Planning Act 2008
Infrastructure Planning (Changes to, and Revocation of, Development Consent Orders) Regulations 2011
Document reference: TR030006/D3/3

Able Marine Energy Park

Material Change 2

Report of Navigation Simulations Exercises Undertaken at South Tyneside Marine College on 6 January 2022

Shipmove

ABLE Marine Energy Park

Material Change 2

Navigation Simulation Report

6th January 2022

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V1 13/1/2022

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Definitions & Abbreviations

Adverse Current	Generally current from astern.
ABLE UK	The Applicant
AMEP	Able Marine Energy Park (AMEP), the new berth
Blade Carrier / Blade Ship	Vessel constructed or converted to carry windmill blades
Chart Datum	The datum on which soundings are based, approximates to the lowest astronomical tide.
CPA	Closest point of Approach
CPP	Controllable Pitch Propellor (more control than conventional)
C.Ro	Operators of the ferry facility North Killingholme
END EX	End of Exercise
Favourable Tide	Generally current from ahead
F5 F6	Force 5, Force 6 (Beaufort Scale of Wind speed0
Ground Track	The track of a vessel over the ground as opposed to through the water. It includes the effects of current.
GT / GRT	Gross Tons / Gross Registered Tons. Cargo carrying capacity (volume) normally used for rates and charges
HR Wallingford	Hydraulic Research Establishment. Also vessel simulator
Harbour Master	Harbour Master Humber
Humber Passage Plan	A formal set of rules applying to specified large vessels.
Hd'g	Heading, the compass baring of the vessel,
HST	Humber Sea Terminal. Former name of C.RO Killingholme
IGT	Immingham Gas Terminal
Knot / Kt	1 Nautical Mile Per Hour (1 knot = 0.514 metres per second)
LOA	Length Overall / Extreme Length
Material Change 2	The latest revised quay design
N E S W	North East South West
NP and PG	Red Buoys marking the outfalls between AMEP and C.Ro
RoRo	Roll On Roll off. A type of vessel
PCC	Dedicated / Pure Car Carrier vessel
Stb'd	Starboard
Swinging	Generally meaning to turn through 180°
Thruster	Propulsion unit providing thrust in a transverse direction.
Tug (T)	Tug bollard pull in Tons. The force they are able to apply.
VTS	Vessel Traffic Services (Humber) Controls traffic on behalf of the Conservancy Authority (ABP)
Water Track	Relative to the water, not the ground. Excludes current effects

1.0 INTRODUCTION

1.1 GENERAL

Shipmove independent consultants have been engaged by Able UK to provide marine advice in relation to the consented Able Marine Energy Park (AMEP) on the Humber. Specifically, to review previous navigation simulation exercises (1st and 2nd set of simulations held at Tynecoast College in November 2010 and March 2012, the original simulations), and to co-ordinate a further set of simulations to assess the impact of a proposed change (Material Change 2) to the quay alignment. This third set of simulations, which are the subject of this report, took place at Tynecoast College simulator on 6th Jan 2022.

1.2 MATERIAL CHANGE 2 - QUAY LAYOUT

Since the original (1st and 2nd) simulations, a change has been proposed to the layout of the quay. This change is part of an application by ABLE UK known as “Material Change 2” (or MC2); and involves the removal of the specialist berth at the SE corner of the quay, while at the NW end of the quay a 288m inset “barge” berth is proposed.

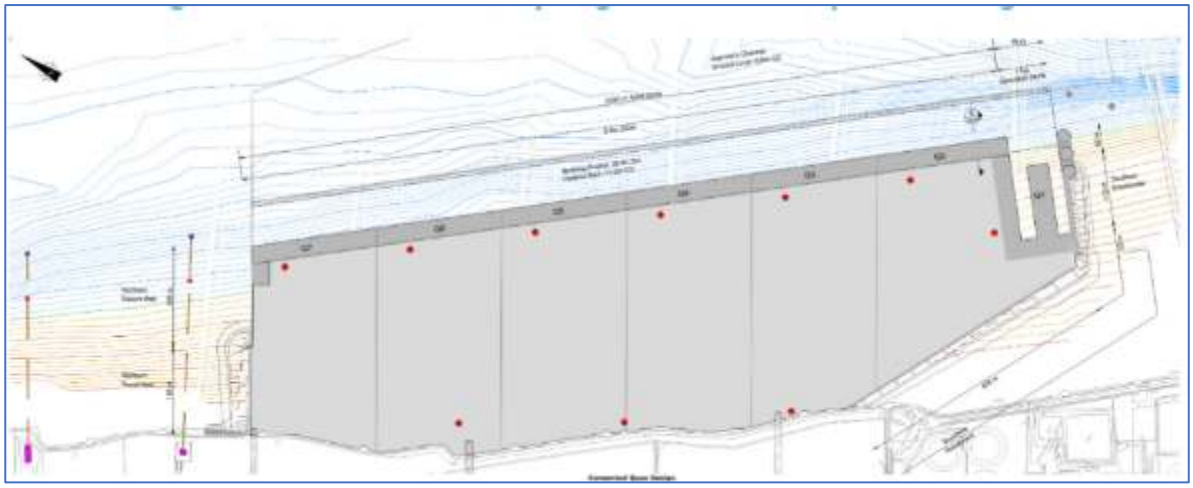

Figure 1 Original Berth Layout Used in 2010 and 2012 Simulations

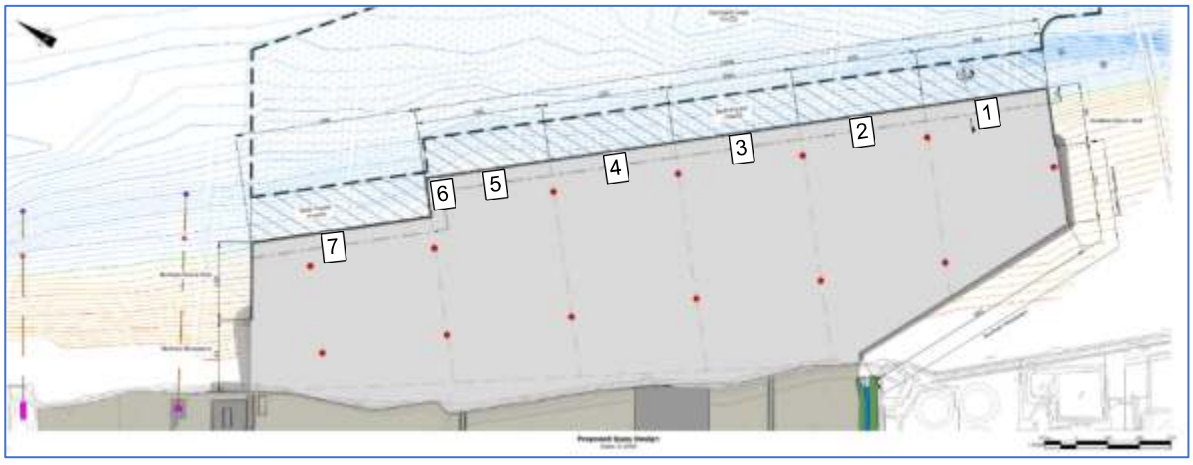

Figure 2 “Material Change 2” Berth layout used in these simulations.

1.3 MATERIAL CHANGE 2 - TIDAL REGIME

The changes to the tidal and current regime in the location of the amended quay has been modelled and reported by HR Wallingford[1]. Figures 3 and 4 below show modelled changes to peak flood and ebb flows respectively for a mean spring tide, pursuant to AMEP Amended Quay and current bathymetry.

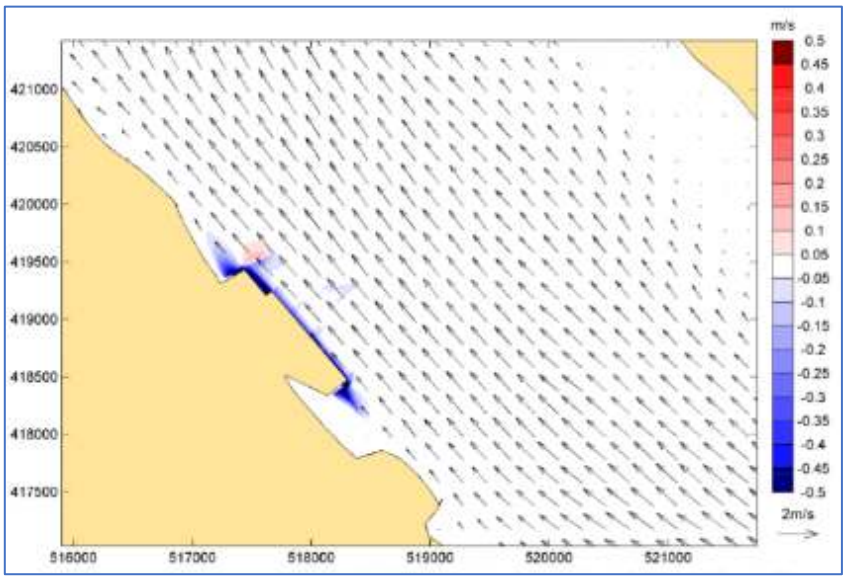

Figure 3 Modelled Changes to Peak Mean Spring Tide Flood Flow

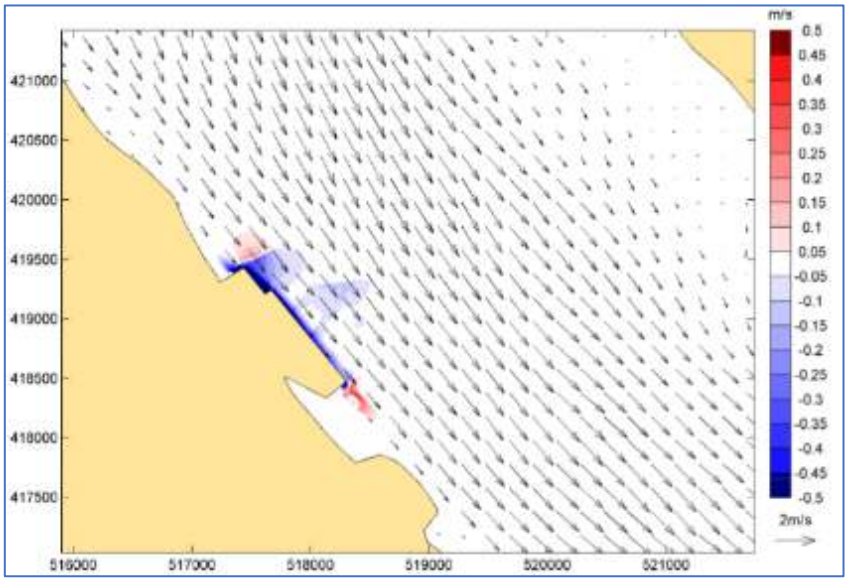

Figure 4 Modelled Changes to Peak Mean Spring Tide Ebb Flow

[1] Microsoft Word - 210623 416.01148.00005 - UES CHAPTER 8 - HYDRO AND SEDIMENT DYNAMICS DRAFT FINAL (planninginspectorate.gov.uk)

1.4 Simulation Architecture

Since the original simulations, the Tyne Coast Simulator has been updated for the previous Kongsberg “Polaris” system, to the “K-Sim” system.

While this has added functionality and complexity, Ship models from the old system are not backwards compatible and so migration of existing models to the new system is resource intensive. As a result, the present library of available ship models (though growing) is limited and this restricted the models available for the planned round of simulations Nevertheless, a sufficiently representative set of vessels was available to enable reasonable judgements.

Figure 5 Simulator Layout

1.5 Comments On Previous Simulations & Navigation Concerns

In the period since 2010 there have been many opportunities for various parties to comment on the original simulations and their adequacy, both as part of the formal planning and consent process and in correspondence between various parties.

Below is a tabulated list of the various concerns raised. This is not intended to be exhaustive, but to reflect the information readily available to the author.

Date	Organisation	Document
31/11/2011	DLA Piper for HST[1]	Letter to Bircham Dyson Bell
Comments		
“13.1 The simulation only uses the Mazarine (195m LOA) and Clementine 162m (LOA) vessels, no simulation was carried out using larger vessels that currently visit HST, for example Humbermax[2] or Pure Car Carriers (PCC) *13.2 “The simulation states that it was not based on ……. The latest bathymetry data for the new terminal”* *“13.3 The simulation does not appear to include the type of vessels that would be expected to use the terminal…… It is not appropriate to simulate options only with an oil tanker and a bulk carrier”*		

"13.4 The simulation also refers to the most extreme weather and current conditions. HST does not agree that simulation using a wind speed of 15 knots and current settings of HW-5 hours can be properly considered extreme" *13.6 / 13.7 Refers to change of alignment of berth and necessity of further current modelling.*
[1] HST - Humber Sea Terminal - Former name of C.RO Ports Killingholme [2] In 2011 "Humbermax" referred to vessels "Pauline" and "Yasmine" built in 2006/7. 200m LOA, 31m Beam, 49,166 GRT.

Date	Organisation	Document
6-9 /01/2012	Able and C.Ro / HST	Email correspondence
Comments		
ABLE: *"We have tidal data for the period 6-12 September 2010 which JBA obtained to calibrate their hydrodynamic model. This data was obtained as it contained the relatively high spring tide on 9 September (7.8m at 07:02 with a low tide of 0.3m at 13:44; this compares to Highest Astronomical Tide of 8.0m at Immingham).* C.Ro: *As far as the tidal conditions for your own simulation work, we would agree at this time to the scenario as outlined in your previous mail* (Above) *of 6 January 2012.*		

Date	Organisation	Document
31/05/2012 & 17/08/2012	Harbour Master Humber	Response to Planning Inspectorate Questions
Comments		
"Q. 45 - Is the Harbour Master Humber now satisfied that enough simulations have been carried out to demonstrate that the development would pose no undue problems for the berthing and un-berthing of vessels at the C.RO facility or at the AMEP development itself? *"1. The Harbour Master, Humber is satisfied that there have been sufficient simulations.*		

Date	Organisation	Document
17/09/2012	C.Ro Ports	Submission to Planning Inspectorate
Comments		
"7.1 C.RO has concerns regarding the adequacy of the navigation assessments that have been carried out by Able…….. the original application was supported by a 2010 assessment based on a superseded quay design. The revised assessment submitted during the course of the examination incorporates the current iteration of the quay but still fails to provide sufficient information on which to base a decision regarding the navigational impacts of AMEP." *"7.2 As part of the revised assessment Able has only carried out a single simulation which shows berthing arrangements at the southern end of the AMEP quay, using a vessel that is not typical of the type used by wind ports. There are a number of wind vessels of substantially greater draught and beam that were not chosen to be included in the simulation."*		

"7.3 Revised simulations are thus required that not only incorporate an appropriate range of vessel types, but also incorporate vessel movements to and from the northern end of the AMEP quay and up to date hydrodynamic data (i.e. that incorporates the berths at CPK and vessels moored alongside the AMEP quay). Moreover, information must be provided as to the weather and tidal conditions (including wind force) inputted into the simulation. C.RO submits that a strong flood tide should be included."

Date	Organisation	Document
17/09/2012	DLA Piper (for C.Ro Ports)	Submission to Planning Inspectorate
Comments		
"4.6 C.Ro therefore submits that AMEP should be required to produce a simulation of the berthing arrangement at AMEP that incorporates; *4.6.1 The final iteration of the quay wall design* *4.6.2 Vessel movements to/from the Northern end of the quay* *4.6.3 Up to date Hydrodynamic data and* *4.6.4 An appropriate range of vessel types* *4.7 The detail of the weather and tidal conditions simulated should also be provided.*		

Date	Organisation	Document
24/2/2013	Planning Inspectorate	Panel's Findings and Recommendations
Comments		
"13.0 Marine Issues and the Implications for Other Users of the Humber *Operation of C.RO with Regard to Navigation* *13.12 C.RO has concerns about the construction and operation of the proposed NSIP in respect of how it will affect their own marine facilities. C.RO has carried out its own hydrodynamic modelling and marine simulation to satisfy itself that the proposed NSIP would not pose any undue problems for the berthing and un-berthing of vessels at their facility. After this work C.RO is now satisfied with this aspect of the proposal…"* *13.16 C.RO has also been concerned about the effect that a large vessel moored at the upstream end of the proposed NSIP might have on its own area. The applicant has commissioned a further study from H.R. Wallingford to model this. In their Interpretation of Model Results, para 2.2 they found that Peak flow speeds for this very large spring tide are predicted to reduce by ~0.4m/s at CPK. No re-circulations are predicted at CPK.* *13.41 Given that further modelling work on the estuary has been carried out, that HR Wallingford has explained the significance of the results of this modelling and that MMO has accepted the findings and requires no further modelling, the Panel considers that these issues have been addressed adequately.*		

Date	Organisation	Document
14/06/2021	ABLE UK	Updated Environmental Statement
Comments		
Navigation Risk Assessment Update (Marico Marine) Stakeholder Consultation;		

ABP Immingham: *"Can't see a need for additional simulation".* C.Ro Ports: *"Activities remain unchanged since previous NRA was undertaken. However, larger vessels (including the "next generation" G9 class vessels at 234m LOA) are now being utilised and therefore they require a large swinging area when turning to berth.*

Date	Organisation	Document
07/09/2021	C.RO Ports Killingholme	Representation to National Infrastructure Planning Inspectorate
Comments		
"Creation of a "barge" ro-ro berth: the change to the quay design in this location is significant, because vessels will need to manoeuvre materially differently, in the direction of the berths at C.RO Ports Killingholme, when berthing and leaving. We do not have any information about what types of vessels would use this revised berth (including length and draught). This is a large berth which, if capable of handling ro-ro type traffic (according to the PEIR), will involve significant vessel movements in our approach channel. This needs to be set out and assessed fully. At present we cannot be satisfied that the existing protective provisions are sufficient, or be confident that AHPL could handle safe berthing and departure of these vessels in this new berth, without impacting the safe and efficient operation of C.RO Ports Killingholme."		

1.6 Summary of Comments & Concerns

The comments in Section 1.6 are broadly summarised below. The planning for the third set of simulations was intended to address these concerns where possible.

1.6.1 Vessels to HST

The largest vessel currently visiting C.RO has not been simulated.

AMEP berth was not occupied by a large vessel at the time.

1.6.2 Vessels to AMEP

Not representative of vessels that are likely to use the quay.

Only berthing at the Southern End has been simulated.

1.6.3 Bathymetry

Was not based on latest information.

1.6.4 Wind and Current

Benign; not extreme, values used.

1.6.5 Quay Layout

Latest Design (Material Change 2) and barge berth not used.

1.7 General Observation

The new AMEP berth is to be built along a line that roughly follows the existing 2.0m (at Chart Datum) depth contour. It is also inside the line connecting the PG buoys and the South Killingholme jetty to the South East. This presently is effectively a no-go area for all but very small craft.

If (as planned) the berth is dredged to -11.0m CD and the approaches to -9.0m CD then this will significantly increase the available width of navigable water in this area.

Once built, any vessels passing the berth and passing as close to the jetty as is reasonably practicable will be able to Navigate in areas that would (prior to the construction) have had insufficient water depth.

The new berth increases the Navigation channel width in this area for passing vessels.

2.0 Simulation Overview

2.1 Aims

The aim of the third set of simulations was to provide assurance that the arrival and departure of vessels both to and from AMEP and C.Ro Port Killingholme could be carried out safely and efficiently, in all realistically feasible and reasonably foreseeable situations.

The runs were chosen to simulate realistic scenarios, that is representing movements that currently take place in the case of C.Ro operations and anticipated vessels for the AMEP that would serve the offshore renewable energy industry. Within those parameters the scenarios were planned to take place with tide and wind conditions at the limit (and in some cases in excess) of what would be anticipated.

The tide chosen (7.5m range) approximated to a once per annum event. The local currents this produced in the middle of the tide cycle were in excess of 3.5 knots on the flood and 5 knots on the ebb tide. The Run timings chosen ensured that these currents were from an adverse direction, increasing the difficulty.

Also, for the simulations the times so as to produce the direction of current was simulated to be from an adverse direction, increasing the navigational difficulty.

Relevantly also, for the C.Ro vessels (Opaline), current strengths for all runs were in excess of those permitted for berthing or unberthing at their facility without tug assistance.

All of the factors combined to make many of the simulations very much a worst case scenario. Some conditions exceeded the limits of the vessel to tolerate, resulting in failed or aborted runs.

2.2 Attendees

The following attended the simulation exercises on 6 January 2022; Steven Harrison leaving after the 1st Run

Organisation	Name	Position	Role in Sim
Tyne Coast College	Mel Irving	Simulation Manager	Operator
	Paul Walton	Marine Simulation Lecturer	Assisting
Able UK	Steven Harrison	Managing Director	Observer
	Mike Nicholson	Consultant	Observer / Master
ABP	Gary Wilson	Head of Marine	Observer
	Andrew Firman	Harbour Master	Observer
	Ian Cousins	Senior Pilot	Pilot
	Stirling Scott	Pilotage Operations Manager	Master / Observer
	Joe Smith	Pilotage Operations Manager	Master / Observer
C.Ro Ports	Hugh Gates	Port Manager	Observer
	Phil Pannett	Owners Representative	Master

2.3 Addressing Concerns

The table below indicates how the simulation schedule, agreed between the attendees, addressed the concerns recorded in 1.5 and 1.6 above.

Concern	Solution
Vessels to C.Ro Port	
The largest vessel currently visiting have not been simulated.	Hydrography shows that the presence of the new AMEP berth (even when occupied) increases the width of Navigable water available to vessels approaching and departing C.Ro berths. Large vessels already have a history of safe operation with the existing (narrower) approach channel. See also S4.6
AMEP berth was not occupied by a large vessel at the time.	In the new simulations the AMEP Berth was occupied by double banked vessels protruding over 90m from the berth
Vessels to AMEP	
Not representative of vessels that are likely to use the quay.	Alternative models to those used in the original simulations were used, namely the “Rotra Mare” and “Xiang Yun Kou”
Only berthing at Southern End has been simulated.	Berthing and unberthing at the northern end (Figure 2, Berth 5) and the new inset barge berth (Figure 2, Berth 7) were both attempted in the new simulations.
Bathymetry	
Was not based on latest information.	Model updated to 2021 bathymetry.
Wind and Current	
Benign; not extreme, values used.	Extreme values were used in the new simulations. The tide used (based on those on 9th September 2010 (HW 7.8m, LW 0.3m and range 7.5m), is approximately a 1/year event
Quay Layout	
Latest Design (Material Change 2) and use of inset barge berth not simulated.	Simulator was updated to incorporate the latest berth model, and simulations included berthing and unberthing at the inset barge berth (Figure 2, Berth 7)

2.4 Number of Simulations

Obviously, to test every single parameter could lead to hundreds of simulations. Therefore, a limited simulation schedule was agreed with the participants using worst case environmental conditions to enable reasonable conclusions to be drawn. Minimal changes were made during the day in light of experience gained during the simulations and with a collaborative approach.

2.5 Recording and Assessment

As well as recording of the timelines and vessel track plots, an attempt was made to assess the simulation runs subjectively using a grading system;

1. **Good,** Straightforward, comparatively easy
2. **Fair**, Significant effort & close monitoring required, but vessel not close to danger
3. **Satisfactory** but less than optimal. Times when vessel not proceeding as desired
4. **Near Miss,** vessel close to edge of set limits, significant force on structure or ropes
5. **Fail,** vessel out of channel, struck object, parted ropes, in irrecoverable position

This along with other details of the run, were recorded on a custom form. All completed forms are appended to this report.

2.6 Vessel Models

The following vessels were chosen for the simulation:

Opaline to represent moves of RoRo vessels to and from C.Ro Port Killingholme ,

Rotra Mare to represent an existing windmill blade carrier,

Xiang Yun Kou as an example of a very large project vessel suitable for transport of windmill jackets and towers.

The main vessel details are below;

Vessel Name	Opaline	Xiang Yun Ku	Rotra Mare
Type	RoRo Freight Ferry	Semi - Submersible Heavy Lift Vessel	Blade Carrier (ex container ship)
Length Overall	195.4m	216.7m	152.7m
Length (BP)	186.2m	212.1m	143.5m
Breadth Moulded	30.0m	43.0m	25.6m
Draught	7.40m	9.68m	7.72m
Gross Tons	33,960	35,568	6,564
DWT	13,439	48,231	8,818
Main Propulsion	10,800 kW	10,500 kW	9,240 kW
Screws	Single	Twin	Single
Rudder	High Lift	Spade	High Lift
Thrusters	F 1,800kW A 900 kW	F 1,200kW F 1,200kW *Not Used*	F 750kW

2.7 Size Of Models / Ships

While the statement from C.Ro ports (S1.6 and S1.7) that the largest vessel currently visiting C.Ro has not been simulated is true, this should be put into context.

- Simulations have shown that the most difficult part of the manoeuvre to and from C.Ro is not the passing of the AMEP berth, but the actual berthing and unberthing evolution. It is logical then that when vessel sizes increase; berthing at C.Ro, not passing AMEP berth, will continue to be the limiting factor.
- The above also applies to PCC (Pure Car Carriers) and any other vessels visiting C.Ro port.
- The largest similar model available at the time of the simulations (Opaline) was used. This is representative of vessels currently using C.Ro ports..
- If the larger vessels were considerably harder to manoeuvre then different parameters (in terms of wind, current and tug requirements) would exist. As far as we are aware, no such conditions are applied.
- The Gross Tonnage of the Celine (one of the largest vessels to visit C,Ro Killinghome) is 74,273, and the Opaline only 33,960 (some 2.2 times greater) but GRT is a measurement of volume. Other size comparisons are more relevant in the context of manoeuvring.
- Below (S4.3.1) are tabulated some relevant vessel dimensions for comparison.

Vessel Name	Opaline	Multiple	Celine
Length Overall	195.4m	1.20	234.1m
Breadth Moulded	30.0m	1.17	35.0m
Draught	7.40m	1.10	8.12m
Depth	24.0m	1.33	31.9m
Nominal Area (LOA x Depth)	4690m^2	1.59	7468m^2
Load Displacement	23,836	1.73	41,200 (est)
Gross Tons	33,960	2.18	74,273
Main Propulsion	10,800 kW	1.72	18,660 kW
Thrusters	F 1,800kW A 900 kW	2.78 5.72	F(2) 5,000kW A(3) 5,150kW

- Note that while displacement is some 1.7x greater, the main engine power is greater by a similar amount. Thus, acceleration would be similar.
- The vessels side area (that aspect most affected by the wind) is estimated as some 1.6x greater but the aggregate thruster power is some 3.7x greater . More than enough to counteract the increased windage area, and also to overcome the greater inertia of the heavier vessel.

2.8 SIMULATION SCHEDULE

For completeness both the planned and actual simulation schedules are shown below.
Any deviation from the plan is generally explained in the run records (See Appendix).

Run	Run Description	Direction	Tide	Notes	Wind	
Planned / Proposed						
1	***Opaline*** *(195m RoRo), berthing C.Ro 5/6*	*Inwards*	*Spring flood, HW -3h*	*AMEP 5 Occupied, double banked. 60m+ Beam*	*NE*	*5/6*
2	***Opaline*** *(195m RoRo), departing C.Ro 5/6*	*Outwards*	*Spring ebb, HW +3h*	*AMEP 5 Occupied, double banked. 60m+ Beam*	*NE*	*5/6*
3	***Xian Yun Kou*** *(217m Heavy Lift) AMEP 5*	*Inwards*	*Flood Tide*	*Max acceptable current for size, 3 Tugs (110t+ BP)*	*S*	*5/6*
4	***Xian Yun Kou*** *(217m Heavy Lift) AMEP 5*	*Outwards*	*Flood Tide*	*Max acceptable current for size, 2 Tugs (60t +BP)*	*N*	*5/6*
5	***Rotra Mare*** *(153m Blade Ship) AMEP 7*	*Inwards*	*Spring flood, HW -3h*	*AMEP 5 Occupied*	*SW*	*5/6*
6	***Rotra Mare*** *(153m Blade Ship) AMEP 7*	*Outwards*	*Spring flood, HW -3h*	*AMEP 5 Occupied*	*NE*	*5/6*
7	***Opaline*** *(195m RoRo), berthing AMEP 7*	*Inwards*	*Spring flood, HW -3h*	*AMEP 3 Occupied*	*SW*	*5/6*
Actual						
1	**Opaline** (195m RoRo), berthing C.Ro 5/6	Inwards	Spring flood, HW -3h	AMEP 5 Occupied, double banked. 80m+ Beam	NE	5/6
2	**Opaline** (195m RoRo), departing C.Ro 5	Outwards	Spring ebb, HW +3h	AMEP 5 Occupied, double banked. 80m+ Beam	NE	4/5
3	**Xian Yun Kou** (217m Heavy Lift) AMEP 5	Inwards	Slack Water	Max acceptable current for size, 3 Tugs (110t+ BP)	S	5/6
4	**Xian Yun Kou** (217m Heavy Lift) AMEP 5	Outwards	Last of flood	Max acceptable current for size, 2 Tugs (60t+BP)	N	5/6
5a	**Rotra Mare** (153m Blade Ship) AMEP 7	Inwards	Spring ebb, HW +3h	AMEP 5 Occupied	SW	5/6
5b	**Rotra Mare** (153m Blade Ship) AMEP 7	Inwards	Spring ebb, HW +1h	AMEP 5 Occupied	SW	4/5
5c	**Rotra Mare** (153m Blade Ship) AMEP 7	Inwards	Spring ebb, HW +1h	AMEP 5 Occupied	SW	4/5
7	**Opaline** (195m RoRo), berthing AMEP 7	Inwards	Spring flood, HW -3h	AMEP 5 Occupied	SW	4/5
8	**Opaline** (195m RoRo), departure AMEP 7	Outwards	Spring flood, HW -3h	AMEP 5 Occupied	SW	4/5

2.9 Berth Layout With Channel Dimensions & Location

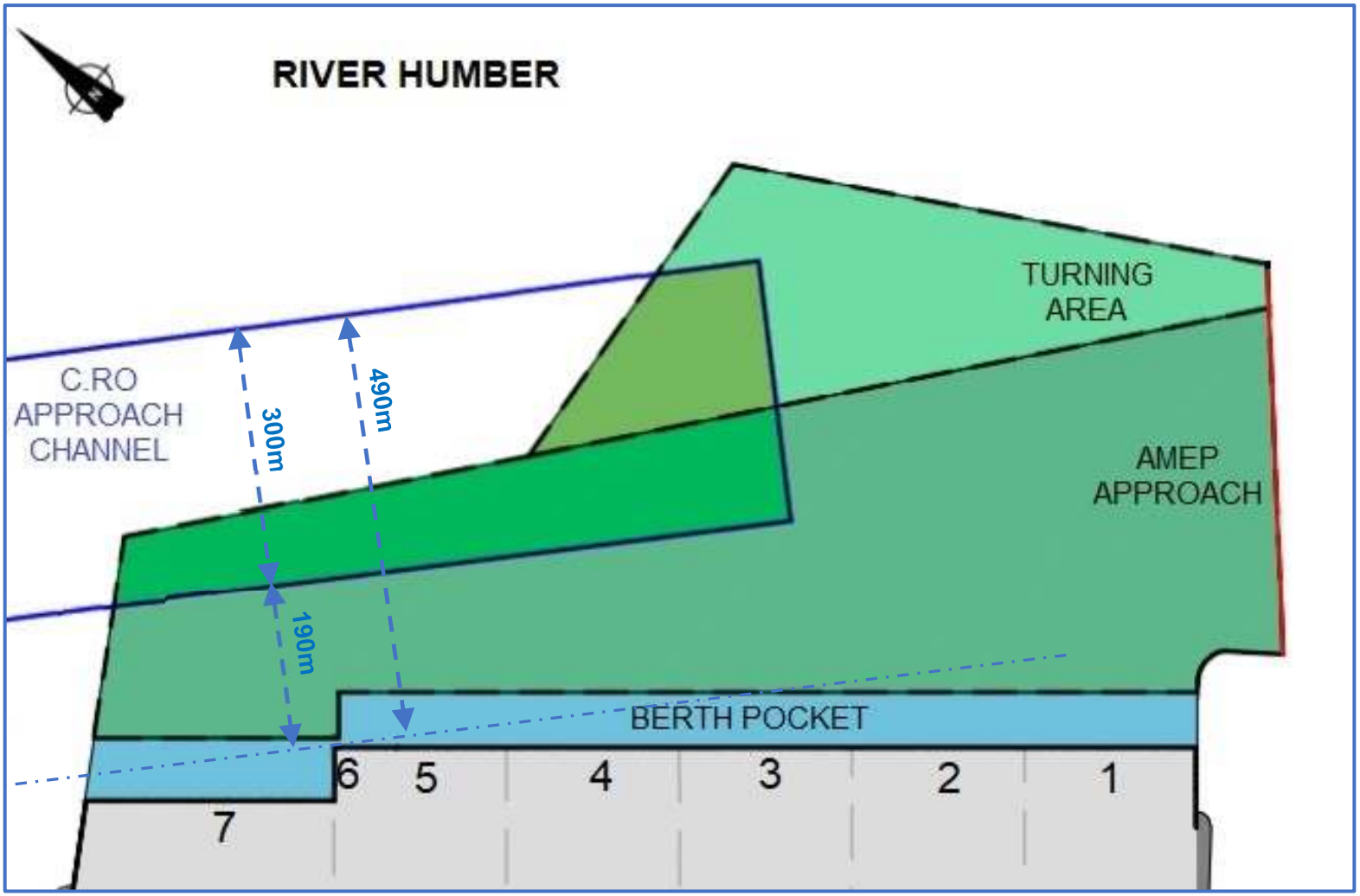

Figure 6 General Berth Layout with Approximate Dredged Channel Dimensions

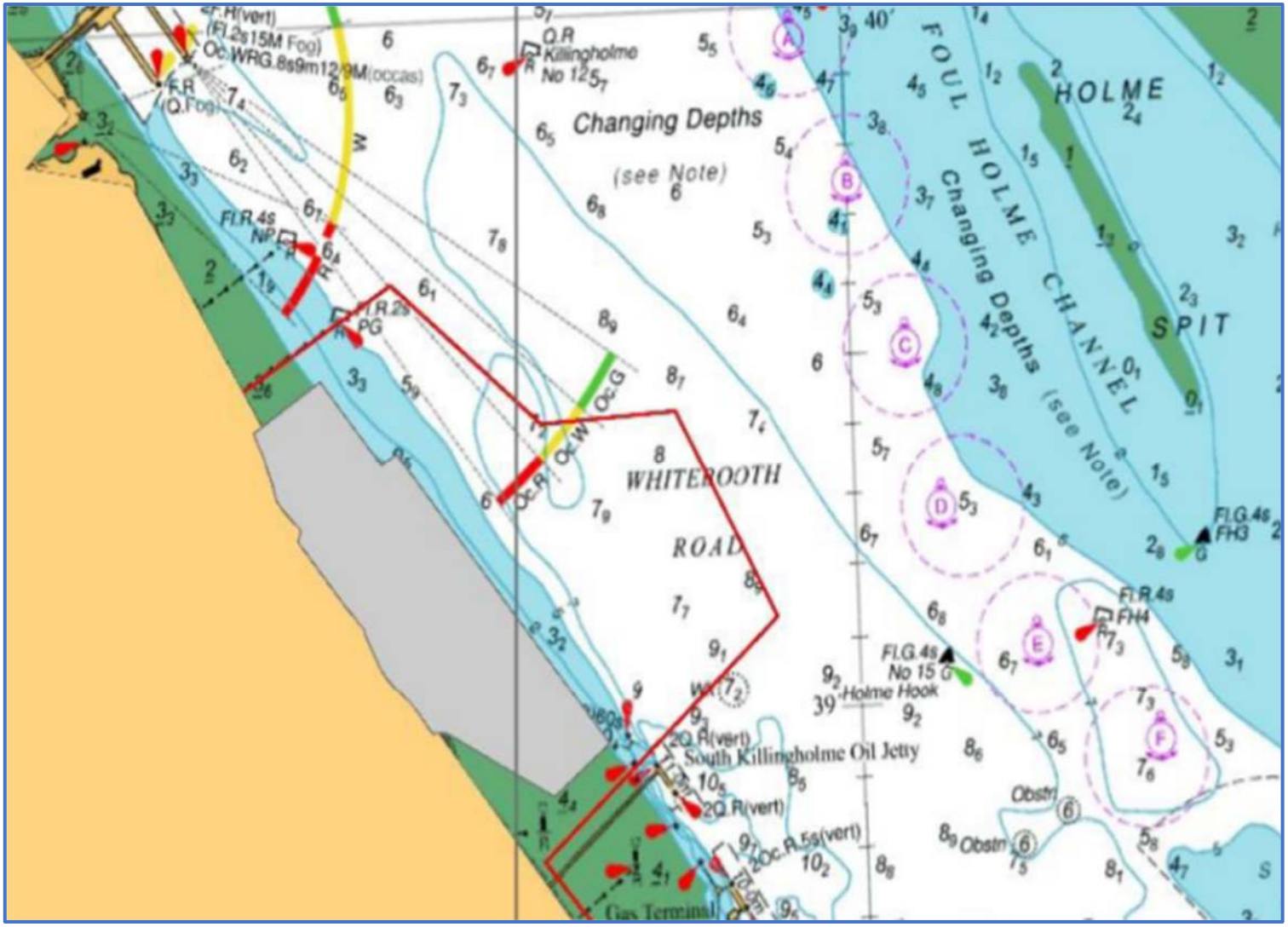

Figure 7 *Chart - Dredge Area Against Nearby Navigation Channels & Buoys*

3 INDIVIDUAL RUNS

3.1 RUN 1 OPALINE BERTHING C.RO 5/6

Scenario: Opaline (195m RoRo), berthing C.Ro 5/6.

Conditions: Spring flood, HW -3h, wind NE 22kts (+/- 3kts)

Objective: Safe passing of Able Humber Port.

Figure 8 Run1: Track of Opaline (1m paints)

Notes: AMEP 5 Occupied, double banked. 93m extent from berth.

Vessel passed the AMEP berth with a significant drift angle (35°), but without undue concern. Closest approach being 185m to the berth and 167m to the double banked vessels.

Figure 9 Run1: Opaline passing AMEP4 showing drift angle

The Opaline was at all times within the approach channel(s) when passing the berth, the farthest out when passing Quay 6 being some 340m (offshore bow), still 150m to the edge of the approach channel in that area (490m offshore).

Figure 10 Run1: Opaline passing AMEP 7, CPA 167m off berthed vessels.

Exercise ended at T+00:20m with Opaline a ships length SE of C.Ro berth1, stern angled in 26° to the berth yet still tracking North. It was clear the vessel would not be able to berth without extreme difficulty. END EX.

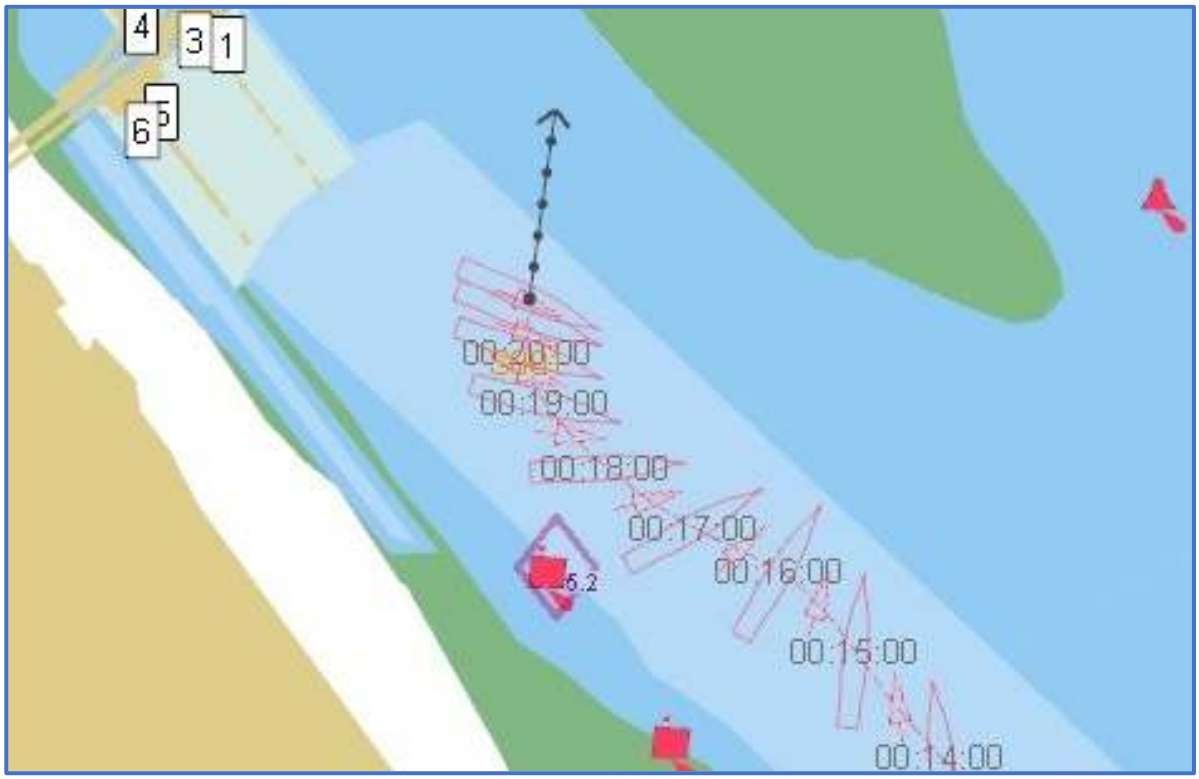

Figure 11 Run1: Opaline End Position Showing Vessel Tracking North.

3.2 RUN 2 OPALINE DEPARTING C.RO 5

Scenario: Opaline (195m RoRo), departure C.Ro 5.

Conditions: Spring ebb, HW -3h, Wind NE 22kts (+/- 3kts), reduced to NE 17kts (+/- 3kts),

Objective: Safe passing of Able Humber Port.

Figure 12 Run2: Track of Opaline (1m paints)

Notes: AMEP 5 Occupied, double banked. 93m+ Beam

Initially with a 22knot (gusting +/- 3knots) wind, the vessels thrusters were unable to lift the vessel. The wind was then reduced to 17knots +/- and a successful departure was carried out.

When departing C.Ro5, it was noted that the berth and the double banked vessels were well outside (South) of the current channels delineated by the red NP and PG Buoys, which mark the cooling water intakes and outfalls.

Clearing the NP and PG buoys required turning to port as soon as clear of the jetty and building up speed quickly. The manoeuvre to clear the buoys being more difficult than that required to pass the AMEP berth.

Figure 13 Run2: Passing AMEP4 Outwards (240m off Vessel)

Figure 14 Run2: Birds Eye View On Departure. IOT in Far Distance

Closest point of approach to AMEP was 315m to the quay and 240m to the berthed vessels. Drift angle was ~34°.

The Opaline was at all times within the approach channel(s) when passing the berth, the farthest out when passing Quay 4 being some 450m (offshore bow), 90m to the edge of the approach channel in that area (540m offshore).

3.3 RUN 3 XIANG YUN KOU BERTHING AMEP 5

Scenario: Xiang Yun Kou (217m Heavy Lift) inwards to AMEP5. In Ballast.

Conditions: Last of Flood / Slack Water, Wind S 22kts (+/- 3kts)

Objective: Safe berthing at AMEP 5, port side to.

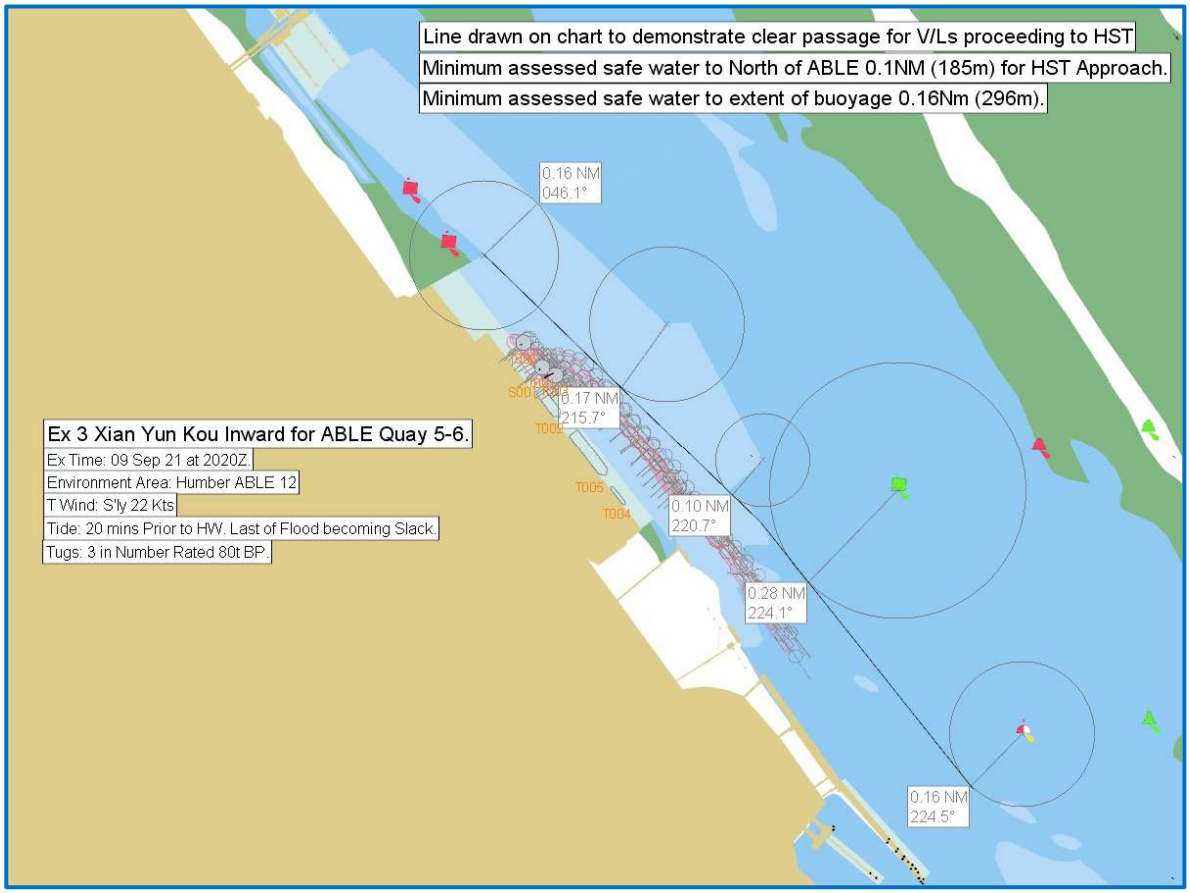

Figure 15 Run3: Xiang Yun Kou Track, Showing Clear Channel Distances.

Notes:

Treated as passage plan vessel, slack water berthing. Three tugs allocated.

Commenced inwards at 20minutes to HW Immingham (40minutes to slack water).

Though vessel was fitted with twin engines these were used in unison (both ahead or both astern) to simulate a less manoeuvrable vessel. Similarly, while this particular vessel is fitted with stern and bow thrusters, these were not used in the simulation exercise.

The vessel was in ballast though had no load on deck, the Tugs were easily able to hold the vessel into the wind. The Xiang Yun Kou passed the AMEP berth at an average of 150m off the berthed vessels. This allowed a minimum of 185m clearance to the edge of the dredged channel at AMEP 1 and 300m clearance at AMEP7.

However as this was a High Water berthing navigable water for vessels proceeding to or from C.Ro would have been delineated by the Navigation buoys and so well over 500m navigable width would be available (at HW) outside the Xiang Yun Kou.

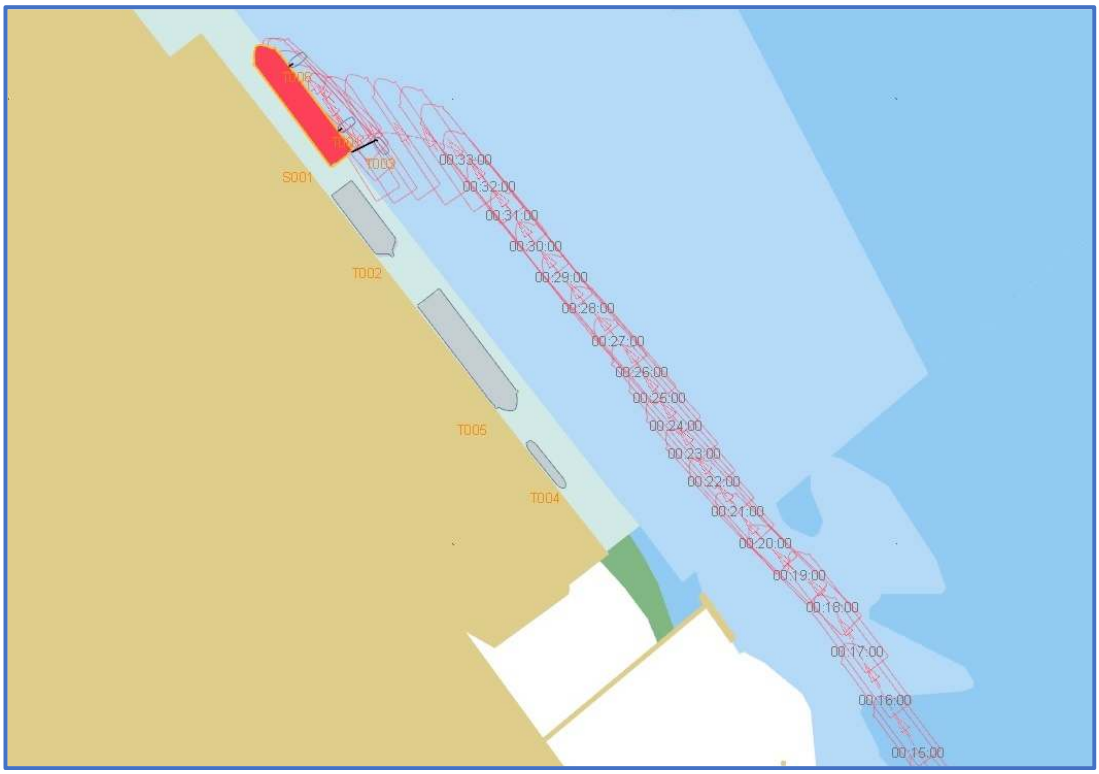

Figure 16 Run3 Xiang Yun Kou Approaching Berth

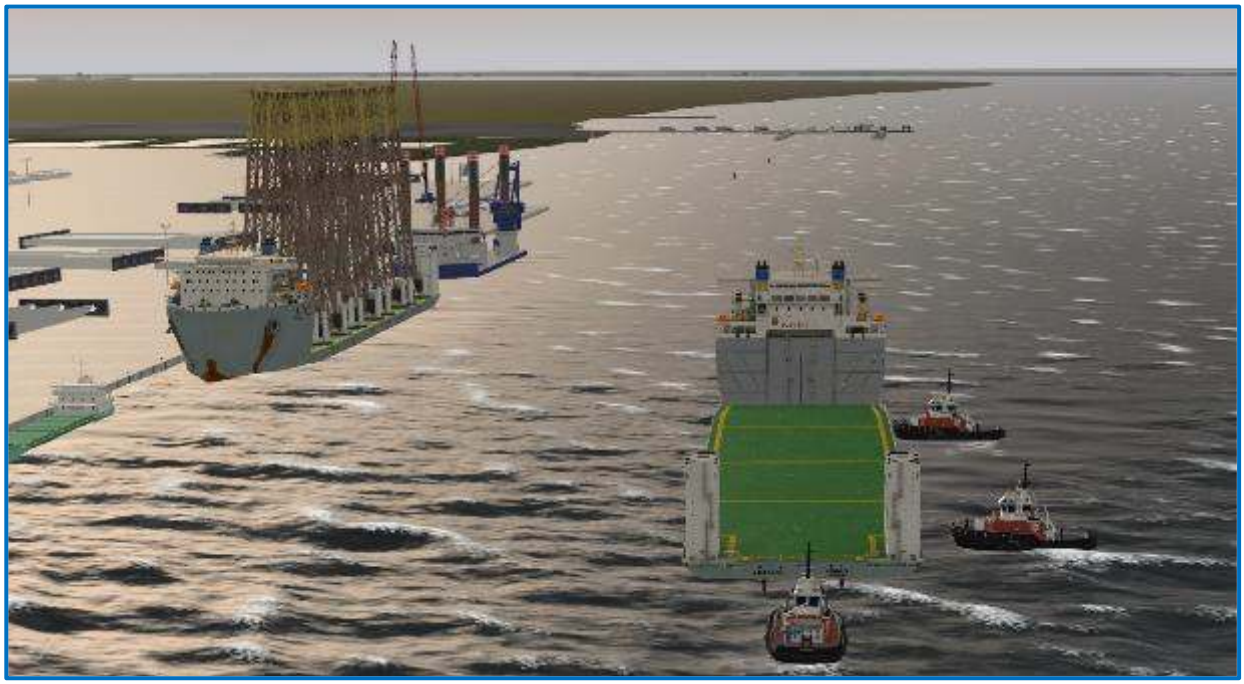

Figure 17 Run3: Xiang Yun Kou. Approaching Berth, Tugs Fast.

3.4 RUN 4 XIANG YUN KOU DEPARTING AMEP 5

Scenario: Xiang Yun Kou (217m Heavy Lift) sailing from AMEP5. Loaded.

Conditions: Flood, 1.5 hours to HW (2.9 knots). Wind N 22kts (+/- 3kts)

Objective: Safe departure from AMEP 5, port side to. Swing and depart.

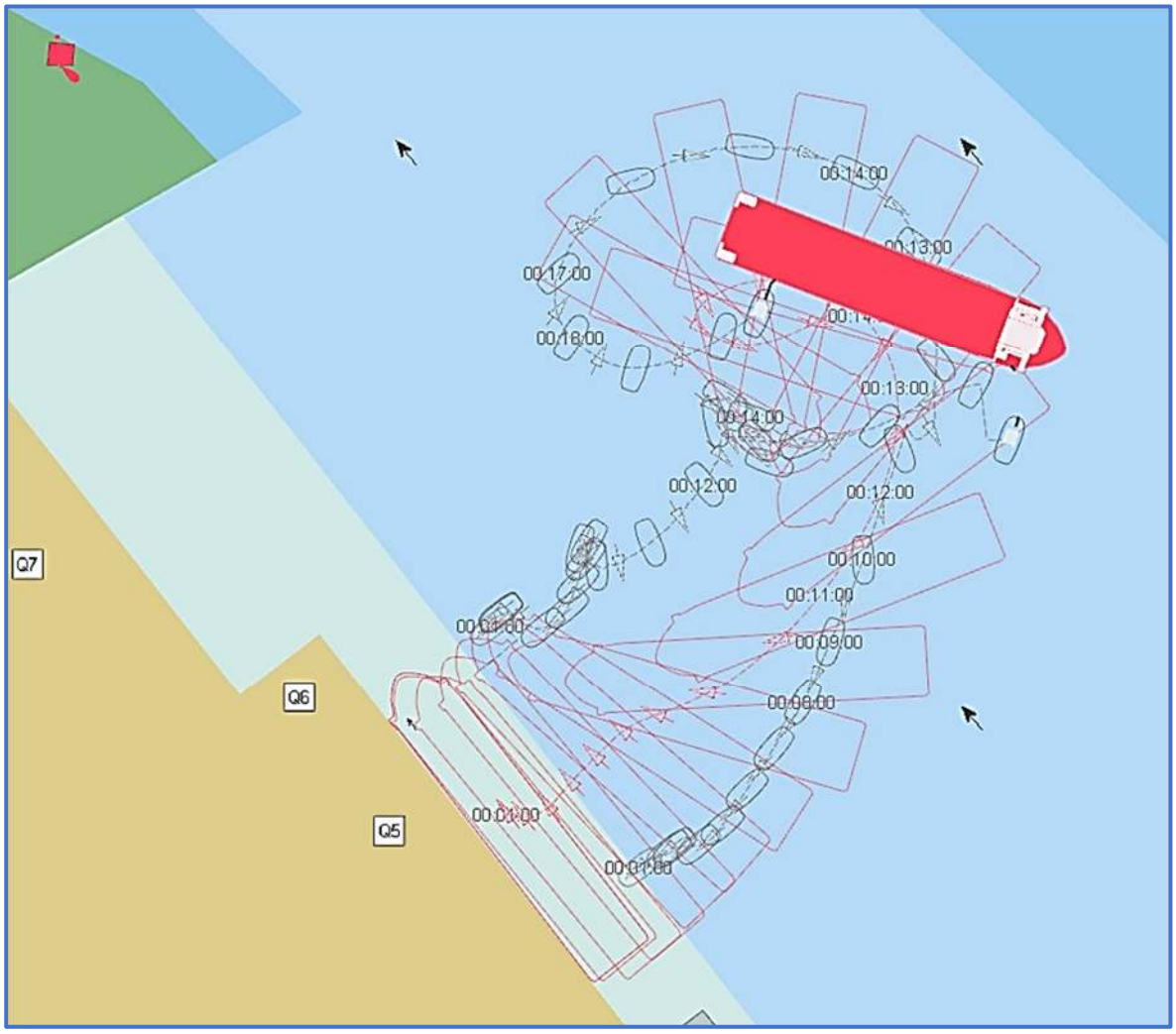

Figure 18 Run4: Xiang Yun Kou Track-Sailing and Turning (1m Paints)

Notes:

Treated as passage plan vessel, departure 1.5hrs before HW. Two tugs allocated. As before engines used in unison and thrusters not used at all.

It was noted that the vessel was swung some distance North of the quay (Bow ~250m off when perpendicular), the pilot advised that this was deliberate to allow for the strong Northerly wind in case she set-down when commencing passage. As it transpired the wind effect was not as severe as anticipated and the vessel could have swung closer to the quay.

Noted that despite the fairly strong flood tide, and requiring to swing, the vessel did not go farther upstream than the end of the AMEP berth. Still some 900m from the C.Ro installation.

Nevertheless, the vessel used approximately 450m of dredged channel width to turn, passing within 70m off the edge of the dredged channel in this area.

Noted also that there was more dredged width available to the East (in the swinging area), and also that as this was close to HW, there would still be a considerable Navigable channel available for vessels to pass if required (800m between IGT and No 15 “Holme Hook” Buoy).

Vessels passing the area transiting up or down river from Hull, would generally pass well North of the area and so are unlikely to be affected by berthing, unberthing or turning manoeuvres at this berth, even for such large vessels as the Xiang Yun Kou.

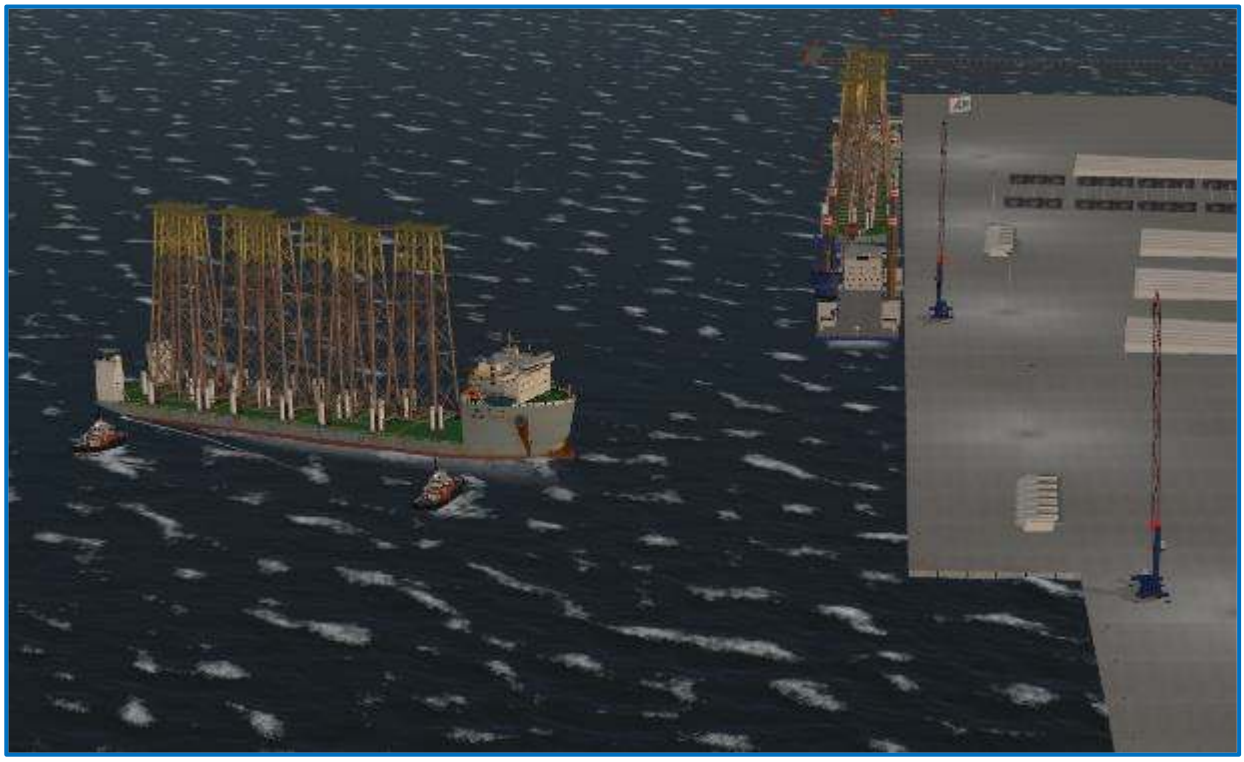

Figure 19 Run3 Xiang Yun Kou. Half Way Round.

3.5 ROTRA MARE BERTHING AMEP 7

3.5.A RUN 5A ROTRA MARE BERTHING AMEP 7

Scenario Rotra Mare (Blade Ship) inwards to AMEP 7.

Conditions: Spring ebb, HW +3h, 5.2 knots. Wind SW 22kts (+/- 3kts)

Objective Safe berthing (head in) at AMEP 7 (Inset berth)

Figure 20 Run 5A: Rotra Mare, Transit Swing(s) and Approach (1m Paints)

Notes:

Most observers felt that this Run would be extremely challenging under the conditions attempted. Pilots experience of handling sister vessels in and out of dock indicated two tugs were sometimes required.

Anticipating a port swing into the strong Southerly wind the pilot made good a track well to the North East to give sea-room for the swing. As it was the vessel was not able to turn into the wind in the sea room available. As soon as the engines were put astern the transverse thrust and wind counteracted any turning moment from the bow thrust (on full throughout), and the vessel merely set downstream. There was not enough sea-room to drive the vessel round with engines as by now she was too close to the berth despite the initial Northerly approach.

The pilot (00:19:00) made the decision to turn the vessel to starboard (where the transverse thrust would assist the turn). This was achieved and then the vessel was placed with the tide on the port quarter to stern-bore and crab across the tide to the berth.

While the initial approach went well it soon became clear that when approaching the berth (and necessarily reducing the angle to the tide by thrusting the bow to starboard, the wind quickly stopped any movement towards the berth. With the tide astern there was no room to drive the stern in with engines. At this stage the berthing was aborted as it was not tenable.

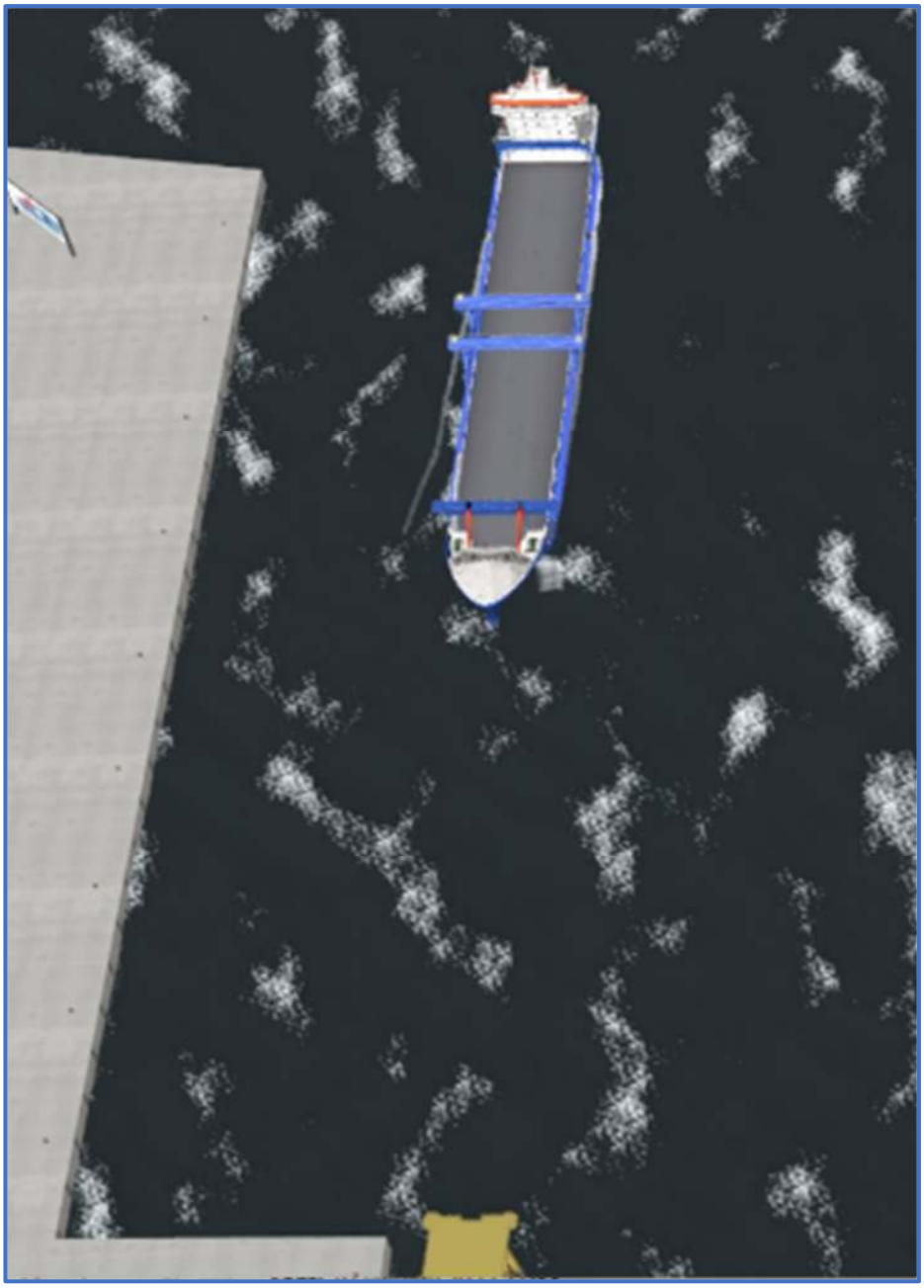

Figure 21 Run5A: Rotra Mare, Final Approach

3.5.B ROTRA MARE BERTHING AMEP 7

Scenario Rotra Mare (Blade Ship) inwards to AMEP 7.

Conditions: Spring ebb, HW +1h, 0.75 knots. Wind SW 10kts (+/- 3kts)

Objective Safe berthing (head in) at AMEP 7 (Inset berth)

Figure 22 Run 5B: Rotra Mare Backing Toward Berth, Out of Position.

Notes:

Run 5b was a repeat of Run 5a, with less wind (and significantly less tide). The vessel was swung to starboard but the approach was too far to the East and in a poor position. The Run was aborted

3.5.C RUN 5C ROTRA MARE BERTHING AMEP 7

Scenario Rotra Mare (Blade Ship) inwards to AMEP 7.

Conditions: Spring ebb, HW +1h, 0.75 knots. Wind SW 10kts (+/- 3kts)

Objective Safe berthing (head in) at AMEP 7 (Inset berth)

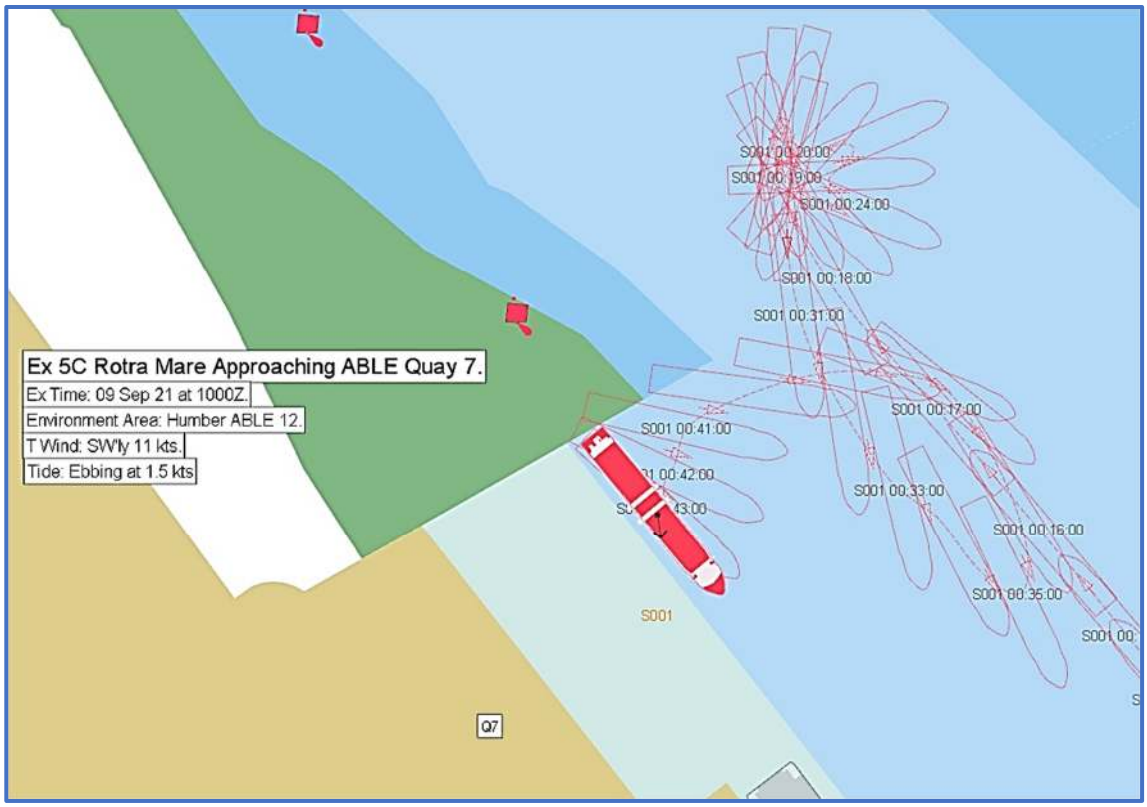

Figure 23 Run5C: Rotra Mare Further Attempts

Notes:

Run 5c was a repeat of Run 5b, with the same conditions.

After swinging to stb'd (00:19:00 to 00:30:00) 11 minutes, a bow first approach was initially attempted (00:30:00 – 00:35:00), when it became apparent that as before the vessel was not closing the berth merely drifting down in the tide.

A stern-bore attempt was then made (00:39:00 to 00:43:00), but as in the previous Run5a, although the vessel was able to "crab" across the tide with the tide on the port quarter, the angle required was too great to allow berthing on the vessel starboard quarter, and as soon as the vessels bow was put to starboard to reduce the angle, the wind predominated and set the vessel away from the berth.

With the cut-out dead ahead and an ebb tide, it was not feasible to use ahead movements with hard to port (in conjunction with starboard thrust) to drive the vessel sideways to the berth as headway was gained too quickly. When astern engine movements were given, the stern just blew off the quay.

3.6 PLANNED RUN 6

Departure of Rotra Mare from AMEP 7 not performed. Departure of Opaline (Run 8) instead.

3.7 RUN 7 OPALINE BERTHING AMEP 7

Scenario: Opaline (195m RoRo), berthing AMEP 7 (inset berth) Spring flood

Conditions: Spring flood, HW +3h, 3.7 knots. Wind SW 15kts (+/- 3kts)

Objective: Safe berthing at AMEP 7, Stern first (Port Side To)

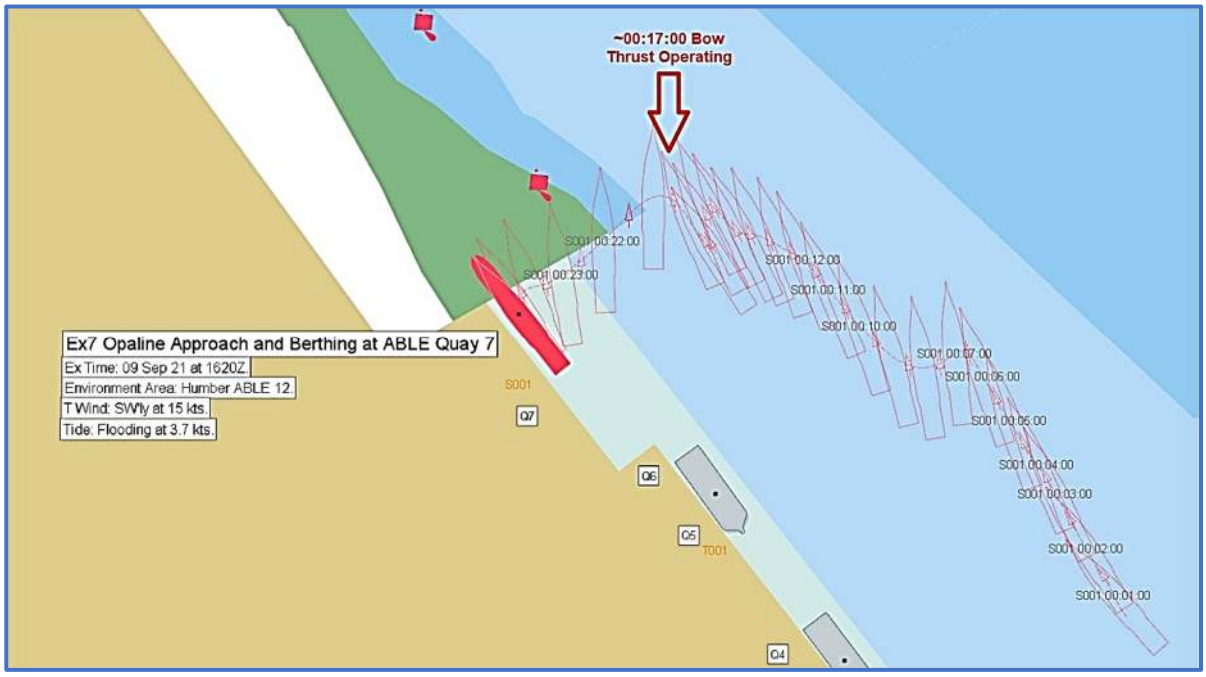

Figure 24 Run7: Opaline Berthing at AMEP7 Stern-first.

Notes: Wind Force 4-5 was used as being the limit for this vessel without tugs.(see Runs 1/2)

Around minute 00:17 it was realised that both the bow and stern thrusters had not been switched on. This was remedied after which control towards the berth was good and comparatively easy, though the vessel was somewhat ahead of position.

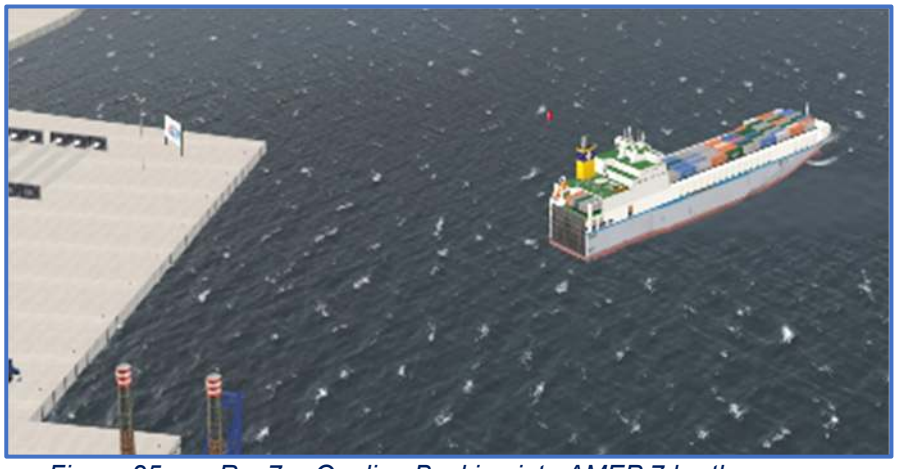

Figure 25 Run7: Opaline Backing into AMEP 7 berth.

Note, as per run 1 & 2 that the tide was extreme (~ once per annum event) and the flood current was approximately 3.2 knots. Berthing and un-berthing limits for this class of vessel at C.Ro terminal mandates at least one Tug assistance when current speed is ≥ 2.5 knots

3.8 RUN 8 OPALINE DEPARTING AMEP 7

Scenario: Opaline (195m RoRo),leaving AMEP 7 (inset berth).

Conditions: Spring flood, HW +3h, 3.7 knots. Wind SW 15kts (+/- 3kts)

Objective: Safe departure and swinging.

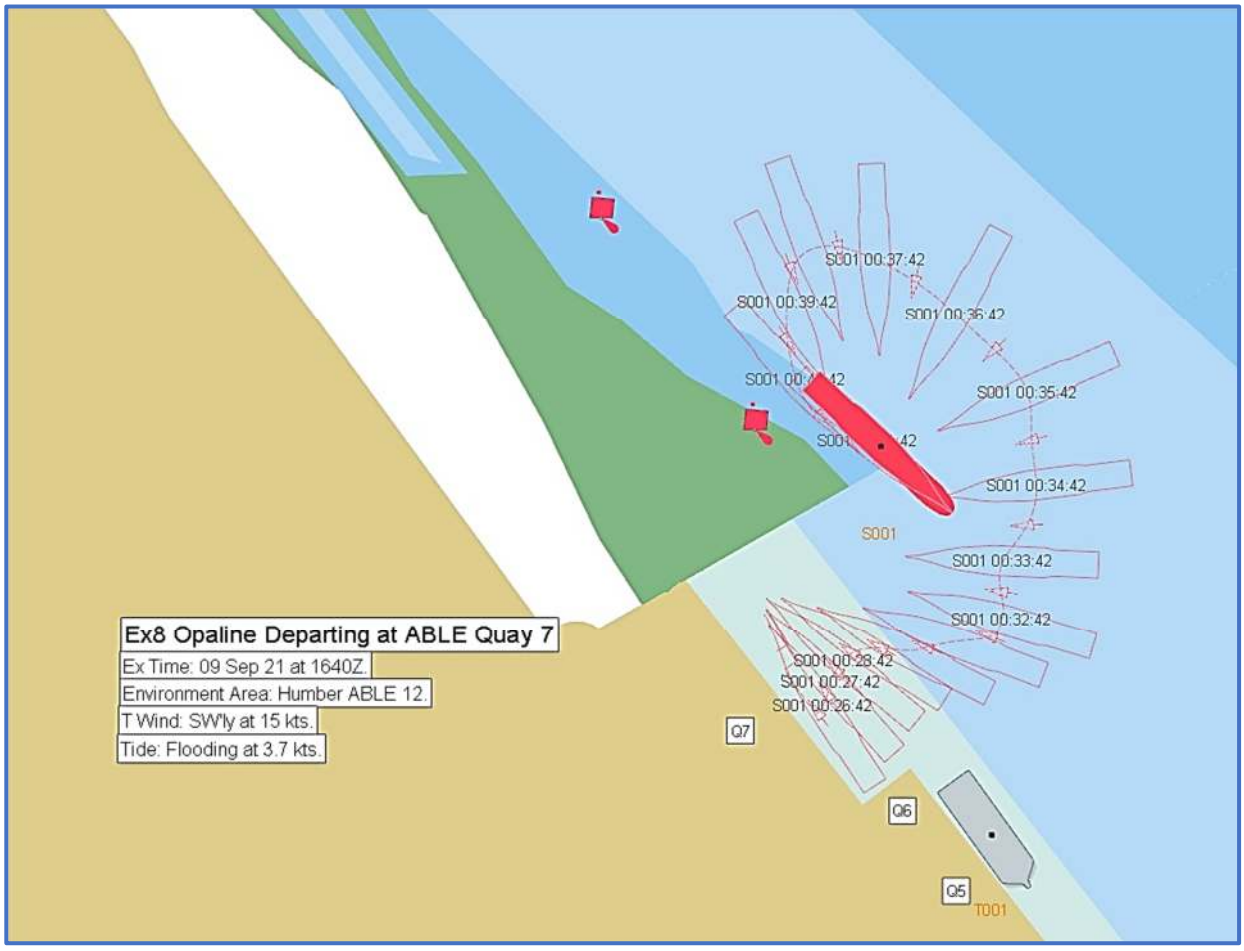

Figure 26 Run8: Opaline Departure AMEP7

Notes:

Additional Run, departure from AMEP 7 with Opaline (instead of Run 6 with Rotra Mare).

Vessel completed swing close to PG Buoy. At the debrief It was felt that departing in such a strong tide there would be some benefit in backing off further to the East before commencing the swing.

Noted that despite the very strong flood tide, and requiring to swing, the vessel did not go farther upstream than the NP buoy. Still some 550m from the C.Ro installation.

Farthest distance into the channel during the swing was ~370m from the main jetty face line, with the stern closing to about 50m from the channel dredge area. Though noted as above that if the vessel at 00:33 had moved farther to the East before swinging, there would have been more room to the North East and she could also have swung closer to the jetty.

On completion of the swing the Opaline was close to the Red PG and NP buoys.

Figure 27 Run8: Opaline head out.

4 SIMULATION OBSERVATIONS

4.1 THE PRESENCE OF THE AMEP BERTH (OCCUPIED OR UNOCCUPIED)

The new simulations demonstrated presence of the AMEP quay does not affect berthing and unberthing at C.Ro Port. The pilot conducting the Opaline departure (Run 1 and 2) commented favourably on the location of the AMEP berth and the lack of protrusion into the channel even with two large vessels double banked at the NW end.

Figure 288 View from Bridge of Opaline at C.Ro 5

On the inward passage the vessel passed no closer than 160m to the berth or vessels alongside, this with a very strong Northerly wind (wind and tide both stronger than the vessel could tolerate when berthing or unberthing at C.Ro berths).

In a Southerly wind, the pilot may have safely passed closer to the berths but the extent to which this would be desirable is limited by the requirement to clear the PG and NP buoys.

Outward bound with a Strong Northerly wind and adverse ebb tide, the Opaline still cleared the double banked berthed vessels by 240m (clearance to a normally berthed vessel would have been approximately 300m).

Swinging for the C.Ro berths (either on arrival or departure) at all states of tide and wind, invariably takes place upstream of the AMEP berths and so its presence should not affect this aspect of their arrivals and departures.

4.1.1 SUMMARY

Material Change 2, has not made any significant difference to passing vessels.

There was nothing in the simulations that suggested that the presence of the AMEP berth itself (including any vessels only berthed at the installation) would require any modification to the passage of vessels transiting to or from C.Ro berth or change the parameters under which they operate.

4.2 Vessels Arriving and Departing AMEP

While some of the arrival simulations proved unsuccessful (Rotra Mare Berthing – Run 5), this was an exercise that was expected by some observers to be extremely challenging (and by some to not be achievable). This proved to be the case, as the conditions were above that which the vessel could tolerate (as was the case with Run 2 from C.Ro).

That said, the vessel was able to navigate and turn in the available channel and had enough space to abort the approach. This though indicates the obvious need for some limitations to operations at the berth.

The Xiang Yun Kou, when treated as a Passage Plan vessel was able to berth, unberth and swing in relative safety. This in the presence of strong winds and a very high tidal range.

The Opaline was able to berth and unberth at AMEP 7 jetty in winds that were on the limit for her, and with current strengths above which would be tolerated if berthing at C.Ro Killingholme berth (≥ 2.5 knots), without using a tug.

In summary, the berth design, with appropriate limits in place, has proved capable of supporting safe operations. This includes, berthing and departing and swinging either before berthing or on departing.

Material Change 2, has not made any significant difference to berthing and operations at the quay.

4.3 Conflicting Vessels

If vessels intend to pass or manoeuvre in the area at the same time as a berthing or unberthing is taking place at the AMEP berth some organisation of vessel traffic, by VTS Humber, is likely to be required. However, this would also be the case with the consented scheme. This is to ensure the requisite spatial separation (time or distance) is maintained.

Except under extreme conditions (very large vessels, very strong winds etc), then:

- For vessels passing to and from Hull and other upstream locations no conflict is envisaged.
- When vessels are berthing or un-berthing at AMEP without swinging, no conflict is envisaged
- When small vessels are manoeuvring onto and off the AMEP berth and swinging, no conflict is envisaged.

5 CONCLUSIONS & RECOMMENDATIONS

5.1 THE BERTH STRUCTURE

There is no evidence to suggest that the berth itself, or any vessels alongside, will:

- Constitute a hazard or an obstacle to vessels passing or manoeuvring in the area.
- Increase the difficulty of Navigation adjacent to the berth.

5.2 BERTH OPERATIONS

Before coming into operation, a set of conditions, dictating the time and manner of arrival or departure of vessels onto and off the berth, including any limiting conditions, will need to be developed and established.

These to be written into both AMEP's berth operating procedures and VTS standing instructions. Formulating these will require collaboration between Able UK and ABP's marine department.

5.3 PORT MARINE SAFETY CODE

It is recommended that AMEP as a Statutory Harbour Authority, in developing such procedures and other arrangements, ensure compliance with the relevant requirements of the Port Marine Safety Code as part of a Marine Safety Management System

5.4 HUMBER PASSAGE PLAN

The Humber Passage Plan applies to vessels of ≥40,000 Summer Deadweight, or ≥ 11.0m actual draft (or gas tankers ≥20,000m3 capacity).

Some vessels in the energy market including specialised project vessels, are of dimensions (length, breadth, Gross Tonnage) similar to or greater than tankers or bulkers that would come under the Humber Passage Plan requirements, but because they are not technically 40,000 DWT and may not be over 11.0m draft, they would not technically be included in the definition.

It is recommended that the Humber Passage Plan definitions be reviewed and if necessary amended, so that vessels of dimensions similar to those specified will be included, and the procedures applied. This would also require the AMEP berth itself to be included in the plan and associated timings.

5.5 TRAFFIC ORGANISATION

On the occasions when the required spatial separation (in terms of time or distance) cannot be maintained, VTS Humber will be required to organise vessel traffic (using its existing powers) to avoid conflict and manage risks.

This situation already exists at many berths and locations on the river and is not a consequence of the material change.

5.6 CONCLUSION

If the above recommendations are followed the berth and its operations should be able to maintain risks to As Low as Reasonably Practicable (ALARP)

APPENDIX 1 INDIVIDUAL RUN RECORDS

All speeds in knots (kts), all ground track / speed over the ground unless otherwise stated.

All headings are ships head (not track)

Distances in metres

Tides on day	9th September 2010 (GMT)	Immingham
07:02 HW 7.80m	13:44 LW 0.30m	19:20 HW 7.80m

Subjective Assessment Criteria

1. **Good,** Straightforward, comparatively easy
2. **Fair**, Significant effort & close monitoring required, but vessel not close to danger
3. **Satisfactory** but less than optimal. Times when vessel not proceeding as desired
4. **Near Miss,** vessel close to edge of set limits, significant force on structure or ropes
5. **Fail,** vessel out of channel, struck object, parted ropes, in irrecoverable position

Run No	**1**	**Pilot / Master**	**ABP**	Ian Cousins
				Joe Smith
Operator	Mel Irving	**Observers**	**ABP**	Fred Firman
				Stirling Scott
Arrive / Sail	Inwards / Berthing		**C.Ro**	Hugh Gates
				Phil Pannett
Date	06/02/2021		**ABLE**	Mike Nicholson
				Steven Harrison
Start Time	09:50	**End Time**		10:10

Scenario	**Opaline** (195m RoRo), berthing C.Ro 5/6. Spring flood, HW -3h
Objective	Safe passing of Able Humber Port.
Notes	AMEP 5 Occupied, double banked. 80m+ Beam

Vessel Characteristics				**Weather & Tidal Conditions**	
Type	RoRo Opaline			**Wind Dir & Force**	NE 22kts (+/- 3kts)
LOA	195m	**Beam**	30.5	**Visibility**	Good
Screws	Single CPP	**Rudder**	Hi-Lift	**Tide Range**	7.5m
Thruster	Bow & Stern			**Tide Height**	3.9m (Half Tide)
Draft	**Load** 7.4	**Light**		**Ebb / Flood**	Full Spring Flood

~Timeline;	Start at Clay Huts Buoy. Hd'g 330°, 8 knots Ground Speed
09:52 Hd'g 335° passing S'Killingholme Jetty	10:06 Swung, backing toward C.Ro
10:00 Hd'g 355°, 6.7kts, pass AMEP 4 @ 230m	10:10 Backing toward berth*
10:02 AMEP7 4.4kts, hard to stb'd	END EX
10:03 commence stb'd swing off "PG" buoy	

Assessment of ease of manoeuvre;	
Passing AMEP	**2 - Fair**
Berthing / Approach to C.Ro	**3 - Satisfactory.** Approach only, berthing not attempted

Notes
Note that the tide was extreme (~ once per annum event) and the flood current was in excess of 3.5 knots. C.Ro Berthing limits for this class of vessel mandates at least one Tug assistance when current speed is ≥ 2.5 knots
Wind speed of 22 knots (+/- 3kts) or F5-6 was at the upper limit of this vessel to tolerate, in these conditions two tugs may have been engaged.
Exercise ended with Opaline a ships length SE of the berth, angled 26° in yet still tracking North. It was clear the vessel would not be able to berth without extreme difficulty. END EX.

Run No	**2**	**Pilot / Master**	**ABP**	Ian Cousins
				Joe Smith
Operator	Mel Irving	**Observers**	**ABP**	Fred Firman
				Stirling Scott
Arrive / Sail	Outwards / Depart		**C.Ro**	Hugh Gates
				Phil Pannett
Date	06/02/2021		**ABLE**	Mike Nicholson
Start Time	10:23	**End Time**		10:42

Scenario	**Opaline** (195m RoRo), departing C.Ro 5. Spring ebb, HW +3h
Objective	Safe departure from C.Ro. Safe passing of Able Humber Port.
Notes	AMEP 5 Occupied, double banked. 80m+ Beam

Vessel Characteristics					**Weather & Tidal Conditions**	
Type	RoRo Opaline				**Wind Dir & Force***	NE 22kts (+/-3kts)*
LOA	195m		**Beam**	30.5	**Visibility**	Good
Screws	Single CPP		**Rudder**	Hi-Lift	**Tide Range**	7.5m
Thruster	Bow & Stern				**Tide Height**	3.9m (Half Tide)
Draft	**Load**	7.4	**Light**		**Ebb / Flood**	Full Spring Ebb

~Timeline;	10:23 Start, Berthed Starboard side to at C.Ro5
10:24 Both Thrusters up to full, Hard Stb'd	10:31 Vessel starting to lift off, moving ahead
10:28 **Aborted** – vessel not lifting.	10:35 Clear of jetty. Hd'g 114°, 4.7 knots
10:29 **Resume** with wind reduced by 5 knots*	10:38 Engines 75% ahead turning to port
10:30 Stb'd 20°, Both Thrusters Full	10:42 Passing AMEP 3, END EX

Assessment of ease of manoeuvre;	
Leaving C.Ro Berth	(1st Attempt 5), **2nd Attempt 2 - Fair**
Passing AMEP	**2 - Fair**

Notes
Note , as per run 1 that the tide was extreme (~ once per annum event) and the ebb current was approximately 5 knots. C.Ro Un- Berthing limits for this class of vessel mandates at least one Tug assistance when current speed is ≥ 2.5 knots
Wind speed of 22 knots (+/- 3kts) or F5-6 was shown to be above the upper limit of this vessel to tolerate, the thrusters were not able to lift the vessel into the wind. In these conditions two tugs are likely to have been engaged or sailing delayed.
The attendees did not see any value in repeating the exercise with a strong SW wind instead.
It was noted that larger vessels may be more difficult to manoeuvre, they may instead of steaming out, crab across the tide once clear to give more sea-room before going ahead.

Run No	**3**	**Pilot / Master**	**ABP**	Ian Cousins
				Stirling Scott
Operator	Mel Irving	**Observers**	**ABP**	Fred Firman
				Gary Wilson
				Ian Cousins
Arrive / Sail	Inwards / Berthing		**C.Ro**	Hugh Gates
				Phil Pannett
Date	06/02/2021		**ABLE**	Mike Nicholson
Start Time	11:08	**End Time**		11:51

Scenario	**Xiang Yun Kou** (217m Heavy Lift) inwards to AMEP.
Objective	Safe berthing at AMEP 5, port side to.
Notes	Treated as passage plan* vessel, slack water berthing. *Minimum 3 Tugs (110t+ BP)

Vessel Characteristics				**Weather & Tidal Conditions**	
Type	Xiang Yun Kou (217m Heavy Lift)			**Wind Dir & Force**	S 22kts (+/-3 kts)
LOA	217m	**Beam**	43m	**Visibility**	Good
Screws	Twin*	**Rudder**		**Tide Range**	7.5m
Thruster	2 - Not used*			**Tide Height**	7.5m (7.8m HW)
Draft	**Load**	**Light**	**7.4**	**Ebb / Flood**	Slack

Tug Bow (T)	No 1 **- 65**	**Use**	Push/Pull on wire Stb'd Shoulder
Tug Mid (T)	No 2 **- 65**	**Use**	Push/Pull on wire Stb'd Main Deck Aft
Tug Stern (T)	No 3 **- 65**	**Use**	Port Quarter Aft - Wire

~Timeline;	Start abeam Immingham West jetty, Hd'g 285°, 6kts. Three Tugs fast.
11:10 Hd'g 280°, Engines 20% ahead	11:35 Passing AMEP 1. Hd'g 318° 1.9 kts. Tugs pushing up extensively
11:11 Hd'g 290° hard stb'd, vessel not answering helm, tugs used to maintain heading	11:46 Stern close to vessel on AMEP 4 (10m)
11:18 Hd'g 323° 3.6 kts Passing IBT @ 100m	11:48 Parallel Berth 5. 11:50 END EX

Assessment of ease of manoeuvre;	**2 – Fair / 3 Satisfactory**

Notes	Commenced at 20mins to HW Immingham, to berth at Slack Water (HW +20m)
Vessel did pass close to the berthed vessel astern but was in control.	
Simulator: It was noted that the cut-out berth though correct on the visuals was not shown on the radar (separate file), this did not affect the dynamics but was initially disconcerting. The berth had not been added to the electronic charts also, and so navigation confirmation from instruments (to supplement the visuals) was compromised. Pilots also did not have access to their PPU's and predictive functions. These though had the effect of making the navigation slightly more difficult, and so does not detract from the outcome.	
Although the vessel model had twin screws, these were used as one to simulate a single screw vessel. Similarly bow and stern thrusters were available, but it was decided not to use these. Both decisions having the effect of simulating a worse-case scenario for a vessel of this size.	

Run No	**4**	**Pilot / Master**	**ABP**	Ian Cousins
				Stirling Scott
Operator	Mel Irving	**Observers**	**ABP**	Fred Firman
				Gary Wilson
				Ian Cousins
Arrive / Sail	Sailing / Outwards		**C.Ro**	Hugh Gates
				Phil Pannett
Date	06/02/2021		**ABLE**	Mike Nicholson
Start Time	12:04	**End Time**		12:22

Scenario	**Xiang Yun Kou** (217m Heavy Lift) sailing from AMEP 5.
Objective	Safe departure and swing at AMEP 5.
Notes	Treated as passage plan* vessel, *Minimum 2 Tugs (60t+ BP)

Vessel Characteristics					**Weather & Tidal Conditions**	
Type	Xiang Yun Kou (217m Heavy Lift)				**Wind Dir & Force**	N 22kts (+/-3 kts)
LOA	217m		**Beam**	43m	**Visibility**	Good
Screws	Twin*		**Rudder**		**Tide Range**	7.5m
Thruster	2 - Not used*				**Tide Height**	6.8m (7.8m HW)
Draft	**Load**	**8.7**	**Light**		**Ebb / Flood**	Last of Flood

Tug Bow (T)	No 1 **- 50**	**Use**	Push/Pull on wire Stb'd Shoulder
Tug Mid (T)	No 2 **- 50**	**Use**	Push/Pull on wire Stb'd Main Deck Aft

~Timeline;	12:04 Vessel Port Side to at AMEP 5, berths 1, 3, 4 occupied. Tugs pushing up.
12:06 Tugs Lifting off	12:16 Half way round, 1.5kts astern
12:08 15m off bow and stern, 12:10 40m off.	12:18 Hd'g 225°, 1.4kts astern, Half Ahead
12:11 commence swing to port (head to berth) No1 Tug 25% Pull, No2 100%)	12:19 Hd'g 175°. 0.2 kts ahead.
	12:20 Completed swing. 200m off jetty
12:12 Hd'g 280°, No 1 make ready for push	12:22 underway, END EX

Assessment of ease of manoeuvre;	**2 - Fair**

Notes	Commenced at 90mins to HW Immingham as per passage plan.
Vessel loaded with several large windmill jackets. Large wind area.	
Pilot noted that he drew the vessel some distance to the North to allow for the strong N'ly wind. In other conditions the turn could have been made closer to the jetty.	
Although the vessel model had twin screws, these were used in unison to simulate a single screw vessel. Similarly bow and stern thrusters were available, but it was decided not to use these. Both decisions having the effect of simulating a worst-case scenario for a vessel of this size.	
Comments afterwards from observers were that there was probably still enough room for vessels to pass both heading upriver to Hull and also to C.Ro.	

Run No	**5a**	**Pilot / Master**	**ABP**	Ian Cousins
				Stirling Scott
Operator	Mel Irving	**Observers**	**ABP**	Fred Firman
				Gary Wilson
				Joe Smith
Arrive / Sail	Inwards / Berthing		**C.Ro**	Hugh Gates
				Phil Pannett
Date	06/02/2021		**ABLE**	Mike Nicholson
Start Time	13:11	**End Time**		13:40

Scenario	**Rotra Mare** (Blade Ship) inwards to AMEP 7. Spring ebb, HW +3h
Objective	Safe berthing (head in) at AMEP 7 (Inset berth)
Notes	AMEP 5 Occupied

Vessel Characteristics					**Weather & Tidal Conditions**	
Type	Rotra Mare (Blade Ship)				**Wind Dir & Force**	SW 22 (+/-3kts)
LOA	153m		**Beam**	25.6m	**Visibility**	Good
Screws	Single		**Rudder**	Hi-Lift	**Tide Range**	7.5m
Thruster	Bow				**Tide Height**	3.9m
Draft	**Load**	7.7m	**Light**	5.0m	**Ebb / Flood**	Full Spring Ebb

~Timeline;	13:11 Start Hd'g 311°, Speed 9.1 knots. Clay huts

13:19 Passing AMEP 1 Hd'g 323° 9kts.	13:33 passing PG Buoy, Hd'g 328° 5.5 kts
13:23 Passing AMEP 3 Hd'g 324° 2.3kts.	13:33 Hard to Starboard,
13:27 Commence turn to port	13:40 All swung, Hd'g 109° @ 2.8kts
13:30 Turn stalled, unable to get head to wind	13:42 END EX

Assessment of ease of manoeuvre;	**5 Fail**

Notes
Initially planned as a stern on, flood tide berthing, noted that the vessel has a bow ramp (not the usual stern one) and so the attendees decided to switch to a bow on, ebb tide berthing to utilise an existing ship and also simulate a worst-case berthing scenario. Most observers felt that this Run would be extremely challenging under the conditions attempted.
At 13:40 after the vessel was swung and while crabbing across the tide a short conversation was held on the bridge. With the strength of tide (~5 knots ebb) the bow thrust was virtually ineffective and it was requiring nearly 75% engines just to maintain station, it was felt there was little point in attempting to berth as in "real-life" this would be aborted anyway.
It was decided to attempt the run again but with less wind and tide. See Run 5b below.

Run No	**5b**	**Pilot / Master**	**ABP**	Ian Cousins
				Stirling Scott
Operator	Mel Irving	**Observers**	**ABP**	Fred Firman
				Gary Wilson
				Joe Smith
Arrive / Sail	Inwards / Berthing		**C.Ro**	Hugh Gates
				Phil Pannett
Date	06/02/2021		**ABLE**	Mike Nicholson
Start Time	13:57	**End Time**		14:05

Scenario	**Rotra Mare** (Blade Ship) inwards to AMEP 7. Spring Ebb, HW +1h
Objective	Safe berthing (head in) at AMEP 7 (Inset berth)
Notes	AMEP 5 Occupied

Vessel Characteristics					**Weather & Tidal Conditions**	
Type	Rotra Mare (Blade Ship)				**Wind Dir & Force**	SW 12 (+/-3kts)
LOA	153m		**Beam**	25.6m	**Visibility**	Good
Screws	Single		**Rudder**	Hi-Lift	**Tide Range**	7.5m
Thruster	Bow				**Tide Height**	7.1m
Draft	**Load**	7.7m	**Light**	5.0m	**Ebb / Flood**	1 hour Ebb.

~Timeline;	13:57 Commence abeam of AMEP 6, 220m off. Hd'g 319° 0.3 knots
13:58 Start swing to starboard	14:05 In irrecoverable position near AMEP 5 corner. Aborted ENDEX
14:01 Half way round. Using bow thrust and engines to swing vessel.	
14:03 Swung, approaching berth	

Assessment of ease of manoeuvre;	**5 Fail**

Notes
This a repeat of run 5a but with ebb current reduced (from HW +3h to HW +1h) and SW wind reduced (from 22kts to 12kts)
As previously most observers felt that this Run would remain very challenging under the conditions attempted.
Nevertheless, it was thought the vessel had swung slightly too early, and so a third attempt was made. See run 5C below.

Run No	**5c**	**Pilot / Master**	**ABP**	Ian Cousins
				Stirling Scott
Operator	Mel Irving	**Observers**	**ABP**	Fred Firman
				Gary Wilson
				Joe Smith
Arrive / Sail	Inwards / Berthing		**C.Ro**	Hugh Gates
				Phil Pannett
Date	06/02/2021		**ABLE**	Mike Nicholson
Start Time	14:10	**End Time**		14:35

Scenario	**Rotra Mare** (Blade Ship) inwards to AMEP 7. Spring Ebb, HW +1h
Objective	Safe berthing (head in) at AMEP 7 (Inset berth)
Notes	AMEP 5 Occupied

Vessel Characteristics					**Weather & Tidal Conditions**	
Type	Rotra Mare (Blade Ship)				**Wind Dir & Force**	SW 12 (+/-3kts)
LOA	153m		**Beam**	25.6m	**Visibility**	Good
Screws	Single		**Rudder**	Hi-Lift	**Tide Range**	7.5m
Thruster	Bow				**Tide Height**	7.1m
Draft	**Load**	7.7m	**Light**	5.0m	**Ebb / Flood**	1 hour Ebb.

~Timeline;	14:10 Vessel Hd'g 319° and stopped
14:13 Swinging to starboard	14:26 Vessel swung to port and attempt to stern bore to berth, closed the berth but unable to get bow across. Aborted END EX
14:17 Half way round	
14:19 Hd'g 097° Speed 0.7kts ahead	
14:27 Attempt made to go in bow first, ineffective	

Assessment of ease of manoeuvre;	**5 Fail**

Notes
This a direct repeat of run 5b.
As previously most observers felt that this Run would remain very challenging under the conditions attempted. It was.
At debrief it was generally felt that with such conventional vessels, only a slack water or head-to-tide berth berthing was tenable without the use of tugs. This especially the case with the cut-out berth 7 where there was a quay directly ahead (or astern) of a berthing vessel.
It was also decided not to conduct Run 6, as it would add very little. Instead it was decided to add a departure from berth 7 of the Opaline, this being Run 8.

Run No	**7**	**Pilot / Master**	**ABP**	Ian Cousins
				Joe Smith
Operator	Mel Irving	**Observers**	**ABP**	Fred Firman
				Gary Wilson
				Stirling Scott
Arrive / Sail	Inwards / Berthing		**C.Ro**	Hugh Gates
				Phil Pannett
Date	06/02/2021		**ABLE**	Mike Nicholson
Start Time	14:50	**End Time**		15:13

Scenario	**Opaline** (195m RoRo), berthing AMEP 7 (inset berth) Spring flood
Objective	Safe berthing at AMEP 7, Stern first (Port Side To)
Notes	AMEP 3,4, Occupied

Vessel Characteristics					**Weather & Tidal Conditions**	
Type	RoRo Opaline				**Wind Dir & Force**	SW 15 (+/-3kts)
LOA	195m		**Beam**	30.5	**Visibility**	Good
Screws	Single CPP		**Rudder**	Hi-Lift	**Tide Range**	7.5m
Thruster	Bow & Stern				**Tide Height**	3.9m (Half Tide)
Draft	**Load**	7.4	**Light**	7.4	**Ebb / Flood**	Full Spring Flood

~Timeline;	14:50 Commence Hd'g 340° at 3.2 kts. Passing IGT
14:52 Abeam AMEP 4	15:07 Slowly approaching berth, vessel hard to control. See Notes below.*
14:54 Hd'g 352° AMEP 5 Crabbing Across Tide	15:12 Vessel 5m off and backing down.
15:00 Hd'g 336° @ 1.6kts	15:13 END EX
15:03 Off AMEP 7 300m off	

Assessment of ease of manoeuvre;	**2 – Fair** (Once thrusters were available)

Notes
Originally planned for wind Force 5/6, experience in run 2, showed that this was probably above the limit for this vessel without tugs, so it was decided to reduce the wind strength by 5 knots to F4/5
* At this point to keep the vessel heading required significant amounts of engine movements (ahead and astern). On investigating it was realised that both the bow and stern thrusters had not been switched on. This was remedied after a couple of minutes, but during this distraction the vessel was moving ahead quite quickly (as last engine movement had been ahead). The situation was recovered and from then on control towards the berth was good and comparatively easy, though the vessel was somewhat ahead of position.

Run No	**8**	**Pilot / Master**	**ABP**	Ian Cousins
				Joe Smith
Operator	Mel Irving	**Observers**	**ABP**	Fred Firman
				Gary Wilson
				Stirling Scott
Arrive / Sail	Outwards / Sailing		**C.Ro**	Hugh Gates
				Phil Pannett
Date	06/02/2021		**ABLE**	Mike Nicholson
Start Time	15:15	**End Time**		15:30

Scenario	**Opaline** (195m RoRo), berthing AMEP 7 (inset berth) Spring flood
Objective	Safe departure AMEP 7.
Notes	AMEP 3,4 Occupied

Vessel Characteristics					**Weather & Tidal Conditions**	
Type	RoRo Opaline				**Wind Dir & Force**	SW 15 (+/-3kts)
LOA	195m		**Beam**	30.5	**Visibility**	Good
Screws	Single CPP		**Rudder**	Hi-Lift	**Tide Range**	7.5m
Thruster	Bow & Stern				**Tide Height**	Half Tide (3.9m)
Draft	**Load**	7.4	**Light**	7.4	**Ebb / Flood**	Full Spring Flood

~Timeline;	15:15 Alongside AMEP 7 Port Side to. Hd'g 322°
15:16 Using thrusters to lift, Vessel 10 metres off	15:27 Hd'g 171°. Vessel stopped
15:18 Stern clear of Berth 6	15:29 Hd'g 135° Moving ahead.
15:20 Hd'g 299°, Stern well clear.	15:30 END EX
15:25 Half way round (to port) bow at NW end of quay	

Assessment of ease of manoeuvre;	**3 / 4 – Satisfactory / Near Miss**

Notes
Additional Run, departure from AMEP 7 with Opaline; instead of Run 6 with Rotra Mare.
Vessel completed swing close to PG Buoy. The stern of the vessel going as far upriver as the NP Buoy.
At the debrief It was felt that departing in such a strong tide there would be some benefit in backing off further to the East before commencing the swing. Also noted that with such a strong tide (≥ 2.5kts), this ship departing C.Ro would require a tug.