vessel	A Recreational Vessel runs aground	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	2	2	1	1	2.0	0.69
38	River	Mooring Incident	Mooring Incident - Tanker	A Tanker is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Multiple minor or single major injury; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	1	1	5.0	3	3	1	2	3.0	1.81
39	River	Mooring Incident	Mooring Incident - General Cargo vessel	A General Cargo Vessel is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Multiple minor or single major injury; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	1	1	5.0	3	3	1	2	3.0	1.81
40	River	Mooring Incident	Mooring Incident - Workboat	A Workboat is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	5.0	2	2	1	1	3.0	0.91

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
41	River	Mooring Incident	Mooring Incident - Project Cargo	A Project Cargo is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Multiple minor or single major injury; Moderate damage to property; Minor impact on environment Tier 1 to Tier 2 criteria reached but capable to being limited to immediate area within site. Temporary suspension of operations or prolonged restrictions.	1	1	1	1	3.0	3	3	2	3	2.0	1.65
42	River	Mooring Incident	Mooring Incident - Recreational Vessel	A Recreational Vessel is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	2.0	2	2	1	1	1.0	0.56
43	River	Foundering	Foundering / Swamping - Workboat	A Workboat founders or is swamped by a passing vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Excessive speed. Fire and explosion.	Vessel takes on water whilst unattended. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel founders or is swamped whilst in service. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	4.0	4	3	1	1	3.0	2.13
44	River	Foundering	Foundering / Swamping - Recreational Vessel	A Recreational Vessel founders or is swamped by a passing vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Excessive speed. Fire and explosion.	Vessel takes on water whilst unattended. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel founders or is swamped whilst in service. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	4	3	1	1	2.0	1.74