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Vattenfall Wind Power Ltd

Thanet Extension Offshore Wind Farm

Annex 10-2: Pilot Transfer Bridge Simulation - Report

June, 2018, Revision A

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June, 2018

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Revision	A

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GOBE CONSULTANTS LTD

THANET EXTENSION OFFSHORE WIND FARM: PILOT TRANSFER BRIDGE SIMULATION - REPORT

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MARINE AND RISK CONSULTANTS LTD

GOBE CONSULTANTS LTD

THANET EXTENSION OFFSHORE WIND FARM: PILOT TRANSFER BRIDGE SIMULATION - REPORT

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ABBREVIATIONS

Abbreviation	Detail
AIS	Automatic Identification System
ALARP	As Low As Reasonably Practicable
CHA	Competent Harbour Authority
DW	Deep Water
EIA	Environmental Impact Assessment
ESL	Estuary Services Ltd
HW	High Water
IMO	International Maritime Organisation
Km	Kilometre
kt	Knot (unit of speed equal to nautical mile per hour, approx 1.15 mph)
LOA	Length Over-All
LW	Low Water
m	Metre
Marico Marine	Marine and Risk Consultants Ltd
MCA	Maritime and Coastguard Agency
MGN	Marine Guidance Note
MW	Megawatt
nm	Nautical Mile
NRA	Navigation Risk Assessment
PEC	Pilotage Exemption Certificate
PLA	Port of London Authority
TEOW	Thanet Extension Offshore Wind Farm
UKC	Under Keel Clearance
VHF	Very High Frequency (radio communication)
VTS	Vessel Traffic Service
WTG	Wind Turbine Generator

1 INTRODUCTION

GoBe Consultants Ltd and Vattenfall Wind Power Ltd (Vattenfall) commissioned Marine and Risk Consultants Ltd (Marico Marine) to undertake the Shipping and Navigation studies in support of the Environment Impact Assessment (EIA) for the proposed extension to the Thanet Offshore Wind farm.

In advance of the Navigation Risk Assessment (NRA), which is due to be undertaken in support of the EIA, a Pilotage Study was commissioned to further investigate concerns, raised by stakeholder consultees during the project feasibility and scoping stages. Concerns specifically relate to potential impact on the feasibility of Pilot boarding at the North East Spit and Tongue Stations. Objectives for the Pilotage Study were defined as:

1. Identify the current pilotage operations around the existing wind farm; and
2. Consider the possible impacts that the extension would have upon these operations.

The Pilotage Study identified and recommended that a real-time bridge navigation simulation study be undertaken to examine the navigation aspects of the proposed extension layout in further detail.

This document describes the bridge navigation simulation study that was undertaken and should be read in conjunction with the following related documents:

Reference	Title
TEOW-PLA_DB-0009	Scoping Report
16UK1255_001	TEOW - Pilotage Study – Technical Note
No Ref **[HOLD]**	Preliminary Environmental Impact Report (PEIR) – Shipping & Navigation
16UK1255_002	Pilot Transfer Bridge Simulation Inception Report

1.1 OBJECTIVES

The objectives of the real-time bridge navigation simulation study were:

- Examine whether the Pilot transfer operations would continue to be feasible at the North East Spit Station with the extended wind farm;
- Assess the wind farm layouts and whether pilotage operations are feasible in a range of defined operational scenarios; and

- Understand/inform the change in encounters and collision risk due to reduced sea room of the proposed layout. This will primarily be investigated by quantitative assessment using traffic flow modelling that is planned to be utilised within the EIA phase of works.

It should be noted that wider impacts on shipping and navigation, including issues relating to vessel routeing, anchorages, search and rescue and small boat traffic (such as fishing and recreational craft) will be considered within the full Navigation Risk Assessment (NRA) submitted as part of the EIA.

It should also be noted that the objectives were focussed on themes of navigation safety only and wider commercial operational aspects will be addressed separately and were considered out with the objectives of the real-time bridge navigation simulation.

2 SITE OVERVIEW

The existing Thanet Offshore Wind Farm has been operational since 2010 and comprises 100 Vestas V90 3.0 MW turbines, situated 11 km off the Kent coast (black boundary in **Figure 1**). The proposed extension (red boundary in **Figure 1**) consists of up to 34 turbines (up to 12 MW) surrounding the existing wind farm with an approximate 20 km export cable to Kent. Pilot Stations relating to the site area are shown in **Figure 1**.

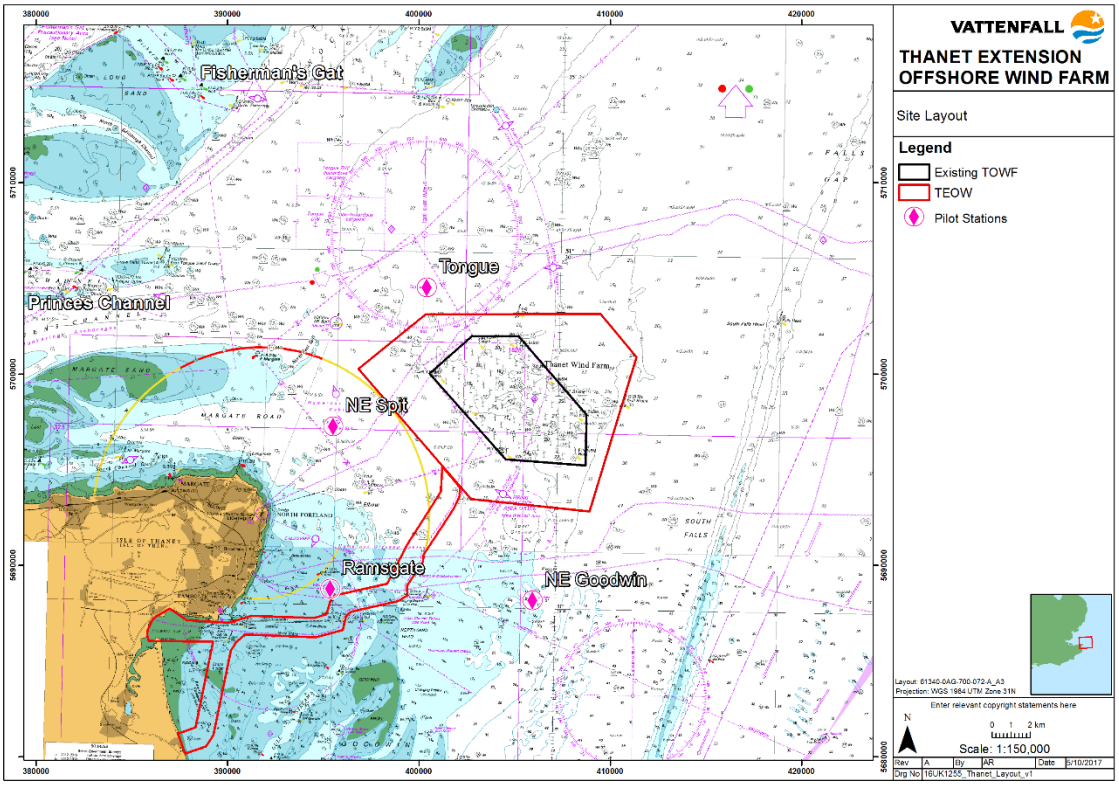


Figure 1: Site Location, Wind Farm layout and Pilot Stations.

3 SIMULATOR CONFIGURATION

The PLA Bridge Simulator was put forward for usage in this assessment as the PLA are a key stakeholder consultee in relation to the themes being addressed and the simulator is suitably established in the area of interest.

The PLA Bridge Simulator is a full mission bridge simulator and is primarily used as a training tool for Pilots as well as a familiarisation and design tool to test new and updated vessels and infrastructure. The simulator was updated most recently in 2012 and a summary of key technical details are provided below:

- Includes full engine controls, bow and stern thrusters, radar, ECDIS, speed logs, a portable pilotage unit and Azimuth Control Device propulsion and steering;
- Variable parameters based on Thames hydrographic modelling, flood and ebb tide, wind speed and direction, meteorological conditions including fog, rain and snow;
- Over 70 ship types can be simulated;
- Record, pause and rewind allowing review and retry of scenarios; and
- Print outs of each exercise for post-exercise discussion and evaluation.

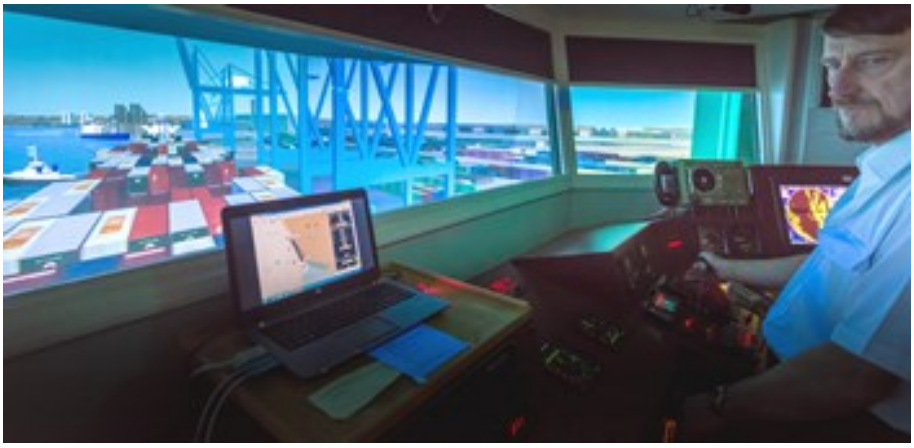


Figure 2: PLA Bridge Simulator.

3.1 SIMULATOR LAYOUT AND VISUAL REPRESENTATION

The area represented in the PLA simulator is shown in **Figure 3.** It should be noted that the simulator area does not currently extend to include the southern portion of the existing or proposed wind farm area (area not included is shown hatched). Enlarging this area was not achievable in the timescale and, given that the study focus was on the North-East Spit pilot station which is situated principally within the area of coverage, it was agreed on the setup day (held on 15-Sep-2017) that this would not limit the assessment.

The existing wind farm was not visually represented in the simulation (being outside the usual area of operations for the simulator) and it was understood that the PLA did not have the functionality to update this in house and the simulator developer was not able to make the modifications within the available timescale. Accordingly, it was agreed to represent the wind farm extension using

approximately spaced oil rigs along the boundary perimeter to provide an adequate visual representation with an object of a similar and appropriate loom and bulk to the proposed WTGs.

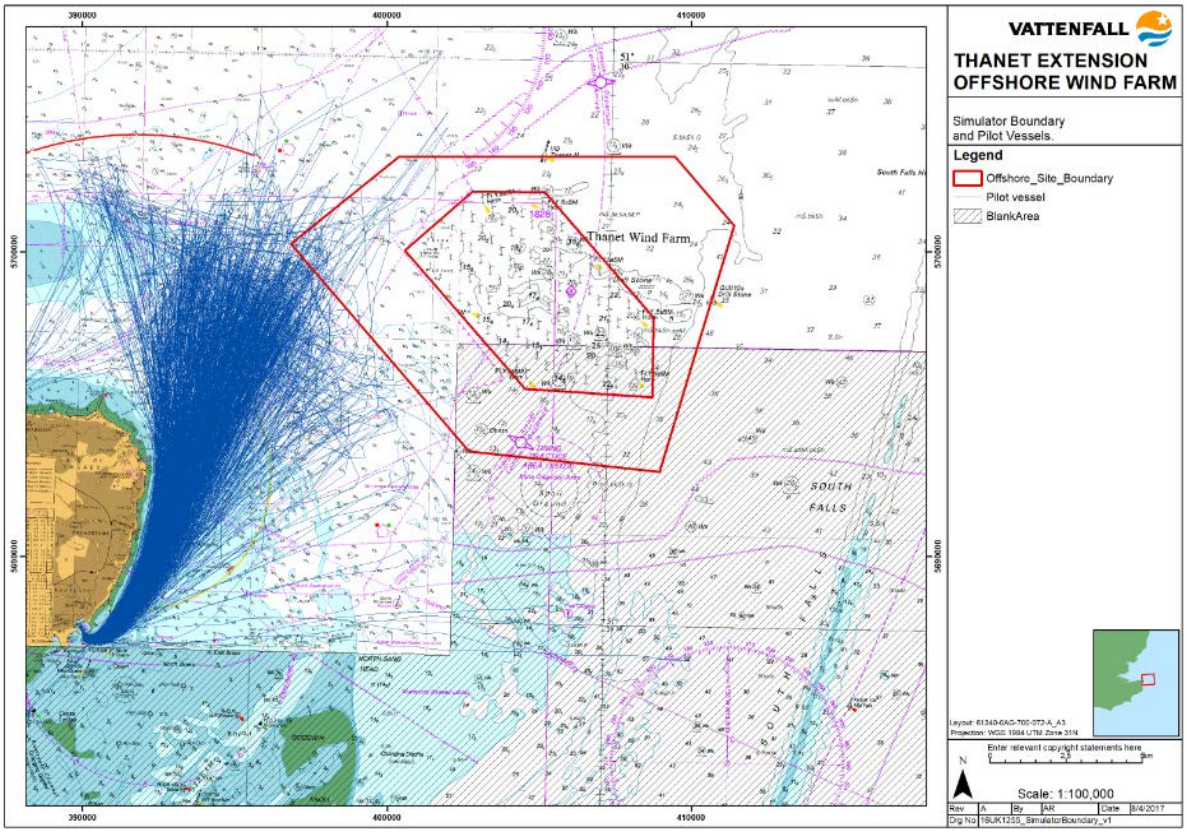


Figure 3: PLA Simulator extent (ESL Pilot Launch tracks also shown - demonstrating area of activity for North East Spit Station).

3.2 MET-OCEAN CONDITIONS

On the set-up day, ESL and the PLA agreed the spectrum of meteorological and oceanographic conditions that would be used to ensure that a representative sample of 'normal' and 'challenging' scenarios would be simulated within the expected operational parameters when North East Spit Station would typically be 'on station'. The setup day was also used to ensure that all the items tabled during the meeting held on 14-Aug-2017 had been included or addressed.

3.2.1 Winds

It was agreed on the setup day to attempt simulations runs with winds coming from 8 points of the compass and to default to a wind strength of 25 knots; the underlying rationale being that a finer distinction in terms of direction was unnecessary as it was unlikely to yield significantly different

results and, similarly, a 25 knot wind strength represented a wind velocity that was operationally realistic while providing challenging enough conditions.

It was anticipated that wind conditions creating a cross channel ship direction (ie: the ship is travelling perpendicular to channel direction) for Pilot transfer would likely form the wind directions of focus for the study.

3.2.2 Waves

Wave conditions (defined by significant wave height and direction) were generated by the simulator and were primarily driven by the wind direction. It was found that the PLA simulator was unable to provide sufficient distinction between geostrophically generated long period waves (swell) and short period (locally wind generated) waves. Nevertheless, it was agreed that the simulation was faithful enough to enforce realistic decision making from the Pilot Launch Coxswain in his selection of transfer course.

3.2.3 Height of Tide / Tidal Stream

Tidal heights and streams during the simulations were selected as shown in Section 5. Ultimately height of tide was significant in influencing Pilot and Master decision making with regard to transit over or around the North-East Spit Bank and the perceived constraint on navigable water. Tidal streams were faithfully reproduced by the simulator but did not figure as a critical factor during simulation.

3.2.4 Water depth

It was accepted on the set-up day that deep draught vessels (>10m) would normally expect to conduct their pilot transfers at the Tongue deep water pilot station in accordance with PLA operational instructions. Where height of tide allowed it, simulations with deep draught vessels were undertaken at the North-East Spit station in accordance with the common practice.

3.2.5 Visibility

Simulated runs were conducted across the full spectrum of conditions as shown in the Section 5. Coxswains and Masters were expected to conduct transfers as they would normally do so in restricted visibility using a combination of AIS and Radar information to complete the intercept. Additionally, the fidelity of the simulator was sufficiently accurate to replicate the transition from radar /AIS

guidance to the Coxswain establishing visual contact with the vessel in the final stages to effect transfer. The longer times taken to complete the poor visibility runs stand testament to the faithfulness of the simulation.

3.3 VESSELS

3.3.1 Ship Models

Existing PLA manoeuvring models were utilised in the assessment and selected to reflect the range of vessels for which Pilot transfers are normally undertaken. Further vessel detail/pilot cards are provided at Annex A.

No	Vessel Type	LOA (m)	Draft (m)	Notes
1	Ro-Ro / Container Carrier	240	10	Grande
2	Container Vessel	145	8	Majestic Sunrise
3	Car Carrier	180	7.5	Sea Mariner
4	Dredger	130	7.5	n/a
5	Tug & Tow	35	3.2	n/a

3.3.2 Pilot Launch

The ESL Pilot Launch Coxswains were incorporated into the simulation run (located in a second bridge space) and communicated using established operational procedures with the Ship. The PLA simulator does not have a Pilot Launch model and so it was agreed on the set-up day to use a tug model as an alternative (see Annex A). This limited transit speed of the "Launch" to 18 knots maximum but it was agreed that with a simulator wind speed of 25 knots the likely resulting sea state would limit the maximum transit speed of a Launch to 18 knots or less. Similarly, the handling characteristics of the tug were different from those expected from a Pilot Launch but after some familiarisation it was agreed the tug provided a close enough facsimile simulation. It is noted that a radar was not available on the tug bridge simulator albeit an ECDIS screen provided AIS data to the Launch Coxswain.

3.3.3 Representation of Baseline Vessel Traffic and Operational Situations

Underlying commercial and recreational vessel activity was introduced during the simulation and in some runs, this vessel activity required the simulation team to respond according to normal collision regulations and operational procedures. Anchored vessels were also placed in the Margate Roads anchorage area. It should be noted that each introduced vessel was compliant with the rules of the road and that no close quarters situations arose; it was accepted by the simulation team that a more detailed examination of the increased vessel congestion and the consequent increase in collision risk will be the subject of the NRA section of the EIA.

It should also be noted that it was agreed that the simulation of ship board emergencies was considered beyond the scope and fidelity of the simulation.

During a selected number of runs, efforts were made to replicate realistic operational challenging scenarios. This included:

- incorrectly rigged ladders (requiring a delay to the procedure);
- language difficulties; and
- incorrect lees provided (requiring a delay to the procedure).

3.3.4 Verification of Simulator

Simulator familiarisation was held on the setup day and simulator run number 001 was selected to prove and verify the accuracy of the simulator, and establish realistic procedures and communications to the satisfaction of all participants.

4 SIMULATION OPERATION

4.1 SIMULATION RUN SEQUENCE

Each simulation run was conducted broadly in accordance with the guideline outlined below:

Serial No.	Activity
0	Prior to each run a short briefing was held to confirm the simulation parameters (**Annex B**) with the simulation team; this was limited to the meteorological conditions, the number of vessels requiring transfer and their destination (inbound or outbound)– this was felt to be faithful to present practice.
1	Each simulation run commenced with the ship(s) circa 1 nautical mile from the start point to provide adequate time for the model to settle and for all concerned to gain proper situational awareness.

2	On simulation start, the Pilot Launch Coxswain was required to use his AIS to assess the situation and provide instruction to the ship(s) on the requirements for transfer (assumed time on station, location, heading, speed and ladder side). This frequently required extended VHF conversations to arrange the geometry of the transfer(s). This was felt to be a realistic reflection of present practice.
3	Once it was steady on transfer course and speed, the ship(s) would confirm on VHF. It was accepted that this rarely happens in practice but as a marker point within the simulation it was felt it would assist with post run analysis.
4	The Pilot Launch approached the ship and, where possible, the Coxswain would attempt to confirm the following operating milestones: • Making approach • Alongside • Completion of Pilot transfer
5	On the setup day it was agreed to allow 1-2 minutes of the Pilot Launch alongside the vessel to represent the physical transfer of one pilot on or off the vessel and 5 minutes to allow the Pilot to transit to or from the bridge.
6	The simulation run was considered complete when ship(s) had recovered to its inward or outward heading.

4.2 SIMULATION RUN GRADING

Immediately after each simulation run a hot debrief was conducted to discuss the conduct of the run and to record all of the salient points arising. The success of each run was assessed against criteria below and the summary sheet is in Section 5.

Grade	Criteria No.	Criteria Description
Successful	1	Ship remained under full control to the satisfaction of the Pilot and Master and it was able to continue to manoeuvre safely at all times
	2	Ship retained acceptable clearances to Wind Farm (inc. buffer) as relates to Contact Risk
	3	Ship retained acceptable Under Keel Clearance (UKC) as relates to Grounding Risk
	4	Ship retained acceptable clearance to other vessels as relates to Collision Risk *(*noting through traffic included)*
	5	Time / sea room available for 1 person Pilot transfer (constant heading and speed) was >5 min

	6	Capacity for ship to respond to emergency was not compromised
Marginal	1	Ship was at limit of full control in the assessment of the Pilot and Master and was not able to continue to manoeuvre safely at all times
	2	Ship remained clear of Wind Farm but not to acceptable clearances (buffer) as relates to Contact Risk
	3	Ship Under Keel Clearance (UKC) became unacceptably low as relates to Grounding Risk
	4	Ship did not retain acceptable clearance to other vessels as relates to Collision Risk *(*noting through traffic included)*
	5	Time / sea room available for 1 person Pilot transfer (constant heading and speed) was between 3 and 5 min
	6	Capacity for ship to respond to emergency was compromised
Fail	1	Ship lost control and was unable to manoeuvre safely
	2	Ship breached Wind Farm boundary as relates to Contact Risk
	3	Ship came out of fairway and grounds as relates to Grounding Risk
	4	Ship collided with other vessels as relates to Collision Risk *(*noting through traffic included)*
	5	Time / Sea room available for 1 person Pilot transfer (constant heading and speed) is < 3 min
	6	Ship did not have capacity to respond to emergency

4.3 SIMULATION AGENDA

The simulation was held at the Port of London Bridge Simulator located at London River House, Royal Pier Road, Gravesend, Kent DA12 2BG.

Date	Time	Activity
Fri-15-Sep-2017	**1030 - 1600**	Setup Day:

		• Reviewed Objectives and Agenda • Confirmed Simulator Configuration • Selection of Runs and Parameters for Day 1
Wed-20-Sep-2017	**1030 - 1700**	Simulation Session Day 1 • Run 1 Verification and familiarisation • Runs 2-9 Single ship with different wind directions
Thu-21-Sep-2017	**0900 - 1700**	Simulation Session Day 2 • Run 10-14 Multiple ships with different wind directions • Simulation debrief and agreement of conclusions

4.4 SIMULATION PARTICIPANTS – ROLES AND RESPONSIBILITIES

The simulation team comprised the following personnel:

Name	Organisation	Role/Responsibility	Location
Capt John Millward	PLA	Ship Master / Pilot	Ship Bridge
Capt Dudley Curtis	PLA	Ship Master / Pilot	Ship Bridge
Capt Phil Cunningham	PLA	Ship Master / Sim Operator	Control Room
Capt Cerwyn Phillips	PLA	Ship Master (various)	Various
Cdr Paul Brown	Marico	Facilitator	Ship Bridge
Richard Jackson	ESL	Pilot Launch Coxswain 1	Bridge 2
David Ninnim	ESL	Pilot Launch Coxswain 2	Bridge 2
Dr Ed Rogers	Marico	Project Director	Obs room
Jamie Holmes	Marico	Project Manager	Obs room

5 PRESENTATION OF RESULTS

A table of run parameters, presenting the Metocean conditions, Ship Types and nature of Pilot Transfer and run grading is shown below. Track plots and a short written summary for each run, including a log of key vessel and bridge commands, is provided at Annex B.

Run No.	Wind Direction	Wind Strength	Tide	Visibility	Ship	Outbound /Inbound	Ladder Side	Transfer Heading	Result
1	SW	25	HW	Good	S1 - Grande	In	Stbd	000	Success
2	NW	25	HW	Good	S1 - Grande	In	Stbd	070	Success
3	N	25	HW	Good	S1 - Grande	In	Stbd	070	Success
4	NE	25	HW	Good	S1 - Grande	In	Port	270	Marginal
5	E	25	HW	Poor (1c)	S1 - Grande	In	Port	330	Success
6	SE	25	HW	Poor (1c)	S1 - Grande	In	Stbd	270	Success
7	S	25	HW	Good	S1 - Grande	In	Stbd	300	Success
8	W	25	HW	Good	S1 - Grande	In	Stbd	030	Success
9	W	25	HW	Good	S1 - Coaster	Out	Stbd	030	Success
					S2 - Grande	Out	Stbd	030	
					S3 - HeidleBerg	In	Stbd	030	
10	NW	25	LW+3	Good	S1 - Grande	In	Stbd	030	Success
					S2 -Majestic Sunrise	In	Stbd	030	
					S3 - Sea Mariner	Out	Stbd	030	
11	NE	25	LW+3	Poor	S1 - Sea Mariner	In	Stbd	160	Success
					S2 - Majestic Sunrise	In	Port	330	
					S3 - Grande	Out	Port	330	
					S4 - Car Carrier	Out	Stbd	160	
12	E	25	LW+3	Night	S 1 - Tug Tow	Out	Stbd	220	Success
					S2 - Majestic Sunrise	In	Port	330	
					S3 - Grande	In	Port	330	
					S4 - Car Carrier	Out	Stbd	220	
13	N	25	LW+3	Poor (1c)	Ship 1 - Grande	Out	Port	220	Success
					Ship 2 -Majestic Sunrise	Out	Port	220	
					Ship 3 - Sea Mariner	In	Stbd	120	
					Ship 4 - Car Carrier	In	Port	220	
14	NE	25	LW+3	Poor (1c)	Ship 1- Grande	In	Port	330	Success
					Ship 2 - Sea Mariner	In	Stbd	160	
					Ship 3 - Car Carrier	Out	Port	330	
					Ship 4 -Majestic Sunrise	Out	Stbd	160	

6 SUMMARY OF RESULTS

The following results were agreed at the simulation debrief:

- The simulations were realistic enough to enable meaningful conclusions to be drawn with regard to navigation and pilot transfers in the vicinity of the North-East Spit station;
- 14 simulation runs and a total of 30 pilot transfers were conducted. 13 of the 14 runs were successful and 1 run (no. 4) was judged to be marginal;
- The marginal run was based on a narrow breach of the proximity criteria (5 cables / 1000 yards) to an anchored ship, although it is important to note that the vessel had completed its pilot transfer and the CPA occurred as it was completing its turn to a northerly heading to begin its entry passage;
- No close quarters situations occurred and no vessels came in dangerous proximity to the wind farm (risk of contact) or shallow water (risk of grounding);
- The reduced operating sea room required much improved and earlier situational awareness from the Launch Coxswain. It is recognised that, under present conditions, the Coxswain is already heavily loaded in organising the geometry of a multi-ship transfer and the reduction in sea room increases this loading;
- The reduction in sea room at the northern end of the study area, bounded by the increased westerly extent of the wind farm and the shoal water of the North East Spit, meant that transfer operations in the simulation tended to occur further to the south (on the current North East Spit Station Diamond) or further to the north (in vicinity of the Tongue Station Diamond) than at present;
- A range of operational scenarios were simulated, including typical profiles of commercial, recreational and fishing vessels in the area – anchored and underway. Within the limits of the simulation these were assessed not to significantly impact on the operation of the North East Spit Station; and
- The simulation proved to be a very useful exercise in training and mutual comprehension between ESL and PLA Pilots.

7 CONCLUSIONS

- The simulations demonstrated that Pilot transfer operations continue to be feasible at North East Spit Station across the full range of operational conditions even with the reduced navigable sea room caused by the extended wind farm layout;

- It is critically important to note that, while the North East Spit station continues to be tenable, the risk profile for pilot transfer operations has significantly changed and the contingency latitude or "room for error" has markedly reduced; and
- It was felt that a range of measures will need to be developed, agreed and introduced at the North East Spit station to ensure that safe and efficient transfer operations are able to continue in the reduced sea room arising from the wind farm extension.

8 RECOMMENDATIONS

The proposed mitigation measures are considered as 3 separate themes.

8.1 CO-ORDINATION AND SITUATIONAL AWARENESS

The improvement of overall situational awareness and more active prior co-ordination of arriving and departing traffic at the North East Spit station will be necessary in the more constrained waters after the construction of the wind farm. Early sequencing and prior organisation of the spatial geometry of the transfers will also be necessary and will assist in reducing the onboard workload of an already busy Launch crew and especially the coxswain. This will require:

- Early and refined planning, supported by enhanced shore support, to reduce pressurised decision making afloat; and
- Improved situational awareness at ESL and on board the Launches through the provision of higher definition, longer range presentation of vessel traffic data.

This could be achieved by:

- Enhancing the role of London VTS to provide early guidance, organisation or formalising the sequencing of arrivals and departures. This could take the form of "slots" at the Pilot Station published in advance in the form of a shipping list;
- Strategically co-ordinating the arrival and departure of vessels estuary wide and, in particular, including traffic to and from the Medway. It is suggested that as a precursor to gaining improved situational awareness estuary wide visibility of the ETA and ETD aspects of POLARIS as a planning tool would significantly aid the subsequent co-ordination of traffic;
- Formalising the method by which the transfer courses and vessel positioning at the pilot station is decided, communicated and executed; at present, this is achieved using a transfer course planning diamond that is refined by the Coxswain afloat and only communicated to the ship immediately prior to transfer. Early promulgation of a likely transfer course and a rendezvous position might help maximise the sea room available for transfer. Aided by weather forecasting, it ought to be possible to plan transfers up to 6 -12 hours in advance and

inform the ship when they make initial VHF contact 2 hours prior to transfer. For example; for a North-East wind, an Inbound vessel could be informed to arrive 2 miles to the south east of the pilot station ready for a port ladder transfer on a course of 330. This could be published earlier in advance by email, SMS or other means to VTS, Pilots and the ship itself;

- ESL could consider re-instating the role of "Station Officer" (a role removed in circa 2010) to provide a centralised and senior point of contact for planning and a real-time co-ordination of traffic and transfers outlined above. The scope of this role might include:
    - Interaction with VTS / ships agents and using POLARIS to coordinate transfers of 6-12 hours in advance ahead.
    - Planning individual Launch trips and the likely order and geometry of the transfers.
    - Operational support to the Coxswain.

8.2 TRAINING

- Consideration could be given to enhancing and broadening the scope of training for ESL Coxswains specifically regarding VTS, traffic management and awareness of themes that will be concerning a Pilot or Ships Master before, during and after transfer;
- The role of the Pilot as a source of advice and guidance for the Coxswain when present on the Launch should also be explored. The authority and responsibility of the Coxswain with regard to the conduct of the transfers would not be changed but discussion and the provision of real time advice by the pilots on board the Launch should be actively encouraged;
- Increase integration and training exposure between Pilots, ESL and VTS. Two days interaction in the simulator between two Pilots and two Coxswains yielded a range of unanticipated benefits with regard to improved mutual understanding and comprehension of the challenges faced by each group. Notwithstanding the acknowledged difficulties of operational rotas the benefits of further integration or exposure between the two groups could only aid cross fertilisation of procedures, planning and mutual understanding. The inclusion of VTS officers in this process is also strongly encouraged.

8.3 REGULATORY / GEOGRAPHICAL

- It is suggested that a re-examination of the authority of the PLA / ESL to direct and co-ordinate vessel arrival and departure timings and traffic in the area is conducted.
- It is recommended that the extent of the permitted anchorage area of the Margate Roads anchorage should be reviewed with a view to relocating it further to the west and creating more navigable water. It is noted that occasionally some vessels, particularly those waiting

for pilots, already anchor outside of the existing anchorage area and it is suggested that an examination of this practice be conducted.

- A review of the arrangement and layout of the North-East Spit pilot station should be conducted. Consideration should be given to applying a navigational precautionary area or other separation measures as employed elsewhere in the UK (eg: Humber). Alternatively, consideration may be given to the creation of 3 or 4 separate NE Spit Sub-Stations to allow for differing wind directions and to maximise the reduced sea room available in a clear manner; thus, for a North-East wind a ship would be instructed to proceed to North East Spit Pilot station number 2 for pilot boarding etc…
- Consideration should also be given to introducing traffic management measures to organise traffic though the reduced area of sea room between the north-westerly extent of the extended wind farm and the shoal water of the North-East Spit.

Annex A Vessel Details

Grande Pilot Card

Ship-model: roro030r1

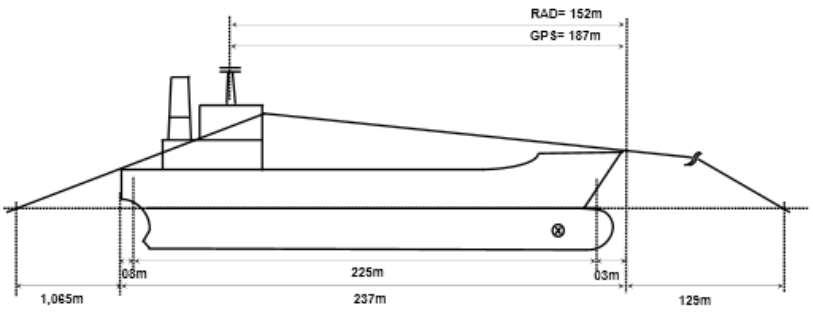
PILOT CARD

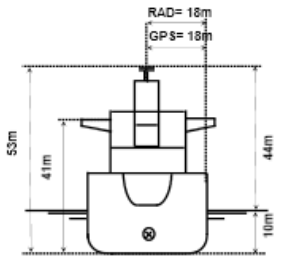
Ship's name:
Call sign:
Draught: Forward 9.80 m / 29.87 ft; Aft 9.80 m / 29.87 ft; Air 40.20 m / 122.53 ft
Wind area: Frontal 1180 m²; Lateral 5897 m²

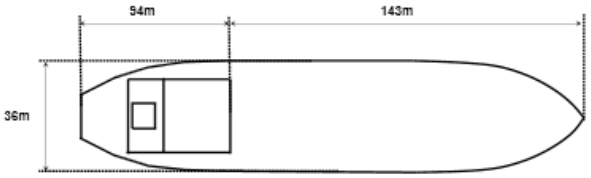
Homeport: Wageningen
Year build: 05 July 2017
Deadweight: 31340 Tonnes
Displacement: 59900 Tonnes

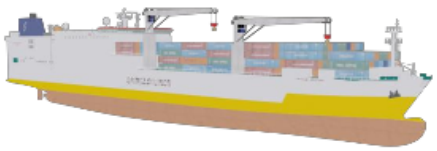
SHIP'S PARTICULARS

Length oa: 236.5 m; Lpp: 225.4 m
Breadth oa: 36.1 m; B moulded: 36.1 m
Anchor chain: Port: 11 shackles; Starboard: 11 shackles; Stern: n/a shackles
(1 shackle = 27.5 m = 15 fathoms)









Manoeuvring engine order	RPM	Pitch (%)	Speed (kn) for indicated draught
Full ahead at sea	123	-	20.0
Full ahead harbour	96	-	15.3
Half ahead	72	-	11.5
Slow ahead	51	-	8.1
Dead slow ahead	30	-	4.8
Stop	0	-	0.0
Dead slow astern	30	-	
Slow astern	51	-	
Half astern	72	-	
Full astern	96	-	

Type of engine: Diesel
Maximum power: 17400 kW / 23334 HP
Amount of propellers/rudders: 1
Rotation direction propeller: clockwise

Time limit astern: - min
Full ahead to astern: - sec.
Max. No. of consecutive starts: - times
Minimum RPM: 30 rpm

STEERING PARTICULARS

Type of rudder: Normal
Rudder angle for neutral effect: 0 deg
Maximum angle: 45 deg
Hard-over to hard-over: 30 sec.
Thruster bow: 1000 kW = 1341 HP / 0 kW = 0 HP
Thruster stern: 1000 kW = 1341 HP / 0 kW = 0 HP

CHECKED IF ABOARD AND READY

Anchors	x	Engine telegraphs	x	Compass system	x
Whistle	x	Steering gear	x	Constant gyro error +/-	0 deg
Radar 3 cm x	10 cm x	Number of power		VHF	x
ARPA	x	units operating	2	Electronic position	
Speed log	Doppler: yes	Indicators:		Fixing system	x
Water speed	x	Rudder	x	Type	GPS
Ground speed	x	Rpm/pitch	x		
Dual-axis	x	Rate of turn	x		

Maritime Research Institute Netherlands, P.O. box 28, 6700 AA, Wageningen, The Netherlands
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Majestic Sunrise Pilot Card

Ship-model: Tan019r1

PILOT CARD

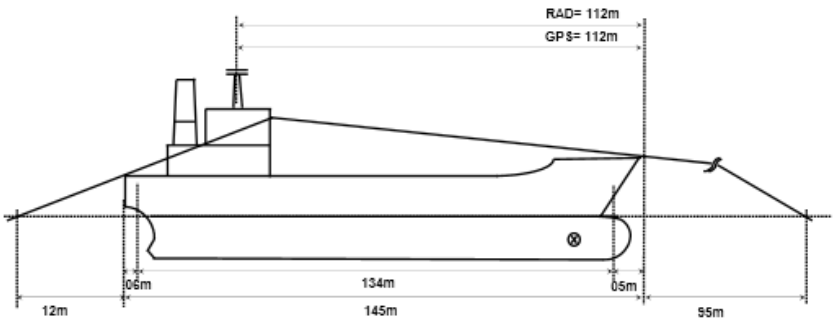
MARIN

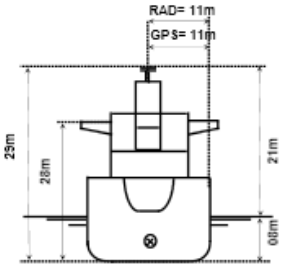
Ship's name:
Call sign:
Draught: Forward 8.20 m / 24.99 ft — Aft 8.20 m / 24.99 ft — Air 21.00 m / 64.01 ft
Wind area: Frontal 394 m² — Lateral 1063 m²

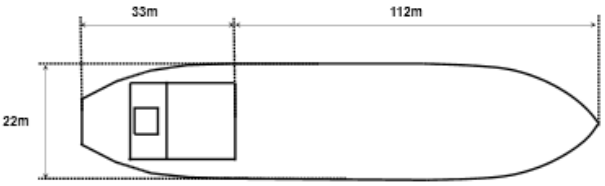
Homeport: Wageningen
Year build: 12 May 2017
Deadweight: 16346 Tonnes
Displacement: 17420 Tonnes

SHIP'S PARTICULARS

Length oa: 145.0 m — Lpp: 133.8 m — Anchor chain: Port: 11 shackles — Starboard: 11 shackles
Breadth oa: 22.1 m — B moulded: 22.1 m — Stern: n/a shackles — (1 shackle = 27.5 m = 15 fathoms)







Manoeuvring engine order	RPM	Pitch (%)	Speed (kn) for indicated draught
Full ahead at sea	120	-	14.6
Full ahead harbour	91	-	11.0
Half ahead	60	-	7.3
Slow ahead	45	-	5.4
Dead slow ahead	33	-	4.0
Stop	0	-	0.0
Dead slow astern	33	-	
Slow astern	45	-	
Half astern	60	-	
Full astern	91	-	

Type of engine: Diesel
Maximum power: 4860 kW / 6517 HP
Amount of propellers/rudders: 1
Rotation direction propeller: clockwise

Time limit astern: - min
Full ahead to astern: - sec.
Max. No. of consecutive starts: - times
Minimum RPM: 33 rpm

STEERING PARTICULARS

Type of rudder: Normal
Rudder angle for neutral effect: 0 deg
Thruster bow: 800 kW = 1073 HP / 0 kW = 0 HP
Maximum angle: 35 deg
Hard-over to hard-over: 20 sec.
Thruster stern: 0 kW = 0 HP / 0 kW = 0 HP

CHECKED IF ABOARD AND READY

Anchors	x	Engine telegraphs	x	Compass system	x
Whistle	x	Steering gear	x	Constant gyro error +/-	0 deg
Radar 3 cm x / 10 cm	x	Number of power units operating	2	VHF	x
ARPA	x			Electronic position	
Speed log Doppler: yes		Indicators:		Fixing system	x
Water speed	x	Rudder	x	Type	GPS
Ground speed	x	Rpm/pitch	x		
Dual axis	x	Rate of turn	x		

Sea Mariner Pilot Card

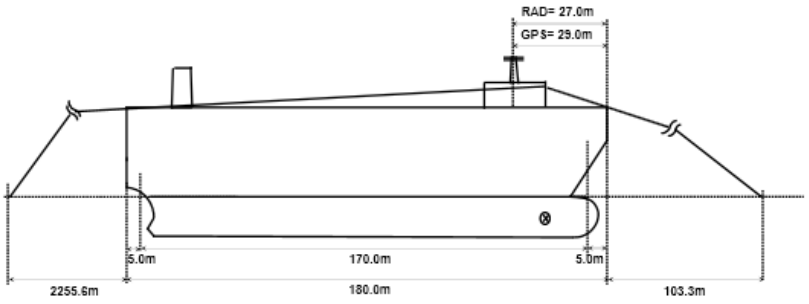
PILOT CARD

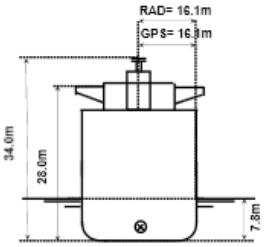
Ship-model	car005a4						
Ship's name :					Homeport	Wageningen	
Call sign :					Year build	15 October 2013	
Draught:	Forward	7.80	m	Aft	7.80	m	
		23.77	ft		23.77	ft	
Wind area	Frontal:	815	m²	Lateral	5137	m²	
					Deadweight :	12920	Tonnes
					Displacement:	23500	Tonnes

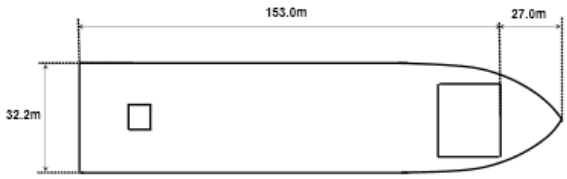
SHIP'S PARTICULARS

Length oa:	180.0	m	Lpp:	170.0	m	Anchor chain:	Port :	11	shackles
Breadth oa:	32.2	m	B moulded:	32.2	m		Stern:	n/a	shackles

Starboard: 11 shackles
(1 shackle = 27.5 m = 15 fathoms)







Manoeuvring engine order	RPM	Pitch (%)	Speed (kn) for indicated draught:
Full ahead at sea	105	-	21.5
Full ahead harbour	57	-	11.7
Half ahead	45	-	9.2
Slow ahead	38	-	7.8
Dead slow ahead	30	-	6.1
Stop	0	-	0.0
Dead slow astern	30	-	
Slow astern	38	-	
Half astern	45	-	
Full astern	57	-	

Type of engine:	Diesel	
Maximum power :	15690	kW
	21041	HP
Amount of propellers/rudders	1	
Rotation direction propeller	Clockwise	
Time limit astern :	4	min
Full ahead to astern :	200	sec.
Max. No. of consecutive starts:	7	times
Minimum RPM :	30	rpm

STEERING PARTICULARS

Type of rudder :	Normal				Maximum angle :	35	deg		
Rudder angle for neutral effect :	0	deg			Hard-over to hard-over :	30	sec.		
Thruster bow :	1000	kW	=	1341	HP	Thruster stern:	0	kW	=	0	HP

CHECKED IF ABOARD AND READY

Anchors	x		Engine telegraphs	x		Compass system	x	
Whistle	x		Steering gear	x		Constant gyro error +/-	0	deg
Radar 3 cm	x	10 cm x	Number of power			VHF	x	
ARPA	x		units operating	2		Electronic position		
Speed log	Doppler: yes		Indicators:			Fixing system	x	
Water speed	x		Rudder	x		Type	GPS	
Ground speed	x		Rpm/pitch	x				
Dual-axis	x		Rate of turn	x				

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Tug Information - Voith Schneider Tug 35m x 12m

Ship's type		SMIT VSP
Length over all	[m]	35.00
Length between perpendiculars	[m]	33.50
Beam	[m]	12.00
Depth	[m]	5.50
Draught amid ship's	[m]	3.20
Draught forward	[m]	3.20
Draught after	[m]	3.20
Displacement	[tons]	850
Engine type	[-]	Diesel
Power	[kW]	2x2280
Bollard Pull	[tons]	66
Service speed	[kn]	14.1
Number of voith units	[-]	2
Frontal wind area	[m2]	120
Lateral wind area	[m2]	241
Bow Thruster	[kW]	-
Stern Thruster	[kW]	-

Annex B Run Summary Sheets and Simulation Track Plots

Run 1

Parameter	Notes
Run Number	01
Date	20 September 2017
Start Time	1030
End Time	1052
Run ID	Proving Run – 1 Ship approaching from South
Wind Direction (from)	SW
Wind Speed (kts)	25k
State of Tide	HW
Visibility	Good
Vessel Type	Grande – RoRo / Container
Outbound/In	In from South
Start Area	South of NE Spit
Finish Area	Outbound to the North
Ladder Side	Starboard
Vessel Heading for Transfer	000
Vessel Speed for Transfer	6 knots
Verdict	Success

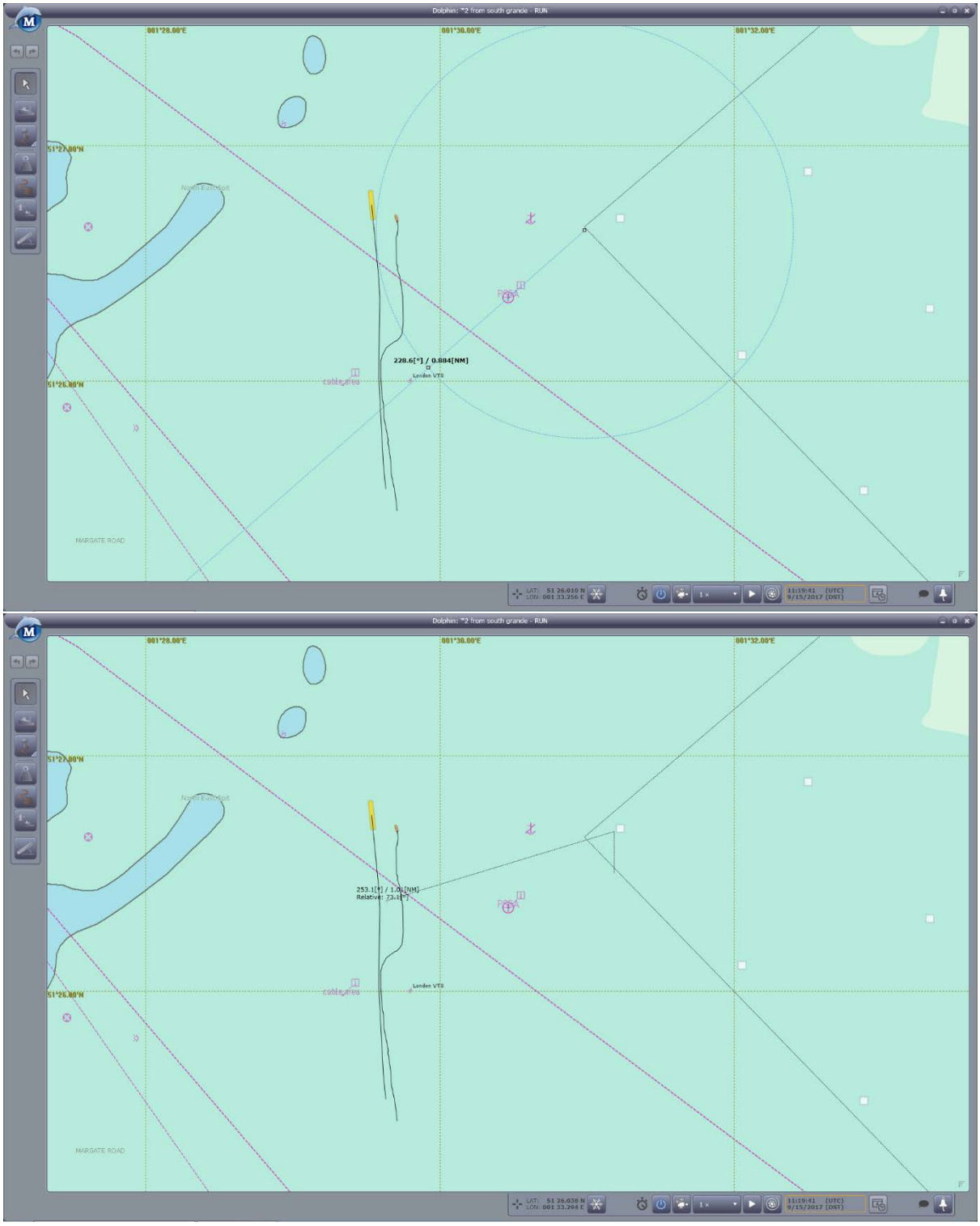
Narrative / Comments:

Proving run to establish accuracy of simulator and to agree conduct, roles and communications for each run.

South West wind direction was chosen as it was likely be the simplest and would require a straightforward transfer course.

Fidelity of the simulation was a sufficiently accurate to allow the Coxswain to carry out a reasonably accurate visual approach and transfer.

Criteria No	Criteria Description	Success	Marginal	Fail	Notes
1	Vessel Control	Pass			
2	WF Clearance – Contact Risk	Pass			
3	UKC – Grounding Risk	Pass			
4	Vessel Clearance – Collision	Pass			
5	Available Pilot Transfer Time	>5 min			
6	Emergency	Not Assessed			


Dolphin: *2 from south grande - RUN
001°28.00'E
001°30.00'E
001°32.00'E
228.6[°] / 0.884[NM]
London VTS
MARGATE ROAD
Dolphin: *2 from south grande - RUN
001°28.00'E
001°30.00'E
001°32.00'E
London VTS
MARGATE ROAD

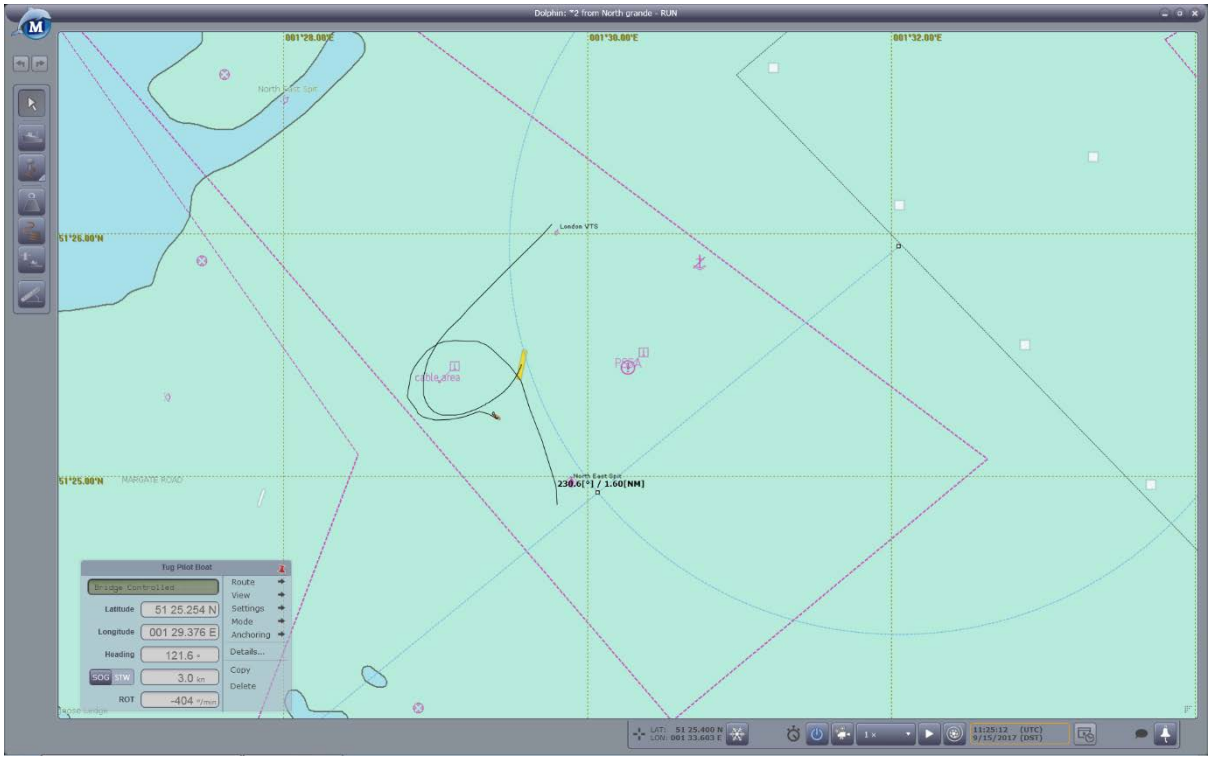
Run 2

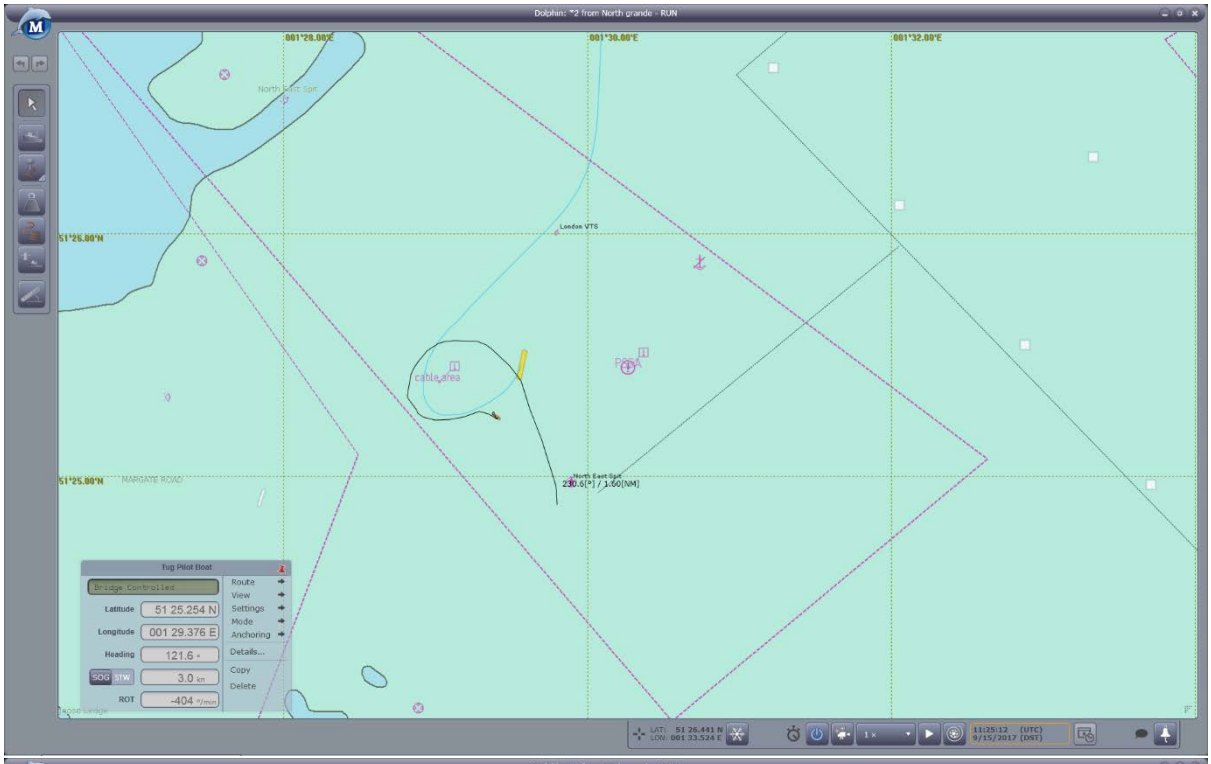
Parameter	Notes
Run Number	02
Date	20 September 2017
Start Time	1110
End Time	1133
Run ID	Single ship - 1 Ship from approaching from North
Wind Direction (from)	NW
Wind Speed (kts)	25k
State of Tide	HW
Visibility	Good
Vessel Type	Grande – RoRo / Container
Outbound/In	In - approach from North
Start Area	North of NE Spit
Finish Area	North of NE Spit
Ladder Side	Starboard
Vessel Heading for Transfer	070
Vessel Speed for Transfer	6 knots
Verdict	Success

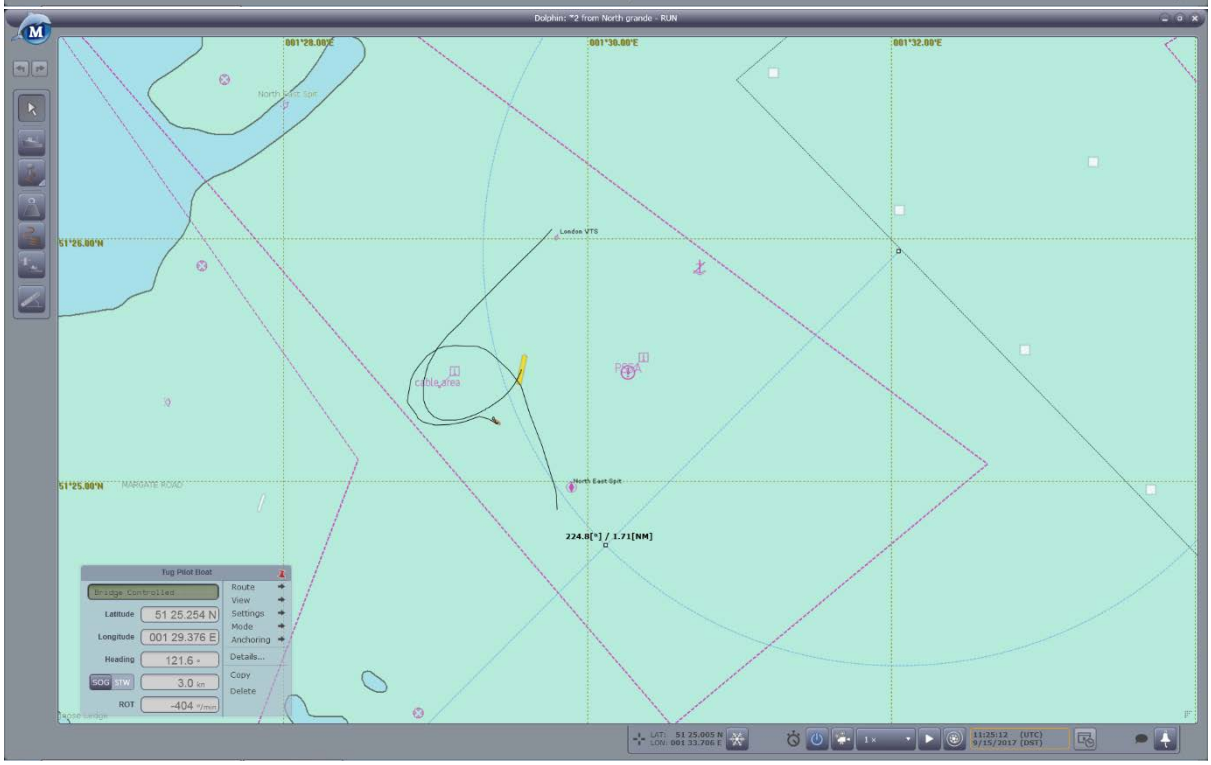
Narrative / Comments:

Long run in from the north – ship turned to port to the west of the pilot station with pilot pulsing the engine to decrease the turning diameter. Agreed that for future runs standard rudder only would be applied. Launch stayed outboard of the turn (ie in the way of the swinging stern) - would not have happened in practice. Once steady, transfer completed – CPA to wind farm 1.83nm.

Criteria No	Criteria Description	Success	Marginal	Fail	Notes
1	Vessel Control	Pass			
2	WF Clearance – Contact Risk	Pass			
3	UKC – Grounding Risk	Pass			
4	Vessel Clearance – Collision	Pass			
5	Available Pilot Transfer Time	>5 min			
6	Emergency	Not Assessed			




Dolphin: *2 from North grande - RUN
001°28.00'E
001°30.00'E
001°32.00'E
51°26.00'N
51°25.00'N
London VTS
cable area
North East Spit
230.6[°] / 1.60[NM]
Tug Pilot Boat
Bridge Controlled
Latitude 51 25.254 N
Longitude 001 29.376 E
Heading 121.6
SOG STW 3.0 kn
ROT -404 °/min
Route
View
Settings
Mode
Anchoring
Details...
Copy
Delete


Dolphin: *2 from North grande - RUN
001°28.00'E
001°30.00'E
001°32.00'E
51°26.00'N
51°25.00'N
London VTS
cable area
North East Spit
224.8[°] / 1.71[NM]
Tug Pilot Boat
Bridge Controlled
Latitude 51 25.254 N
Longitude 001 29.376 E
Heading 121.6
SOG STW 3.0 kn
ROT -404 °/min
Route
View
Settings
Mode
Anchoring
Details...
Copy
Delete

Run 3

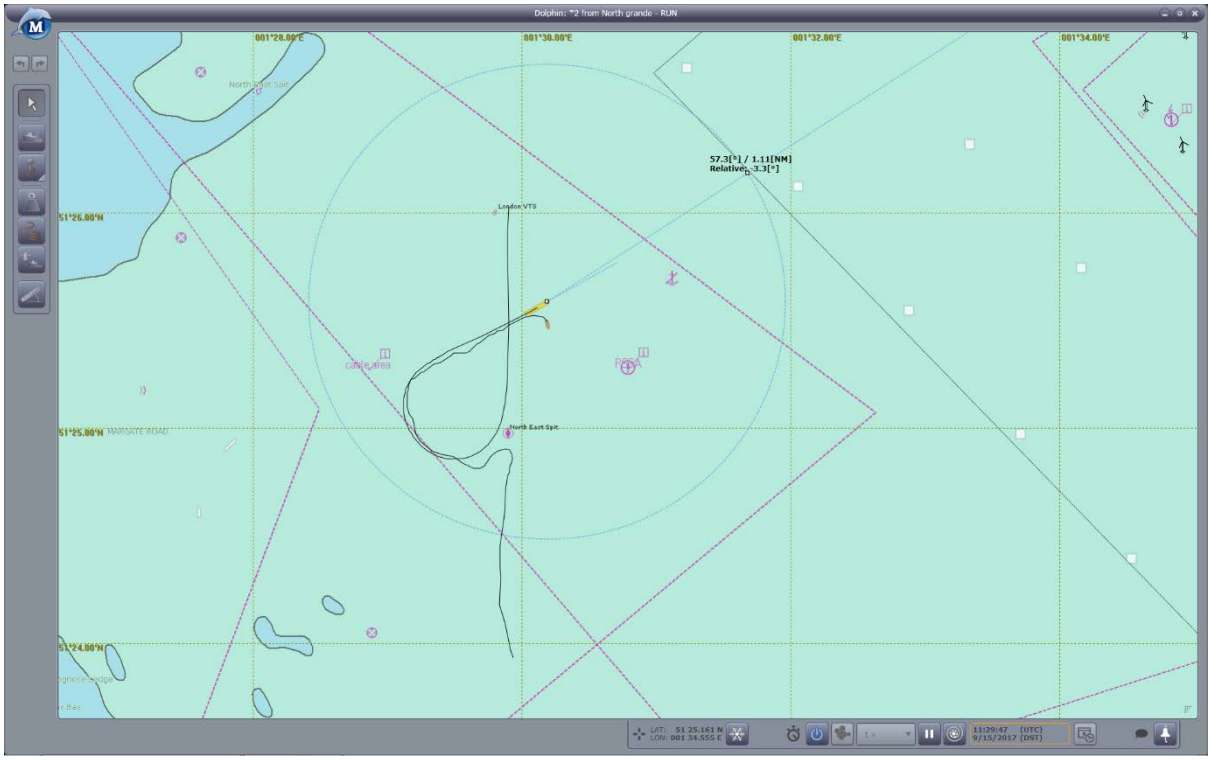
Parameter	Notes
Run Number	03
Date	20 September 2017
Start Time	1146
End Time	1217
Run ID	Single ship - 1 Ship from approaching from North
Wind Direction (from)	N
Wind Speed (kts)	25k
State of Tide	HW
Visibility	Good
Vessel Type	Grande – RoRo / Container
Outbound/In	In - approach from North
Start Area	North of NE Spit
Finish Area	North bound from Pilot Station
Ladder Side	Starboard
Vessel Heading for Transfer	070
Vessel Speed for Transfer	6 knots
Verdict	Success

Narrative / Comments:

Ship turned to starboard positioned to the west of the pilot station using standard rudder. Turn through 250 degrees took 15mins and ship had slowed to 3 knots in the turn – took 6 minutes to get back up to transfer speed.

Transfer course was directly towards wind farm but with 1.92nm sea room to effect transfer. Transfer was complete after 6 minutes and with 1.5nm sea room left – there after ship turned North for entry.

Criteria No	Criteria Description	Success	Marginal	Fail	Notes
1	Vessel Control	Pass			
2	WF Clearance – Contact Risk	Pass			
3	UKC – Grounding Risk	Pass			
4	Vessel Clearance – Collision	Pass			
5	Available Pilot Transfer Time	>5 min			
6	Emergency	Not Assessed			


Dolphin: *2 from North grande - RUN
001°28.80'E
001°30.00'E
001°32.00'E
001°34.00'E
51°26.00'N
51°25.00'N
51°24.00'N
57.3[°] / 1.11[NM]
Relative 3.3[°]
London VTS
North East Spit

Run 4

Notes	
Run Number	04
Date	20 September 2017
Start Time	1228
End Time	1243
Run ID	Single ship - 1 Ship from approaching from North
Wind Direction (from)	NE
Wind Speed (kts)	25k
State of Tide	HW
Visibility	Good
Vessel Type	Grande – RoRo / Container
Outbound/In	In - approach from North
Start Area	North of NE Spit
Finish Area	North bound from Pilot Station
Ladder Side	Port
Vessel Heading for Transfer	270
Vessel Speed for Transfer	6 knots
Verdict	Marginal

Narrative / Comments:

Ship turned to starboard at the pilot station (just North of) using standard rudder.

Transfer course was directly towards Margate anchorage area but the ship stayed 5c clear of any anchored vessels. This was felt to be safe but breached the vessel clearance criteria and thus the marginal assessment. It is important to note that the vessel was making way with good steerage control and the CPA to the anchored vessels occurred during the turn to the north after completing pilot transfer – a marginal run but perfectly under control.

It was also noted that the location of the windfarm made no impact to the positioning of this transfer. The start point was almost on the pilot transfer station diamond and the decision to turn to Starboard generated the proximity to the anchorage – this situation is extant today and the windfarm extension has little or no bearing on it.

Criteria No	Criteria Description	Success	Marginal	Fail	Notes
1	Vessel Control	Pass			
2	WF Clearance – Contact Risk	Pass			
3	UKC – Grounding Risk	Pass			
4	Vessel Clearance – Collision	Pass			
5	Available Pilot Transfer Time	>5 min			
6	Emergency	Not Assessed			


Dolphin: "2 from North grande - RUN
001°26.00'E
001°28.00'E
001°30.00'E
001°32.00'E
51°26.00'N
51°25.00'N
51°24.00'N
MARGATE SAND
MARGATE ROAD
London VTS
235.3[°] / 0.461[NM]
Relative: 127.0[°]

Run 5

Parameter	Notes
Run Number	05
Date	20 September 2017
Start Time	1315
End Time	1331
Run ID	Single ship - 1 Ship from North
Wind Direction (from)	E
Wind Speed (kts)	25k
State of Tide	HW
Visibility	Poor 1 Cable Vis
Vessel Type	Grande – RoRo / Container
Outbound/In	In - approach from North
Start Area	North of NE Spit
Finish Area	North bound from Pilot Station
Ladder Side	Port
Vessel Heading for Transfer	330
Vessel Speed for Transfer	6 knots
Verdict	Success

Narrative / Comments:

Ship turned to starboard on the pilot station using standard rudder.

Transfer course was directly towards Margate anchorage area but the ship stayed 6c clear of any anchored vessels. This was felt to be safe – and the similarities with run 4 are stark but with just a slightly larger CPA.

It was noted that the location of the windfarm made no impact to the positioning of this transfer. Start point was on the diamond and the decision to turn to Starboard generated the proximity

to the anchorage – as it would do and does today. After transfer the ship continued north to begin In transit.

Criteria No	Criteria Description	Success	Marginal	Fail	Notes
1	Vessel Control	Pass			
2	WF Clearance – Contact Risk	Pass			
3	UKC – Grounding Risk	Pass			
4	Vessel Clearance – Collision	Pass			
5	Available Pilot Transfer Time	>5 min			
6	Emergency	Not Assessed			

Run 6

Parameter	Notes
Run Number	06
Date	20 September 2017
Start Time	1350
End Time	1407
Run ID	Single ship - 1 Ship approaching pilot station from North
Wind Direction (from)	SE
Wind Speed (kts)	25k
State of Tide	HW
Visibility	Poor 1 Cable Vis in snow
Vessel Type	Grande – RoRo / Container
Outbound/In	In - approach from North
Start Area	North of NE Spit
Finish Area	North bound from Pilot Station
Ladder Side	Starboard
Vessel Heading for Transfer	270
Vessel Speed for Transfer	6 knots
Verdict	Success

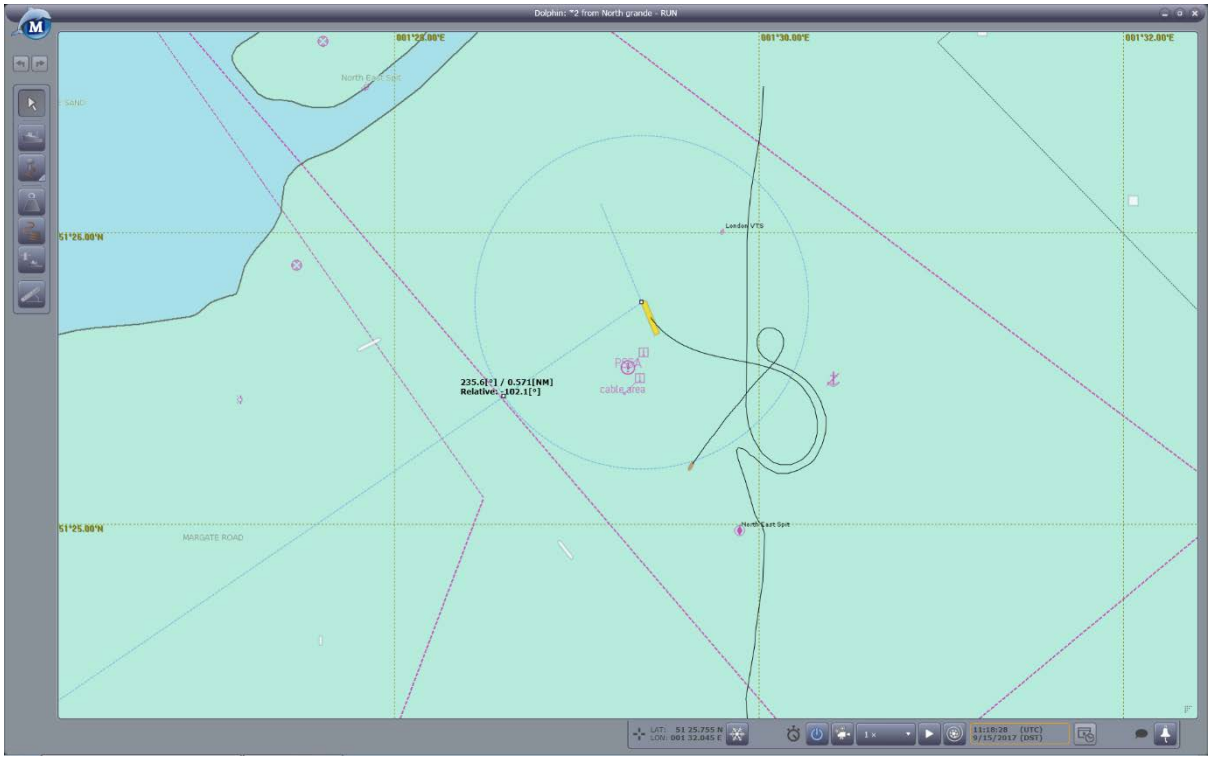
Narrative / Comments:

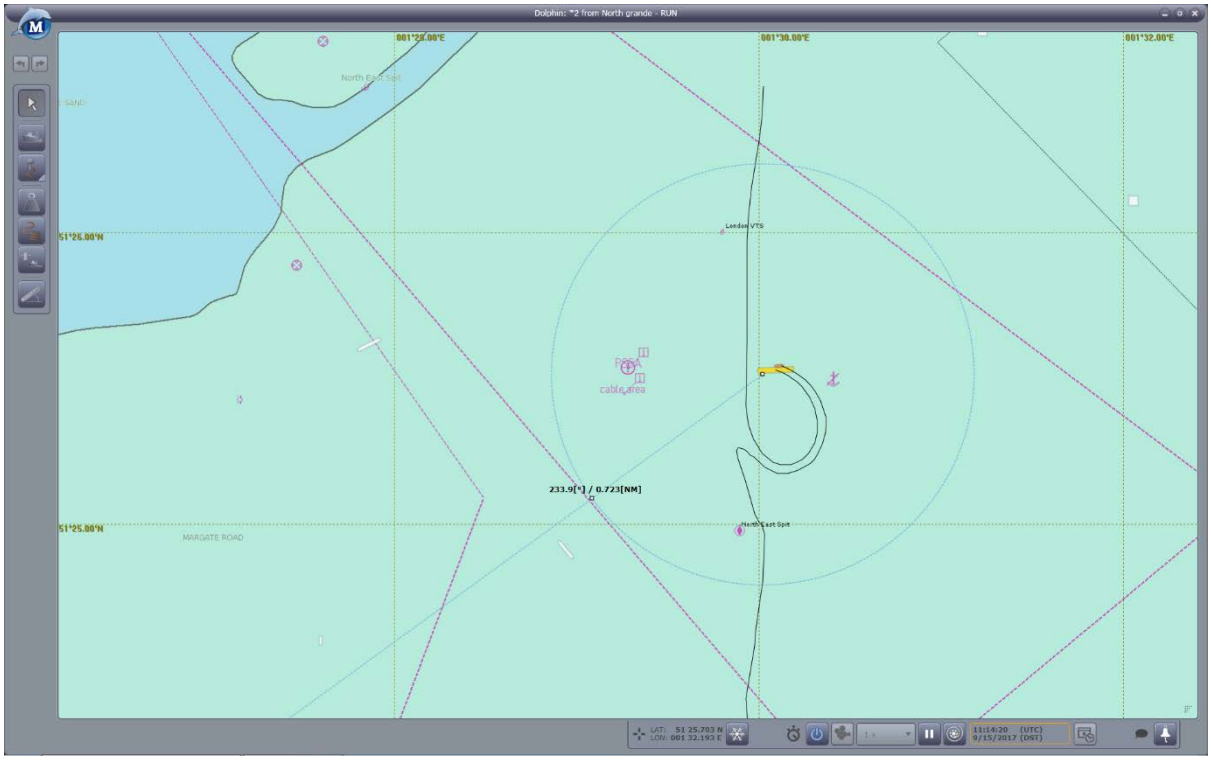
Ship turned to port on reaching the pilot station using standard rudder.

Starboard ladder was ordered by the Coxswain and the transfer was completed safely after a swing from 180 through North to 290 (stated transfer course was 270). During the turn, it was discussed that the transfer could have been safely conducted using a port ladder as the ship swung through the turn to port but this allowed no margin for error – incorrect rigging of ladders etc.

After transfer, the ship continued north to begin Inbound transit.

Criteria No	Criteria Description	Success	Marginal	Fail	Notes
1	Vessel Control	Pass			
2	WF Clearance – Contact Risk	Pass			
3	UKC – Grounding Risk	Pass			
4	Vessel Clearance – Collision	Pass			
5	Available Pilot Transfer Time	>5 min			
6	Emergency	Not Assessed			




Dolphin: "2 from North grande - RUN
001°28.00'E
001°30.00'E
001°32.00'E
51°26.00'N
51°25.00'N
London VTS
cable area
233.9[°] / 0.723[NM]
MARGATE ROAD

Run 7

Parameter	Notes
Run Number	07
Date	20 September 2017
Start Time	1420
End Time	1436
Run ID	Single ship - 1 Ship approaching pilot station from North
Wind Direction (from)	SE
Wind Speed (kts)	25k
State of Tide	HW
Visibility	Good
Vessel Type	Grande – RoRo / Container
Outbound/In	In - approach from North
Start Area	North of NE Spit
Finish Area	North bound from Pilot Station
Ladder Side	Starboard
Vessel Heading for Transfer	300
Vessel Speed for Transfer	6 knots
Verdict	Success

Narrative / Comments:

Ship turned to port on reaching the pilot station using standard rudder.

Starboard ladder was ordered by the Coxswain and the transfer was completed safely after a swing from 180 through North to 300.

After transfer, the ship continued north to begin In transit.

Criteria No	Criteria Description	Success	Marginal	Fail	Notes
1	Vessel Control	Pass			
2	WF Clearance – Contact Risk	Pass			
3	UKC – Grounding Risk	Pass			
4	Vessel Clearance – Collision	Pass			
5	Available Pilot Transfer Time	>5 min			
6	Emergency	Not Assessed			

Run 8

Parameter	Notes
Run Number	08
Date	20 September 2017
Start Time	1451
End Time	1504
Run ID	Single ship - 1 Ship approaching pilot station from North
Wind Direction (from)	W
Wind Speed (kts)	25k
State of Tide	HW
Visibility	Good
Vessel Type	Grande – RoRo / Container
Outbound/In	In - approach from North
Start Area	North of NE Spit
Finish Area	North bound from Pilot Station
Ladder Side	Starboard
Vessel Heading for Transfer	030
Vessel Speed for Transfer	6 knots
Verdict	Success

Narrative / Comments:

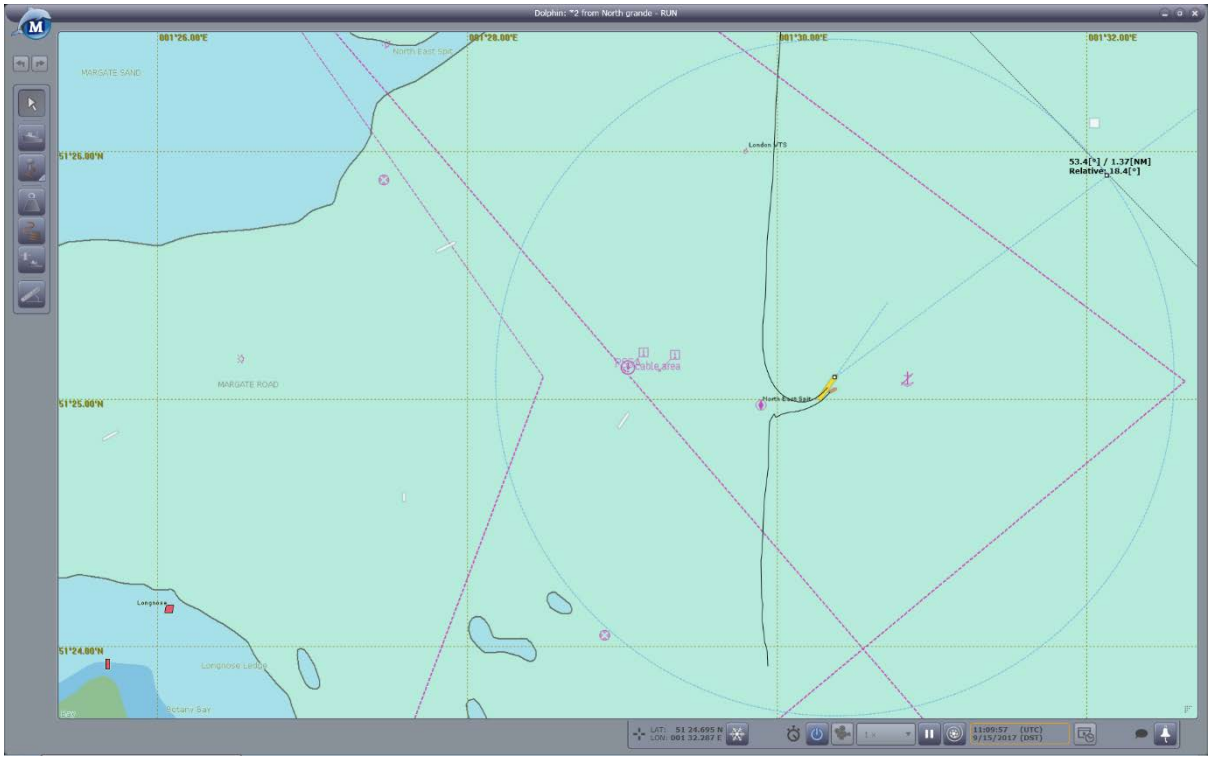
Ship turned to port on reaching the pilot station using standard rudder.

It took 6 minutes to complete the turn, on reaching the transfer course the Pilot Launch crew asked for the “ladder to be lowered from 2.5m to 1.5m above the waterline” a perfectly regular occurrence in pilot transfers – this was judged to have been complete after 4 minutes and the transfer proceeded.

The CPA to the nearest wind turbine was 9 cables.

After transfer, the ship continued north to begin In transit.

Criteria No	Criteria Description	Success	Marginal	Fail	Notes
1	Vessel Control	Pass			
2	WF Clearance – Contact Risk	Pass			
3	UKC – Grounding Risk	Pass			
4	Vessel Clearance – Collision	Pass			
5	Available Pilot Transfer Time	>5 min			
6	Emergency	Not Assessed			


Dolphin: "2 from North grande - RUN
001°26.00'E
001°28.00'E
001°30.00'E
001°32.00'E
MARGATE SAND
51°26.00'N
51°25.00'N
51°24.00'N
MARGATE ROAD
London UTS
53.4[°] / 1.37[NM]
Relative: 18.4[°]
Longnose
Longnose Ledge
Botany Bay

Run 9

Parameter	Notes
Run Number	09
Date	20 September 2017
Start Time	1539
End Time	1602
Run ID	Multi ship - 2 out 1 in
Wind Direction (from)	W
Wind Speed (kts)	25k
State of Tide	HW
Visibility	Good
Vessel Type	Ship 1 - Coaster
	Ship 2 - Grande
	Ship 3 – MSC Heidelberg
Outbound/In	2 x Outbound from North 1 x In from South
Start Area	NE Spit
Finish Area	North bound from Pilot Station
Ladder Side	Starboard
Vessel Heading for Transfer	030
Vessel Speed for Transfer	6 knots
Verdict	Success

Narrative / Comments:

The first multi ship simulation with 3 ships arriving at the pilot station at the same time – 2 outbound (with pilots embarked) and 1 In.

It took 4 minutes for the Launch Coxswain to gain sufficient situational awareness of the ships headings and positions to construct and then begin explaining his transfer plan on VHF.

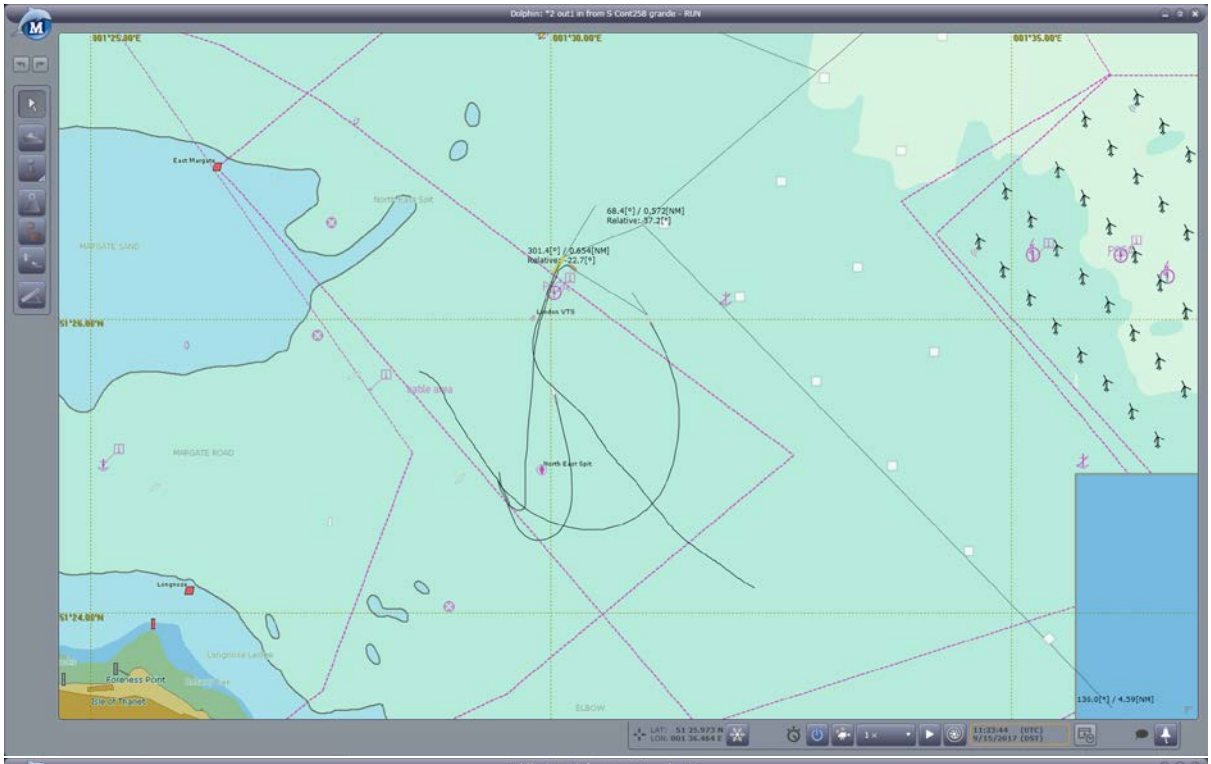
The plan took both pilots off the outbound ships before embarking the pilot on the In ship – meaning that at one moment there were three ships near the pilot station without pilots embarked.

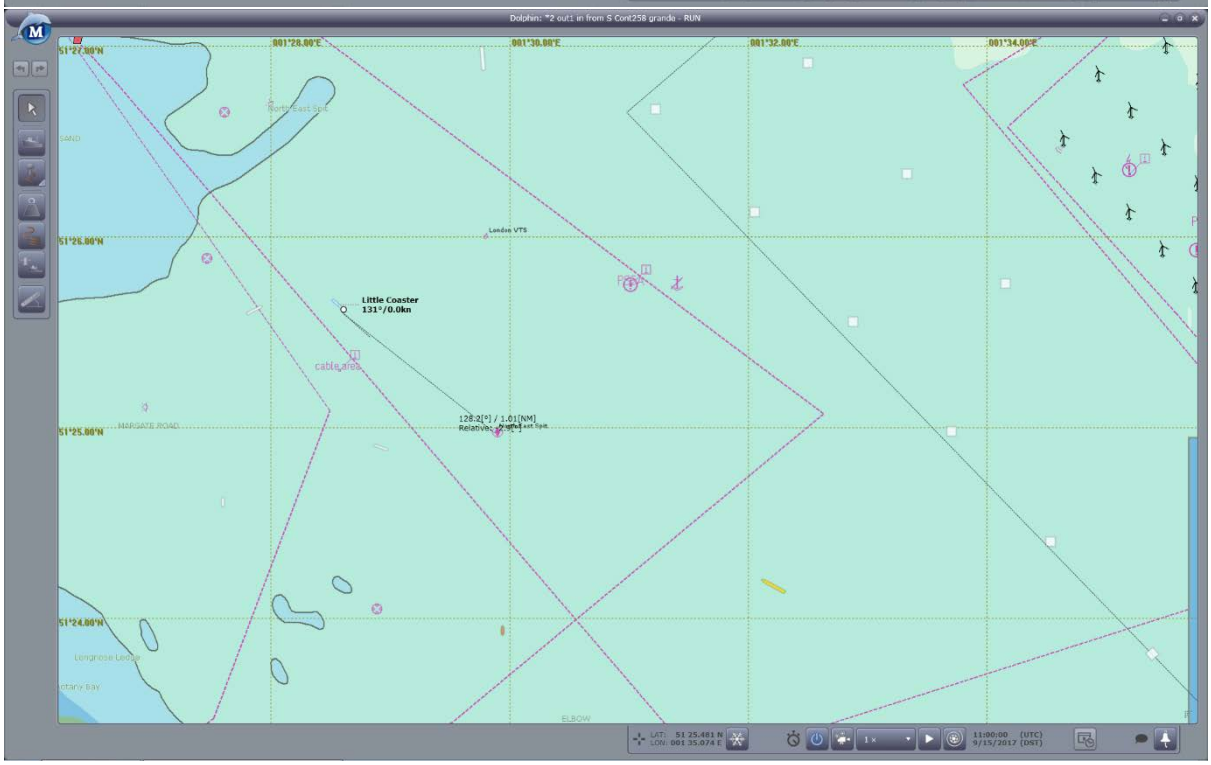
The conducting Coxswain was keen to point out that established ESL practice tries to avoid this situation and that he would have expected to embark the pilot first before disembarking the outbound pair. From a pilotage perspective this was not considered significant.

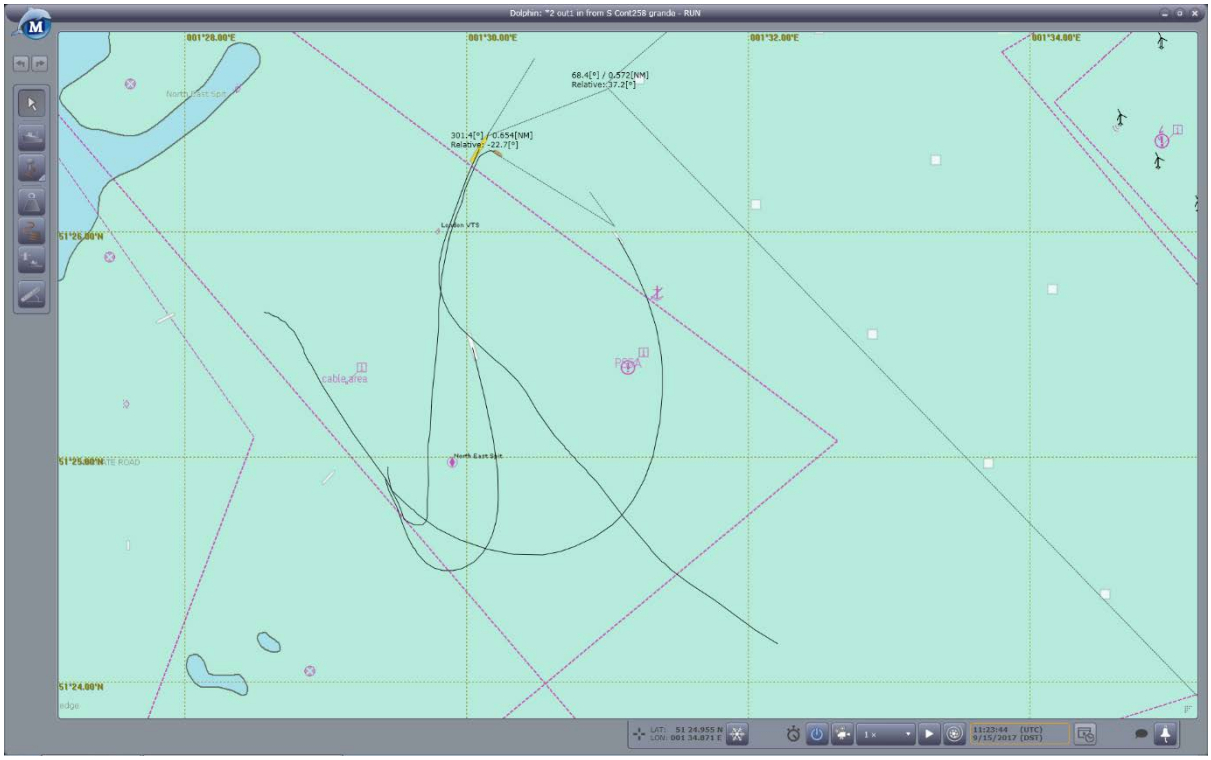
The CPA to the nearest wind turbine was 5.5 cables as this occurred but each ship was under way and pointing into safe water.

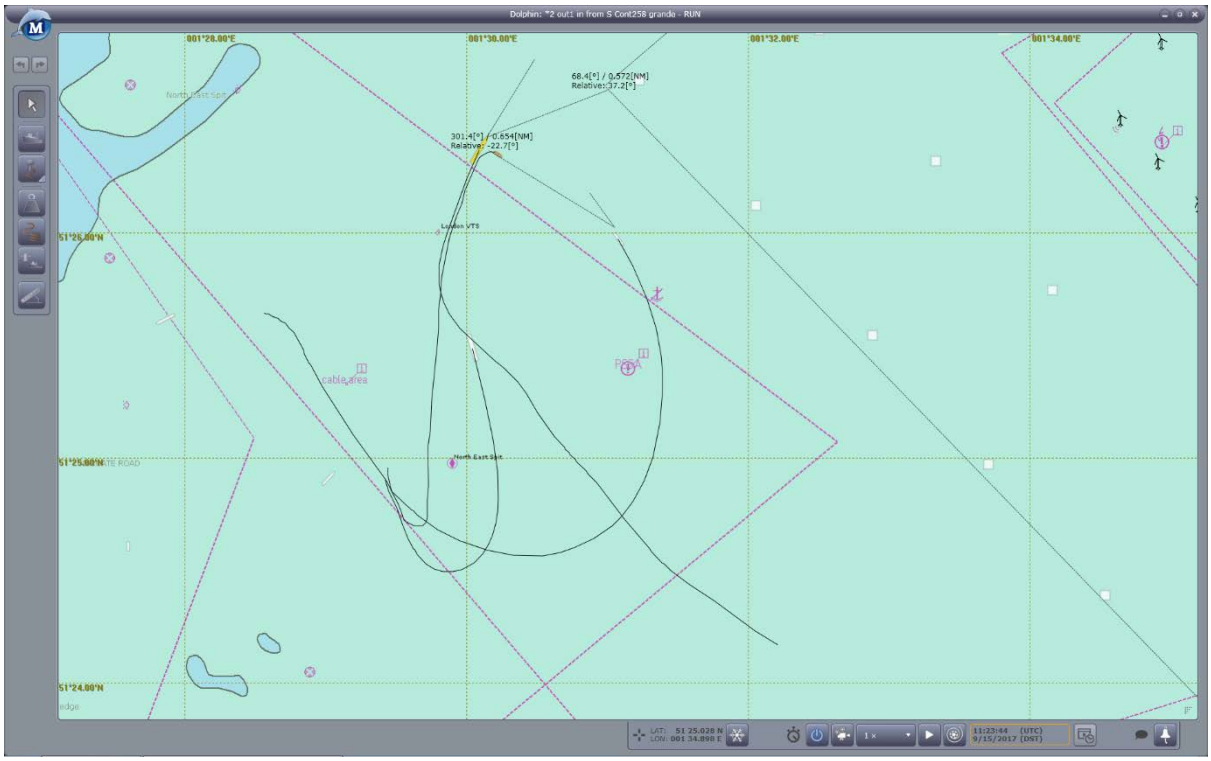
After transfer, all 3 ships continued north on passage and it was noted that the bottleneck between the westerly extent of the wind farm and the shoal water of the North-East Spit might very well become quite congested.

Criteria No	Criteria Description	Success	Marginal	Fail	Notes
1	Vessel Control	Pass			
2	WF Clearance – Contact Risk	Pass			
3	UKC – Grounding Risk	Pass			
4	Vessel Clearance – Collision	Pass			
5	Available Pilot Transfer Time	>5 min			
6	Emergency	Not Assessed			


Dolphin: *2 out1 in from S Cont258 grande - RUN
001°25.00'E
001°30.00'E
001°35.00'E
East Margate
North East Spit
68.4[°] / 0.572[NM]
Relative: 57.2[°]
301.4[°] / 0.654[NM]
Relative: 22.7[°]
London VTS
51°26.00'N
MARGATE SAND
MARGATE ROAD
North East Spit
Longness
51°24.00'N
Foreness Point
Stone Of Margate
ELBOW
136.0[°] / 4.59[NM]


Dolphin: *2 out1 in from S Cont258 grande - RUN
001°28.00'E
001°30.00'E
001°32.00'E
001°34.00'E
51°27.00'N
North East Spit
51°26.00'N
London VTS
Little Coaster
131°/0.0kn
cable area
128.2[°] / 1.01[NM]
Relative: 97.9[°]
MARGATE ROAD
51°25.00'N
51°24.00'N
Longness Ledge
ELBOW


Dolphin: *2 out1 in from S Cont258 grande - RUN
001°28.00'E
001°30.00'E
001°32.00'E
001°34.00'E
51°26.00'N
51°25.00'N
51°24.00'N
68.4[°] / 0.572[NM]
Relative: 37.2[°]
301.4[°] / 0.654[NM]
Relative: -22.7[°]
London VTS
cable area
North East Sht
edge


Dolphin: *2 out1 in from S Cont258 grande - RUN
001°28.00'E
001°30.00'E
001°32.00'E
001°34.00'E
51°26.00'N
51°25.00'N
51°24.00'N
68.4[°] / 0.572[NM]
Relative: 37.2[°]
301.4[°] / 0.654[NM]
Relative: -22.7[°]
London VTS
cable area
North East Sht
edge

Run 10

Parameter	Notes
Run Number	10
Date	21 September 2017
Start Time	0925
End Time	0951
Run ID	Multi ship - 2 in 1 out
Wind Direction (from)	NW
Wind Speed (kts)	25k
State of Tide	LW+3
Visibility	Good
Vessel Type	Ship 1 – Grande
	Ship 2 – Majestic
	Ship 3 – Sea Mariner
Outbound/In	2 x In from North 1 x outbound from North
Start Area	NE Spit
Finish Area	North bound from Pilot Station
Ladder Side	Starboard
Vessel Heading for Transfer	030
Vessel Speed for Transfer	6 knots
Verdict	Success

Narrative / Comments:

The second multi ship simulation with 3 ships arriving at the pilot station at the same time – 2 In and 1 outbound (with a pilot embarked).

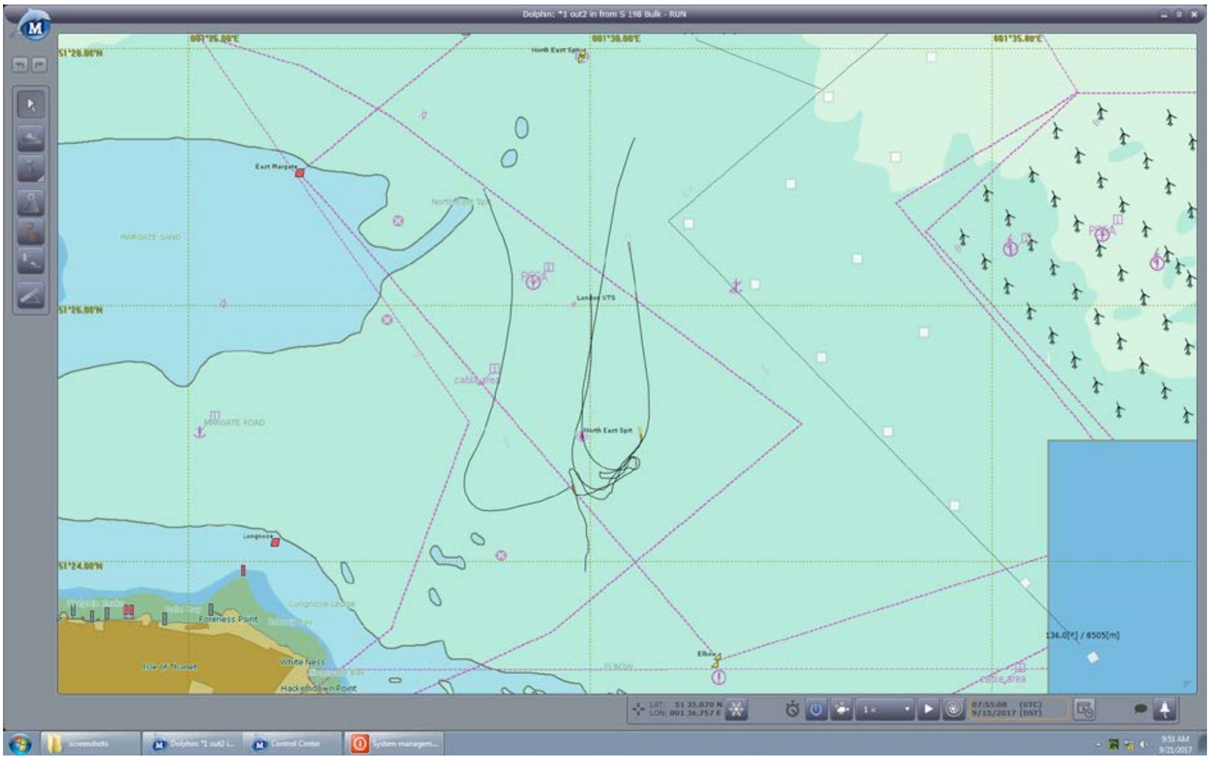
It took 5 minutes for the Launch Coxswain to gain sufficient situational awareness of the ships headings and positions to construct a plan and then another 3 minutes to explain it on VHF. The absence of language friction on VHF was noted.

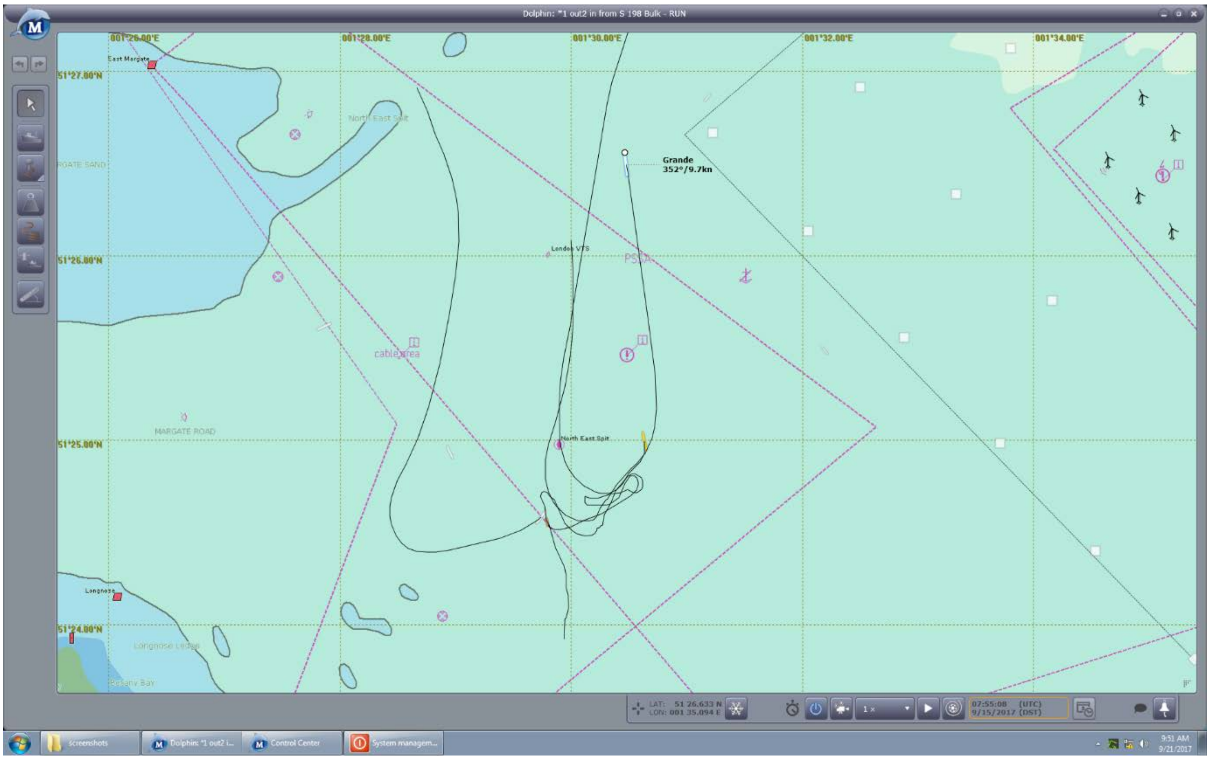
The plan ordered a 030-transfer course for all 3 ships and knowing that the vessel with a pilot embarked was likely to be a “known known” and behave in a predicable manner this vessel was directed to transfer as 3rd turn and asked to hold to the west of the pilot station.

Grande and Majestic followed line astern to the pilot station and the Coxswain controlled the initiation of each vessels turn to the transfer course very positively.

Once the transfer with the two unpiloted outbound vessels was complete and they were safely northbound the simulation was stopped.

Criteria No	Criteria Description	Success	Marginal	Fail	Notes
1	Vessel Control	Pass			
2	WF Clearance – Contact Risk	Pass			
3	UKC – Grounding Risk	Pass			
4	Vessel Clearance – Collision	Pass			
5	Available Pilot Transfer Time	>5 min			
6	Emergency	Not Assessed			


Dolphin: *1 out2 in from S 198 Bulk - RUN
East Margate
North East Spit
London VTS
Longnose
Foreness Point
Isle of Thanet
White Ness
Elbow
136.0[°] / 8505[m]


Dolphin: *1 out2 in from S 198 Bulk - RUN
East Margate
Grande
352°/9.7kn
London VTS
North East Spit
MARGATE ROAD
Longnose

Run 11

Parameter	Notes
Run Number	11
Date	21 September 2017
Start Time	1016
End Time	1047
Run ID	Multi ship - 2 in 2 out
Wind Direction (from)	NE
Wind Speed (kts)	25k
State of Tide	LW+3
Visibility	Good
Vessel Type	Ship 1 – Grande
	Ship 2 – Majestic
	Ship 3 – Sea Mariner
	Ship 4 – Car Carrier
Outbound/In	2 x In from North 2 x outbound from North
Start Area	NE Spit
Finish Area	North bound from Pilot Station
Ladder Side	Starboard / Port / Port / Starboard
Vessel Heading for Transfer	160 / 330 /330 /160
Vessel Speed for Transfer	6 knots
Verdict	Success

Narrative / Comments:

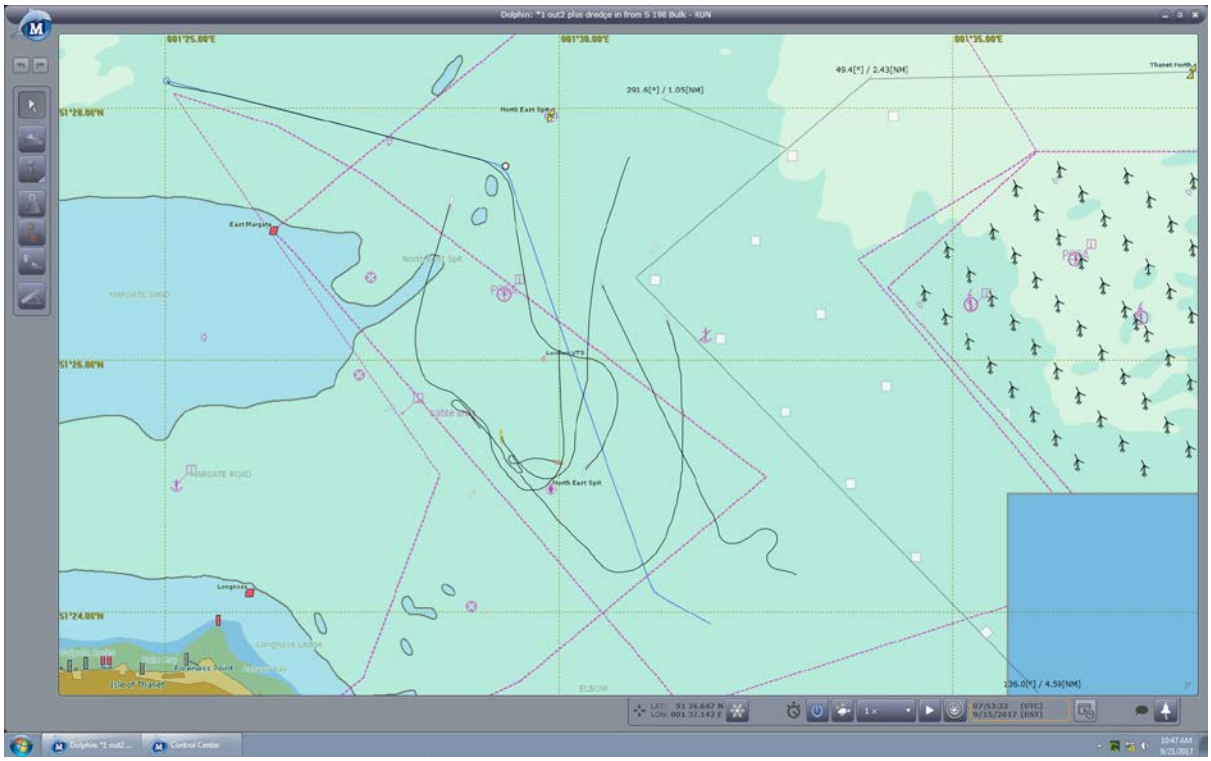
4 ships arriving at the pilot station at the same time – 2 In and 2 outbound (with pilots embarked).

This required two separate transfer courses (160 and 330) to match the geometry and the timing of the arrival of all 4 ships.

As an added complication, a dredger transited through the area but was receptive on VHF and compliant with the ROR.

Once the geometry and “batting order” had been decided and transmitted - the transfers went according to plan.

Criteria No	Criteria Description	Success	Marginal	Fail	Notes
1	Vessel Control	Pass			
2	WF Clearance – Contact Risk	Pass			
3	UKC – Grounding Risk	Pass			
4	Vessel Clearance – Collision	Pass			
5	Available Pilot Transfer Time	>5 min			
6	Emergency	Not Assessed			



Run 12

Parameter	Notes
Run Number	12
Date	21 September 2017
Start Time	1115
End Time	1136
Run ID	Multi ship - 2 in 2 out
Wind Direction (from)	E
Wind Speed (kts)	25k
State of Tide	LW+3
Visibility	Night
Vessel Type	Ship 1 – Grande
	Ship 2 – Majestic
	Ship 3 – Sea Mariner
	Ship 4 – Car Carrier
Outbound/In	2 x In from North 2 x outbound from North
Start Area	NE Spit
Finish Area	North bound from Pilot Station
Ladder Side	Starboard / Port / Port / Starboard
Vessel Heading for Transfer	220 / 330 / 330 / 220
Vessel Speed for Transfer	6 knots
Verdict	Success

Narrative / Comments:

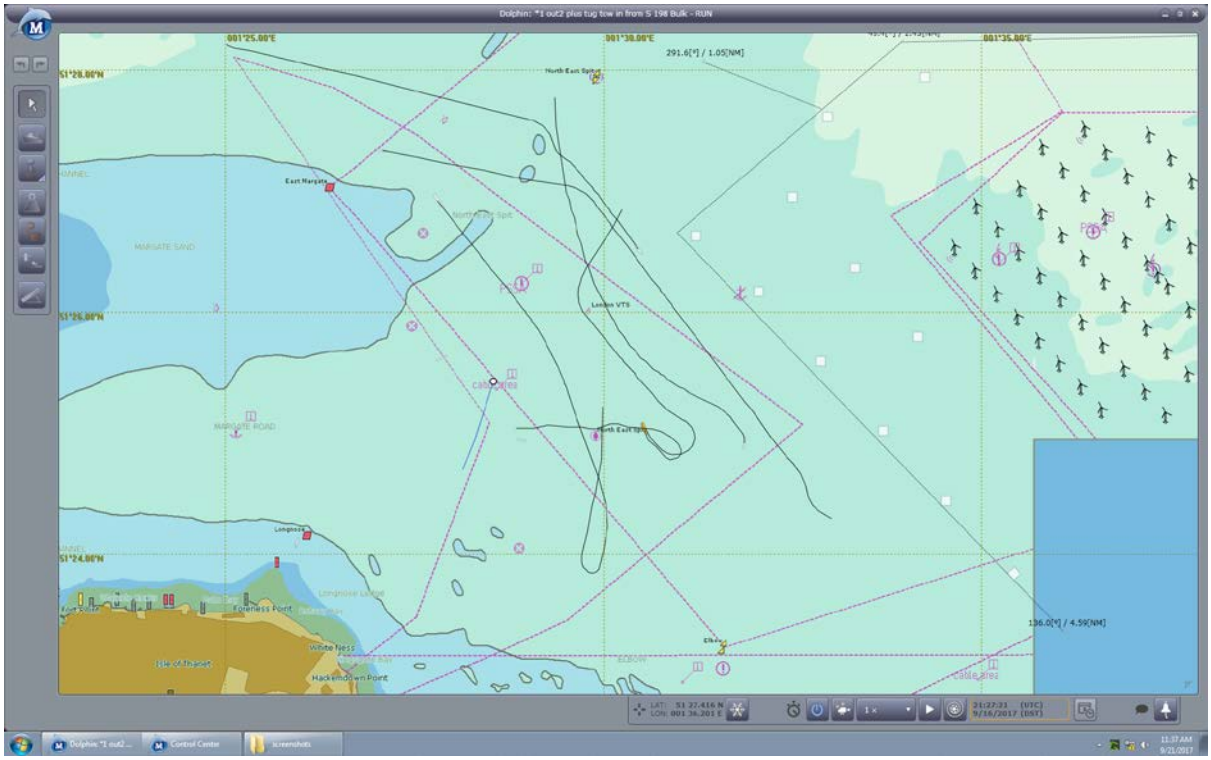
4 ships arriving at the pilot station at the same time – 2 In and 2 outbound (with pilots embarked).

This required two separate transfer courses (220 and 330) to match the geometry and the timing of the arrival of all 4 ships.

The dredger once again transited through the area but was receptive on VHF and compliant with the ROR.

The addition of the tug and tow as the first transfer added an extra dimension but once the geometry and "batting order" had been decided and transmitted - the transfers went according to plan.

Criteria No	Criteria Description	Success	Marginal	Fail	Notes
1	Vessel Control	Pass			
2	WF Clearance – Contact Risk	Pass			
3	UKC – Grounding Risk	Pass			
4	Vessel Clearance – Collision	Pass			
5	Available Pilot Transfer Time	>5 min			
6	Emergency	Not Assessed			


Dolphin: *1 out2 plus tug tow in from S 198 Bulk - RUN
001°25.00'E
001°30.00'E
001°35.00'E
51°26.00'N
51°25.00'N
51°24.00'N
291.6[°] / 1.05[NM]
136.0[°] / 4.59[NM]
North East Spit
East Margate
MARGATE SAND
MARGATE ROAD
Longnose
Foreness Point
White Ness
Isle of Thanet
Hackendown Point
ELBOW

Run 13

Parameter	Notes
Run Number	13
Date	21 September 2017
Start Time	1202
End Time	1227
Run ID	Multi ship - 2 in 2 out
Wind Direction (from)	N
Wind Speed (kts)	25k
State of Tide	LW+3
Visibility	Poor 1c – heavy snow
Vessel Type	Ship 1 – Grande
	Ship 2 – Majestic
	Ship 3 – Sea Mariner
	Ship 4 – Car Carrier
Outbound/In	2 x In from North 2 x outbound from North
Start Area	NE Spit
Finish Area	North bound from Pilot Station
Ladder Side	Port / Port / Starboard / Port
Vessel Heading for Transfer	220 / 220 / 120 / 220
Vessel Speed for Transfer	6 knots
Verdict	Success

Narrative / Comments:

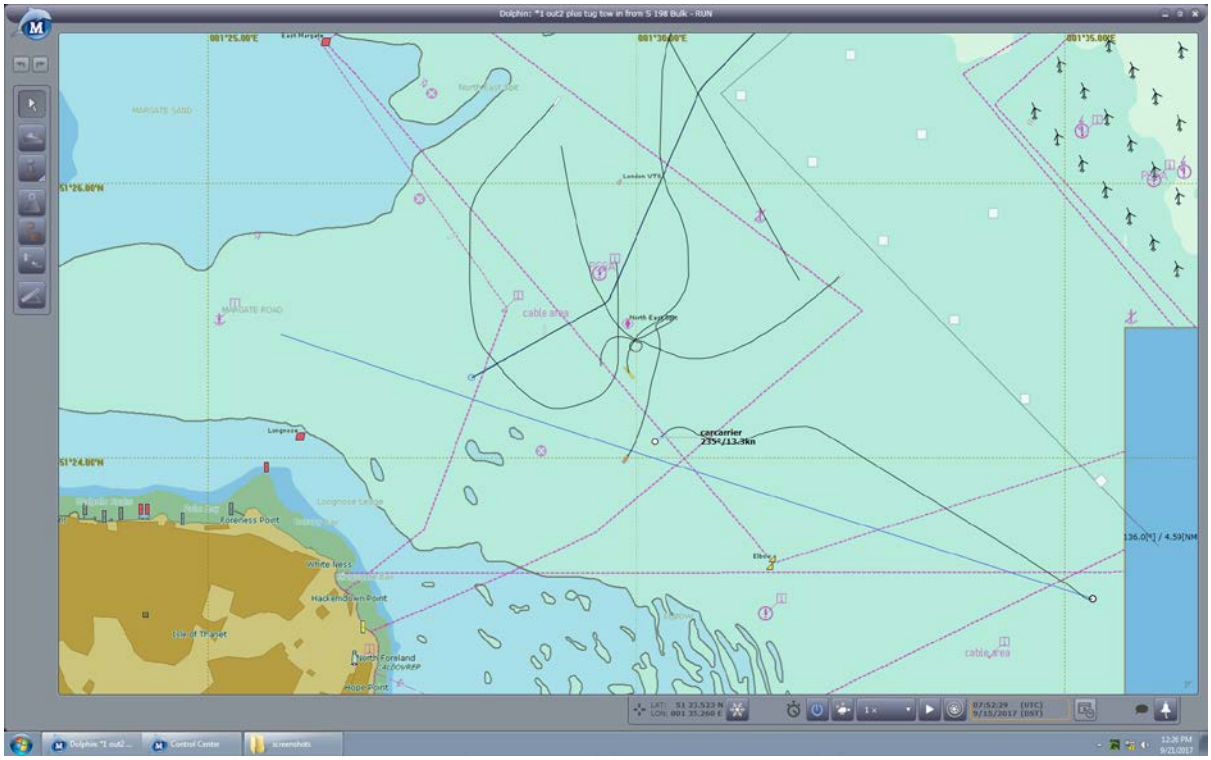
4 ships arriving at the pilot station at the same time – 2 In and 2 outbound (with pilots embarked).

This required two separate transfer courses (220 and 120) to match the geometry and the timing of the arrival of all 4 ships.

This simulation had a tug and tow (restricted in ability to manoeuvre) on a slow transit through the area and almost on top of the pilot station at simulation start.

It is perhaps telling that despite the complexity of the simulation and the reduced sea room the Coxswain quickly sorted through the different courses and speeds, transmitted his plan clearly on VHF and executed it comparatively quickly – in poor visibility.

Criteria No	Criteria Description	Success	Marginal	Fail	Notes
1	Vessel Control	Pass			
2	WF Clearance – Contact Risk	Pass			
3	UKC – Grounding Risk	Pass			
4	Vessel Clearance – Collision	Pass			
5	Available Pilot Transfer Time	>5 min			
6	Emergency	Not Assessed			


Dolphin: *1 out2 plus tug tow in from S 198 Bulk - RUN
001°25.00'E
001°30.00'E
001°35.00E
MARGATE SAND
51°25.00'N
MARGATE ROAD
cable area
London VTS
carcarrier
235°/13.3kn
51°24.00'N
Longnose
Longnose Ledge
Foreness Point
White Ness
Hackendown Point
Isle of Thanet
North Foreland
Hope Point
cable area
136.0[*] / 4.59[NM

Run 14

Parameter	Notes
Run Number	14
Date	21 September 2017
Start Time	1247
End Time	1321
Run ID	Multi ship - 2 in 2 out
Wind Direction (from)	NE
Wind Speed (kts)	25k
State of Tide	LW+3
Visibility	Poor 1c – heavy snow
Vessel Type	Ship 1 – Grande
	Ship 2 –Car Carrier
	Ship 3 – Sea Mariner
	Ship 4 – Majestic
Outbound/In	2 x In from North 2 x outbound from North (1 x deep draught)
Start Area	NE Spit
Finish Area	North bound from Pilot Station
Ladder Side	Port / Starboard / Port / Starboard
Vessel Heading for Transfer	330 / 160 / 330 / 160
Vessel Speed for Transfer	6 knots
Verdict	Success

Narrative / Comments:

4 ships arriving at the pilot station at the same time – 2 In and 2 outbound (with pilots embarked).

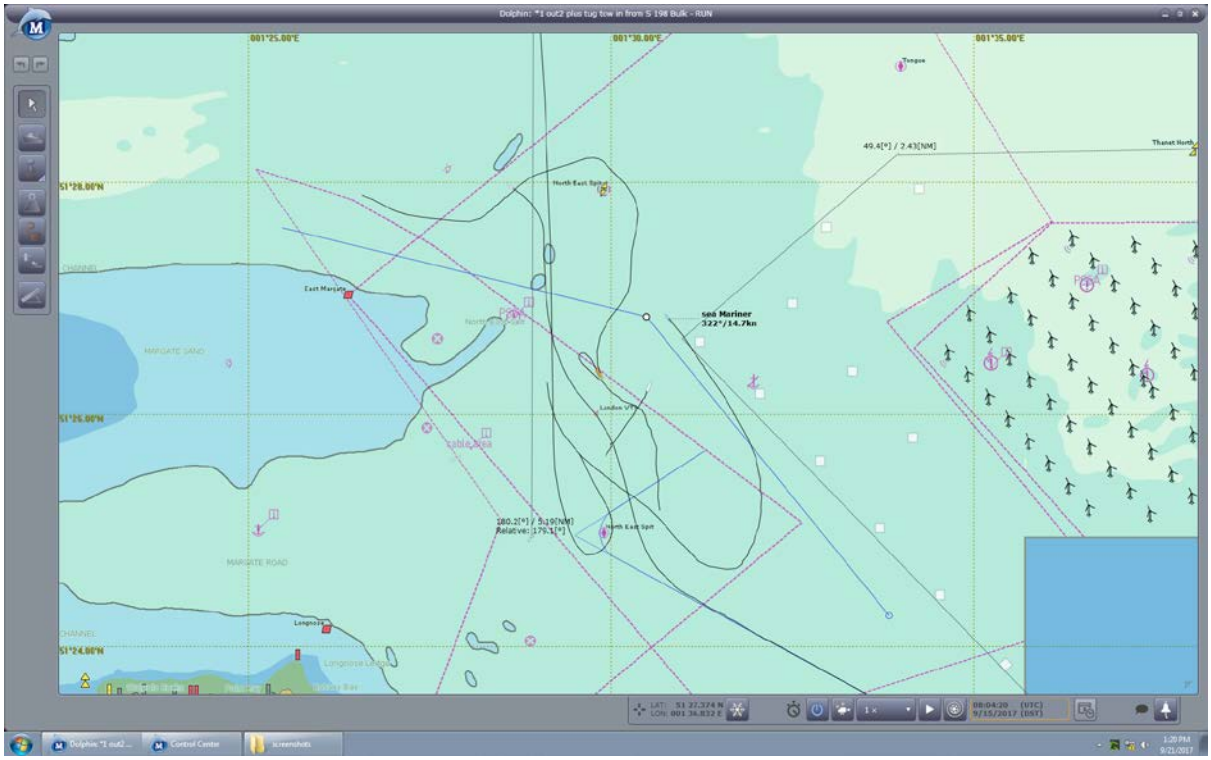
This required two separate transfer courses (330 and 160) to match the geometry and the timing of the arrival of all 4 ships.

The tug and tow (restricted in ability to manoeuvre) was on a slow transit through the area.

This simulation attempted to explore the requirement to service a deep draught vessel outbound from the north and examine the nature of the reduced area of sea room between the wind farm and the North-East Spit shoal water (narrowest point).

The transfers with the preceding 3 ships occurred without incident and although all three exited to the north though the narrow point at the same time as the deep draught vessel came south – no close quarters situations developed and adequate separation was achieved. The length of the run was purely a function of the transit distance required for the Pilot Launch to reach the deep draught vessel.

Criteria No	Criteria Description	Success	Marginal	Fail	Notes
1	Vessel Control	Pass			
2	WF Clearance – Contact Risk	Pass			
3	UKC – Grounding Risk	Pass			
4	Vessel Clearance – Collision	Pass			
5	Available Pilot Transfer Time	>5 min			
6	Emergency	Not Assessed			


001°25.00'E
001°30.00'E
001°35.00'E
51°28.00'N
51°26.00'N
51°24.00'N
Tongue
49.4[°] / 2.43[NM]
Thanet North
North East Spit
East Margate
Sea Mariner
322°/14.7kn
MARGATE SAND
CHANNEL
London Array
Cable Area
180.2[°] / 5.19[NM]
Relative: 179.1[°]
North East Spit
MARGATE ROAD
Longscar
Longscar Ledge
CHANNEL
Dolphin: *1 out2 plus tug tow in from S 198 Bulk - RUN
LAT: 51 27.374 N
LON: 001 36.822 E
08:04:20 (UTC)
9/15/2017 (DST)
1:20 PM
9/21/2017