

# **Vattenfall Wind Power Ltd**

## **Thanet Extension Offshore Wind Farm**

Appendix 38 to Deadline 6: Shipping and  
Navigation: ISH 8: ExQ Action Point 20: Pilot  
Transfer Bridge Simulation Study Specification

Relevant Examination Deadline: 6

Submitted by Vattenfall Wind Power Ltd

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Revision A

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## Contents

1	Introduction .....	4
2	PTBS - Simulation Aims and Objectives .....	5
2.1	Aims and Objectives of original PTBS.....	5
2.2	Aims and Objectives of PTBS arising from NRAA and IP submissions during Examination .....	5
2.3	Summary of Proposed Objectives.....	8
3	Simulation Providers.....	9
3.1	Types of Simulator Providers .....	9
3.2	Types of Simulator Providers .....	9
4	Additional Simulation Specification.....	12
4.2	Introduction/Overview.....	12
4.3	Aims/Objectives .....	12
4.4	Task 0: Project Management .....	12
4.5	Task 1: Set up and configuration of simulator for TOW / TEOW area.....	13
4.6	Operation, Evaluation and Assessment Criteria .....	14
4.7	Task 2: Verification of simulator models and setup .....	14
4.8	Task 3: Simulation Workshop.....	15
4.9	Task 4: Reporting.....	17
5	Annex A: Parameters .....	18
6	Annex B: Run Grading (from original PTBS Study Inception Report) .....	20

## Figures

Figure 1: Extract from NRAA .....	5
Figure 2: Extract from NRAA.....	6

## 1 Introduction

- 1 The Pilot Transfer Bridge Simulation (PTBS) study formed a component of the Navigation Risk Assessment (NRA) that accompanied the Thanet Extension Offshore Windfarm (TEOW) application and considered the feasibility of pilotage transfers at the NE Spit Pilot Transfer area with the pre-application (PEIR) TEOW Red Line Boundary (RLB). The project has since been updated to reduce the RLB (following the PTBS study but before submission of the application) and a Structures Exclusion Zone (SEZ) has been subsequently introduced (during the Examination phase). An updated NRA Addendum (NRAA) has been drafted to accompany the SEZ in which it is identified that a further pilot transfer bridge simulation exercise is not considered necessary, but which if undertaken could be for verification of risk controls.
- 2 During the examination however, Interested Parties (IPs) and the Examination Authority (ExA) have focused on the PTBS study which was conducted at the Port of London Authority (PLA) Simulation Centre on the pre-application RLB, and there have been a number of requests from IPs to undertake an updated PTBS study prior to the end of the Examination. The ExA have confirmed an updated simulation study is not being requested at this stage, for reasons provided in the Issue Specific Hearing (ISH) 8 Action Point document [EV-046]. The ExA have however in Action Point 20 of the same document requested IPs and the Applicant to comment on what the precise brief for such a body of work (summarised below):
  - ***“Action Point 20: Updated simulation report.***
  - *The ExA has considered requests that an updated simulation report be carried out to inform the NRA/ NRAA process in the light of the SEZ material change. The ExA has declined to make a procedural decision that such a study should be prepared at this time, for reasons set out fully in Annex A to this action list.*
  - *However, the Annex provides an action for the Applicant and ISH8 IPs / OPs to:*
    - *comment on what the precise brief for such a body of work might be;*
    - *respond to submitted comments by others on this point; and*
    - *the Applicant to exercise its final right of reply on all such submissions.*
  - *The Applicant and all ISH8 IPs / Ops to respond at Deadline 6, 7 and 8.”*
- 3 This note therefore represents the Applicant’s position with regards the *“precise brief for such a body of work might be”*. This note describes the considerations of an updated simulation study in terms of, Study Aims and Objectives, Simulation Providers and Simulation Specification.

## 2 PTBS - Simulation Aims and Objectives

### 2.1 Aims and Objectives of original PTBS

- 4 The objectives of the original PTBS study were as specified in the PTBS Inception Report and were developed from the Scoping Study and early liaison with the Applicant and PLA, ESL and MCA (extract below from PTBS Inception Report (REP1-046))
- “Examine whether the Pilot Transfer operations are feasible at North East Spit Station with the extended wind farm” [Note: This is with respect to the original PEIR RLB];
  - “Assess the wind farm layouts and whether pilotage operations are feasible in a range of defined operational scenarios”

### 2.2 Aims and Objectives of PTBS arising from NRAA and IP submissions during Examination

- 5 The Applicant has laid out the Aims and Objectives of any additional simulation study in the NRAA at Para. 169-171 (see Figure 1 below).

<b>Risk Controls Not Recommended / Adopted</b>	
<b>Risk Control Validation</b>	
169	Allied to post-consent monitoring is the possibility of considering, on the basis of the final design of the project, the undertaking of a bridge simulation study to validate the risk controls which have been proposed as part of the project.
170	Although the Applicant does not consider validation to be necessary, a further simulation study would facilitate validation and refinement of control measures, including the placement of buoys and navigational aids.
171	The exercise could also enable improvements to training and integration of pilots and ESL crew, building on the benefits of mutual co-operation that were identified through the pilotage simulation carried out as part of the preparation of the original NRA (see Table 22 of the NRA, unadopted risk control No. 4).

Figure 1: Extract from NRAA

- 6 The NRAA further mentions that simulation could be used to investigate the “Not Adopted” risk control measures of relocating pilotage transfers to the north within the NE Spit Pilot Transfer Operational Area as determined by PLA / ESL (see Figure 2).

#### TEOW Control Measures

140 Further to the risk controls identified above, risk controls considered but 'not applied' within the original NRA (for reasons already identified, primarily relating to the measures not being necessary in order to reduce the risk to ALARP) remain under consideration and refinement subject to stakeholder feedback and preferences. These include:

- **Relocate Pilot Transfers Area**
- Relocate pilot transfers as necessary to ameliorate concern over sea room for large vessels at NE Spit under challenging MetOcean or operational conditions. Relocation based on vessel type to north of NE Spit transfer area or alternative pilot diamond, assessed through Shipping and Navigation Liaison Plan / Group using full bridge simulation.

Figure 2: Extract from NRAA

- 7 The NRAA therefore principally confirms that whilst an additional simulation is not required, were it to be requested then the aims of the study should be a validation exercise to confirm the requirement for adopted risk control measures.
- 8 The Applicant notes however that this view is at odds with the views of IP's which *inter alia* are summarised as:
- Port of Tilbury (POTLL) and DPW London Gateway (DPWLG) – have suggested additional simulation studies based on perceived flaws in the original simulation (though they have noted that the original simulation is largely valid), and have made particular reference to inclusion of larger vessels on transit and pilotage operations at NE Spit to confirm / characterise sea room requirements.
  - London Pilots Council (LPC) – have suggested additional simulation studies based on perceived flaws in original PTBS – particularly around the PLA simulator suitability and vessel sizes.
  - Port of London Authority (PLA) / Estuary Services Ltd (ESL) – have noted flaws in the original PTBS study, particularly around deficiencies in their own simulation centre, but have only latterly in the ExA process requested additional simulation studies.
  - Trinity House (TH)– noted a flaw of the original PTBS in use of mariners experienced to navigating vessels to and from the pilot boarding area, and the limited number of scenarios trialled, but have noted that further simulation may not necessarily address those concerns.
  - Maritime Coastguard Agency (MCA) – have not been clear on the requirement for additional simulation studies, except they have noted that such studies are not mandated by guidance – MCA Marine Guidance Note 543.
  - Chamber of Shipping – have noted that an additional simulation study is required though without an identified scope.

- 9 In specifying the aims and objectives of any additional PTBS study, and out with the aims identified above, the scope identified in Table 1 has been requested by IP’s in varying MetOcean conditions and with a variety of vessel types.

**Table 1: Additional Simulation scope requested by IPs with Applicant response.**

IP request	Applicant Responses
Sea room for transit of large vessels (e.g. 333m LOA Container ship) at: NE Spit RACON Elbow Buoy	Sea room requirements have been considered through reference and application of the Marine Spatial Planning calculations as proposed by IP’s (LPC, POTLL / DWPLG) [REP5-014]. Through reference to the SoCGs with MCA and Trinity House it is understood that the searoom is agreed for passage, but there remains uncertainty regarding pilotage with key stakeholders referring to PLA/ESL with regards sea room for pilotage.
Sea Room Considerations for Pilot Transfer for vessels (including large and high sided wind effected vessels) at:	Whilst the sea room requirements have been considered through reference and application of the Marine Spatial Planning calculations as proposed by IP’s (LPC, POTLL / DWPLG) [REP5-014], it is recognised that there remains uncertainty regarding pilotage with key stakeholders deferring to PLA/ESL with regards sea room for pilotage for vessels in transit
NE Spit Pilot Diamond	The Applicant has provided for 2nm plus 1nm buffer at the NE Spit Pilot Diamond as requested by the PLA and ESL and therefore the need to undertake further simulation is not considered necessary. Notwithstanding this it is recognised that there remains uncertainty regarding pilotage with key stakeholders deferring to PLA/ESL with regards sea room for pilotage.
Tongue Pilot Diamond	The Applicant notes that Tongue represents a very small number of pilot transfers and the need to move the Tongue pilot boarding station will be considered based on the final design layout of the TEOW and that further sea room is available to the NNE of the current diamond and as such sea room is not restricted. Notwithstanding this it is recognised that there remains uncertainty regarding pilotage with key stakeholders deferring to PLA/ESL with regards sea room for pilotage.
In vicinity of Elbow Buoy	The Applicant notes that Elbow represents a very small number of total pilot transfers compared to the NE Spit operational area and as additional sea rom is available to the south and south west Elbow. Notwithstanding this it is recognised that there remains uncertainty regarding pilotage with key stakeholders deferring to PLA/ESL with regards sea room for pilotage.

IP request	Applicant Responses
Optimised location for pilot boarding of large vessels (likely to be between NE Spit Pilot Diamond and Tongue Pilot Diamond)	As the Applicant has provided the 2nm plus 1 nm buffer at NE Spit pilot diamond, the Applicant does not consider the need for relocation of pilot transfers to Tongue Pilot Diamond. Notwithstanding this it is recognised that there remains uncertainty regarding pilotage with key stakeholders deferring to PLA/ESL with regards sea room for pilotage.
Multiple concurrent pilot transfers within NE Spit Boarding Operational Area	Multiple concurrent pilotage transfers were undertaken in the original PTBS. Notwithstanding this it is recognised that there remains uncertainty regarding pilotage with key stakeholders deferring to PLA/ESL with regards sea room for pilotage.

## 2.3 Summary of Proposed Objectives

10 The Applicant is cognisant of the IP's view on the scope of any further simulation studies and as such proposes the scope of any additional studies to be focussed on pilotage, rather than passage/transit. As such the proposed objectives are:

- Confirmation of:
  - Searoom for pilot transfers to and from vessels (including 333m container vessel at approved draught and large and high sided wind effected vessels) and including multiple concurrent transfers within NE Spit Boarding Operational Area at:
    - NE Spit Pilot Diamond
    - Tongue Pilot Diamond
    - In vicinity of Elbow Buoy
- Validation and refinement of proposed risk controls measures based on likely final windfarm layout. The Applicant will provide clear breakdown of risk controls that will be taken into account (either as embedded or as additional) and will include: :
  - Scope of Aids to Navigation review,
  - Scope of Shipping and Navigation Liaison Group



## 3 Simulation Providers

### 3.1 Types of Simulator Providers

11 The choice of simulator provider is important in meeting the Aims and Objectives of any further simulation studies. The following types of simulation providers have been identified including selected examples of possible suppliers by type:

- Port or Harbour Authority Providers
  - Port of London Authority Simulation Centre
  - Milford Haven Port Authority Simulation Centre
  - Aberdeen Harbour Commissioners Simulation Centre
- Maritime Training Providers
  - South Tyneside College
  - Warsash Maritime College
  - Liverpool John Moores University
- Infrastructure Design Providers
  - Maritime Research Institute Netherlands (Marin) (Netherlands)
  - HR Wallingford (UK)
  - Force Technologies (Denmark)

### 3.2 Types of Simulator Providers

12 In general terms, simulators are available through port or harbour authorities such as the PLA, a maritime training provider or at infrastructure design provider simulation centres.

13 The use of the PLA Simulator (which is developed by Marin) was agreed with the PLA having regard to its position as relevant harbour authority and consultee on the application. Its set up was agreed with the PLA and PTBS attendees at the time of the simulation, after potential limitations had been understood, addressed and agreed by all participants not to compromise the results of any simulation. However, concerns have subsequently been raised by the PLA / ESL (despite these not being raised at the original PTBS) and other IP's as being issues, including the following:

- The wind farm layout was not in the simulator and therefore jack up oil rigs were used as proxy for the TEOW.
- Vessel models were limited (the PLA did not have a pilot launch vessel model).

- The ability to change and update models immediately is generally limited as simulator personnel commonly undertake repeated training simulations of various exercises including approaching / departing specific berths / approaches within their port.
  - The out puts available such as swept path plots, helm/engine order plots, met ocean considerations are normally limited (as was apparent in the PLA simulations where the Applicant had to make use of screen shots to demonstrate vessel track plots).
- 14 Maritime training providers generally have more flexibly set up simulators than port or harbour authorities such as the PLA and are commonly able to update visual models to reflect various locations and changes to infrastructure - such as inclusion of a windfarm. They commonly develop visual models for various geographical areas and will likely have a good library of vessel models. Some training providers may also have multiple ship bridge simulators, enabling full bridge simulation of multiple vessels concurrently.
- 15 Maritime training providers are however primarily geared up for the provision of training, and as such are generally less well used to more complicated simulations, such as those associated with infrastructure development. Typically, college simulators are “off the shelf” simulators based on proprietary software - that at times limits utility. When changes are needed to layouts, visual scenes or ship seakeeping models, outwith of standard settings, they may need to revert to the simulator manufacturer, which invariably takes time and increases costs.
- 16 The most advanced simulators are typically those developed, set up and managed by the organisations that operate them - infrastructure design providers. As the developers of the simulators are typically on site, immediate changes, updates and manipulations of visual models, or ship sea keeping models can be undertaken quickly and efficiently. This enables, on a “set up” day for example, the fine tuning/calibration of settings to reflect the local users experience of navigating vessels in the area in question to ensure representativeness. Also, infrastructure design providers simulators generally have the most advanced output reporting systems, enabling output of many different parameters. The preparation of technical reports containing technical summary and professional opinion/conclusions is generally better developed compared with the other providers.
- 17 Infrastructure design providers simulators therefore provide for the most technologically advanced and flexible solution for any additional TEOW simulation requirements and should be able to ameliorate many of the IP’s PTBS set up criticisms. It is noted that HR Wallingford and MARIN have variously been identified by IP’s through the examination process and thus these have been carefully considered and consulted with by the Applicant.

- 18 HR Wallingford have the necessary capabilities and this operator can still be considered, with appropriate controls over the management and operation of the simulation. Liverpool John Moores University is also understood to be a suitable alternative that many of the IPs, and the Applicant's independent experts, are familiar with as part of pilot training. MARIN, has a long history of undertaking simulation, and have undertaken simulation studies to inform guidance such as the Marine Spatial Planning (MSP) document which feeds into the MCA MGN543 as well as other standards and guidance documentation. They are well used to undertaking simulations involving offshore windfarms.
- 19 As the PLA simulator is developed by MARIN, the use of a MARIN simulator has some benefits relating to compatibility and stakeholder acceptance. The underlying mathematics on ship sea keeping, including vessel turn radii, are likely to be the same/similar as for the PLA simulator used for the original PTBS study and that any technical content/settings in the PLA simulator can be utilised in developing a MARIN simulator for the purposes of any commission. Further, post simulation, it would be possible for any technical inputs and visual scenes or ship models to be incorporated into the PLA simulator.
- 20 It should be noted, that given lead times, the simulation should be programmed as soon as possible to ensure proper consideration by the Secretary of State.

## 4 Additional Simulation Specification

21 The intention of this section is to set out the key parameters or ‘precise brief’ of what would be provided to the selected simulator provider to develop a scope and specification.

### 4.2 Introduction/Overview

22 The following tasks/stages are requirements:

- Task 0: Project Management
- Task 1: Set up and configuration of simulator for TOW / TEOW area
- Task 2: Verification of simulator models (visual and vessel sea keeping)
- Task 3: Undertake simulation exercises to test objectives
- Task 4: Reporting

### 4.3 Aims/Objectives

23 Table 1 summarises the purpose and objectives of this simulation. It is anticipated that a detailed run structure (see section) with defined scenarios will be developed prior to and during the simulation to investigate and define these objectives in line with the evaluation criteria.

**Table 2: Objectives**

Aim No	Description of facet to be examined
1	Searoom for pilot transfers in vicinity of NE Spit PBS
2	Searoom for pilot transfers in vicinity of Tongue PBS
3	Searoom for pilot transfers in vicinity of Elbow Buoy
4	Validation and refinement of proposed risk controls

### 4.4 Task 0: Project Management

24 The Applicant notes the need for the simulations to be managed to ensure the aims and objectives of the study area met in the required time frame – it is envisaged that this will be provided by the Simulator Provider whilst overall management would be led by the Applicant.

**Table 3: Indicative PTBS Study Schedule**

Task	Wk1	Wk2	Wk3	Wk4	Wk5	Wk6
Task 0: Project Management						
Task 1: Set up						
Task 2: Verification						
Task 3: Simulation						
Task 4: Reporting						

25 An outline 6 week duration schedule is envisaged for an additional simulation study (see Table 1), and whilst this could be expedited (principally depending on set-up), it would not be prudent for time constraints to affect the quality of any study findings.

#### 4.5 Task 1: Set up and configuration of simulator for TOW / TEOW area

26 The following specification and set up of the simulations will be required and shall be consistent with the parameters as established in the original PTBS (with reference to the Inception Report).

- Simulator Configuration:
  - 1 x full mission bridge simulator – for navigating vessels
  - 1 x small boat bridge simulator – for pilot launch
  - Option for control of multiple navigating vessels (e.g. multiple pilot transfers/interacting vessels) either through simulator operator control or partial/full bridge simulator
- High Definition and accurate visual representation of TOW / TEOW and NE Spit area, including wider TEOW NRA study area and relevant visual scene and navigation cues (e.g. marine and shore based aids to navigation).
- MetOcean conditions to be provided using existing settings (e.g. existing PLA MARIN simulator) and/or inputs from the TEOW Application (time domain model outputs will be provided where available or developed by simulator provider from publicly available data). Selection of metocean conditions for simulation will be dependent on vessel types and existing conditions for transfers for simulation (with restrictions and limiting conditions reflected) (see Annex A for simulation exercise table outlining potential extent of scenarios):
  - Wind – direction and strength
  - Wave - direction and height
  - Tide / Water Depth – tidal times and hydrodynamic flows

- Visibility – night time and conditions of restricted visibility (e.g. 1 cable as per original PTBS)
- Vessel – ship models, to include:
  - 333m Container Ship - largest vessel to transit the area (at draught tbc)
  - 240m Grande Class Vessel – as used in the original PTBS
  - 299m LNG Vessel
  - 135m Feeder Container Ship
  - Pilot launch (to specification of ESL launch)
- Baseline third party traffic characteristic profiles, derived from outputs of AIS data and MGN543 compliant vessel traffic survey (to be provided by Applicant), including inclusion of:
  - Recreational Vessels
  - Fishing Vessels
  - Wind Farm Service Vessels

#### 4.6 Operation, Evaluation and Assessment Criteria

- 27 A detailed procedure for simulation operations was set up for the original PTBS inception report and shall form the basis of this assessment (and reviewed prior to running the simulation exercise). The simulation run-grading will be as per the original PTBS study for any additional simulation (provided at Annex B) in order to provide clear and measurable metric outputs (synchronous with the original risk criteria from the NRA and NRAA) to inform the assessment conclusions.
- 28 Outputs from the simulator to inform the evaluation against the criteria will include provision of replays with time series outputs of vessel parameters (including speed, heading, rate of turn, rudder angle and engine control positions) together with CPA and TCPA's to other vessels, structures/boundaries and limiting depth contours for each vessel.
- 29 Outputs on other factors will be provided to inform examination of any violation of limits, manoeuvring margin reserves, speed, distance and number of manoeuvres.

#### 4.7 Task 2: Verification of simulator models and setup

- 30 In order to ensure that the simulations models are fit for purpose, representative and provide an accurate reflection of the TEOW area - a verification process is required. This will ensure that the chosen simulator is suitably set up and configured to meet the project requirements with regards to:

- Visual models of TOW, TEOW and pilot boarding areas
- Numerical models to the geometric and temporal behaviour of a ship in the project area and conditions

- 31 This would be undertaken prior to the simulation exercises in sufficient time that any modifications can be implemented, and that in addition to attendees, key IP's are invited to attend to observe acceptance of the models by the simulator provider.
- 32 Confirmation of evaluation and assessment criteria, run sequence logic and roles/responsibilities of participants will also be undertaken in line with the protocols set out in the original PTBS.

#### **4.8 Task 3: Simulation Workshop**

- 33 The simulation exercises are anticipated to last 4 – 5 days and it is anticipated that allowance should be made for up to 40-50 scenario runs on the basis of between 8-12 simulation runs to be completed each day (including run debriefs).
- 34 The scenarios being tested shall form an incremental increase in complexity around the objectives (by vessels and metocean conditions). It is envisaged that initial 'reference' runs will be undertaken in order to form a baseline (and participant familiarisation with area and procedures) using the existing TOW in place. Thereafter runs shall be undertaken with TEOW in place and other relevant aspects of the proposed scheme (e.g. risk controls).
- 35 An 'input data' and 'outline structured run plan matrix' is provided at Annex A to provide boundary parameters and context to be developed through the workshop simulations – drawing together the variables by vessel and metocean characteristics together with the objectives. The assessment shall deal with each vessel type as shown in succession with a structured approach to varying metocean conditions for each vessel. The scenarios are structured around vessels per individual transfers although multiple transfers (up to 4 transfers from one pilot launch) shall be undertaken in order to combine runs (as undertaken in the original PTBS which conducted circa 30 transfers over 14 runs).

- 36 Runs shall not be undertaken in conditions beyond existing thresholds. Reference should be made to existing metocean limits in place for transit and/or pilot transfers to ensure that scenarios are undertaken within operational limits that currently exist and not at boundary limit states. This will be informed by the indicative guide to baseline metocean conditions worked by ESL<sup>1</sup> which provide outline availability of the inner boarding ground by wind strength and direction – with commentary on state of tide and wave conditions. Whilst an upper boundary of 25/30kts is considered a reference upper boundary for all vessels at the inner boarding ground by any wind direction (with potential higher limits for wind directions from between 190 to 245), it is noted that limits differ by vessel size (specifically draught and length) and thus these will be considered and evidenced and thus some runs of greater wind strengths could be examined in the inner boarding ground. Documentation of limits is sought from PLA/ESL and LPC on upper metocean condition limits for vessels >240m LOA and LNG vessels and shall be confirmed to the simulation team. Where operational limits cannot be defined with reference to the above evidence the simulation team participants will seek to identify an upper bound through simulation of a baseline scenario at TOW before simulating the condition at TEOW.
- 37 It is important to note that the simulation team and participants should retain flexibility over the scenarios being tested and run plans throughout the simulations such that any key issues and scenarios that arise can be investigated where deemed necessary and conversely, where scenarios successfully meet evaluation criteria, that further assessment on those scenarios is not warranted.
- 38 In order to simulate the navigation of vessel traffic activity for the study the simulator provider will provide appropriately qualified and independent personnel, experienced in simulation, for the following roles:
- **Simulation Facilitator**
    - Independent Master Mariner experienced in simulation and pilotage
  - **Personnel performing simulation:**
    - **Bridge Team** for vessel transiting to / from pilot transfer area
    - **Pilots** – minimum of 2 x independent pilots
    - **Pilot Launch coxswain** – minimum of 2 x independent coxswains

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<sup>1</sup> <https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010084/EN010084-001031-Port%20of%20London%20Authority%20and%20Estuary%20Service-%20PLA%20and%20ESL%20Response%20to%20ExQ1.pdf>



- 39 IP's will be invited to observe the setup day and interact with participants in order to ensure representativeness of the simulator and setup is agreed and other relevant local area practices are understood.
- 40 IPs will be able to attend the simulation exercises in an observer capacity.
- 41 It is envisaged that an independent observer is provided by the MCA to ensure that the simulations are undertaken to appropriate standards. It may be possible for the MCA to identify an appropriately qualified individual master mariner with pilotage experience, who has hitherto not been involved in the examination. This could be an individual from a different department.

#### **4.9 Task 4: Reporting**

- 42 The following reports would be produced from any additional simulation studies:
- Draft & final inception report outlining the setup and operation of the study (Draft to be developed by Applicant and Simulator Provider prior to the setup of the simulator, Final to be issued on completion of simulator setup)
  - Draft and final technical report outlining the findings of the study
- 43 A final technical report for the additional simulation study would be undertaken to ensure all aspects of the project aims and objectives are covered.

## 5 Annex A: Parameters

### 44 Draft parameters to include:

- Simulator Configuration, at least
  - 1 x full mission bridge simulator – for navigating vessels
  - 1 x small boat bridge simulator – for pilot launch
  - Option for control of multiple navigating vessels (e.g. multiple pilot transfers/interacting vessels) either through simulator operator control or partial/full bridge simulator
- High Definition and accurate visual representation of TOW / TEOW and NE Spit area, including wider TEOW NRA study area and relevant visual scene and navigation cues (e.g. marine and shore based aids to navigation).
- MetOcean conditions to be characterised based on vessel type (noting some vessels have restriction in place for transfer at the moment which will be discussed with IPs):
  - Wind – direction and strength
  - Wave - direction and height
  - Tide / Water Depth – tidal times
  - Visibility
- Vessel – ship models, e.g.
  - 333m Container Ship - largest vessel to transit the area
  - 240m Grande Class Vessel – as used in the original PTBS
  - 299m LNG Vessel
  - 135m Feeder container vessel
  - Pilot launch
- Baseline third party traffic characteristic profiles, derived from outputs of AIS data and vessel traffic survey (to be provided by Applicant), including inclusion of:
  - Recreational Vessels
  - Fishing Vessels
  - Wind Farm Service Vessels

**OUTLINE STRUCTURED RUN PLAN MATRIX**

Run No.	Aims				Vessel				Met-Ocean Characteristics					Notes
	1: Pilot Transfer at NE Spit Pilot Diamond	2: Pilot Transfer at Tongue	3: Pilot transfer at Elbow	4: Risk Controls Review	Vessel type	Outbound/Inbound	Start	Finish	Visibility	Wind Strength [Kts]	Wind Direction (from)	Swell direction (from)	State of tide (HW relative) HW +/- Hr	
1.1	N	N	Y	Y	1: 135m Feeder (Ensemble)	Inbound	South - Inshore	Princes Channel	Day restricted	15	West-North-West to South	West-North-West to South	HW - 0	
1.2	N	N	Y	Y	1: 135m Feeder (Ensemble)	outbound	Princes Channel	South - Inshore	Day restricted	15	West-North-West to South	West-North-West to South	HW - 0	
1.2	Y	N	N	Y	1: 135m Feeder (Ensemble)	Inbound	South - Inshore	Princes Channel	Day restricted	15	West-North-West to South	West-North-West to South	HW - 0	
1.2	Y	N	N	Y	1: 135m Feeder (Ensemble)	outbound	Princes Channel	South - Inshore	Day restricted	15	West-North-West to South	West-North-West to South	HW - 0	
1.2	N	N	Y	Y	1: 135m Feeder (Ensemble)	Inbound	South - Inshore	Princes Channel	Day	25	West-North-West to South	West-North-West to South	HW - 0	Refer existing limits
1.2	N	N	Y	Y	1: 135m Feeder (Ensemble)	outbound	Princes Channel	South - Inshore	Day	25	West-North-West to South	West-North-West to South	HW - 0	Refer existing limits
1.2	Y	N	N	Y	1: 135m Feeder (Ensemble)	Inbound	South - Inshore	Princes Channel	Day	30	West-North-West to South	West-North-West to South	HW - 0	
1.2	Y	N	N	Y	1: 135m Feeder (Ensemble)	outbound	Princes Channel	South - Inshore	Day	30	West-North-West to South	West-North-West to South	HW - 0	
2.1	Y	N	N	Y	2: 240m Ro-Ro - Grande	Inbound	East	Princes Channel	Day restricted	15	West-North-West to South	West-North-West to South	HW - 0	
2.2	Y	N	N	Y	2: 240m Ro-Ro - Grande	Inbound	East	Princes Channel	Day restricted	15	South-East to East	South-East to East	HW - 0	
2.3	Y	N	N	Y	2: 240m Ro-Ro - Grande	Inbound	East	Princes Channel	Day	25	West-North-West to South	West-North-West to South	HW - 0	
2.4	Y	N	N	Y	2: 240m Ro-Ro - Grande	Inbound	East	Princes Channel	Day	25	East to North	East to North	HW - 0	
2.5	Y	N	N	Y	2: 240m Ro-Ro - Grande	outbound	Princes Channel	East	Day	25	West-North-West to South	West-North-West to South	HW - 0	
2.6	Y	N	N	Y	2: 240m Ro-Ro - Grande	outbound	Princes Channel	East	Day	25	East to North	East to North	HW - 0	
2.7	Y	N	N	Y	2: 240m Ro-Ro - Grande	outbound	Princes Channel	East	Day	25	West-North-West to South	West-North-West to South	HW - 0	
2.8	Y	N	N	Y	2: 240m Ro-Ro - Grande	outbound	Princes Channel	East	Day	25	East to North	East to North	HW - 0	
2.9	Y	N	N	Y	2: 240m Ro-Ro - Grande	Inbound	South - Inshore	Princes Channel	Day	25	West-North-West to South	West-North-West to South	HW - 0	
2.10	Y	N	N	Y	2: 240m Ro-Ro - Grande	outbound	Princes Channel	South - Inshore	Day	30	West-North-West to South	West-North-West to South	HW - 0	
2.11	N	N	Y	Y	2: 240m Ro-Ro - Grande	Inbound	South - Inshore	Princes Channel	Day	30	West-North-West to South	West-North-West to South	HW - 0	
2.12	N	N	Y	Y	2: 240m Ro-Ro - Grande	outbound	Princes Channel	South - Inshore	Day	30	West-North-West to South	West-North-West to South	HW - 0	
2.13	N	Y	N	Y	2: 240m Ro-Ro - Grande	Inbound	East	Princes Channel	Day	35	West-North-West to South	West-North-West to South	HW - 0	Refer existing limits
2.14	N	Y	N	Y	2: 240m Ro-Ro - Grande	outbound	Princes Channel	East	Day	35	West-North-West to South	West-North-West to South	HW - 0	Refer existing limits
2.15	Y	N	N	Y	2: 240m Ro-Ro - Grande	Inbound	East	Princes Channel	Night	25	South-East to East	South-East to East	HW - 0	
2.16	Y	N	N	Y	2: 240m Ro-Ro - Grande	Inbound	East	Princes Channel	Night	30	North to West-North-West	North to West-North-West	HW - 0	
2.17	Y	N	N	Y	2: 240m Ro-Ro - Grande	outbound	Princes Channel	East	Night	30	South-East to East	South-East to East	HW - 0	
2.18	Y	N	N	Y	2: 240m Ro-Ro - Grande	outbound	Princes Channel	East	Night	30	North to West-North-West	North to West-North-West	HW - 0	
2.19	Y	N	N	Y	2: 240m Ro-Ro - Grande	outbound	Princes Channel	East	Night	35	South-East to East	South-East to East	HW - 0	
2.20	Y	N	N	Y	2: 240m Ro-Ro - Grande	outbound	Princes Channel		Night	35	North to West-North-West	North to West-North-West	HW - 0	
3.1	N	Y	N	Y	3: 299m LNG Vessel	Inbound	East	North	Day	25	West-North-West to South	West-North-West to South	HW - 0	Existing limits/practices/RC's for LNG to be confirmed. <25kts?
3.2	Y	N	N	Y	3: 299m LNG Vessel	outbound	North	South - Inshore	Day	25	West-North-West to South	West-North-West to South	HW - 0	
4.1	Y	N	N	Y	4: 333m Cap Sans Container	Inbound	East	Princes Channel	Day	25	West-North-West to South	West-North-West to South	HW - 0	
4.2	Y	N	N	Y	4: 333m Cap Sans Container	Inbound	East	Princes Channel	Day	15	South-East to East	South-East to East	HW - 0	
4.3	Y	N	N	Y	4: 333m Cap Sans Container	Inbound	East	Princes Channel	Day	15	East to North	East to North	HW - 0	
4.4	Y	N	N	Y	4: 333m Cap Sans Container	Inbound	East	Princes Channel	Day	25	North to West-North-West	North to West-North-West	HW - 0	
4.5	Y	N	N	Y	4: 333m Cap Sans Container	outbound	Princes Channel	North East	Day	25	West-North-West to South	West-North-West to South	HW - 0	
4.6	Y	N	N	Y	4: 333m Cap Sans Container	outbound	Princes Channel	North East	Day	25	East to North	East to North	HW - 0	
4.7	Y	N	N	Y	4: 333m Cap Sans Container	Inbound	South - Inshore	Princes Channel	Day	25	West-North-West to South	West-North-West to South	HW - 0	
4.8	Y	N	N	Y	4: 333m Cap Sans Container	outbound	Princes Channel	South - Inshore	Day	25	West-North-West to South	West-North-West to South	HW - 0	
4.9	N	Y	N	Y	4: 333m Cap Sans Container	Inbound	East	Princes Channel	Day	25	West-North-West to South	West-North-West to South	HW - 0	
4.10	N	Y	N	Y	4: 333m Cap Sans Container	outbound	Princes Channel	East	Day	25	West-North-West to South	West-North-West to South	HW - 0	
tbc	Additional runs as determined/agreed													

**Notes:**

Runs shown with individual transits and transfers. Multiple concurrent transits/transfers can be undertaken at discretion of participants (noting this may allow multiple scenarios to be tested per run)

No runs to be undertaken in limits which exceed limits as defined or determined by Nav Sim team with ref to TOW (noting variable threshold limits by wind direction, strength, visibility, tide and vessel). This is pertinent to vessels of >240m LOA where thresholds to be provided by PLA, ESL and LPC following recent PLA risk assessment

Height of tide to be representative of height of tide for transiting deep draught vessels (circa HW +/- 2hrs)

## 6 Annex B: Run Grading (from original PTBS Study Inception Report)

Grade	Criteria No.	Criteria Description
<b>Successful</b>	1	Ship remains under full control to the satisfaction of the Pilot and Master and is able to continue to manoeuvre safely at all times
	2	Ship retains acceptable clearances to Wind Farm (inc. buffer) as relates to Contact Risk
	3	Ship retains acceptable Under Keel Clearance (UKC) as relates to Grounding Risk
	4	Ship retains acceptable clearance to other vessels as relates to Collision Risk ( <i>*noting through traffic included</i> )
	5	Time available for 1 person Pilot transfer (constant heading and speed) is >5 min
	6	Capacity for ship to respond to emergency is not compromised
<b>Marginal</b>	1	Ship is at limit of full control at assessment of the Pilot and Master and is not able to continue to manoeuvre safely at all times
	2	Ship remains clear of Wind Farm but not to acceptable clearances (buffer) as relates to Contact Risk
	3	Ship Under Keel Clearance (UKC) become unacceptably low as relates to Grounding Risk
	4	Ship does not retain acceptable clearance to other vessels as relates to Collision Risk ( <i>*noting through traffic included</i> )
	5	Time available for 1 person Pilot transfer (constant heading and speed) is between 3 and 5 min
	6	Capacity for ship to respond to emergency is compromised
<b>Fail</b>	1	Ship loses control and is unable to manoeuvre safely
	2	Ship breaches Wind Farm boundary as relates to Contact Risk
	3	Ship comes out of fairway and grounds as relates to Grounding Risk
	4	Ship collides with other vessels as relates to Collision Risk ( <i>*noting through traffic included</i> )
	5	Time available for 1 person Pilot transfer (constant heading and speed) is < 3 min
	6	Ship does not have capacity to respond to emergency