



# Morecambe Offshore Windfarm: Generation Assets Environmental Statement

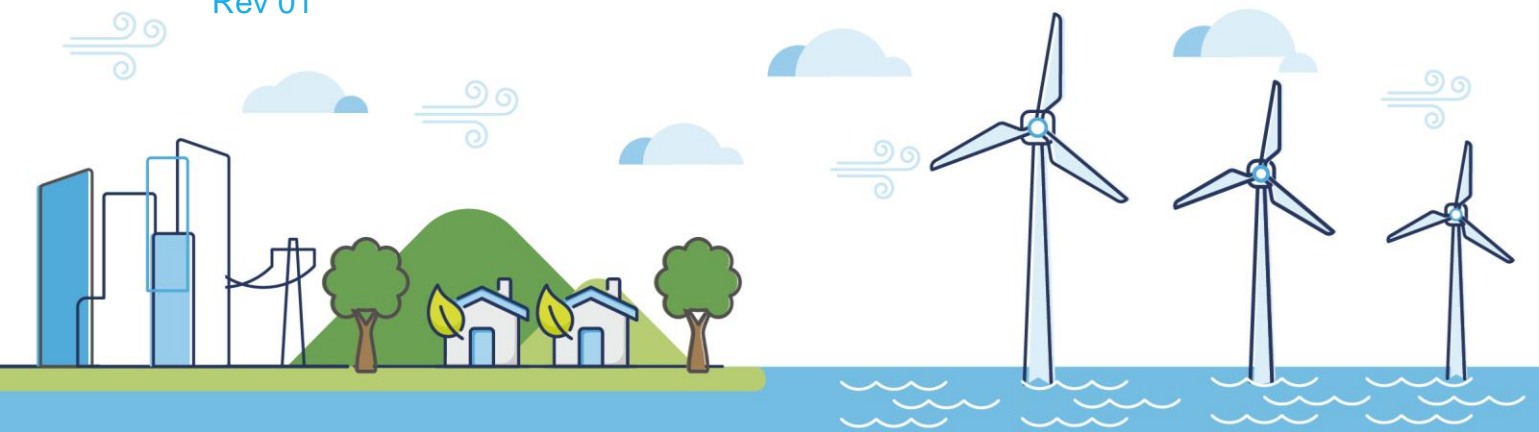
## Volume 5

### Appendix 16.3 Other Instrument Flight Procedure Assessments

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# Morecambe Offshore Windfarm Generation Assets

## Safeguarding Assessment Instrument Flight Procedures (IFPs)

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# Executive Summary

Osprey CSL has been commissioned by Offshore Wind Limited to assess the potential impact of Morecambe Offshore Windfarm Generation Assets in the vicinity of Manchester, Liverpool John Lennon, Isle of Man Ronaldsway, Warton, Walney, RAF Woodvale and RAF Valley Airports, with turbine tip heights of 315m Above Mean Sea Level (AMSL).

This report includes an assessment of the potential impact the Windfarm may have in relation to the Instrument Flight Procedures (IFPs) serving each of the airports.

## IFPs

**For a summary of the Potential Impact to IFPs see below table:**

*NOTE: A full IFP review will need to be conducted by the Approved Procedure Design Organisation (APDO) for each Airport at the relevant stage in the planning process. Any actions suggested in this report will need to be agreed and developed with the individual Airport Safeguarding Teams through their appointed APDO. Any mitigation or redesign must be actioned by the Procedure Sponsor (Airport). This Impact Assessment highlights those procedures that may be impacted but is not a formal IFP Safeguarding Review as defined by UK CAA CAP 738 or an APDO Review as defined by CAP785. Such formal reviews will be required through separate commercial agreement between the developer and the individual Airports.*

Airport	Morecambe Offshore Windfarm Generation Assets
Manchester	No Impact on IFPs.
Liverpool	No Impact on IFPs.
Warton	<p><b>Potential impact on MSA 25NM WTN TAC SW Sector.</b> MOCA needs increasing from 1800ft to 2100ft. See Section 4.1.20</p> <p><b>Potential impact on MSA 25NM WTN NDB SW Sector.</b> MOCA needs increasing from 1800ft to 2100ft. See Section 4.1.20</p>
Isle of Man	No Impact on IFPs.
Valley	<p><b>Potential impact on ATCSMAC 1500ft QNH 1400ft QFE SMAA.</b> MOCA needs increasing to 2100ft QNH 2000ft QFE. See Section 6.2.1</p>
Walney	<b>Potential impact on RNP RWY 35.</b> MOCA for 10NM TAA UVNUB needs to be increased from 1900ft to 2100ft.

	<p>See Section 7.1.4</p> <p><b>Potential impact on MSA 25NM NDB(L) WL SW Sector. MOCA needs increasing from 1800ft to 2100ft.</b></p> <p>See Section 7.1.10.</p>
Woodvale	NA

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# 1 Introduction

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## 1.1 Overview

Osprey CSL has been commissioned by Offshore Wind Limited to assess the potential impact of Morecambe Offshore Windfarm Generation Assets in the vicinity of Manchester, Liverpool John Lennon, Isle of Man Ronaldsway, Warton, Walney, RAF Woodvale and RAF Valley Airports, with turbine tip heights of 315m Above Mean Sea Level (AMSL).

This report includes an assessment of the potential impact the Windfarm may have in relation to the Instrument Flight Procedures (IFPs) serving each of the airports.

## 1.2 Scope

This report assesses the windfarm in relation to the IFPs at each airport and has been completed with the use of the latest published procedures in the State Aeronautical Information Publication (AIP), AIRAC 11/2023 effective date 02 NOV 2023. Also, the UK Military AIP, AIRAC Cycle 2311, effective date 02 NOV 23.

The survey data used is the SLC Aerodrome Survey Report dated Sep 2021 for Manchester Airport, Paul Fassam Geomatics Survey Report dated Sep 2021 for Liverpool Airport, Pell Frischmann Survey Report dated Sep 2021 for RAF Valley and Pell Frischmann Survey Report dated Aug 2021 for BAE Warton. For the remaining airfields, the key point to define the procedures were sourced from the AIP. Autodesk AutoCAD, ASD PD Toolkit and ICAO Software was used to compile drawings and evaluate the potential impact.

## 1.3 Data Provided by Client

The client provided shapefiles for the proposed windfarm which were converted to Lat/Long files in UTM84-30N using Global Mapper software to provide a compatible format which could be uploaded into AutoCAD.

The client provided estimated maximum turbine tip elevations of 315m above mean sea level (AMSL). This was confirmed via email on the 2<sup>nd</sup> November 2023.

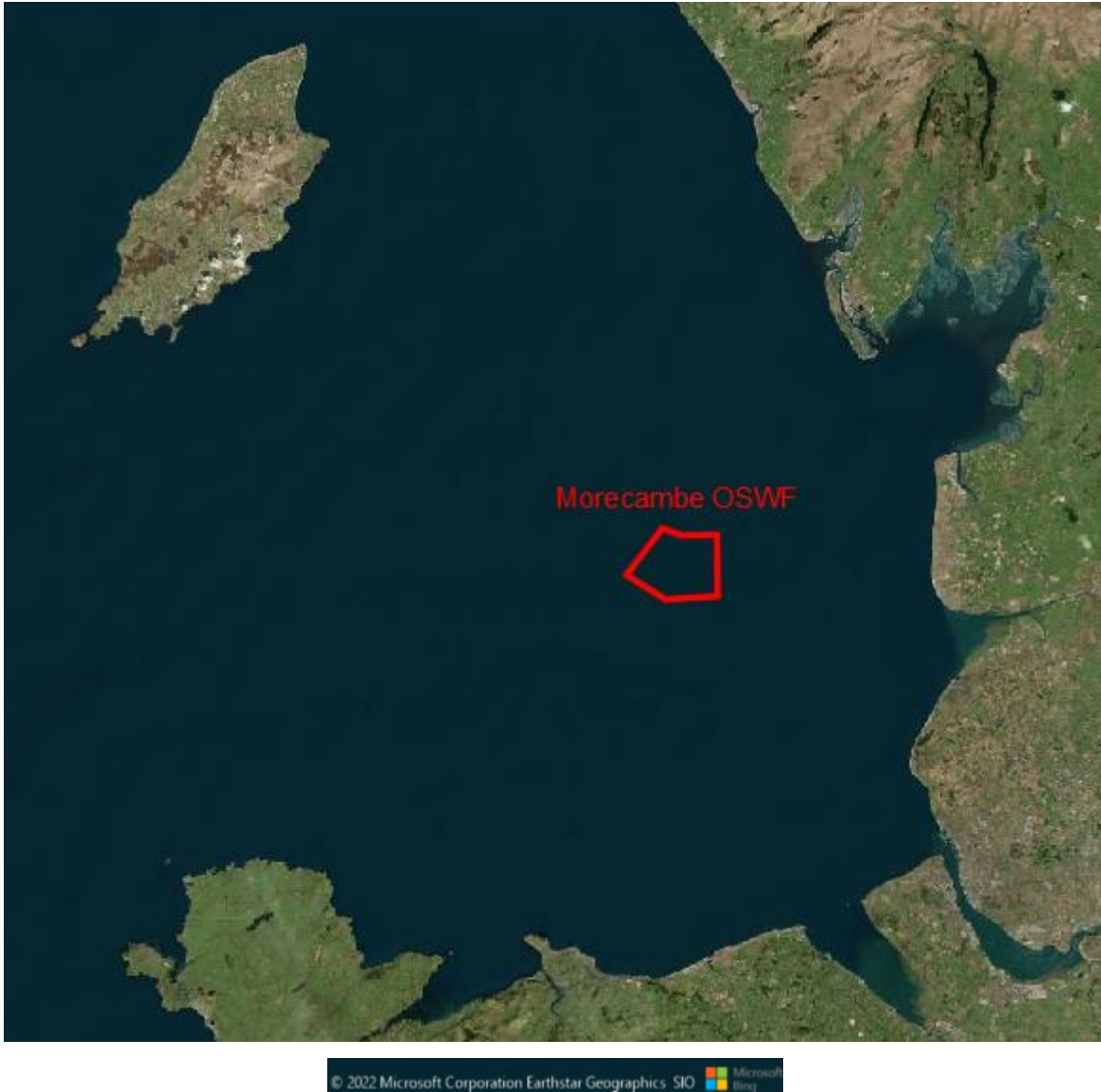


Figure 1 – Development Boundaries

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All Figures shown in this report that contain an Aerial Map Background, are from Autodesk AutoCAD 2019 embedded Online Maps Data.  
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## 1.4 Obstacle and Orientation

The site location was added to the AutoCAD Model with distance to the airports shown below:

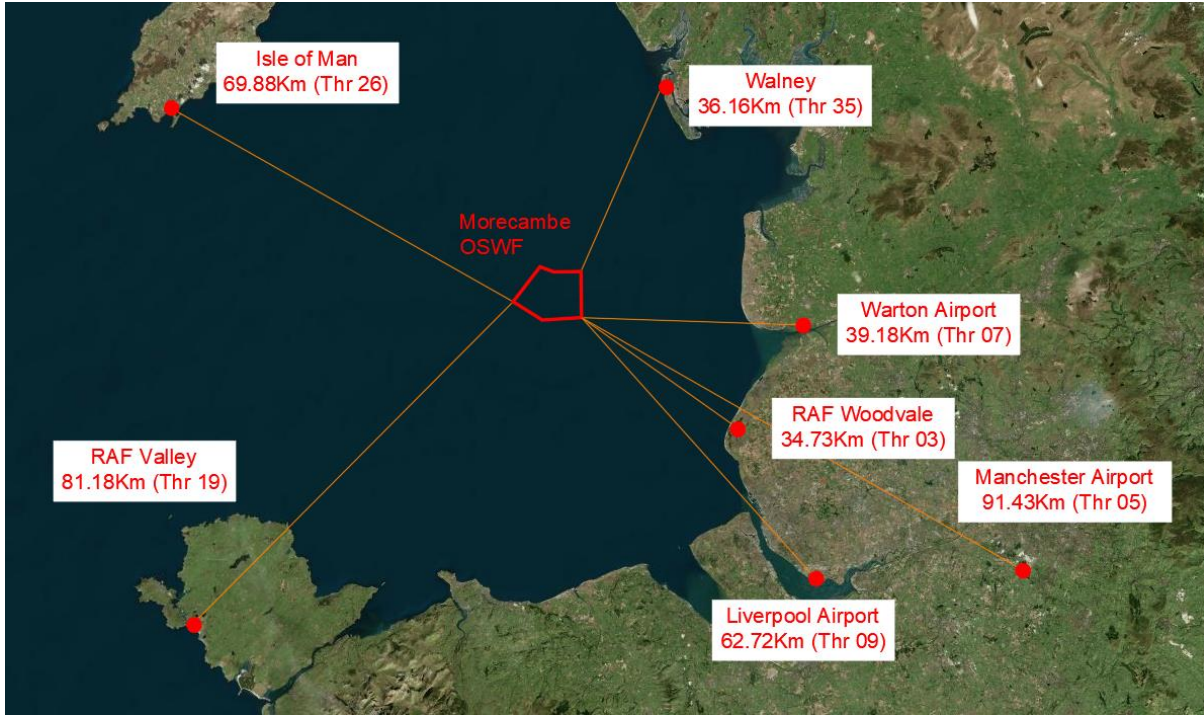


Figure 2 - Location of Morecambe Array Area in Relation to Airports

## 2 Manchester Airport OLS and IFP Assessment

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### 2.1 IFP Assessment

The ATCSMAC and IFPs assessed are as follows:

AIRAC 11/2023 (Effective 02 NOV 2023)

- AD 2.EGCC-5-1 ATC SURVEILLANCE MINIMUM ALTITUDE CHART (18 MAY 23);
- AD 2.EGCC-6-1 SID MONTY 1R 1S 1Y 1Z (05 OCTOBER 23);
- AD 2.EGCC-6-2 SID ASMIM 1S 1Z/KUXEM 1R 1Y/EKLAD 1R 1Y (05 OCTOBER 23);
- AD 2.EGCC-6-3 SID LISTO 2S 2Z (05 OCTOBER 23);
- AD 2.EGCC-6-4 SID LISTO 2R 2Y (05 OCTOBER 23);
- AD 2.EGCC-6-5 SID POL 5R 4S 1Y 1Z (05 OCTOBER 23);
- AD 2.EGCC-6-6 SID SONEX 1R 1Y/DESIG 1S 1Z (05 OCTOBER 23);
- AD 2.EGCC-6-7 SID SANBA 1R 1Y (18 MAY 23);
- AD 2.EGCC-7-1 STAR RNAV1 (DME/DME or GNSS) LAKEY 1M SETEL 1M TILNI 1M (23 MAR 23);
- AD 2.EGCC-7-2 STAR RNAV1 (DME/DME or GNSS) LIBSO 1M OTBED 1M (23 MAR 23);
- AD 2.EGCC-7-3 STAR RNAV1 (DME/DME or GNSS) MAKUX 1M MALUD 1M AXCIS 1M PENIL 1M (23 MAR 23);
- AD 2.EGCC-7-4 STAR RNAV1 (DME/DME or GNSS) ELVOS 1M LESTA 1M (23 MAR 23);
- AD 2.EGCC-8-1 ILS/DME (I-MC) RWY 05R (18 MAY 23);
- AD 2.EGCC-8-2 ILS/DME (MCT) RWY 05R (18 MAY 23);
- AD 2.EGCC-8-3 LOC/DME (I-MC) RWY 05R (18 MAY 23);
- AD 2.EGCC-8-4 VOR/DME RWY 05R (18 MAY 23);
- AD 2.EGCC-8-5 ILS/DME (I-MM) RWY 05L (18 MAY 23);
- AD 2.EGCC-8-6 ILS/DME (MCT) RWY 05L (18 MAY 23);
- AD 2.EGCC-8-7 LOC/DME RWY 05L (18 MAY 23);
- AD 2.EGCC-8-8 VOR/DME RWY 05L (18 MAY 23);
- AD 2.EGCC-8-9 ILS/DME (I-NN) RWY 23R (18 MAY 23);
- AD 2.EGCC-8-10 ILS/DME (MCT) RWY 23R (18 MAY 23);
- AD 2.EGCC-8-11 LOC/DME RWY 23R (18 MAY 23);
- AD 2.EGCC-8-12 VOR/DME RWY 23R (18 MAY 23);
- AD 2.EGCC-8-13 VOR/DME RWY 23L (18 MAY 23);
- AD 2.EGCC-8-14 RNP RWY 23L (18 MAY 23).

Additionally, the following were checked:

- Visual Circling
- Holding
- Visual Segment Surface (VSS)
- Minimum Sector Altitudes (MSA)

**2.1.1 AD 2.EGCC-5-1 ATC SURVEILLANCE MINIMUM ALTITUDE CHART**



Figure 3 – Windfarms in Relation to ATCSMAC

The windfarm lies outside the lateral buffer of all Surveillance Minimum Altitude Areas (SMAAs).

**The proposed Windfarm would not impact Manchester Airport's ATCSMAC.**



### 2.1.2 SIDs (Departures)

The windfarm is located outside of the initial departure splays for all departures.



Figure 4 – Initial Departure Splays

Aircraft in a turn would have to be at a minimum altitude of 757ft.

The closest point between the most restrictive Manchester DER (Departure End of Runway) and the closest windfarm point is 91433.78m. Over such distance, minus 150m (width of departure areas at DER), aircraft would have climbed an altitude of  $0.033 * 91283.78m = 3012.36m / 9884ft$  above DER.

This provides sufficient clearance as the maximum MOC for SIDs is 300m and therefore aircraft should be at a minimum of  $315m + 300m = 615m / 2018ft$  AMSL to safely clear the obstacle.

**There is no impact on the Departures.**

### 2.1.3 STARs (Arrivals)

All Arrivals terminate at or above FL070.

The maximum possible elevation of the windfarm, before affecting the Minimum Initial Altitude of FL070, has been calculated.

$7000ft = 2133.6m$

$2133.6m - 300m$  Minimum Obstacle Clearance (MOC) = 1833.6m AMSL.

The maximum elevation of the windfarm (315m) is below this altitude; therefore, the procedure would be unaffected.

**The proposed windfarm will have no impact on any of published Arrival Procedures.**

2.1.4 ILS/DME (I-MC) RWY 05R

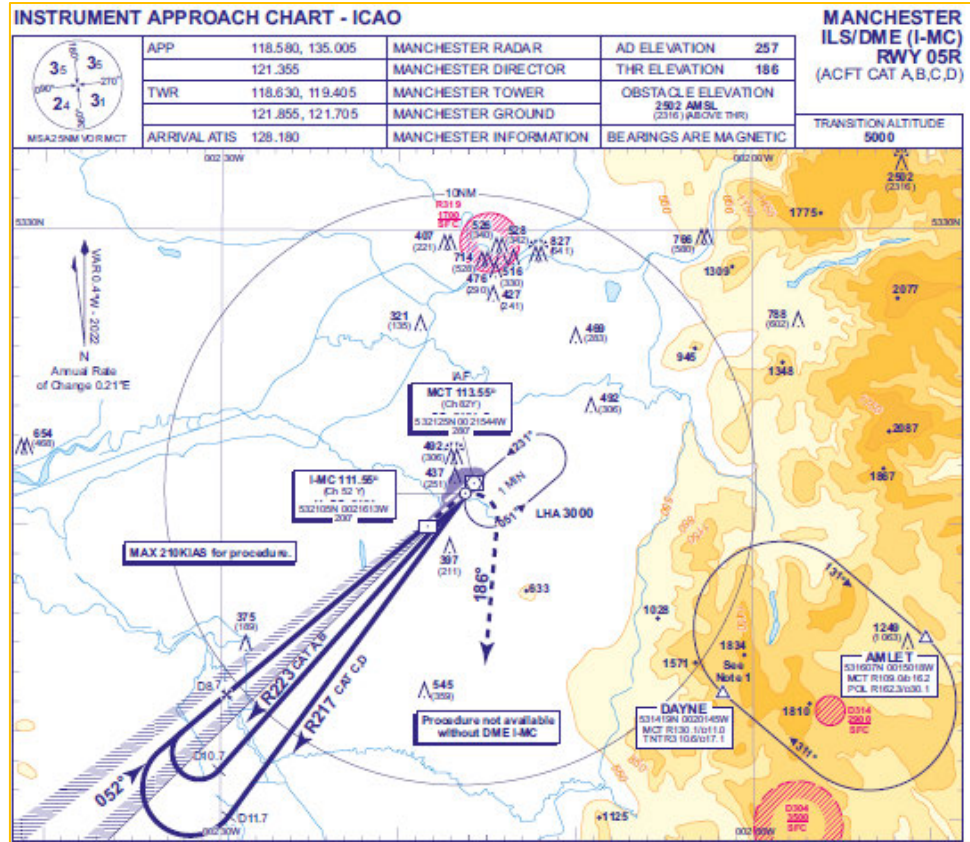


Figure 5 – ILS/DME (I-MC) RWY 05R Procedure

The proposed windfarm is outside of the protection areas associated to the ILS/DME Procedure to Runway 05R.



Figure 6 – ILS/DME (I-MC) RWY 05R OAS

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Additionally, the procedure features two reversals: a CAT A,B and a CAT C,D base turn. The minimum altitude within the base turns is 3000ft. Provided the obstacles were inside the protection areas (which is unlikely) the highest MOC required over the obstacles would be full Initial Approach MOC (300m). Therefore, aircraft should be at a minimum of 315m + 300m = 615m / 2018ft AMSL to safely clear the obstacles. As the minimum altitude within the base turn is 3000ft, this provides sufficient margin to clear the obstacles safely.

**The proposed windfarm will not have an impact on the ILS/DME (I-MC) RWY 05R Procedure.**

**2.1.5 ILS/DME (MCT) RWY 05R**

See Section 2.1.4.

**The proposed windfarm will not have an impact on the ILS/DME (MCT) RWY 05R Procedure.**

**2.1.6 LOC/DME (I-MC) RWY 05R**

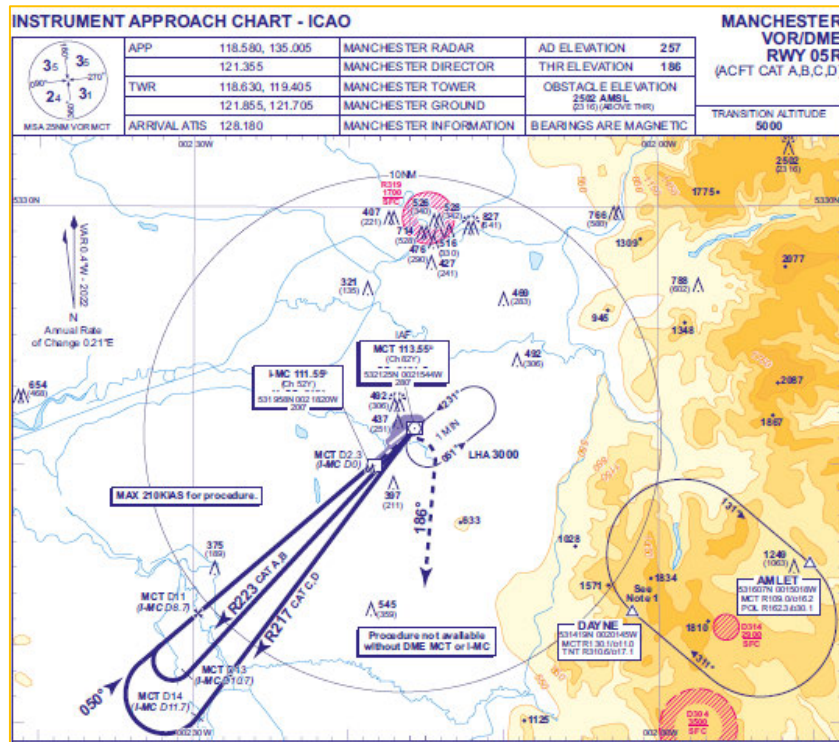


Figure 7 – LOC/DME (I-MC) RWY 05R Procedure

The windfarm is outside the protection areas associated to the LOC Procedure to Runway 05R.

Additionally, base turns were assessed on Section 2.1.4, without any impact noted.

**The proposed windfarm will not have an impact on the LOC/DME (I-MC) RWY 05R Procedure.**

2.1.7 VOR/DME RWY 05R

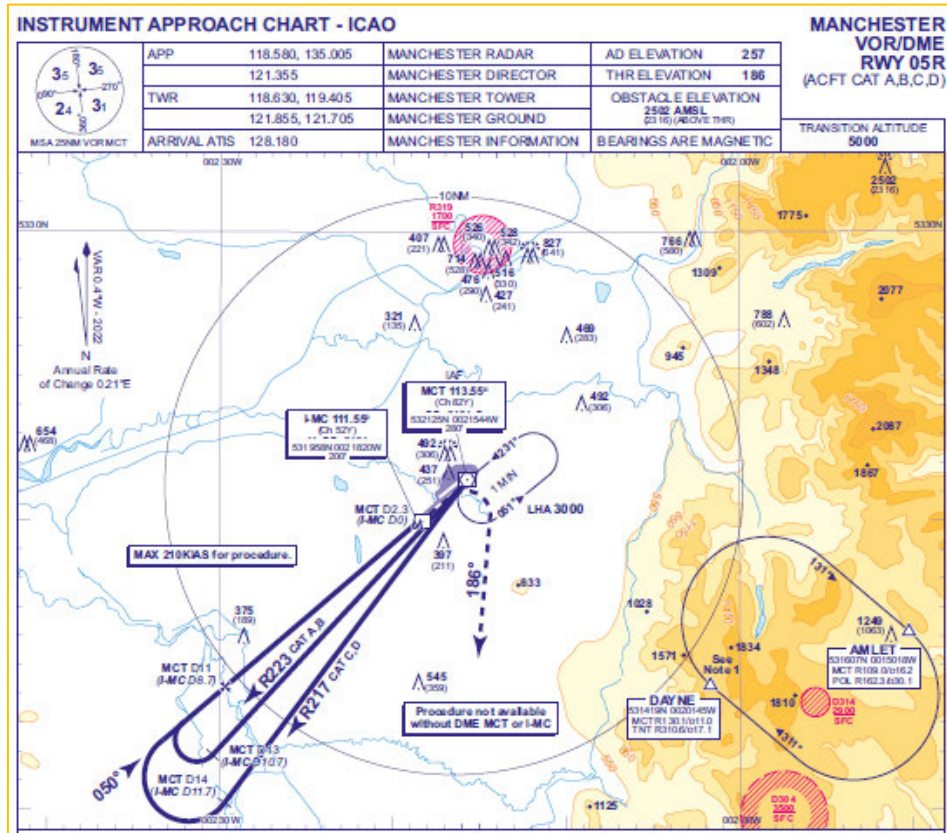


Figure 8 – VOR/DME RWY 05R Procedure

The windfarm is outside of the protection areas associated to the VOR/DME Procedure to Runway 05R.



Figure 9 – VOR/DME RWY 05R Protection Areas

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Additionally, the procedure features two reversals: a CAT A,B and a CAT C,D base turn. The minimum altitude within the base turns is 3000ft. Provided the obstacles were inside the protection areas (which is unlikely), the highest MOC required over the obstacles would be full Initial Approach MOC (300m). Therefore, aircraft should be at a minimum of 315m + 300m = 615m / 2018ft AMSL to safely clear the obstacles. As the minimum altitude within the base turn is 3000ft, this provides sufficient margin to clear the obstacles safely.

**The proposed windfarm will not have an impact on the VOR/DME RWY 05R Procedure.**

**2.1.8 ILS/DME (I-MM) RWY 05L**

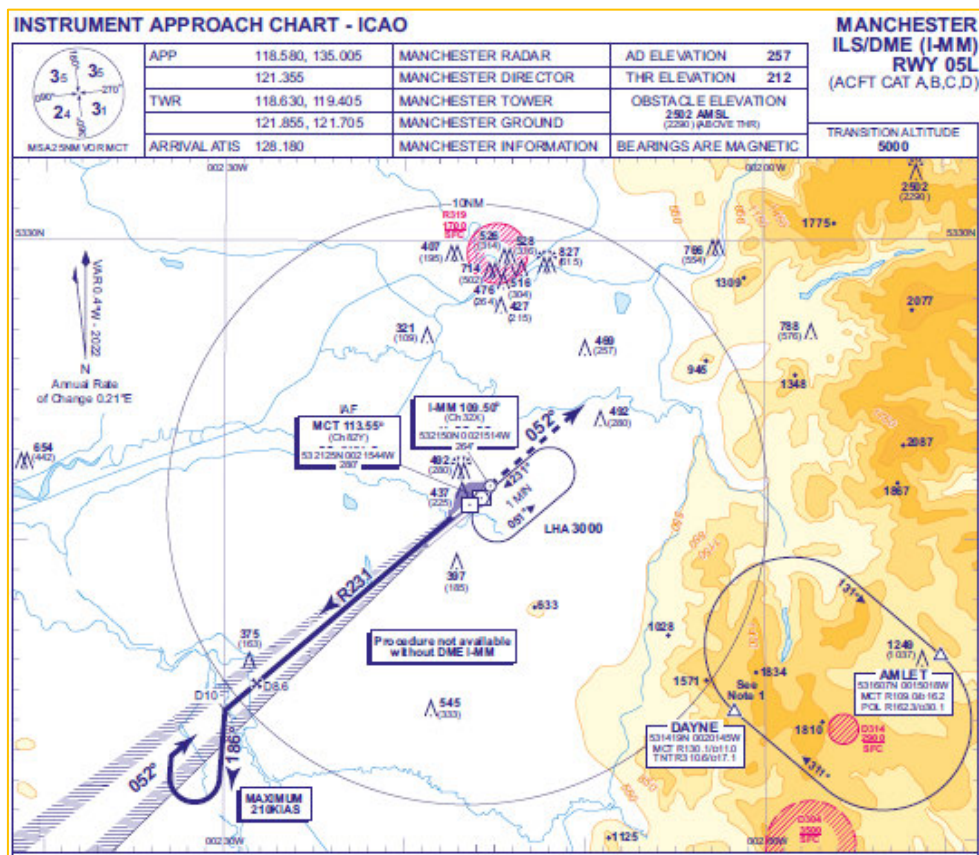


Figure 10 – ILS/DME (I-MM) RWY 05L

The windfarm is outside of the protection areas associated to the ILS/DME (CAT I and II) Procedure to Runway 05L.

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Figure 11 – ILS/DME (I-MM) CAT I & II RWY 05L OAS

Additionally, the procedure features a reversal published on the approach chart (45°/180° Procedure Turn). The minimum altitude within the reversal is 3000ft. Provided the obstacles were inside the protection areas (which is unlikely) the highest MOC required over the obstacles would be full Initial Approach MOC (300m). Therefore, aircraft should be at a minimum of  $315\text{m} + 300\text{m} = 615\text{m} / 2018\text{ft}$  AMSL to safely clear the obstacles. As the minimum altitude within the reversal is 3000ft, this provides sufficient margin to clear the obstacles safely.

**The proposed windfarm will not have an impact on the ILS/DME (I-MM) RWY 05L Procedure.**

#### 2.1.9 ILS/DME (MCT) RWY 05L

See Section 2.1.8.

**The proposed windfarm will not have an impact on the ILS/DME (MCT) RWY 05L Procedure.**

2.1.10 LOC/DME RWY 05L

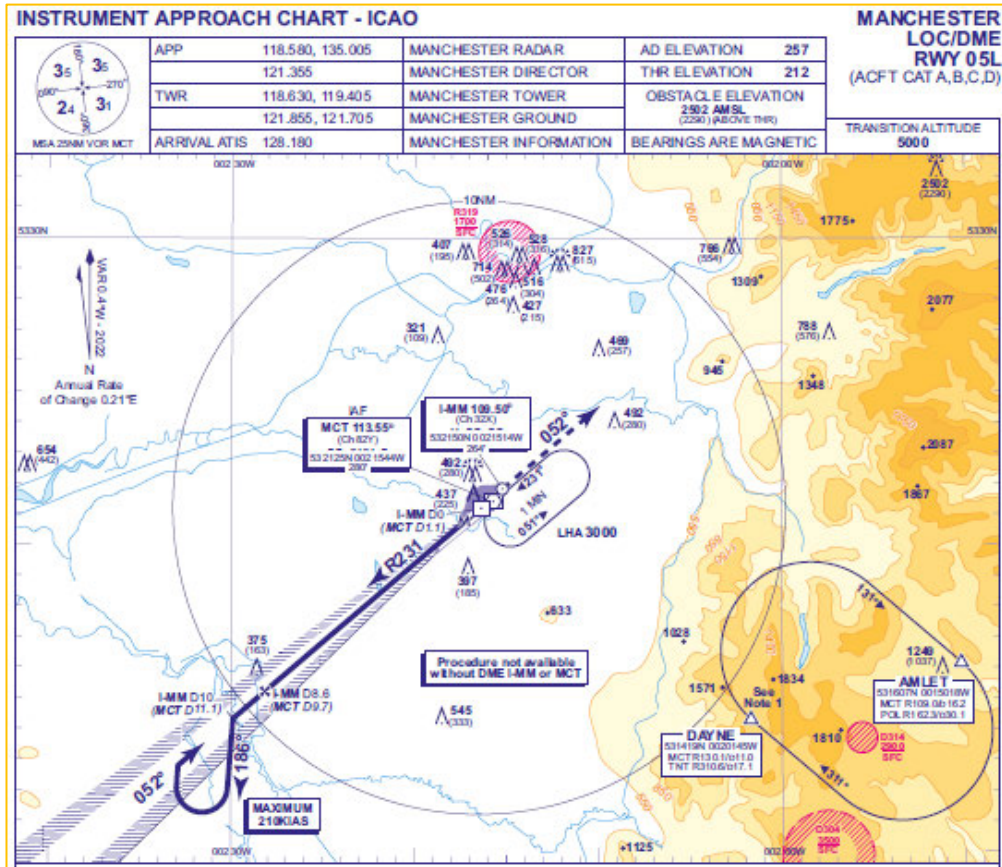


Figure 12 - LOC/DME RWY 05L Procedure

The windfarm lays outside the protection areas associated to the LOC Procedure to Runway 05L.

Additionally, the reversal was assessed in Section 2.1.8, without any impact noted.

**The proposed windfarm will not have an impact on the LOC/DME RWY 05L Procedure.**

**2.1.11 VOR/DME RWY 05L**

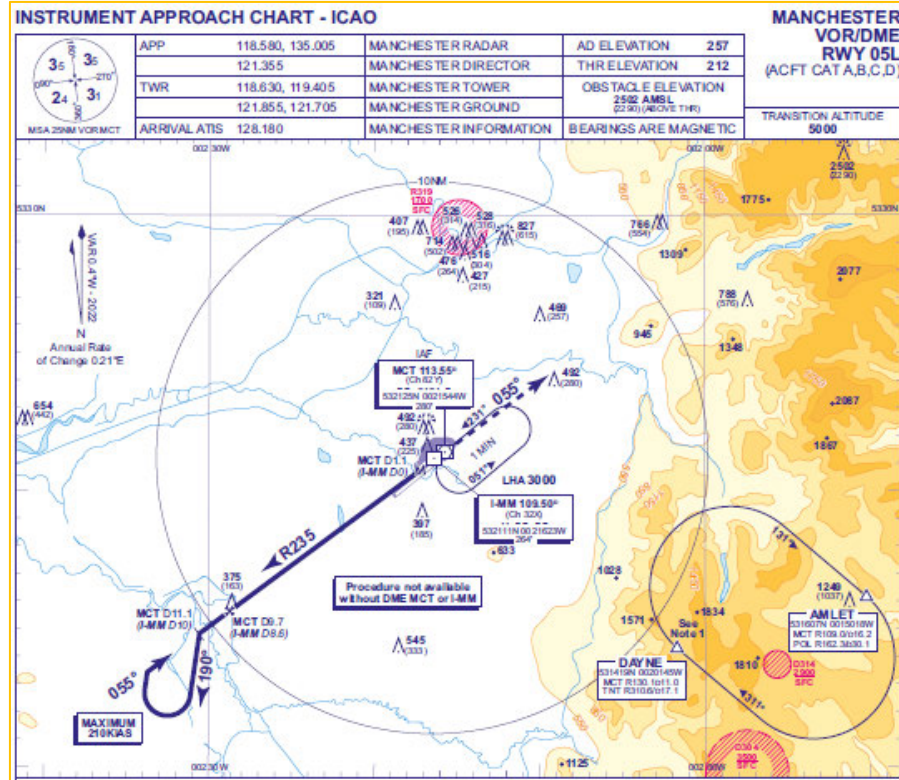


Figure 13 – VOR/DME RWY 05L Procedure

The windfarm lays outside the protection areas associated to the VOR/DME Procedure to Runway 05L.



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Figure 14 – VOR/DME RWY 05L Protection Areas

Additionally, the procedure features a reversal published on the approach chart (45°/180° Procedure Turn). The minimum altitude within the reversal is 3000ft. Provided the obstacles were inside the protection areas (which is unlikely), the highest MOC required over the obstacles would be full Initial Approach MOC (300m). Therefore, aircraft should be at a minimum of 315m + 300m = 615m / 2018ft AMSL to safely clear the obstacles. As the minimum altitude within the reversal is 3000ft, this provides sufficient margin to clear the obstacles safely.

**The proposed windfarm will not have an impact on the VOR/DME RWY 05L Procedure.**

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2.1.12 ILS/DME (I-NN) RWY 23R

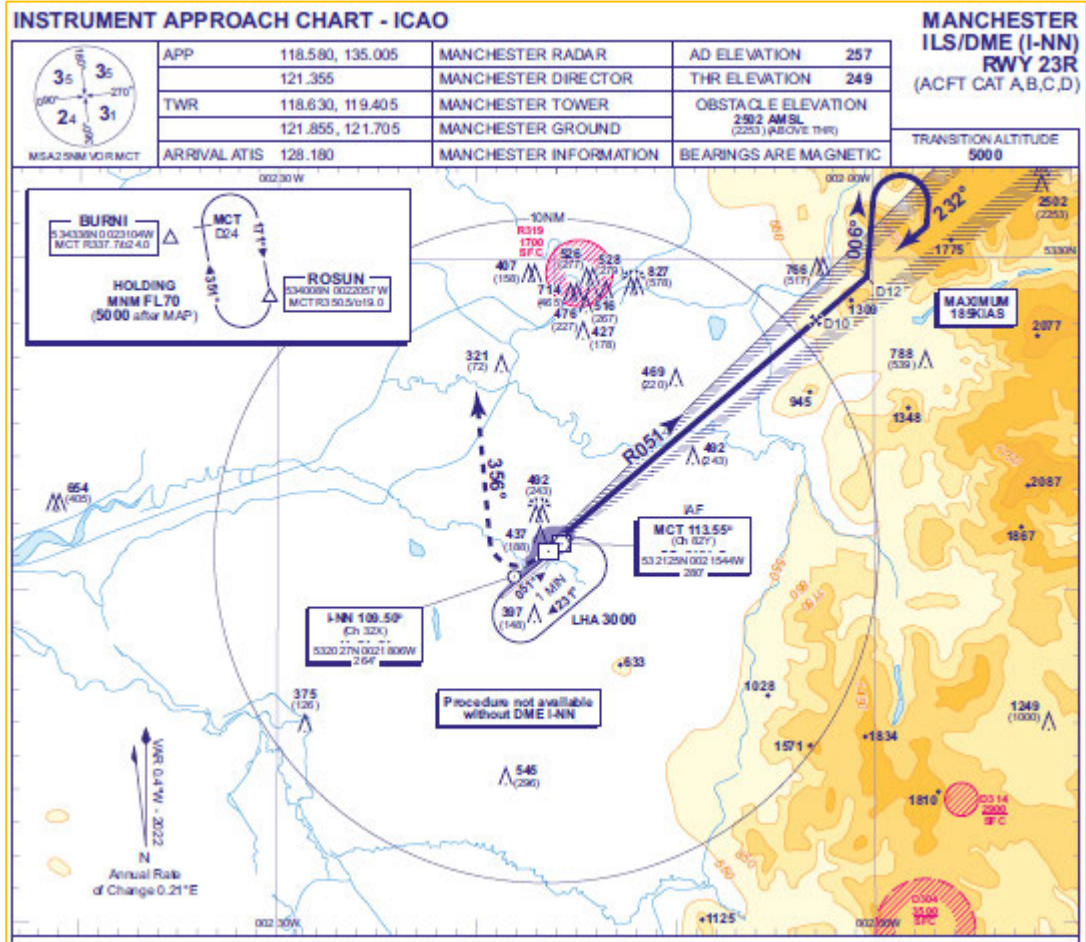


Figure 15 – ILS/DME (I-NN) RWY 23R

The windfarm lays outside of the protection areas associated with the ILS/DME (CAT I and II) Procedure to Runway 23R.



Figure 16 – ILS/DME (I-NN) CAT I & II RWY 23R OAS

Additionally, the procedure features a reversal published on the approach chart (45°/180° Procedure Turn). The minimum altitude within the reversal is 3500ft. Provided the obstacles were inside the protection areas (which is unlikely), the highest MOC required over the obstacles would be full Initial Approach MOC (300m). Therefore, aircraft should be at a minimum of 315m + 300m = 615m / 2018ft AMSL to safely clear the obstacles. As the minimum altitude within the reversal is 3500ft, this provides sufficient margin to clear the obstacles safely.

**The proposed windfarm will not have an impact on the ILS/DME (I-NN) RWY 23R Procedure.**

#### 2.1.13 ILS/DME (MCT) RWY 23R

See Section 2.1.12.

**The proposed windfarm will not have an impact on the ILS/DME (MCT) RWY 23R Procedure.**

2.1.14 LOC/DME RWY 23R

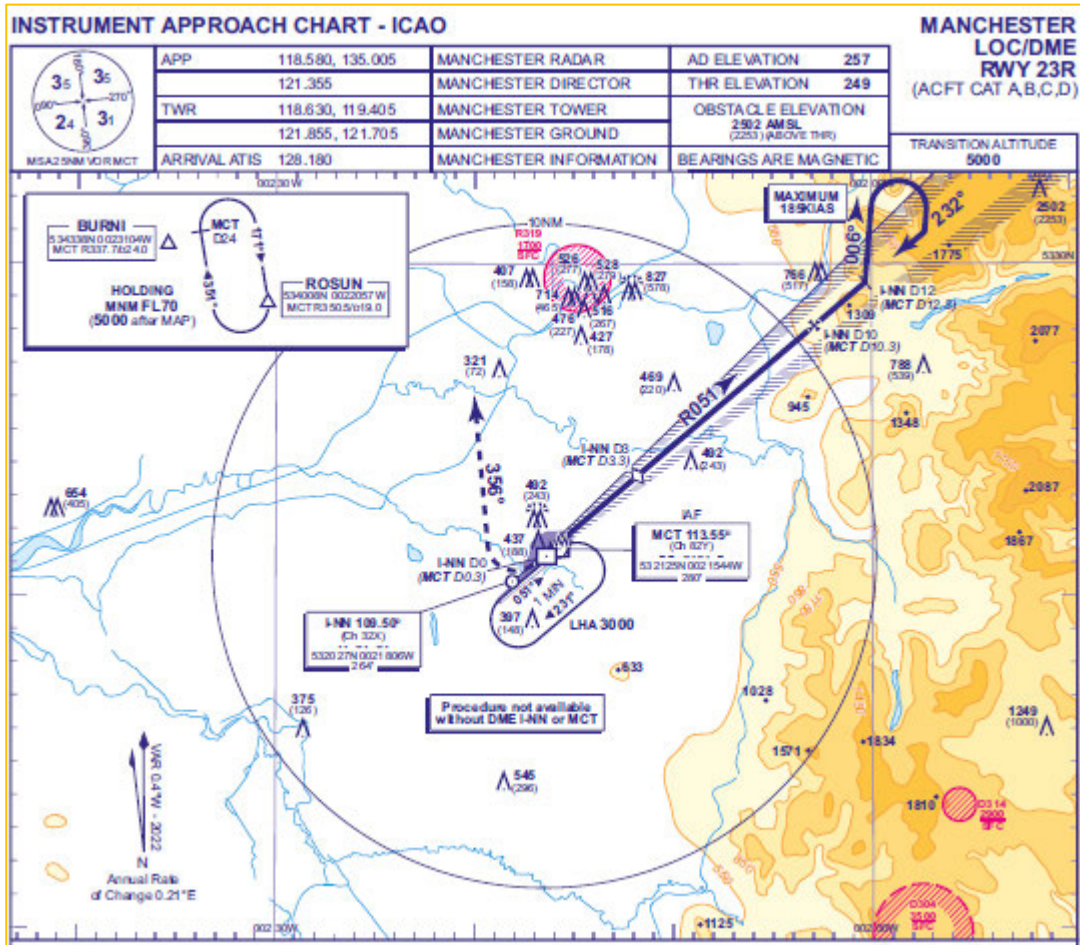


Figure 17 – LOC/DME RWY 23R

The windfarm lays outside of the protection areas associated with the LOC Procedure to Runway 23R.

Additionally, the reversal was assessed on Section 2.1.12, without any impact noted.

**The proposed windfarm will not have an impact on the LOC/DME RWY 23R Procedure.**

2.1.15 VOR/DME RWY 23R

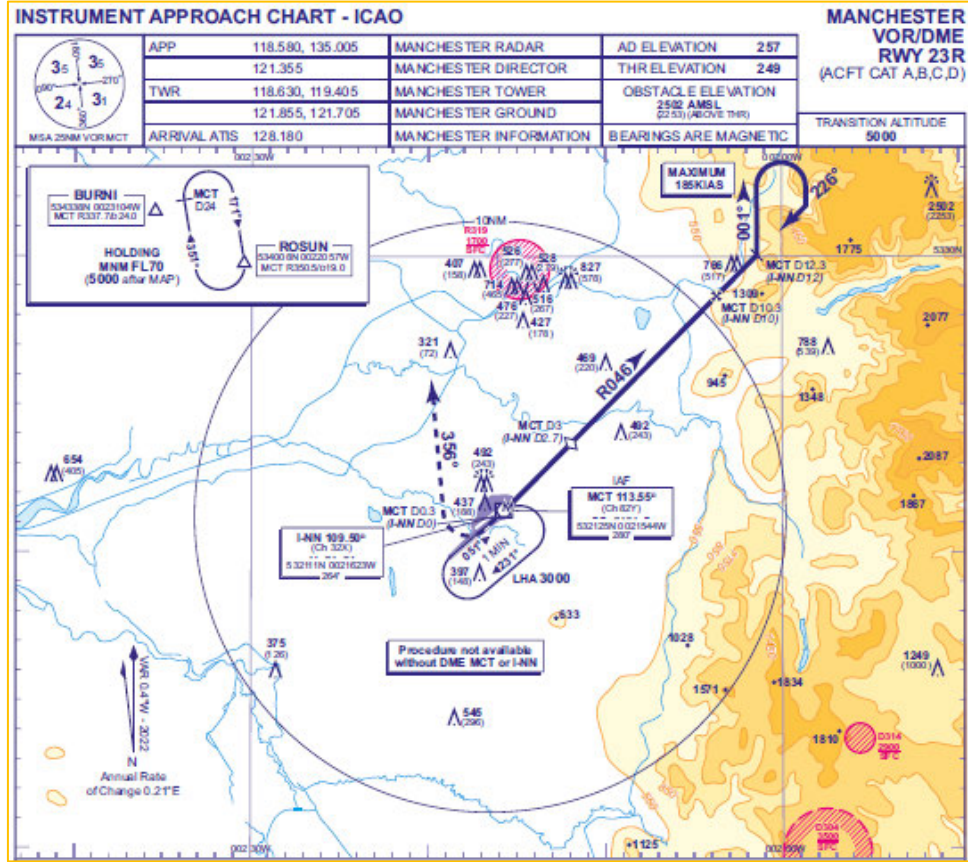


Figure 18 - VOR/DME RWY 23R

The windfarm lays outside of the protection areas associated with the VOR/DME Procedure to Runway 23R.



Figure 19 - VOR/DME RWY 23R Protection Areas



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Figure 21 – VOR/DME RWY 23L Protection Areas

Additionally, the procedure features two reversals: a CAT A,B and a CAT C,D base turn. The minimum altitude within the base turns is 3500ft. Provided the obstacles were inside the protection areas (which is unlikely), the highest MOC required over the obstacles would be full Initial Approach MOC (300m). Therefore, aircraft should be at a minimum of  $315\text{m} + 300\text{m} = 615\text{m} / 2018\text{ft}$  AMSL to safely clear the obstacles. As the minimum altitude within the base turn is 3500ft, this provides sufficient margin to clear the obstacles safely.

**The proposed windfarm will not have an impact on the VOR/DME RWY 23L Procedure.**

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2.1.17 RNP RWY 23L

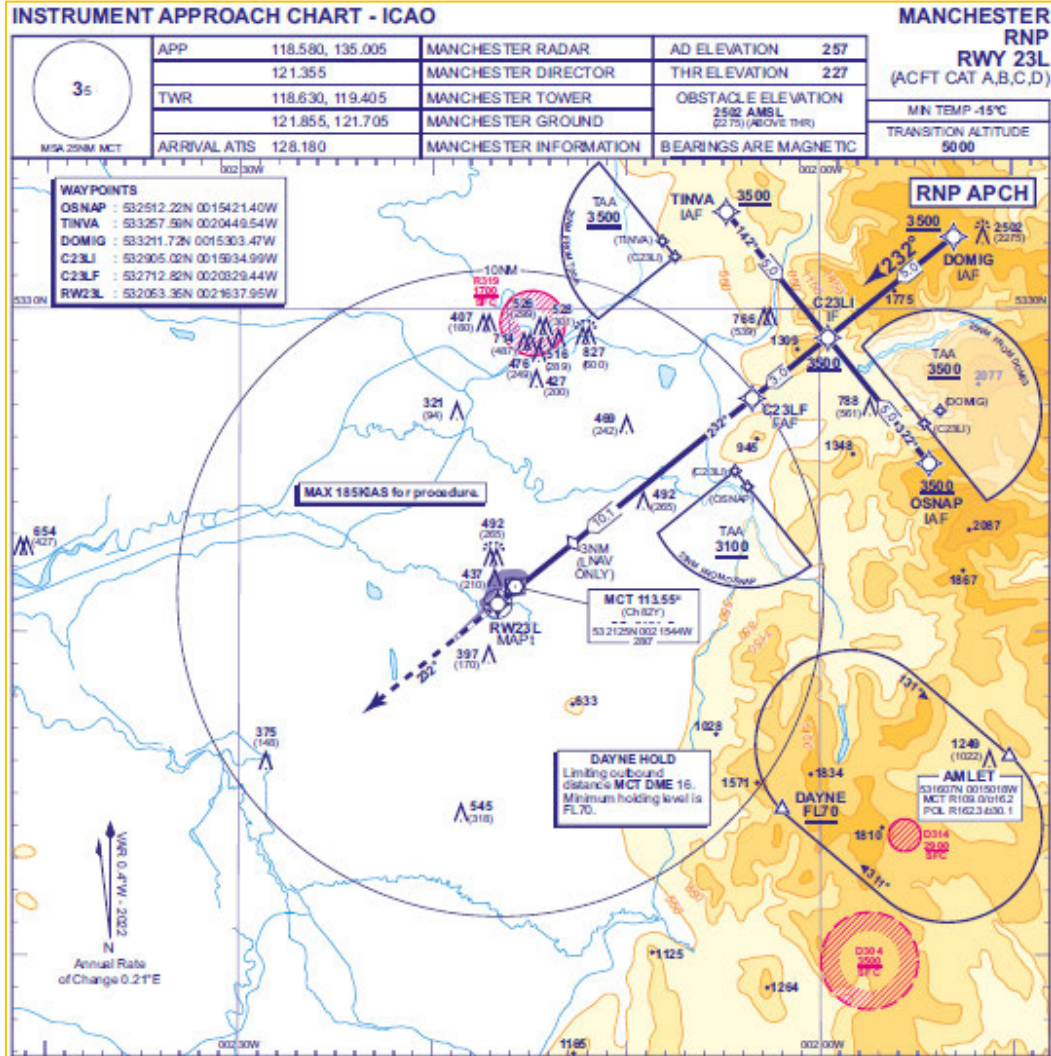


Figure 22 – RNP RWY 23L

The windfarm lays outside of the protection areas associated with the RNP Procedure to Runway 23L.



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Figure 23 – RNP RWY 23L Protection Area

Additionally, Terminal Arrival Altitudes (TAAs) on each of the Initial Approach Fixes (IAFs; TINVA, OSNAP and DOMIG) have been constructed:

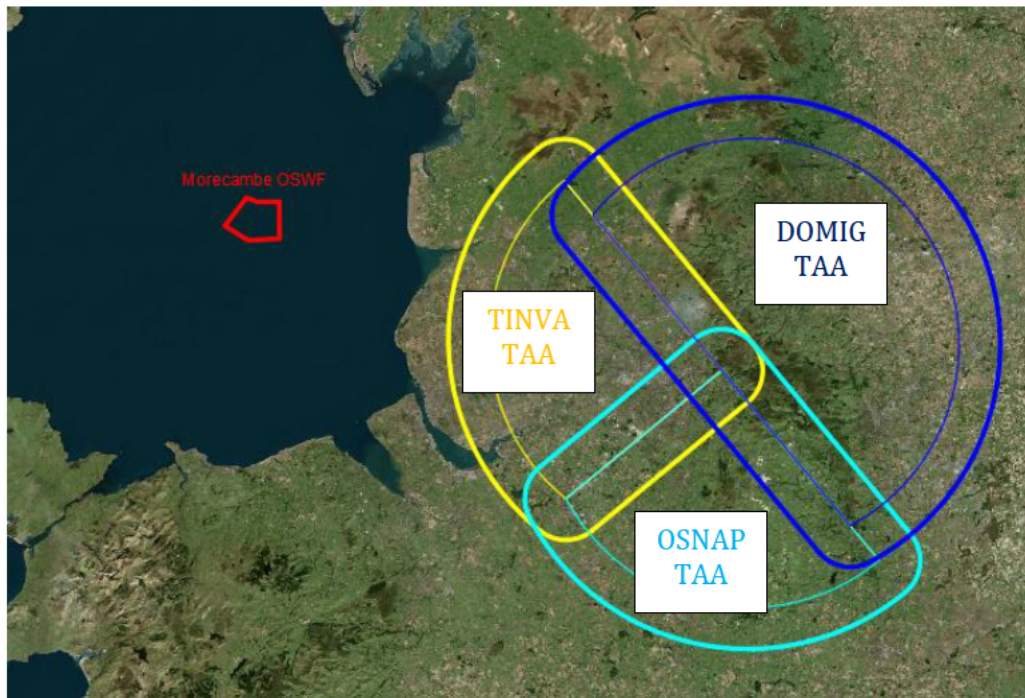


Figure 24 - Windfarms vs RNP RWY 23L TAAs

As the windfarm is outside the protection areas for the TAAs, they will not cause an impact.

**The proposed windfarm will not have an impact on the RNP RWY 23L Procedure.**

### 2.1.18 Visual Manoeuvring (Circling)

The proposed windfarm is outside the Visual Circling VM(C) Obstacle Clearance areas for all aircraft categories (A, B, C and D).



Figure 25 – Circling Protection Area

**The proposed windfarm would have no impact on the Visual Circling.**

### 2.1.19 Visual Segment Surface (VSS)

The proposed windfarm lays outside of the lateral confines of VSS for all Runways.

**The proposed windfarm would have no impact on the VSS for Manchester Airport Runways.**

**2.1.20 Holding**

The Lowest Holding Altitude (LHA) for any of the Manchester Holds is 3000ft.

The maximum possible elevation of the windfarm, before affecting the LHA of 3000ft, has been calculated.

- 3000ft = 914.4m
- 914.4m – 300m MOC = 614.4m AMSL. The maximum windfarm elevation is below this altitude.

**The proposed windfarm would have no impact on any of the holds for Manchester Airport.**

**2.1.21 Minimum Sector Altitude (MSA)**

MSA 25NM VOR MCT

The Windfarm lays outside the MSA protection areas for all sectors and their associated buffers.

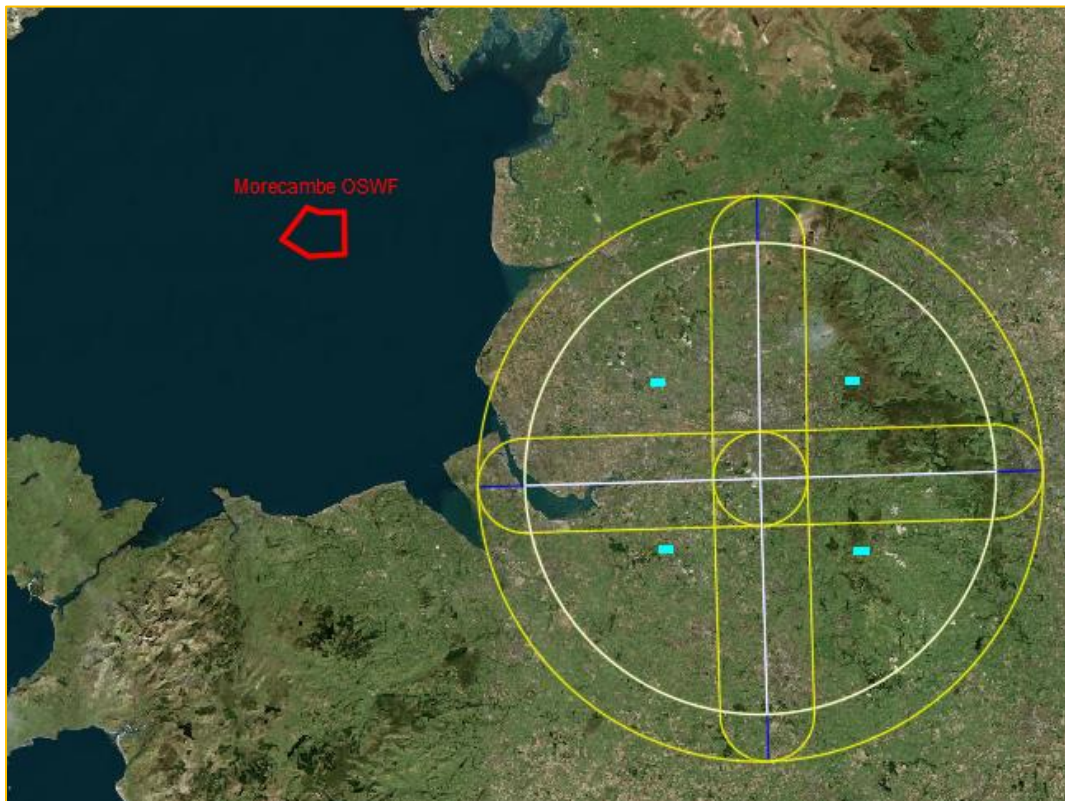


Figure 26 – VOR MCT MSA vs Windfarm

**The proposed windfarm would have no impact on the published VOR MCT MSA.**

MSA 25NM ARP

We have additionally protected for an MSA based on the ARP owing to the fact the minimum levels shown outside the ATCSMAC are based on the ARP as per note 4 in the ATCSMAC chart:

*“4. Minimum Sector Altitudes are based on obstacles and spot heights within 25NM of the Aerodrome Reference Point”*

The Windfarm lays outside the MSA protection areas for all sectors and their associated buffers.



Figure 27 –ARP MSA vs Windfarm

**The proposed windfarm would have no impact on the published ARP MSA.**

# 3 Liverpool John Lennon Airport OLS and IFP Assessment

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## 3.1 IFP Assessment

The ATCSMAC and IFPs assessed are as follows:

AIRAC 11/2023 (Effective 02 NOV 2023)

- AD 2.EGGP-5-1 ATCSMAC (18 MAY 2023);
- AD 2.EGGP-6-1 SID POLE HILL (02 NOV 2023);
- AD 2.EGGP-6-2 SID REXAM (02 NOV 2023);
- AD 2.EGGP-6-3 SID BARTN 1T 1V (02 NOV 2023);
- AD 2.EGGP-6-4 SID WALLASEY 2T 2V/NANTI 2T (02 NOV 2023);
- AD 2.EGGP-6-5 SID NANTI 2V (02 NOV 2023);
- AD 2.EGGP-7-1 STAR RNAV1 (DME/DME or GNSS) GASKO 1L LAKEY 1L LIBSO 1L POL 1L VEGUS 1L (23 MAR 2023);
- AD 2.EGGP-7-2 STAR RNAV1 (DME/DME or GNSS) BOFUM 1L PENIL 1L (23 MAR 2023);
- AD 2.EGGP-7-3 STAR RNAV1 (DME/DME or GNSS) ELVOS 1L LESTA 1L PEPZE 1L (20 APR 2023);
- AD 2.EGGP-8-1 ILS/DME/NDB(L) RWY 09 (15 JUN 2023);
- AD 2.EGGP-8-2 LOC/DME/NDB(L) RWY 09 (15 JUN 2023);
- AD 2.EGGP-8-3 SRA RTR 2NM RWY 09 (17 JUN 2021);
- AD 2.EGGP-8-4 RNP RWY 09 (17 JUN 2021);
- AD 2.EGGP-8-5 ILS/DME/NDB(L) RWY 27 (17 JUN 2021);
- AD 2.EGGP-8-6 LOC/DME/NDB(L) RWY 27 (17 JUN 2021);
- AD 2.EGGP-8-7 SRA RTR 2NM RWY 27 (17 JUN 2021);
- AD 2.EGGP-8-8 RNP RWY 27 (17 JUN 2021);
- AD 2.EGGP-8-9 NDB(L)/DME RWY 27 (17 JUN 2021).

Additionally, the following were checked:

- Visual Circling
- Holding
- Visual Segment Surface (VSS)
- Minimum Sector Altitudes (MSA)

**3.1.1 AD 2.EGGP-5-1 ATCSMAC**

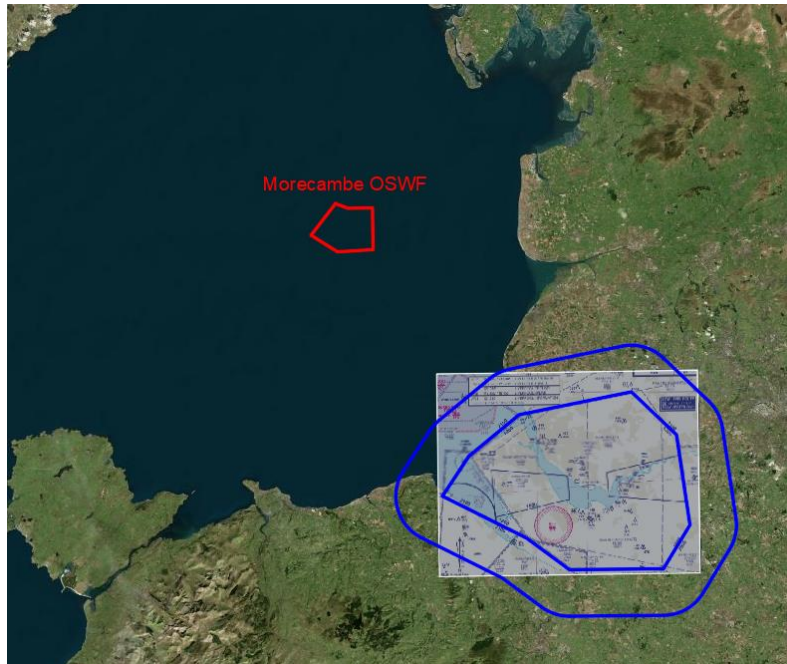


Figure 28 - Windfarm in Relation to ATCSMAC

The Windfarm development lays outside of the lateral buffer of all Surveillance Minimum Altitude Areas (SMAAs).

**The windfarm would not impact Liverpool Airport's ATCSMAC.**



Straight Departure Areas (SIDs)

The Windfarm lays outside the Straight Protection Areas for the SIDs departing RWY 09 and 27 to POLE HILL.

Turn Areas

The POL 5V procedure, departing RWY 09, turns left initially before a right turn, heading north-east, away from the windfarm and would not be affected.

The POL 4T procedure, departing RWY 27, turns right and continues north-east, heading away from the windfarm and would not be affected.

**The proposed windfarm would have no impact on the SID POLE HILL 5V and 4T procedures.**

**3.1.3 AD 2.EGGP-6-2 SID REXAM**

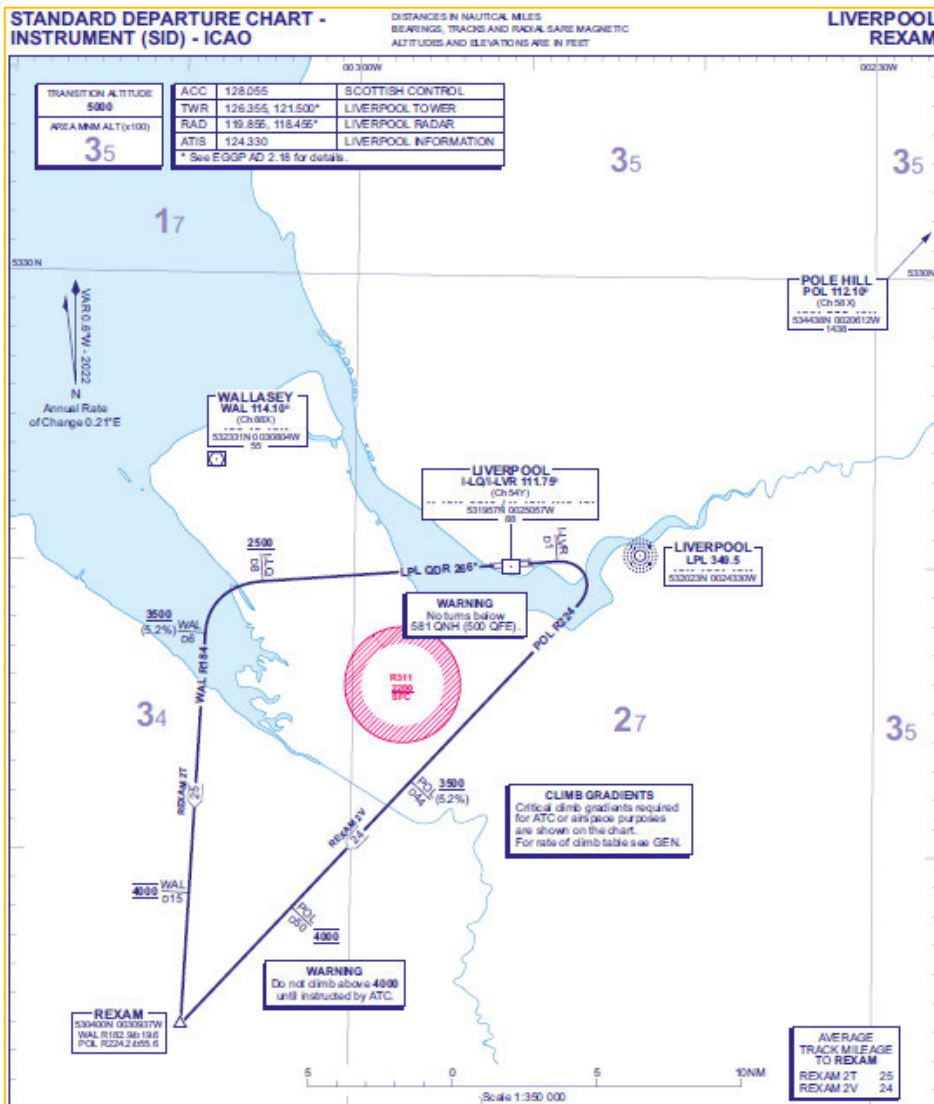


Figure 31 - SID REXAM 2V 2T Procedure



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Straight Departure Areas (SIDs)

The Windfarm lays outside the Straight Protection Areas for the SIDs departing RWY 09 and 27 to REXAM.

Turn Areas

The REXAM 2V procedure, departing RWY 09, turns right and continues south-west, away from the windfarm and would not be affected.

The REXAM 2T procedure, departing RWY 27, turns left and continues south, heading away from the windfarm and would not be affected.



Figure 32 - SID REXAM 2T/2V Protection areas in Relation to Windfarm

**The proposed windfarm would have no impact on the SID REXAM 2V and 2T procedures.**

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### Straight Departure Areas (SIDs)

The Windfarm lays outside the Straight Protection Areas for the SIDs departing RWY 09 and 27 towards WALLASEY and NANTI.

### Turn Areas for WALLASEY 2V/2T and NANTI 2V

The WALLASEY 2V procedure, departing RWY 09, turns left and continues west towards WALLASEY VOR where aircraft climb to 4000ft and would not be affected.

The WALLASEY 2T procedure, departing RWY 27, turns right and continues west towards WALLASEY VOR where aircraft climb to 4000ft and would not be affected.

The NANTI 2T procedure, departing RWY 27, turns left, away from the windfarm, continuing south-east, away from the windfarm and would not be affected.



Figure 36 - SID WALLASEY 2V/2T and NANTI 2T Protection Areas in Relation to Windfarm

**The proposed windfarm development would have no impact on the SIDs WALLASEY and NANTI 2T procedures.**

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3.1.6 AD 2.EGGP-6-4 SID NANTI 2V

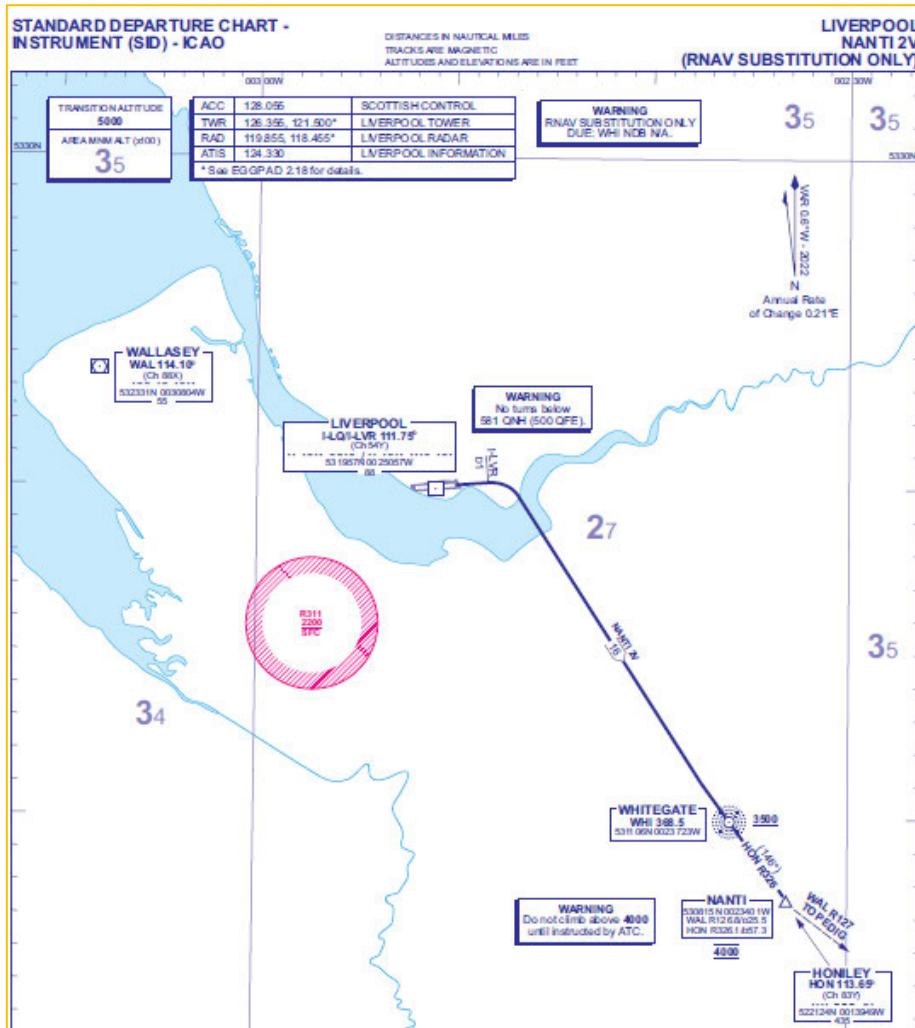


Figure 37 - SID NANTI 2V Procedure

Straight Departure Areas (SID)

The Windfarm lays outside the Straight Protection Areas for the SIDs departing RWY 09 towards NANTI.

Turn Areas

The NANTI 2V procedure, departing RWY 09, turns right, away from the windfarm, continuing south-east, away from the windfarm and would not be affected.



Figure 38 - SID NANTI 2V Protection Areas in Relation to Windfarm

**The proposed windfarm development would have no impact on the NANTI 2V procedure.**

- 3.1.7 AD 2.EGGP-7-1 STAR RNAV1 (DME/DME or GNSS) GASKO 1L LAKEY 1L LIBSO 1L POL 1L VEGUS 1L;**  
**AD 2.EGGP-7-2 STAR RNAV1 (DME/DME or GNSS) BOFUM 1L PENIL 1L;**  
**AD 2.EGGP-7-3 STAR RNAV1 (DME/DME or GNSS) ELVOS 1L LESTA 1L PEPZE 1L.**

The 7-1 and 7-2 STARs terminate at TIPOD and 7-3 terminates at KEGUN both at FL70.

Using the Windfarm elevation of 315m and MOC of 300m, the windfarm produces a MOCA of:

$$315\text{m} + 300\text{m} = 615\text{m} / 2018\text{ft AMSL.}$$

This is below the termination altitude of the STARs at 7000ft.

**The Windfarm development would have no impact on the published STARs.**

3.1.8 AD 2.EGGP-8-1 ILS/DME/NDB(L) RWY 09

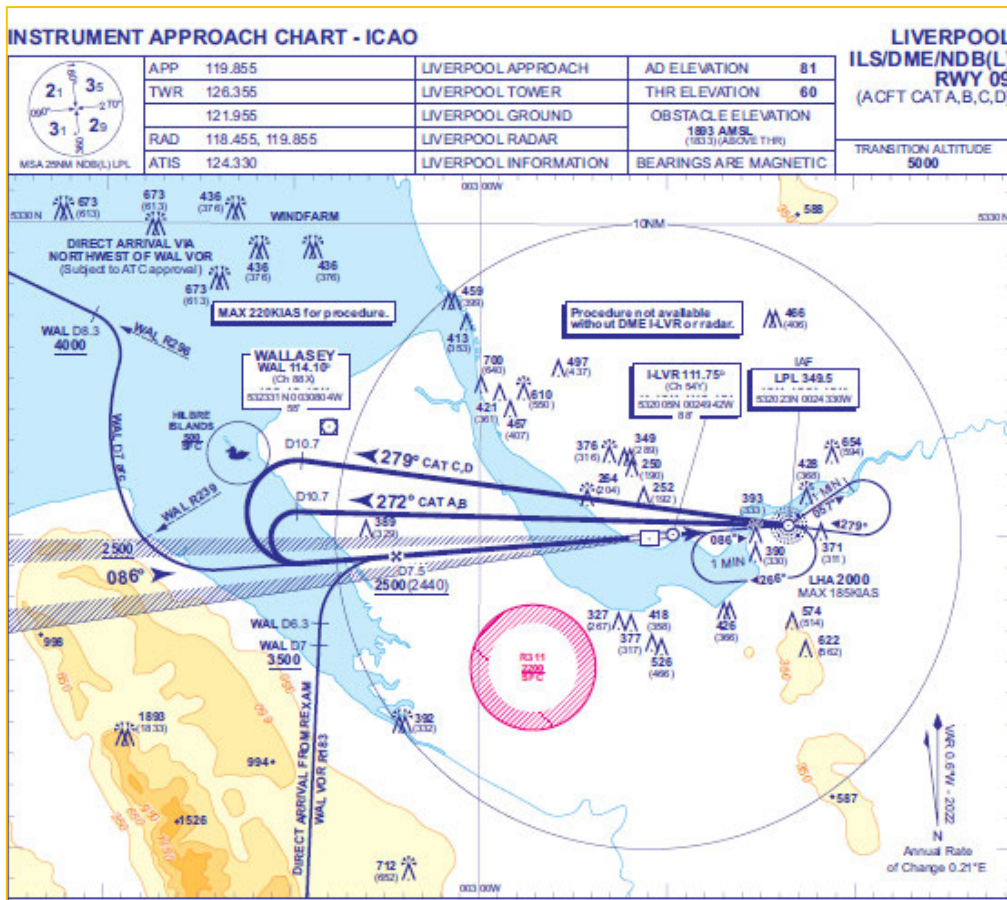


Figure 39 - ILS/DME/NDB(L) RWY 09 Procedure

The altitude for Direct arrivals procedure via WALLASEY and REXAM is published as 'At or Above 2500ft'.

The MOCA required at the windfarm using the elevation of 315m and maximum MOC of 300m is  $315\text{m} + 300\text{m} = 615\text{m}$  / 2018ft AMSL, which is below the arrival altitude and would have no impact on the arrival to the procedure.

The Windfarm lays outside of the protection areas for the ILS/DME/NDB(L) procedure, including the Missed Approach, and would have no impact.

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Figure 40 - ILS/DME/NDB(L) RWY 09 Procedure Protection Areas

Additionally, the protection areas for both Base turns published on the chart have been constructed, including the Base turn outbound from the NDB(L) LPL Hold and the Base turn inbound to I-LVR DME for both CAT A&B and CAT C&D aircraft:

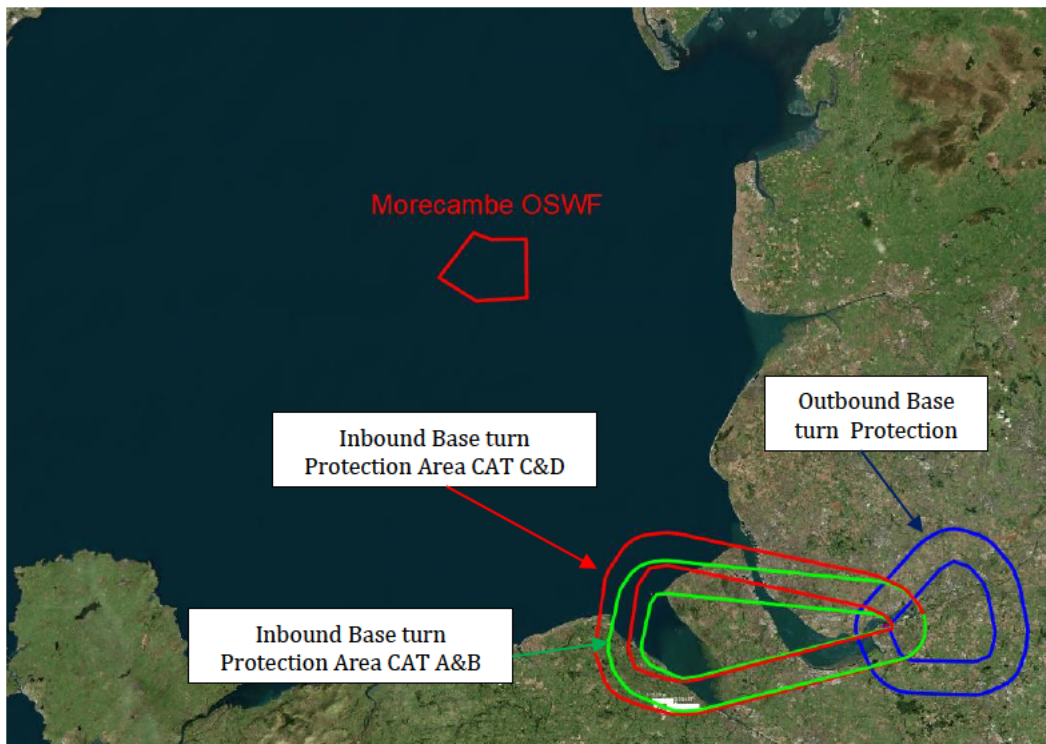


Figure 41 - ILS/DME/NDB(L) RWY 09 Base turn Protection Areas

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The Windfarm lays outside the protection area for all Base turns associated with the procedure and will have no impact.

**The proposed windfarm would not impact the published ILS/DME/NDB(L) RWY 09 procedure.**

**3.1.9 AD 2.EGGP-8-2 LOC/DME/NDB(L) RWY 09**

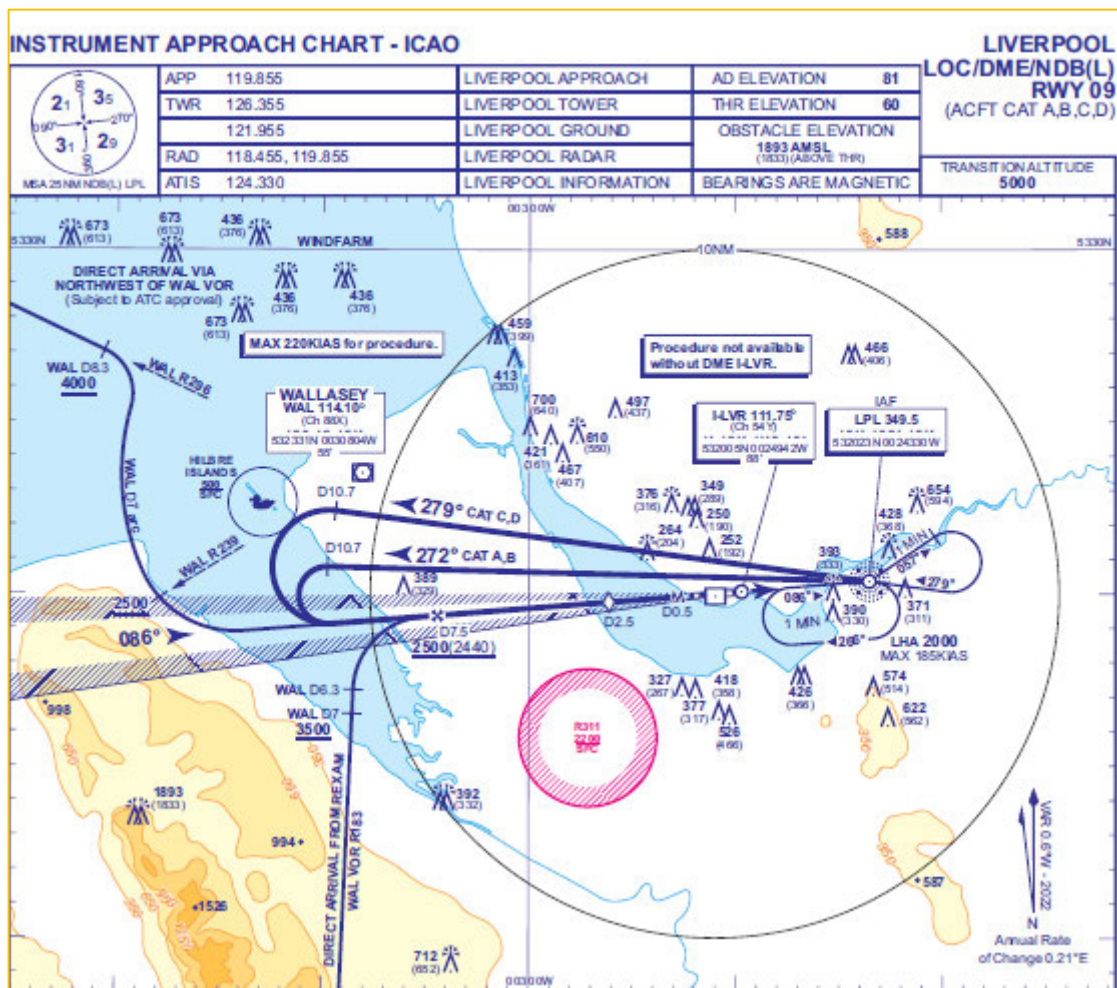


Figure 42 - LOC/DME/NDB(L) RWY 09 Procedure

The Direct arrivals altitude and Base turn protection area are common to the ILS/DME/NDB(L) RWY 09 procedure as shown in Figure 40 and Figure 41 which is not affected.

**The proposed windfarm would not impact the published LOC/DME/NDB(L) RWY 09 procedure.**

3.1.10 AD 2.EGGP-8-3 SRA RTR 2NM RWY 09

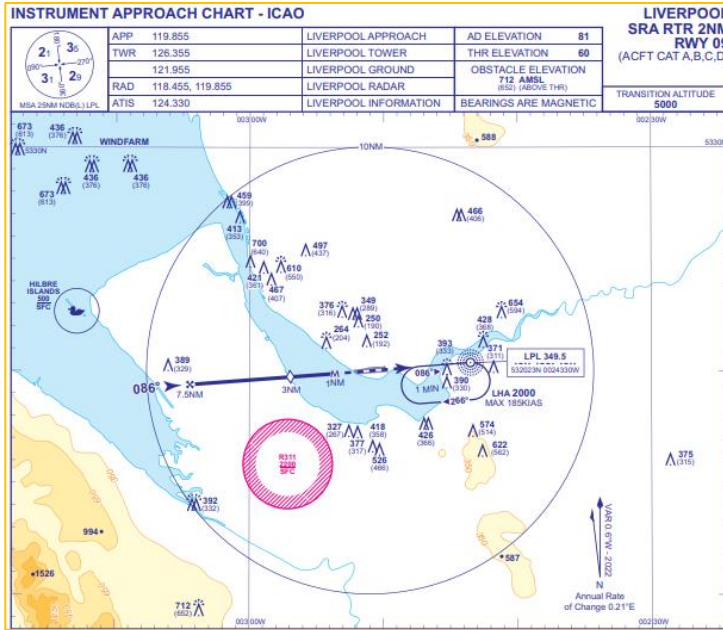


Figure 43 - SRA RTR 2NM RWY 09 Procedure

The windfarm lies outside the protection areas for the SRA to Runway 09.



Figure 44 - SRA RTR 2NM RWY 09 Protection Areas

**The proposed windfarm would not impact the published SRA RTR 2NM RWY 09 procedure.**

**3.1.11 AD 2.EGGP-8-4 RNP RWY 09**

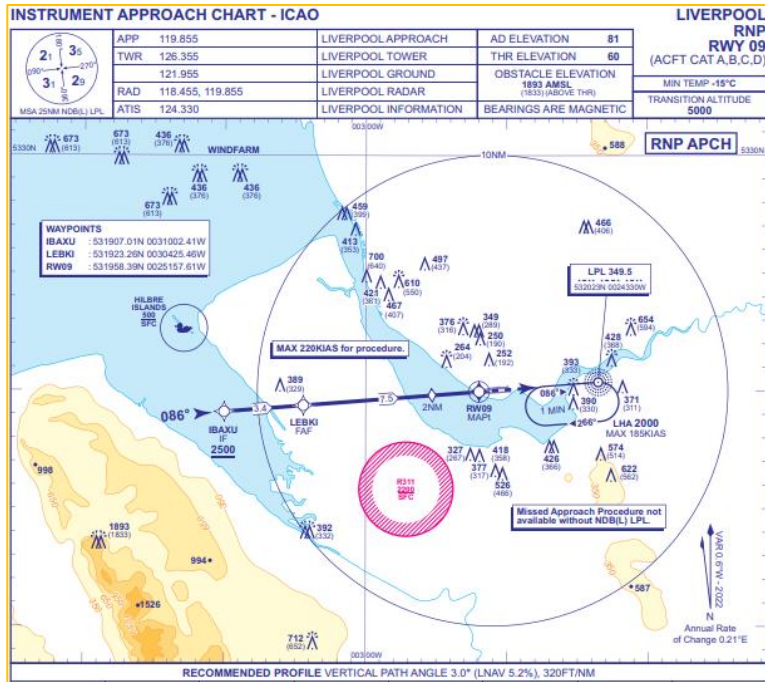


Figure 45 - RNP RWY 09 Procedure

Arrival to the RNP RWY 09 procedure is published as 'At or Above 2500ft' and would not be affected.

The windfarm lays outside the protection areas associated to the RNP Procedure to Runway 09.

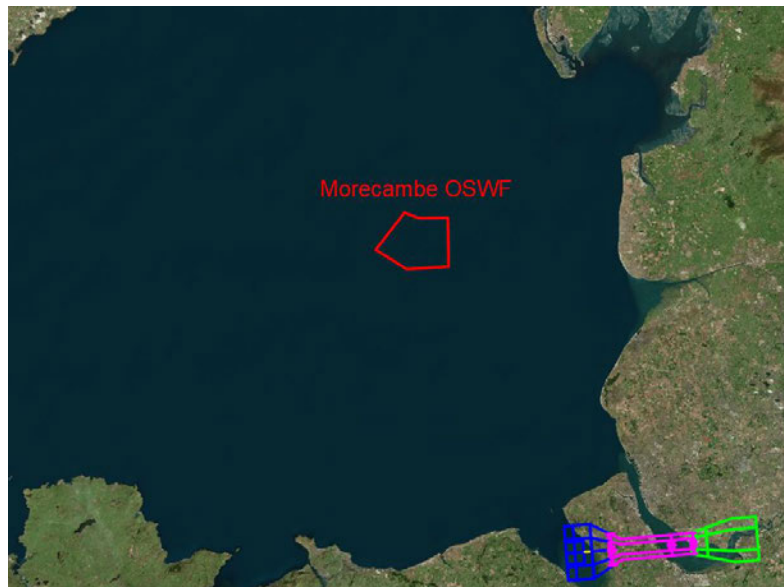


Figure 46 - RNP RWY 09 Protection Areas

**The proposed windfarm would not impact the published RNP RWY 09 procedure.**

**3.1.12 AD 2.EGGP-8-5 ILS/DME/NDB(L) RWY 27**

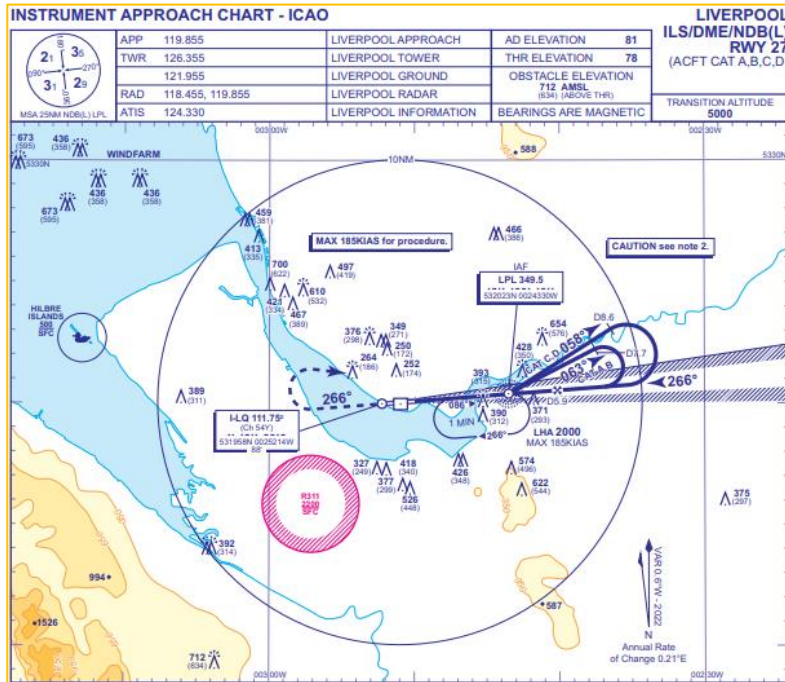


Figure 47 - ILS/DME/NDB(L) RWY 27 Procedure

Arrival to the procedure is published as 'At or Above 2500ft' which is above the required MOCA for the windfarm.

The windfarm lays outside the protection areas for the ILS/DME/NDB(L) Procedure to Runway 27, including the Missed Approach which climbs to the west before turning right towards NDB(L) LPL and will not be affected.

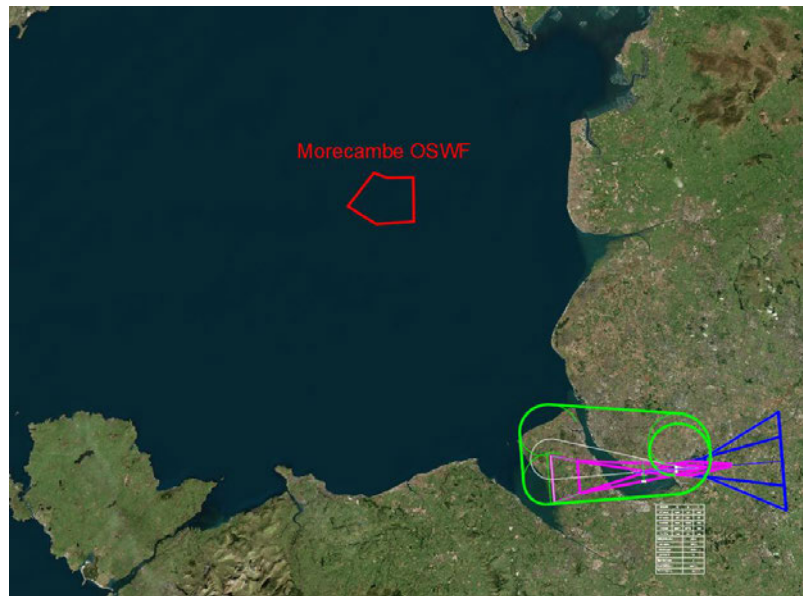


Figure 48 - ILS/DME/NDB(L) RWY 27 Protection Areas

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Additionally, the protection areas for the Base turns published on the chart have been constructed for both CAT A&B and CAT C&D aircraft:



Figure 49 - ILS/DME/NDB(L) RWY 27 Base turn Protection Areas

The proposed windfarm would not impact the published ILS/DME/NDB(L) RWY 27 procedure.

3.1.13 AD 2.EGGP-8-6 LOC/DME/NDB(L) RWY 27

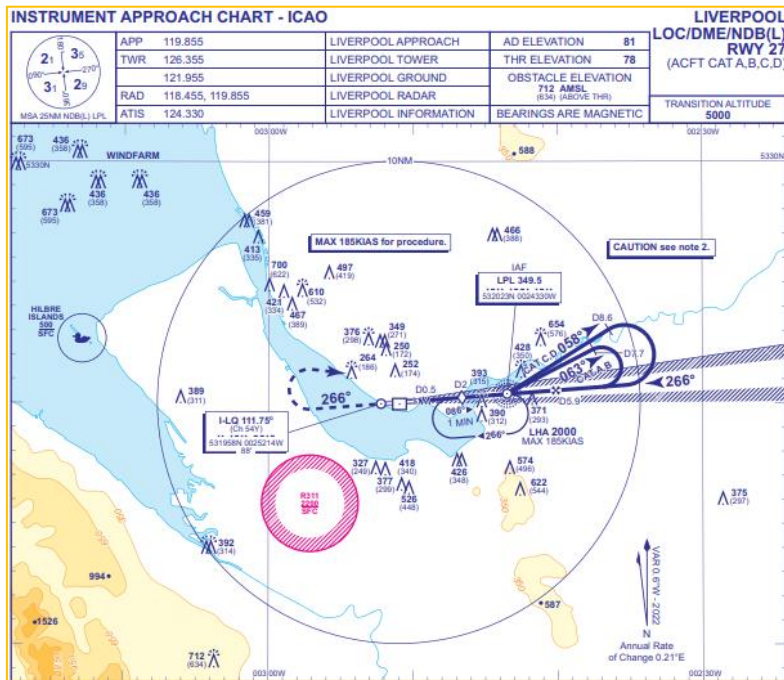


Figure 50 - LOC/DME/NDB(L) RWY 27 Procedure

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Arrival at the procedure is 'At or Above 2500ft' which is above the required MOCA for the windfarm using the elevation of 315m + 300m = 615m / 2018ft AMSL and would not be affected.

The windfarm lays outside the protection areas for all aircraft categories for the published LOC/DME/NDB(L) Runway 27 procedure, specifically the Missed Approach which climbs to the west before turning right towards NDB(L) LPL.



Figure 51 - LOC/DME/NDB(L) RWY 27 Protection Area

The windfarm lays outside the protection areas for the Base turn for Runway 27 as shown in Figure 49 and will not be affected.

**The proposed windfarm would not impact the published LOC/DME/NDB(L) RWY 27 procedure.**

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3.1.14 AD 2.EGGP-8-7 SRA RTR 2NM RWY 27

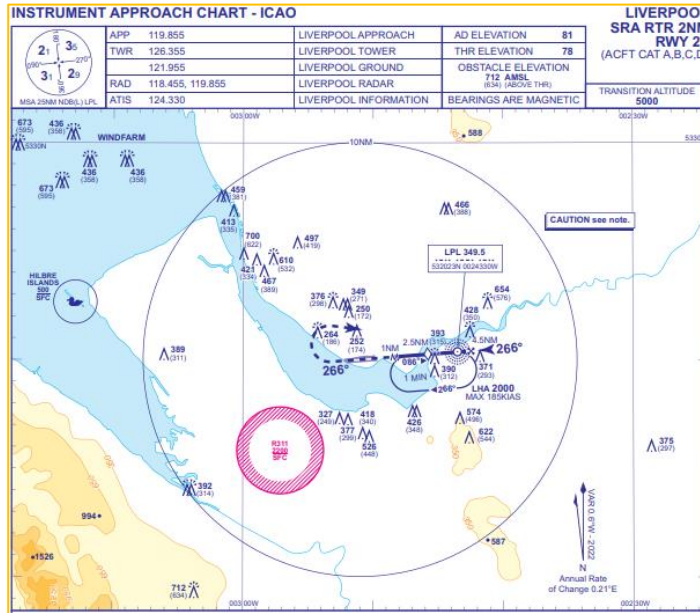


Figure 52 - SRA RTR 2NM RWY 27 Procedure

The initial and Intermediate Approach are directed by radar with no minima published on the chart (covered by ATCSMAC).

The windfarm lies outside the protection areas for the SRA RWY 27 and Hold Procedures for Runway 27 and will not be affected.

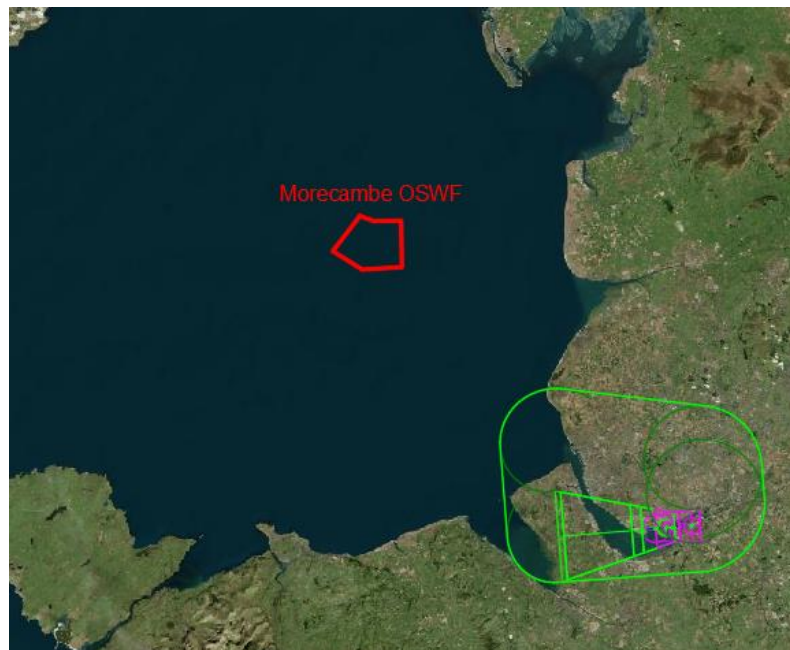


Figure 53 - SRA RTR 2NM RWY 27 Protection Area

**The proposed windfarm would not impact the published SRA RTR 2NM RWY 27 procedure.**

3.1.15 AD 2.EGGP-8-8 RNP RWY 27

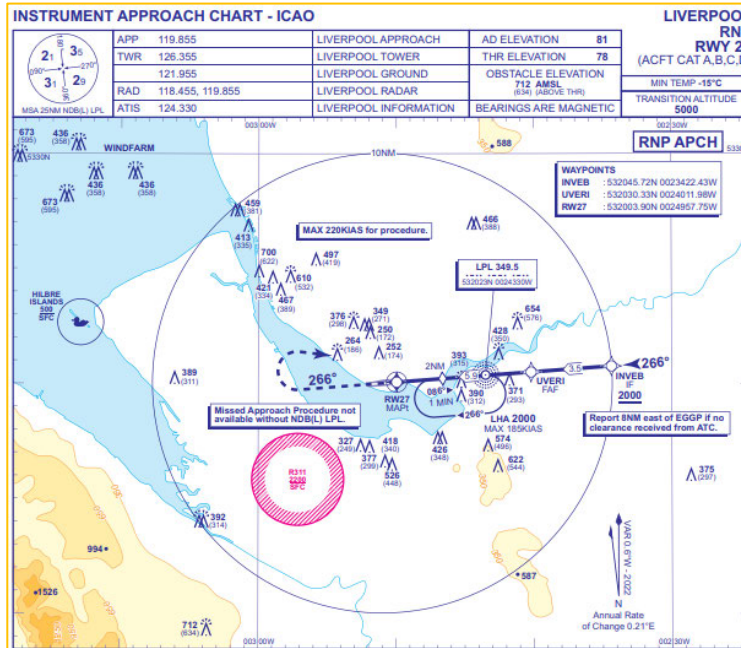


Figure 54 - RNP RWY 27 Procedure

Arrival to the RNP RWY 27 procedure is published as 'At or Above 2500ft' and would not be affected.

The windfarm lays outside the protection areas associated to the RNP Procedure to Runway 27.

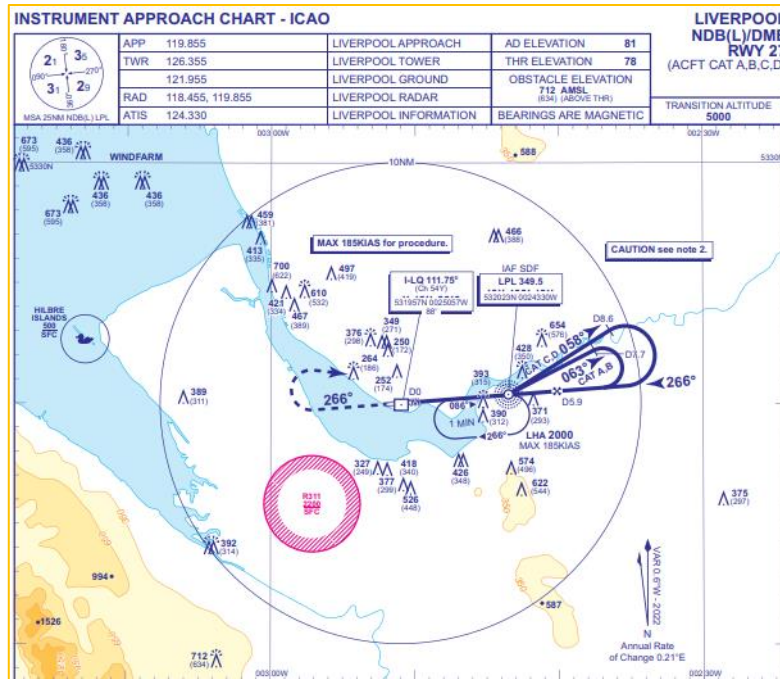


Figure 55 - RNP RWY 27 Protection Area

**The Windfarm would not impact the published RNP RWY 27 procedure.**



**3.1.16 AD 2.EGGP-8-9 NDB(L)/DME RWY 27**



### 3.1.17 Visual Circling

The windfarm is outside the Visual Circling VM(C) Obstacle Clearance areas for all aircraft categories (A, B, C and D).

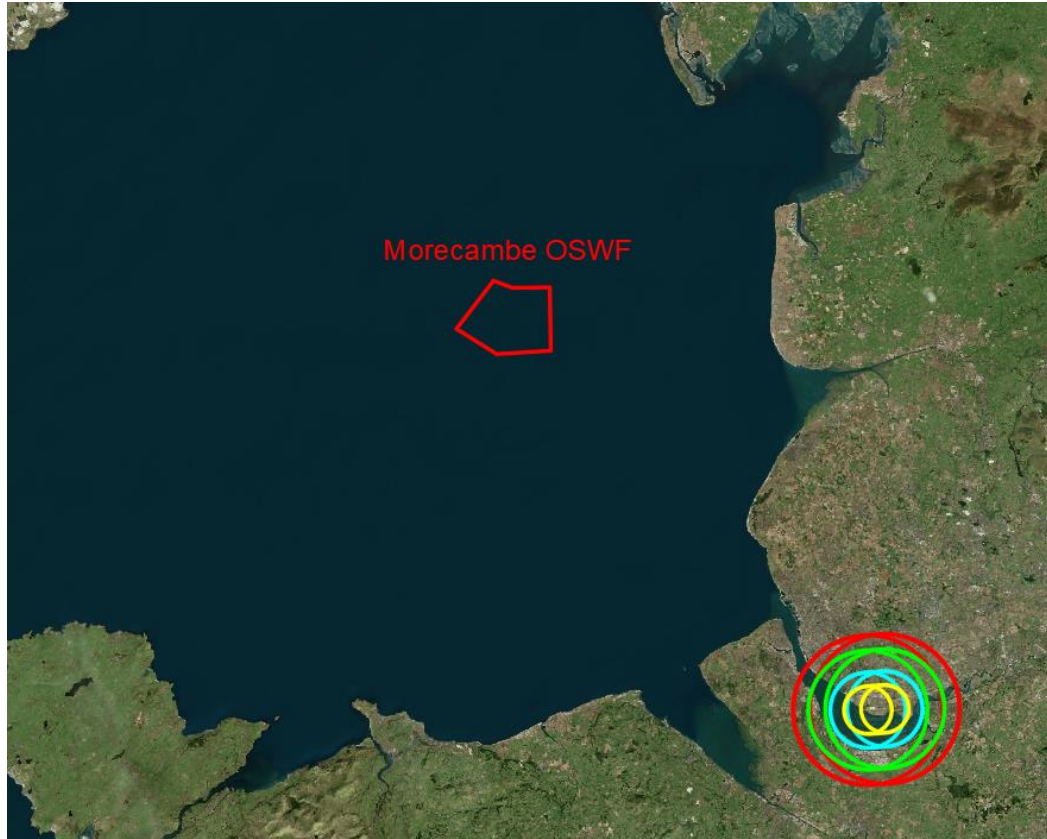


Figure 58 - Visual Circling Protection Areas

**The proposed windfarm would have no impact on the Visual Circling.**

### 3.1.18 Holding

NDB(L) LPL Hold

The NDB(L) LPL Hold has an existing Lowest Holding Altitude (LHA) of 2000ft.

With a maximum MOC of 300m the proposed Windfarm would potentially impact the hold:

$$315\text{m} + 300\text{m} = 615\text{m} / 2018\text{ft AMSL}$$

Existing Lowest Holding Altitude (LHA) = 2000ft

However, further analysis has deemed that the windfarm lays outside the protection areas associated to the NDB(L) LPL Hold, including its buffers – therefore there will be no impact on the NDB(L) LPL Hold.

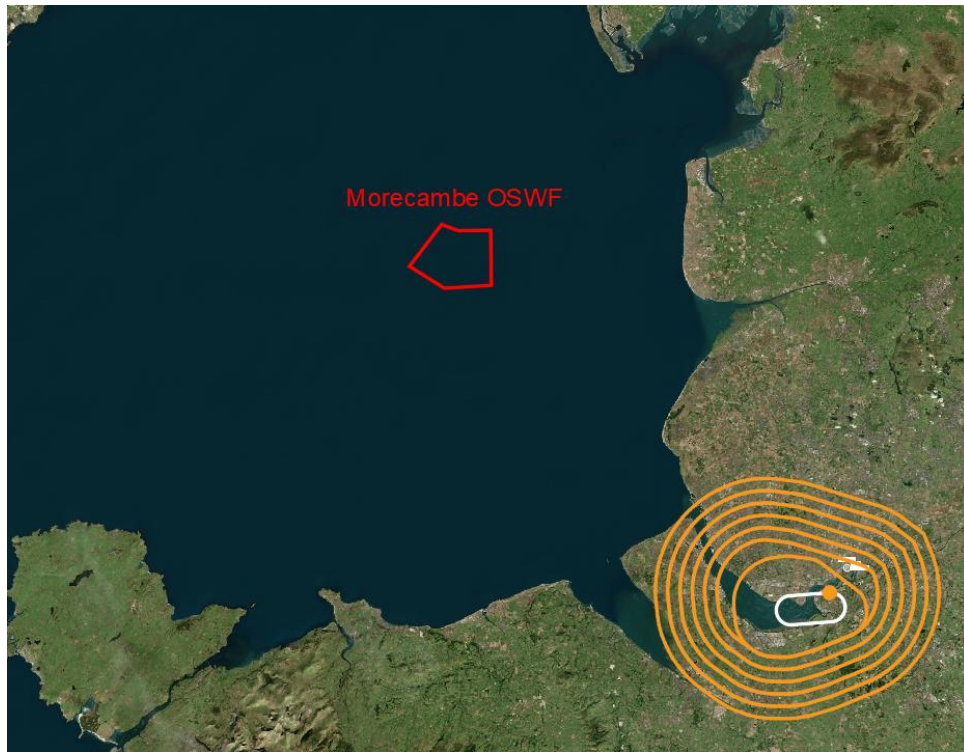


Figure 59 - NDB(L) LPL Hold and Protection Area and Buffers

**The proposed windfarm would have no impact on the NDB(L) LPL Hold for Liverpool Airport.**

**3.1.19 Visual Segment Surface (VSS)**

The windfarm is outside the lateral confines of VSS for all Runways.

**The proposed windfarm would have no impact on the VSS for Liverpool Airport Runways.**

**3.1.20 Minimum Sector Altitudes (MSA)**

MSA 25NM NDB(L) LPL

The windfarm lays outside the MSA 25NM NDB(L) LPL including the buffer and will have no impact.

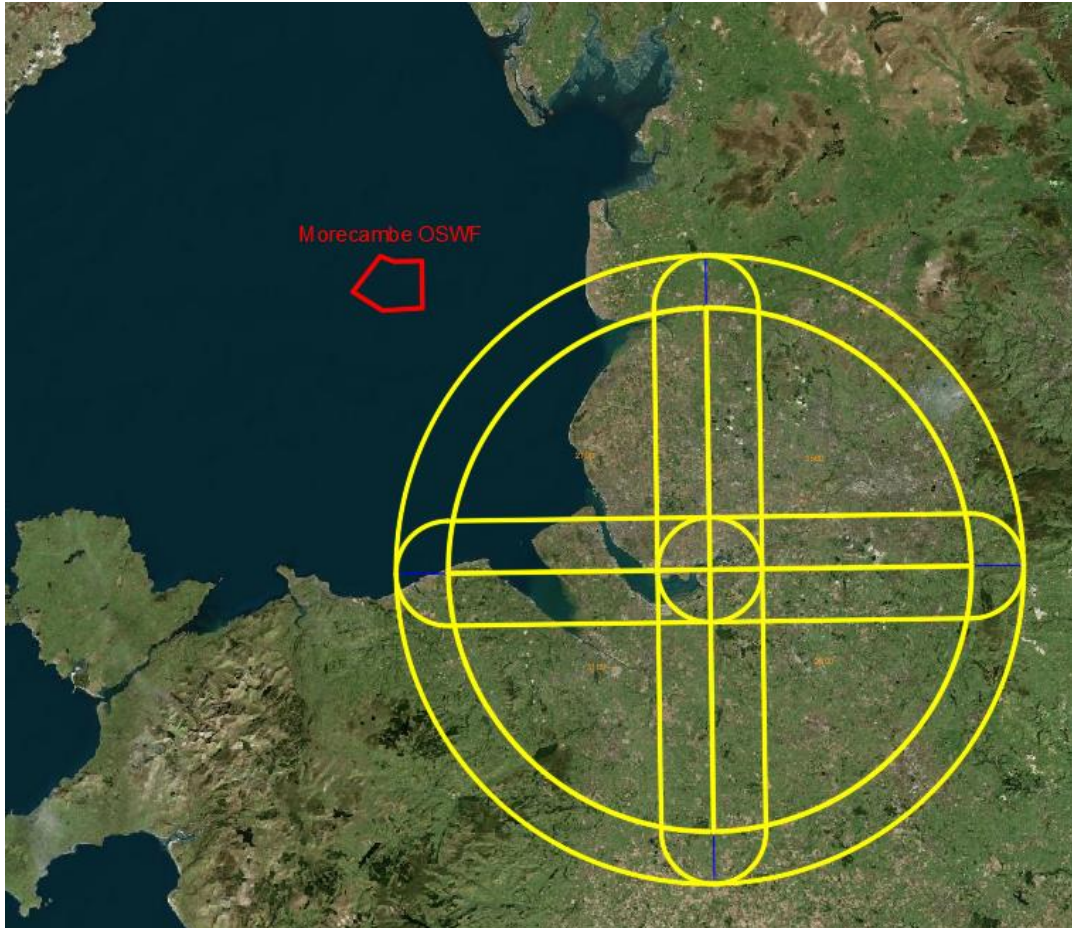


Figure 60 - MSA NDB(L) LPL Area including Buffer

**The proposed windfarm would have no impact on the published NDB(L) LPL MSA.**

**MSA 25NM ARP**

We have additionally protected for an MSA of 25NM based on the ARP as this was used for the ATCSMAC at Liverpool.

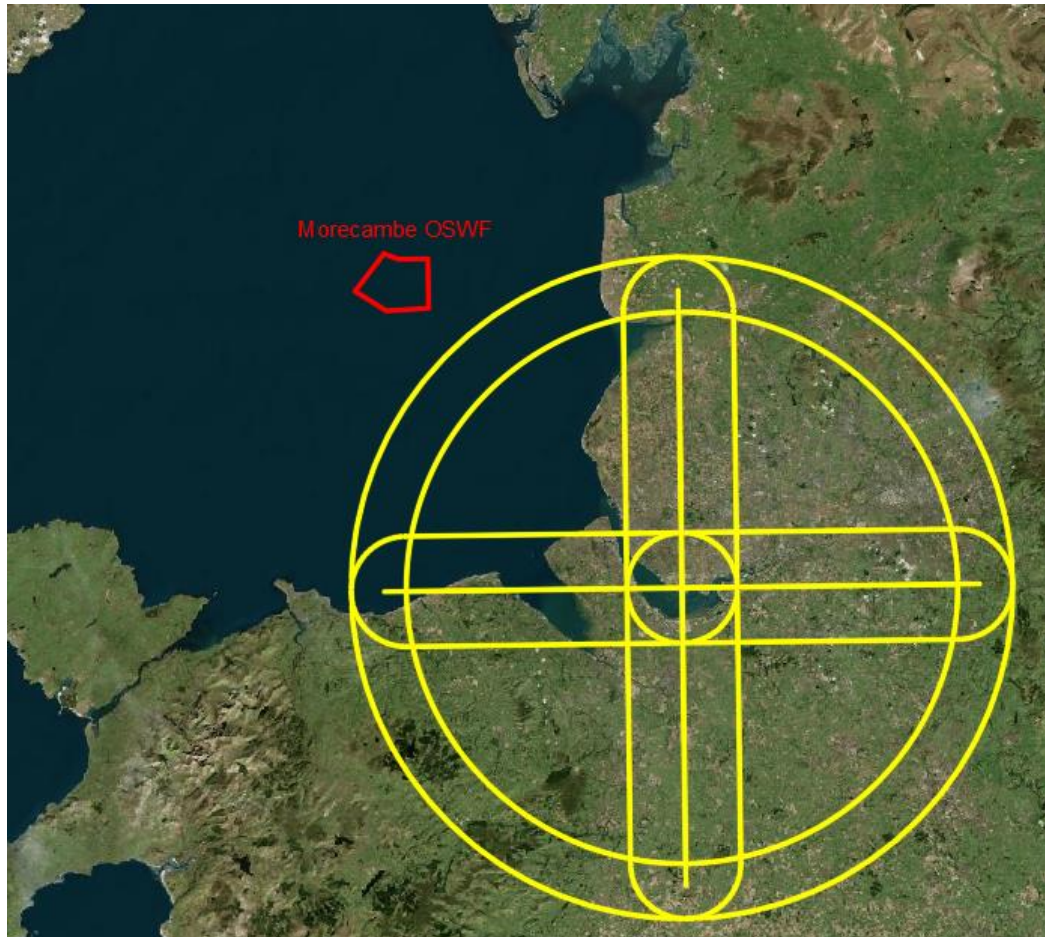


Figure 61 - MSA 25NM ARP

**The proposed windfarm would have no impact on the MSA 25NM from the ARP.**

## 4 BAE Warton Airport OLS and IFP Assessment

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### 4.1 IFP Assessment

Warton is a Civilian aerodrome with Military aerodrome charts.

The ATCSMAC and IFPs assessed are as follows:

Procedures from the UK Civil AIP

AIRAC 11/2023 (Effective 02 NOV 2023)

- AD 2.EGNO-5-1 ATCSMAC (17 JUN 21)

Procedures from the UK Mil AIP

AIRAC 2311 (Effective 02 NOV 23)

- AD 2 EGNO-1-5 ATC Surveillance MNM Altitude (23 FEB 23);
- AD 2 EGNO-1-7 SRA RWY 07 0.5NM (29 DEC 22);
- AD 2 EGNO-1-8 SRA RWY07 2NM (29 DEC 22);
- AD 2 EGNO-1-9 SRA RWY 25 0.5NM (29 DEC 22);
- AD 2 EGNO-1-10 SRA RWY 25 2NM (29 DEC 22);
- AD 2 EGNO-1-11 NDB to ILS/DME RWY 25 (29 DEC 22);
- AD 2 EGNO-1-12 TAC to ILS/DME RWY 25 (29 DEC 22);
- AD 2 EGNO-1-13 HI-TAC to ILS/DME RWY 25 (29 DEC 22);
- AD 2 EGNO-1-14 DCT ARR POL to ILS/DME RWY 25 (29 DEC 22);
- AD 2 EGNO-1-15 NDB/DME RWY 07 (29 DEC 22);
- AD 2 EGNO-1-16 NDB RWY 07 (29 DEC 22);
- AD 2 EGNO-1-17 DCT ARR WAL to NDB/DME RWY 07 (29 DEC 22);
- AD 2 EGNO-1-18 TAC RWY 07 (29 DEC 22);
- AD 2 EGNO-1-19 TAC RWY 25 (29 DEC 22);
- AD 2 EGNO-1-20 HI-TAC RWY 07 (29 DEC 22);
- AD 2 EGNO-1- 21 HI TAC RWY 25 (29 DEC 22).

Additionally, the following were checked:

- Visual Circling
- Holding
- Visual Segment Surface (VSS)
- Minimum Sector Altitudes (MSA)

4.1.1 AD 2 EGNO-1-5 ATCSMAC

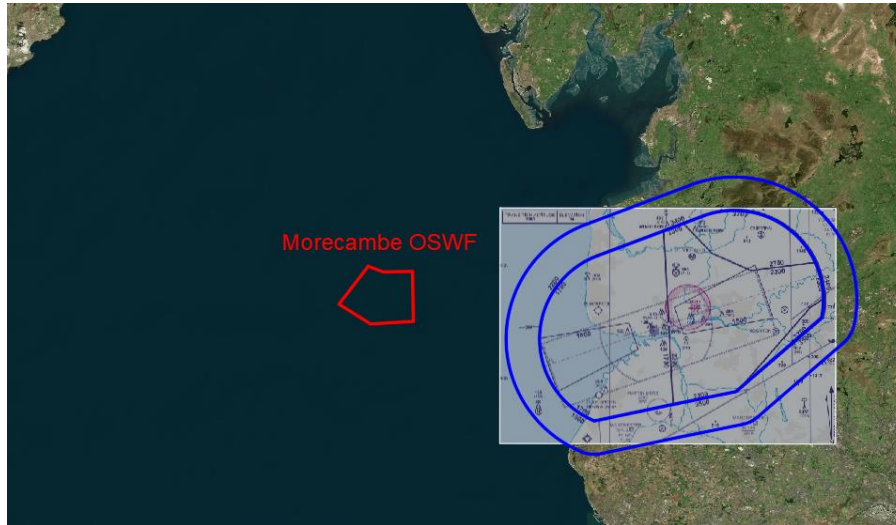


Figure 62 - Windfarm in Relation to ATCSMAC

The Civil and Military ATCSMAC are identical so only one assessment is necessary. The windfarm lays outside the lateral buffer of all Surveillance Minimum Altitude Areas (SMAAs).

**The proposed windfarm would not impact Warton Airport's ATCSMAC.**

4.1.2 AD 2 EGNO-1-7 SRA RWY 07 0.5NM

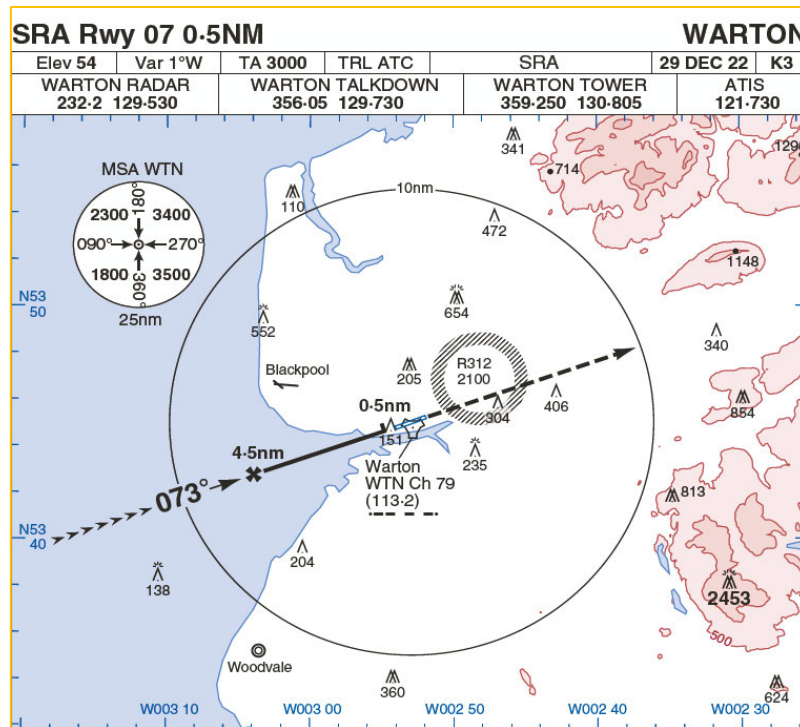


Figure 63 - SRA RWY 07 0.5NM Procedure

COMMERCIAL IN CONFIDENCE

The windfarm lays outside the protection areas for the SRA procedure to runway 07 with a Missed Approach Point at 0.5NM.

The Missed Approach continues east, away from the windfarm and climbs to 3400ft, common to the MSA WTN north-east sector, and will not be affected.



Figure 64 - SRA RWY 07 0.5NM Protection Areas

Arrival to the procedure could be conducted using the ATCSMAC OR MSA to conduct radar vectoring until reaching the FAF at 1500ft.

The ATCSMAC has been considered in section 4.1.1 and the MSA WTN in section 4.1.20.

**The proposed windfarm would not impact the published SRA RWY 07 0.5NM procedure.**



4.1.3 AD 2 EGNO-1-8 SRA RWY 07 2NM

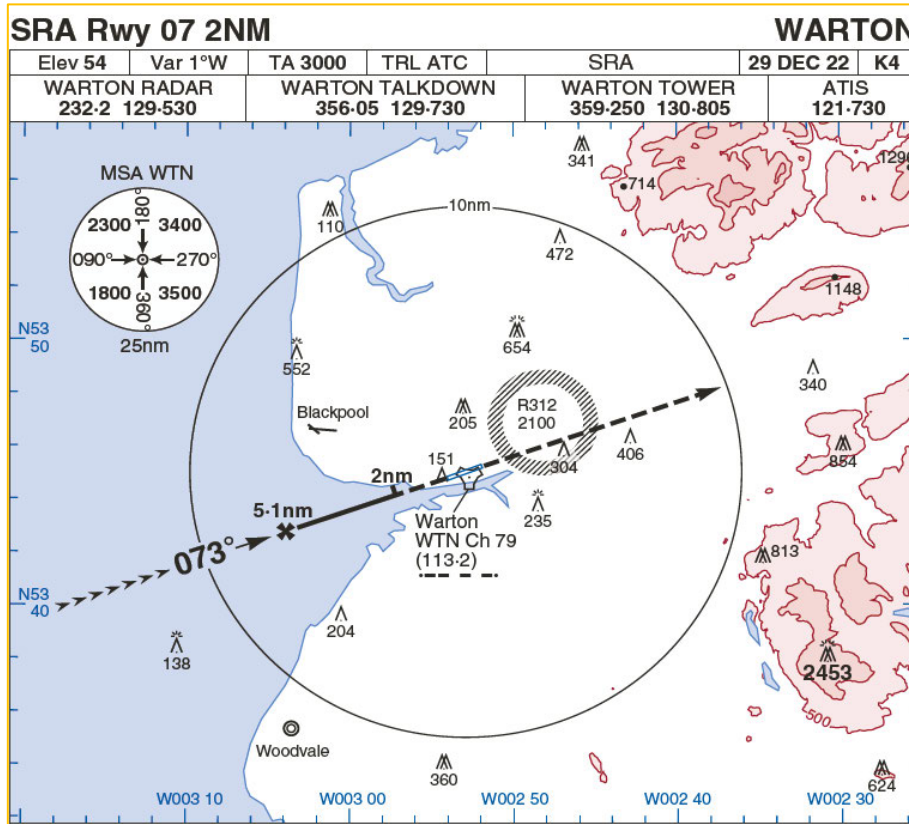


Figure 65 - SRA RWY 07 2NM Procedure

The windfarm lays outside the protection areas for the SRA procedure to runway 07 with a Missed Approach Point at 2NM.

The Missed Approach continues east, away from the windfarm and climbs to 3400ft, common to the MSA WTN north-east sector, and will not be affected.

Arrival to the procedure could be conducted using the ATCSMAC OR MSA to conduct radar vectoring until reaching the FAF at 1700ft.



COMMERCIAL IN CONFIDENCE

The windfarm lays outside the protection areas for the SRA procedure to runway 25 with a Missed Approach Point at 0.5NM.

The Missed Approach text is as follows:

*'Climb on Rwy Tr to 2000 1950'.*

Aircraft are required to climb to 2000ft QNH in the Missed Approach, ahead on the runway track, towards the vicinity of the Morecambe development, as shown in Figure 68.

The windfarm is outside of the protection for the Warton MSA's and as such will not impact the Missed Approach Procedure.

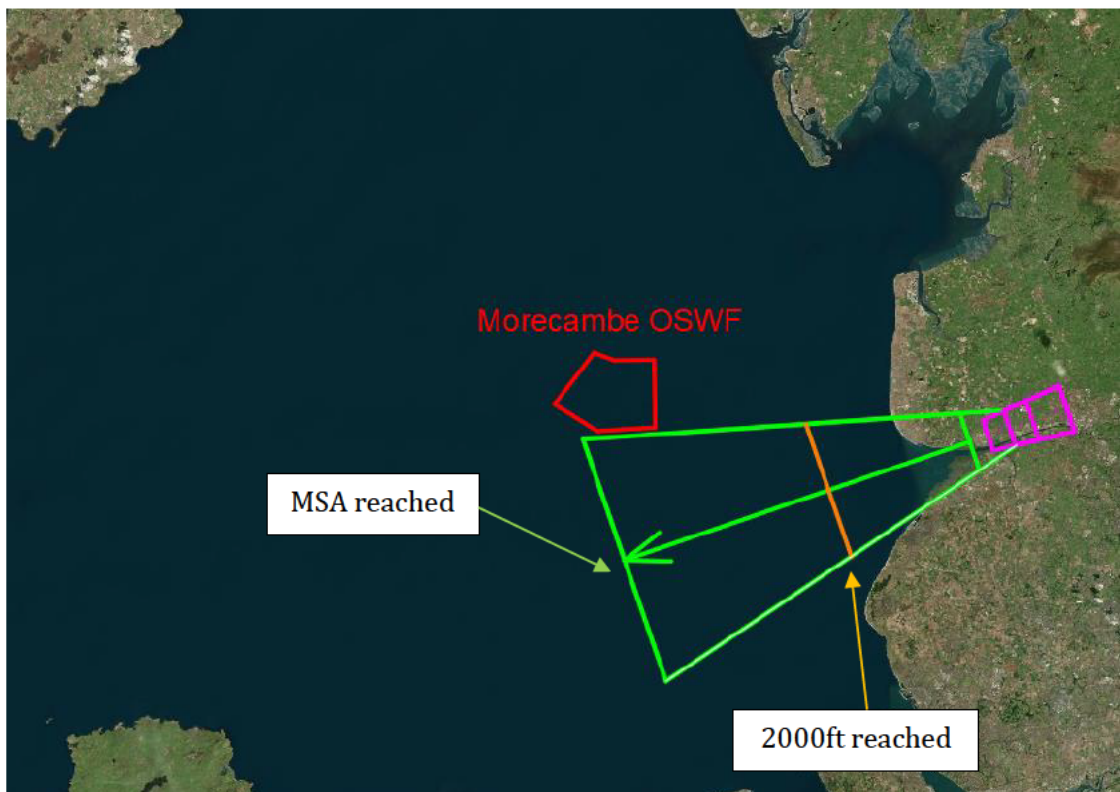


Figure 68 - SRA RWY 25 0.5NM Protection Areas

**The proposed windfarm would not impact the published SRA RWY 25 0.5NM procedure.**

COMMERCIAL IN CONFIDENCE

4.1.5 AD 2 EGNO-1-10 SRA RWY 25 2NM

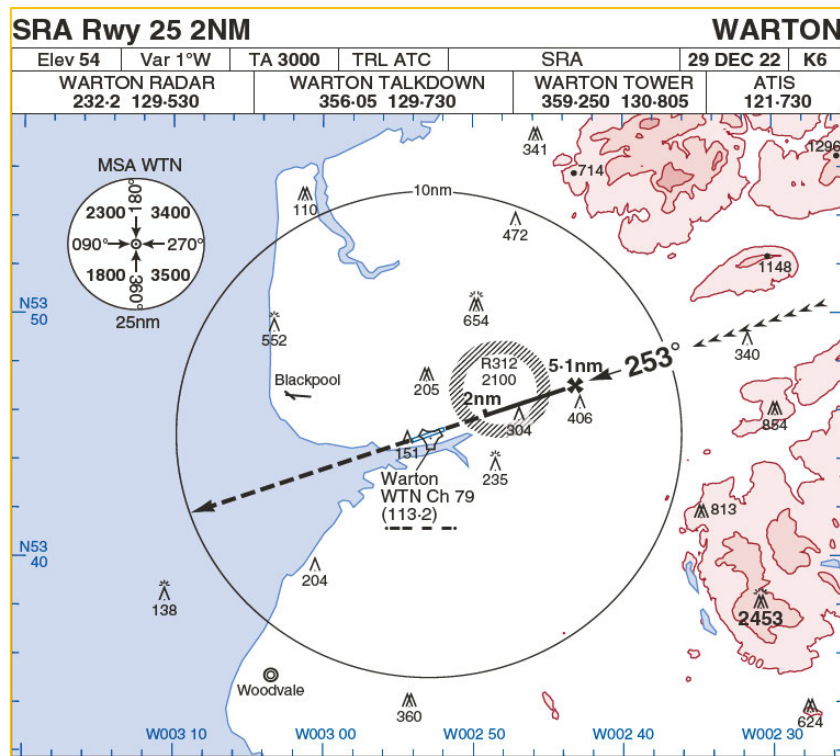


Figure 69 - SRA RWY 25 2NM Procedure

The windfarm is inside the Missed Approach protection areas for the SRA procedure to runway 25 with a Missed Approach Point at 2NM.

The Missed Approach text is as follows:

*'Climb on Rwy Tr to 2000 1950'.*

Aircraft are required to climb to 2000ft QNH in the Missed Approach, ahead on the runway track, towards the vicinity of the development as shown in Figure 70.

The OIS at the point above the closest section of the windfarm when using maximum MOC of 50m is:

- $OCA + (\text{distance from SOC} * 0.025) - 50m$
- $228.6m (750ft) + (38710.88 * 0.025) - 50m = 1196.37m$

This is above the max value of 315m of the wind turbines.

COMMERCIAL IN CONFIDENCE

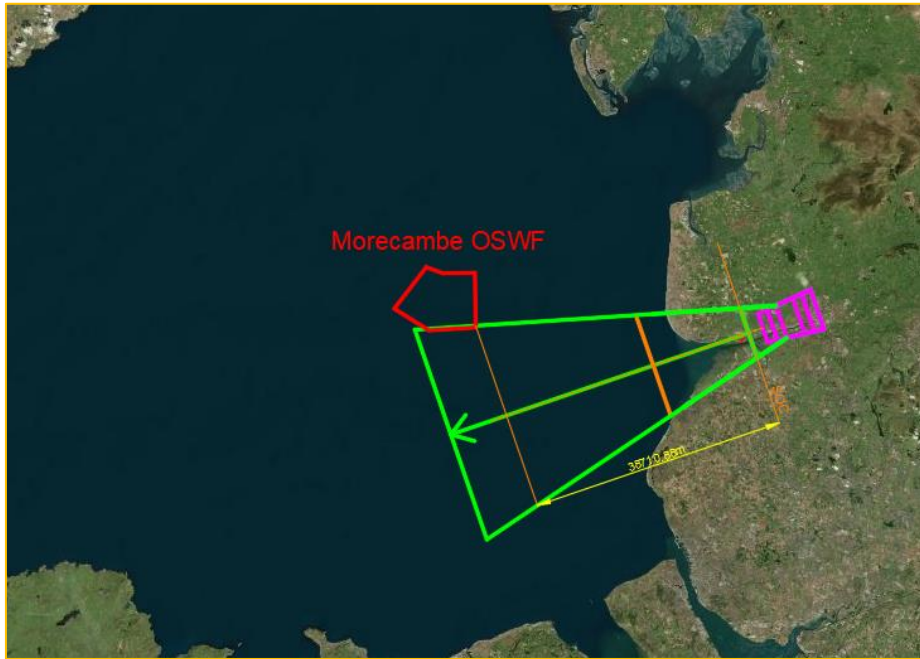


Figure 70 - SRA RWY 25 2NM Protection Area

The proposed windfarm would not impact the published SRA RWY 25 2NM procedure.

4.1.6 AD 2 EGNO-1-11 NDB to ILS/DME RWY 25

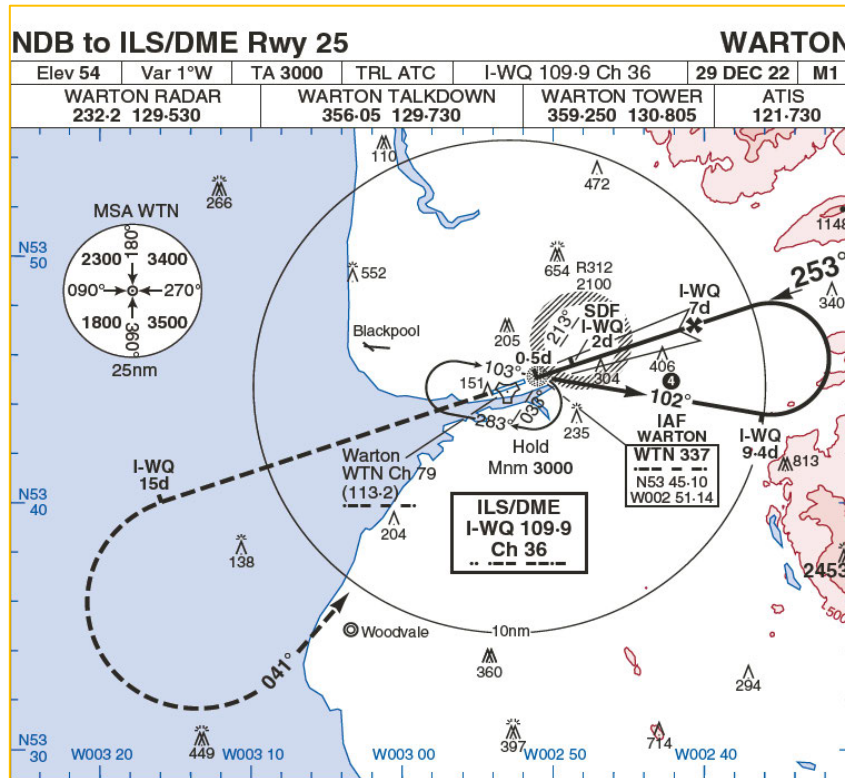


Figure 71 - NDB to ILS/DME RWY 25 Procedure

COMMERCIAL IN CONFIDENCE

COMMERCIAL IN CONFIDENCE

The windfarm lays outside the protection areas for the NDB to ILS/DME RWY 25 procedure to runway 25 and will have no impact.

This includes the Missed Approach which climbs to 3000ft and turns left, away from the windfarm.

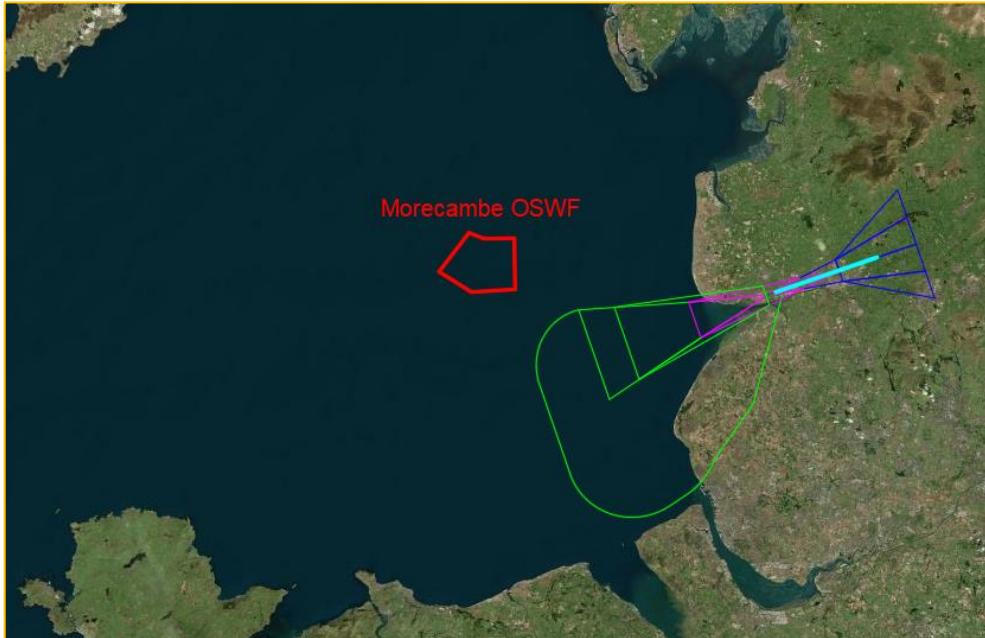


Figure 72 - NDB to ILS/DME RWY 25 Protection Areas

Additionally, the reversal procedure from NDB WTN, published on the approach chart has been constructed:



Figure 73 - NDB to ILS/DME RWY 25 Base turn Protection Area

COMMERCIAL IN CONFIDENCE

The windfarm lays outside the protection area for the Base turn and will not impact the reversal procedure.

The Hold from NDB WTN has been considered in section 4.1.18.

**The proposed windfarm will not impact the published NDB to ILS/DME RWY 25 procedure.**

#### 4.1.7 AD 2 EGNO-1-12 TAC to ILS/DME RWY 25

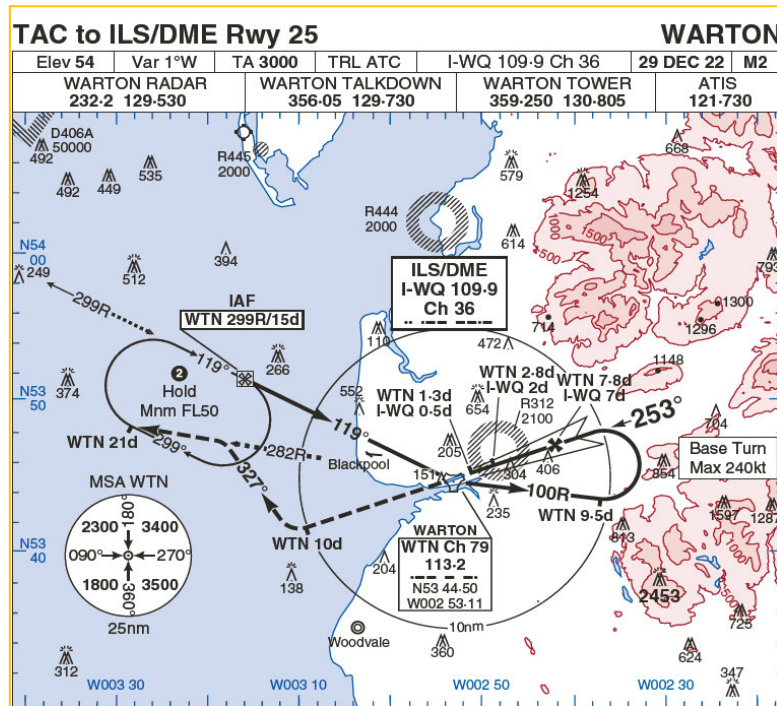


Figure 74 - TAC to ILS/DME RWY 25

The windfarm lays outside the protection areas for the ILS as considered in section 4.1.6 and will have no impact.

Aircraft will be at 5000ft at the IAF at the NDB WTN Hold which is above the MOCA required at the windfarm. The procedure then heads east, away from the windfarm.

Additionally, the procedure features a reversal Base turn. The minimum altitude within the Base turn is 2560ft which is above the MOCA required at the windfarm which will have no impact to the procedure.

However, the windfarm is within the protection area of the Final Missed Approach area associated with the TAC to ILS/DME RWY 25 and could potentially impact the procedure:

COMMERCIAL IN CONFIDENCE

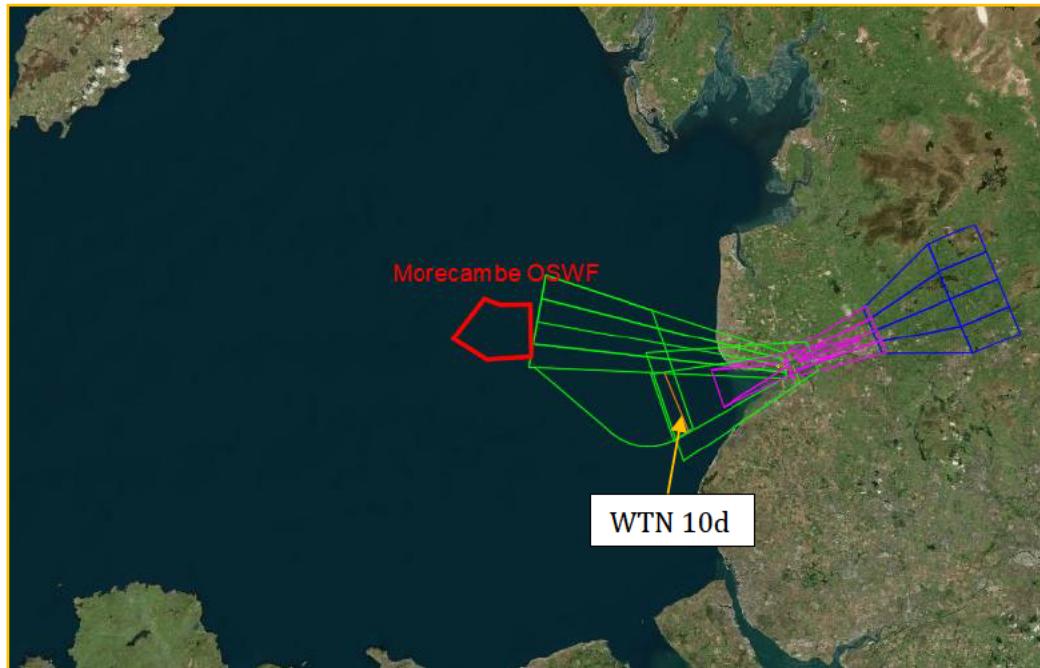


Figure 75 - TAC to ILS/DME RWY 25 Protection Areas

This Missed Approach Text is as follows:

*Climb on Rwy Tr to 2060 2000. At WTN 10d right onto 327° to intercept WTN 282R outbound climbing to FL150 and join high WTN hold at 285R/37d.*

Aircraft are required to climb to 2060ft before turning at WTN 10d which is shown in figure 75 and are, at this point, already above the MOCA required at the windfarm.

Using the MOC for the Missed Approach of 50m and Windfarm elevation of 315m, aircraft should be at a minimum altitude of  $315\text{m} + 50\text{m} = 365\text{m} / 1198\text{ft}$  to safely clear the obstacle.

The High WTN Hold has a minimum altitude of FL150 and will not be affected and is considered in section 4.1.18.

**The proposed windfarm will not impact the published TAC to ILS/DME RWY 25 procedure.**

COMMERCIAL IN CONFIDENCE



4.1.8 AD 2 EGNO-1-13 HI-TAC to ILS/DME RWY 25

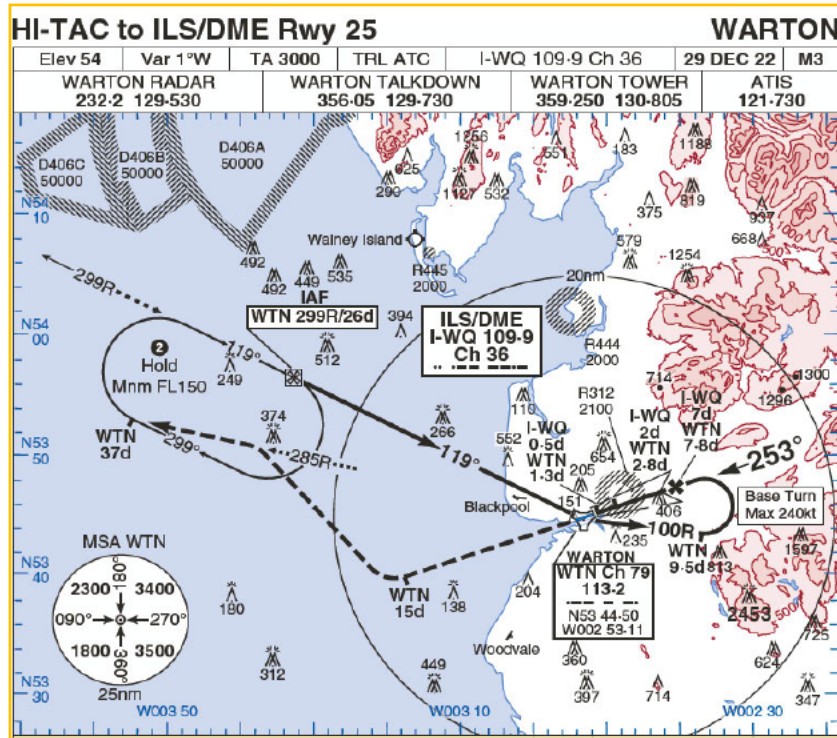


Figure 76 – HI-TAC to ILS/DME RWY 25

The proposed windfarm is outside of the protection areas for the ILS as considered in section 4.1.6 and will have no impact.

However, the windfarm lays within the protection area of the Final Missed Approach area associated with the HI-TAC to ILS/DME RWY 25 and could potentially impact the procedure:

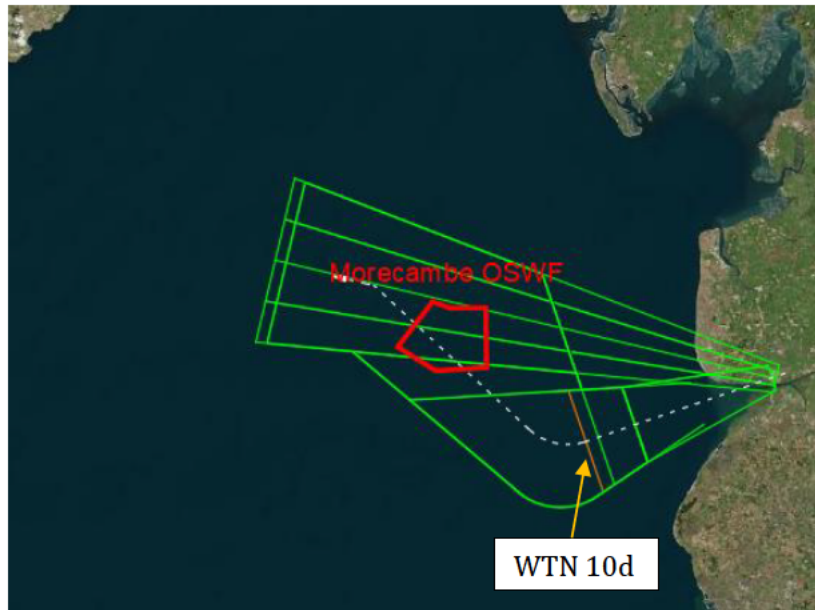


Figure 77 - HI-TAC to ILS/DME, Final Missed Approach Protection Areas

COMMERCIAL IN CONFIDENCE

This Missed Approach Text is as follows:

*Climb on Rwy Tr to 2060 2000. At WTN 15d right onto 285R oubd, climbing to FL150 and join high WTN hold at 285R/37d.*

Aircraft are required to climb to 2060ft before turning at WTN 15d which is shown in figure 77 and are, at this point, already above the MOCA required at the windfarm.

Using the MOC for the Missed Approach of 50m and Windfarm elevation of 315m, aircraft should be at a minimum altitude of 315m + 50m = 365m / 1198ft to safely clear the obstacle.

The High WTN Hold has a minimum altitude of FL150 and will not be affected and is considered in section 4.1.18.

**The proposed windfarm will not impact the published HI-TAC to ILS/DME RWY 25 procedure.**

#### 4.1.9 AD 2 EGNO-1-14 DCT ARR POL to ILS/DME RWY 25

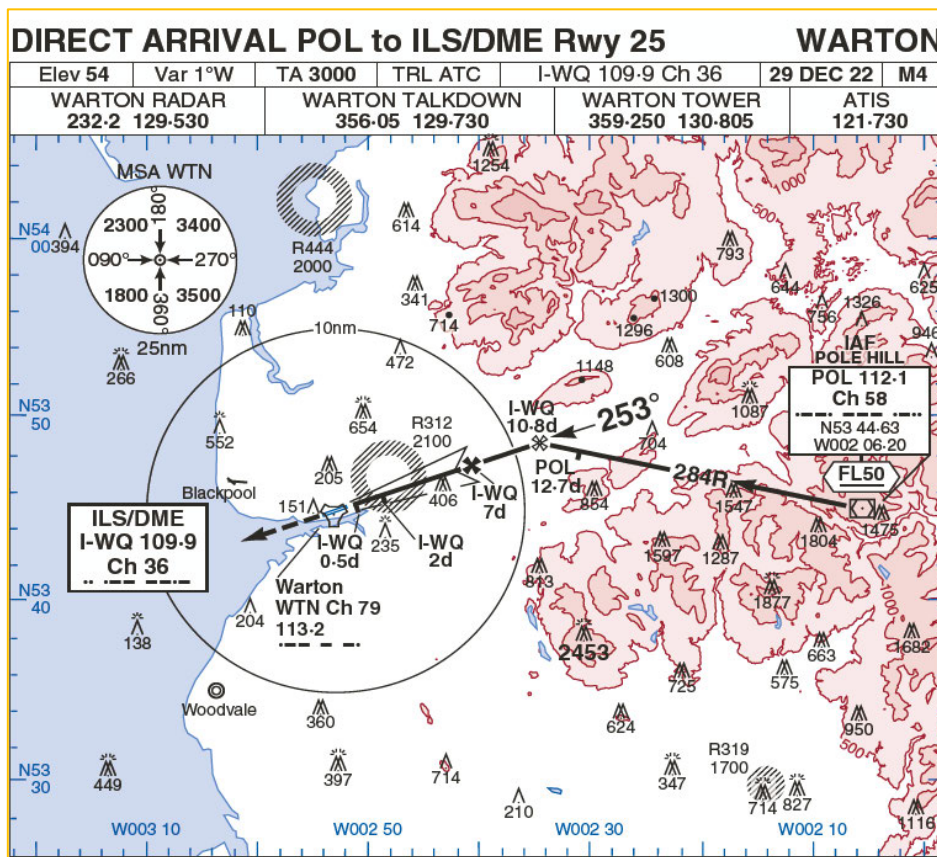


Figure 78 - DIRECT ARRIVAL POL to ILS/DME RWY 25 Procedure

The windfarm lays outside the protection areas associated with the Direct Arrival procedure from POL VOR to the ILS/DME for runway 25.



COMMERCIAL IN CONFIDENCE

The windfarm lays outside the protection areas for the NDB/DME procedure to runway 07, including the Missed Approach which heads east, away from the windfarm and will have no impact.

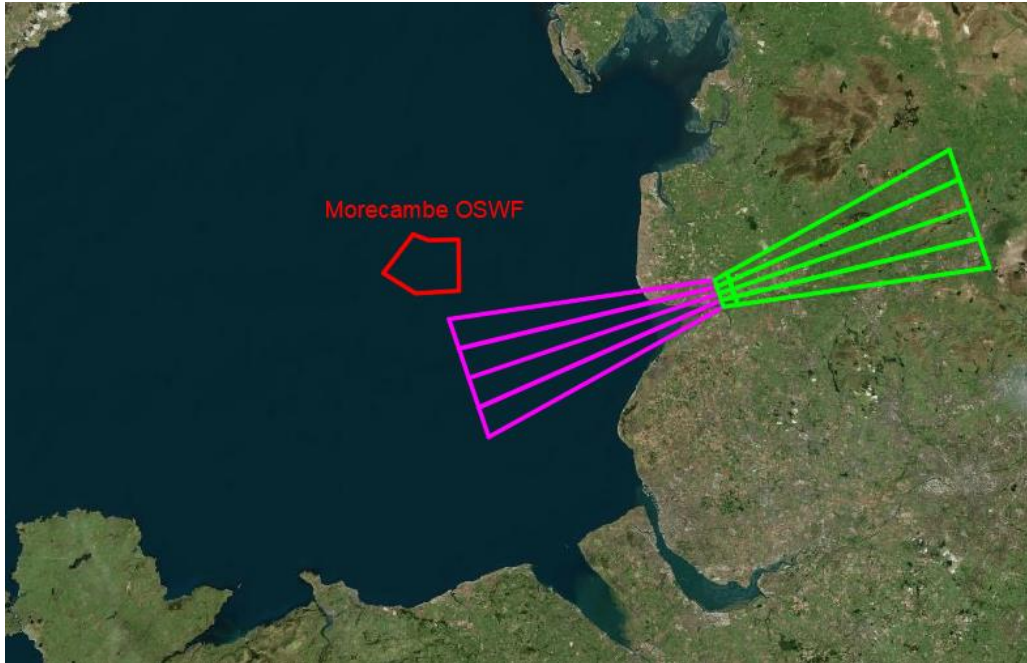


Figure 81 - NDB/DME RWY 07 Protection Areas

The procedure reversals published on the approach chart allows aircraft to descend to 1530ft at the FAF. The protection area for the Base turn has been constructed:

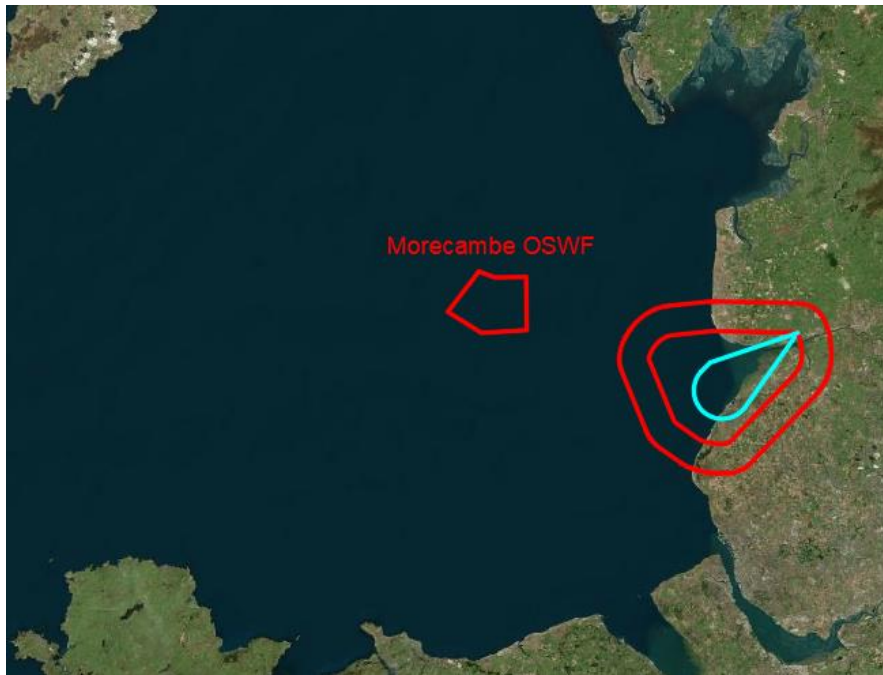


Figure 82 – NDB/DME RWY 07 NDB WTN Base turn Protection Areas

COMMERCIAL IN CONFIDENCE

COMMERCIAL IN CONFIDENCE

The windfarm lays outside the protection area for the procedure reversal published on the NDB/DME RWY 07 chart. The NDB WTN Hold has been considered in section 4.1.18.

**The proposed windfarm will not impact the published NDB/DME RWY 07 procedure.**

4.1.11 AD 2 EGNO-1-16 NDB RWY 07

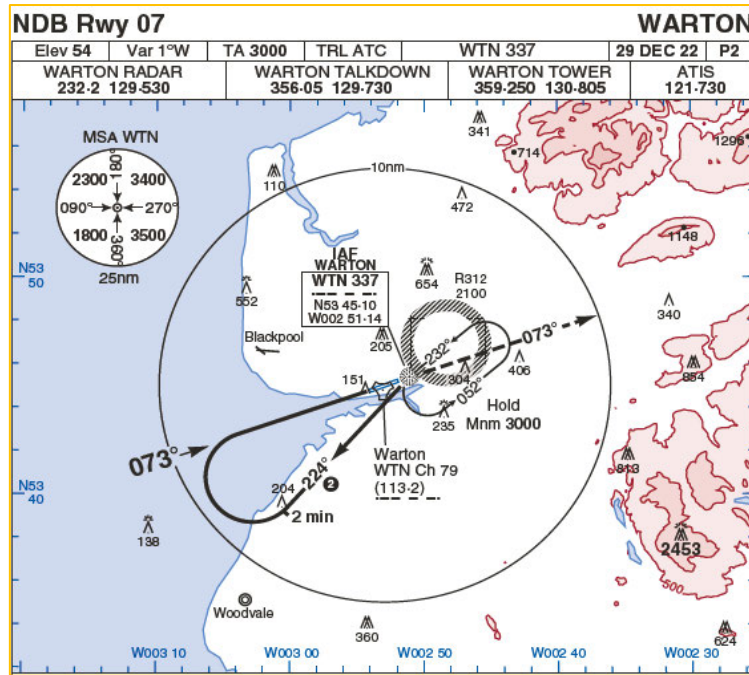


Figure 83 - NDB RWY 07 Procedure

The windfarm lays outside the protection areas for the NDB procedure to runway 07 and will have no impact.

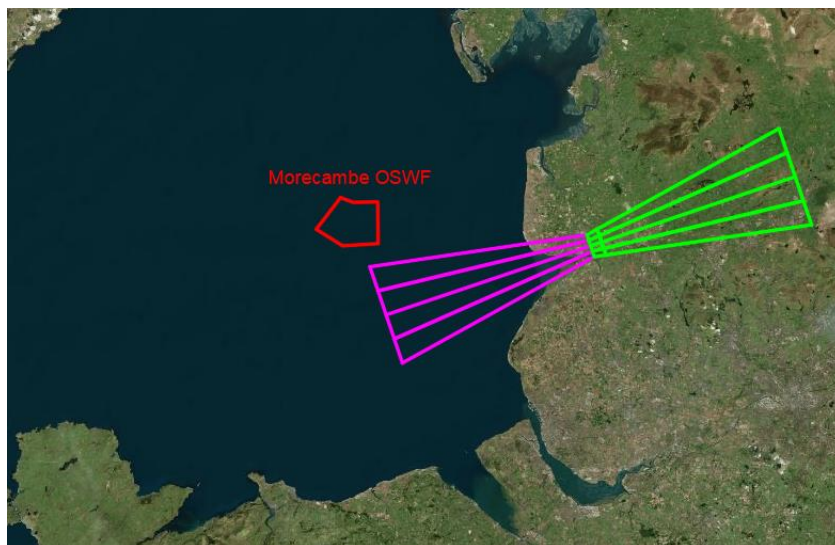


Figure 84 - NDB RWY 07 Protection Areas

COMMERCIAL IN CONFIDENCE

The procedure reversals published on the approach chart allows aircraft to descend to 1730ft in the Base turn. The protection area for the base turn has been constructed:

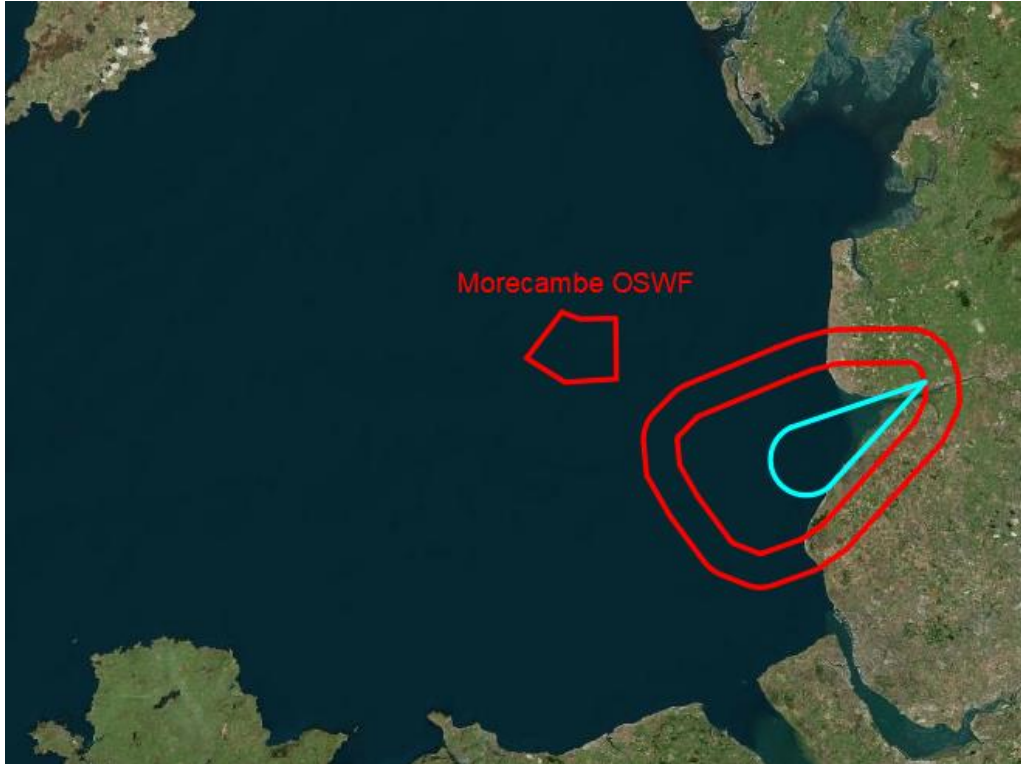


Figure 85 - NDB RWY 07 Base turn Protection Area

The windfarm lays outside the protection area for the procedure reversal published on the NDB RWY 07 chart.

**The proposed windfarm will not impact the published NDB RWY 07 procedure.**

4.1.12 AD 2 EGNO-1-17 DCT ARR WAL to NDB/DME RWY 07

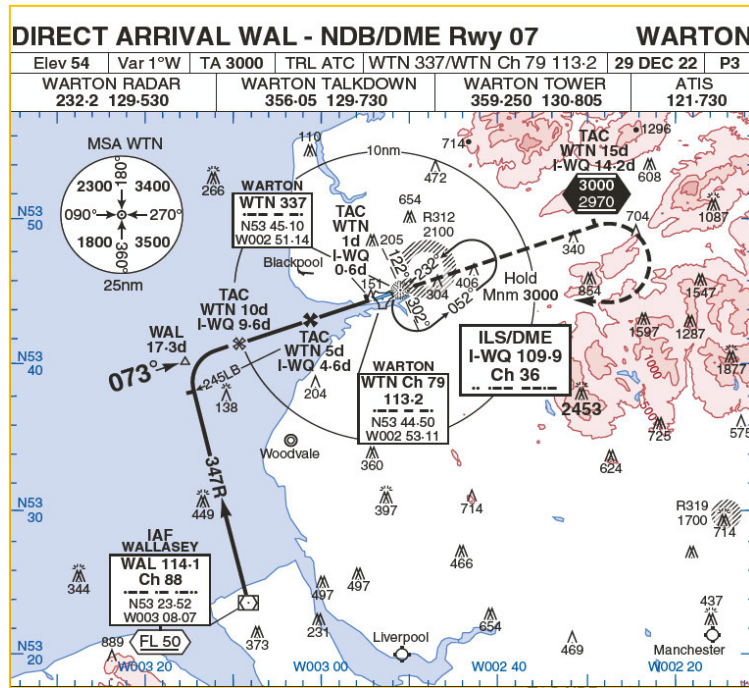


Figure 86 - DIRECT ARRIVAL WAL - NDB/DME RWY 07 Procedure

The proposed windfarm is outside the protection areas for the DIRECT ARRIVAL from WAL VOR to the NDB/DME procedure to runway 07, which has already been assessed in section 4.1.10 and will have no impact.

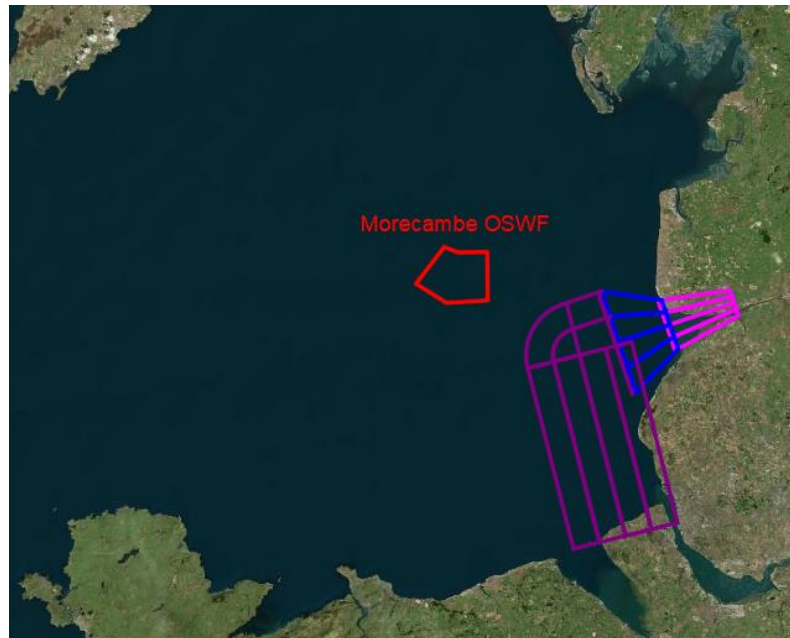


Figure 87 - DIRECT ARRIVAL WAL to NDB/DME RWY 07 Protection Areas

**The proposed windfarm will not impact the published DIRECT ARRIVAL WAL to NDB/DME RWY 07 procedure.**

4.1.13 AD 2 EGNO-1-18 TAC RWY 07

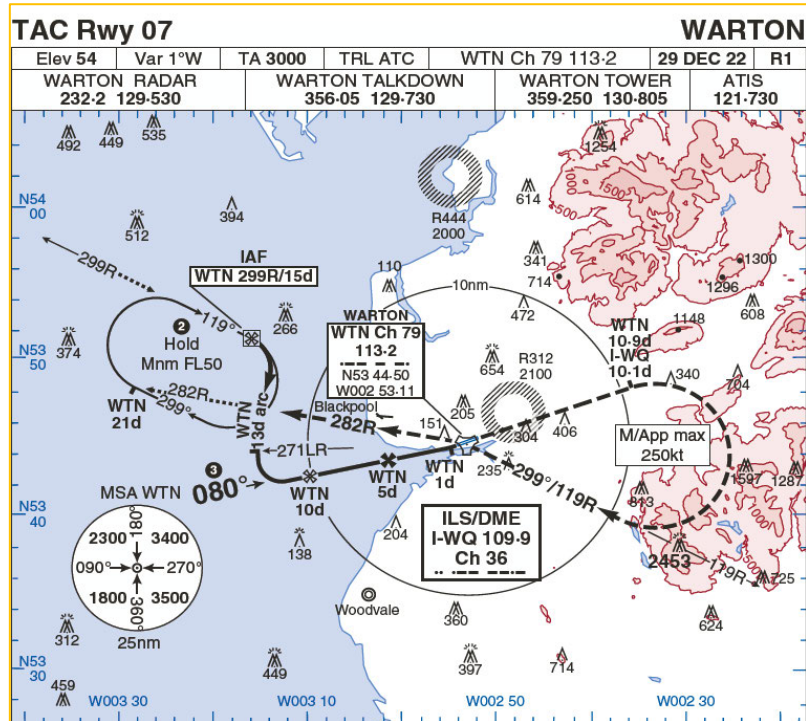


Figure 88 - TAC RWY 07 Procedure

The windfarm lays inside the Final Missed Approach protection areas for the TAC approach procedure.

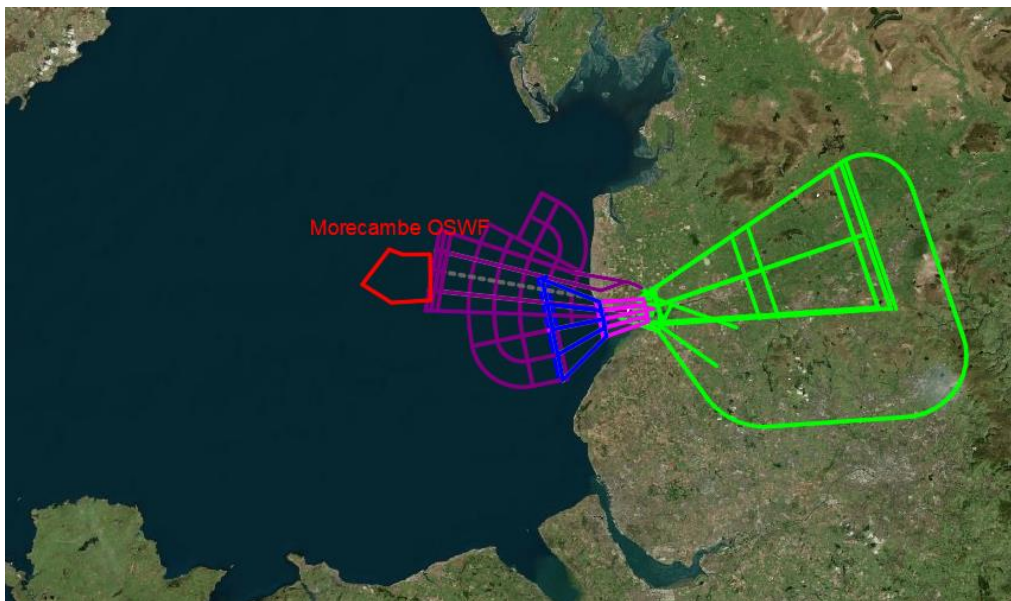


Figure 89 - TAC RWY 07 Protection Areas



COMMERCIAL IN CONFIDENCE

This Missed Approach Text is as follows:

*Climb on Rwy Tr to 3470 3440 or WTN 10.9d/I-WQ 10.1d, whichever later, then level turn right and intercept WTN 119R inbound. At WTN turn left on 282R climbing to FL50 and join hold at 282R/21d.*

Aircraft are required to climb to 3470ft before turning at WTN 10.9d. At this point, the aircraft are already above the MOCA required at the windfarm.

Using the MOC for the Missed Approach of 50m and Windfarm elevation of 315m, aircraft should be at a minimum altitude of 315m + 50m = 365m / 1198ft to safely clear the obstacle.

Arrival to the procedure is via the IAF at the WTN Hold at a minimum altitude of FL50 and will not be affected.

**The proposed windfarm will not impact the published TAC RWY 25 procedure.**

#### 4.1.14 AD 2 EGNO-1-19 TAC RWY 25

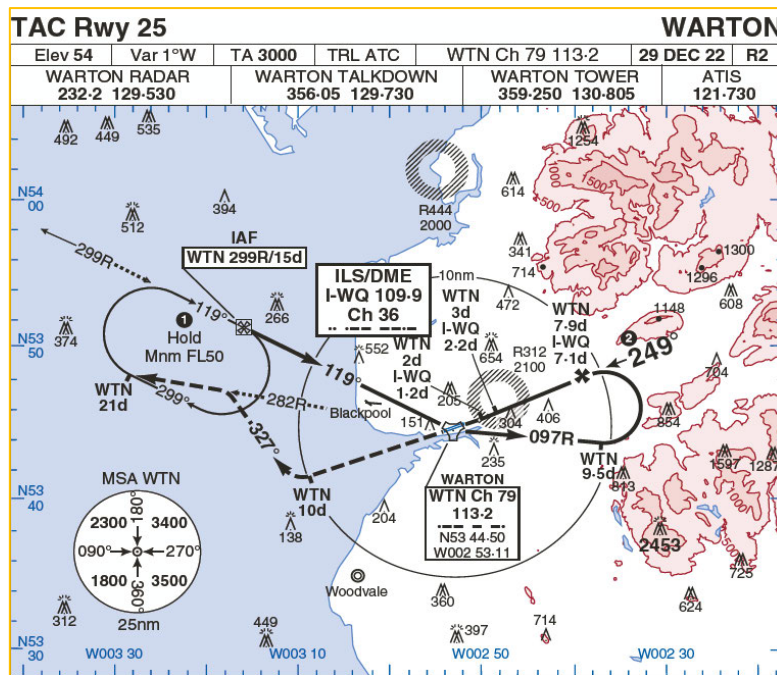


Figure 90 - TAC RWY 25 Procedure

Aircraft will be at 5000ft at the IAF at the WTN 299R/15D Hold which is above the MOCA required at the windfarm. The procedure then heads east, away from the windfarm.

However, the windfarm is within the protection area of the Final Missed Approach area associated with the TAC RWY 25 and could potentially impact the procedure:



Figure 91 - TAC RWY 25 Protection Areas

This Missed Approach Text is as follows:

*Climb on Rwy Tr to 2060 2000. At WTN 10d continue climb to FL50 and right onto 327° to intercept WTN 282R outbound climbing to FL150 and join high WTN hold at 282R/21d.*

Aircraft are required to climb to 2060ft before turning at WTN 10d which is shown in figure 91 and are, at this point, already above the MOCA required at the windfarm.

Using the MOC for the Missed Approach of 50m and Windfarm elevation of 315m, aircraft should be at a minimum altitude of  $315\text{m} + 50\text{m} = 365\text{m} / 1198\text{ft}$  to safely clear the obstacle.

Arrival to the procedure is via the IAF at the WTN Hold at a minimum altitude of FL50 and will not be affected.

**The proposed windfarm will not impact the published TAC RWY 25 procedure.**

#### 4.1.15 AD 2 EGNO-1-20 HI-TAC RWY 07

The TAC approach procedure to runway 07 has been assessed in section 4.1.13 and will not be affected by the windfarm.

Arrival to the procedure via the IAF at WTN Hold is at FL150 is above the MOCA required at the windfarm.

**The proposed windfarm will not impact the published HI-TAC RWY 07 procedure.**

**4.1.16 AD 2 EGNO-1- 21 HI TAC RWY 25**

The TAC approach procedure to runway 25 has been assessed in section 4.1.14 and will not be affected by the windfarm.

Arrival to the procedure via the IAF at WTN Hold at FL150 and is above the MOCA required at the windfarm.

**The proposed windfarm will not impact the published HI-TAC RWY 25 procedure.**

**4.1.17 Visual Circling**

The windfarm is outside the Visual Circling VM(C) Obstacle Clearance areas for all aircraft categories (A, B, C, D and E).

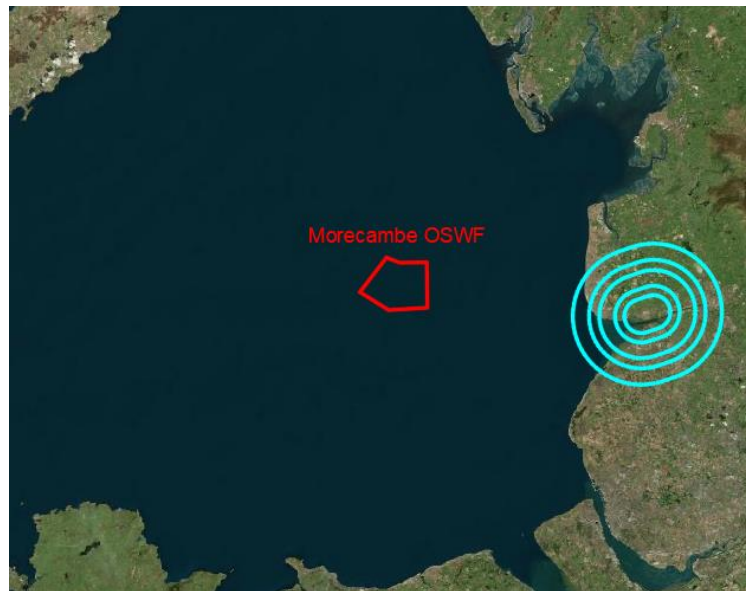


Figure 92 - Visual Circling

**The proposed windfarm would have no impact on the Visual Circling at Warton.**

**4.1.18 Holding**

NDB WTN Hold (All Entries)

The NDB WTN Hold has a published minimum altitude of 3000ft.

With a maximum MOC of 300m, the windfarm would not impact the hold:

- 315m + 300m = 615m / 2018ft AMSL
- Published minimum altitude = 3000ft

WTN IAF Hold

The WTN IAF Hold has a published minimum altitude of FL50.

With a maximum MOC of 300m, the windfarm would not impact the hold:

COMMERCIAL IN CONFIDENCE

- 315m + 300m = 615m / 2018ft AMSL
- Published minimum altitude = 5000ft

High WTN Hold

The High WTN Hold has a published minimum altitude of FL150.

With a maximum MOC of 300m, the windfarm would not impact the hold:

- 315m + 300m = 615m / 2018ft AMSL
- Published minimum altitude = 15000ft

**The proposed windfarm would have no impact on any of the holds for Warton Airport.**

**4.1.19 Visual Segment Surface (VSS)**

The windfarm is outside the lateral confines of VSS for all Runways.

**The proposed windfarm would have no impact on the VSS for Warton Airport Runways.**

**4.1.20 Minimum Sector Altitudes (MSA)**

WTN TAC MSA 25NM

The windfarm lays within the North West and South West MSA sectors of the WTN TAC MSA 25NM.

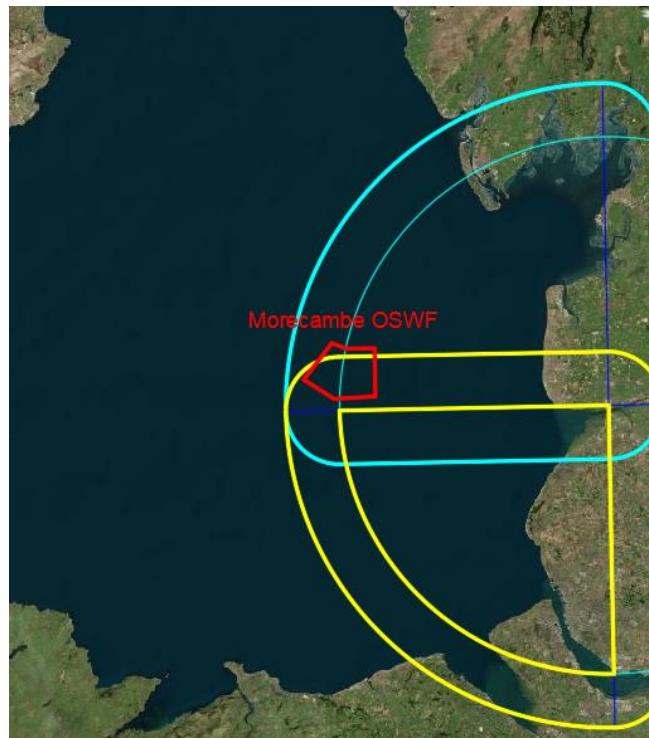


Figure 93 - WTN TAC MSA 25NM

Northwest Sector

With a maximum MOC of 300m, the windfarm would not impact the MSA:

- $315\text{m} + 300\text{m} = 615\text{m} / 2018\text{ft}$  AMSL
- Published minimum altitude = 2300ft

Southwest Sector

With a maximum MOC of 300m, the windfarm would impact the MSA:

- $315\text{m} + 300\text{m} = 615\text{m} / 2018\text{ft}$  AMSL
- Published minimum altitude = 1800ft

**The proposed windfarm would impact the published WTN TAC MSA. The Southwest Sector will need to be increased to 2100ft.**

WTN NDB MSA 25NM

The windfarm lays within the North West and South West MSA sectors of the WTN NDB MSA 25NM.

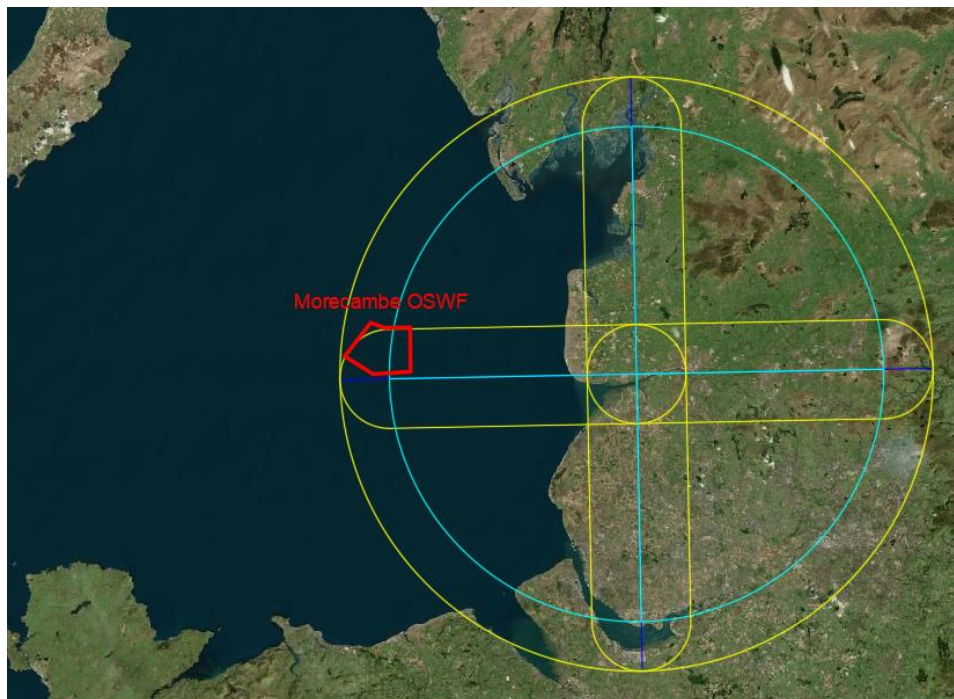


Figure 94 - WTN NDB MSA 25NM

Northwest Sector

With a maximum MOC of 300m, the windfarm would not impact the MSA:

- $315\text{m} + 300\text{m} = 615\text{m} / 2018\text{ft}$  AMSL
- Published minimum altitude = 2300ft

Southwest Sector

COMMERCIAL IN CONFIDENCE

With a maximum MOC of 300m, the windfarm would impact the MSA:

- $315\text{m} + 300\text{m} = 615\text{m} / 2018\text{ft}$  AMSL
- Published minimum altitude = 1800ft

**The proposed windfarm would impact the published WTN TAC MSA. The Southwest Sector will need to be increased to 2100ft.**

# 5 Isle of Man Ronaldsway Airport OLS and IFP Assessment

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## 5.1 IFP Assessment

The ATCSMAC and IFPs assessed are as follows:

AIRAC 11/2023 (Effective 02 NOV 2023)

- AD 2.EGNS-5-1 ATCSMAC (24 MAR 22);
- AD 2.EGNS-8-1 SRA RTR 2NM RWY 03 (07 Sep 2023);
- AD 2.EGNS-8-2 OFFSET ILS/DME RWY 08 (07 Sep 2023);
- AD 2.EGNS-8-3 OFFSET LOC/DME RWY 08 (07 Sep 2023);
- AD 2.EGNS-8-4 SRA RTR 2NM RWY 08 (07 Sep 2023);
- AD 2.EGNS-8-5 VOR/DME RWY 08 (07 Sep 2023);
- AD 2.EGNS-8-6 NDB(L)/DME RWY 08 (07 Sep 2023);
- AD 2.EGNS-8-7 ILS/DME RWY 26 (07 Sep 2023);
- AD 2.EGNS-8-8 LOC/DME RWY 26 (07 Sep 2023);
- AD 2.EGNS-8-9 SRA RTR 2NM RWY 26 (07 Sep 2023);
- AD 2.EGNS-8-10 NDB(L)/DME RWY 26 (07 Sep 2023).

Additionally, the following were checked:

- Visual Circling
- Holding
- Visual Segment Surface (VSS)
- Minimum Sector Altitudes (MSA)

5.1.1 AD 2.EGNS-5-1 ATCSMAC



Figure 95 - Windfarm in Relation to ATCSMAC

The windfarm development lays outside the protection areas of the ATCSMAC and will therefore not impact the MOCA's.

The proposed windfarm would have no impact on the ATCSMAC for the Isle of Man Airport.

5.1.2 SRA RTR 2NM RWY 03

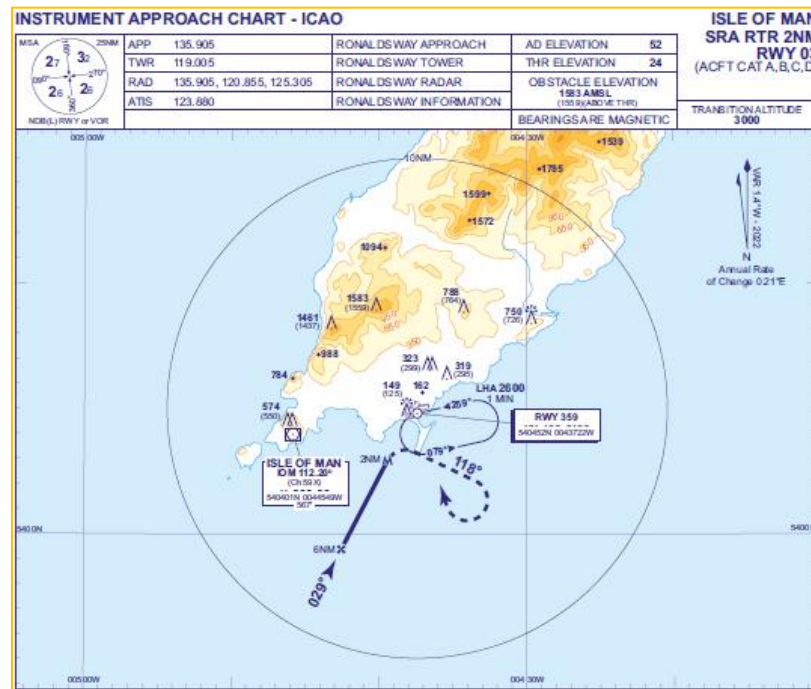


Figure 96 - SRA RWY03



COMMERCIAL IN CONFIDENCE

The windfarm lays outside the protection areas associated with the SRA Procedure to Runway 03 and therefore will not impact the procedure.

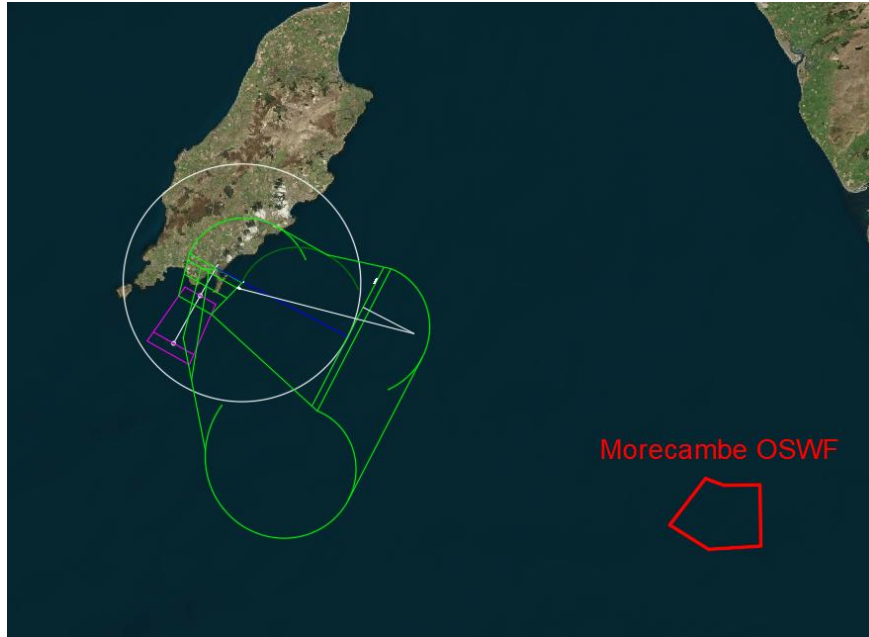


Figure 97 - Windfarm vs SRA RWY 03 Protection Areas

The proposed windfarm will not have an impact on the SRA RWY 03 Procedure.

### 5.1.3 OFFSET ILS/DME RWY 08

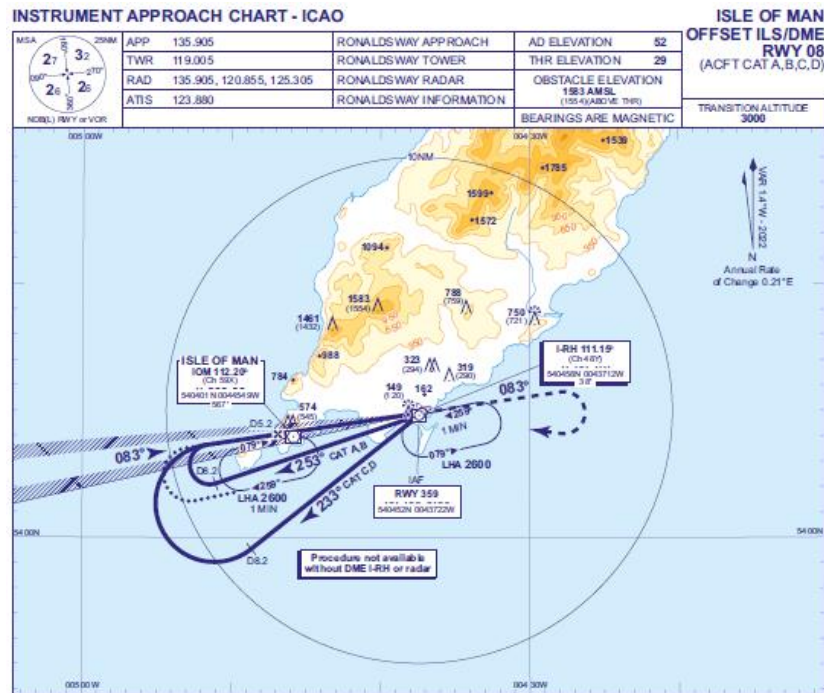


Figure 98 - OFFSET ILS/DME RWY08

COMMERCIAL IN CONFIDENCE

COMMERCIAL IN CONFIDENCE

The windfarm lies outside the protection areas associated with the Offset ILS to Runway 08 and therefore will not impact the procedure.

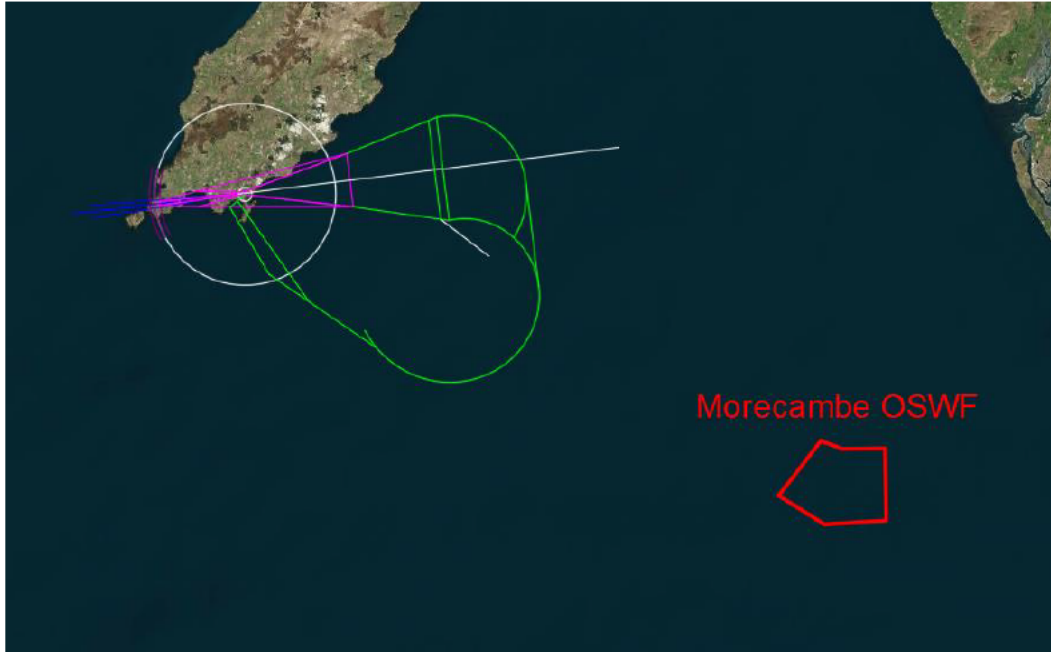


Figure 99 - Windfarm vs OFFSET ILS/DME RWY 08 Protection Areas

Additionally, procedure reversals published on the approach chart (CAT A,B & CAT C,D Base turns and the Alternative Extended Holding Pattern, as per the textual note in the chart) from IOM VOR have been constructed:

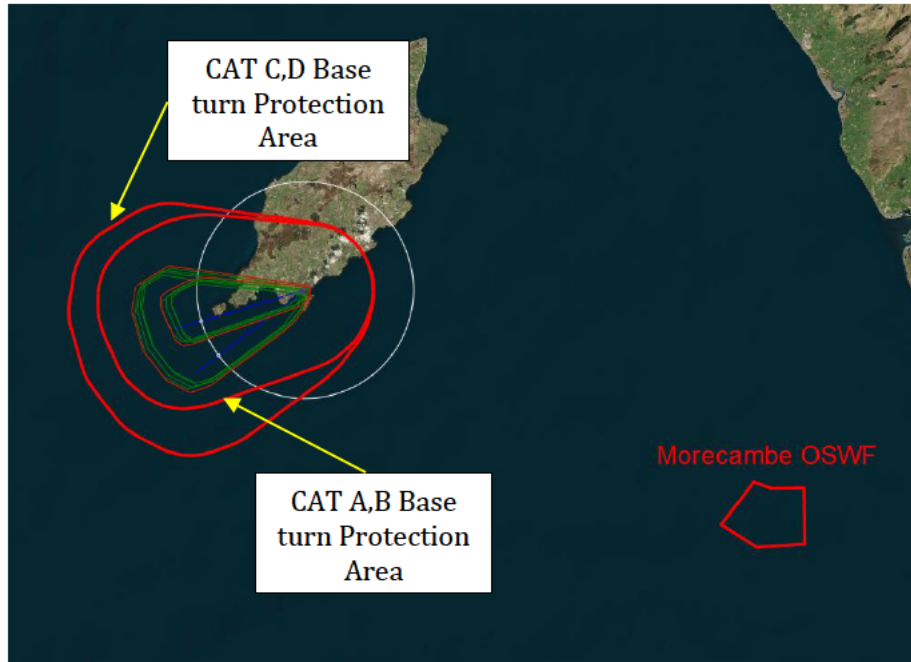


Figure 100 - Windfarm vs OFFSET ILS/DME RWY 08 Base turns

COMMERCIAL IN CONFIDENCE

COMMERCIAL IN CONFIDENCE

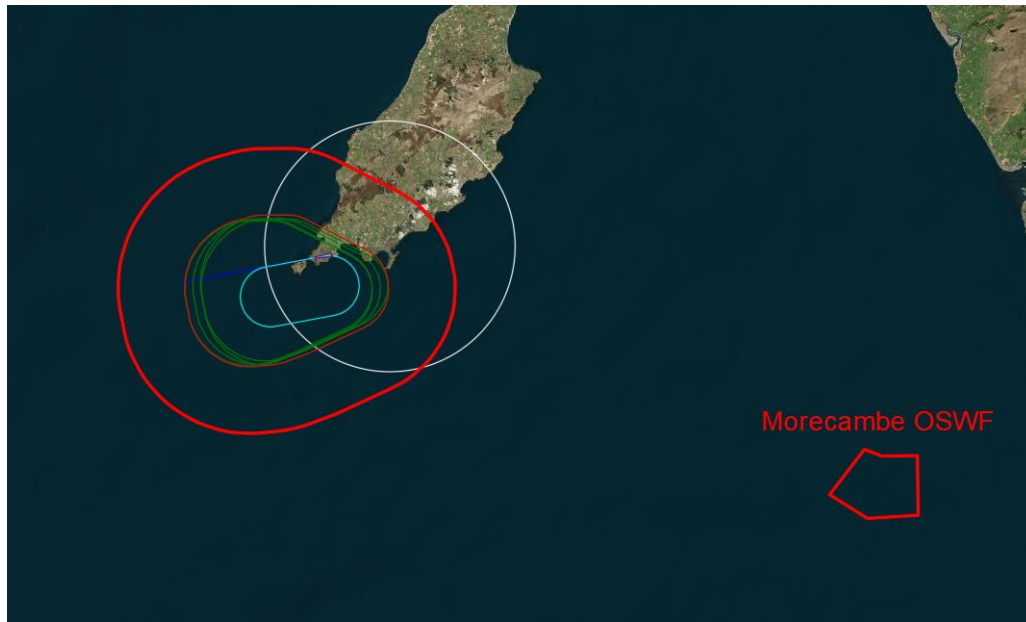


Figure 101 - Windfarm vs OFFSET ILS/DME RWY 08 Extended Holding

The windfarm is outside the protection areas for the base turn and the extended holding, so they will not impact the reversals.

**The proposed windfarm will not have an impact on the OFFSET ILS/DME RWY 08 Procedure.**

#### 5.1.4 OFFSET LOC/DME RWY 08

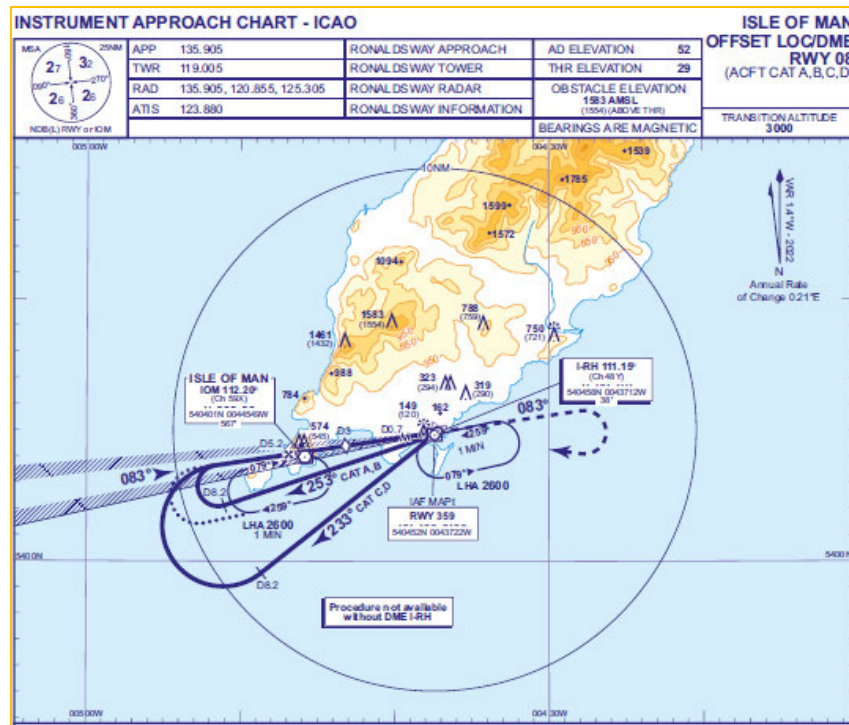


Figure 102 - OFFSET LOC/DME RWY 08

COMMERCIAL IN CONFIDENCE

The windfarm lays outside the protection areas associated to the Offset LOC to Runway 08 and therefore will not impact the procedure.

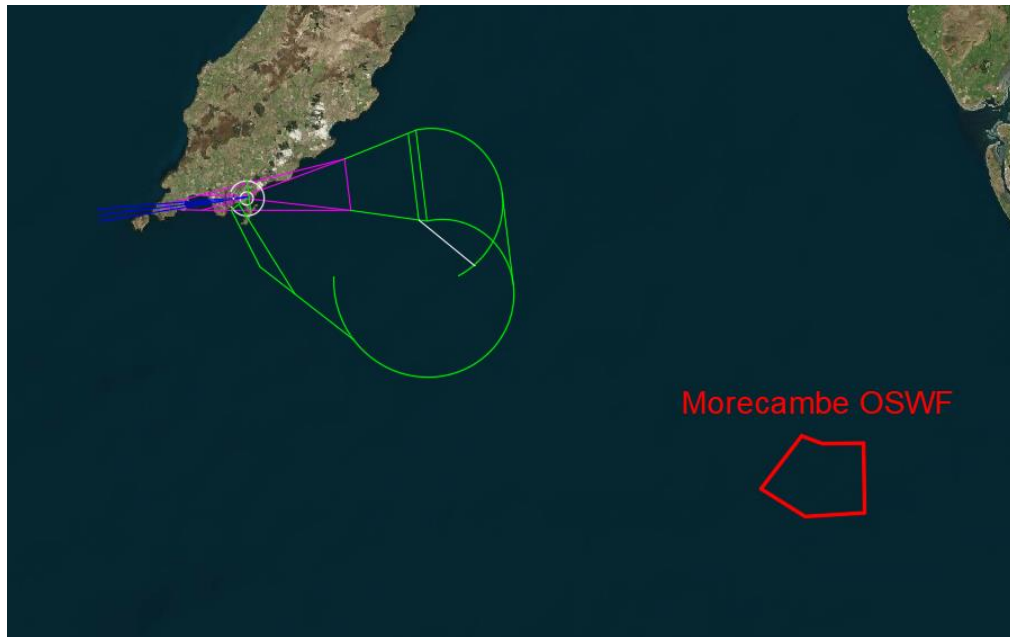


Figure 103 - Windfarm vs OFFSET LOC/DME RWY 08 Protection Areas

Additionally, procedure reversals published on the approach chart (CAT A,B & CAT C,D Base turns and the Alternative Extended Holding Pattern, as per the textual note in the chart) from IOM VOR have already been assessed in Section 5.1.3 and are not impacted.

**The proposed windfarm will not have an impact on the OFFSET LOC/DME RWY 08 Procedure.**

5.1.5 SRA RTR 2NM RWY 08

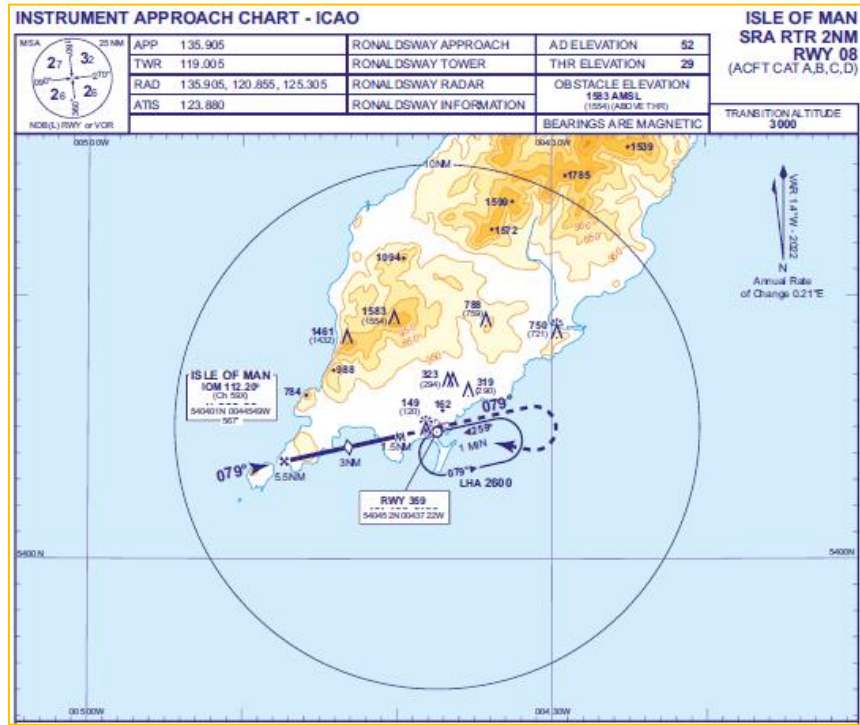


Figure 104 - SRA RWY 08

The windfarm lies outside the protection areas associated with the SRA to Runway 08 and therefore will not impact the procedure.

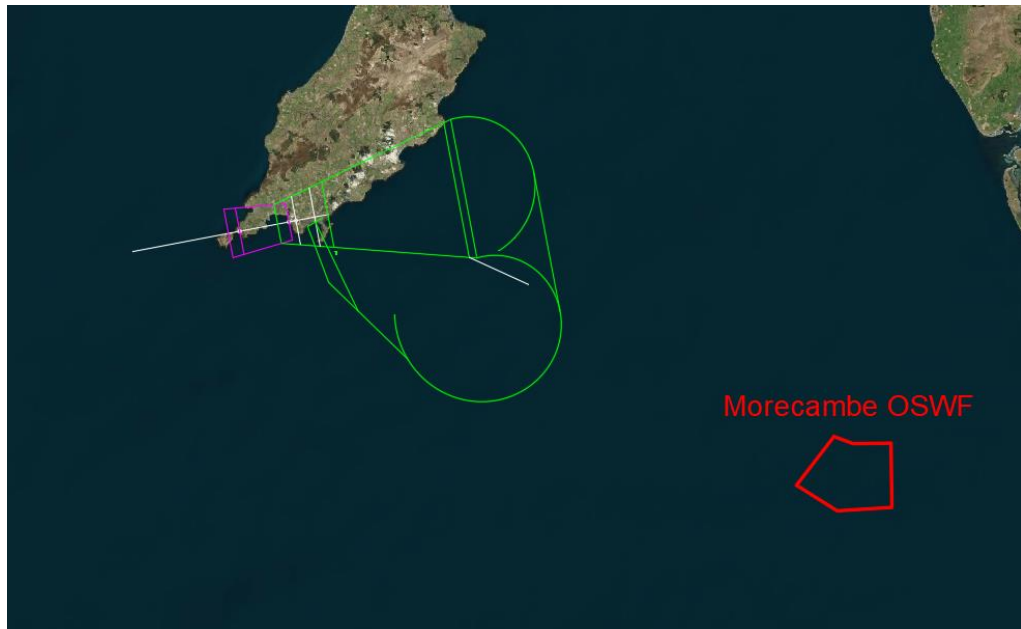


Figure 105 - Windfarm vs SRA RWY 08 Protection Areas

**The proposed windfarm will not have an impact on the SRA RWY 08 Procedure.**

5.1.6 VOR/DME RWY 08

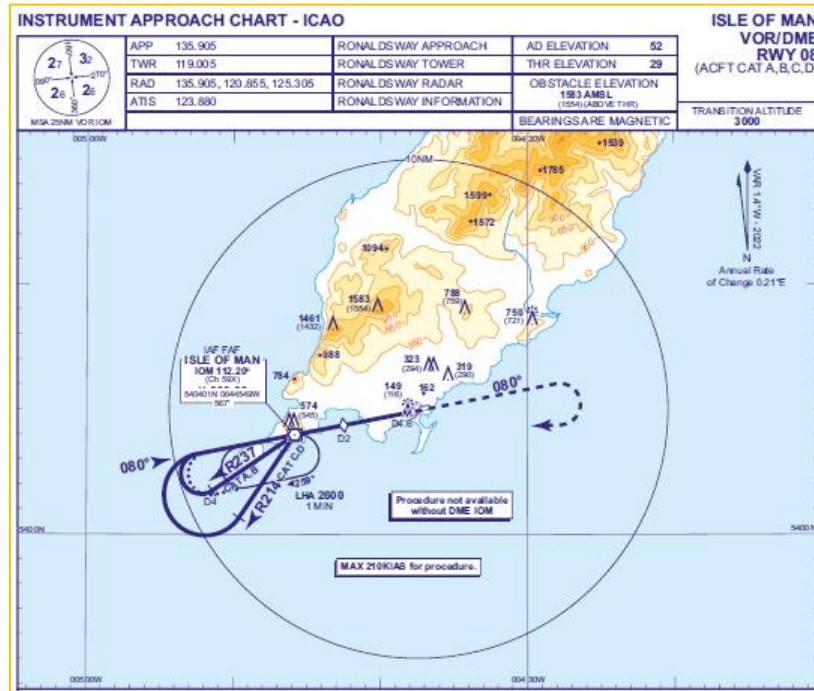


Figure 106 - VOR/DME RWY 08

The windfarm lies outside the protection areas associated to the VOR/DME to Runway 08 and therefore will not impact the procedure.

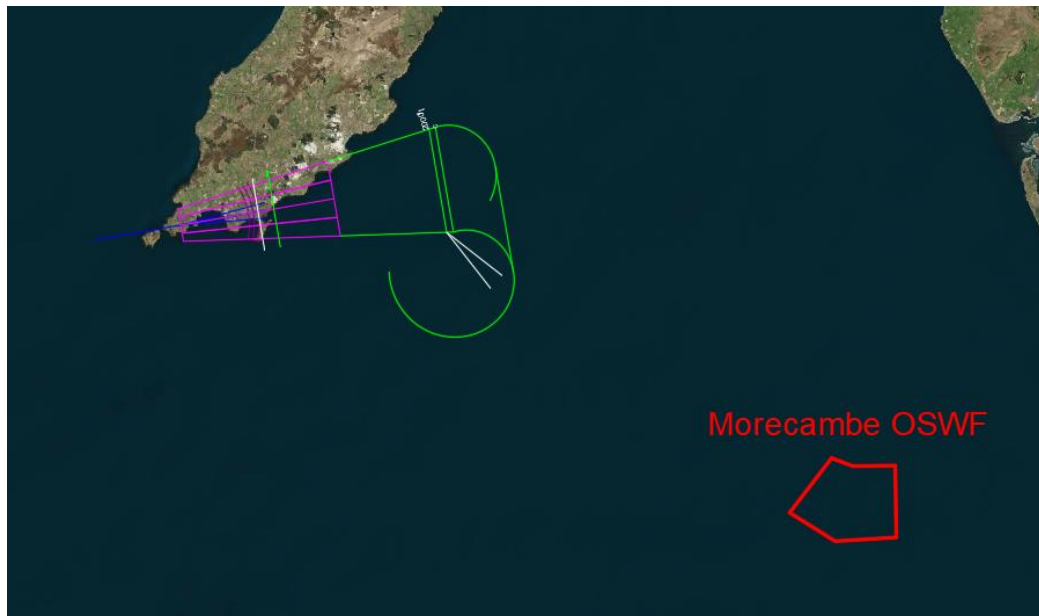


Figure 107 - Windfarm vs VOR/DME RWY 08 Protection Areas

Additionally, procedure reversals published on the approach chart (CAT A,B & CAT C,D Base turns and the Alternative Extended Holding Pattern, as per the textual note in the chart) from IOM VOR have been constructed:

COMMERCIAL IN CONFIDENCE

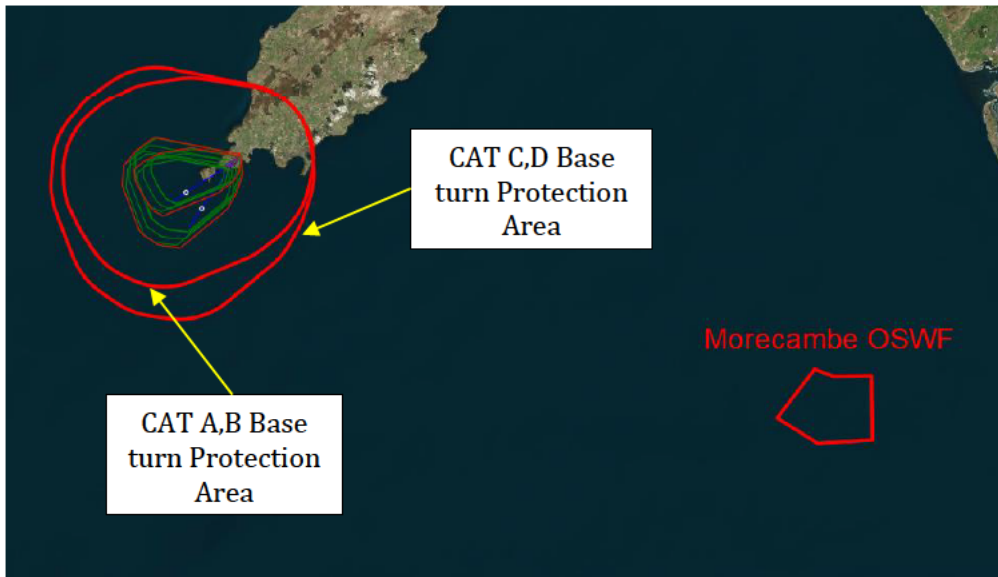


Figure 108 - Windfarm vs VOR/DME RWY 08 Base turns



Figure 109 - Windfarm vs VOR/DME RWY 08 Extended Holding

The windfarm is outside the protection areas for the base turn and the extended holding, so it will not impact the reversals.

**The proposed windfarm will not have an impact on the VOR/DME RWY 08 Procedure.**

5.1.7 NDB(L)/DME RWY 08

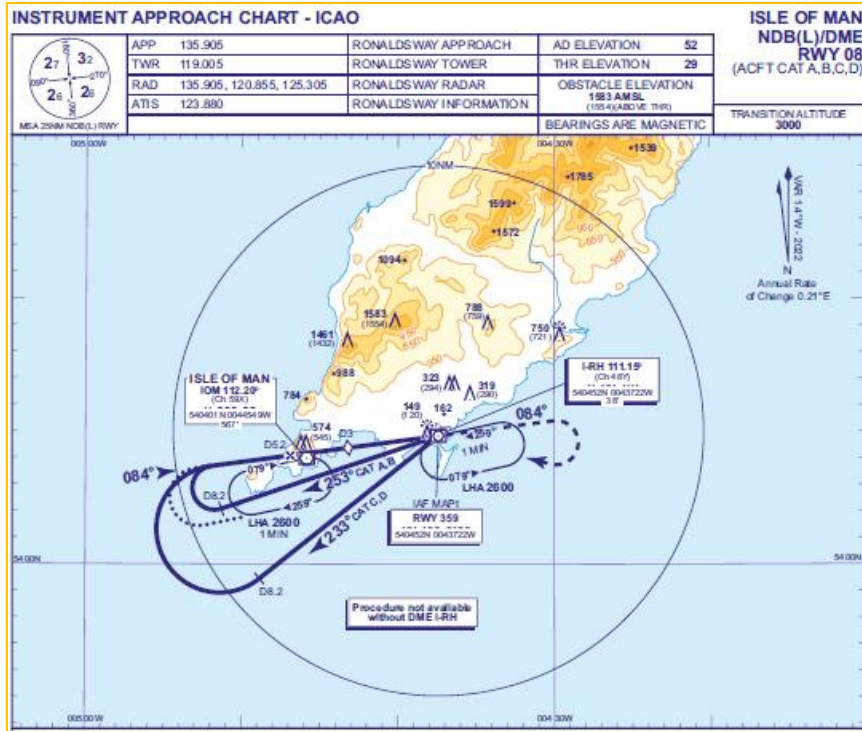


Figure 110 - NDB(L)/DME RWY 08

The windfarm lies outside the protection areas associated to the NDB(L)/DME to Runway 08 and therefore will not impact the procedure.

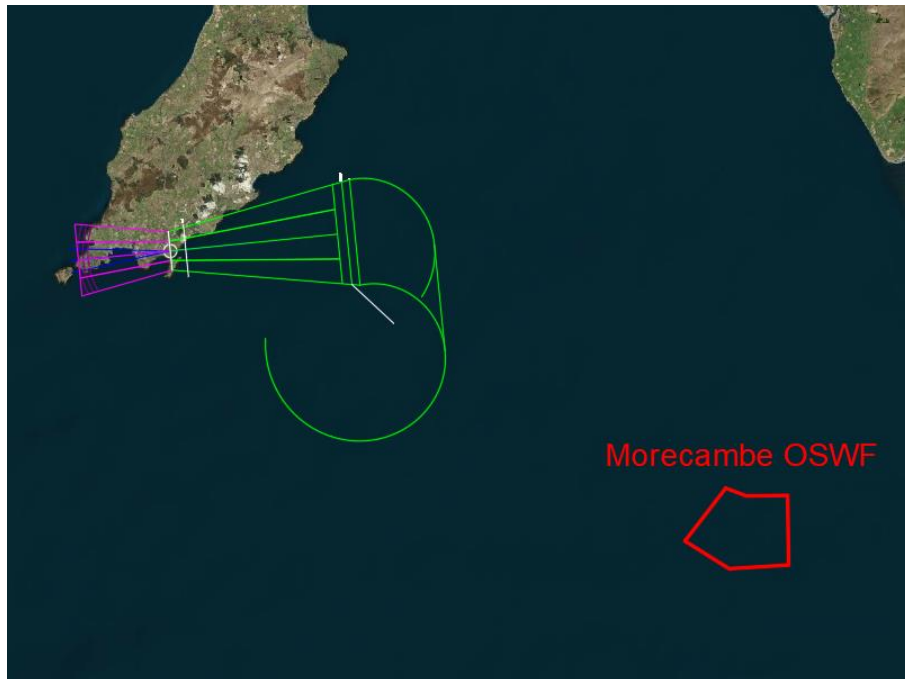


Figure 111 - Windfarm vs NDB(L)/DME RWY 08 Protection Areas



COMMERCIAL IN CONFIDENCE

Additionally, procedure reversals published on the approach chart (CAT A,B & CAT C,D Base turns and the Alternative Extended Holding Pattern, as per the textual note in the chart) from IOM VOR have been constructed:

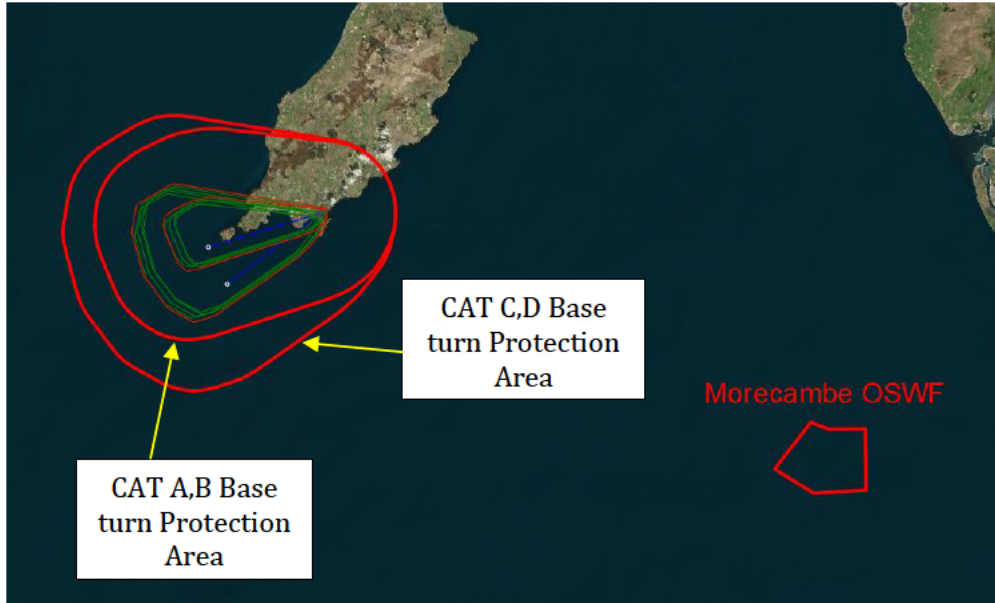


Figure 112 - Windfarm vs NDB(L)/DME RWY 08 Base turns

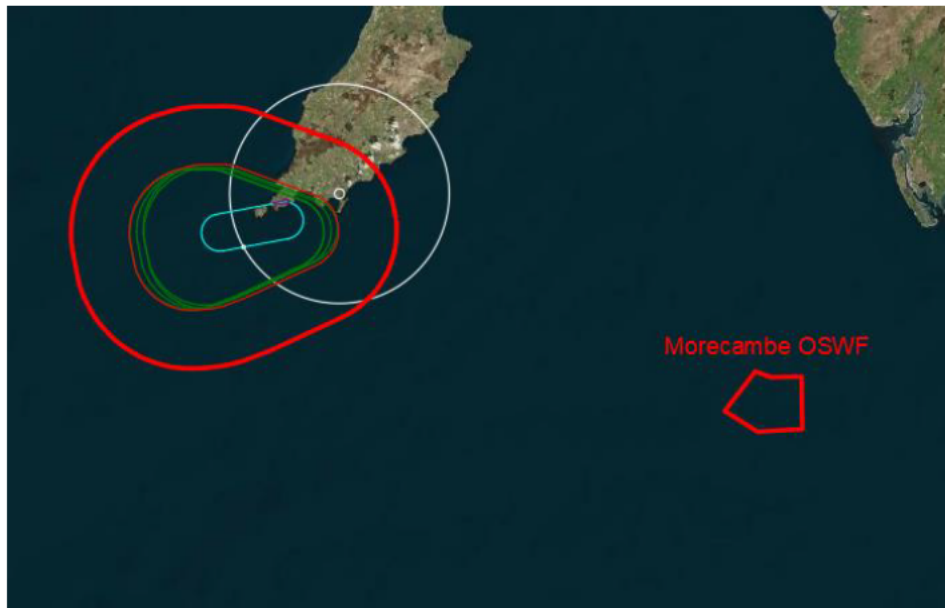


Figure 113 - Windfarm vs NDB(L)/DME RWY 08 Extended Holding

As the windfarm is outside the protection areas for the base turn and the extended holding, it will not impact the reversals.

**The proposed windfarm will not have an impact on the NDB(L)/DME RWY 08 Procedure.**

5.1.8 ILS/DME RWY 26

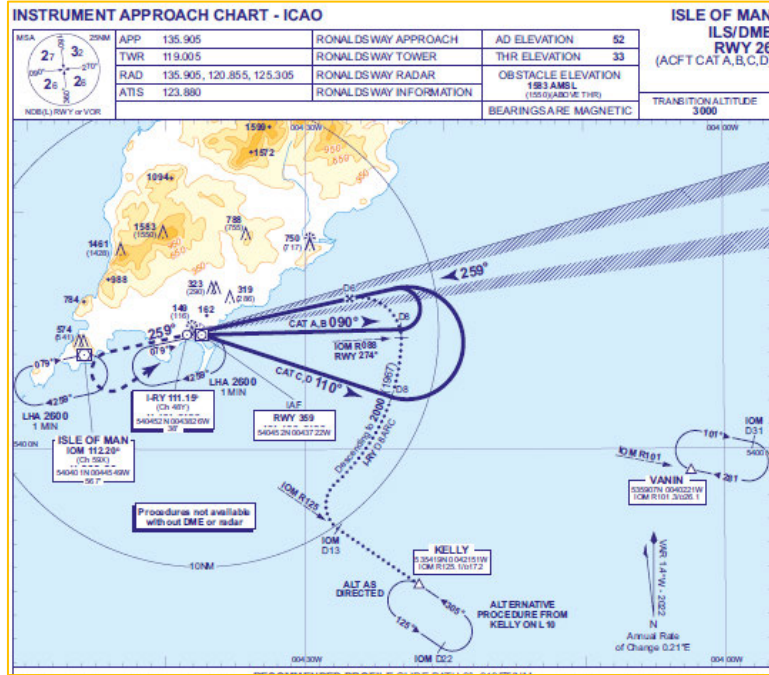


Figure 114 - ILS/DME RWY 26

The windfarm lays outside the final approach and missed approach protection areas associated to the ILS/DME Procedure to Runway 26.

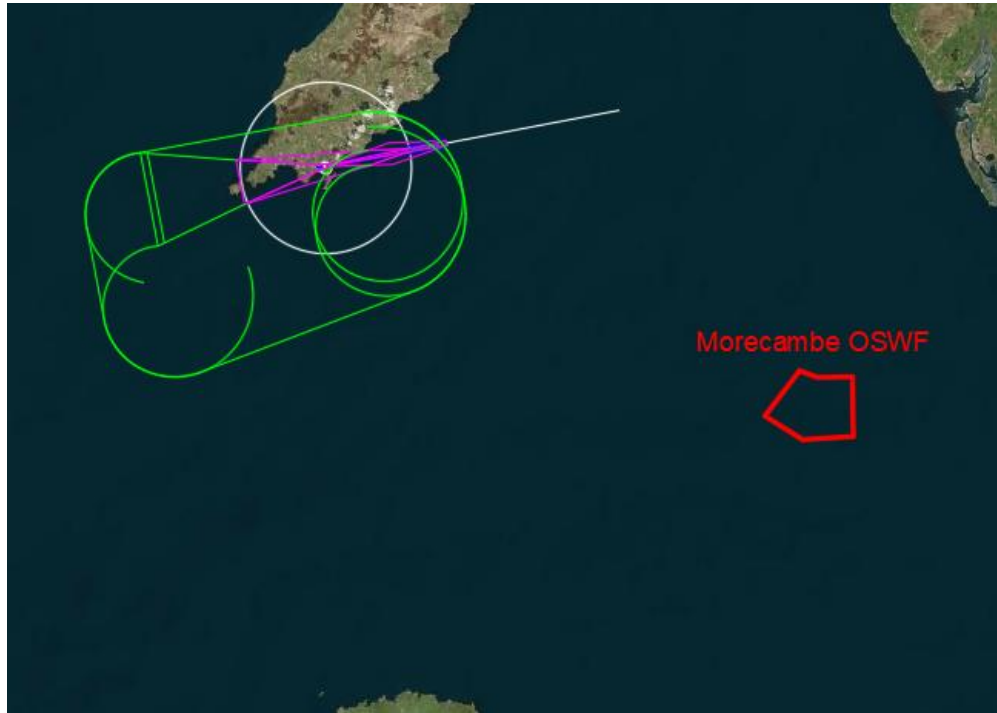


Figure 115 - Windfarm vs ILS/DME RWY 26 Protection Areas

COMMERCIAL IN CONFIDENCE

Additionally, procedure reversals published on the approach chart (CAT A,B & CAT C,D Base turns) from NDB(L) RWY have been constructed:

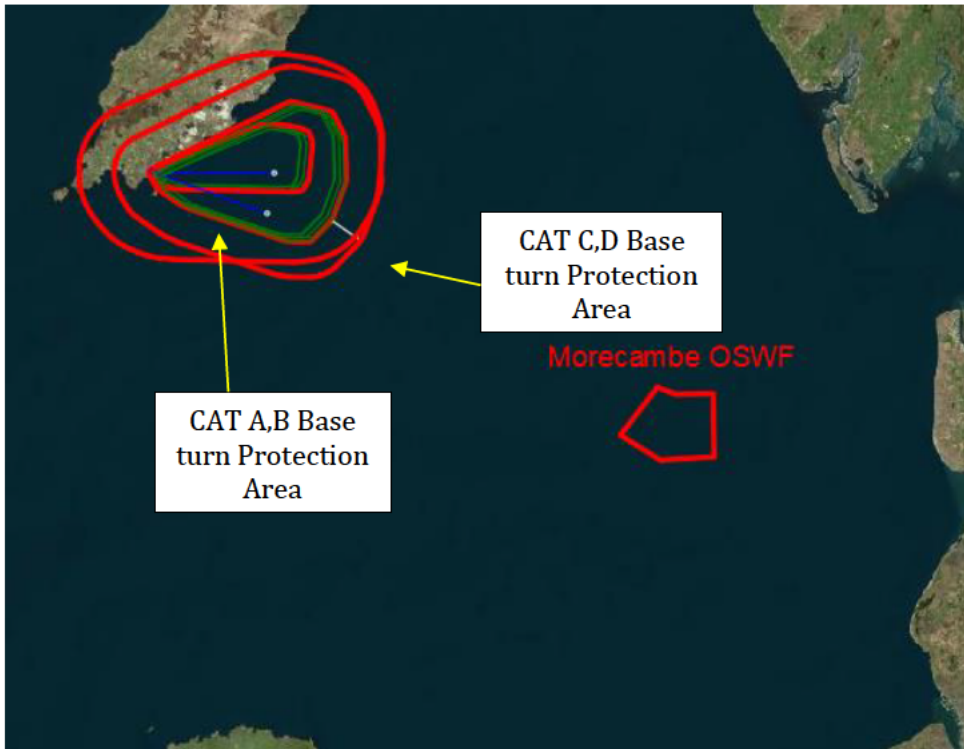


Figure 116 - Windfarm vs ILS/DME RWY 26 Base turn CAT A,B

As the windfarm is outside the protection areas for the base turn, it will not impact the reversals.

Alternative Procedure from KELLY on L10

The chart features a note specifying 'Arrival not below 3000 or MSA whichever is the higher'.

COMMERCIAL IN CONFIDENCE

COMMERCIAL IN CONFIDENCE

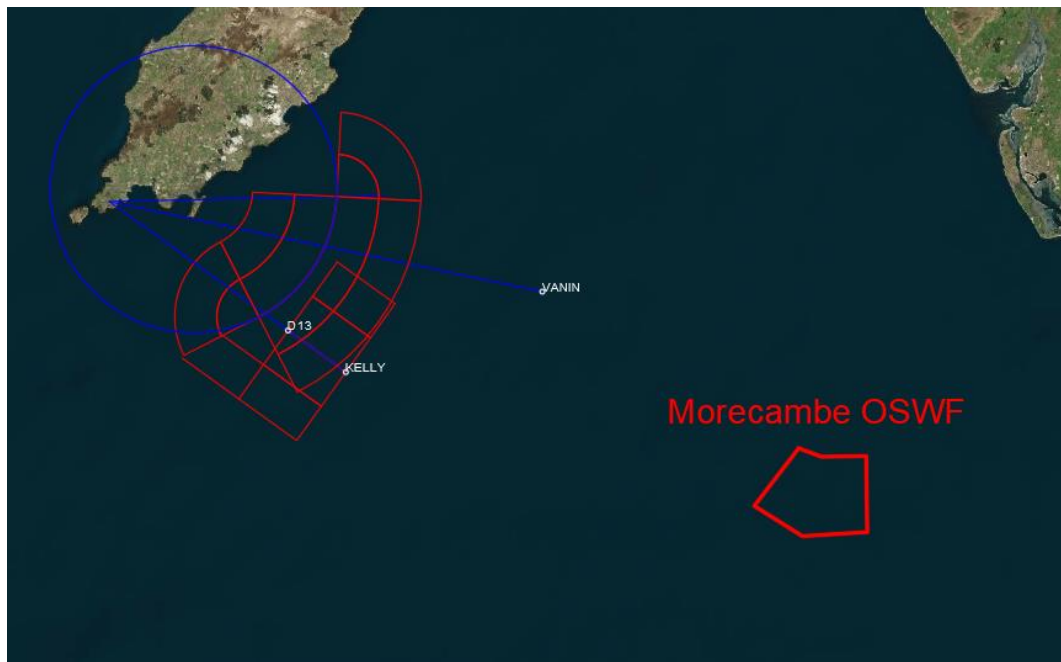


Figure 117 - Windfarm vs Direct Arrivals from KELLY

As the windfarm is outside the protection areas for the Direct Arrivals from KELLY, they will not impact the arrival.

Alternative Procedure from VOR IOM

*FROM OVERHEAD VOR IOM: Descend as required to 3000 inbound to NDB(L) RWY on QDM 079°, then continue as for full procedure.*

As the Direct Arrival from VOR IOM is above 3000ft before continuing as per the already assessed procedure, obstacles lower than 614.4m would not cause any impact.

**The proposed windfarm will not have an impact on the ILS/DME RWY 26 Procedure.**

COMMERCIAL IN CONFIDENCE

5.1.9 LOC/DME RWY 26

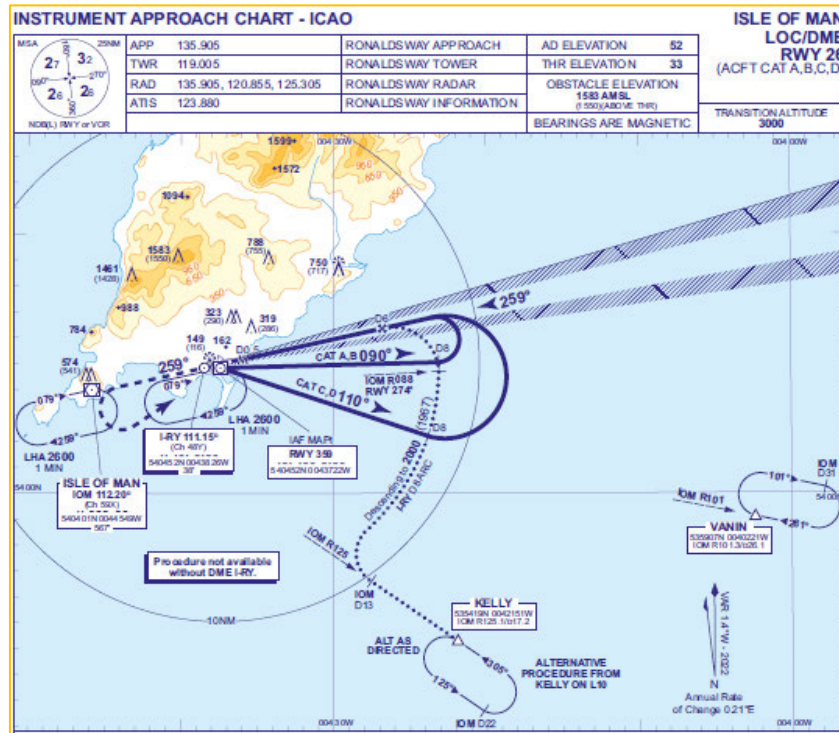


Figure 118 - LOC/DME RWY 26

The proposed windfarm is outside the final approach and missed approach protection areas associated to the LOC/DME Procedure to Runway 26.

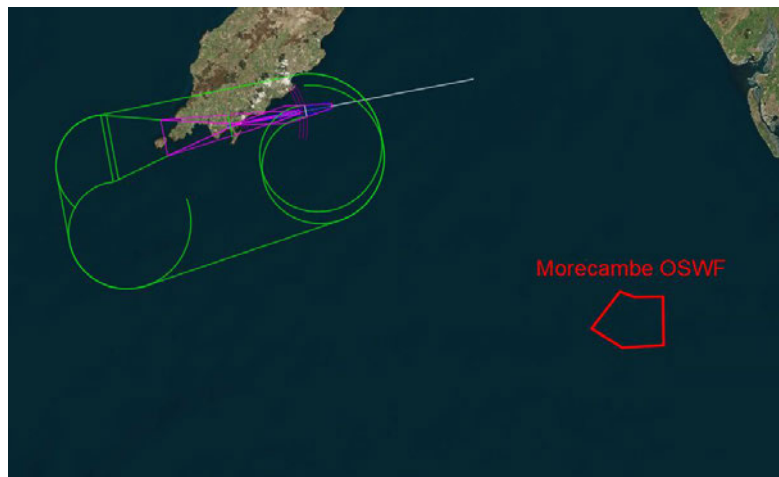


Figure 119 - Windfarm vs LOC/DME RWY 26 Protection Areas

Additionally, procedure reversals published on the approach chart (CAT A,B & CAT C,D Base turns) and the Direct Arrivals from IOM VOR and KELLY have already been assessed in Section 5.1.8 and are not impacted.

COMMERCIAL IN CONFIDENCE

The proposed windfarm will not have an impact on the LOC/DME RWY 26 Procedure.

5.1.10 SRA RTR 2NM RWY 26

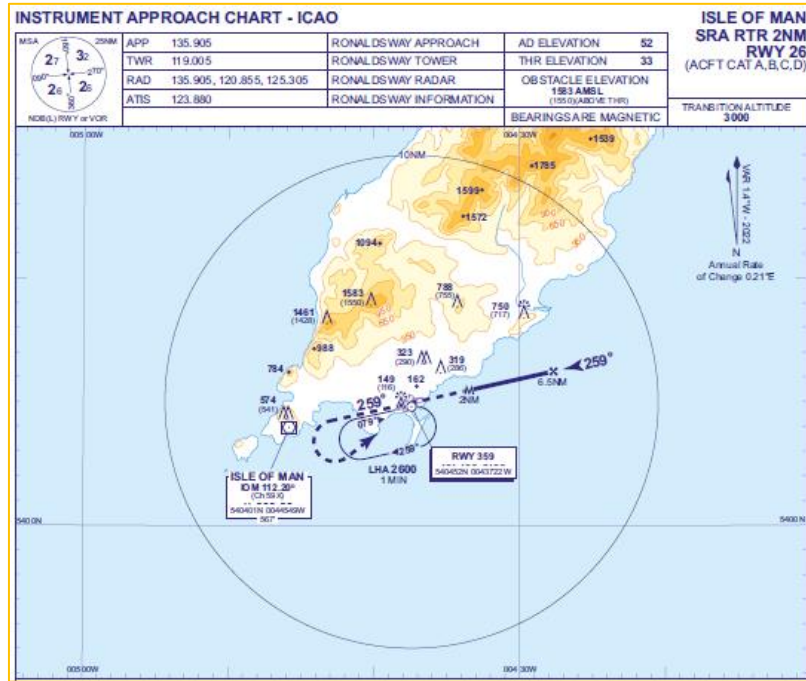


Figure 120 - SRA RTR 2NM RWY 26

The windfarm lays outside the protection areas associated with the SRA to Runway 26 and therefore will not impact the procedure.

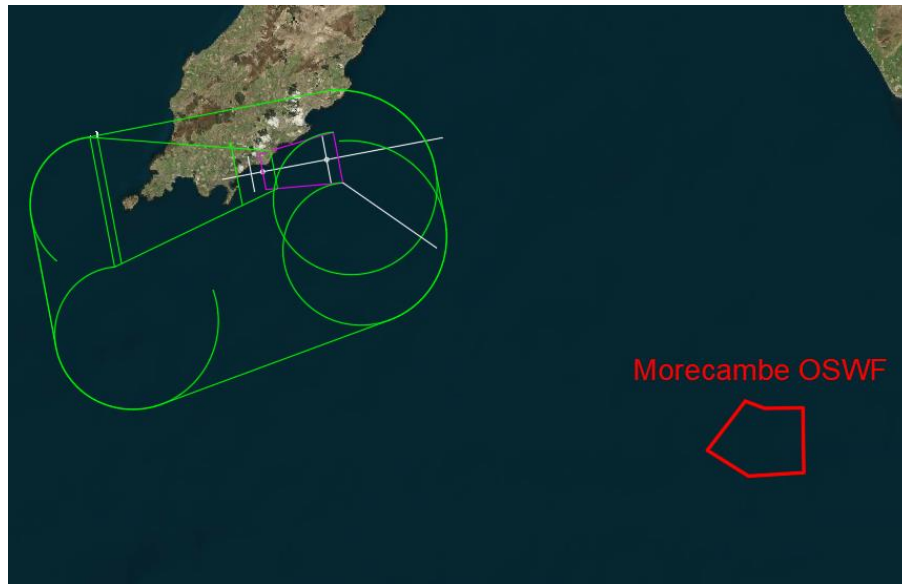


Figure 121 - Windfarm vs SRA RWY 26 Protection Areas

COMMERCIAL IN CONFIDENCE

The proposed windfarm will not have an impact on the SRA RWY 26 Procedure.

5.1.11 NDB(L)/DME RWY 26

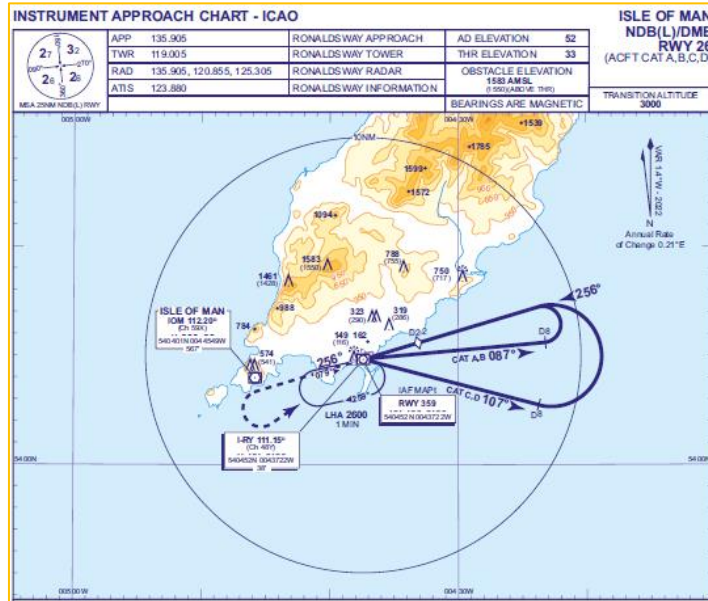


Figure 122 - NDB(L)/DME RWY 26

DME I-RY Operative

The windfarm lays outside the protection areas associated with the NDB(L)/DME to Runway 26 and therefore will not impact the procedure.

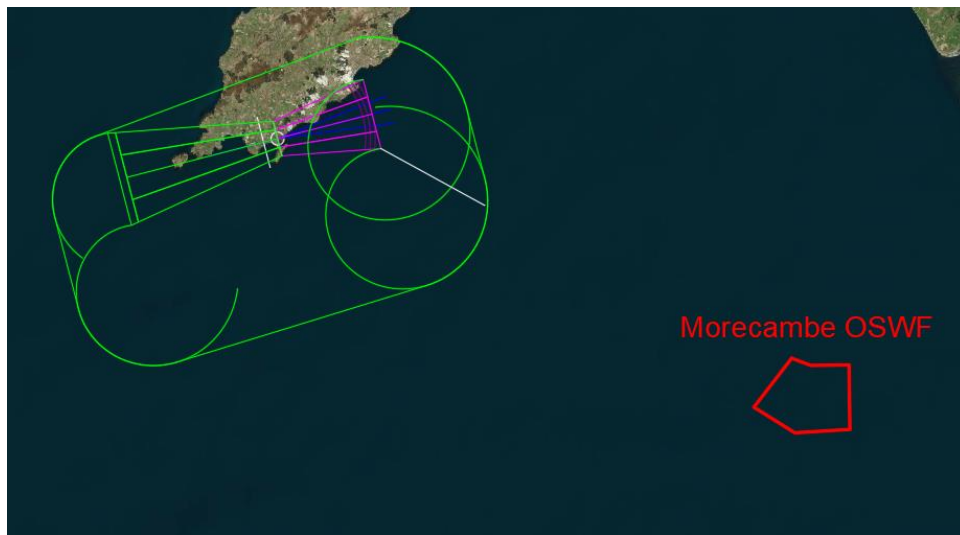


Figure 123 - Windfarm vs NDB(L)/DME RWY 26 Protection Areas

Additionally, procedure reversals published on the approach chart (CAT A,B & CAT C,D Base turns) have been constructed:



Figure 124 - Windfarm vs NDB(L)/DME RWY 26 Base turns

As the windfarm is outside the protection areas for the base turn and the extended holding, it will not impact the reversals.

**The proposed windfarm will not have an impact on the NDB(L)/DME RWY 26 (With DME I-RY Operative) Procedure.**

DME I-RY Inoperative

The windfarm lays outside the protection areas associated to the NDB(L)/DME to Runway 26 and therefore will not impact the procedure.



COMMERCIAL IN CONFIDENCE

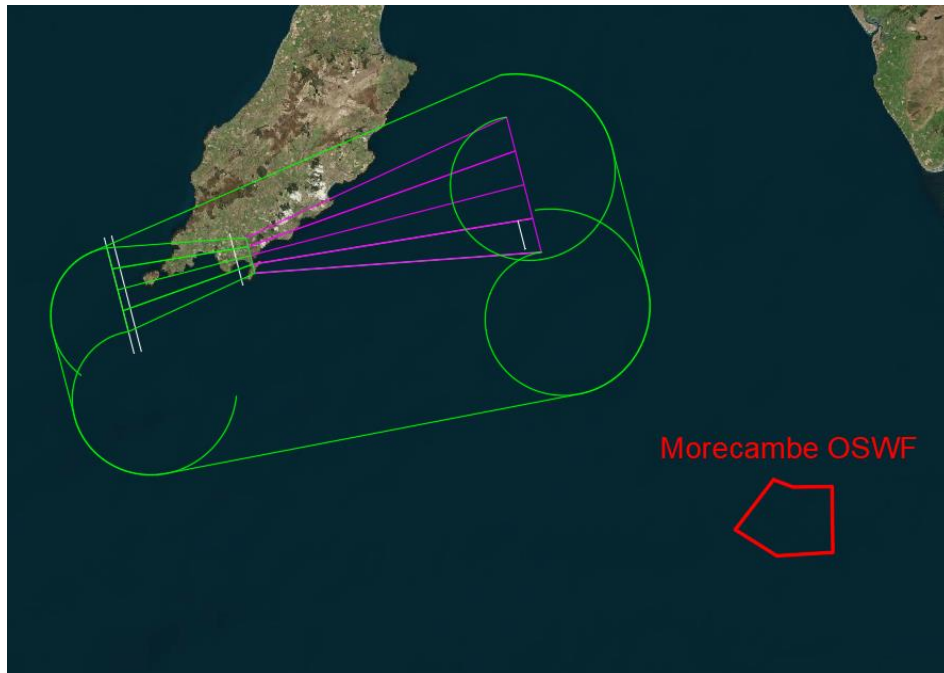


Figure 125 - Windfarm vs NDB(L)/DME RWY 26 (NO DME) Protection Areas

When DME I-RY is inoperative or cannot be used for aircraft flying the NDB(L)/DME RWY 26 Approach, there is no defined FAF (Final Approach Fix) and therefore the final approach areas extend to the edge of the Base turn primary protection area. Therefore, we will analyse base turns in the first instance.

CAT A,B

The CAT A,B procedure reversal published on the approach chart has been constructed:

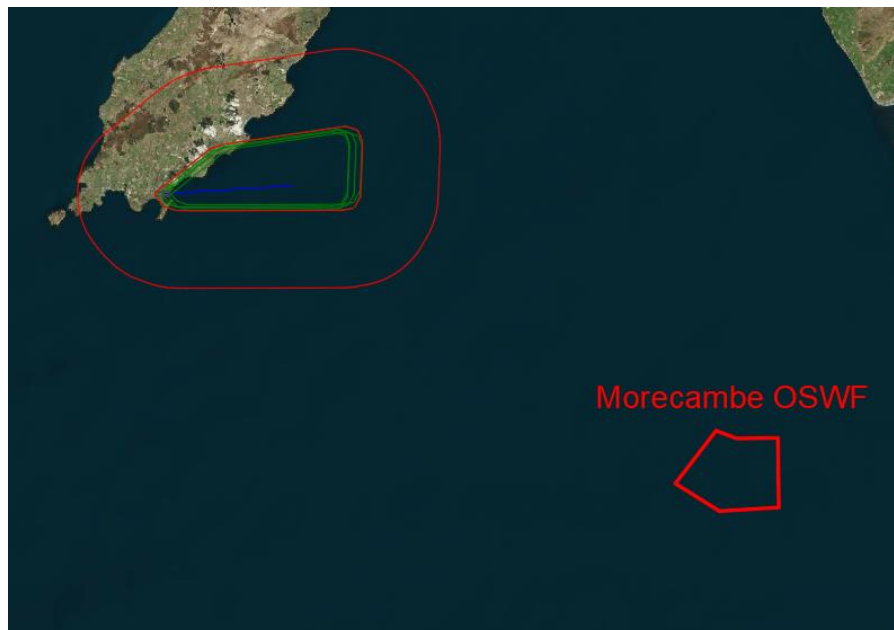


Figure 126 - Windfarm vs NDB(L)/DME RWY 26 Base turn CAT A,B (NO DME; 3 MIN)

COMMERCIAL IN CONFIDENCE

COMMERCIAL IN CONFIDENCE

As can be observed in the above figure, the windfarm is outside the protection areas for the CAT A, B base turn and therefore will not impact the reversal.

The final approach areas have been extended to the edge of the primary area for the CAT A,B base turn:

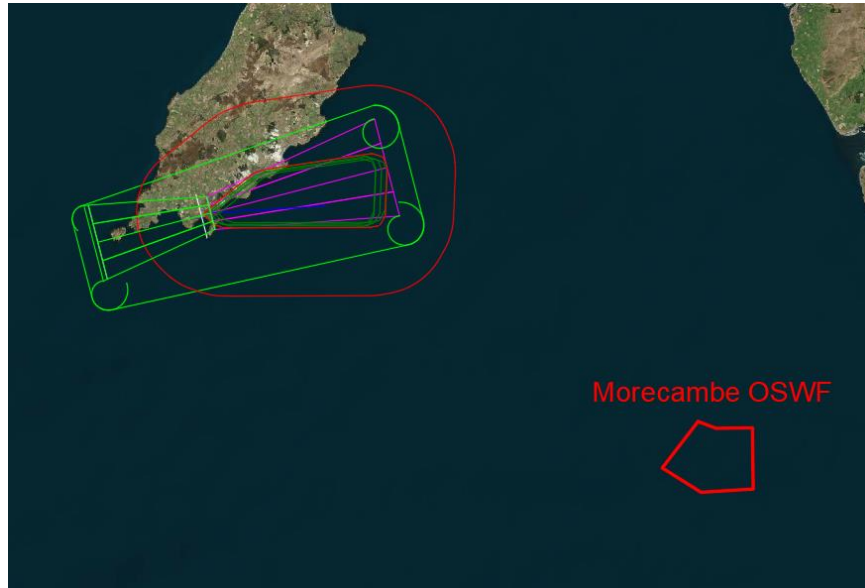


Figure 127 - Windfarm vs NDB(L)/DME RWY 26 (NO DME) CAT A,B

As can be observed in the above figure, the windfarm is outside the protection areas for the CAT A, B final and missed approach, therefore it will not impact the Procedure.

#### CAT C,D

The CAT C,D procedure reversal published on the approach chart has been constructed:



Figure 128 - Windfarm vs NDB(L)/DME RWY 26 Base turn CAT C,D (NO DME; 2.5 MIN)

As can be observed in the above figure, the windfarm is outside the protection areas for the CAT A, B base turn and therefore will not impact the reversal.

The final approach areas have been extended to the edge of the primary area for the CAT C, D base turn:

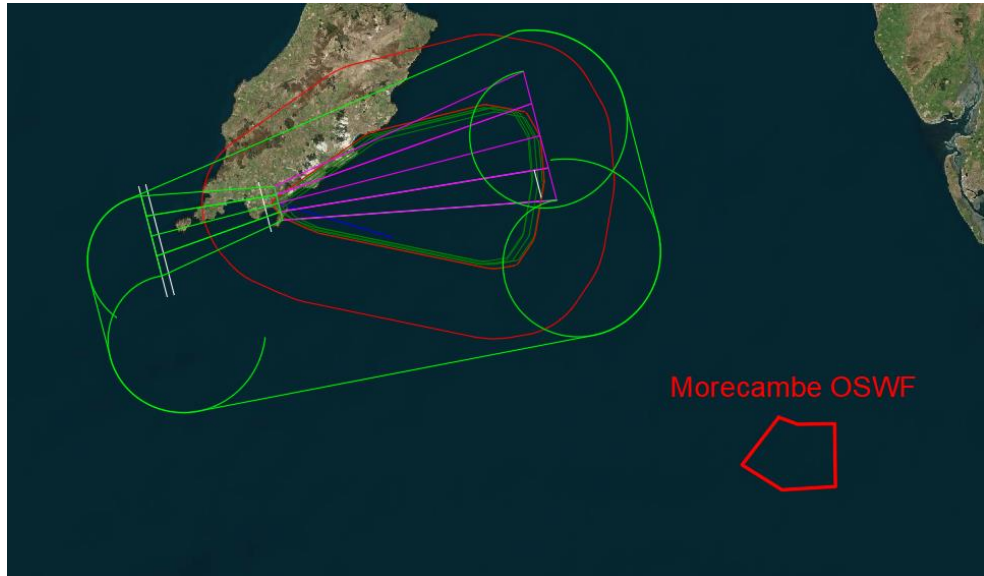


Figure 129 - Windfarm vs NDB(L)/DME RWY 26 (NO DME) CAT C, D

As can be observed in the above figure, the windfarm is outside the protection areas for the CAT C, D final and missed approach, therefore it will not impact the Procedure.

**The proposed windfarm will not have an impact on the NDB(L)/DME RWY 26 (With DME I-RY inoperative) Procedure.**

### 5.1.12 Visual Circling

The proposed windfarm is outside the Visual Circling VM(C) Obstacle Clearance areas for all aircraft categories (A, B, C and D).

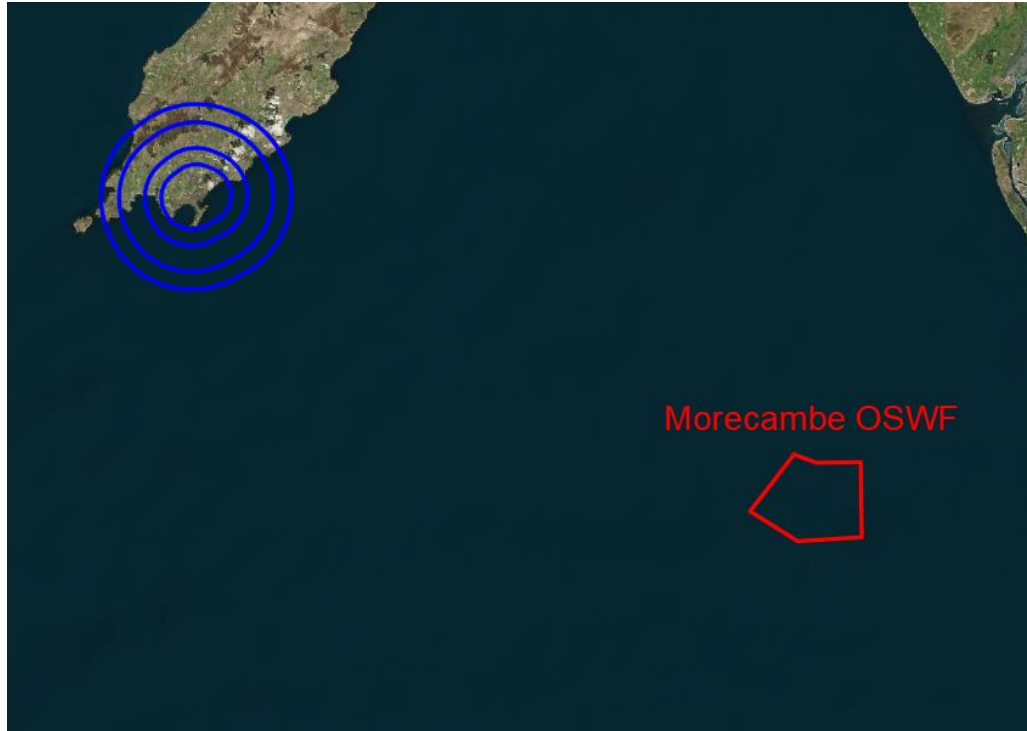


Figure 130 – Visual Circling

**The proposed windfarm would have no impact on the Visual Circling.**

### 5.1.13 Holding

#### NDB(L) RWY Holds

The NDB(L) RWY Holds have an existing Lowest Holding Altitude (LHA) of 2600ft. With a maximum MOC of 300m the proposed turbines would not impact the hold:

- $315\text{m} + 300\text{m} = 615\text{m} / 2018\text{ft AMSL}$
- Existing Lowest Holding Altitude (LHA) = 2600ft

#### VOR IOM Hold

The VOR IOM Hold has an existing Lowest Holding Altitude (LHA) of 2600ft.

With a maximum MOC of 300m the proposed turbines would not impact the hold:

- $315\text{m} + 300\text{m} = 615\text{m} / 2018\text{ft AMSL}$
- Existing Lowest Holding Altitude (LHA) = 2600ft

#### VANIN & KELLY Holds

The VANIN and KELLY Holds do not have an existing Lowest Holding Altitude (LHA) Published.

COMMERCIAL IN CONFIDENCE

However, they are part of the arrival, and the following note is present on the charts: *'Arrival not below 3000 or MSA whichever is the higher'*.

With a maximum MOC of 300m the proposed turbines would not impact the holds:

- 315m + 300m = 615m / 2018ft AMSL
- Derived Lowest Holding Altitude (LHA) by Chart Notes = Higher between 3000ft and MSA.

**The proposed windfarm would have no impact on any of the holds for Isle of Man Airport.**

#### 5.1.14 Visual Segment Surface (VSS)

The proposed windfarm is outside the lateral confines of VSS for all Runways.

**The proposed windfarm would have no impact on the VSS for Isle of Man Airport Runways.**

#### 5.1.15 Minimum Sector Altitudes

MSA 25NM NDB(L) RWY

The Windfarm lays outside the protection areas and associated buffers of the MSA 25NM NDB(L) RWY.

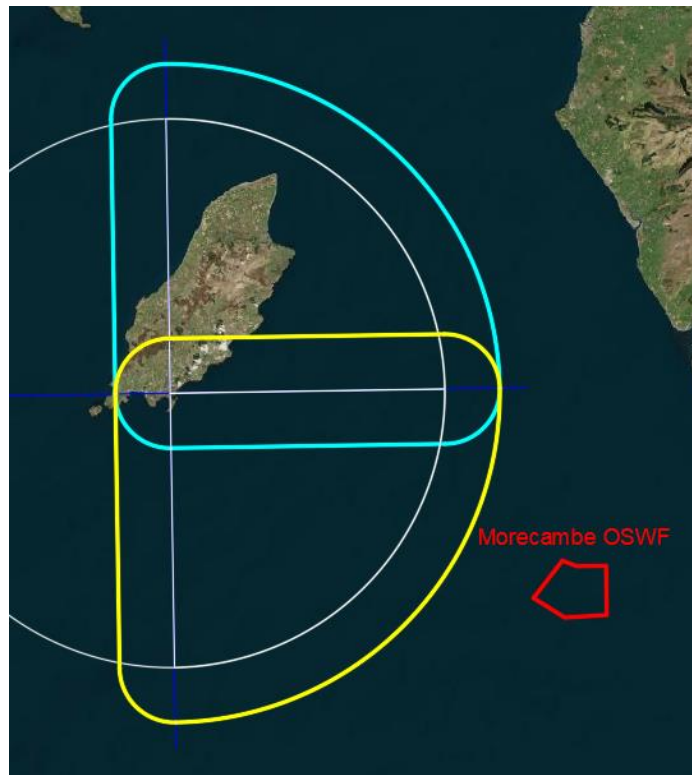


Figure 131 – NDB(L) RWY vs Windfarm

**The proposed windfarm would have no impact on the published NDB(L) RWY MSA.**

MSA 25NM VOR IOM

The Windfarm lays outside the protection areas and associated buffers of the MSA 25NM VOR IOM.

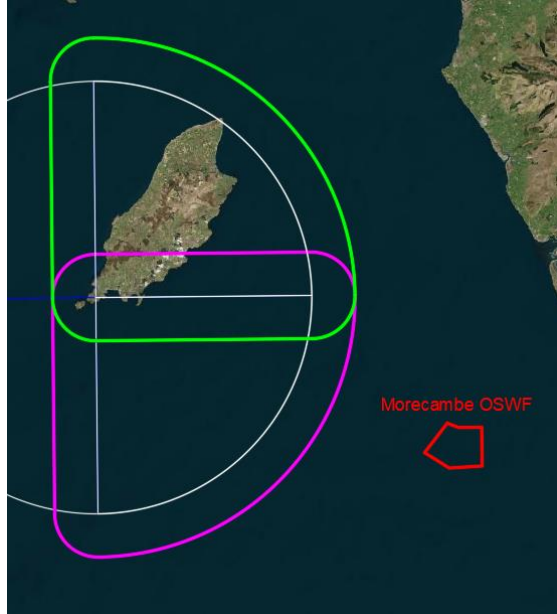


Figure 132 – VOR IOM vs Windfarm

**The proposed windfarm would have no impact on the published VOR IOM MSA.**

MSA 25NM ARP

The Windfarm lays outside the protection areas and associated buffers of the MSA 25NM ARP.



Figure 133 –ARP MSA vs Windfarm

**The proposed windfarm would have no impact on the published ARP MSA.**

## 6 RAF Valley Airport OLS and IFP Assessment

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### 6.1 IFP Assessment

The IFPs assessed are as follows:

AIRAC 2311 (Effective 02 NOV 23)

- AD 2 EGOV-1-13 EAST MID (05 OCT 23);
- AD 2 EGOV-1-14 SOUTH MID (05 OCT 23);
- AD 2 EGOV-1-16 TAC to PAR RWY 13 (Point X-Ray Hold) (05 OCT 23);
- AD 2 EGOV-1-17 TAC to PAR RWY 19 (Point X-Ray Hold) (05 OCT 23);
- AD 2 EGOV-1-18 TAC to PAR RWY 31 (Point Alpha Hold) (05 OCT 23);
- AD 2 EGOV-1-19 PAR RWY 13 (05 OCT 23);
- AD 2 EGOV-1-20 PAR RWY 19 (05 OCT 23);
- AD 2 EGOV-1-21 PAR RWY 31 (05 OCT 23);
- AD 2 EGOV-1-22 SRA RWY 01 (05 OCT 23);
- AD 2 EGOV-1-23 SRA RWY 13 (05 OCT 23);
- AD 2 EGOV-1-24 SRA RWY 19 (05 OCT 23);
- AD 2 EGOV-1-25 SRA RWY 31 (05 OCT 23);
- AD 2 EGOV-1-26 ATCSMAC (05 OCT 23);
- AD 2 EGOV-1-27 TAC to ILS/DME RWY 13 (Point X-Ray Hold) (05 OCT 23);
- AD 2 EGOV-1-28 TAC RWY 01 (Point Alpha Hold) (05 OCT 23);
- AD 2 EGOV-1-29 TAC RWY 13 (Point X-Ray Hold) (05 OCT 23);
- AD 2 EGOV-1-30 TAC RWY 19 (Point X-Ray Hold) (05 OCT 23).

Additionally, the following were checked:

- Visual Circling
- Holding
- Visual Segment Surfaces (VSS)
- Minimum Sector Altitudes (MSA)

6.1.1 AD 2 EGOV-1-26 ATCSMAC

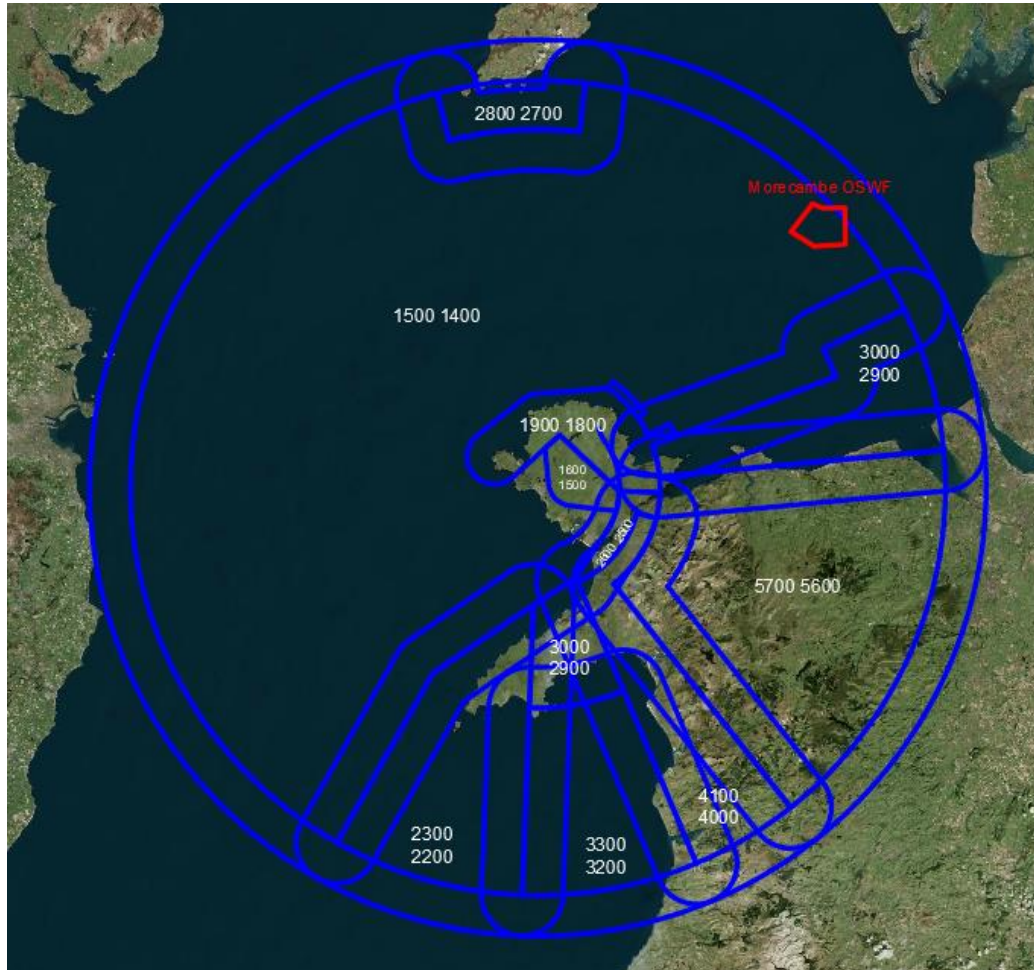


Figure 134 - Windfarm in Relation to ATCSMAC

The windfarm development lays within the lateral confines of the Outside SMAA (Surveillance Minimum Altitude Area) which has a 5NM buffer applied. The area has a MOCA (Minimum Obstacle Clearance Altitude) of 1500ft.

Using the development elevation of 315m AMSL, the development produces an OCA of 315m + 300m MOC (Minimum Obstacle Clearance) = 615m / 2018ft AMSL.

**Current, Published OCA/OCH derived from existing controlling obstacle:**

OCA = 1435ft, rounding to **1500ft**

OCH = 1399ft, rounding to **1400ft**.

**Required MOCA using development elevation of 315m AMSL:**

315m + 300m MOC (MOC) = 615m / 2018ft AMSL

Airfield elevation at Valley = 36ft



Military Procedures

QFE = 2018ft - 36ft = 1982ft, rounding to **2000ft**

QNH = 2000ft + 36ft = 2036ft, rounding to **2100ft**

**The development would have a potential impact on RAF Valley's ATCSMAC and would require the 1500ft QNH/1400ft QFE area to be raised to 2100ft QNH/2000ft QFE.**

6.1.2 AD 2 EGOV-1-13 EAST MID

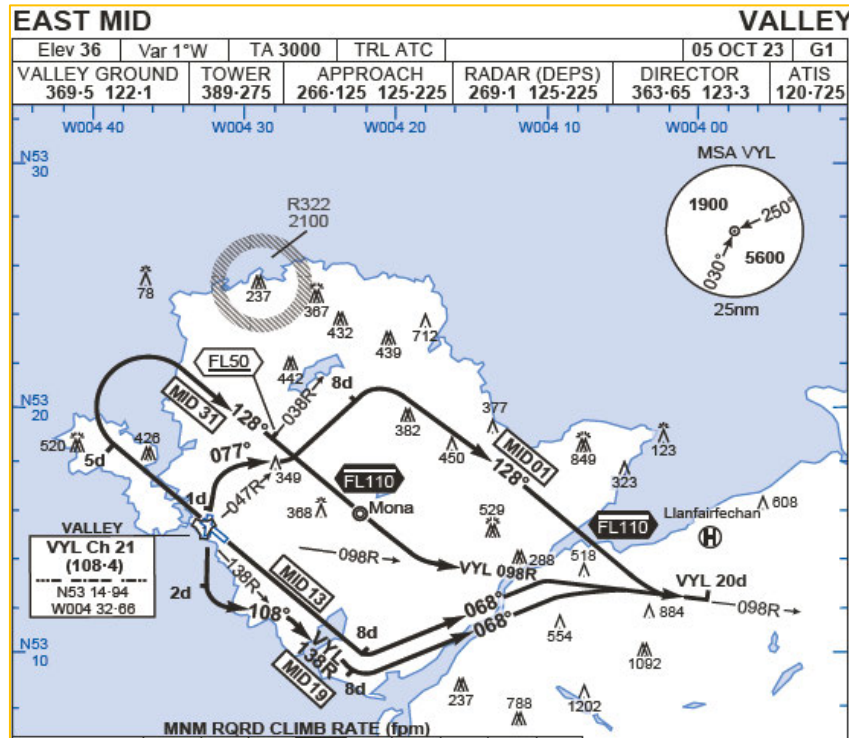


Figure 135 - East MID Procedure

Straight Departure

The windfarm lays outside the Straight Departure protection areas for the MIDs departing to the east from Runways 01, 13, 19 and 31.

Turn Areas

The MID 01 procedure turns right and continues away from the windfarm and would have no impact.

The MID 13 procedure departs to the south-east and continues away from the windfarm and would be unaffected.

The MID 19 procedure departs to the south and continues away from the windfarm and would be unaffected.

The MID 31 procedure departs to the north-west but then turns right, away from the windfarm and would be unaffected.

**The proposed windfarm would have no impact on the EAST MID procedures.**

6.1.3 AD 2 EGOV-1-14 SOUTH MID

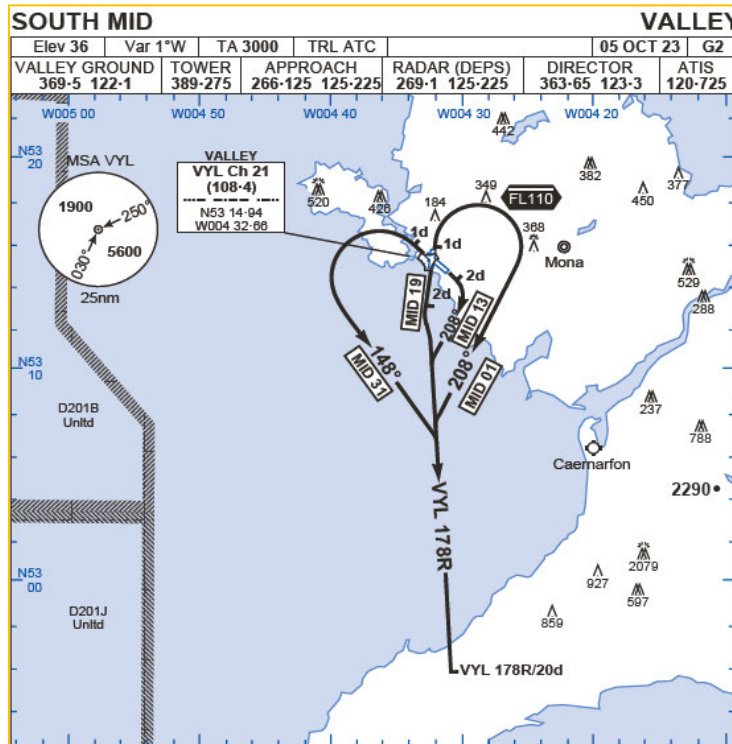


Figure 136 - SOUTH MID Procedure

Straight Departure

The windfarm lays outside the Straight Departure protection areas for the MIDs departing to the south from Runways 01, 13, 19 and 31.

Turn Area

The MID 01 and 13 procedures turn right and head south, away from the windfarm and would not be affected.

The MID 19 and 31 procedures turn left and head south, away from the windfarm and would not be affected.

**The proposed windfarm would have no impact on the SOUTH MID procedures.**

6.1.4 AD 2 EGOV-1-16 TAC to PAR RWY 13 (Point X-Ray Hold)

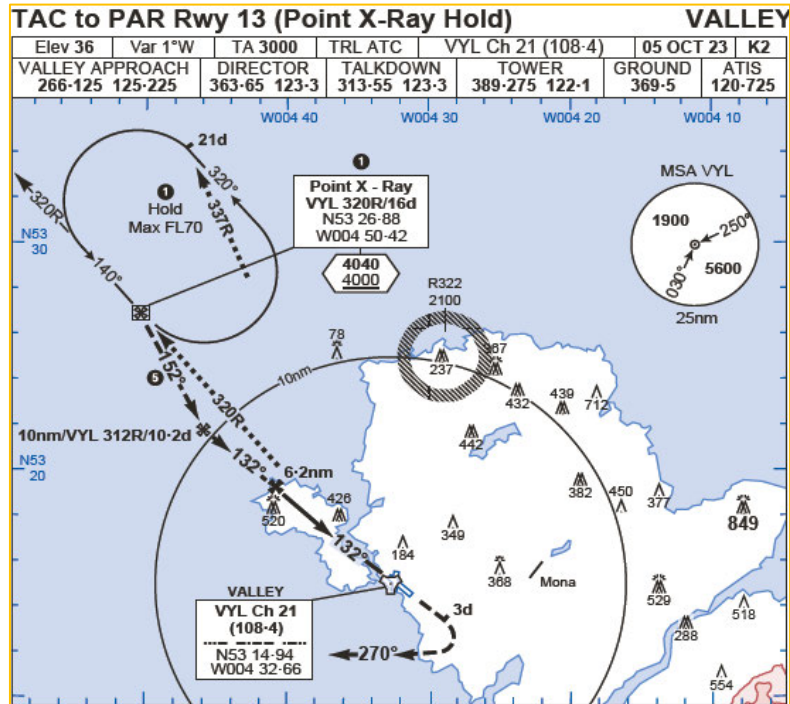


Figure 137 - TAC to PAR RWY 13 (Point X-Ray Hold) Procedure

The windfarm lays outside the protection areas for the TAC to PAR Procedure to Runway 13 where the initial approach tracks south from the IAF at Point X-Ray Hold before reaching the IF at 2040ft.

The procedure then turns away from the windfarm after the Missed Approach and would not be affected.

POINT X-RAY Hold has been considered in section 6.1.19.

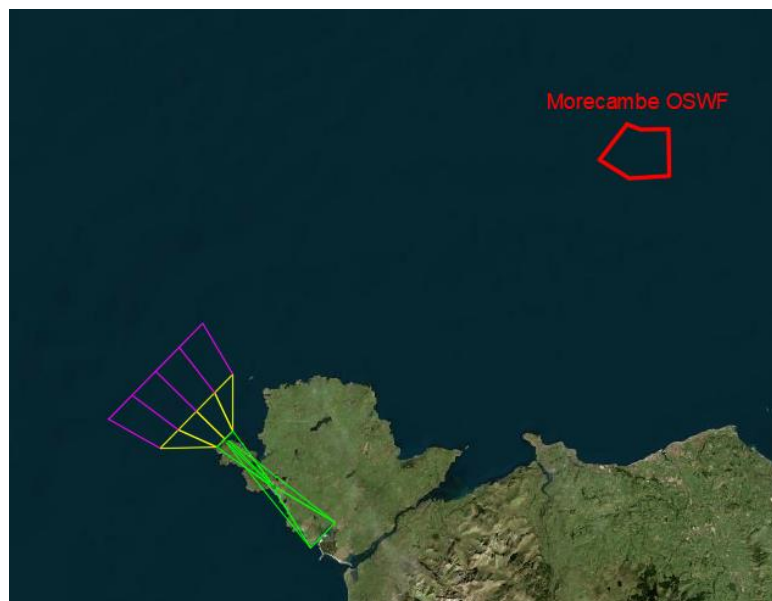


Figure 138 - TAC to PAR RWY 13 Protection Areas

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The proposed windfarm would have no impact on the TAC to PAR RWY 13 procedure.

**6.1.5 AD 2 EGOV-1-17 TAC to PAR RWY 19 (Point X-Ray Hold)**

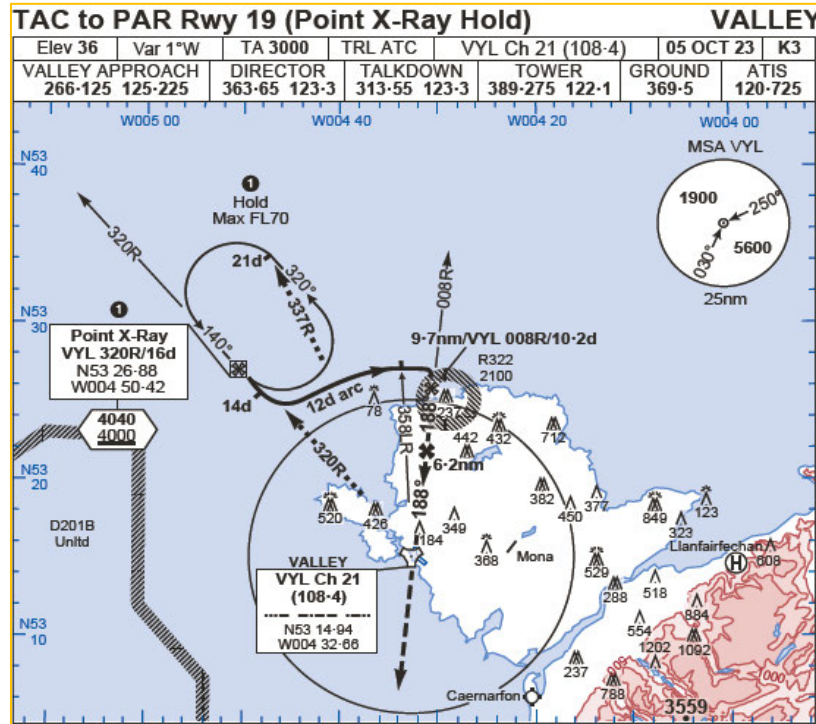


Figure 139 - TAC to PAR RWY 19 (Point X-Ray Hold) Procedure

The windfarm lays outside the protection areas for the TAC to PAR Procedure to Runway 19 where the initial approach tracks east from the IAF at Point X-Ray Hold before reaching the IF at 2040ft.

The procedure then turns south, away from the windfarm and would not be affected.

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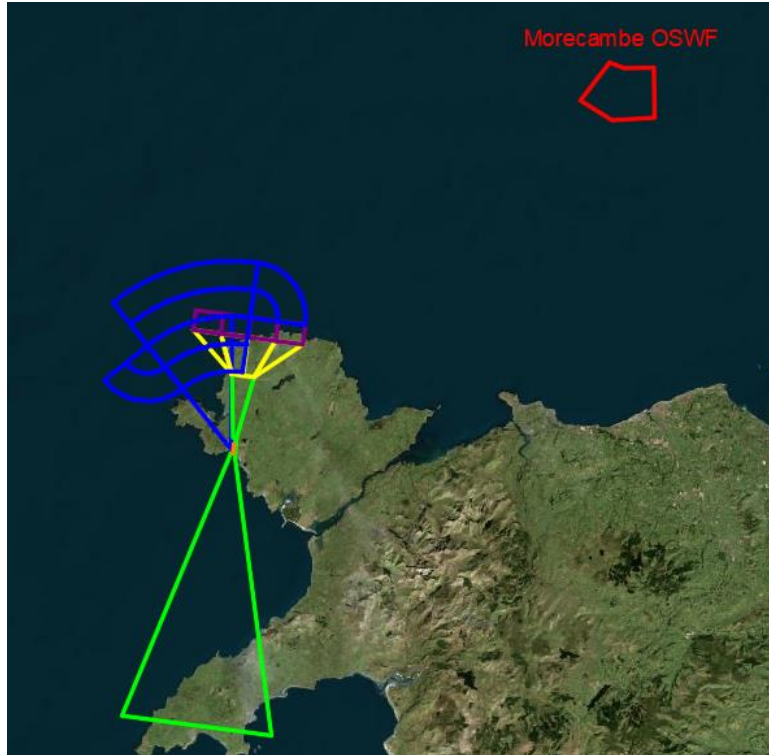


Figure 140 - TAC to PAR RWY 19 Protection Areas

The proposed windfarm would have no impact on the TAC to PAR RWY 19 procedure.

6.1.6 AD 2 EGOV-1-18 TAC to PAR RWY 31 (Point Alpha Hold)

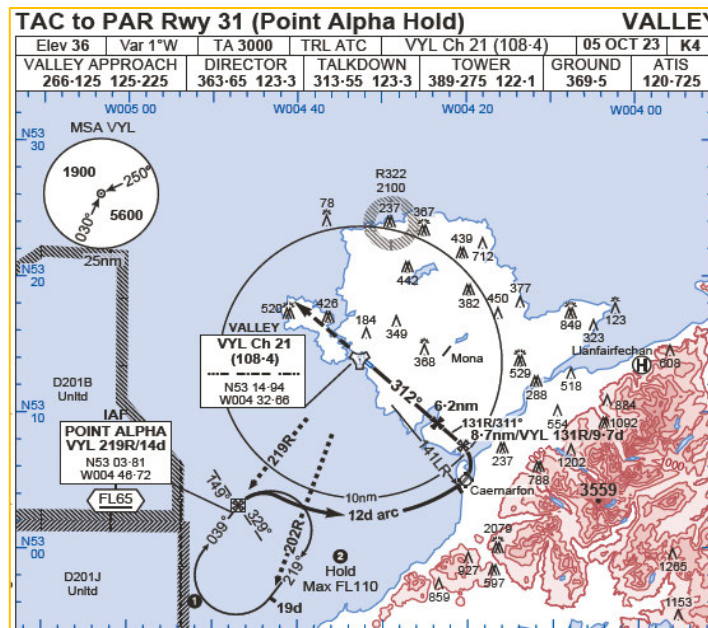


Figure 141 - TAC to PAR RWY 31 (POINT ALPHA Hold) Procedure

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The windfarm lays outside the protection areas for the TAC to PAR Procedure to Runway 31 where the initial approach tracks east initially from the IAF at Point Alpha Hold before reaching the IF at 2530ft which is above the 2179ft MOCA required at the windfarm.

The procedure tracks away from the windfarm after the Missed Approach and climb then climbs to 2530ft and would not be affected.

POINT ALPHA Hold has been considered in section 6.1.19.

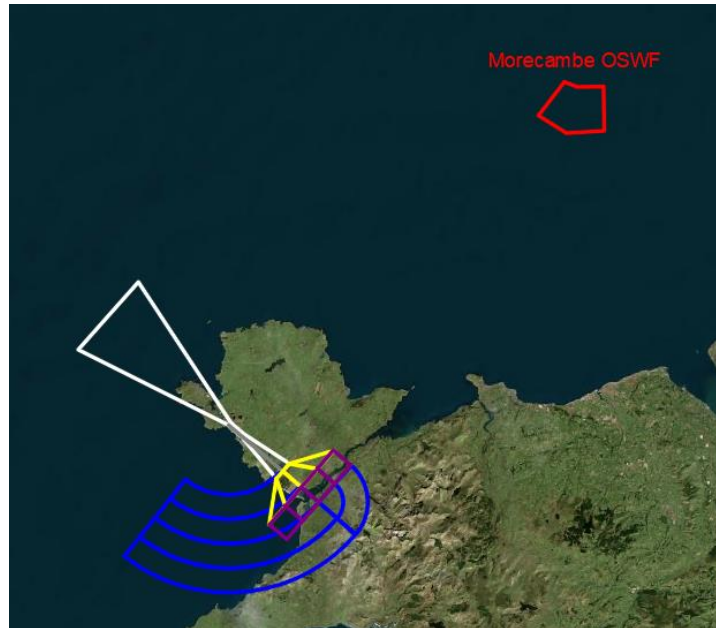


Figure 142 - TAC to PAR RWY 31 Protection Areas

**The proposed windfarm would have no impact on the TAC to PAR RWY 31 procedure.**

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6.1.7 AD 2 EGOV-1-19 PAR RWY 13

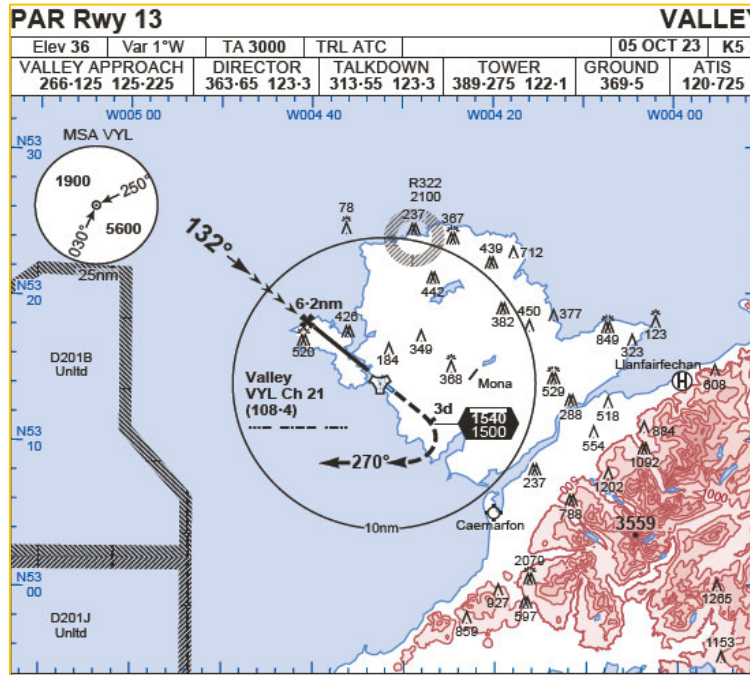


Figure 143 - PAR RWY 13 Procedure

The windfarm is outside the protection area for the PAR procedure to Runway 13, including the Missed Approach which turns away from the windfarm.

**However, arrival to the procedure could be conducted using the ATCSMAC or MSA VYL to conduct radar vectoring until reaching the FAF at 2040ft.**

The windfarm lays within the ATCSMAC 1400ft/1500ft area which has been assessed separately in section 6.1.1.



Figure 144 - PAR RWY 13 Protection Areas

**The proposed windfarm would have no impact on the PAR RWY 13 procedure.**



6.1.8 AD 2 EGOV-1-20 PAR RWY 19

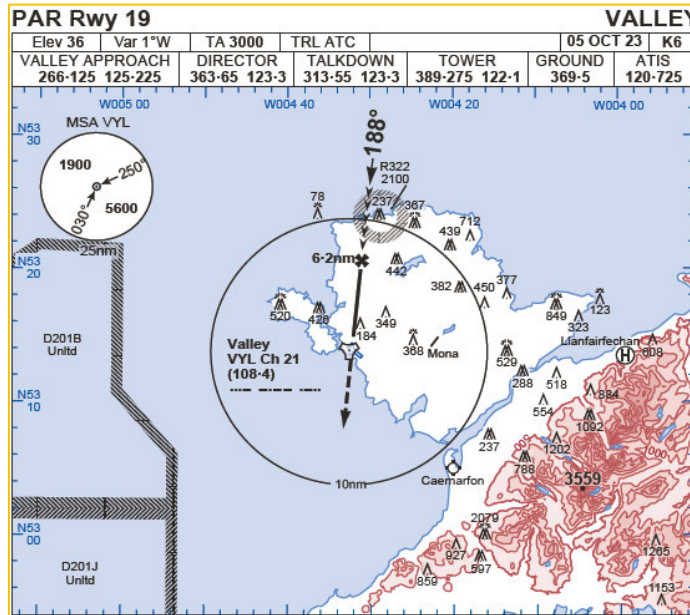


Figure 145 - PAR RWY 19 Procedure

The windfarm is outside the protection area for the PAR procedure to Runway 19, including the Missed Approach which turns away from the windfarm.

**However, arrival to the procedure could be conducted using the ATCSMAC or MSA VYL to conduct radar vectoring until reaching the FAF at 2040ft.**

The windfarm lays within the ATCSMAC 1400ft/1500ft area which has been assessed separately in section 6.1.1.



Figure 146 - PAR RWY 19 Protection Areas

**The proposed windfarm would have no impact on the PAR RWY 19 procedure.**

6.1.9 AD 2 EGOV-1-21 PAR RWY 31

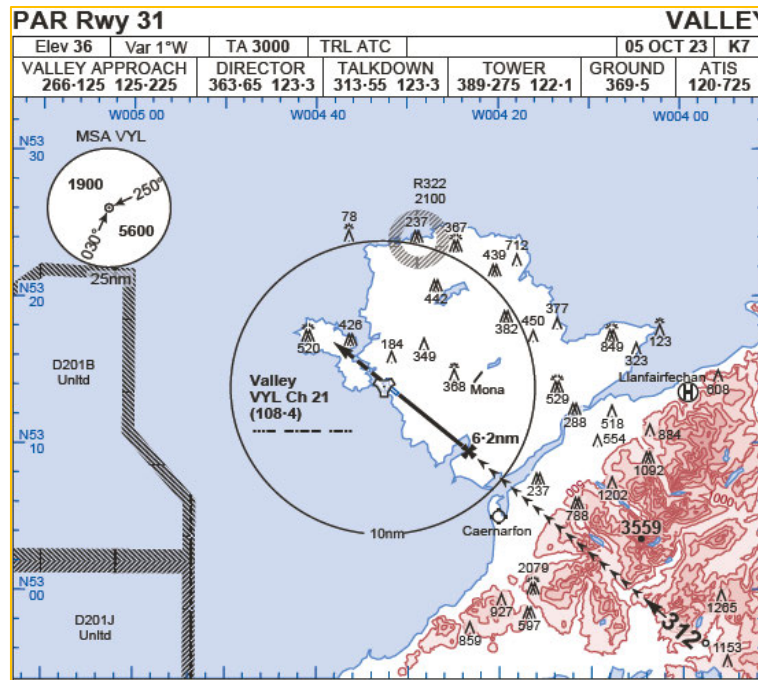


Figure 147 - PAR RWY 31 Procedure

The windfarm lays outside the protection areas for the PAR procedure to runway 31, including the Missed Approach which tracks west, away from the windfarm and climbs to 2530ft which is above the MOCA required at the windfarm.



Figure 148 - PAR RWY 31 Protection Areas

**The proposed windfarm would have no impact on the PAR RWY 31 procedure.**

6.1.10 AD 2 EGOV-1-22 SRA RWY 01

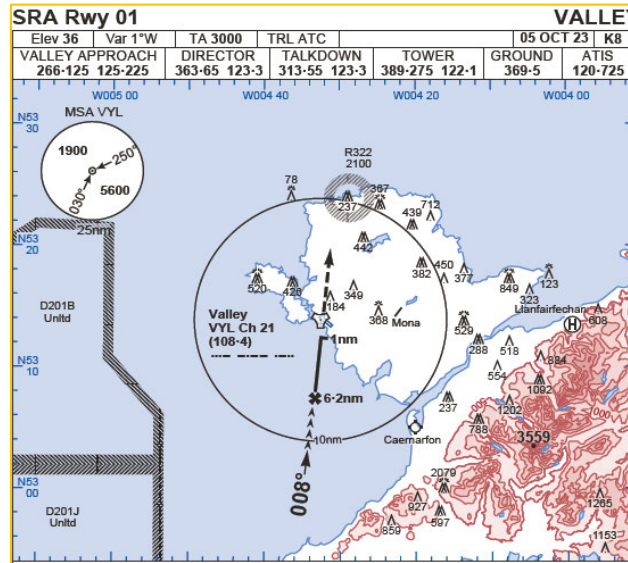


Figure 149 - SRA RWY 01 Procedure

The windfarm is outside the protection area for the SRA procedure to Runway 01. This includes the Missed Approach which tracks north, towards the vicinity of the windfarm where aircraft are required to climb to 2520ft which is above the MOCA required at the windfarm.

**However, arrival to the procedure could be conducted using the ATCSMAC or MSA VYL to conduct radar vectoring until reaching the FAF at 2040ft.**

The windfarm lays within the ATCSMAC 1400ft/1500ft area which has been assessed separately in section 6.1.1.

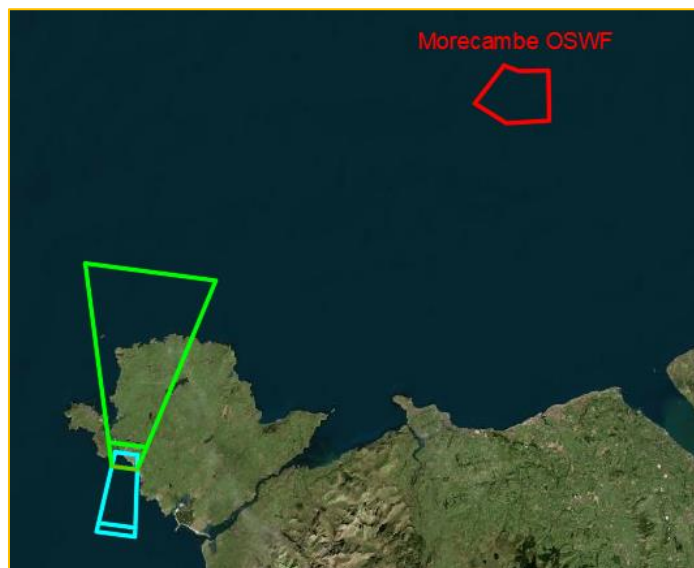


Figure 150 - SRA RWY 01 Protection Areas

**The proposed windfarm would have no impact on the SRA RWY 01 procedure.**

6.1.11 AD 2 EGOV-1-23 SRA RWY 13

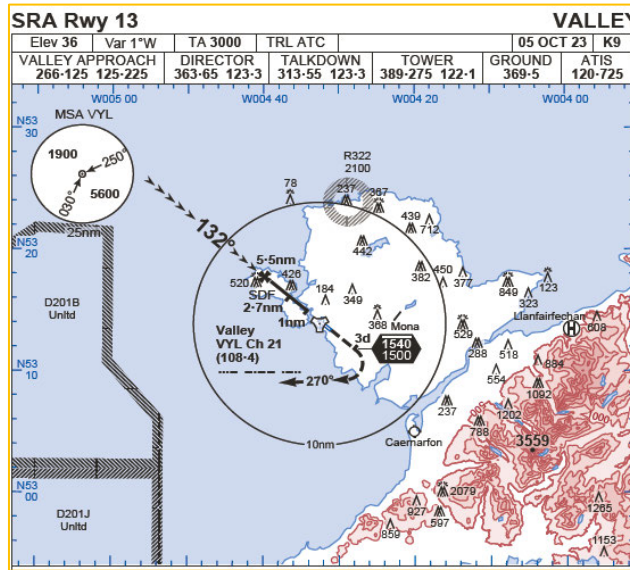


Figure 151 - SRA RWY 13 Procedure

The windfarm is outside the protection area for the SRA procedure to Runway 13, including the Missed Approach which tracks south-east before turning right, away from the windfarm.

**However, arrival to the procedure could be conducted using the ATCSMAC or MSA VYL to conduct radar vectoring until reaching the FAF at 2040ft.**

The windfarm lays within the ATCSMAC 1400ft/1500ft area which has been assessed separately in section 6.1.1.

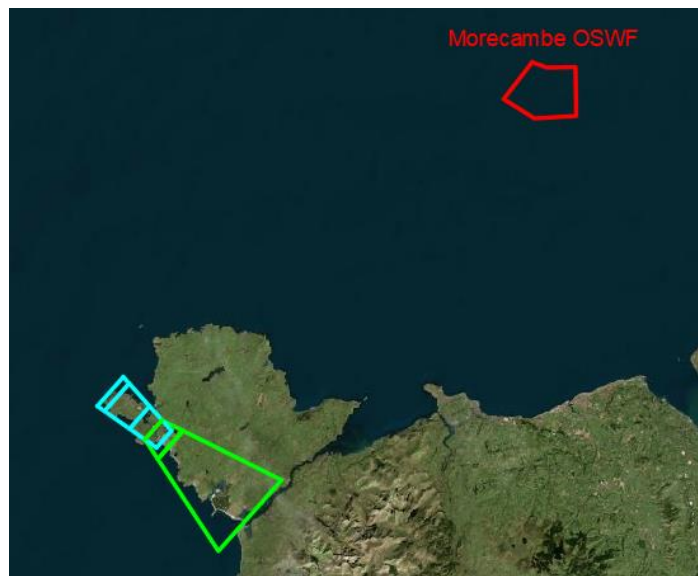


Figure 152 - SRA RWY 13 Protection Areas

**The proposed windfarm would have no impact on the SRA RWY 13 procedure.**



6.1.13 AD 2 EGOV-1-25 SRA RWY 31

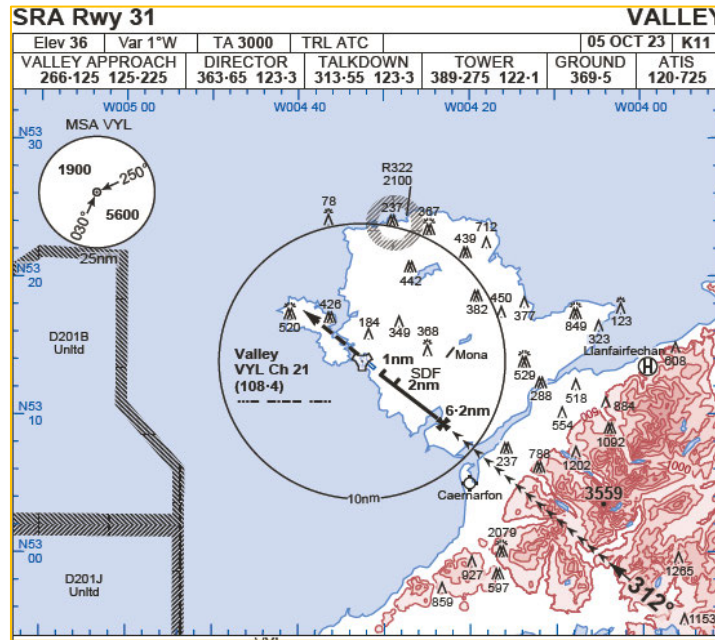


Figure 155 - SRA RWY 31 Procedure

The windfarm lays outside the protection areas for the SRA procedure to runway 31, including the Missed Approach which tracks west, away from the windfarm and climbs to 2530ft which is above the MOCA required at the windfarm.



Figure 156 - SRA RWY 31 Protection Areas

Arrival to the procedure from the east lies in the 5600ft south-east sector of the MSA which would offer protection from the windfarm which lays in the 1900ft NW sector.

**The proposed windfarm would have no impact on the SRA RWY 31 procedure.**



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**The proposed windfarm would have no impact on the TAC to ILS/DME RWY 13 (Point X-Ray Hold) Procedure.**

**6.1.15 AD 2 EGOV-1-28 TAC RWY 01 (Point Alpha Hold)**

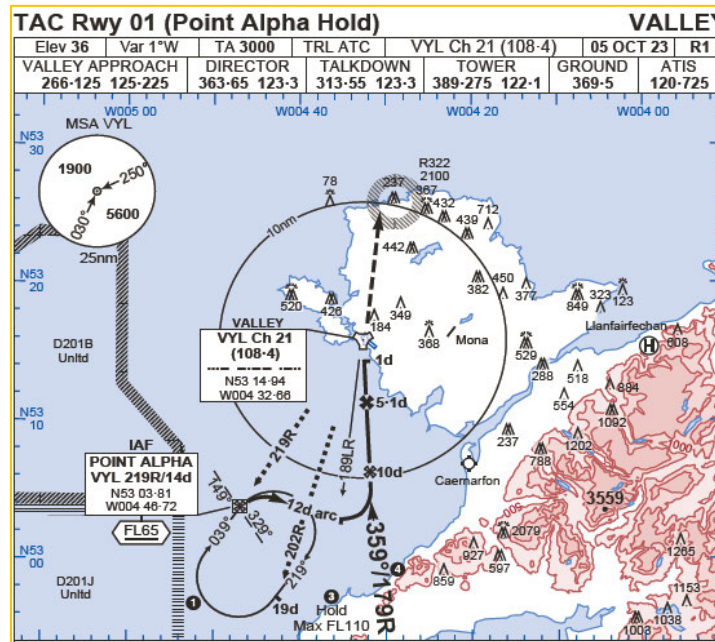


Figure 159 - TAC RWY 01 (Point Alpha Hold) Procedure

The TAC RWY 01 Procedure has an initial altitude of 2520ft at the IF.

With a maximum MOC of 300m the proposed turbines require a MOCA of:

$315\text{m} + 300\text{m MOC} = 615\text{m} / 2018\text{ft AMSL}$ , which is below the procedure altitude for TAC RWY 01.

The Missed Approach tracks north, towards the vicinity of the windfarm where aircraft are required to climb to 2520ft which is above the MOCA required at the windfarm.

**The proposed windfarm would have no impact on the TAC RWY 01 (Point Alpha Hold) Procedure.**



6.1.16 AD 2 EGOV-1-29 TAC RWY 13 (Point X-Ray Hold)

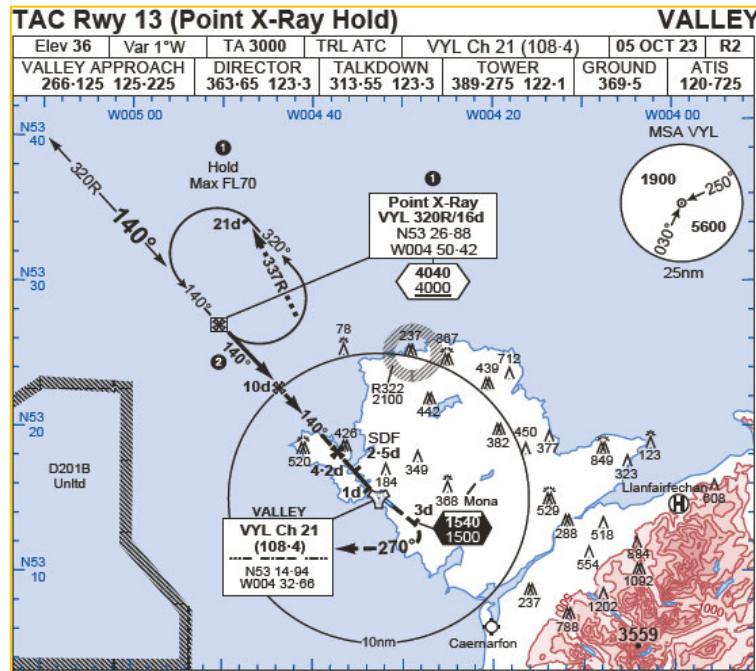


Figure 160 - TAC RWY 13 (Point X-Ray Hold) Procedure

The windfarm lays outside the protection areas for the TAC procedure to runway 13 which arrives from the Point X-Ray Hold.

The Missed Approach climbs ahead on runway track before turning right, away from the windfarm and would not be affected.

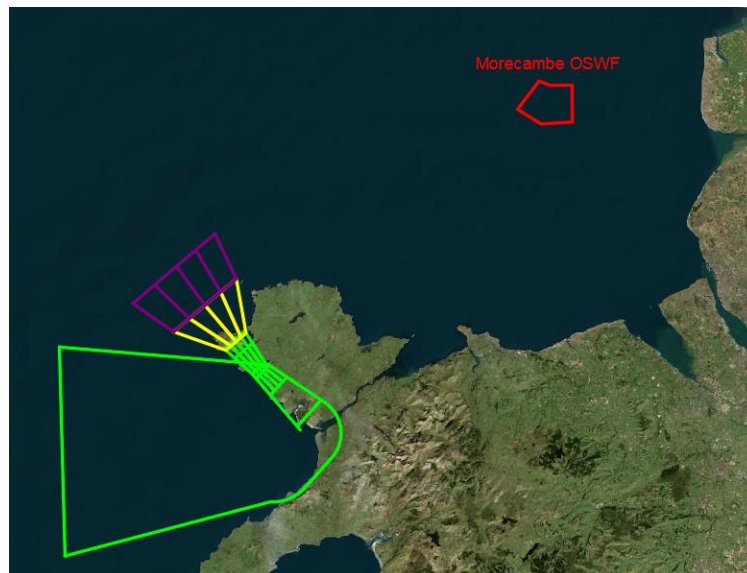


Figure 161 - TAC RWY 13 (Point X-Ray Hold) Protection Areas

**The proposed windfarm would have no impact on the TAC RWY 13 (Point X-Ray Hold) procedure.**

6.1.17 AD 2 EGOV-1-30 TAC RWY 19 (Point X-Ray Hold)

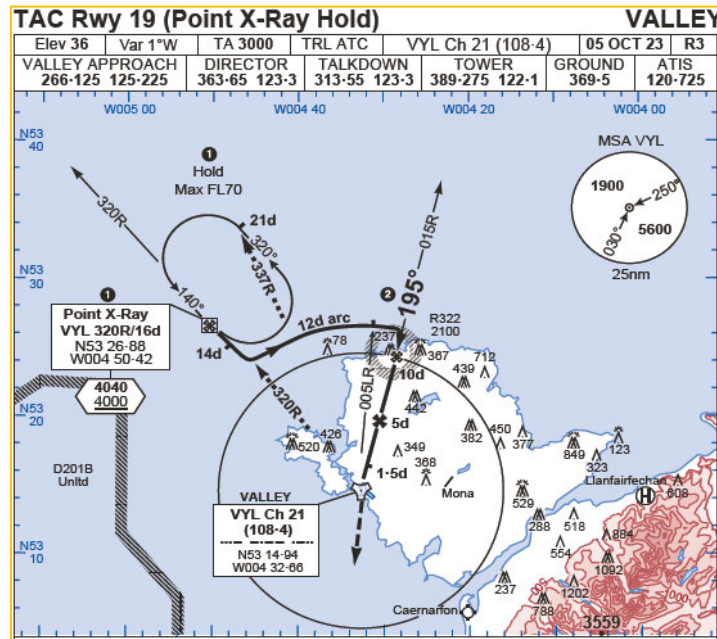


Figure 162 - TAC RWY 19 (Point X-Ray Hold) Procedure

The windfarm lays outside the protection areas for the TAC procedure to runway 19 which arrives from the Point X-Ray Hold.

The Missed Approach tracks south, away from the windfarm and climbs to 2540ft so is not affected.

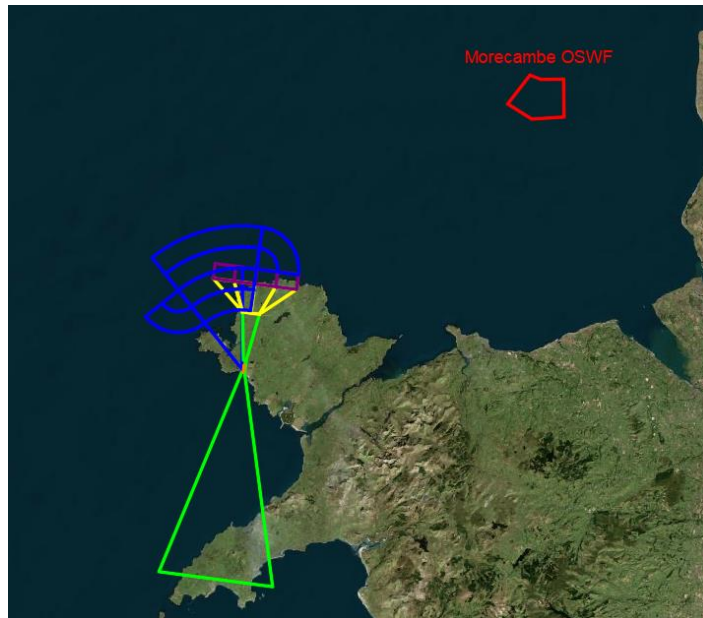


Figure 163 - TAC RWY 19 (Point X-Ray Hold) Protection Areas

**The proposed windfarm would have no impact on the TAC RWY 19 (Point X-Ray Hold) procedure.**

**6.1.18 Visual Circling**

The windfarm is outside the Visual Circling VM(C) Obstacle Clearance areas for all aircraft categories (A, B, C, D and E).

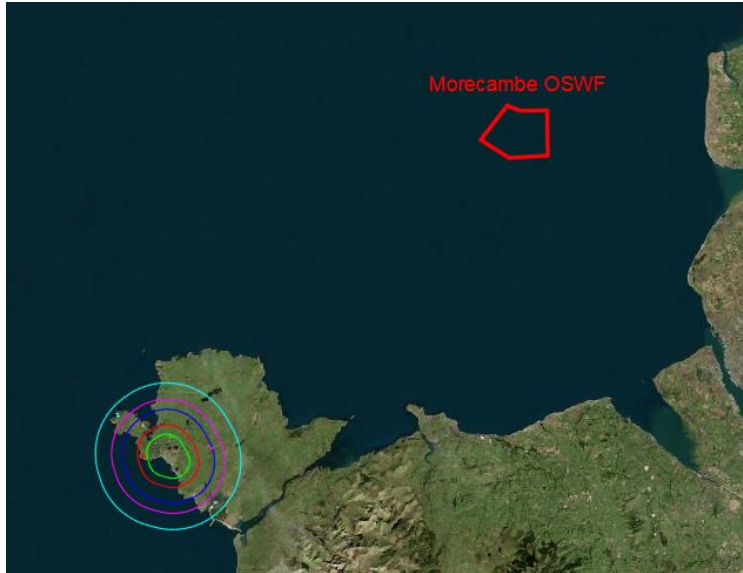


Figure 164 - Visual Circling Protection Area

**The proposed windfarm would have no impact on the Visual Circling at RAF Valley.**

**6.1.19 Holding**

Point X-Ray Hold

The windfarm lays outside the protection areas associated to the Point X-Ray Hold, including its buffers – therefore there will be no impact on the Point X-Ray Hold.

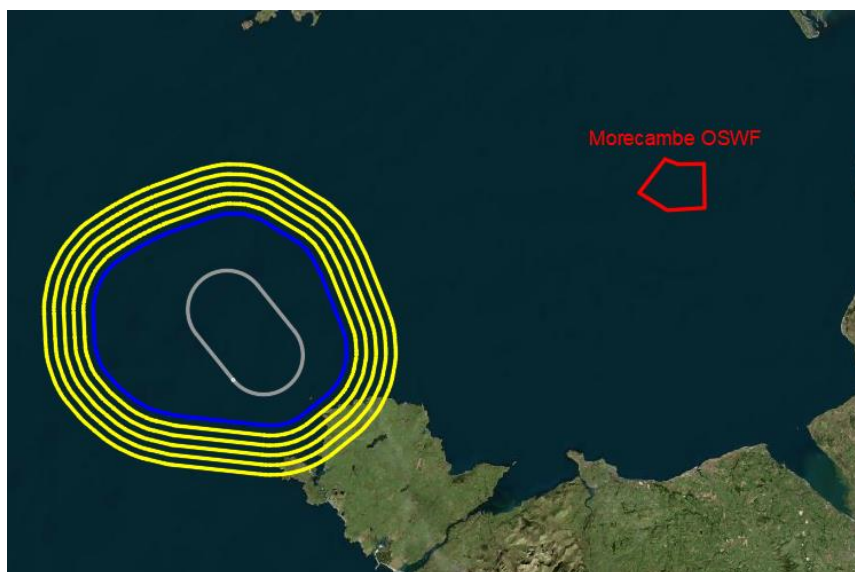


Figure 165 - Point X-Ray Hold Protection Areas and Buffers

Point Alpha Hold

The windfarm lays outside the protection areas associated to the Point Alpha Hold, including its buffers – therefore there will be no impact on the Point Alpha Hold.



Figure 166 - Point Alpha Hold Protection Area and Buffers

**The proposed windfarm would have no impact on any of the holds for RAF Valley.**

**6.1.20 Visual Segment Surface (VSS)**

The proposed windfarm is outside the lateral confines of VSS for all Runways.

**The proposed windfarm would have no impact on the VSS for RAF Valley's Runways.**

**6.1.21 Minimum Sector Altitudes**

**MSA VYL 25NM**

The proposed windfarm lie outside the lateral confines of all MSA sectors.

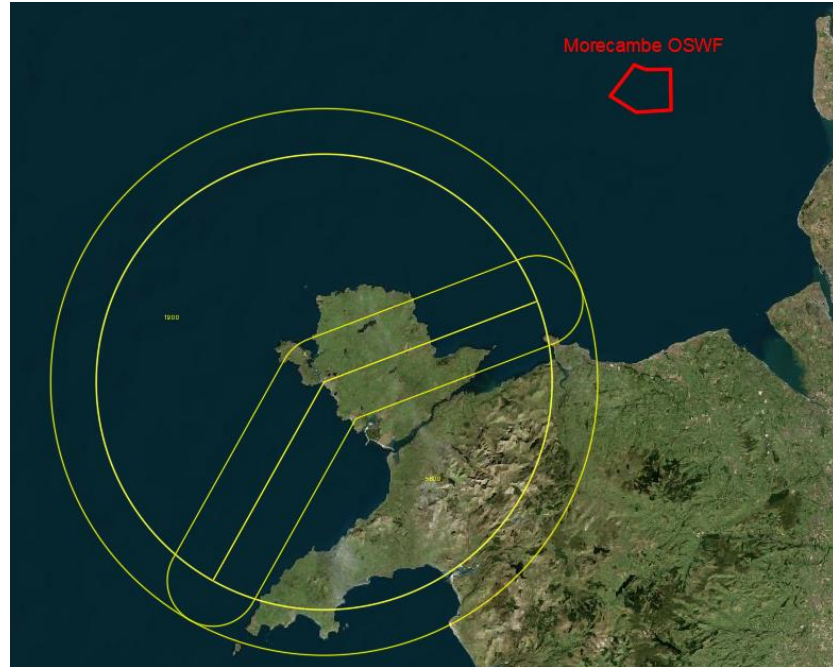


Figure 167 - MSA VYL 25NM and Buffer Area

**The proposed windfarm would have no impact on the MSA for RAF Valley.**

# 7 Walney Airport OLS and IFP Assessment

## 7.1 IFP Analysis

The IFPs assessed are as follows:

AIRAC 11/2023 (Effective 02 NOV 2023)

- AD 2.EGNL-8-1 RNP 17 (02 NOV 23)
- AD 2.EGNL-8-2 ILS/DME/NDB(L) 35 (02 NOV 23)
- AD 2.EGNL-8-3 LOC/DME/NDB(L) 35 (02 NOV 23)
- AD 2.EGNL-8-4 RNP 35 (02 NOV 23)
- AD 2.EGNL-8-5 NDB(L)/DME 35 (02 NOV 23)
- AD 2.EGNL-8-6 NDB(L)/DME TO AERODROME (02 NOV 23)

Additionally, the following were checked:

- Visual Circling
- Holding
- Visual Segment Surface (VSS)
- Minimum Sector Altitudes (MSA)

### 7.1.1 RNP RWY17

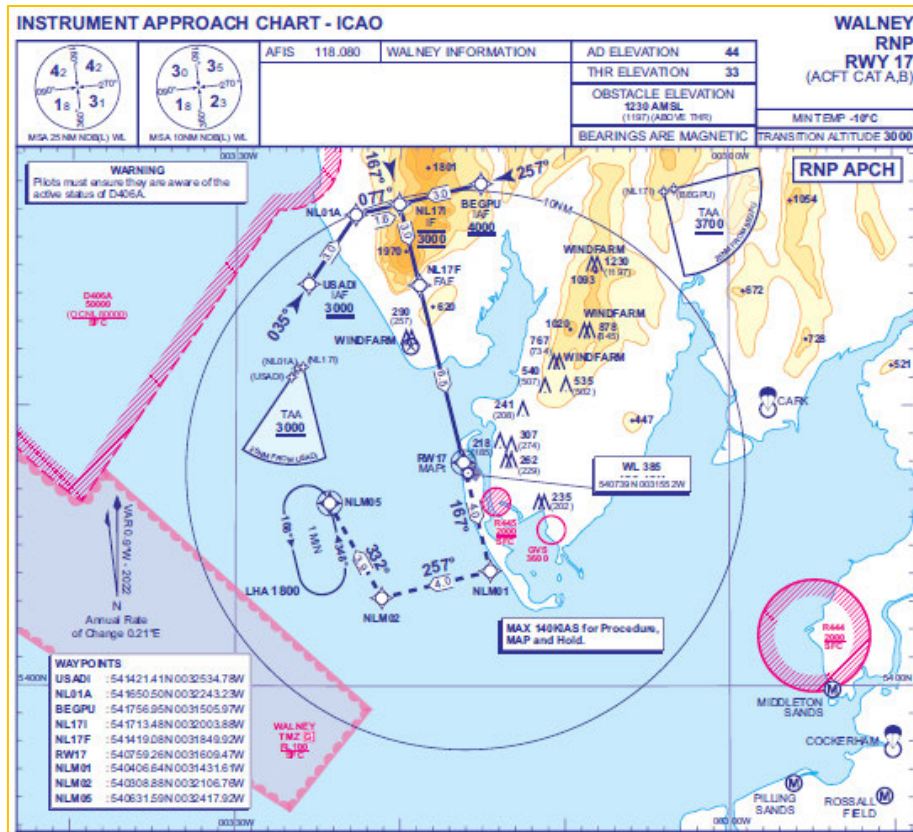


Figure 168 – RNP RWY 17 Procedure

The windfarm outside the protection areas associated to the RNP Procedure to Runway 17. This includes the hold protection. However, it is within the USADI TAA protection area.

The MOCA for the Windfarm is 315m + 300m = 615m / 2018ft AMSL which is lower than the altitude for the USADI TAA (3000ft).

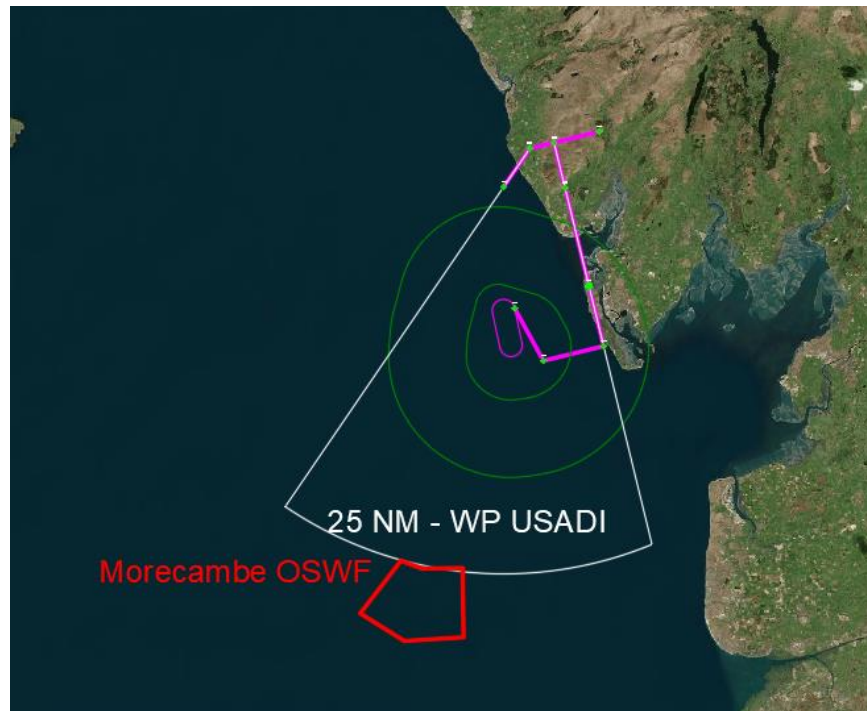


Figure 169 - RNP RWY 17 Protection Areas

**The proposed windfarm will not have an impact on the RNP 17 Procedure.**

7.1.2 ILS/DME/NDB(L) RWY 35

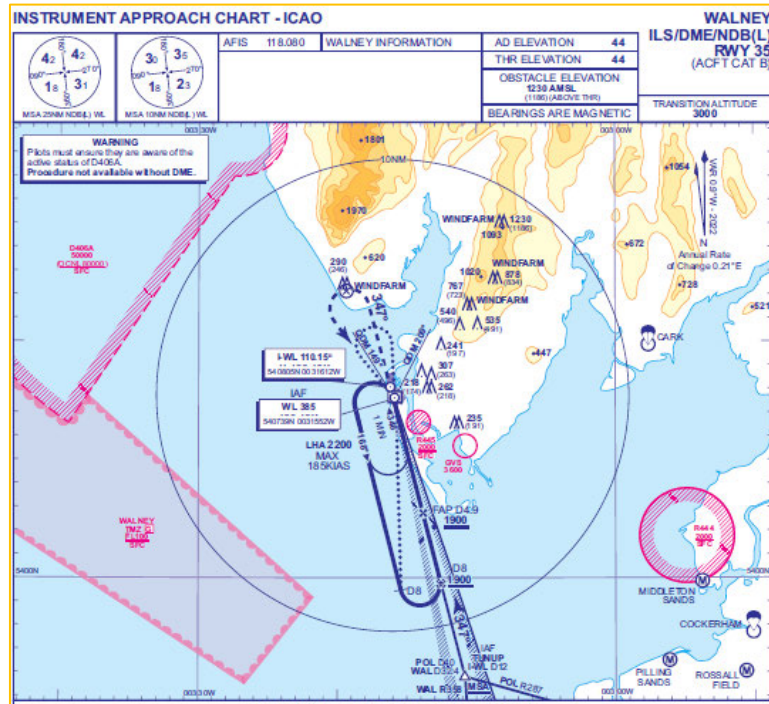


Figure 170 - ILS/DME/NDB(L) RWY 35

The windfarm lays outside the protection areas associated with the ILS/DME Procedure to Runway 35.

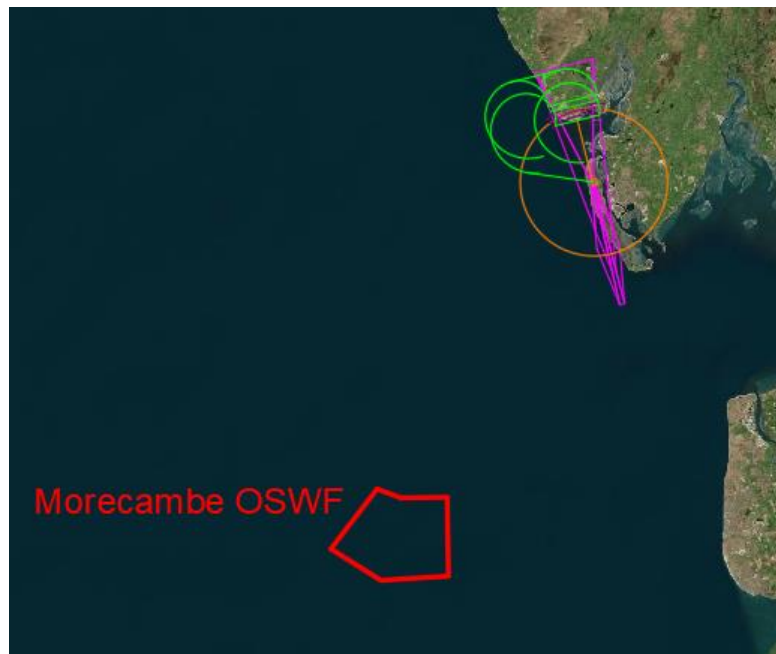


Figure 171 - Windfarm vs ILS/DME RWY 35 Protection Areas

Additionally, all the reversal procedures published on the approach chart have been constructed:



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- Primary Racetrack overhead NDB(L) WL.
- Alternative Base Turn Procedure overhead NDB(L) WL.
- Alternative base turn procedure direct entry overhead NDB(L) WL.

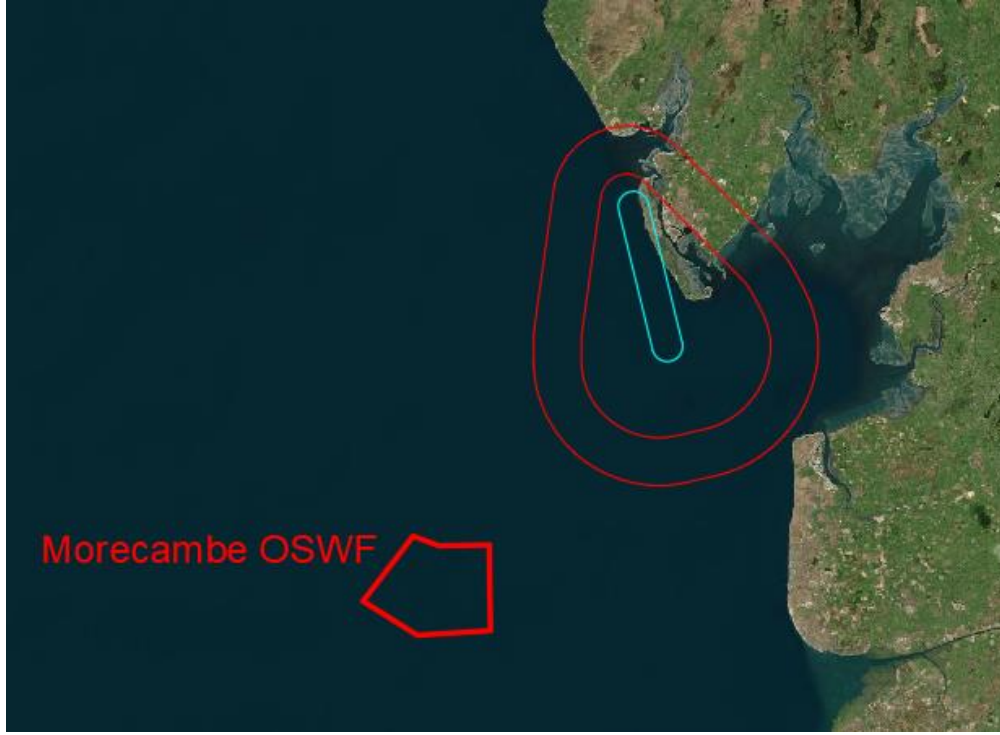


Figure 172 - Windfarm vs ILS/DME RWY 35 Primary Reversal



Figure 173 – Windfarm vs ILS/DME RWY 35 Alternative Baseturn Reversals

As the windfarm is outside the protection areas for the reversals, they will not cause an impact.

**The proposed windfarm will not have an impact on the ILS/DME/NDB(L) RWY 35 Procedure.**

**7.1.3 LOC/DME/NDB(L) RWY 35**

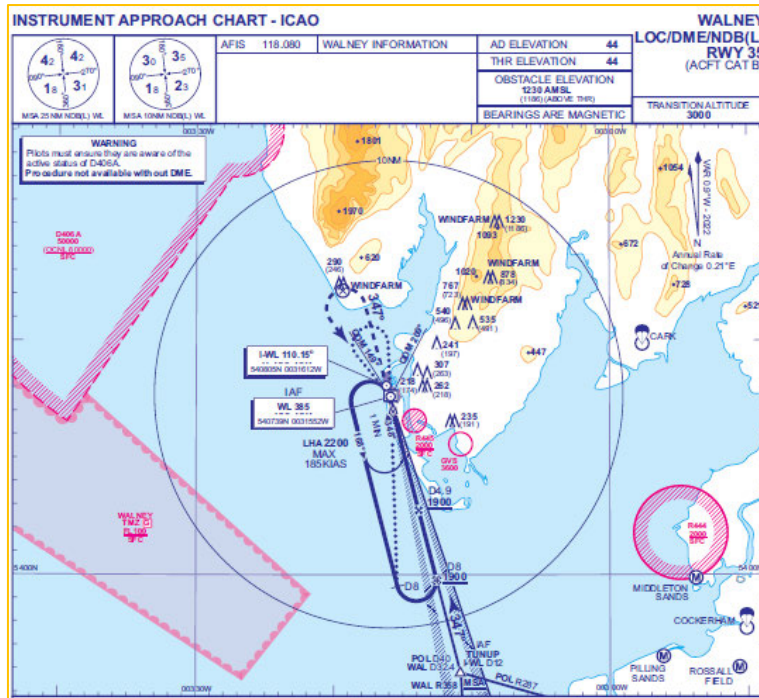


Figure 174 - LOC/DME/NDB(L) RWY 35

The protection areas for the LOC RWY 35 Procedure are common to the ones from the ILS RWY 35 in the previous section.

As the windfarm is outside the protection areas for the procedure and reversals, it will not cause an impact.

**The proposed windfarm will not have an impact on the LOC/DME/NDB(L) RWY 35 Procedure.**

**7.1.4 RNP RWY 35**

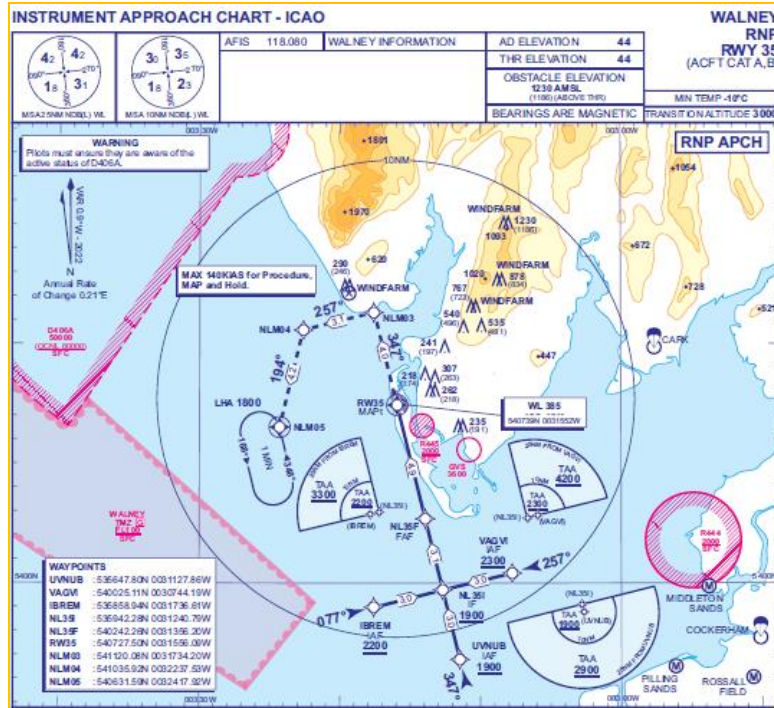


Figure 175 - RNP RWY 35

The windfarm is outside the protection areas associated to the RNP Procedure to Runway 35. This includes the hold protection.



Figure 176 - Windfarm vs RNP RWY 35

Additionally, Terminal Arrival Altitudes (TAAs) on each of the Initial Approach Fixes (IAFs; IBREM, UVNUB and VAGVI) have been constructed:

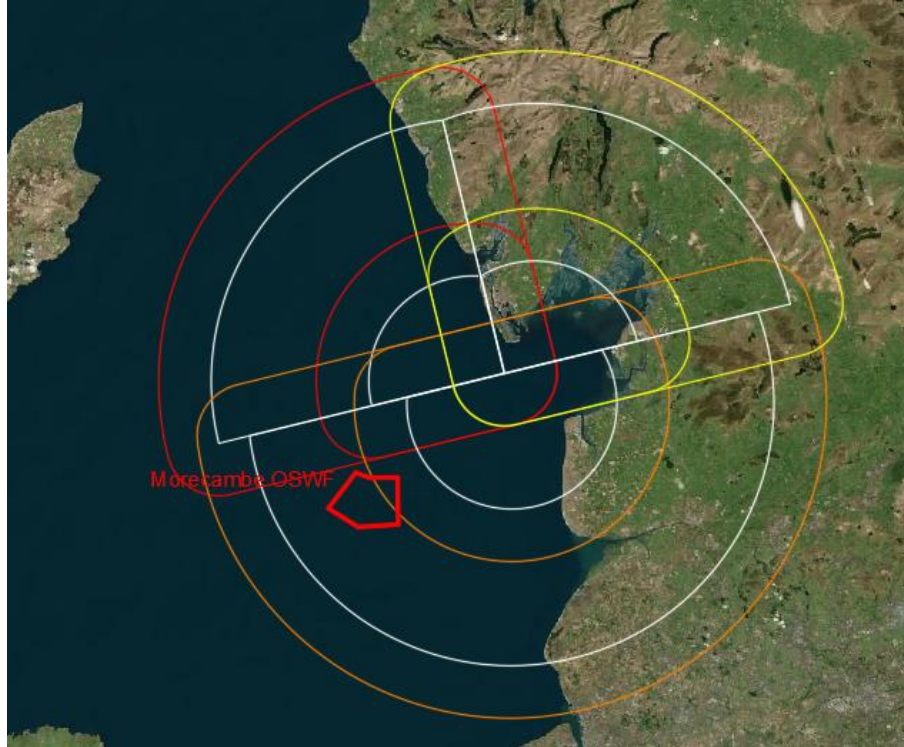


Figure 177 - Windfarm vs RNP RWY 35 TAAs

The windfarm is within the protection areas for the 25NM and 10NM TAAs of UVNUB. They remain outside all remaining TAAs.

The MOCA for the Windfarm is:  $315\text{m} + 300\text{m MOC} = 615\text{m} / 2018\text{ft AMSL}$  which is lower than the published 25NM TAA of UVNUB (2900ft) but above the published 10NM TAA of UVNUB (1900ft)

**The 10NM TAA of UVNUB will need to be increased to 2100ft.**

**The proposed windfarm will impact on the RNP RWY 35 Procedure.**

**7.1.5 NDB(L)/DME RWY 35**

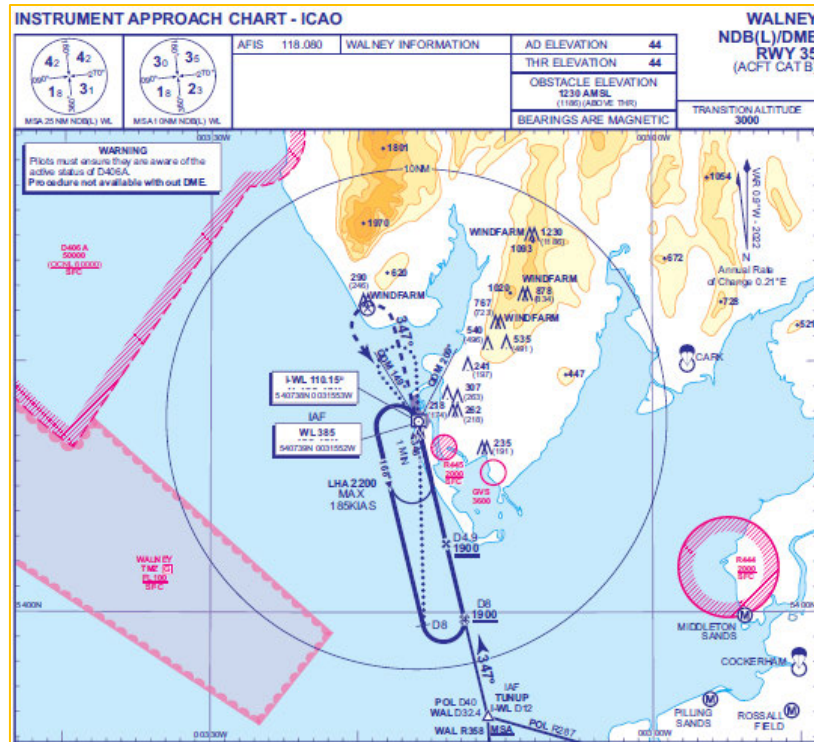


Figure 178 – NDB(L)/DME RWY 35

The windfarm lays outside the protection areas associated to the NDB(L)/DME Procedure to Runway 35.

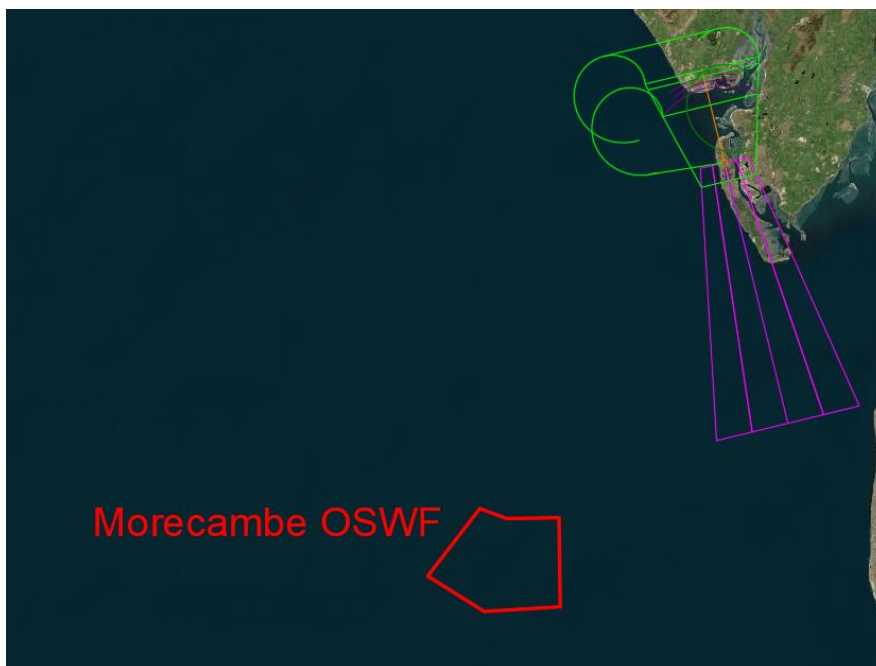


Figure 179 - Windfarm vs NDB(L)/DME RWY 35 Protection Areas

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Additionally, all the reversal procedures published on the approach chart have been constructed:

- Primary Racetrack overhead NDB(L) WL.
- Alternative Base Turn Procedure overhead NDB(L) WL.
- Alternative base turn procedure direct entry overhead NDB(L) WL.

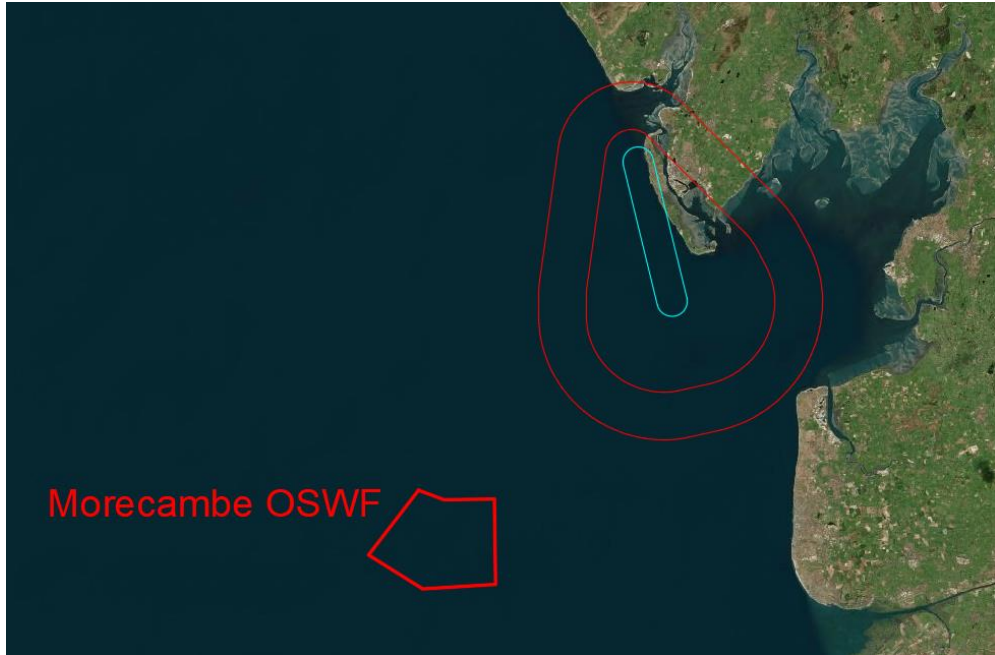


Figure 180 - Windfarm vs NDB(L)/DME RWY 35 Primary Reversal



Figure 181 - Windfarm vs NDB(L)/DME RWY 35 Alternative Base Turn Reversals

The windfarm is outside the protection areas for the reversals, it will not cause an impact.

**The proposed windfarm will not have an impact on the NDB(L)/DME RWY 35 Procedure.**

**7.1.6 NDB(L)/DME TO AERODROME**

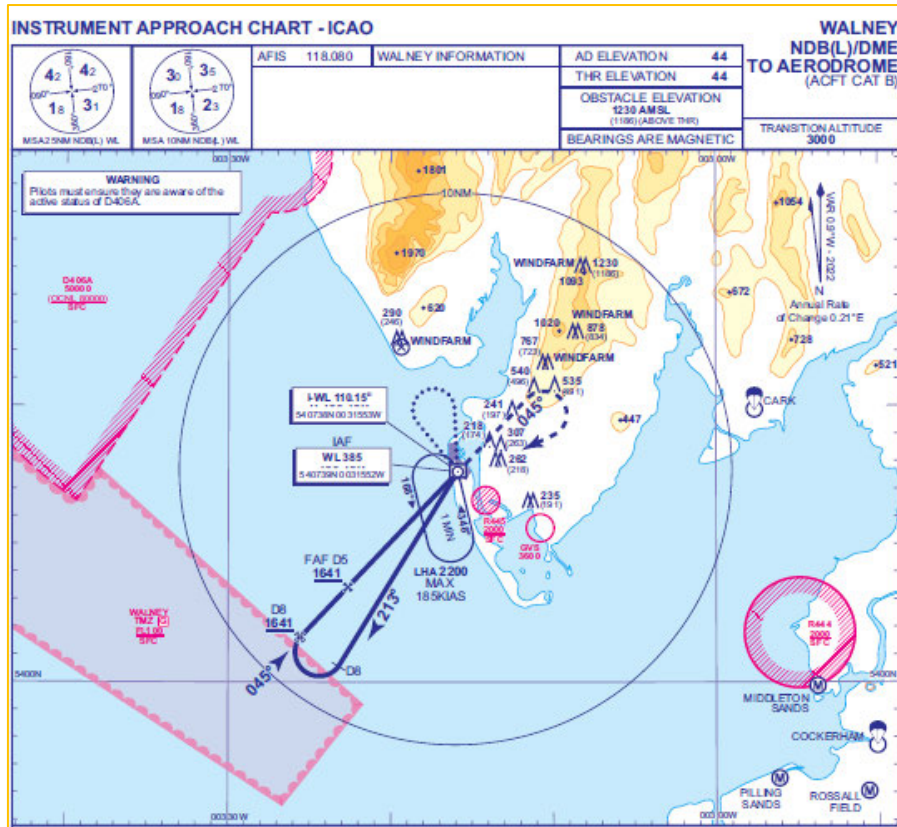


Figure 182 - NDB(L)/DME to Aerodrome

The proposed windfarm is outside of the protection areas associated to the NDB(L)/DME Procedure to Aerodrome:

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Figure 183 – Windfarm vs NDB(L)/DME to Aerodrome

Additionally, all the reversal procedures published on the approach chart have been constructed:

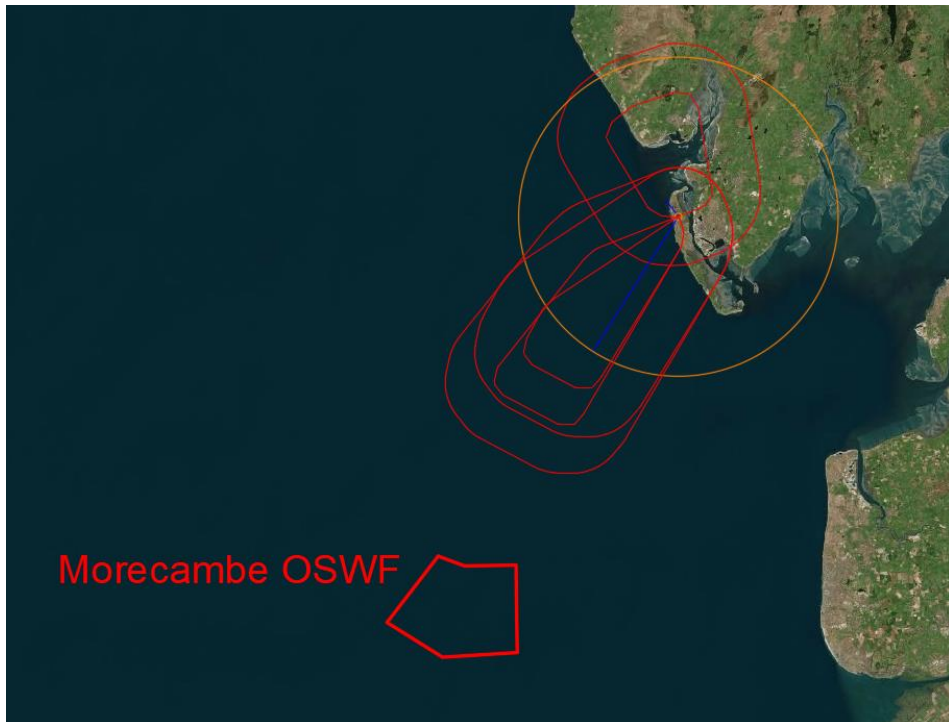


Figure 184 - Windfarm vs NDB(L)/DME to Aerodrome Reversals

As the windfarm is outside the protection areas for the reversals, it will not cause an impact.

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Also note the extension of the NDB Navaid Splay into the timed baseturn (NO DME Case, NO FAF) is also unaffected as windfarm is not within the timed baseturn areas.

**The proposed windfarm will not have an impact on the NDB(L)/DME to Aerodrome Procedure.**

#### 7.1.7 Visual Circling

The windfarm is outside the lateral boundaries of the CAT A and B Circling Areas:



Figure 185 - Windfarm vs Circling

**The proposed windfarm will not have an impact on the Visual Circling.**

#### 7.1.8 Holding

The RNP Holds have been assessed as part of the RNP Procedures – no impact was noted.

The Lowest Holding Altitude (LHA) for the rest of holds is 2200ft.

Note: MOCA for the Windfarm is: 315m + 300m MOC = 615m / 2018ft AMSL which is lower than the LHA.

**The proposed windfarm would have no impact on the Holds for Walney Airport.**

#### 7.1.9 Visual Segment Surface (VSS)

The windfarm is outside the lateral confines of VSS for all Runways.

**The proposed windfarm would have no impact on the VSS for Walney Airport Runways.**

**7.1.10 Minimum Sector Altitudes (MSA)**

MSA 10NM NDB(L) WL

The windfarm is beyond the 10NM MSA Sub-Sector protection area:



Figure 186 - Windfarm vs Circling

MSA 25NM NDB(L) WL

The Windfarm lies within the south west quarter of the MSA 25NM NDB(L) WL, the published MSA is 1800ft.

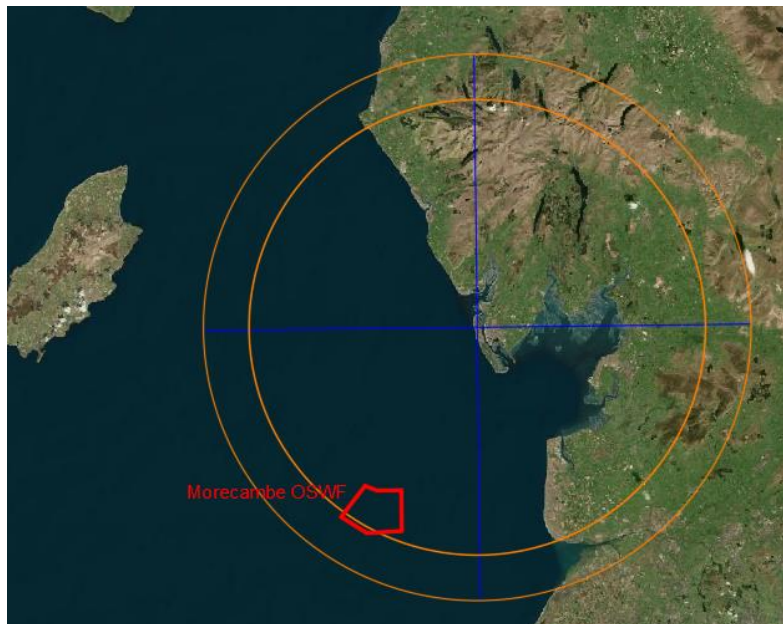


Figure 187 - Windfarm vs MSA 25NM NDB(L) WL

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The proposed windfarm would produce a MOCA of  $315\text{m} + 300\text{m} = 615\text{m} / 2018\text{ft}$  AMSL for the south-western quadrants.

**This is above the SW quadrant published MSA which has a MOCA of 1800ft which will need to be increased to 2100ft to clear the wind turbines.**

**The proposed windfarm would cause a potential impact on the published NDB(L) WL MSA.**

## 8 RAF Woodvale IFP Assessment

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### 8.1 IFP Assessment

Woodvale has no published IFP's.

## 9 Summary

Airport	Morecambe Offshore Windfarm Generation Assets
Manchester	No Impact on IFPs.
Liverpool	No Impact on IFPs.
Warton	<p><b>Potential impact on MSA 25NM WTN TAC SW Sector.</b> MOCA needs increasing from 1800ft to 2100ft. See Section 4.1.20</p> <p><b>Potential impact on MSA 25NM WTN NDB SW Sector.</b> MOCA needs increasing from 1800ft to 2100ft. See Section 4.1.20</p>
Isle of Man	No Impact on IFPs.
Valley	<p><b>Potential impact on ATCSMAC 1500ft QNH 1400ft QFE SMAA.</b> MOCA needs increasing to 2100ft QNH 2000ft QFE. See Section 6.2.1</p>
Walney	<p><b>Potential impact on RNP RWY 35.</b> MOCA for 10NM TAA UVNUB needs to be increased from 1900ft to 2100ft. See Section 7.1.4</p> <p><b>Potential impact on MSA 25NM NDB(L) WL SW Sector.</b> MOCA needs increasing from 1800ft to 2100ft. See Section 7.1.10.</p>
Woodvale	NA

Table 2 - Conclusions Summary