Vattenfall Wind Power Ltd

Thanet Extension Offshore Wind Farm

Outline Navigational Risk Assessment Addendum and Hazard Logs

Relevant Examination Deadline: 4

Submitted by Vattenfall Wind Power Ltd

Date: April 2019

Revision A

Drafted By:	Vattenfall Wind Power Ltd
Approved By:	Daniel Bates
Date of Approval:	April 2019
Revision:	A

Revision A	Original Document submitted to the Examining Authority and Interested Parties
N/A	
N/A	
N/A	

Contents

1 Interim deliverable

1 This document represents an interim deliverable in relation to shipping and navigation submissions. It has been submitted to provide further consultation information on the evolution of shipping and navigation matters in relation to the introduction of the Structural Exclusions Zone (SEZ).

2 The document outlines the consultation progress made since Deadline 4, including revised hazard logs following a workshop held with Interested Parties on the 29th March, and provides an overview of the proposed NRA addendum for submission.

1.2 Background

3 During the Thanet Extension examination, it has become apparent that there is a disconnect between Interested Parties and the Applicant on certain areas of the Navigational Risk Assessment (NRA). These matters have resulted in 3 steps being taken by the Applicant, which are as follows:

- Introduction of the SEZ
- Data Validation exercise
- Revision to the Hazard Logs that underpin the NRA.

4 These steps have been taken in order to:

- Provide IPs with further comfort by expanding the searoom that will remain following construction of the proposed project;
- In order to address uncertainty with regards the underlying data; and
- To address concerns with regards the level of consultee input made to the hazard log drafting.

5 The overarching rationale being to provide IPs and the Examining Authority (ExA) with confidence in the underlying assumptions that inform the NRA, to build consensus through open and transparent consultation with all shipping and navigation IPs, and to present to the ExA a revision to the NRA that is as fully developed and representative of all IPs as possible.

6 The remainder of this document provides a summary of each of the above steps, including introducing the hazard logs which were developed during a workshop held with shipping and navigation IPs.

1.3 Summary of the progress - SEZ

7 The rationale behind the introduction of the SEZ was provided at Deadline 4 at Appendix 14 (PINS ref: REP4-018). The document identified the rationale, through reference to submissions made by IPs, industry wide information, and marine spatial planning guidance, of the SEZ and demonstrated that with the addition of the SEZ there is sufficient remaining searoom to facilitate transit of up to 4 of the largest vessels known to use the area (noting that only a single vessel of that size had used the inshore route area within a 21 month IP and Applicant combined dataset). This highly precautionary approach allows for vessels to undertake other manoeuvres and includes turning and, where necessary, pilot boarding.

8 This is proposed to facilitate the necessary searoom for either multiple vessels during unrestricted use of the pilot boarding area and wider area inshore of the proposed project (whether in terms of metocean, weather or volume of traffic), or infrequent occurrences either during less favourable weather, infrequent use of the area by larger vessels (e.g. two 400m vessels passing concurrently), or indeed future traffic scenarios.

9 This has resulted in what the Applicant has demonstrated is an area of remaining searoom that meets of IP concerns, and the desire to provide for the rare and infrequent occurrence and the qualitative understanding of the area, and also representative of the searoom requirements for one of the busiest port approaches in the world[1], and the busiest approach in Europe.

10 The SEZ was provided to all IPs in advance of Deadline 4 to provide as much notice as possible, and to allow for meaningful consultation in the context of the NRA hazard ID workshop which had been planned. The rationale was then provided as a formal submission in order to allow all IPs adequate time to provide consultation responses.

1.4 Summary of progress – data validation

11 In order to address uncertainty with regards the underlying data that informed the NRA submitted with the application a data validation exercise was undertaken and provided at Deadline 4 at Appendix 27 (PINS Ref REP4-030). The data validation employed a combination of a further 12 months AIS (SeaPlanner) data and IP data submitted at Deadline 3 to validate the and compliment the data used within the NRA.

[1] The Marine Spatial Planning document provides the Rotterdam Approach and TSS Maas West as benchmarks when considering the widest areas of searoom that should be provided (AIS data employed to identify vessel densities of 18,000+ vessels per annum lead to a requirement for the accommodation of 4 concurrent vessels of the maximum size).

12 This resulted in a combined 15 months of Applicant data from December 2016 to March 2018, one of the largest datasets used in any Offshore Wind Farm DCO application to date, in addition to the 28 days MGN543 compliant survey data.

13 The findings of the data validation are that the data employed within the original NRA are fit for purpose and adequately characterise the receiving environment. Notably the extrapolation of the MGN543 survey provided a slightly higher, and therefore more precautionary, estimate of the annual vessel transits made around the proposed project than was found from the SeaPlanner data and the IP data. It is also of note that the data employed within the original NRA identified a similar use and extent of searoom for pilotage operations, inshore route transit, dipping traffic, and maximum vessel size. It is only with the addition of a further dataset provided by an IP for a period in late November following commencement of the Thanet Extension examination (November 2018) that the largest vessel changed from the recorded 299m to the 333m vessel employed in calculating the necessary extent of the SEZ.

14 The data validation has been submitted as a formal submission in order to allow all IPs adequate time to provide consultation responses. Key outputs were also provided in advance of the Deadline 4 submission in order to aid IPs and facilitate an informed discussion at the proposed HAZID workshop.

1.5 Summary of Progress - further consultation and Hazard log identification

15 The Applicant embarked on a further iteration of consultation on Shipping and Navigation following ISH5 which included the following process:

- Shipping Workshop (27th February) to seek inputs from IPs to help define the project amendment (latterly the SEZ) and to identify primary areas of sea room. The following IPs were in attendance:
    - Port of London Authority (PLA_
    - Estuary Services Limited (ESL)
    - Chamber of Shipping (CoS)
    - Port of Tilbury London Limited (POTLL)
    - Dubai Ports World London Gateway (DPWLG)
    - Maritime Coastguard Agency (MCA)
    - Trinity House (TH)

- Pre-Hazard Workshop Meetings to provide rationale on SEZ and outline Addendum NRA strategy (including hazard identification approach, benchmarking to hazards to incident data, hazard workshop approach and identification of risk control measures), with:
  - MCA / Trinity House – 21st March – MCA Head Quarters
  - PLA / ESL - 22nd March - Teleconference
  - LPC / PLA - 25thMarch – PLA Head Quarters
  - POTLL / DWPLG – 25th March – Teleconference
  - Thanet Fishermen's Association (TFA) - 26th March - Ramsgate
- Issue hazard workshop pack (including Agenda, Attendees, Methodology, Initial hazard Identification, supporting analysis (track data, gate data, incident data and PLA NRA for NE Spit) with request for comment prior to hazard workshop – 26th March (presented at Annex A).
- Hazard Workshop – 29th March – 10:00 – 16:00 London, attendees;
  - MCA
  - Trinity House
  - PLA
  - ESL
  - POTLL
  - DPWLG
  - TFA
  - Applicant (including Navigation Risk Assessment specialist (Workshop Chair) and Master Mariner)
- Issue draft Hazard log and request for comment on hazard scores – 1st April
- Post Hazard Teleconference to run through additional hazard scores as drafted by the Navigation Risk Assessment Specialist – 2nd April - attendees;
  - PLA
  - ESL
  - LPC
  - MCA
  - DPWLG

- POTLL

16 During the Post Hazard Teleconference a request was made to illustrate the maximum design scenario for WTG blade diameter in relation to an indicative layout. This is included at Annex C of this interim submission and is based on the illustrative layout associated with the SEZ and considered for all topic areas.

17 The Pre-workshop meetings included presentation of the SEZ and further explanation of the changes made, seeking stakeholder views and responding to questions about the approach. The approach to the hazard workshop was explained along with the content of the NRA Addendum. It was agreed that further details of the Hazard workshop would be sent out in advance to allow IPs to review and respond with comments in advance.

18 On the 29th March a Hazard workshop was undertaken by the Applicant with all IPs invited to attend. In advance of the Hazard workshop (26th March) a hazard workshop information pack was circulated. The Hazard workshop information pack is included at Annex A of this document for the benefit of the ExA, noting that all IPs were provided with it. The pack included a detailed agenda, attendee list, outline of the proposed methodology to be adopted, a revised 'Hazard' list[2], the full assessment methodology, and a list of risk controls to be adopted as appropriate. Supplementary data were also included with the pack, including vessel plots derived from the 12 months AIS data validation, updated MAIB incident data, PLA incident data and a PLA provided NRA for the NE Spit region. The latter NRA and near miss incident data provided by PLA have been utilised where appropriate to benchmark return periods, and are included within Annex A (hazard workshop information pack) to this interim submission as provided in advance of the workshop.

19 At the workshop hazard scoring for the baseline and inherent risk profile was made on 4 of the most navigational sensitive hazards from the proposed 18 hazards identified, with a full and detailed discussion held with all IPs (save MCA who were in attendance in an observation capacity only). It was agreed at the workshop that the remaining 14 hazards were be assessed at an initial level by the NRA lead for the Applicant (Dr Edward Rogers, representing Marico Marine), who would submit a draft list for hazard 5-18 on the 1st April for IP consideration, prior to a further review meeting to be held on the 2nd April.

[2] The hazard list differed from the hazard list presented in the application NRA in order to facilitate a focus on the area of greatest concern, and the SEZ in particular.

20 The outputs of the workshop on the 29th March are attached Annex B to this interim submission and reflect the hazards which were agreed on the day, and the baseline (without TEOW) and inherent risk (with TEOW but no additional risk controls) scores for Hazards 1 – 4 which were also agreed on the day with IPs present. Hazards 5-18 are also included in the Hazard Log.

21 At the meeting held on the 2nd April, the Port of London Authority and Estuary Services Limited identified that following further consideration they felt that the scores agreed at the workshop represented required further internal consideration. PLA and ESL confirmed that an internal review of the scores would be undertaken and a submission made confirming the output of the internal review at Deadline 4a.

22 Section 2 of this document provides an overview of the hazard log which accompanies this submission at Annex B.

2 Hazard Log

23 As noted in Section 1.5, a hazard log was drafted during and following consultation with IPs, on the basis of agreed quantification of consequence and likelihood for the baseline risk and inherent risk scores for key hazards. Whilst it is noted that PLA and ESL are undertaking a further internal review of the categories and hazard scores the hazard logs have been completed for submission with is interim deliverable.

24 The methodology utilised is as agreed with IPs on the 29th March and discussed at the pre-workshop meetings identified in paragraph 1.515 *et seq*, as agreed within the application NRA as MGN543 compliant, and as outlined in the workshop information pack presented at Annex A of this interim submission.

25 The hazard logs, presented at Annex B to this interim submission, contain baseline and inherent risk scores for Hazards 1 – 4 that are derived from agreed consequence and likelihood hazard scores agreed with IPs on the 29th March (collisions). The scores for Hazards 5 – 18 represent the input of the Applicant's technical NRA expert (Dr Edward Rogers of Marico Marine) with allowance made for the discussions on the 29th March. Namely that there should in general be an allowance made and consideration given for an increasing the 'baseline' likelihood of incident to reach an appropriate 'inherent' likelihood following the introduction of the proposed project – in the most onerous case this involved the doubling of hazard likelihood for Class 1 or 2 vessel collision hazard from a 1 in 40 year occurrence, to a 1 in 20 year occurrence for the most likely outcome of a collision which relates to a glancing blow, and minimal damage.

26 Further caution was applied to the agreed hazard logs through using the industry specific most likely / worst credible conversion factor which suggests that based on historic analysis a 'most likely' hazard likelihood is around 100 fold less likely to occur for the 'worst credible' likelihood outcome. Through the workshop, and in all hazards assessed, the likelihoods ratios between most likely and worst credible hazard scores (for hazards 1-4), were agreed with IPs without definitive reliance on the statistical basis for the industry approved ratio, and in all cases the assessed likelihood was significantly more likely than this methodology leading to higher hazard scores. This was undertaken to provide confidence that the most likely and worst credible occurrences were defined in full through the application of local stakeholder input and were based on a precautionary approach.

27 Following the identification of appropriate scores for the baseline consequences and likelihoods, agreed where possible with IPs, the baseline and inherent risk scores were calculated based on the risk matrix and HAZMAN software (which is the same software used by the PLA have used to manage their port wide Navigation Risk Assessment since 2001, as mandated by the Department for Transport's Port Marine Safety Code). The methodology was used to ensure that there was a common platform used when deriving the 'inherent' (with Thanet Extension in place but without Risk Controls) and 'residual' (with Thanet Extension and with the risk controls adopted) scores.

28 This is anticipated to provide all parties (ExA and IPs) with comfort that an agreed basis for assessment (consequence and likelihood for the most likely and worst credible occurrences for hazard IDs 1- 4), and NRA approach has been continued, giving an overall common currency for assessment.

29 When combined with the data validation exercise it is anticipated that this approach provides the highest level of confidence in the baseline data, methodology, and software analysis to the ExA and IPs.

2.2 Workshop Results

30 Summary results of the hazard workshop (full details of which are provided in Annex B to this interim submission) are given in Table 1, as they relate to the 4 hazards assessed during the workshop by all attendees. Hazard Id's 4-18 were assessed based by the NRA consultant and issued to IP for comment (Hazards Id's 1,2,3 & 4).

31 No comments were provided by IP at the teleconference held on 2nd April related to the hazard scores inputted by the Applicant. During the teleconference (and as noted above) PLA / ESL requested additional time to consider hazards 1-4, and review the initial scores applied to Hazard ID's 5-18.

32 The results of the assessment show that in the Baseline and Inherent case hazard risk scores are at an ALARP level or lower. Hazard scores cannot be directly referenced to those generated within the original NRA, as they were broken down by more definitive vessel types (as requested by the PLA / ESL / LPC – by PLA pilotage length characteristics), and the geographical area of focus is the western extent of the proposed project. This approach was put forward to the IPs in advance of, and at, the workshop as it allowed the numbers of hazards for consideration to be refined whilst maximising differentiation of hazards pertinent to interested parties. This approach was agreed at the workshop on the 29th March.

Table 1: Ranked Hazard List for Baseline (no TEOW) and Inherent Risk Scores (TEOW without risk controls).

Hazard ID	Category	Vessel Type	Most Likely Hazard Occurrence						Worst Credible Hazard Occurrence						Baseline Risk Score	Baseline Risk Rank	Inherent Risk Score	Inherent Risk Rank
			Consequence				Likelihood 1 in x yrs		Consequence				Likelihood 1 in x yrs					
			People	Property	Environment	Stakeholders	Baseline Risk	Inherent Risk	People	Property	Environment	Stakeholders	Baseline Risk	Inherent Risk				
1	Collision	Class 1 or 2 vessels	2	2	1	1	40	20	4	5	5	4	500	250	4.01	4	4.29	1
2	Collision	Class 3 or 4 Vessels	2	2	1	1	30	20	4	5	5	4	400	267	4.11	2	4.28	2
4	Collision	Fishing or Recreational	2	2	1	2	10	8	5	3	2	4	500	400	4.15	1	4.26	3
3	Collision	Vessel less than 90m	2	2	1	1	30	20	4	5	4	4	400	267	4.04	3	4.21	4
7	Contact	Class 1 or 2 Vessels	2	2	1	2	50	25	4	4	4	4	600	300	3.70	8	3.99	5
8	Contact	Class 3 or 4 Vessels	2	2	1	2	40	27	4	4	4	4	500	333	3.78	5	3.95	6
14	Grounding	Class 3 or 4 Vessels	2	2	1	2	60	45	3	4	3	5	800	600	3.78	6	3.88	7
13	Grounding	Class 1 or 2 Vessels	2	2	1	2	80	53	3	4	3	5	1000	667	3.69	9	3.83	8
5	Collision	WSV	2	2	1	2	50	40	5	4	2	4	1000	800	3.74	7	3.83	9
9	Contact	Vessel less than 90m	2	2	1	2	50	33	4	4	4	4	1000	667	3.60	10	3.75	10
15	Grounding	Vessel less than 90m	2	2	1	2	60	48	3	4	3	4	500	400	3.53	11	3.62	11
6	Collision	Pilot Launch	2	2	1	2	50	40	4	4	2	4	1000	800	3.41	13	3.49	12
10	Contact	WSV	2	2	1	2	50	40	4	4	2	4	1000	800	3.41	13	3.49	12
17	Grounding	WSV	2	2	1	2	25	23	4	3	2	4	1250	1125	3.42	12	3.46	14
11	Contact	Fishing or Recreational	2	2	1	1	20	16	4	3	2	3	500	400	3.36	15	3.45	15
18	Grounding	Pilot Launch	2	2	1	2	40	36	4	3	2	4	2000	1800	3.25	16	3.28	16
16	Grounding	Fishing or Recreational	2	1	1	2	25	23	4	3	2	3	1250	1125	3.15	17	3.19	17
12	Contact	Pilot Launch	2	2	1	1	50	40	4	3	2	3	1000	800	3.07	18	3.15	18

33 An uplift to the hazard likelihood scores will be applied based on future vessel traffic projections for the area during the Addendum NRA based on IP representations and MMO Marine Spatial Planning guidelines.

34 The next stage of the assessment is the identification and allocation of risk control measures to mitigate any high risk or ALARP risk hazards. The risk control measures from the existing NRA were taken and refined based on those that would be expected to include within any offshore Windfarm assessment (embedded) and those specific to TEOW and the disposition of navigation risk in the study area.

35 The following control measures are therefore assumed to be included within TEOW project and therefore included within the inherent assessment (embedded):

- All construction, operational and maintenance vessels are to be fully compliant with legislation, guidance and best practice.
- All those involved in construction, operational and maintenance operations are to be trained and competent persons, using appropriate PPE.
- ERCOP to be drafted in conjunction with MCA/HMCG and other stakeholders.
- Inter-array / export cables to be buried to the depth agreed, or suitably protected, which provides sufficient protection without compromising UKC.

- Blade Clearance of at least 22m above MHWS.
- Layout Plan to be submitted to MCA for approval prior to construction. The layout plan should include the proposed location and foundation types of all structures, the height and clearances of blades and length and arrangement of cables.
- Cable Burial Risk Assessment and periodic cable inspections to be conducted and protection so not to exceed 5% UKC.
- Update navigational charts to show wind farm layout and cable route.
- A cable exclusion area should be implemented that covers the port limits, approach channel and dredged channel of the Port of Ramsgate. Within this area no cables will be installed associated with this project. During cable laying and or maintenance, it may be necessary for anchor spreads or moorings to be temporarily placed within this area to assist with the installation.

36 Risk controls specifically designed to mitigate the increase in navigation risk brought about by the TEOW are identified as follows, and it is planned to review these with Interested Parties to determine their need and appropriateness based on the addendum NRA hazard log risk scores:

- **Promulgation of Information** (already adopted by the Applicant)
  - Navigation Hazards Charted, Notices to Mariners Issues, Information promulgated to fishing and recreational users of the area.
- **Shipping and Navigation Liaison Plan / Group** (already adopted by the Applicant)
  - Plan detailing co-operation between interested parties on navigation within the NE Spit Area. Plan to be regularly reviewed and will consider systems and procedures that could be utilised to maintain navigation safety. Members to be MCA, Trinity House, PLA, ESL, Estuary Ports, London Pilot Council, Vattenfall, RYA, Thanet Fisherman's Association. Plan could include review of pilotage boarding, regular review of navigation risk assessment, assessment of need for further controls, etc.
- **Post Consent Monitoring**
  - Post Consent monitoring using AIS and Radar data (from PLA VTS) to identify hazardous occurrences and feed into Shipping and Navigation Liaison Plan.
- **Optimise TEOW line of orientation and symmetry** (already adopted by Applicant)
  - Ensure TEOW orientation is optimised for navigation safety.
- **Aids to Navigation / Buoyage** (already adopted by the Applicant)
  - Relocate Drill Stone & North Thanet as necessary.

- Review need for adjustment of NE Spit and Elbow Cardinal Buoys through Post Consent Monitoring and Navigation Co-operation Plan.

37 The Applicant remains committed to the consideration of further risk control measures (not already adopted) to reduce navigation risk to acceptable levels for Interested Parties for the TEOW as necessary.

38 A review of the PLA "*Navigation Risk Assessment Working Group on the Safety of Navigation in the North East Spit Area*", dated 3rd September 2015, and received from the PLA Harbour Master Lower Catheryn Spain on 26/03/2019, following reference made during Issue Specific hearings and requested during the Pre-Workshop Meeting, was undertaken with respect to the identification of risk controls measures.

39 This NRA workshop that was attended by representatives of the PLA (including personnel from the Harbour Master, Vessel Traffic Services and Pilotage departments), Peel Ports (including personnel from the Harbour Master and Pilotage departments), the Maritime and Coastguard Agency (including personnel from the Navigation Safety Department and the Channel Navigation Information System / SUNK VTS) and ESL.

40 In addition to those risk controls already identified above as part of the original NRA, the addendum NRA now allows the review of the controls brought to light as a result of the PLA NRA working group report on the Safety of Navigation in the North East Spit Area. The risk controls measures adopted and not adopted as part of this NRA are provided in Table 2. Therefore, it is possible to further review the need for those controls that are adopted and not adopted as part of this addendum NRA.

Table 2: *Risk Controls identified as part of* PLA NRA *Working Group on the Safety of Navigation in the North East Spit Area.*

Recommended / Existing Risk Controls	Status
Additional advice in Admiralty products	Recommended
Additional met sensors closer to NE Spit	Recommended
Coordination of Pilot cutter operations on VHF Ch 69	Recommended
Enhanced Pilotage/PEC navigational guidance/lessons identified	Recommended
ESL/PLA/MPA Pilot cutter scheduling and monitoring process	Recommended
Planning of critical/high risk vessels with ESL/Pilot/VTS	Recommended

Recommended / Existing Risk Controls	Status
Prohibited anchorage area/control of anchorage	Recommended
Provision of charted Pilot boarding grounds to enhance traffic separation	Recommended
Single channel VHF operations	Recommended
Where practicable, prioritise embarking vessels	Recommended
Dedicated VTS Operator	Not adopted
Use of encounter prediction VTS software	Not adopted
Precautionary area/exclamation mark	Not adopted
Modification of Tongue Anchorage location	Not adopted
Formal charting of Margate Roads Anchorage	Not adopted
Undertake responsibility to monitor vessels in Tongue and Margate Roads (VTS Anchor Watch)	Not adopted

41 Further to the risk controls identified in above, risk controls considered but 'not applied' within the NRA submitted at the application phase (for reasons already identified) remain under consideration and refinement within the proposed NRA addendum. 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. Re-location based on vessel type to north of NE Spit transfer area or alternative pilot diamond, assessed through Navigation Co-operation Group using full bridge simulation.
- **Enhanced co-ordination of Pilotage Transfer**
    - The improvement of overall situational awareness and more active prior co-ordination of arriving and departing traffic at the NE Spit station could be considered for the more constrained waters after the construction of the wind farm (this is similar to the controls identified by the PLA for the NE NRA). Early sequencing and prior organisation of the transfers would assist in reducing the onboard workload of an already busy Launch crew and especially the coxswain. This will require:
- **Training / Integration**
    - Enhance the scope of training for pilot transfer personnel (e.g. ESL coxswains, VTS personnel and pilots) 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 PLA 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. The benefits of further integration or exposure between the groups involved in pilotage transfer operations could only aid cross fertilisation of procedures, planning and mutual understanding. The inclusion of VTS officers in this process is also strongly encouraged. Inclusion of a pilot launch, TOW and TEOW within the PLA simulator would be necessary to carry out this type of training.)

3 Proposed NRA addendum

42 The NRA addendum will draw on the hazard logs accompanying this document, and the data validation exercise. In order to provide as much information as possible at this interim stage the NRA addendum is proposed to take the following structure:

Section	Summary of contents
Executive Summary	Summary of the NRA addendum
Introduction	Overview of Addendum NRA.
Scope - Structures Exclusion Zone	Details of the SEZ.
Determination of Sea Room	Characterisation of the sea room needs based on MGN 543 and Marine Spatial Plan documentation.
Addendum NRA Methodology	Confirmation of adoption of existing NRA methodology, as utilised by the PLA to undertake their Port Marine Safety Code strategic navigation risk assessment.
Guidance	Confirmation that the addendum NRA conforms to the Guidance Requirements.
Study Area	Confirmation that the study area remains the TEOW RLB with 5nm buffer and does not use the SEZ as the basis of the 5nm buffer.
Baseline Navigation Vessel Traffic	Updated vessel traffic analysis.
Track Analysis	Track analysis of based on additional vessel traffic data, referenced to original NRA.
Pilotage Transfer Analysis	Analysis of pilotage transfer operations, based on methodology employed in existing NRA, but updated based on data received by PLA / ESL post Deadline 4⇳
Incident Analysis (MAIB & PLA/ESL)	Existing and updated data analysis for Marine Accident Investigation Branch data and PLA / ESL incident data received post Deadline 4.

Section	Summary of contents
Sea Room Assessment	
NE Spit Racon	Details of sea room needs for NE Spit Racon buoy and referenced to IP requirements specified through the ExA process.
NE Spit Pilot Transfer	Details of sea room needs for pilot transfer referenced to IP requirements specified through the ExA process.
Elbow Buoy	Details of sea room needs at the Elbow Buoy referenced to IP requirements specified through the ExA process.
Risk Assessment	
Introduction	Overview of Addendum NRA process
FSA Step 1: Hazard Identification	Documenting hazard identification process with Interested Parties.
FSA Step 2: Hazard Scoring	Hazard Scoring based on hazard workshop
Future traffic profiles	Consideration given to increasing the hazard likelihood score to account for future increases in vessel traffic transiting within the study area.
FSA Step 3: Risk Controls	Refining of existing risk controls identified during the original NRA process and updating to reflect risk controls identified by the PLA for the 2015 NE Spit NRA.
FSA Step 4: Cost Benefit	Determination of cost benefit for ALARP level hazards.
FSA Step 5: Results	Documented results and recommendations
Construction / Decommissioning	Review of the construction decommissioning phase assessment.
Operational Phase	Review of the operational phase assessment conducted with IP.

Section	Summary of contents
Conclusions and Recommendations	Documented Conclusions / Recommendations
Conclusions	Conclusions
Recommendations	Recommendations
Summary	Summary

Annex A: Hazard Workshop Information Pack

Thanet Extension Offshore Wind Farm

Addendum NRA: Hazard Workshop Information Pack

This workshop pack includes:

- Workshop Details
- Details on the Risk Assessment Methodology including:
    - Draft Hazard Identification List
    - Existing risk control options list identified as part of original NRA
- Supplementary Information
    - Vessel Track Analysis
    - Incident Analysis
    - Other useful documents

Workshop Details

Time: 10:00 – 16:00

Date: 29th March 2019

Location:

St Bride Foundation
Bride Lane
Fleet Street
London
EC4Y 8EQ

Attendees:

Interested Parties	Organisation	Attending
Fena Boyle	Chamber of Shipping	Apologies sent
Trevor Hutchinson	DPWLG / POLTT	Yes
Vince Crocket	DPWLG / POLTT	Yes
Richard Jackson	Estuary Services Limited	Yes
Dave Ninnim	Estuary Services Limited	Yes
Andy Sims	London Pilot Council	Yes
Tony Evans	Maritime Coastguard Agency	TBA
Helen Croxson	Maritime Coastguard Agency	Apologies sent
Nick Slater	Maritime Coastguard Agency	TBA
Rakesh Pandit	Maritime Coastguard Agency	Yes
Catheryn Spain	Port of London Authority / Estuary Services Limited	Yes
Merlin Jackson	Thanet Fishermen's Association	Yes
Trevor Harris	Trinity House	Yes
Steve Vanstone	Trinity House	Yes
Roger Barker	Trinity House	Apologies sent

Applicant	Organisation	Attending 29th March
Dan Bates	Vattenfall	Yes
Sean Leak	GoBe	Yes
Simon Moore	Dover Marine Services	Yes
Ed Rogers	Marico	Yes
Jamie Holmes	Marico	Am only

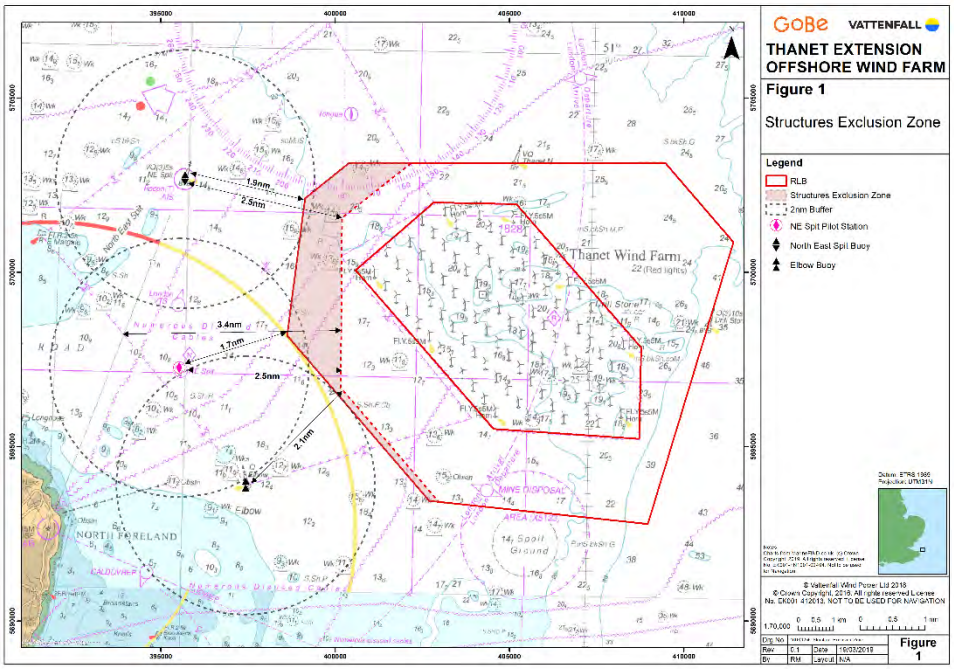
Draft Agenda:

- 10:00 Introductions
- 10:10 Workshop Methodology
- 10:30 Hazard Identification confirmation
- 11:00 Hazard Scoring – Baseline / Inherent / Residual (Operational phase only)
    - Hazard Likelihood
    - Hazard Consequence
- 13:00 Lunch
- 13:45 Continue hazard scoring
- 14:30 Risk Control Identification / Effectiveness
- 15:30 Hot Wash Up / Concluding Remarks

Workshop Risk Assessment Methodology

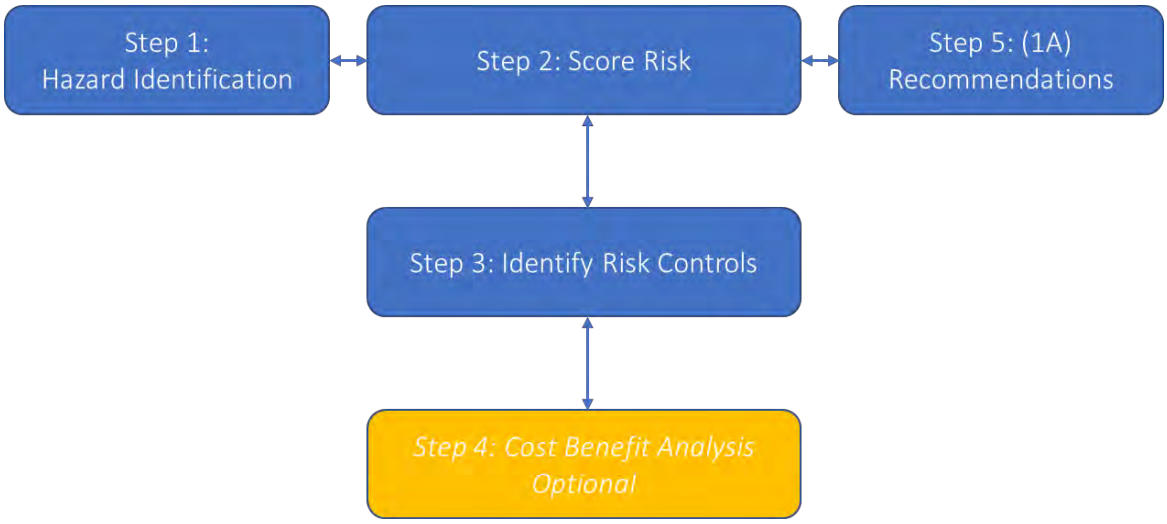
Methodology

The Addendum NRA aims to identify and quantify any change in navigational risk resulting from the TEOW project based on the submitted RLB with a defined Structures Exclusions Zone in place (see plot below).



TEOW with Structures Exclusion Zone

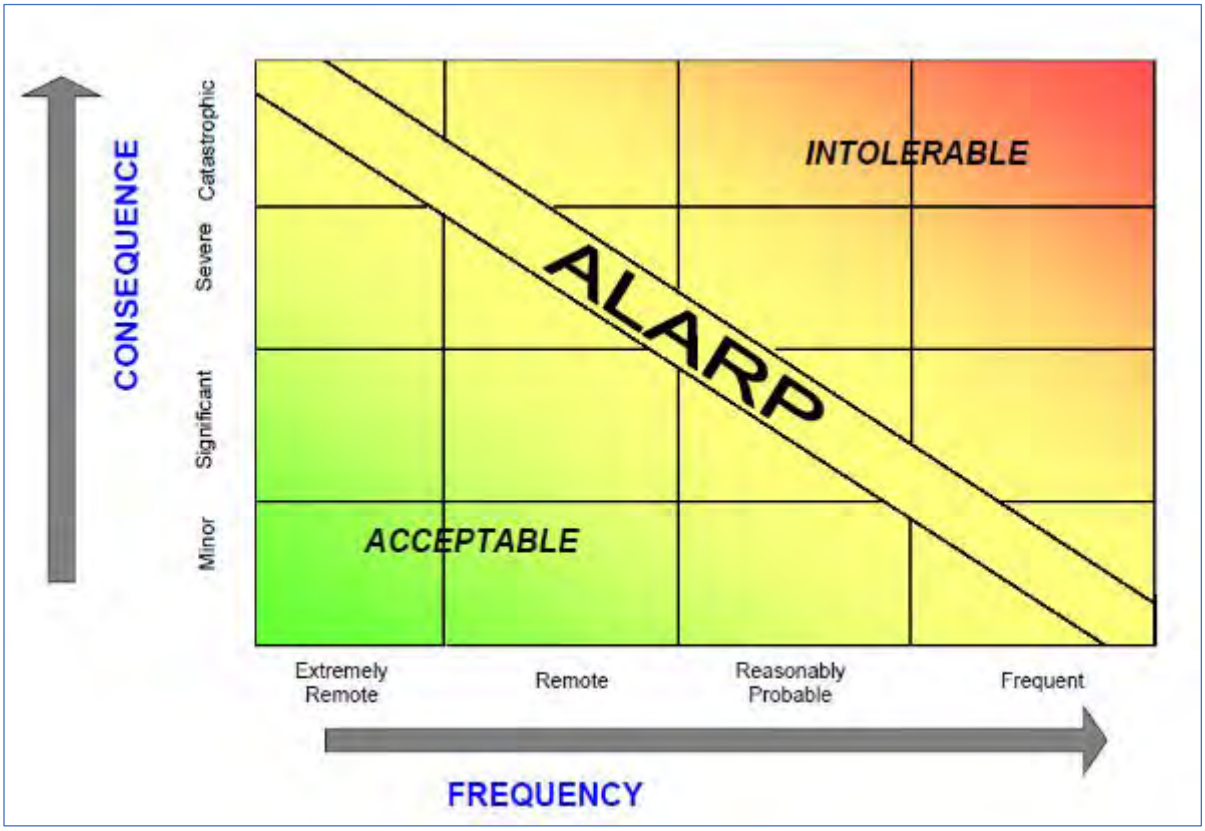
The proposed methodology is based on the International Maritime Organisation Formal Safety Assessment risk assessment methodology (see figure below) and is as documented in the original NRA and further described in Examination Deadline submissions.



Formal Safety Assessment Methodology

In summary the process starts with the identification of potential hazards. It then assesses the likelihood of a hazard occurring and considers the possible consequences of the hazard. It does so in respect of two scenarios, namely the "most likely" and the "worst credible" outcomes. The quantified values of frequency and consequence are then combined using a risk matrix (generic risk matrix shown below) to produce an individual risk score for each hazard. These are collated into a "Ranked Hazard List" from which the need for risk controls measures can be reviewed.

International Maritime Organisation (IMO) Guidelines define a hazard as "something with the potential to cause harm, loss or injury", the realisation of which results in an accident, e.g. collision, contact and grounding.



General risk matrix.

The combination of consequence and frequency of occurrence of a hazard is combined using a risk matrix which enables hazards to be ranked and a risk score assigned (See above for generic risk matrix). The resulting scale can be divided into three general categories:

- Acceptable;
- As Low as Reasonable Practicable (ALARP); and
- Intolerable.

At the low end of the scale, frequency is extremely remote and consequence minor, and as such the risk can be said to be "acceptable", whilst at the high end of the matrix, where hazards are defined as frequent and the consequence catastrophic, then risk is termed "intolerable". Every effort should be made to mitigate all risks such that they lie in the "acceptable" range. Where this is not possible, they should be reduced to the level where further reduction is not practicable.

This region, at the centre of the matrix is described as the ALARP region. It is possible that some hazards will lie in the "intolerable" region, but can be mitigated by measures, which reduce their risk score and moves them into the ALARP region, where they can be tolerated, albeit efforts should continue to be made when opportunity presents itself to further reduce their risk score. The FSA methodology used in this NRA, determines where to prioritise risk control options for the navigational aspects of an offshore wind farm site.

Assessment of Risk

The assessment of risk will be undertaken as follows:

- Baseline Risk: Assessment of risk for the area with the current TOW in place.
- Inherent Risk: Assessment of risk for the area with the proposed TEOW in place including the Structures Exclusion Zone.
- Residual Risk: Assessment of risk for the area with the proposed TEOW in place including the Structures Exclusion Zone and any risk control or mitigation measures in place.

The following FSA Risk Assessment Steps will be undertaken for each hazard:

FSA Step	Baseline Risk	Inherent Risk	Residual Risk
1: Hazard Identification	✓	-	-
2. Hazard Scoring	✓	✓	
3. Identify and score Risk Controls	-	-	✓
4. Cost Benefit	-	-	✓
5. Recommendations	-	-	✓

FSA Step 1: Hazard Identification

Hazard identification is the first and fundamental step in the risk assessment process. A draft list is provided below and will be finalised at the Hazard Workshop.

Draft hazard list (icw = in collision with)

#	Hazard Type	Area	Haz # Collision Vls1	Workshop Priority
1	Collision	West TEOW	Class 1 & 2 Vessels icw. another vessel	Yes
2	Collision	West TEOW	Class 3 & 4 Vessels icw. another vessel	Yes
3	Collision	West TEOW	Fishing & Recreational icw. another vessel	No
4	Collision	West TEOW	WSV icw. another vessel	No
5	Collision	West TEOW	Pilot Launch icw. another vessel	Yes
6	Contact	West TEOW	Class 1 & 2 Vessels	Yes
7	Contact	West TEOW	Class 3 & 4 Vessels	Yes
8	Contact	West TEOW	Fishing & Recreational	No
9	Contact	West TEOW	WSV	No

10	Contact	West TEOW	Pilot Launch	Yes
11	Grounding	West TEOW	Class 1 & 2 Vessels	Yes
12	Grounding	West TEOW	Class 3 & 4 Vessels	Yes
13	Grounding	West TEOW	Fishing & Recreational	No
14	Grounding	West TEOW	WSV	No
15	Grounding	West TEOW	Pilot Launch	Yes

FSA Step 2: Hazard Risk Scoring

As indicated above, frequency of occurrence and likely consequence are assessed for the "most likely" and "worst credible" hazard outcome.

Frequencies are assessed according to the levels set out below – and determined based on hazard return rates.

Frequency criteria.

Scale	Description	Definition	Operational Interpretation
F5	Frequent	An event occurring in the range once a week to once an operating year.	One or more times in 1 year
F4	Likely	An event occurring in the range once a year to once every 10 operating years.	One or more times in 10 years 1 - 9 years
F3	Possible	An event occurring in the range once every 10 operating years to once in 100 operating years.	One or more times in 100 years 10 – 99 years
F2	Unlikely	An event occurring in the range less than once in 100 operating years.	One or more times in 1,000 years 100 – 999 years
F1	Remote	Considered to occur less than once in 1,000 operating years (e.g. it may have occurred at a similar site, elsewhere in the world).	Less than once in 1,000 years >1,000 years

Using the assessed notional frequency for the "most likely" and "worst credible" scenarios for each hazard, the probable consequences associated with each are assessed in terms of damage to:

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

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

Consequence categories and criteria.

Cat.	People	Property	Environment	Business
C1	**Negligible** Possible very minor injury (e.g. bruising)	**Negligible** Costs <£10k	**Negligible** No effect of note. Tier1 may be declared but criteria not necessarily met. Costs <£10k	**Negligible** Costs <£10k
C2	**Minor** (single minor injury)	**Minor** Minor damage Costs £10k – £100k	**Minor** Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity Costs £10K–£100k	**Minor** Bad local publicity and/or short-term loss of revenue Costs £10k – £100k
C3	**Moderate** Multiple minor or single major injury	**Moderate** Moderate damage Costs £100k - £1M	**Moderate** Tier 2 spill criteria reached but capable of being limited to immediate area within site Costs £100k -£1M	**Moderate** Bad widespread publicity Temporary suspension of operations or prolonged restrictions at wind farm Costs £100k - £1M
C4	**Major** Multiple major injuries or single fatality	**Major** Major damage Costs £1M -£10M	**Major** Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release Costs £1M - £10M	**Major** National publicity, Temporary closure or prolonged restrictions on wind farm operations Costs £1M -£10M
C5	**Catastrophic** Multiple fatalities	**Catastrophic** Catastrophic damage Costs >£10M	**Catastrophic** Tier 3 oil spill criteria reached. International support required. Widespread shoreline contamination. Serious chemical or gas release. Significant threat to environmental amenity. Costs >£10M	**Catastrophic** International media publicity. wind farm site closes. Operations and revenue seriously disrupted for more than two days. Ensuing loss of revenue. Costs >£10M

Risk scores are calculated using the matrix below for each individual hazard consequence for most likely and worst credible outcomes of the hazard.

Risk matrix used for hazard assessment.

Consequences						
	Cat 5	5.1	5.9	7.0	8.3	10.0
	Cat 4	4.1	4.9	5.9	7.4	9.4
	Cat 3	2.9	3.5	4.4	5.9	8.3
	Cat 2	1.5	1.8	2.4	3.5	5.9
	Cat 1	0	0	0	0	0
	Frequency	>1,000 years	100-1,000 years	10-100 years	1 to 10 years	Yearly

Where:

Risk Number	***Risk***
0 to 1.9	*Negligible*
2 to 3.9	*Low Risk*
4 to 6.9	*As Low as Reasonably Practical*
7 to 8.9	*Significant Risk*
9 to 10.0	*High Risk*

FSA Step 3: Identify Risk Controls

The project has to date identified the following risk controls, previously described as Embedded, Additional Recommended and Additional Non-recommended, which are shown below for the operational phase of the TEOW.

Mitigation measures that could be employed to reduce the inherent risk for high or ALARP level hazards either by reducing likelihood or consequence of the hazards occurring will be identified and implemented where necessary.

#	Risk Control	NRA Definition
1	Training	Embedded Risk Controls
2	ERCOP	Embedded Risk Controls
3	Promulgation/Ntm	Embedded Risk Controls
4	Reduction in RLB at PIER stage	Embedded Risk Controls
5	Aids to Navigation Plan	Embedded Risk Controls
6	Blade Clearance	Embedded Risk Controls
7	Continuous Monitoring	Embedded Risk Controls
8	Sufficient Cable/Burial Protection	Embedded Risk Controls
9	Cable Exclusion Area	Embedded Risk Controls

#	Risk Control	NRA Definition
10	Coordination with Leisure/Fishing	Additional - Recommended
11	Maintain Lines of Orientation	Additional - Recommended
12	Relocation of Buoyage	Additional - Recommended
13	Construction and Post-Construction Monitoring	Additional Not Recommended
14	Relocation of Pilot Boarding Area	Additional Not Recommended
15	Inc. Co-ordination & Sit. Awareness	Additional Not Recommended
16	Training Pilots, ESL & VTS	Additional Not Recommended

FSA Step 4: Cost Benefit

Cost benefit is an optional step of FSA process and is aimed at determining risk controls to justify As Low As Reasonable Practical (ALARP) judgements. This stage will be reviewed following the outcome of Steps 1 – 3.

FSA Step 5: Recommendations

Risk assessment recommendations will be drafted in the Addendum NRA report issued at Deadline 4a.

Supplementary Data

Vessel Traffic Data

1. Plot of vessel traffic by Class (defined by length)
2. Plot of vessel traffic by length
3. Plot of vessel traffic by type
4. Table of vessel movements at NE Spit Racon Buoy and Elbow Buoy
5. Pilotage transfer distribution plot

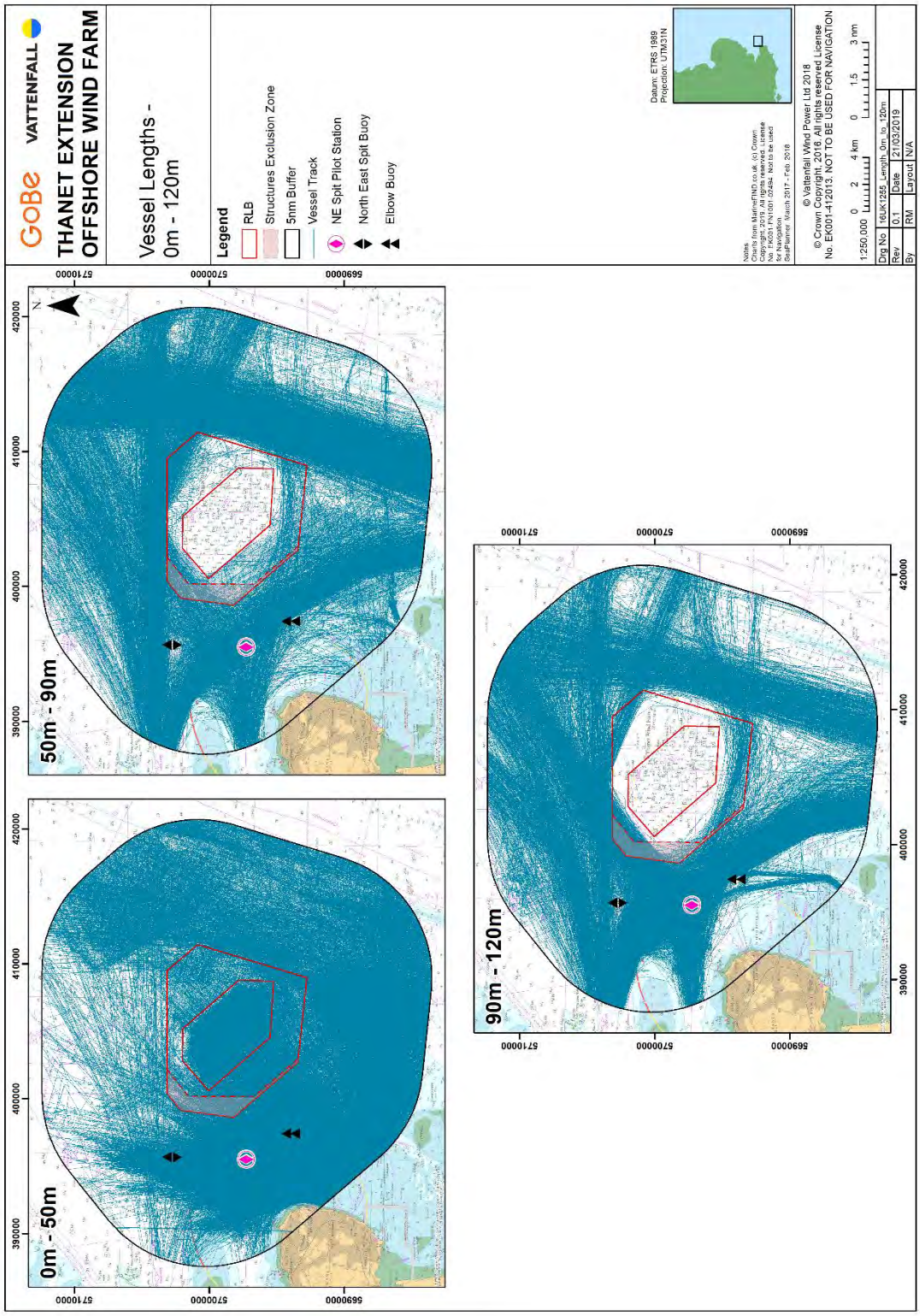
Vessel Traffic Incidents

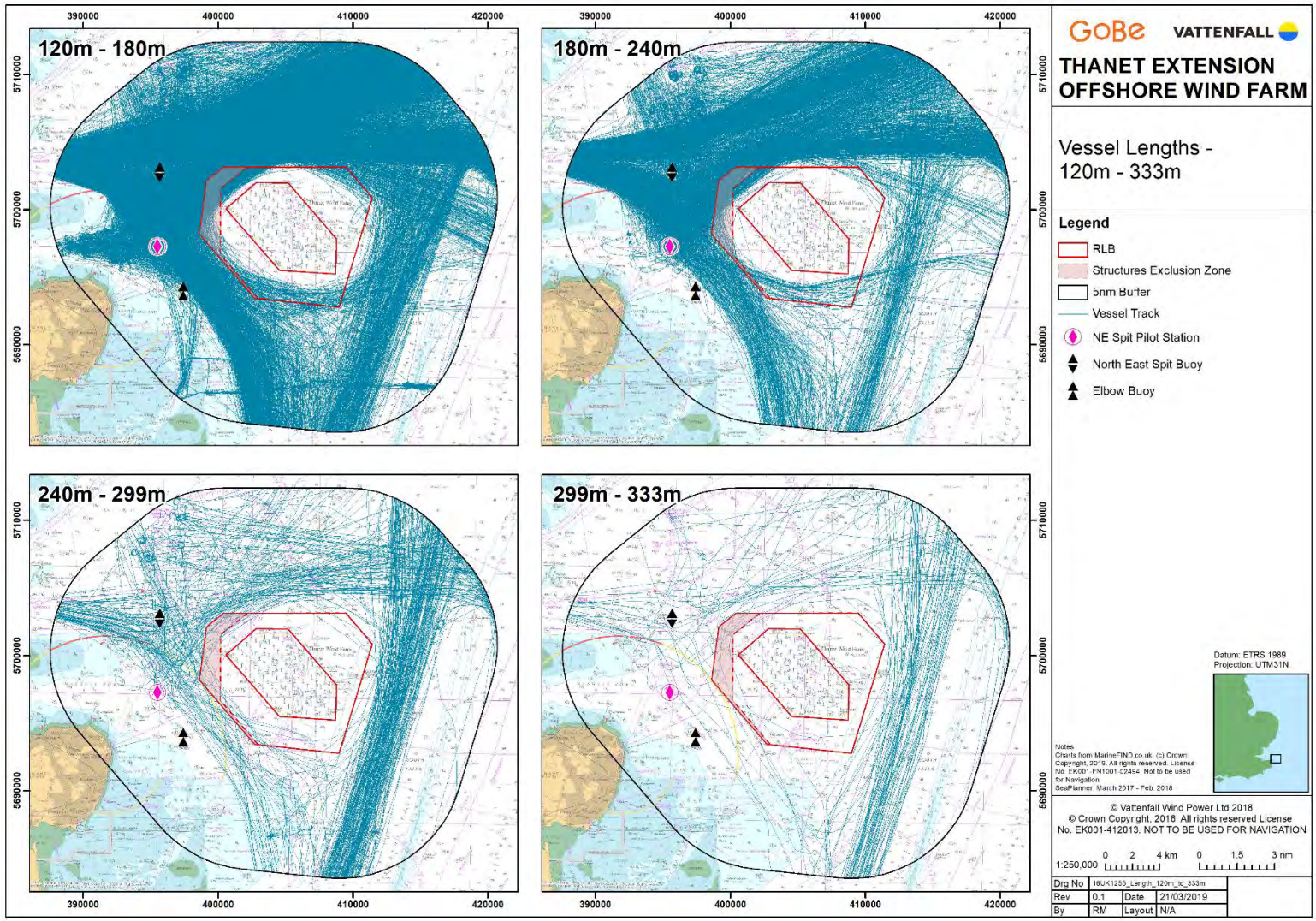
1. MAIB incidents – plot of incidents
2. PLA / ESL incidents

Ancillary Information:

1. Port of London Authority: 2015 Safety of Navigation at North East Spit Navigation Risk Assessment
2. Details of incident involving recent Wind Farm Service Vessel – https://www.4coffshore.com/news/updates-on-vessel-collision-nid11264.html

Vessel Traffic Plots





GoBe VATTENFALL

THANET EXTENSION OFFSHORE WIND FARM

Vessel Lengths - 120m - 333m

Legend

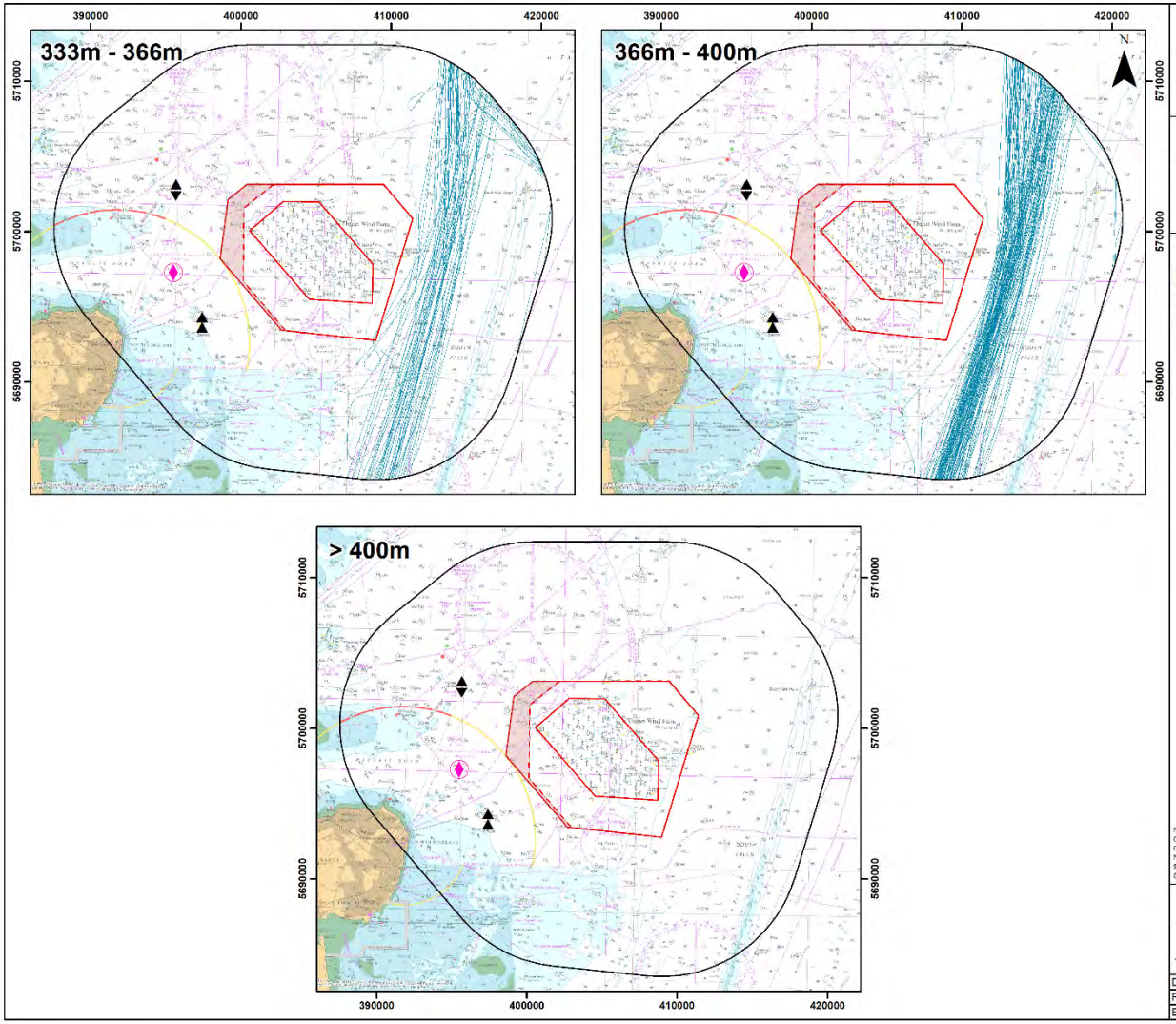
- RLB
- Structures Exclusion Zone
- 5nm Buffer
- Vessel Track
- NE Spit Pilot Station
- North East Spit Buoy
- Elbow Buoy

Datum: ETRS 1989
Projection: UTM31N

Notes
Charts from MarineFIND.co.uk. (c) Crown Copyright, 2019. All rights reserved. License No: EK001-FN1001-00494. Not to be used for Navigation.
SeaPlanner. March 2017 - Feb. 2018

1:250,000 0 2 4 km 0 1.5 3 nm

Drg No	16UK1255_Length_120m_to_333m		
Rev	0.1	Date	21/03/2019
By	RM	Layout	N/A



GoBe VATTENFALL

THANET EXTENSION OFFSHORE WIND FARM

Vessel Lengths - 333m - > 400m

Legend

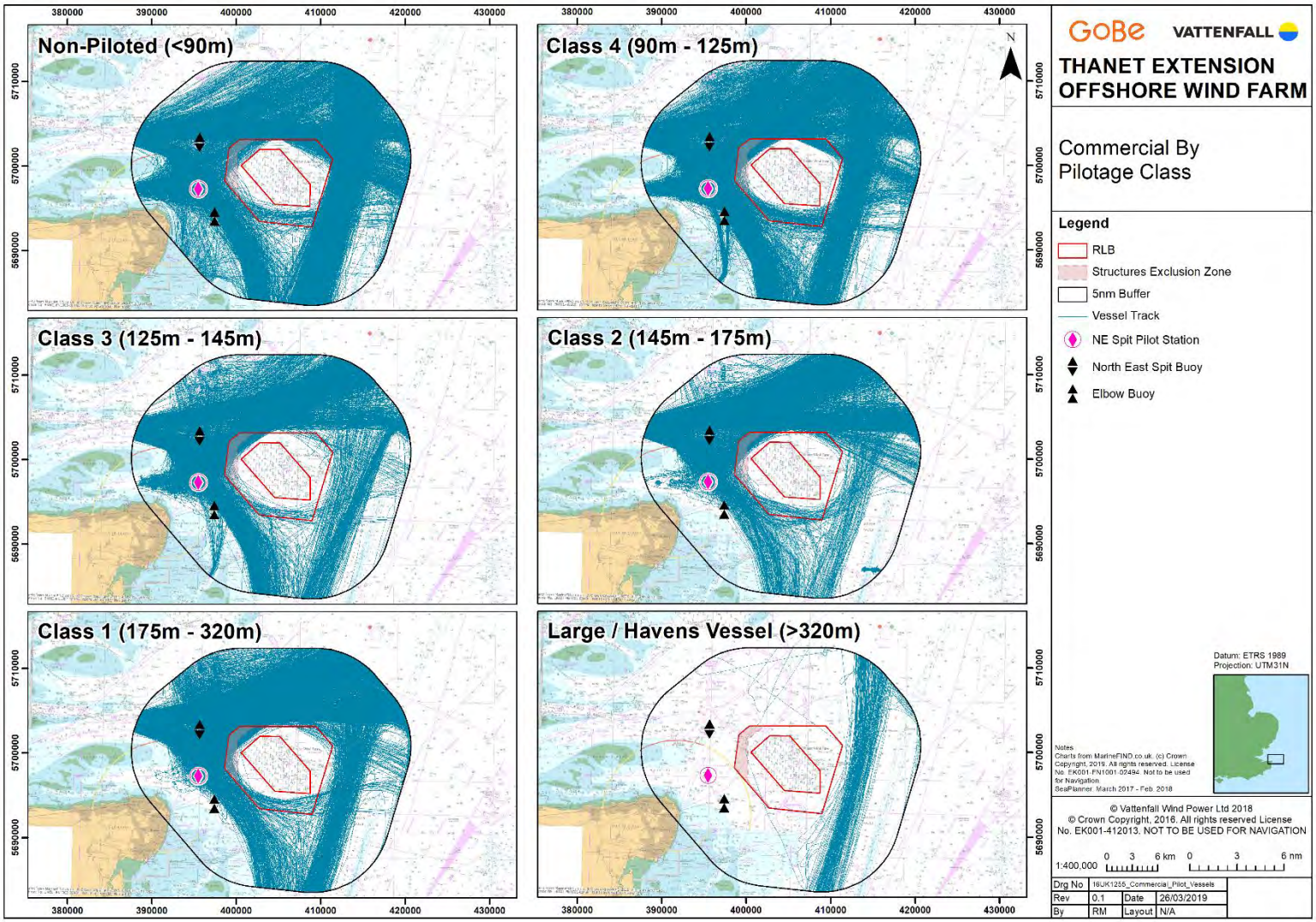
- RLB
- Structures Exclusion Zone
- 5nm Buffer
- Vessel Track
- NE Spit Pilot Station
- North East Spit Buoy
- Elbow Buoy

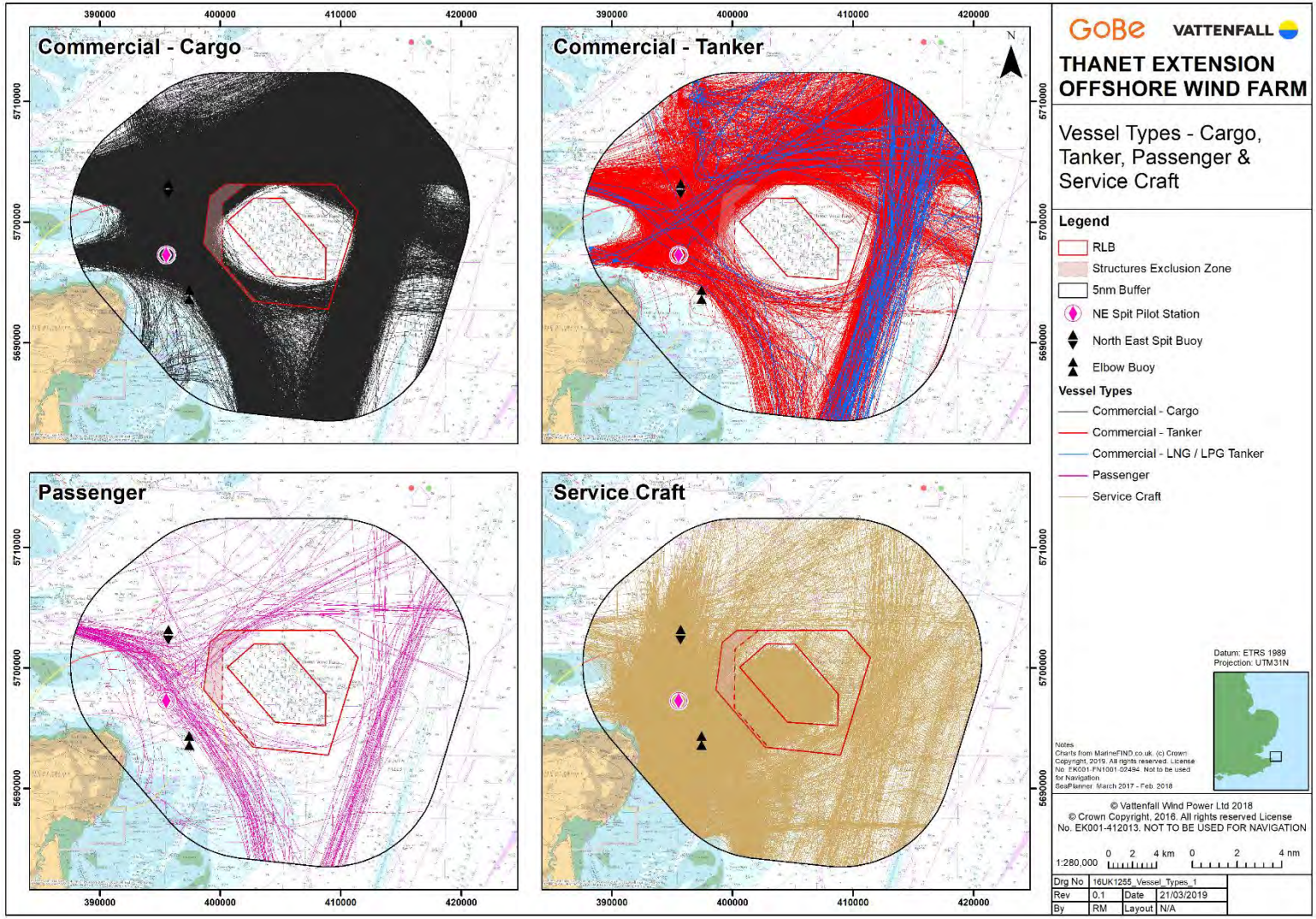
Datum: ETRS 1989
Projection: UTM31N

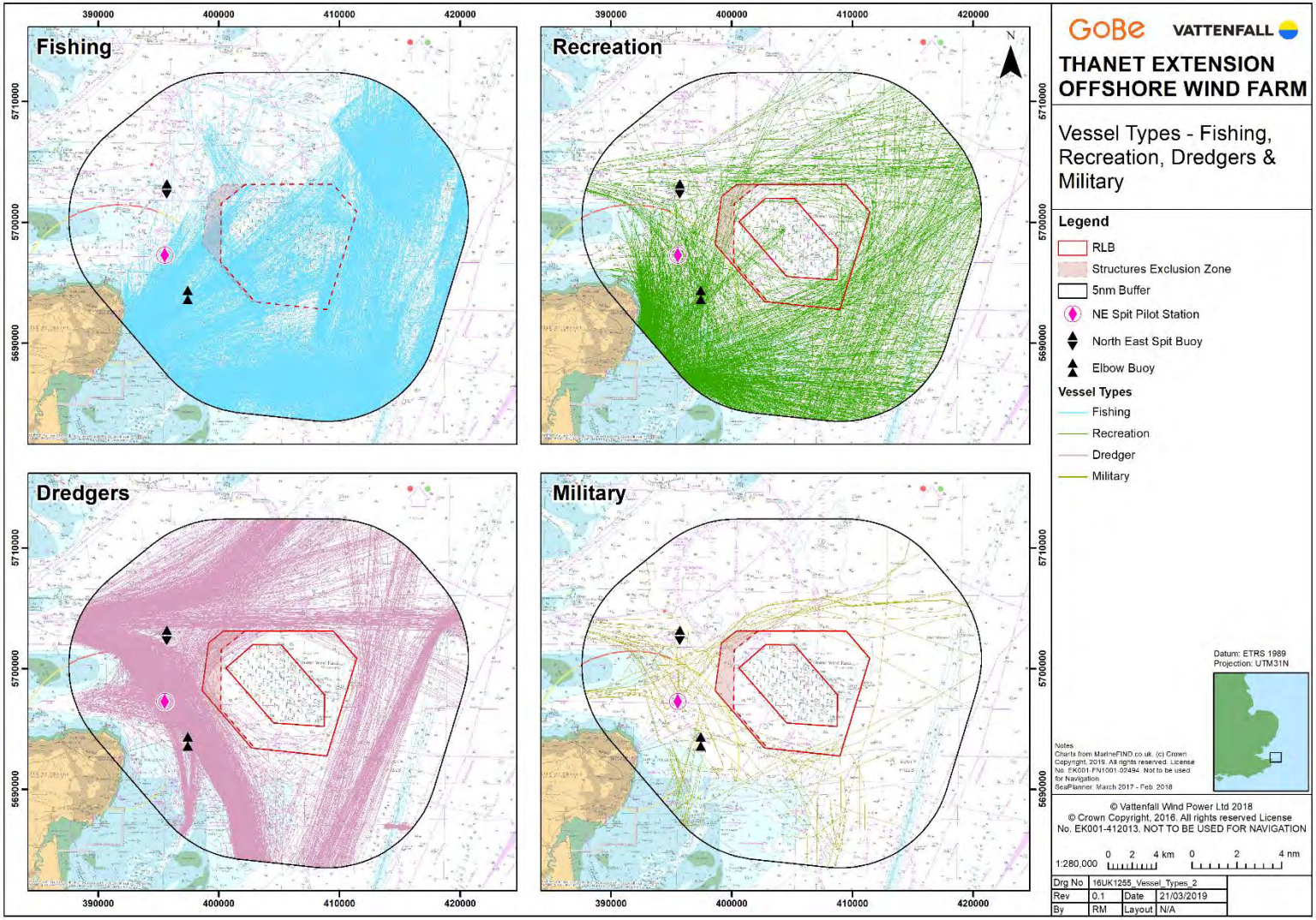
Notes
Charts from MarineFIND.co.uk. (c) Crown Copyright, 2019. All rights reserved. License No. EK001-FN1001-00494. Not to be used for Navigation
SeaPlanner: March 2017 - Feb. 2018

1:250,000 0 2 4 km 0 1.5 3 nm

Drg No	16UK1255_Length_333m_to_gt400m		
Rev	0.1	Date	21/03/2019
By	RM	Layout	N/A


Non-Piloted (<90m)
Class 4 (90m - 125m)
Class 3 (125m - 145m)
Class 2 (145m - 175m)
Class 1 (175m - 320m)
Large / Havens Vessel (>320m)
N
380000
390000
400000
410000
420000
430000
5710000
5700000
5690000
GoBe
VATTENFALL
THANET EXTENSION OFFSHORE WIND FARM
Commercial By Pilotage Class
Legend
RLB
Structures Exclusion Zone
5nm Buffer
Vessel Track
NE Spit Pilot Station
North East Spit Buoy
Elbow Buoy
Datum: ETRS 1989
Projection: UTM31N
Notes
Charts from MarineFIND.co.uk. (c) Crown Copyright, 2019. All rights reserved. License No. EK001-FN1001-00494. Not to be used for Navigation.
SeaPlanner. March 2017 - Feb. 2018
© Vattenfall Wind Power Ltd 2018
© Crown Copyright, 2016. All rights reserved License No. EK001-412013. NOT TO BE USED FOR NAVIGATION
1:400,000
0 3 6 km
0 3 6 nm
Drg No 16UK1255_Commercial_Pilot_Vessels
Rev 0.1
Date 26/03/2019
By RM
Layout N/A

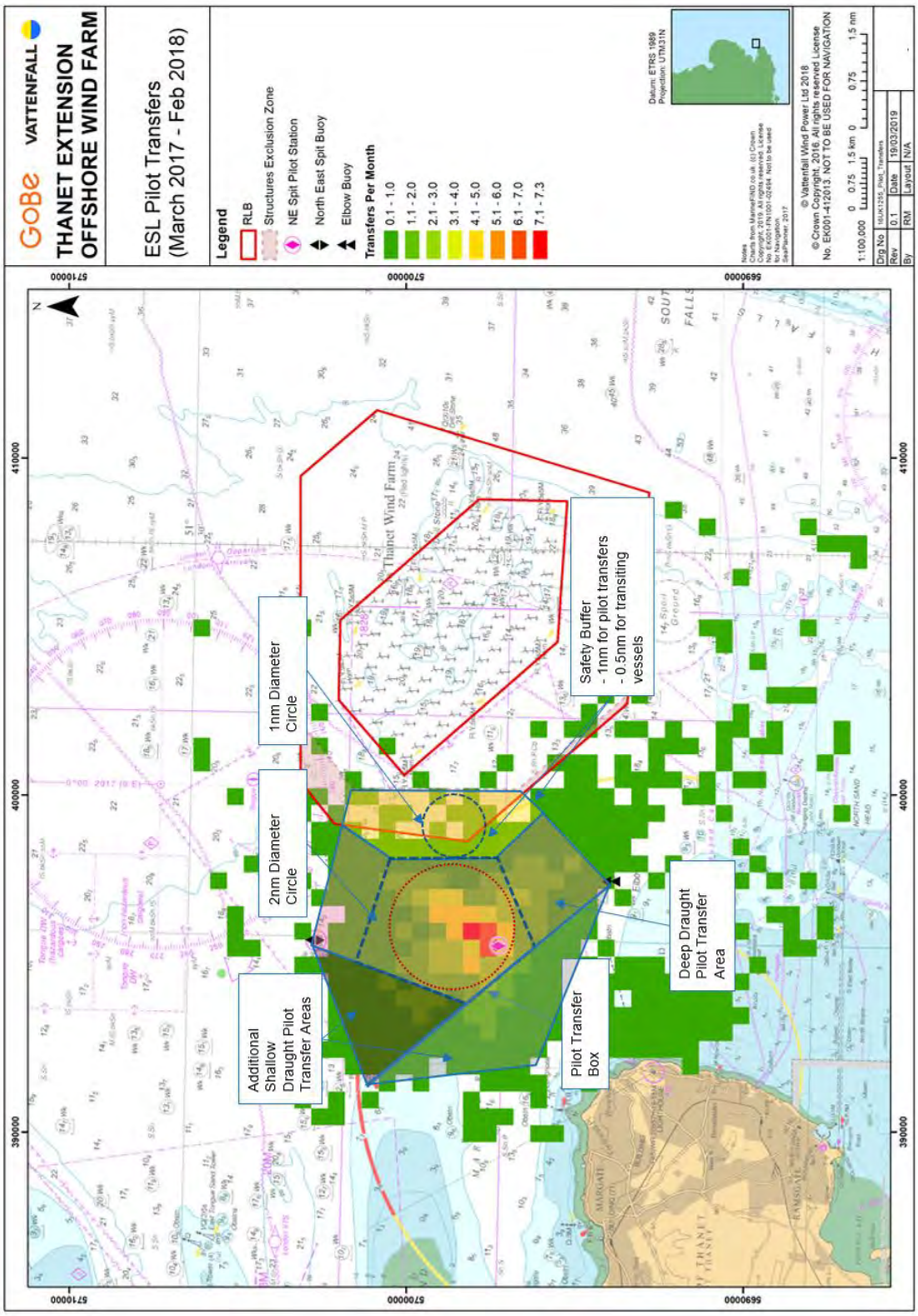

Commercial - Cargo
Commercial - Tanker
Passenger
Service Craft
390000
400000
410000
420000
5710000
5700000
5690000
N
GoBe
VATTENFALL
THANET EXTENSION OFFSHORE WIND FARM
Vessel Types - Cargo, Tanker, Passenger & Service Craft
Legend
RLB
Structures Exclusion Zone
5nm Buffer
NE Spit Pilot Station
North East Spit Buoy
Elbow Buoy
Vessel Types
Commercial - Cargo
Commercial - Tanker
Commercial - LNG / LPG Tanker
Passenger
Service Craft
Datum: ETRS 1989
Projection: UTM31N
Notes
Charts from MarineFIND.co.uk. (c) Crown Copyright, 2019. All rights reserved. License No. EK001-FN1001-00494. Not to be used for Navigation.
SeaPlanner. March 2017 - Feb. 2018
© Vattenfall Wind Power Ltd 2018
© Crown Copyright, 2016. All rights reserved License No. EK001-412013. NOT TO BE USED FOR NAVIGATION
1:280,000
0 2 4 km
0 2 4 nm
Drg No 16UK1255_Vessel_Types_1
Rev 0.1
Date 21/03/2019
By RM
Layout N/A


Fishing
Recreation
Dredgers
Military
390000
400000
410000
420000
5710000
5700000
5690000
N
GoBe
VATTENFALL
THANET EXTENSION OFFSHORE WIND FARM
Vessel Types - Fishing, Recreation, Dredgers & Military
Legend
RLB
Structures Exclusion Zone
5nm Buffer
NE Spit Pilot Station
North East Spit Buoy
Elbow Buoy
Vessel Types
Fishing
Recreation
Dredger
Military
Datum: ETRS 1989
Projection: UTM31N
Notes
Charts from MarineFIND.co.uk. (c) Crown Copyright, 2019. All rights reserved. License No. EK001-FN1001-00494. Not to be used for Navigation.
SeaPlanner. March 2017 - Feb. 2018
© Vattenfall Wind Power Ltd 2018
© Crown Copyright, 2016. All rights reserved License No. EK001-412013. NOT TO BE USED FOR NAVIGATION
1:280,000
0 2 4 km
0 2 4 nm
Drg No 16UK1255_Vessel_Types_2
Rev 0.1
Date 21/03/2019
By RM
Layout N/A

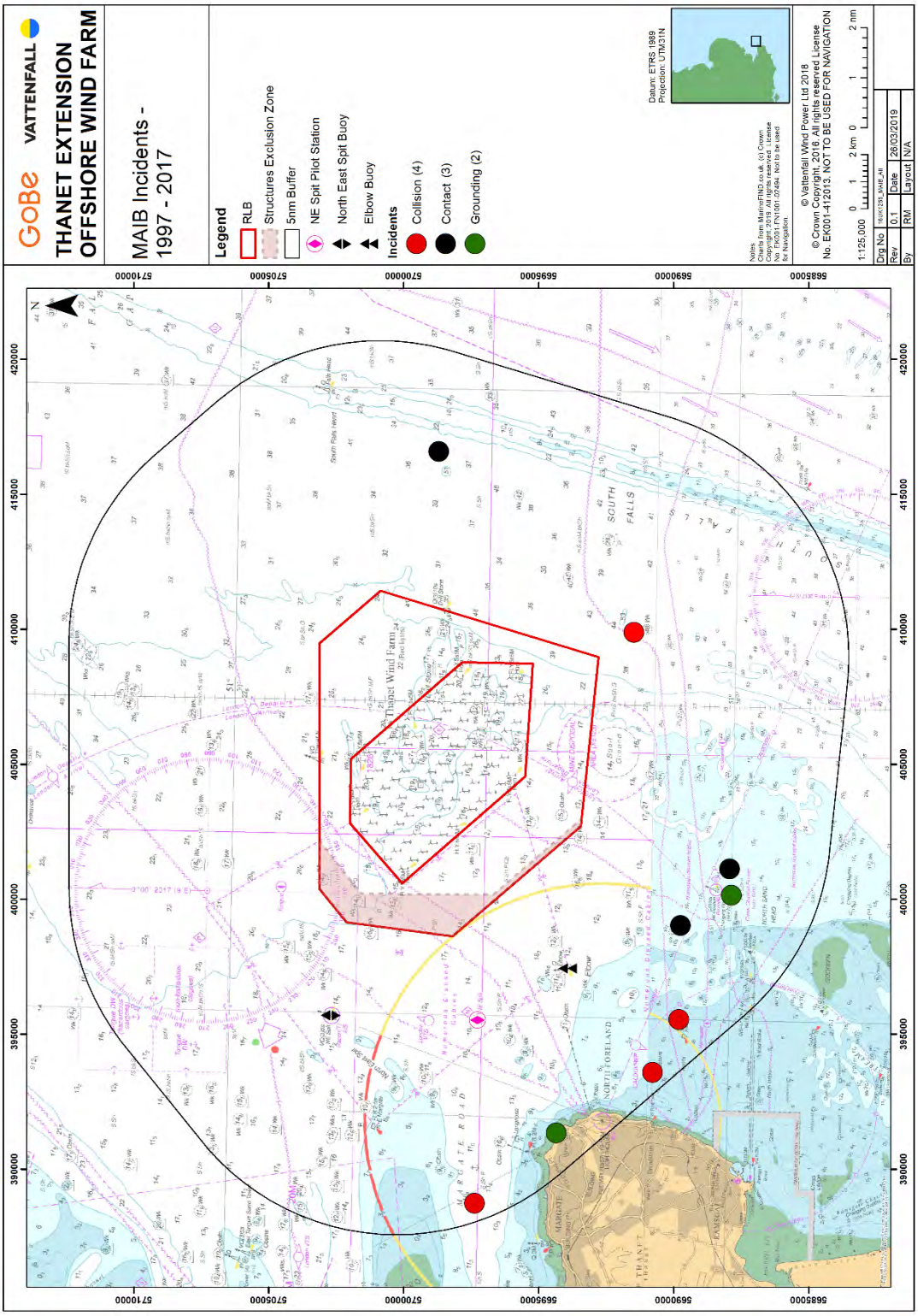
Vessel traffic counts based on AIS data

Elbow Buoy to RLB/SEZ			NE Spit Buoy to RLB/SEZ		
Ship Length [m]	**March 2017 - Feb 2018**		**Ship Length [m]**	**March 2017 - Feb 2018**	
	No	**%**		**No**	**%**
0 – 50	433	11%	0 – 50	554	11%
50 – 90	790	20%	50 – 90	421	8%
90 – 120	1523	38%	90 – 120	1089	22%
120 – 180	885	22%	120 – 180	2049	41%
180 – 240	293	7%	180 – 240	790	16%
240 - 299	44	1%	240 - 299	65	1%
299 - 333	10	0%	299 - 333	13	0%
333 - 366	0	0%	333 - 366	0	0%
366 - 400	0	0%	366 - 400	0	0%
400 -	0	0%	400 -	0	0%
Total	**3978**		**Total**	**4981**	
*180 (<5%) tracks missing length			*126 (<3%) tracks missing length		

Pilotage Transfer Plot based on Pilot Launch speeds



MAIB Incidents



MAIB Accidents (Collision, Contact, Grounding – 5nm of TOW)

Date Of Casualty	Type	Lat_DD	Long_DD	Vessel Type	Length Overall	Damage	Pollution Caused
11/10/1997	Collision	51.35	1.5	Fishing vessel	9.98	Material Damage	
02/11/1998	Grounding	51.3333333	1.56666667	Ro-ro/lo-lo, freight only (< 12 drivers)	109.71		
08/04/2001	Contact	51.4333333	1.8	Cargo ship	77.63	Material Damage	
24/05/2003	Collision	51.3583333	1.47166667	Recreational craft	0.01	Material Damage	
18/11/2004	Grounding	51.39	1.43833333	Cargo ship	96.17	Minor Damage	
15/12/2008	Collision	51.4166667	1.4	Tanker	109.1	Minor Damage	No
23/05/2010	Contact	51.35	1.55	Cargo ship	91.44	No Damage	No
27/05/2012	Contact | Floating object	51.334	1.58066667	Sailboat (sail only)	13.1	Damage - Minor	
13/11/2016	Collision	51.367333	1.7055	Recreational craft	8.48	Damage - Minor	

PLA NE Spit Incidents (9 years of data – presented as frequency per year)

Frequency [Year] Incident Synopsis Category	East Margate Buoy	Margate Roads Anchorage	NE Spit Deep Water Pilot Boarding\Landing	NE Spit Pilot Boarding\ Landing	North East Spit	Tounge Anchorage	Tounge Sand Towers	Total [yr]
Pilot Ladder Deficiency	-	-	-	3.4	2.6	-	-	**6.0**
Other	0.1	0.1	0.2	0.1	0.1	-	-	**0.7**
Navigation Equipment Failure	0.1	0.1	-	0.1	-	-	-	**0.3**
Near Miss Collision	0.1	-	-	0.6	0.3	0.1	0.1	**1.2**
Fishing in Channel	-	-	-	-	-	-	0.1	**0.1**
Mechanical Failure	0.1	0.1	-	0.4	0.3	0.1	0.4	**1.6**
Near Miss Grounding	0.1	-	0.1	0.1	-	0.1	-	**0.4**
Personal Injury	-	-	-	0.1	0.1	-	-	**0.2**
Near Miss	-	-	-	-	-	-	0.1	**0.1**
Hull Failure	-	0.1	-	-	-	-	-	**0.1**
Total [yr]	**0.6**	**0.4**	**0.3**	**4.9**	**3.4**	**0.3**	**0.8**	**10.8**

Hazard ID	Baseline Hazard Rank	Residual Hazard Rank	Hazard Area	Hazard Category	Hazard Title	Credible Hazard Outcome ID [Consequence]	Credible Hazard Outcome [Consequence]	Hazard Causes ID [Likelihood]	Hazard Causes [Likelihood]	Baseline Risk - with existing risk controls in place			Risk Reduction								Results	Control Actionee	Complete
										Likelihood	Consequence	Baseline Risk	Risk Control ID.	Additional Risk Control (RC) Measures	Cross-reference Consequence Likelihood	Include Risk Control	% Likelihood Reduction	% Consequence Reduction	Residual Risk Score with RC in place: Likelihood Return Period [yr]	Residual Risk Score with RC in place: Consequence Cost [£]	Residual Risk Score with RC in place: Cumulative Risk Score			
							Damage to vessels		Inappropriate Pilot Cutter scheduling					Baseline with no additional risk controls					10.0	£1,000,000	12.0	Baseline Risk		
							Pollution (Tier 2)		Inadequate traffic managament				1	ESL/PLA/MPA Pilot cutter scheduling and monitoring process		Yes	60%	20%	25.0	£800,000	10.2	12.0		
							Minor to moderate injuries		Failure to apply COLREGS				2	Coordination of Pilot cutter operations on VHF Ch 69		Yes	60%	60%	62.4	£320,000	7.7			
							Reputational harm		Conflict with other vessels boarding/landing/transiting				3	Where practicable, prioritise embarking vessels		Yes	40%	20%	104.0	£256,000	6.8	Baseline Level		
							Corporate liability		Loss of situational awareness (including radar interference)				4	Planning of critical/high risk vessels with ESL/Pilot/VTS		Yes	10%	20%	115.6	£204,800	6.4	High		
							Disruption to port operations		Inadequate/insufficient passage planning				5	Additional met sensors closer to NES		Yes	5%	5%	121.7	£194,560	6.3			
									Use of inappropriate Pilot boarding/landing position				6	Provision of charted Pilot boarding grounds to enhance traffic separation		Yes	30%	20%	173.8	£155,648	5.6	Residual Risk		
									Mechanical failure				7	Prohibited anchorage area		Yes	10%	5%	193.1	£147,866	5.4			
									Onboard deficiency				8	Additional advice in Admiralty products		Yes	10%	0%	214.6	£147,866	5.3	5.3		
									Adverse weather conditions				9	Dedicated VTS Operator		No	70%	40%	214.6	£147,866	5.3			
													10			No	0%	0%	214.6	£147,866	5.3	Residual Level		
													11			No	0%	0%	214.6	£147,866	5.3			
													12			No	0%	0%	214.6	£147,866	5.3	Moderate		
													13			No	0%	0%	214.6	£147,866	5.3			
													14			No	0%	0%	214.6	£147,866	5.3	Risk Reduction		
													15			No	0%	0%	214.6	£147,866	5.3	6.7		
													16			No	0%	0%	214.6	£147,866	5.3			
													17			No	0%	0%	214.6	£147,866	5.3			
													18			No	0%	0%	214.6	£147,866	5.3			
													19			No	0%	0%	214.6	£147,866	5.3			
1	1	2			Collision during or preparing for Pilot boarding/landing operations					3	4	12.0	20			No	0%	0%	214.6	£147,866	5.3			
													21			No	0%	0%	214.6	£147,866	5.3			
													22			No	0%	0%	214.6	£147,866	5.3			
													23			No	0%	0%	214.6	£147,866	5.3			
													24			No	0%	0%	214.6	£147,866	5.3			
													25			No	0%	0%	214.6	£147,866	5.3			
													26			No	0%	0%	214.6	£147,866	5.3			
													27			No	0%	0%	214.6	£147,866	5.3			
													28			No	0%	0%	214.6	£147,866	5.3			
													29			No	0%	0%	214.6	£147,866	5.3			
													30			No	0%	0%	214.6	£147,866	5.3			
													31			No	0%	0%	214.6	£147,866	5.3			
													32			No	0%	0%	214.6	£147,866	5.3			
													33			No	0%	0%	214.6	£147,866	5.3			
													34			No	0%	0%	214.6	£147,866	5.3			
													35			No	0%	0%	214.6	£147,866	5.3			
													36			No	0%	0%	214.6	£147,866	5.3			
													37			No	0%	0%	214.6	£147,866	5.3			
													38			No	0%	0%	214.6	£147,866	5.3			
													39			No	0%	0%	214.6	£147,866	5.3			
													40			No	0%	0%	214.6	£147,866	5.3			

Hazard ID	Baseline Hazard Rank	Residual Hazard Rank	Hazard Area	Hazard Category	Hazard Title	Credible Hazard Outcome ID [Consequence]	Credible Hazard Outcome [Consequence]	Hazard Causes ID [Likelihood]	Hazard Causes [Likelihood]	Baseline Risk - with existing risk controls in place			Risk Reduction								Results	Control Actionee	Complete
										Likelihood	Consequence	Baseline Risk	Risk Control ID.	Additional Risk Control (RC) Measures	Cross-reference Consequence Likelihood	Include Risk Control	% Likelihood Reduction	% Consequence Reduction	Residual Risk Score with RC in place					
																			Likelihood Return Period [yr]	Consequence Cost [£]	Cumulative Risk Score			
							Damage to vessels		Failure to apply COLREGS					Baseline with no additional risk controls					100.0	£1,000,000	8.0	Baseline Risk		
							Pollution (Tier 2)		Inadequate traffic managament				1	Precautionary area/exclamation mark		No	20%	5%	100.0	£1,000,000	8.0	8.0		
							Minor to moderate injuries		Loss of situational awareness (including radar interference)				2	Enhanced Pilotage/PEC navigational guidance/lessons identified		Yes	10%	0%	111.1	£1,000,000	7.8			
							Reputational harm		Inadequate/insufficient passage planning				3	Additional advice in Admiralty products		Yes	10%	0%	123.5	£1,000,000	7.6	Baseline Level		
							Corporate liability		Conflict with other vessels boarding/landing/transiting				4	Single channel VHF operations		Yes	60%	30%	308.6	£700,000	5.8	Moderate		
							Disruption to port operations		Use of inappropriate Pilot boarding/landing position				5	Prohibited anchorage area/control of anchorage		Yes	5%	5%	324.9	£665,000	5.7			
									Mechanical failure				6	Where practicable, prioritise embarking vessels		Yes	10%	10%	361.0	£598,500	5.4	Residual Risk		
									Onboard deficiency				7	Ddedicated VTS Operator		No	50%	30%	361.0	£598,500	5.4	5.4		
									Adverse weather conditions				8			No	0%	0%	361.0	£598,500	5.4			
													9			No	0%	0%	361.0	£598,500	5.4			
													10			No	0%	0%	361.0	£598,500	5.4	Residual Level		
													11			No	0%	0%	361.0	£598,500	5.4	Moderate		
													12			No	0%	0%	361.0	£598,500	5.4			
													13			No	0%	0%	361.0	£598,500	5.4	Risk Reduction		
													14			No	0%	0%	361.0	£598,500	5.4	2.6		
													15			No	0%	0%	361.0	£598,500	5.4			
													16			No	0%	0%	361.0	£598,500	5.4			
													17			No	0%	0%	361.0	£598,500	5.4			
													18			No	0%	0%	361.0	£598,500	5.4			
													19			No	0%	0%	361.0	£598,500	5.4			
2	2	1			Collision between vessels in transit					2	4	8.0	20			No	0%	0%	361.0	£598,500	5.4			
													21			No	0%	0%	361.0	£598,500	5.4			
													22			No	0%	0%	361.0	£598,500	5.4			
													23			No	0%	0%	361.0	£598,500	5.4			
													24			No	0%	0%	361.0	£598,500	5.4			
													25			No	0%	0%	361.0	£598,500	5.4			
													26			No	0%	0%	361.0	£598,500	5.4			
													27			No	0%	0%	361.0	£598,500	5.4			
													28			No	0%	0%	361.0	£598,500	5.4			
													29			No	0%	0%	361.0	£598,500	5.4			
													30			No	0%	0%	361.0	£598,500	5.4			
													31			No	0%	0%	361.0	£598,500	5.4			
													32			No	0%	0%	361.0	£598,500	5.4			
													33			No	0%	0%	361.0	£598,500	5.4			
													34			No	0%	0%	361.0	£598,500	5.4			
													35			No	0%	0%	361.0	£598,500	5.4			
													36			No	0%	0%	361.0	£598,500	5.4			
													37			No	0%	0%	361.0	£598,500	5.4			
													38			No	0%	0%	361.0	£598,500	5.4			
													39			No	0%	0%	361.0	£598,500	5.4			
													40			No	0%	0%	361.0	£598,500	5.4			

Hazard ID	Baseline Hazard Rank	Residual Hazard Rank	Hazard Area	Hazard Category	Hazard Title	Credible Hazard Outcome ID [Consequence]	Credible Hazard Outcome [Consequence]	Hazard Causes ID [Likelihood]	Hazard Causes [Likelihood]	Baseline Risk - with existing risk controls in place			Risk Reduction								Results	Control Actionee	Complete
										Likelihood	Consequence	Baseline Risk	Risk Control ID.	Additional Risk Control (RC) Measures	Cross-reference Consequence Likelihood	Include Risk Control	% Likelihood Reduction	% Consequence Reduction	Residual Risk Score with RC in place: Likelihood Return Period [yr]	Residual Risk Score with RC in place: Consequence Cost [£]	Residual Risk Score with RC in place: Cumulative Risk Score			
							Damage to vessels		Failure to apply COLREGS					Baseline with no additional risk controls					1000.0	£100,000	3.0	Baseline Risk		
							Pollution (Tier 2)		Inadequate traffic managament				1	Modification of Tongue Anchorage location		No	20%	0%	1000.0	£100,000	3.0	3.0		
							Minor to moderate injuries		Vessels anchored close to prevailing traffic flows				2	Formal charting of Margate Roads Anchorage		No	10%	0%	1000.0	£100,000	3.0			
							Reputational harm		High density of vessels anchored due to adverse weather				3			No	0%	0%	1000.0	£100,000	3.0	Baseline Level		
							Corporate liability		Inadequate/insufficient passage planning				4			No	0%	0%	1000.0	£100,000	3.0	Minor		
									Loss of situational awareness (including radar interference)				5			No	0%	0%	1000.0	£100,000	3.0			
									Conflict with other vessels boarding/landing/transiting				6			No	0%	0%	1000.0	£100,000	3.0	Residual Risk		
									Use of inappropriate Pilot boarding/landing position				7			No	0%	0%	1000.0	£100,000	3.0	3.0		
									Mechanical failure				8			No	0%	0%	1000.0	£100,000	3.0			
									Onboard deficiency				9			No	0%	0%	1000.0	£100,000	3.0			
									Adverse weather conditions				10			No	0%	0%	1000.0	£100,000	3.0	Residual Level		
													11			No	0%	0%	1000.0	£100,000	3.0	Minor		
													12			No	0%	0%	1000.0	£100,000	3.0			
													13			No	0%	0%	1000.0	£100,000	3.0	Risk Reduction		
													14			No	0%	0%	1000.0	£100,000	3.0	0.0		
													15			No	0%	0%	1000.0	£100,000	3.0			
													16			No	0%	0%	1000.0	£100,000	3.0			
													17			No	0%	0%	1000.0	£100,000	3.0			
													18			No	0%	0%	1000.0	£100,000	3.0			
													19			No	0%	0%	1000.0	£100,000	3.0			
3	5	4			Contact with anchored vessel					1	3	3.0	20			No	0%	0%	1000.0	£100,000	3.0			
													21			No	0%	0%	1000.0	£100,000	3.0			
													22			No	0%	0%	1000.0	£100,000	3.0			
													23			No	0%	0%	1000.0	£100,000	3.0			
													24			No	0%	0%	1000.0	£100,000	3.0			
													25			No	0%	0%	1000.0	£100,000	3.0			
													26			No	0%	0%	1000.0	£100,000	3.0			
													27			No	0%	0%	1000.0	£100,000	3.0			
													28			No	0%	0%	1000.0	£100,000	3.0			
													29			No	0%	0%	1000.0	£100,000	3.0			
													30			No	0%	0%	1000.0	£100,000	3.0			
													31			No	0%	0%	1000.0	£100,000	3.0			
													32			No	0%	0%	1000.0	£100,000	3.0			
													33			No	0%	0%	1000.0	£100,000	3.0			
													34			No	0%	0%	1000.0	£100,000	3.0			
													35			No	0%	0%	1000.0	£100,000	3.0			
													36			No	0%	0%	1000.0	£100,000	3.0			
													37			No	0%	0%	1000.0	£100,000	3.0			
													38			No	0%	0%	1000.0	£100,000	3.0			
													39			No	0%	0%	1000.0	£100,000	3.0			
													40			No	0%	0%	1000.0	£100,000	3.0			

Hazard ID	Baseline Hazard Rank	Residual Hazard Rank	Hazard Area	Hazard Category	Hazard Title	Credible Hazard Outcome ID [Consequence]	Credible Hazard Outcome [Consequence]	Hazard Causes ID [Likelihood]	Hazard Causes [Likelihood]	Baseline Risk - with existing risk controls in place			Risk Reduction								Results	Control Actionee	Complete
										Likelihood	Consequence	Baseline Risk	Risk Control ID.	Additional Risk Control (RC) Measures	Cross-reference Consequence Likelihood	Include Risk Control	% Likelihood Reduction	% Consequence Reduction	Residual Risk Score with RC in place					
																			Likelihood Return Period [yr]	Consequence Cost [£]	Cumulative Risk Score			
							Damage to vessels		Failure to apply COLREGS					Baseline with no additional risk controls					1000.0	£100,000	3.0	**Baseline Risk**		
							Pollution (Tier 2)		Inadequate traffic managament				1	Use of encounter prediction VTS software		No	60%	5%	1000.0	£100,000	3.0	**3.0**		
							Minor to moderate injuries		Inadequate/insufficient passage planning				2			No	0%	0%	1000.0	£100,000	3.0			
							Reputational harm		Loss of situational awareness (including radar interference)				3			No	0%	0%	1000.0	£100,000	3.0	**Baseline Level**		
							Corporate liability		Use of inappropriate Pilot boarding/landing position				4			No	0%	0%	1000.0	£100,000	3.0	**Minor**		
							Damage to infrastructure		Mechanical failure				5			No	0%	0%	1000.0	£100,000	3.0			
									Onboard deficiency				6			No	0%	0%	1000.0	£100,000	3.0	**Residual Risk**		
									Adverse weather conditions				7			No	0%	0%	1000.0	£100,000	3.0			
													8			No	0%	0%	1000.0	£100,000	3.0	**3.0**		
													9			No	0%	0%	1000.0	£100,000	3.0			
													10			No	0%	0%	1000.0	£100,000	3.0	**Residual Level**		
													11			No	0%	0%	1000.0	£100,000	3.0	**Minor**		
													12			No	0%	0%	1000.0	£100,000	3.0			
													13			No	0%	0%	1000.0	£100,000	3.0	**Risk Reduction**		
													14			No	0%	0%	1000.0	£100,000	3.0	**0.0**		
													15			No	0%	0%	1000.0	£100,000	3.0			
													16			No	0%	0%	1000.0	£100,000	3.0			
													17			No	0%	0%	1000.0	£100,000	3.0			
													18			No	0%	0%	1000.0	£100,000	3.0			
													19			No	0%	0%	1000.0	£100,000	3.0			
4	5	4			Gcontact with windfarm or other fixed structure					1	3	**3.0**	20			No	0%	0%	1000.0	£100,000	3.0			
													21			No	0%	0%	1000.0	£100,000	3.0			
													22			No	0%	0%	1000.0	£100,000	3.0			
													23			No	0%	0%	1000.0	£100,000	3.0			
													24			No	0%	0%	1000.0	£100,000	3.0			
													25			No	0%	0%	1000.0	£100,000	3.0			
													26			No	0%	0%	1000.0	£100,000	3.0			
													27			No	0%	0%	1000.0	£100,000	3.0			
													28			No	0%	0%	1000.0	£100,000	3.0			
													29			No	0%	0%	1000.0	£100,000	3.0			
													30			No	0%	0%	1000.0	£100,000	3.0			
													31			No	0%	0%	1000.0	£100,000	3.0			
													32			No	0%	0%	1000.0	£100,000	3.0			
													33			No	0%	0%	1000.0	£100,000	3.0			
													34			No	0%	0%	1000.0	£100,000	3.0			
													35			No	0%	0%	1000.0	£100,000	3.0			
													36			No	0%	0%	1000.0	£100,000	3.0			
													37			No	0%	0%	1000.0	£100,000	3.0			
													38			No	0%	0%	1000.0	£100,000	3.0			
													39			No	0%	0%	1000.0	£100,000	3.0			
													40			No	0%	0%	1000.0	£100,000	3.0			

Hazard ID	Baseline Hazard Rank	Residual Hazard Rank	Hazard Area	Hazard Category	Hazard Title	Credible Hazard Outcome ID [Consequence]	Credible Hazard Outcome [Consequence]	Hazard Causes ID [Likelihood]	Hazard Causes [Likelihood]	Baseline Risk - with existing risk controls in place			Risk Reduction								Results	Control Actionee	Complete
										Likelihood	Consequence	Baseline Risk	Risk Control ID.	Additional Risk Control (RC) Measures	Cross-reference Consequence Likelihood	Include Risk Control	% Likelihood Reduction	% Consequence Reduction	Residual Risk Score with RC in place: Likelihood Return Period [yr]	Residual Risk Score with RC in place: Consequence Cost [£]	Residual Risk Score with RC in place: Cumulative Risk Score			
							Damage to vessels		Inadequate/insufficient passage planning					Baseline with no additional risk controls					100.0	£100,000	6.0	Baseline Risk		
							Pollution (Tier 2)		Inadequate traffic managament				1	ESL/PLA/MPA Pilot cutter scheduling and monitoring process		Yes	50%	10%	200.0	£90,000	5.0	6.0		
							Minor to moderate injuries		Use of inappropriate Pilot boarding/landing position				2	Where practicable, prioritise embarking vessels		Yes	40%	30%	333.3	£63,000	4.1			
							Reputational harm		Loss of situational awareness (including radar interference)				3	Planning of critical/high risk vessels with ESL/Pilot/VTS		Yes	80%	20%	1000.0	£50,400	2.7	Baseline Level		
							Corporate liability		Action taken to avoid collision				4			No	0%	0%	1000.0	£50,400	2.7	Moderate		
							Disruption to port operations		Mechanical failure				5			No	0%	0%	1000.0	£50,400	2.7			
									Onboard deficiency				6			No	0%	0%	1000.0	£50,400	2.7	Residual Risk		
									Adverse weather conditions				7			No	0%	0%	1000.0	£50,400	2.7	2.7		
													8			No	0%	0%	1000.0	£50,400	2.7			
													9			No	0%	0%	1000.0	£50,400	2.7			
													10			No	0%	0%	1000.0	£50,400	2.7	Residual Level		
													11			No	0%	0%	1000.0	£50,400	2.7	Minor		
													12			No	0%	0%	1000.0	£50,400	2.7			
													13			No	0%	0%	1000.0	£50,400	2.7	Risk Reduction		
													14			No	0%	0%	1000.0	£50,400	2.7	3.3		
													15			No	0%	0%	1000.0	£50,400	2.7			
													16			No	0%	0%	1000.0	£50,400	2.7			
													17			No	0%	0%	1000.0	£50,400	2.7			
													18			No	0%	0%	1000.0	£50,400	2.7			
													19			No	0%	0%	1000.0	£50,400	2.7			
5	3	6			Grounding of a vessel not at anchor					2	3	6.0	20			No	0%	0%	1000.0	£50,400	2.7			
													21			No	0%	0%	1000.0	£50,400	2.7			
													22			No	0%	0%	1000.0	£50,400	2.7			
													23			No	0%	0%	1000.0	£50,400	2.7			
													24			No	0%	0%	1000.0	£50,400	2.7			
													25			No	0%	0%	1000.0	£50,400	2.7			
													26			No	0%	0%	1000.0	£50,400	2.7			
													27			No	0%	0%	1000.0	£50,400	2.7			
													28			No	0%	0%	1000.0	£50,400	2.7			
													29			No	0%	0%	1000.0	£50,400	2.7			
													30			No	0%	0%	1000.0	£50,400	2.7			
													31			No	0%	0%	1000.0	£50,400	2.7			
													32			No	0%	0%	1000.0	£50,400	2.7			
													33			No	0%	0%	1000.0	£50,400	2.7			
													34			No	0%	0%	1000.0	£50,400	2.7			
													35			No	0%	0%	1000.0	£50,400	2.7			
													36			No	0%	0%	1000.0	£50,400	2.7			
													37			No	0%	0%	1000.0	£50,400	2.7			
													38			No	0%	0%	1000.0	£50,400	2.7			
													39			No	0%	0%	1000.0	£50,400	2.7			
													40			No	0%	0%	1000.0	£50,400	2.7			

Hazard ID	Baseline Hazard Rank	Residual Hazard Rank	Hazard Area	Hazard Category	Hazard Title	Credible Hazard Outcome ID [Consequence]	Credible Hazard Outcome [Consequence]	Hazard Causes ID [Likelihood]	Hazard Causes [Likelihood]	Baseline Risk - with existing risk controls in place			Risk Reduction								Results	Control Actionee	Complete
										Likelihood	Consequence	Baseline Risk	Risk Control ID.	Additional Risk Control (RC) Measures	Cross-reference Consequence Likelihood	Include Risk Control	% Likelihood Reduction	% Consequence Reduction	Residual Risk Score with RC in place: Likelihood Return Period [yr]	Residual Risk Score with RC in place: Consequence Cost [£]	Residual Risk Score with RC in place: Cumulative Risk Score			
							Damage to vessels		Failure to maintain anchor watch					Baseline with no additional risk controls					100.0	£10,000	4.0	Baseline Risk		
							Pollution (Tier 1)		Insufficient VTS oversight				1	Formal charting of Margate Roads Anchorage		No	10%	0%	100.0	£10,000	4.0	4.0		
							Reputational harm		Mechanical failure				2	Undertake responsibility to monitor vessels in Tongue and Margate Roads (VTS Anchor Watch)		No	40%	0%	100.0	£10,000	4.0			
							Corporate liability		Onboard deficiency				3			No	0%	0%	100.0	£10,000	4.0	Baseline Level		
							Disruption to port operations		Adverse weather conditions				4			No	0%	0%	100.0	£10,000	4.0	Minor		
									High density of vessels anchored due to adv				5			No	0%	0%	100.0	£10,000	4.0			
													6			No	0%	0%	100.0	£10,000	4.0	Residual Risk		
													7			No	0%	0%	100.0	£10,000	4.0	4.0		
													8			No	0%	0%	100.0	£10,000	4.0			
													9			No	0%	0%	100.0	£10,000	4.0			
													10			No	0%	0%	100.0	£10,000	4.0	Residual Level		
													11			No	0%	0%	100.0	£10,000	4.0	Minor		
													12			No	0%	0%	100.0	£10,000	4.0			
													13			No	0%	0%	100.0	£10,000	4.0	Risk Reduction		
													14			No	0%	0%	100.0	£10,000	4.0	0.0		
													15			No	0%	0%	100.0	£10,000	4.0			
													16			No	0%	0%	100.0	£10,000	4.0			
													17			No	0%	0%	100.0	£10,000	4.0			
													18			No	0%	0%	100.0	£10,000	4.0			
													19			No	0%	0%	100.0	£10,000	4.0			
6	4	3			Grounding of a vessel at anchor (Margate Roads or Tongue)					2	2	4.0	20			No	0%	0%	100.0	£10,000	4.0			
													21			No	0%	0%	100.0	£10,000	4.0			
													22			No	0%	0%	100.0	£10,000	4.0			
													23			No	0%	0%	100.0	£10,000	4.0			
													24			No	0%	0%	100.0	£10,000	4.0			
													25			No	0%	0%	100.0	£10,000	4.0			
													26			No	0%	0%	100.0	£10,000	4.0			
													27			No	0%	0%	100.0	£10,000	4.0			
													28			No	0%	0%	100.0	£10,000	4.0			
													29			No	0%	0%	100.0	£10,000	4.0			
													30			No	0%	0%	100.0	£10,000	4.0			
													31			No	0%	0%	100.0	£10,000	4.0			
													32			No	0%	0%	100.0	£10,000	4.0			
													33			No	0%	0%	100.0	£10,000	4.0			
													34			No	0%	0%	100.0	£10,000	4.0			
													35			No	0%	0%	100.0	£10,000	4.0			
													36			No	0%	0%	100.0	£10,000	4.0			
													37			No	0%	0%	100.0	£10,000	4.0			
													38			No	0%	0%	100.0	£10,000	4.0			
													39			No	0%	0%	100.0	£10,000	4.0			
													40			No	0%	0%	100.0	£10,000	4.0			

Annex B: Hazard Workshop Log

Hazard ID	Category	Vessel Type	Hazard Detail	Possible Causes	Y/N	Consequences			Most Likely Hazard Occurrence						Worst Credible Hazard Occurrence												Notes
									Consequence				Likelihood 1 in x yrs		Consequence				Likelihood 1 in x yrs								
						Type	Most Likely Outcome	Worst Credible Outcome	People	Property	Environment	Stakeholders	Baseline Risk	Inherent Risk	People	Property	Environment	Stakeholders	Baseline Risk	Inherent Risk	Residual 1 in X return	Baseline Freq	Inherent Freq	Residual Freq	Baseline Risk	Inherent Risk	
1	Collision	Class 1 or 2 vessels	Collision Class 1 or 2 vessel with another navigating vessel	1 - Adverse Environmental Conditions	Yes	Narrative	Glancing Blow	Fire / Sinking / Foundering	2	3	1	1	40	20	4	5	5	4	500	250	0	2.301	2.602		4.01	4.29	Workshop attendees thought collision of Class 1 or 2 vessel was likely to occur twice as often with TEOW in place and no risk controls in place. The inherent likelihood value was therefore increased by 50%.
				2 - Avoiding Other traffic	Yes			Loss Cargo																			
				3 - Constriction of Shipping Routes	Yes			Loss of life																			
				4 - Equipment or Mechanical Failure	Yes			Large vessel / Tanker / Dangerous Goods																			
				5 - Human Error	Yes																						
				6 - Increased Traffic Density	Yes	People	Minor-Single minor injury	Major-Multiple major injuries or single fatality																			
				7 - Loss of UKC	No	Property	Minor damage-Costs £10k –£100k	Catastrophic damage-Costs >£10M																			
				8 - Low Manoeuvrability of Vessels	Yes	Environment	Negligible-Very Small Spill	Catastrophic-Tier 3+																			
				9 - Pilot Transfer Issues	Yes	Stakeholders	Negligible-No significant effects	Major-National adverse media publicity and/or medium-term loss of revenue																			
				10 -																							
2	Collision	Class 3 or 4 Vessels	Collision Class 3 or 4 vessel with another navigating vessel	1 - Adverse Environmental Conditions	Yes	Narrative	Glancing Blow	Fire / Sinking / Foundering	2	2	1	1	30	20	4	5	5	4	400	267	0	2.398	2.574		4.11	4.28	With TEOW in constructed and no risk controls in place the workshop attendees thought that the increase in likelihood of collision for a Class 3 or 4 vessels was not a great as for the Class 1 or 2 vessel, and they would have more sea room following construction of the TEOW (as can pass inshore of NE Racon buoy). With the TEOW constructed and no additional risk controls in place the inherent likelihood return rate was increased by 33%.
				2 - Avoiding Other traffic	Yes			Loss Cargo																			
				3 - Constriction of Shipping Routes	Yes			Loss of life																			
				4 - Equipment or Mechanical Failure	Yes			Vessel / Tanker / Dangerous Goods																			
				5 - Human Error	Yes																						
				6 - Increased Traffic Density	Yes	People	Minor-Single minor injury	Major-Multiple major injuries or single fatality																			
				7 - Loss of UKC	No	Property	Minor damage-Costs £10k –£100k	Catastrophic damage-Costs >£10M																			
				8 - Low Manoeuvrability of Vessels	Yes	Environment	Negligible-Very Small Spill	Catastrophic-Tier 3+																			
				9 - Pilot Transfer Issues	Yes	Stakeholders	Negligible-No significant effects	Major-National adverse media publicity and/or medium-term loss of revenue																			
				10 -																							
3	Collision	Vessel less than 90m	Collision vessel less than 90m with another navigating vessel	1 - Adverse Environmental Conditions	Yes	Narrative	Glancing Blow	Fire / Sinking / Foundering	2	3	1	1	30	20	4	5	4	4	400	267	0	2.398	2.574		4.04	4.21	Workshop attendees thought collision of a vessel less than 90m a similar change as with Class 3 or 4 vessels with the TEOW constructed. With the TEOW constructed and no additional risk controls in place the inherent likelihood return rate was increased by 33%.
				2 - Avoiding Other traffic	Yes		Vessel do not need to slow for Pilot Transfer	Loss Cargo																			
				3 - Constriction of Shipping Routes	Yes			Loss of life																			
				4 - Equipment or Mechanical Failure	Yes			Cargo / Bunker Barge																			
				5 - Human Error	Yes																						
				6 - Increased Traffic Density	Yes	People	Minor-Single minor injury	Major-Multiple major injuries or single fatality																			
				7 - Loss of UKC	No	Property	Minor damage-Costs £10k –£100k	Catastrophic damage-Costs >£10M																			
				8 - Low Manoeuvrability of Vessels	Yes	Environment	Negligible-Very Small Spill	Major-Tier 3																			
				9 - Pilot Transfer Issues	No	Stakeholders	Negligible-No significant effects	Major-National adverse media publicity and/or medium-term loss of revenue																			

Hazard ID	Category	Vessel Type	Hazard Detail	Possible Causes	Y/N	Consequences			Most Likely Hazard Occurrence						Worst Credible Hazard Occurrence												Notes
									Consequence				Likelihood 1 in x yrs		Consequence				Likelihood 1 in x yrs								
						Type	Most Likely Outcome	Worst Credible Outcome	People	Property	Environment	Stakeholders	Baseline Risk	Inherent Risk	People	Property	Environment	Stakeholders	Baseline Risk	Inherent Risk	Residual 1 in X return	Baseline Freq	Inherent Freq	Residual Freq	Baseline Risk	Inherent Risk	
				10 -																							
4	Collision	Fishing or Recreational	Collision Fishing Vessel or recreational craft with another navigating vessel	1 - Adverse Environmental Conditions	Yes	Narrative	Small vessels colliding	Collides with larger vessel (WSV, Cargo, etc.)	2	2	1	2	10	8	5	3	2	4	500	400	0	2.301	2.398		4.15	4.26	Agreement on likelihood of WC outcome was not reached at the workshop. A review of literature published by the Marine Accident Investigation Branch - Analysis of UK Fishing Vessel Safety 1992 to 2006 , shows that for fishing vessels under 12m vessels (typical of those operating in the study area) there were 10 collision/contacts between 1992-2006 that results in vessel loss. The UK under 12m fishing fleet at 2006 was 6119, and therefore the likelihood of vessel loss (note that most vessels lost did not result in multiple fatalities) was 10 losses for 6119 vessels over 14 years. This gives an incident rate for loss of a fishing vessel from collision/contact of 1 in 12,238 per vessel years. The fleet operating in the study area is around 10 vessels, who also operate in other areas, and as such based on national incidents, it would be expected that the area would have a WC likelihood vaule at most 1 in 2000 years. Based on the complexity of traffic profile this could be increased to 1 in 1000 years, and when added to recreational craft incidents which show a similar return rate, then a conservative estimate would be around 1 in 500 year likelihood for the WC assessment. Based on continued navigation (and fishing) of fishing vessels and recreational craft through the windfarm then the workshop agreed that an increase in likelihood for the inherent assessment would be expected of around 20%.
				2 - Avoiding Other traffic	Yes		Glancing Blow / Loss of gear	Crossing / Head on Collision																			
				3 - Constriction of Shipping Routes	Yes		Lighting of WTG - displace fishing vessels	Sinking / Foundering / Capsize																			
				4 - Equipment or Mechanical Failure	Yes		Mostly - potting / netting (less likely trawling) (LOA 8-10m)																				
				5 - Human Error	Yes		Wake / Wash Impacts	* assumes lights as per Kentish Flats																			
				6 - Increased Traffic Density	Yes	People	Minor-Single minor injury	Catastrophic-Multiple fatalities																			
				7 - Loss of UKC	No	Property	Minor damage-Costs £10k –£100k	Moderate damage-Costs £100k -£1M																			
				8 - Low Manoeuvrability of Vessels	Yes	Environment	Negligible-Very Small Spill	Minor-Tier 1																			
				9 - Pilot Transfer Issues	No	Stakeholders	Minor-Bad local publicity and/or possible short-term loss of revenue	Major-National adverse media publicity and/or medium-term loss of revenue																			
				10 -																							
5	Collision	WSV	Collision of WSV working or transiting to from Thanet or other OWF in area with another vessel	1 - Adverse Environmental Conditions	Yes	Narrative	Collides with small vessel at low speed	Collides at speed with other vessel	2	2	1	2	50	40	5	4	2	4	1000	800	0	2	2.097		3.74	3.83	With the TEOW constructed and no additional risk controls in place the inherent likelihood return rate was increased by 20%.
				2 - Avoiding Other traffic	Yes		Glancing blow	Crossing / Head on Collision																			
				3 - Constriction of Shipping Routes	Yes			Sinking / Foundering / Capsize																			
				4 - Equipment or Mechanical Failure	Yes																						
				5 - Human Error	Yes																						
				6 - Increased Traffic Density	Yes	People	Minor-Single minor injury	Catastrophic-Multiple fatalities																			
				7 - Loss of UKC	No	Property	Minor damage-Costs £10k –£100k	Major damage -Costs £1M - £10M																			
				8 - Low Manoeuvrability of Vessels	No	Environment	Negligible-Very Small Spill	Minor-Tier 1																			
				9 - Pilot Transfer Issues	No	Stakeholders	Minor-Bad local publicity and/or possible short-term loss of revenue	Major-National adverse media publicity and/or medium-term loss of revenue																			
				10 -	Yes																						
6	Collision	Pilot Launch	Collision Pilot Launch with another navigating vessel	1 - Adverse Environmental Conditions		Narrative	Slow Speed collision	High speed collision	2	2	1	2	50	40	4	4	2	4	1000	800	0	2	2.097		3.41	3.49	With the TEOW constructed and no additional risk controls in place the inherent likelihood return rate was increased by 20%.
				2 - Avoiding Other traffic			Glancing Blow	Crossing / Head on Collision																			
				3 - Constriction of Shipping Routes			Minimal damage	Significant damage																			
				4 - Equipment or Mechanical Failure																							
				5 - Human Error																							
				6 - Increased Traffic Density		People	Minor-Single minor injury	Major-Multiple major injuries or single fatality																			
				7 - Loss of UKC		Property	Minor damage-Costs £10k –£100k	Major damage -Costs £1M - £10M																			
				8 - Low Manoeuvrability of Vessels		Environment	Negligible-Very Small Spill	Minor-Tier 1																			
				9 - Pilot Transfer Issues		Stakeholders	Minor-Bad local publicity and/or possible short-term loss of revenue	Major-National adverse media publicity and/or medium-term loss of revenue																			
				10 -																							
7	Contact	Class 1 or 2 Vessels	Class 1 or 2 Vessel comes into contact with a WTG or other structure	1 - Adverse Environmental Conditions	Yes	Narrative	Glancing Blow	Fire / Sinking / Foundering	2	2	1	2	50	25	4	4	4	4	600	300	0	2.222	2.523		3.70	3.99	With the TEOW constructed and no additional risk controls in place the inherent likelihood return rate was increased by 50% which is the same increase in likelihood as applied to Haz # 1: Collision Class 1 or 2 vessels.
				2 - Avoiding Other traffic	Yes			Loss Cargo																			
				3 - Constriction of Shipping Routes	Yes			Loss of life																			
				4 - Equipment or Mechanical Failure	Yes			Large vessel / Tanker / Dangerous Goods																			
				5 - Human Error	Yes																						
				6 - Increased Traffic Density	Yes	People	Minor-Single minor injury	Major-Multiple major injuries or single fatality																			
				7 - Loss of UKC	No	Property	Minor damage-Costs £10k –£100k	Major damage -Costs £1M - £10M																			
				8 - Low Manoeuvrability of Vessels	Yes	Environment	Negligible-Very Small Spill	Major-Tier 3																			
				9 - Pilot Transfer Issues	Yes	Stakeholders	Minor-Bad local publicity and/or possible short-term loss of revenue	Major-National adverse media publicity and/or medium-term loss of revenue																			

Hazard ID	Category	Vessel Type	Hazard Detail	Possible Causes	Y/N	Consequences			Most Likely Hazard Occurrence						Worst Credible Hazard Occurrence												Notes
									Consequence				Likelihood 1 in x yrs		Consequence				Likelihood 1 in x yrs								
						Type	Most Likely Outcome	Worst Credible Outcome	People	Property	Environment	Stakeholders	Baseline Risk	Inherent Risk	People	Property	Environment	Stakeholders	Baseline Risk	Inherent Risk	Residual 1 in X return	Baseline Freq	Inherent Freq	Residual Freq	Baseline Risk	Inherent Risk	
				10 -																							
8	Contact	Class 3 or 4 Vessels	Class 3 or 4 Vessel comes into contact with a WTG or other structure	1 - Adverse Environmental Conditions	Yes	Narrative	Glancing Blow	Fire / Sinking / Foundering	2	2	1	2	40	27	4	4	4	4	500	333	0	2.301	2.477		3.78	3.95	With the TEOW constructed and no additional risk controls in place the inherent likelihood return rate was increased by 33% which is the same increase in likelihood as applied to Haz # 2: Collision Class 3 or 4 vessels.
				2 - Avoiding Other traffic	Yes			Loss Cargo																			
				3 - Constriction of Shipping Routes	Yes			Loss of life																			
				4 - Equipment or Mechanical Failure	Yes			Large vessel / Tanker / Dangerous Goods																			
				5 - Human Error	Yes																						
				6 - Increased Traffic Density	Yes	People	Minor-Single minor injury	Major-Multiple major injuries or single fatality																			
				7 - Loss of UKC	No	Property	Minor damage-Costs £10k –£100k	Major damage -Costs £1M - £10M																			
				8 - Low Manoeuvrability of Vessels	Yes	Environment	Negligible-Very Small Spill	Major-Tier 3																			
				9 - Pilot Transfer Issues	Yes	Stakeholders	Negligible-No significant effects	Major-National adverse media publicity and/or medium-term loss of revenue																			
				10 -																							
9	Contact	Vessel less than 90m	Commercial Vessel less than 90m comes into contact with a WTG or other structure	1 - Adverse Environmental Conditions	Yes	Narrative	Slow Speed contact	High speed contact	2	2	1	2	50	33	4	4	4	4	1000	667		2	2.176		3.60	3.75	With the TEOW constructed and no additional risk controls in place the inherent likelihood return rate was increased by 33% which is the same increase in likelihood as applied to Haz # 3: Collision less than 90m length.
				2 - Avoiding Other traffic	Yes		Glancing blow	Significant damage																			
				3 - Constriction of Shipping Routes	Yes		Minimal damage																				
				4 - Equipment or Mechanical Failure	Yes																						
				5 - Human Error	Yes																						
				6 - Increased Traffic Density	Yes	People	Minor-Single minor injury	Major-Multiple major injuries or single fatality																			
				7 - Loss of UKC	No	Property	Minor damage-Costs £10k –£100k	Major damage -Costs £1M - £10M																			
				8 - Low Manoeuvrability of Vessels	Yes	Environment	Negligible-Very Small Spill	Major-Tier 3																			
				9 - Pilot Transfer Issues	No	Stakeholders	Negligible-No significant effects	Major-National adverse media publicity and/or medium-term loss of revenue																			
				10 -																							
10	Contact	WSV	WSV comes into contact with a WTG or other structure whilst navigating	1 - Adverse Environmental Conditions	Yes	Narrative	Slow Speed contact	High speed contact	2	2	1	2	50	40	4	4	2	4	1000	800	0	2	2.097		3.41	3.49	With the TEOW constructed and no additional risk controls in place the inherent likelihood return rate was increased by 20%.
				2 - Avoiding Other traffic	Yes		Glancing blow	Significant damage																			
				3 - Constriction of Shipping Routes	Yes		Minimal damage																				
				4 - Equipment or Mechanical Failure	Yes																						
				5 - Human Error	Yes																						
				6 - Increased Traffic Density	Yes	People	Minor-Single minor injury	Major-Multiple major injuries or single fatality																			
				7 - Loss of UKC	No	Property	Minor damage-Costs £10k –£100k	Major damage -Costs £1M - £10M																			
				8 - Low Manoeuvrability of Vessels	Yes	Environment	Negligible-Very Small Spill	Minor-Tier 1																			
				9 - Pilot Transfer Issues	No	Stakeholders	Minor-Bad local publicity and/or possible short-term loss of revenue	Major-National adverse media publicity and/or medium-term loss of revenue																			
				10 -																							
11	Contact	Fishing or Recreational	Narrative	1 - Adverse Environmental Conditions	Yes	Narrative	Slow Speed contact	High speed contact	2	2	1	1	20	16	4	3	2	3	500	400	0	2.301	2.398		3.36	3.45	With the TEOW constructed and no additional risk controls in place the inherent likelihood return rate was increased by 20%.
				2 - Avoiding Other traffic	Yes		Glancing blow	Significant damage																			
				3 - Constriction of Shipping Routes	Yes		Minimal damage																				
				4 - Equipment or Mechanical Failure	Yes																						
				5 - Human Error	Yes																						
				6 - Increased Traffic Density	Yes	People	Minor-Single minor injury	Major-Multiple major injuries or single fatality																			
				7 - Loss of UKC	No	Property	Minor damage-Costs £10k –£100k	Major damage -Costs £1M - £10M																			
				8 - Low Manoeuvrability of Vessels	Yes	Environment	Negligible-Very Small Spill	Minor-Tier 1																			
				9 - Pilot Transfer Issues	No	Stakeholders	Negligible-No significant effects	Major-National adverse media publicity and/or medium-term loss of revenue																			

Hazard ID	Category	Vessel Type	Hazard Detail	Possible Causes	Y/N	Consequences			Most Likely Hazard Occurrence						Worst Credible Hazard Occurrence												Notes
									Consequence				Likelihood 1 in x yrs		Consequence				Likelihood 1 in x yrs								
						Type	Most Likely Outcome	Worst Credible Outcome	People	Property	Environment	Stakeholders	Baseline Risk	Inherent Risk	People	Property	Environment	Stakeholders	Baseline Risk	Inherent Risk	Residual 1 in X return	Baseline Freq	Inherent Freq	Residual Freq	Baseline Risk	Inherent Risk	
				10 -																							
12	Contact	Pilot Launch	Pilot Launch comes into contact with a WTG or other structure	1 - Adverse Environmental Conditions	Yes	Narrative	Slow Speed contact	High speed contact	2	2	1	1	50	40	4	3	2	3	1000	800	0	2	2.097		3.07	3.15	With the TEOW constructed and no additional risk controls in place the inherent likelihood return rate was increased by 20%.
				2 - Avoiding Other traffic	Yes		Glancing blow	Significant damage																			
				3 - Constriction of Shipping Routes	Yes		Minimal damage																				
				4 - Equipment or Mechanical Failure	Yes																						
				5 - Human Error	Yes																						
				6 - Increased Traffic Density	Yes	People	Minor-Single minor injury	Major-Multiple major injuries or single fatality																			
				7 - Loss of UKC	No	Property	Minor damage-Costs £10k –£100k	Major damage -Costs £1M - £10M																			
				8 - Low Manoeuvrability of Vessels	Yes	Environment	Negligible-Very Small Spill	Minor-Tier 1																			
				9 - Pilot Transfer Issues	Yes	Stakeholders	Negligible-No significant effects	Major-National adverse media publicity and/or medium-term loss of revenue																			
				10 -																							
13	Grounding	Class 1 or 2 Vessels	Displacement or constriction of shipping routes and the loss of depth along cable route results in a Class 1 or 2 vessel running aground.	1 - Adverse Environmental Conditions	Yes	Narrative	Slow Speed grounding	Vessel unable to re-float on same tide / assistance required	2	2	1	2	80	53	3	4	3	5	1000	667	0	2	2.176		3.69	3.83	With the TEOW constructed and no additional risk controls in place the inherent likelihood return rate was increased by 33.33%.
				2 - Avoiding Other traffic	Yes		Re-float on the same tide	Fire / Sinking / Foundering																			
				3 - Constriction of Shipping Routes	Yes			Loss Cargo																			
				4 - Equipment or Mechanical Failure	Yes			Loss of life																			
				5 - Human Error	Yes			Large vessel / Tanker / Dangerous Goods																			
				6 - Increased Traffic Density	Yes	People	Minor-Single minor injury	Major-Multiple major injuries or single fatality																			
				7 - Loss of UKC	Yes	Property	Minor damage-Costs £10k –£100k	Catastrophic damage-Costs >£10M																			
				8 - Low Manoeuvrability of Vessels	Yes	Environment	Minor-Tier 1	Catastrophic-Tier 3+																			
				9 - Pilot Transfer Issues	Yes	Stakeholders	Minor-Bad local publicity and/or possible short-term loss of revenue	Major-National adverse media publicity and/or medium-term loss of revenue																			
				10 -																							
14	Grounding	Class 3 or 4 Vessels	Displacement or constriction of shipping routes and the loss of depth along cable route results in a Class 3 or 4 vessel running aground.	1 - Adverse Environmental Conditions	Yes	Narrative	Slow speed grounding	Higher speed Grounding	2	2	1	2	60	45	3	4	3	5	800	600	0	2.097	2.222		3.78	3.88	With the TEOW constructed and no additional risk controls in place the inherent likelihood return rate was increasedincreased by 25%.
				2 - Avoiding Other traffic	Yes		Vessel touches bottom	Vessel firmly aground																			
				3 - Constriction of Shipping Routes	Yes		Vessel re-floats on same tide	Vessel is not re-floated on same tide																			
				4 - Equipment or Mechanical Failure	Yes																						
				5 - Human Error	Yes																						
				6 - Increased Traffic Density	Yes	People	Minor-Single minor injury	Major-Multiple major injuries or single fatality																			
				7 - Loss of UKC	Yes	Property	Minor damage-Costs £10k –£100k	Catastrophic damage-Costs >£10M																			
				8 - Low Manoeuvrability of Vessels	Yes	Environment	Minor-Tier 1	Catastrophic-Tier 3+																			
				9 - Pilot Transfer Issues	Yes	Stakeholders	Minor-Bad local publicity and/or possible short-term loss of revenue	Major-National adverse media publicity and/or medium-term loss of revenue																			
				10 -																							
15	Grounding	Vessel less than 90m	Displacement or constriction of shipping routes and the loss of depth along cable route results in a vessel less than 90m running aground.	1 - Adverse Environmental Conditions	Yes	Narrative	Slow speed grounding	Higher speed Grounding	2	2	1	2	60	48	3	4	3	4	500	400	0	2.301	2.398		3.53	3.62	With the TEOW constructed and no additional risk controls in place the inherent likelihood return rate was increased by 20%.
				2 - Avoiding Other traffic	Yes		Vessel touches bottom	Vessel firmly aground																			
				3 - Constriction of Shipping Routes	Yes		Vessel re-floats on same tide	Vessel is not re-floated on same tide																			
				4 - Equipment or Mechanical Failure	Yes																						
				5 - Human Error	Yes																						
				6 - Increased Traffic Density	Yes	People	Minor-Single minor injury	Major-Multiple major injuries or single fatality																			
				7 - Loss of UKC	Yes	Property	Minor damage-Costs £10k –£100k	Catastrophic damage-Costs >£10M																			
				8 - Low Manoeuvrability of Vessels	Yes	Environment	Minor-Tier 1	Catastrophic-Tier 3+																			
				9 - Pilot Transfer Issues	No	Stakeholders	Minor-Bad local publicity and/or possible short-term loss of revenue	Major-National adverse media publicity and/or medium-term loss of revenue																			

Hazard ID	Category	Vessel Type	Hazard Detail	Possible Causes	Y/N	Consequences			Most Likely Hazard Occurrence						Worst Credible Hazard Occurrence												Notes
									Consequence				Likelihood 1 in x yrs		Consequence				Likelihood 1 in x yrs								
						Type	Most Likely Outcome	Worst Credible Outcome	People	Property	Environment	Stakeholders	Baseline Risk	Inherent Risk	People	Property	Environment	Stakeholders	Baseline Risk	Inherent Risk	Residual 1 in X return	Baseline Freq	Inherent Freq	Residual Freq	Baseline Risk	Inherent Risk	
				10 -																							
16	Grounding	Fishing or Recreational	Displacement or constriction of shipping routes and the loss of depth along cable route results in a Fishing vessel or recreational vessel running aground.	1 - Adverse Environmental Conditions	Yes	Narrative	Slow speed grounding	Higher speed Grounding	2	1	1	2	25	23	4	3	2	3	1250	1125	0	1.903	1.949		3.15	3.19	With the TEOW constructed and no additional risk controls in place the inherent likelihood return rate was increased by 10%.
				2 - Avoiding Other traffic	Yes		Vessel touches bottom	Vessel firmly aground																			
				3 - Constriction of Shipping Routes	Yes		Vessel re-floats on same tide	Vessel is not re-floated on same tide																			
				4 - Equipment or Mechanical Failure	Yes																						
				5 - Human Error	Yes																						
				6 - Increased Traffic Density	Yes	People	Minor-Single minor injury	Major-Multiple major injuries or single fatality																			
				7 - Loss of UKC	No	Property	Negligible-Costs <£10k	Moderate damage-Costs £100k -£1M																			
				8 - Low Manoeuvrability of Vessels	Yes	Environment	Negligible-Very Small Spill	Minor-Tier 1																			
				9 - Pilot Transfer Issues	No	Stakeholders	Minor-Bad local publicity and/or possible short-term loss of revenue	Moderate-Bad widespread publicity and/or short-term loss of revenue																			
				10 -																							
17	Grounding	WSV	Displacement or constriction of shipping routes and the loss of depth along cable route results in a WSV vessel running aground.	1 - Adverse Environmental Conditions	Yes	Narrative	Slow speed grounding	Higher speed Grounding	2	2	1	2	25	23	4	3	2	4	1250	1125	0	1.903	1.949		3.42	3.46	With the TEOW constructed and no additional risk controls in place the inherent likelihood return rate was increased by 10%.
				2 - Avoiding Other traffic	Yes		Vessel touches bottom	Vessel firmly aground																			
				3 - Constriction of Shipping Routes	Yes		Vessel re-floats on same tide	Vessel is not re-floated on same tide																			
				4 - Equipment or Mechanical Failure	Yes																						
				5 - Human Error	Yes																						
				6 - Increased Traffic Density	Yes	People	Minor-Single minor injury	Major-Multiple major injuries or single fatality																			
				7 - Loss of UKC	No	Property	Minor damage-Costs £10k –£100k	Moderate damage-Costs £100k -£1M																			
				8 - Low Manoeuvrability of Vessels	Yes	Environment	Negligible-Very Small Spill	Minor-Tier 1																			
				9 - Pilot Transfer Issues	No	Stakeholders	Minor-Bad local publicity and/or possible short-term loss of revenue	Major-National adverse media publicity and/or medium-term loss of revenue																			
				10 -																							
18	Grounding	Pilot Launch	Displacement or constriction of shipping routes and the loss of depth along cable route results in a Pilot Launch running aground.	1 - Adverse Environmental Conditions	Yes	Narrative	Slow speed grounding	Higher speed Grounding	2	2	1	2	40	36	4	3	2	4	2000	1800	0	1.699	1.745		3.25	3.28	With the TEOW constructed and no additional risk controls in place the inherent likelihood return rate was increased by 10%.
				2 - Avoiding Other traffic	Yes		Vessel touches bottom	Vessel firmly aground																			
				3 - Constriction of Shipping Routes	Yes		Vessel re-floats on same tide	Vessel is not re-floated on same tide																			
				4 - Equipment or Mechanical Failure	Yes																						
				5 - Human Error	Yes																						
				6 - Increased Traffic Density	Yes	People	Minor-Single minor injury	Major-Multiple major injuries or single fatality																			
				7 - Loss of UKC	No	Property	Minor damage-Costs £10k –£100k	Moderate damage-Costs £100k -£1M																			
				8 - Low Manoeuvrability of Vessels	Yes	Environment	Negligible-Very Small Spill	Minor-Tier 1																			
				9 - Pilot Transfer Issues	No	Stakeholders	Minor-Bad local publicity and/or possible short-term loss of revenue	Moderate-Bad widespread publicity and/or short-term loss of revenue																			
				10 -																							

Annex C: Maximum Design Scenario 110 m WTG Diameter Chart

GoBe VATTENFALL

THANET EXTENSION OFFSHORE WIND FARM

Maximum Design Scenario 110m WTG Diameter

Legend

- Order Limits
- Indicative WTG Locations
- Structures Exclusion Zone
- Maximum Design Scenario 110m WTG Diameter

This turbine layout is purely indicative and has been produced for the purposes of seascape, landscape and visual impact assessment only.

Datum: ETRS 1989
Projection: UTM 31N

Scale @ A1 - 1:50,000 (0 1.5 3 km)

Drg No	MDS_110m_WTG_Diameter		
Rev	D	Date	03/04/2019
By	RM	Check	SL