



# Sheringham Shoal and Dudgeon Offshore Wind Farm Extension Projects

## Waveney Helicopter Access Supplementary Analysis

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## **Sheringham & Dudgeon Wind Farm Extension**

## **Waveney Helicopter Access Supplementary Analysis**

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Revision Number	Date	Summary of Change
00	04 May 2023	Initial Draft
01	12 May 2023	Updated with Client Comments

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## Abbreviations Table

Abbreviation	Definition
°	Degrees Magnetic
°C	Degrees Celsius
AW139	AgustaWestland 139
CAA	Civil Aviation Authority
CAP	Civil Aviation Publication
CAT	Commercial Air Transport
DEP	Dudgeon Extension Project
ft	Foot
hPa	Hectopascal Pressure Unit. 1 hPa = 1 millibar
IMC	Instrument Meteorological Conditions
kt	Knot
m	Metre
MGN	Marine Guidance Notice
nm	Nautical Mile
NPI	Non-Productive Installation
NUI	Normally Unmanned Installation
OEI	One Engine Inoperative
Radar	Radio Detection and Ranging
SAR	Search and Rescue
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions

## 1 Introduction

1. Following the Dudgeon Extension Project (DEP) Issue Specific Hearing on 31 March 2023 that addressed helicopter access to the Waveney Platform in relation to **Environmental Statement Chapter 16 – Petroleum Industry and Other Marine Users** [APP-109], the **Examining Authority’s Second Written Questions (WQ2)** [PD-012] were published. This note addresses Questions Q2.21.1.2 and Q2.21.1.4.

2. Question 2.21.1.2 asked:

*The Applicant’s submitted Helicopter Access Study [APP205, Paragraph 54] states that - “If an obstacle free circle of circa 1nm could be provided, then approaches and take-off under Day VMC conditions could be conducted safely. That would increase the daylight access from approximately 14.6% to 92.3% (2020) of day conditions”.*

*Given the disagreement between parties at ISH6 [EV-086] [EV-090], over the accuracy of these figures, provide a set of jointly produced comparative calculations based on current guidance and restrictions.*

3. For Question 2.21.1.2, there are two main issues to address: firstly, the distance required for an approach and take-off which is addressed in Section 2.3.4 and Section 2.3.5 respectively; and secondly, the helicopter access to the Waveney platform under the current Commercial Air Transport Regulations (CAT) (Section 3.1.1).

4. Question 2.21.1.4 asked:

*Provide detail on any emerging guidance relating to helicopter access to installations such as that at Waveney from the CAA or that involved with Hornsea Project 4, as referred to in ISH6 [EV-086] [EV-090].*

5. Question 2.21.1.4 addresses the potential for the Civil Aviation Authority (CAA) to impose slightly higher weather limits for flights close to wind farms. As both the Applicant’s aviation specialist and Perenco’s aviation specialist have seen a draft of the CAA proposals, the impact of this change can also be considered. The result of these calculations are provided in Section 3.1.2.

6. A meeting was held between the Applicant’s aviation specialist and Perenco’s aviation specialist on 26 April 2023. The Perenco specialist was representing Bond Helicopters, which will commence the Perenco aviation contract from January 2024, replacing the incumbent, Bristow Helicopters. Prior to the meeting additional data and working assumptions had been exchanged between the parties.

## 2 Data and Working Assumptions

### 2.1 Meteorological Data

7. Previously Perenco had provided the Applicant with meteorological data from the West Sole Alpha platform. The data had been sampled at 10-minute intervals between 15 January 2020 and 16 July 2021, resulting in 78,790 samples in total. The results from the analysis of that data are reported in **Environmental Statement Appendix 16.2 – Helicopter Access Study** [APP-205]. This set of data will be referred to as dataset 1.
8. Prior to the specialists' meeting, Perenco provided additional data from the West Sole Alpha covering the period 1 January 2021 to 31 December 2022. This second tranche of data was recorded on an hourly frequency, resulting in 17,477 samples in total. This set of data will be referred to as dataset 2. It was agreed that the different sampling frequency made it difficult to merge the data and so they would be assessed as separate data sets.

### 2.2 Indicative layouts

9. Two indicative layouts for DEP were provided to Perenco by the Applicant. These showed potential layouts for 15MW and 26MW wind turbines as illustrated in **Environmental Statement Appendix 13.1 – Navigation Risk Assessment** [APP-198] and **Environmental Statement Chapter 15 Figures – Seascape and Visual Impact Assessment – Part 2 of 18** [APP-136].

### 2.3 Working Assumptions

10. A number of assumptions were agreed.

#### 2.3.1 Rate of Turn to be Applied

11. A Rate 1 Turn, that results in a turn rate of  $3^{\circ}$  per second would be applied to all turns.

#### 2.3.2 Approach and Departure Speed

12. The approach speed to the stabilisation point on approach and post take-off was agreed at 80 kts. The combination of rate of turn and aircraft speed determines the distance necessary to make a turn.

#### 2.3.3 Stabilisation Point on Approach

13. A number of accidents have occurred both in commercial airlines and offshore helicopters due to unstable approaches. The helicopter operators have adopted aviation industry best practice and apply stabilised approach criteria during an approach. Basically, this requires the crew to be on the correct flightpath, at a fixed airspeed and power, with all checks complete at a fixed distance before landing. The helicopter industry collaborated through

their trade body, HeliOffshore, to develop Flightpath Management Guidance<sup>1</sup>. The latest stabilisation point in the guidance is shown as 0.5nm, which is also the distance used by Perenco’s current helicopter contractor, Bristow Helicopters. During the meeting it was stated that Bond Helicopters use a stabilisation point at 0.75nm due to the minimum range of their radar. The radar is used to cross check the distance to the landing point against the navigation system to confirm the correct deck is being approached. Worldwide, a number of incidents have occurred where a helicopter has landed on the wrong helideck. However in the case of Waveney there are no nearby platforms and so the risk of a “wrong deck landing” is extremely remote. Therefore, during the meeting it was agreed that a stabilisation point at 0.5nm could be applied, as it is line with Perenco’s current operator. By adopting a 0.5nm stabilisation point Bond Helicopters would require a change to their draft Operations Manual and some additional crew training.

### 2.3.4 Approach Distance Required

14. Applying a stabilisation point at 0.5nm, and the agreed turn and speed criteria, the minimum approach distance required was calculated as 1.01nm. This is the distance between the platform helideck and the closest wind turbine tip. The distance to the closest turbine tip should be used for determining the obstacle free environment as this is independent of the size of wind turbine eventually installed.

### 2.3.5 Take-off Distance Required

15. The take-off distance must take into account the remote possibility of an engine failure during the take-off; this is known as a One Engine Inoperative (OEI) condition. A worse case assumption is that the engine fails immediately on rotation from the helideck. The take-off performance will vary with the ambient wind temperature and pressure, with higher pressure and lower temperature improving performance.
16. The two aviation specialists agreed that the AW139 maximum offshore take-off mass from Waveney of 6,800kg should be the basis for the take-off distance assessment. However, it should be noted that a lower take-off mass is usually sufficient to provide a full payload of 12 passengers from Waveney to Norwich Airport. The relevant performance graphs from Supplement 50 in the AW139’s Rotorcraft Flight Manual were agreed.
17. For his OEI calculations, the Applicant’s specialist used a pressure of 1013 hPa and a temperature of 20°C. Perenco’s specialist chose a lower pressure of 993 hPa and a temperature of 20°C. In the opinion of the Applicant’s specialist 993 hPa and 20°C is an extreme case. Dataset 1 contained pressure data, which dataset 2 did not. Dataset 1 contained 78,790 samples, of which only one single 10-minute period had a pressure as low as 993 hPa with a temperature as high as 20°C. In comparison, there were 36,652 10-minute periods when the pressure was 1013 hPa or higher. The Mean pressure over the

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18 months of data was 1010 hPa. Therefore, the Applicant's calculations are considered to be conservative based on the historical data.

18. Applying the Applicant's environmental conditions of 1013 hPa and 20°C the OEI distance required, followed by a 30° turn away from any obstacle was 0.97nm. The Applicant's aviation specialist chose a 30° turn as that is sufficient to avoid a turbine in the take-off flightpath. The Perenco distance, using 993 hPa and 20°C, followed by a turn of 90° resulted in a distance of 1.32nm. The Perenco aviation specialist applied a turn of 90° as his calculations were conducted prior to the meeting, without the benefit of seeing the indicative DEP turbine layout.
19. It was agreed that if the final wind turbine layout was similar to the DEP indicative turbine layouts provided by the Applicant (realistic worst case scenarios for 15MW and 26MW wind turbines respective to navigation risk and seascape and visual impacts illustrated in **Environmental Statement Appendix 13.1 – Navigation Risk Assessment** [APP-198] and **Environmental Statement Chapter 15 Figures – Seascape and Visual Impact Assessment – Part 2 of 18** [APP-136]), then OEI distance required was not a factor as the wind turbines were spaced sufficiently to be avoided. These layouts were provided to aid discussion and discussion is ongoing about how an agreement may be reached.

### 3 Weather Dependent Helicopter Access

20. The Waveney platform is only approved for daytime operations. It is assumed in **Environmental Statement Appendix 16.2 – Helicopter Access Study** [APP-205] that only operations under Visual Meteorological Conditions (VMC) will be permitted after DEP is constructed. At present flights to Waveney can be flown under both VMC and Instrument Meteorological Conditions (IMC), so the potential loss of access under IMC will be assessed. During decommissioning, a Non-Productive Installation (NPI), such as a jack-up platform, will be positioned over Waveney; these installations are usually equipped with a helideck approved for night flying. Therefore, for any period of time when a NPI is located at Waveney, the potential loss of night flying should be considered.

21. Dataset 2 for 2021 and 2022 recorded hourly data. It was agreed between the Applicant and Perenco that the following parameters would be used to calculate VMC, IMC and no-fly conditions:

- Timestamp – date and time
- Visibility- recorded in metres
- Windspeed – recorded in kts
- Cloud height1- lowest cloud (cloud base) recorded in ft
- Wind direction 2 – recorded in degrees
- Air temperature – recorded in degrees Celsius
- Dew point - recorded in degrees

The current day VMC conditions require a cloud base of 600ft or higher and a visibility of 4,000m or higher. IMC are when the weather is below VMC limits. No-fly conditions exist when the cloud base and visibility are too low for an Airborne Radar Approach, there are icing conditions present at the lowest available transit height, or the wind speed exceeds 60 kt. A more detailed explanation of no-fly conditions is given in Section 2.2.6 of **Environmental Statement Appendix 16.2 – Helicopter Access Study** [APP-205]. A sea state with the Significant Wave Height above 6m is also a limit for the AW139 helicopter but was not applied as dataset 1 was missing that parameter.

#### 3.1 DAY VMC and IMC

##### 3.1.1 Current Limitations

22. For operations to the Waveney platform only day conditions need to be considered. The Day VMC results for 2020 are shown in **Environmental Statement Appendix 16.2 – Helicopter Access Study** [APP-205]. Following the exchange of dataset 2, the Applicant and Perenco specialists compared their results, and it was agreed they were very similar. The Applicants figures are shown in Table 3.1.

**Table 3.1 Day VMC, IMC and No Fly Conditions**

Condition	2020 <sup>Note</sup> Dataset 1	2021 Dataset 2	2022 Dataset 2
Day VMC	92.3%	94.5%	95.4%
Day IMC	7.7%	5.5%	4.6%
Day No-Fly Conditions	4.6%	1.9%	3.1%
Day Usable IMC (IMC minus No-Fly)	3.1%	3.6%	1.5%

Note: Table 4.2 of **Environmental Statement Appendix 16.2 – Helicopter Access Study** [APP-205].

### 3.1.2 Proposed New CAA Limitations

23. The CAA is consulting on operational limits within 3nm of wind farms. The Applicant and Perenco aviation specialists have seen the draft proposal and agree the following should be applied to this analysis:

- Day VMC only operations within 3nm of a wind farm; and
- Within 3nm of a wind farm, the VMC limits are increased from a minimum cloud base of 600ft to 700ft with the visibility increased from a minimum of 4,000m to 5,000m.

24. Table 3.2 shows the difference between the current VMC and proposed VMC access.

**Table 3.2 Day VMC Under Current and Proposed Minima**

Condition	2020 Dataset 1	2021 Dataset 2	2022 Dataset 2
Current Day VMC Cloud base >=600ft AND Visibility >=4000m	93.2%	94.5%	95.4%
Draft Day VMC Limitations Cloud base >=700ft AND Visibility >=5000m	90.8%	93.3%	94.7%
Loss of DAY VMC	2.4%	1.2%	0.7%

25. Under the proposed CAA change, the percentage of day VMC access will reduce slightly, the percentage of IMC will increase slightly, the percentage of no-fly conditions will remain unchanged. Table 3.3 updates the figures shown in Table 3.1 to reflect this change.

**Table 3.3 Day VMC, IMC and No Fly Conditions- Applying CAA Draft Limits**

Condition	2020 Dataset 1	2021 Dataset 2	2022 Dataset 2
Day VMC	90.8%	93.3%	94.7%
Day IMC	9.2%	6.7%	5.3%
Day No-Fly Conditions	4.6%	1.9%	3.1%
Day Usable IMC (IMC minus No-Fly)	4.6%	4.8%	2.2%

26. The increased weather limits will have a minor impact on day helicopter access to the Waveney platform.

### 3.2 Night VMC and IMC

27. Due to a lack of specific equipment installed, flights to the Waveney platform are constrained to day operations. A NPI located over Waveney would normally be equipped for night operations and so the loss of night access needs to be considered. This is a logistic issue which can usually be overcome, as flights can be scheduled to take place in daylight. Any emergency flights for sick or injured personnel would be flown by MCA helicopters who operate under Civil Aviation Publication 999, permitting greater flexibility and lower day and night weather limits.

28. CAT flights to a NPI would be limited by the Norwich Airport opening times, promulgated as 06:00 to 21:30<sup>2</sup>. It was agreed by the Applicant and Perenco that the earliest flight arrival at Waveney would be the airport opening time plus 30 minutes (06:30hrs) and the latest take-off time from Waveney would be the airport closing time minus 30 minutes (21:00hrs). Table 3.4 shows the time when night flights can currently be conducted to any NPI over Waveney, before DEP is constructed.

29. Night VMC limits are a minimum cloud base of 1200ft AND a minimum visibility of 5,000m.

**Table 3.4 Night Flights to NPI over Waveney**

Condition	2020 Dataset 1	2021 Dataset 2	2022 Dataset 2
Total Hours of Night	3582 <sup>Note 1</sup>	3822	3816
Hours of Available Night (Norwich Airport Open +30 mins Closed -30 mins)	721 <sup>Note 2</sup>	941	941

<sup>2</sup>

Condition	2020 Dataset 1	2021 Dataset 2	2022 Dataset 2
Current Percentage of Night Operating Hours Available	20.1%	24.6%	24.7%

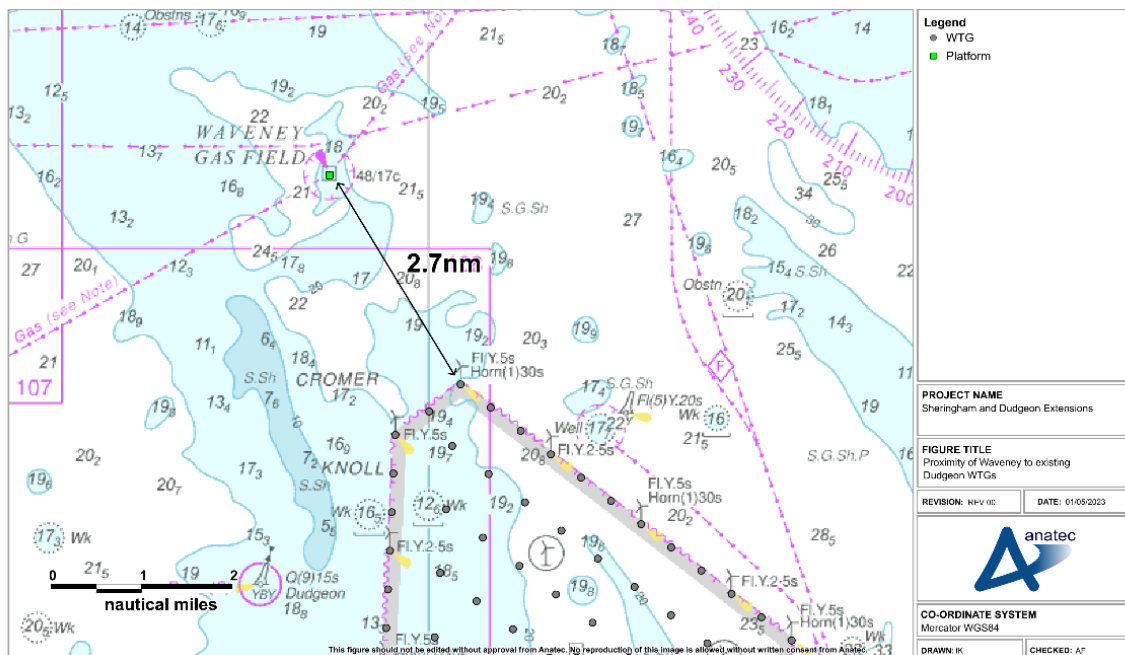
**Note1:** Data 1 starts 15/1/2020 at 12:10

**Note2:** As Dataset 1 is recorded every 10 minutes, it provided a more accurate assessment of total night and available night hours.

30. Even with a suitably equipped NPI located over Waveney, the number of available night operating hours to Waveney is constrained by the Norwich Airport opening times; for example, only 24.7% of all night hours in 2022 are actually available for flights to Waveney.

### 3.2.1 Proposed New CAA Regulations

31. The draft CAA regulations will prohibit night flights within 3nm of a wind farm. The current Dudgeon wind farm is within 3nm of Waveney, with the closest turbine 2.7nm away, as shown in Figure 3.1. If the CAA implements the new regulations in full, then no night CAT operations will be possible to a NPI over Waveney and so DEP will have no material impact on night access.



**Figure 3.1 Proximity of Dudgeon Wind Farm Turbines to the Waveney Platform**

32. Historically, the CAA has provided dispensations to operators, providing they are supported by a safety case. Based on previous cases, it is possible that the CAA will provide a limited dispensation for night operations.

### 3.2.2 Potential Night Operations Under a CAA Dispensation

33. If a dispensation from day only operations was granted by the CAA, then some limited night operations might be possible to an NPI located at Waveney. It was agreed that, subject to a CAA dispensation, approaches when the wind was from 110° clockwise to 240° could be conducted safely. These approaches would be flown into wind, i.e. from the reciprocal of the wind direction, and permit a night stabilised approach point at 2nm or greater. The percentage of time when a Night VMC approach could be conducted, with the wind from the appropriate direction, and Norwich Airport open is shown in Table 3.5.

**Table 3.5 Night Flights to NPI over Waveney**

Condition	2020 Dataset 1	2021 Dataset 2	2022 Dataset 2
Total Night Hours	3582 <sup>Note 1</sup>	3822	3816
Hours of Night VMC Approaches post DEP Available Night AND VMC AND Wind from the safe arc	335	335	421
Percentage of Available Night Access Dependant on a CAA dispensation	46.5%	35.6%	44.7%

**Note1:** Data 1 starts 15/1/2020 at 12:10

## 4 Summary

34. The distance necessary for an approach was agreed as 1.01nm.
35. The Applicant's calculation of the OEI take-off distance required was 0.97nm and Perenco's distance was 1.32nm. The Applicant believes that their temperature and pressure assumptions are sufficiently conservative whilst Perenco's are excessively conservative. Notwithstanding this difference, both parties agreed that if, for example, the final wind turbine layout is similar to the indicative drawings provided, the OEI take-off distance required will not reduce helicopter access. These example layouts were provided to aid discussion which is ongoing about how an agreement may be reached.
36. The meteorological data supplied by Perenco demonstrates that the impact of DEP on operations to the Waveney platform will be minor. See Table 3.1.
37. The updated meteorological limits proposed by the CAA will only have a minor impact of day access to the Waveney platform. For example, the day VMC access in 2021 reduced from 94.5% to 93.3%.
38. The existing Dudgeon wind farm has wind turbines within 3nm of Waveney. If the CAA implements their draft regulations in full, then all future flights to any helideck located over Waveney will be day VMC only (including any NPI operations). In this case DEP will have no additional impact on night operations, as they will already be forbidden. The CAA may issue a helicopter operator with a dispensation from the regulations, when supported by a safety case. If a dispensation is provided, then some limited night operations to a helideck at the Waveney site may be possible.
39. Subject to a CAA dispensation, when a NPI is located at Waveney, some night access, subject to Norwich Airport opening times, will be available. Table 3.4 shows the available night access when Norwich Airport is open: the access varies between 20.1% and 24.7%.
40. A CAA dispensation might also allow night operations after DEP is constructed. Both parties agreed that safe approaches could be made when the wind is from an arc 110° clockwise to 240°. This access is reported in Table 3.5: of the available hours of night access based on Norwich Airport opening hours, the access varies between 35.6% and 44.7%.