APPENDIX 15-6

Aviation Review Statement

Report

Cahermurphy West Wind Farm

Aviation Review Statement

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Executive Summary

Cahermurphy West Wind Farm Limited is proposing to develop a new wind farm development adjacent to the existing operational wind farm (submitted under 14551/ PL03.245189 Cahermurphy Wind Farm) which consists of four wind turbines. The proposed development of Cahermurphy West Wind Farm would consist of eight wind turbines with maximum tip height of with maximum tip height of 180-185 m above ground level.

During consultations with the Shannon Airport Group (who are responsible for the operation of Shannon Airport) regarding the proposed development, the EIAR consultants (MKO Ltd) received a response from Shannon Airport Safety Compliance and Environment Management Team stating that the potential impacts on Instrument Flight Procedures for flights to/from Shannon Airport and potential impacts on NAVAIDS/Radar systems should be considered.

> *"The locations of the turbines are approx. 6 km from the perimeter of our safeguarding boundary. Therefore, technically they are not impacting the Obstacle Limitational Surfaces (OLS). The closest area within that boundary has a height restriction of between 15m and 45m.*
> *This is only one aspect of a combined required assessment process and consideration of potential impacts on Instrument Flight Procedures (IFP's) and NAVAIDS/Radar is also required."*

A consultation response was also received from the Department of Defense (DoD) in which observations were made regarding the Aviation Lighting

> *"All turbines should be illuminated by Type C, Medium intensity, Fixed Red obstacle lighting with a minimum output of 2,000 candela to be visible in all directions of azimuth and to be operational H24/7 days a week. Obstacle lighting should be incandescent or, if LED or other types are used, of a type visible to Night Vision equipment. Obstacle lighting used must emit light at the near Infra-Red (IR) range of the electromagnetic spectrum, specifically at or near 850nanometres (nm) of wavelength. Light intensity to be of similar value to that emitted in the visible spectrum of light."*

Following the consultation responses from the Shannon Airport Group and the DoD, Ai Bridges Ltd were commissioned by MKO Ltd. to review the possible impacts of the proposed wind farm on aviation systems in the vicinity of the proposed development at Cahermurphy West. As part of the review, the following subjects were considered, which include a review of the Instrument Flight Procedures at Shannon Airport, NAVAIDS/Radar, and a review of the DoD observations regarding military aviation lighting:

- Annex 14 - Obstacle Limitation Surfaces (OLS)
- Annex 15 – Aerodrome Surfaces
- Building Restricted Areas (BRA)
- Minimum Sector Altitudes (MSA)
- Instrument Flight Procedures (IFPs)
- Permitted Wind Farms in vicinity of Proposed Wind Farm
- Communication and Navigation Systems
- Radar Surveillance Sensors
- Flight Inspection and Calibration
- Aeronautical Obstacle Warning Light Scheme
- Irish Air Corps / Department of Defence Safeguarding
- Garda Air Support Unit (GASU) and Emergency Aeromedical Service (EAS)

Annex 14 - Obstacles Limitation Surfaces (OLS)

A review shows that the proposed wind farm would be located outside the Outer Horizontal Surface of the Shannon Runway Obstacles Limitation Surfaces, as defined in ICAO (International Civil Aviation Organization) Annex 14.

As the proposed wind farm is situated outside the Outer Horizontal Surface and there is no penetration of the take-off or approach surfaces, it is unlikely that there will be any impacts to the OLS surfaces for Shannon Airport.

Annex 15 - Aerodrome Surfaces

Following a review of "*Terrain and obstacle requirements*" as defined in ICAO Annex 15, wind turbines need to be registered if they are more than 100 meters above terrain. From the centre point (ARP – Airport Reference Point) of Shannon Airport to the boundary of the Area 1 of the Annex 15 Aerodrome Surface is 45km. This area encloses the TMA area i.e. Total Maneuvering Area and this is used for circling and maneuvering by aircraft.

Should the proposed windfarm be permitted, the turbines would be within 45 km of Shannon Airport's ARP and would be greater than 100 m in height. Therefore, the turbines would be required to be included in the AirNav Electronic Air Navigation Obstacle Dataset.

Building Restricted Areas (BRA)

A Building Restricted Area is the airspace surrounding an aviation facility that needs to be clear from physical intrusions. The purpose of the safeguarded areas is to identify developments with the potential for causing unacceptable interference to navigation facilities. A review shows that the proposed wind farm is over 20 km from the BRA surfaces at Shannon Airport. At this distance there will be no impact to the BRAs due to the proposed wind turbines at Cahermurphy West.

Minimum Sector Altitudes (MSA)

The Minimum Sector Altitudes (MSA) is the lowest altitude which must be used to provide a minimum obstacle clearance of 1000 ft above all obstacles within a sector of 25 nautical miles (46 km) from the VOR/DME at Shannon Airport.

The maximum turbine tip-height at the proposed wind farm site is 994 ft above mean sea level (AMSL). There is over 1000 ft from the highest of the proposed turbines to the MSA altitude and therefore there would be no impact on the published MSA altitudes for Shannon Airport.

Instrument Flight Procedures

There are 10 published Instrument Flight Procedures for flights to/from Shannon Airport. A review indicates that the instrument flight procedures for the airport are unlikely to be impacted; however, an assessment by the ANSP is likely to be required.

The proposed turbines at Cahermurphy would be located relatively near to a number of routes as set out within the IFP charts. A detailed instrument flight procedure analysis is outside of the scope of this report, however, an initial review indicates that these flight procedures are unlikely to be impacted by the proposed development. This is based on the initial screening assessment review.

Communications and Navigation Systems

As the proposed wind farm is approximately 29 km from the Localizer and transmitting antennas at Shannon Airport, it is very unlikely that wind turbines at the proposed development will have any impact on these ATS communications and radio navigational aids

Radar Surveillance Sensors

For Radar Surveillance Systems, EUROCONTROL Guidelines state that a Detailed Technical Assessment is not required for turbines that are more than 15 km away from a Primary Surveillance Radar system (PSR). For Secondary Surveillance Radar systems (SSR), detailed technical assessments are not required for turbines that are more than 16 km away from the SSR.

It has been highlighted in the analysis that turbines at the proposed farm would be located at a minimum distance of over 25 km from the PSR/SSR radar station at Shannon Airport. At this distance it is unlikely that there would be any significant impact on the PSR/SSR station, and a request by AirNav for a detailed impact assessment on Radar Surveillance Systems would not be expected.

Flight Inspection and Calibration

Flight checks are conducted annually to ensure that flight procedures and associated navigational aids are safe and accurate. These flight checks are carried out by an IAA / AirNav approved Flight Inspection Service Provider. The checks are carried out during annual inspections consisting of radial and orbital test flights around Shannon Airport for calibration of instrument landing systems.

A desk-top analysis review indicates that the bi-annual Flight Inspection and Calibration procedures will not be impacted by the proposed wind farm development, however AirNav may require that a confirmatory assessment be conducted by their flight calibration experts FCSL Limited.

Aeronautical Obstacle Warning Light Scheme

In the event of a grant of planning consent AirNav are likely to request lighting of the proposed wind turbines in the interest of aviation safeguarding as the proposed development would be considered as an en-route obstacle.

Irish Air Corps / Department of Defence (DoD) Safeguarding

The Irish Air Corps position on wind farms / tall structures are outlined in the paper which was published in 2014: "*Air Corps Wind Farm/ Tall Structures Position Paper*". In the position paper the Irish Air Corps outlines restricted areas where they would object to the installation of wind turbines /tall structures. The areas defined by the Air Corps have been mapped and analysis shows that proposed wind farm site is located outside the restricted areas. As the proposed wind farm is not located in a restricted area it should have no impacts on the Irish Air Corps activities.

Regarding Military Aviation Lightning, the recommendation is to engage at the early stage in a consented development (subject to planning conditions), to agree on the details relating to the lighting requirements for the IAC.

Garda Air Support Unit (GASU) and Emergency Aeromedical Service (EAS)

The standard concerns that are being raised in recent consultations with the Irish Air Corps also highlight the potential for obstacles that could impact the operations of the Garda Air Support Unit (GASU) and the Emergency Aeromedical Service (EAS). An assessment of GASU and EAS operations indicates that they are unlikely to be impacted by the proposed wind farm development.

Abbreviations

AGL Above Ground Level

AIP Aeronautical Information Publication

AMSL Above Mean Sea Level

ARP Airport Reference Point

BRA Building Restricted Area

DME Distance Measuring Equipment

DoD Department of Defence

EAS Emergency Aeromedical Service

GASU Garda Air Support Unit

GP Glide Path

HLS Helicopter Landing Site

ICAO International Civil Aviation Organization

IFP Instrument Flight Procedure

ILS Instrument Landing System

OLS Obstacle Limitation Surface

PSR Primary Surveillance Radar

RWY Runway

SID Standard Instrument Departure Route

STAR Standard Arrival Route

SSR Secondary Surveillance Radar

NATS National Air Traffic Services (UK)

NM Nautical Miles

OLS Obstacle Limitation Surface

VOR VHF Omni-directional Range Station

WF Wind Farm

Sections

Appendices

1. Introduction

This section provides a brief summary of the proposed wind farm development at Cahermurphy West and of the nearest significant aviation installation at Shannon Airport.

1.1 Wind Farm Site Information

The proposed wind farm development is located in County Clare approximately 29 km west of Shannon Airport. Figure 1 shows the proposed wind farm site with respect to Shannon Airport and the AirNav Ireland (ANI) MSSR and PSR radar sensors at Shannon and Woodcock Hill.

The proposed wind farm consists of eight wind turbines. The co-ordinates, hub-heights and rotor diameters of the proposed turbines are shown below in Table 1.

Figure 1. Location of proposed wind farm at Cahermurphy West.

Turbine No.	ITM Easting [m]	ITM Northing [m]	Hub-Height [m]	Rotor Diameter [m]	Tip-Height [m]
CYW_01	507772	669761	98.5 - 110.5	149 - 163	180 - 185
CYW_02	508411	669739	98.5 - 110.5	149 - 163	180 - 185
CYW_03	507788	669301	98.5 - 110.5	149 - 163	180 - 185
CYW_04	508308	669151	98.5 - 110.5	149 - 163	180 - 185
CYW_05	508887	669573	98.5 - 110.5	149 - 163	180 - 185
CYW_06	509055	669148	98.5 - 110.5	149 - 163	180 - 185
CYW_07	508309	668624	98.5 - 110.5	149 - 163	180 - 185
CYW_08	508942	668587	98.5 - 110.5	149 - 163	180 - 185

Table 1. Cahermurphy West Wind Turbine Details

1.2 Shannon Airport

Table 2 below shows the co-ordinates of Shannon Airport and the distance from the Airport reference Point (ARP) to the proposed wind farm site. Shannon Airport operates in Class C controlled airspace with Instrument Flight Rules (IFR) and Visual Flight Rules (VFR) Flight rules.

Location	Installation	Description	Airport Ref. Point (ARP)	Distance of ARP from nearest of Proposed Turbines
Shannon, Co Clare	International Airport	Single Asphalt Runway Airspace: Class C	52 42 07 N 008 55 29 W (Mid-point of Runway 06/24).	29.4 km

Table 2. Shannon Airport Details

The aeronautical navigation aids at the aerodrome include DVOR/DME, NDB, ILS LOC and ILS GP.

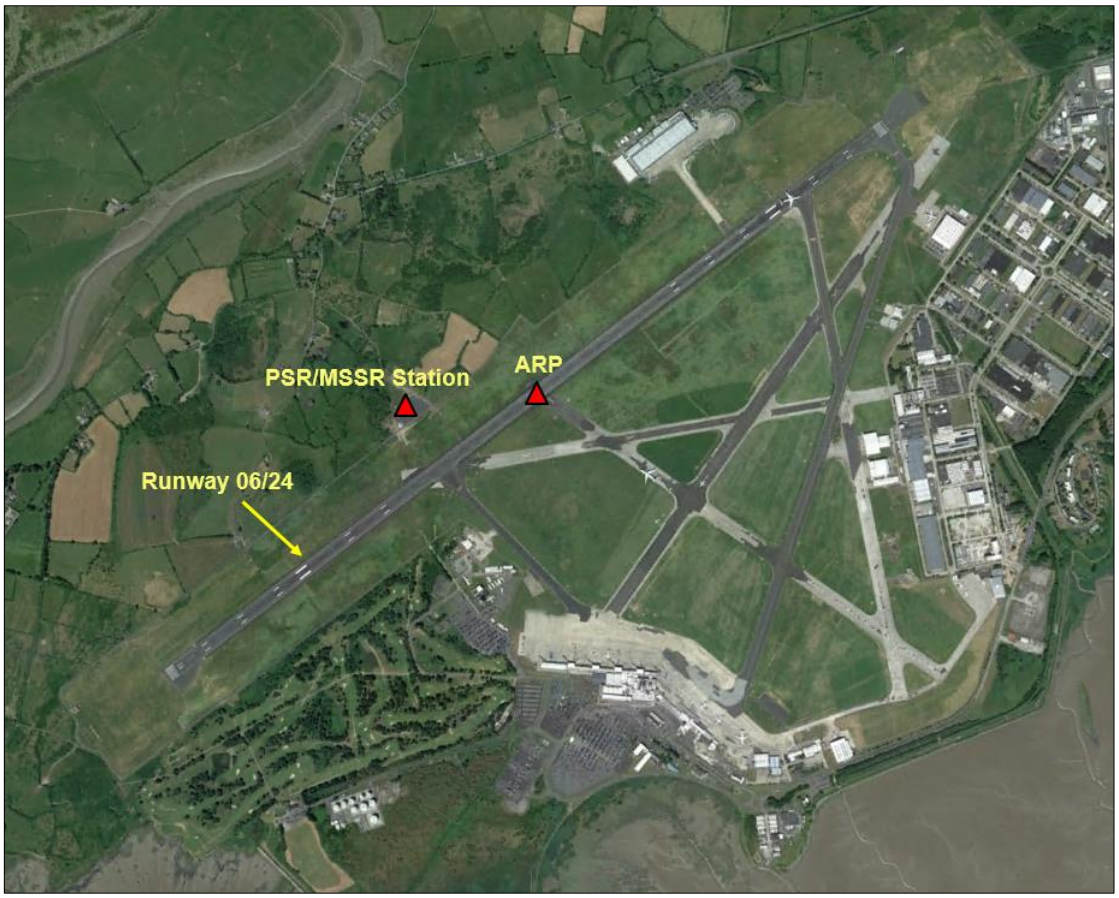

Figure 2. Shannon International Airport

2. Aviation Review

In this section a review of the following Aviation topics is provided.

- Annex 14 - Obstacle Limitation Surfaces (OLS)
- Annex 15 – Aerodrome Surfaces
- Building Restricted Areas (BRA)
- Minimum Sector Altitudes (MSA)
- Instrument Flight Procedures
- Permitted Wind Farms in vicinity of proposed Wind Farm
- Communications and Navigation Systems
- Radar Surveillance Sensors (PSR and SSR)
- Flight Inspection and Calibration
- Aeronautical Obstacle Warning Light Scheme
- Irish Air Corps / DoD Safeguarding
- Garda Air Support Unit (GASU) and Emergency Aeromedical Service (EAS)

2.1 Annex 14 Obstacle Limitation Surfaces (OLS)

A review of the Annex 14 Obstacles Limitation Surfaces (OLS) was first carried out by first plotting the proposed turbines and the airport obstacle surfaces. The obstacle limitation surfaces for Shannon Airport are plotted based on the following:

- Annex 14 to the Convention on International Civil Aviation Aerodromes Volume I - Aerodrome Design and Operations Seventh Edition July 2016"
- Certification Specifications and Guidance Material for Aerodromes Design CS-ADR-DSN Issue 4, 8th of December 2017

Figure 3 below shows the OLS in relation to the proposed Cahermurphy West wind farm. The distance from Shannon Airport ARP (runway centre-point), to the nearest of the proposed turbines is 29.4 km.

The analysis of the OLS plots indicates that turbines at the proposed wind farm would not penetrate the Outer Horizontal Surface which extends to 15 km from Shannon Airport's ARP.

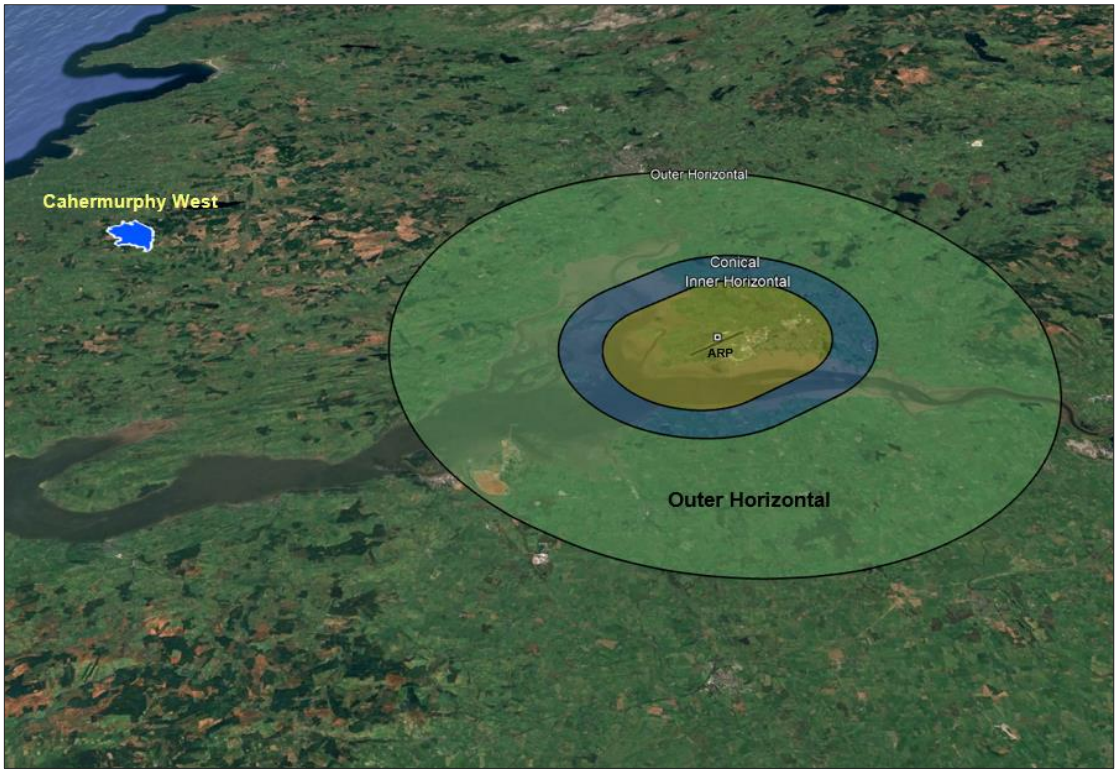

Figure 3. Cahermurphy West Wind Farm in relation to Shannon Airport OLS.

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Annex 14 Obstacle Limitation Surfaces	No action.	None

Table 3. Aviation Impact Review - Annex 14 Obstacle Limitation Surfaces

2.2 Annex 15 Aerodrome Surfaces

Turbines at the proposed wind farm would penetrate the ICAO Annex 15 Aerodrome Surface as shown in Figure 4. The "*Terrain and obstacle requirements Area*" is defined in ICAO Annex 15 as an area of 45 km from the Aerodrome ARP. (An illustration of the ICAO Annex 15 Area 1 and Area 2 Surfaces is provided in Appendix A).

As the proposed wind farm is approximately 29 km from the ARP at Shannon Airport, there is penetration of the Annex 15 surface. All obstacles, if they are more than 100 meters above terrain for a distance of 45 km from Shannon ARP, need to be registered in the AirNav Air Navigation Obstacle Data Set. This 45 km area is known as the TMA area i.e. Total Maneuvering Area and is used for en-route circling and maneuvering and is shown in Figure 4.

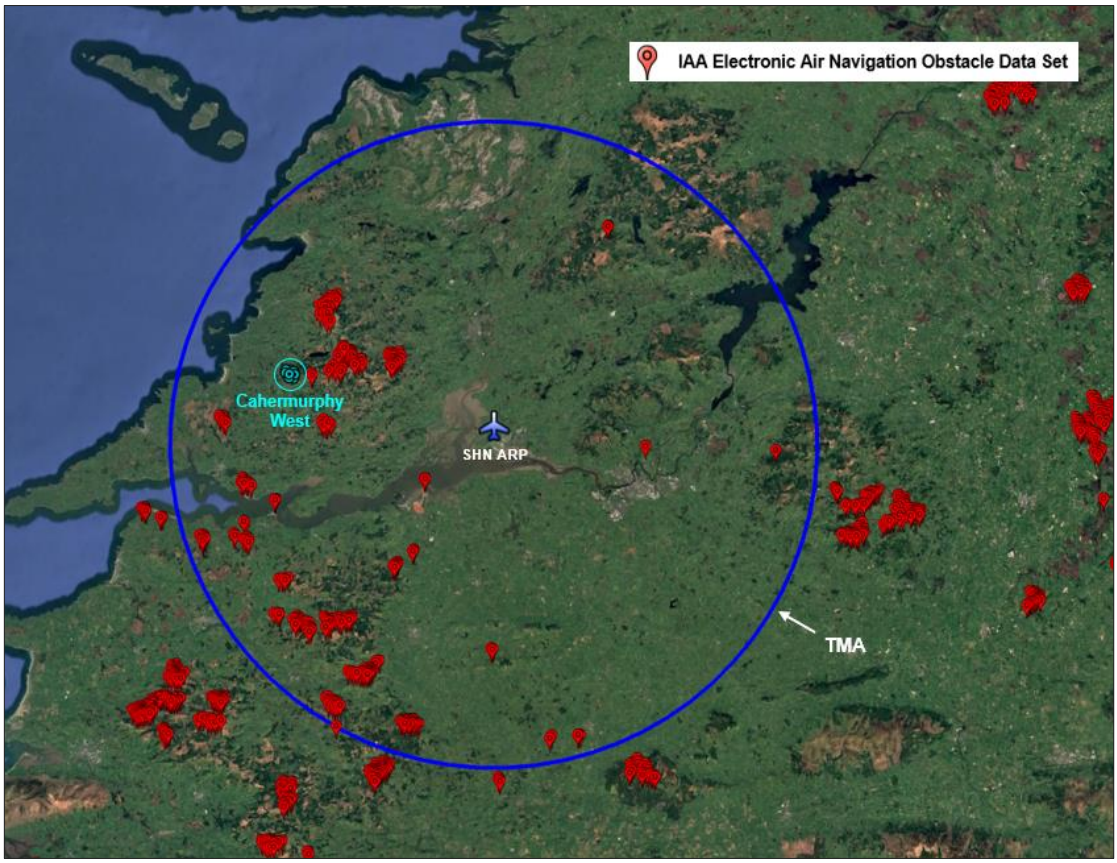

Figure 4. Annex 15 Aerodrome Surface and AirNav Electronic Air Navigation Obstacle Data Set

There are other existing tall structures (obstacles) in the vicinity of the proposed wind farm, notably the operational wind farms at Boolynagleragh, Booltiagh, Glenmore, Cahermurphy, Letteragh and Slieve Callan. The AirNav Electronic Air Navigation Obstacle Data Set permitted obstacles are shown relative to the proposed wind farm in Figure 5.

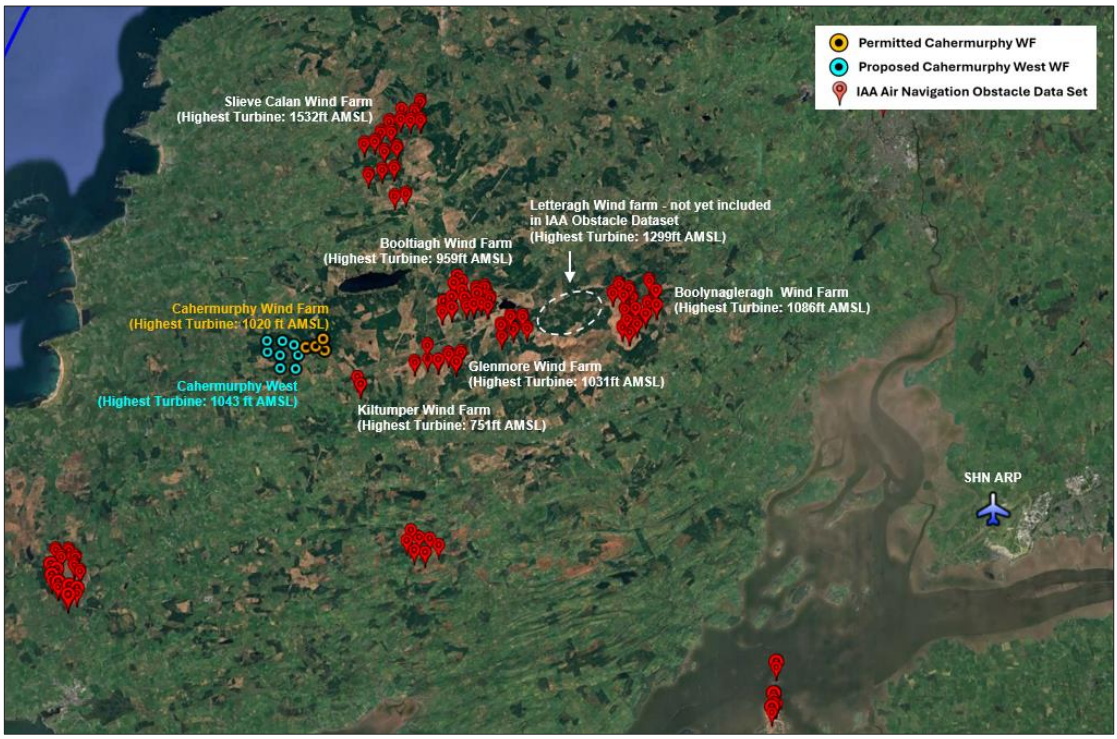

Figure 5. Permitted Obstacles in vicinity of Cahermurphy West Wind Farm

Although there are other obstacles in close proximity to the proposed wind farm, all new obstacles must be considered and assessed to see if they cause a “hazard to air navigation” and all Terrain Obstacle Data (including man-made obstacles) have to be considered by the relevant Aviation Authorities.

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Annex 15 Aerodrome Surfaces	The proposed wind turbines would be required to be included in the AirNav Obstacle Data Set.	None

Table 4. Aviation Impact Review - Annex 15 Aerodrome Surfaces

2.3 Building Restricted Areas (BRA)

A Building Restricted Area is the airspace surrounding an aviation facility that needs to be clear from physical intrusions. The purpose of the safeguarded areas is to identify developments with the potential for causing unacceptable interference to navigation facilities.

The navigation facilities to be considered at Shannon Airport include the ILS Localisers, Glidepaths and DMEs that provide guidance for aircraft landings. The minimum safeguarded areas for these facilities are defined by the International Civil Aviation Organisation (ICAO) in the document ICAO EUR DOC 015, Section 7. The BRA parameters specified by the ICAO are provided in Appendix B of this report.

Figure 6 below illustrates that the proposed wind farm at Cahermurphy West is over 20 km from the nearest BRA at Shannon Airport. At this distance, turbines at the proposed wind farm will have no impact on the navigation facilities associated with the Building Restricted Areas for Shannon Airport.

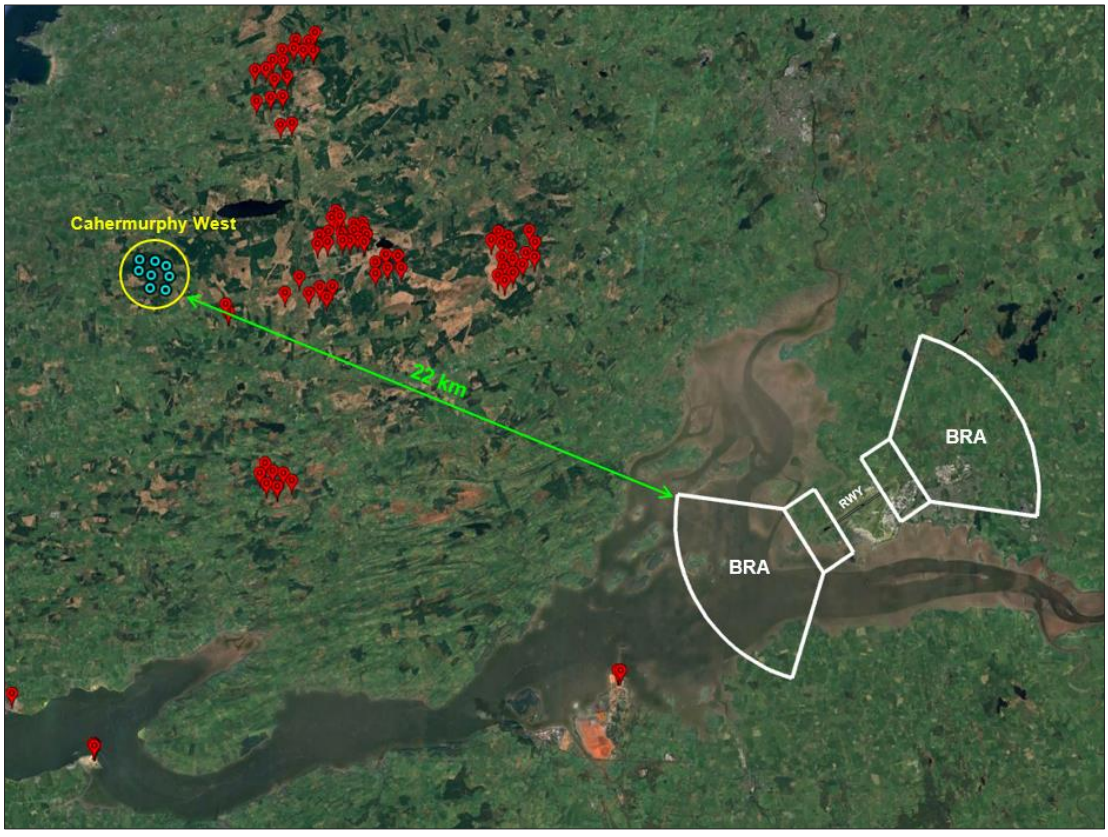

Figure 6. Proposed Wind Farm relative to Shannon Airport BRA - RWY 06/24

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Building Restricted Areas	No action.	None

Table 5. Aviation Impact Review - Building Restricted Areas

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2.4 Minimum Sector Altitudes

A review of the Minimum Sector Altitudes (MSA) shows that the proposed wind farm is within 25 nautical miles of the VOR/DME at Shannon Airport. The MSA provides a minimum obstacle clearance of 1000 ft above the highest obstacle within specified sectors. The wind turbines are located within the Main Sector (MSA 3000 ft), as shown in Figure 7. According to the wind farm location, the maximum construction height for the site would be 2000 ft/609.6m AMSL (3000 ft MVA minus 1000 ft).

The highest of the proposed turbines is T05 with a maximum tip-height of 1043.3 ft (318.0 m) AMSL. This is below the 2000 ft threshold, therefore the MSA would not be affected and there will be no impact on the published MSA altitude figures for Shannon Airport.

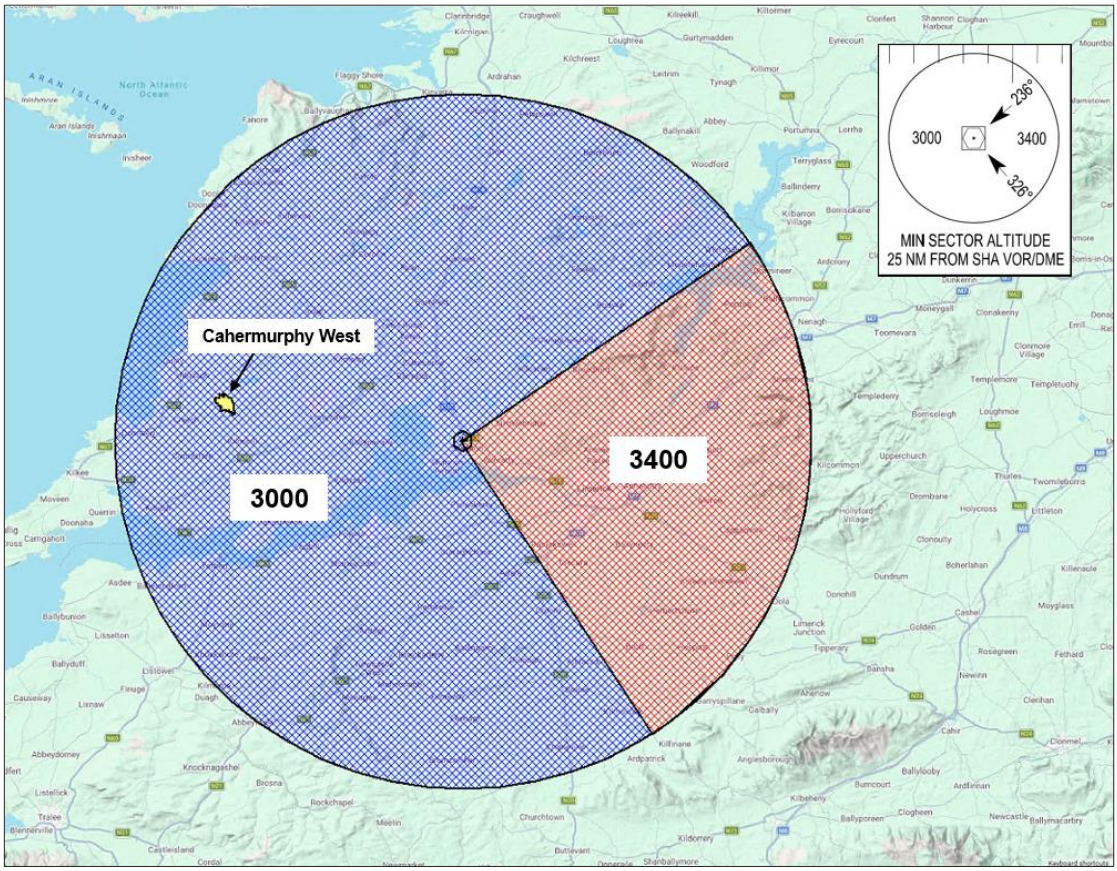


Figure 7. Shannon Airport (EINN) Minimum Sector Altitudes

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Minimum Sector Altitudes	No action	None

Table 6. Aviation Impact Review - Minimum Sector Altitudes

2.5 Instrument Flight Procedures

There are ten published Instrument and Visual Flight Procedures for arrivals and departures to/from Shannon Airport. Table 7 below lists the Instrument Flight Procedures for Shannon Airport.

Aerodrome	Aerodrome Procedure (ICAO)	AIP Chart ID	Likely WF Impacts
Shannon	RNAV Standard Instrument Departure Chart RWY 06	EINN AD 2.24-5	No Impacts, based on initial screening
Shannon	RNAV Standard Instrument Departure Chart RWY 24	EINN AD 2.24-6	No Impacts, based on initial screening
Shannon	RNAV Standard Arrival Chart RWY 06	EINN AD 2.24-7	No Impacts, based on initial screening
Shannon	RNAV Standard Arrival Chart RWY 24	EINN AD 2.24-8	No Impacts, based on initial screening
Shannon	Instrument Approach Chart ILS or LOC RWY 06	EINN AD 2.24-10	No impact.
Shannon	Instrument Approach Chart VOR RWY 06	EINN AD 2.24-11	No impact.
Shannon	Instrument Approach Chart ILS CAT I & II or LOC 24	EINN AD 2.24-13	No impact.
Shannon	Instrument Approach Chart VOR RWY 24	EINN AD 2.24-14	No impact.
Shannon	Visual Approach Chart	EINN AD 2.24-15	No impact.
Shannon	ATC Surveillance Minimum Altitude Chart	EINN AD 2.24-16	No impact.

Table 7. Shannon Airport Instrument and Visual Flight Procedures

An initial review of the Instrument Flight Procedures (IFPs) indicates that they are unlikely to be impacted by the proposed development. However, the proposed turbines would be located relatively near to a number of routes as set out within the IFP charts, including:

- RNAV Standard Instrument Departure Chart RWY 06 (EINN AD 2.24-5)
- RNAV Standard Instrument Departure Chart RWY 24 (EINN AD 2.24-6)
- RNAV Standard Arrival Chart RWY 06 (EINN AD 2.24-7)
- RNAV Standard Arrival Chart RWY 24 (EINN AD 2.24-8)

A review of these four IFP charts is provided in Section 2.5.1 to Section 2.5.4 below.

Note: The remaining IFPs (i.e. EINN AD 2.24-10 to EINN AD 2.24-16) do not specify flight paths over/near the Cahermurphy area and therefore these IFPs/charts would not be impacted by the proposed development and on this basis these charts have not been reviewed as part of this screening assessment.

2.5.1 RNAV Standard Instrument Departure Chart RWY06 (EINN AD 2.24-5)

The proposed wind farm location is shown below in Figure 8 in relation to Shannon Airport's instrument departure chart for Runway 06 (Ref. EINN AD 2.24-5). The departure flight path to "*GULTU"* passes over/near the proposed wind farm site. The procedure also specifies that the climb gradient for obstacle clearance is 3.3%.

Following the flight path from Runway 06 west towards GUTU (as specified in this IFP), the flight distance from the runway to the Cahermurphy area would be 42 km. An aircraft with minimum climb gradient of 3.3% (for obstacle clearance) would have an altitude of over 4500 ft as it passes over the Cahermurphy area. At this altitude there would be no impact due to the proposed development.

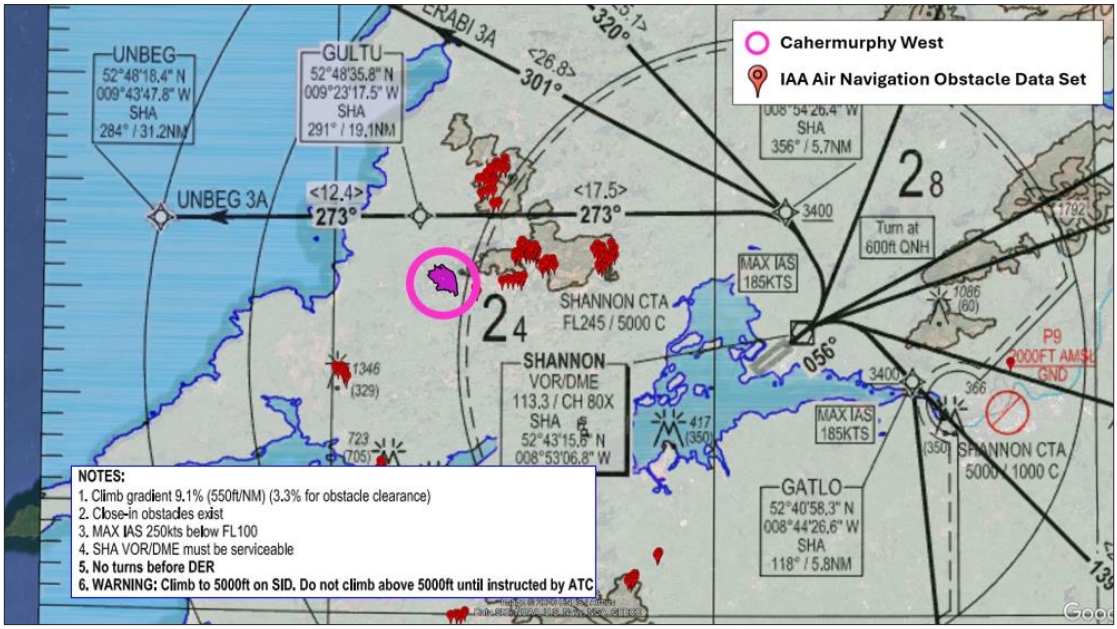


Figure 8. EINN AD 2.24-6 – Standard Instrument Departure Chart RWY 24

Obstacle Clearance Climb Gradient	Altitude over Cahermurphy West (ft AMSL)	Clearance to highest of proposed turbines (T05) (ft AMSL)
3.3% (1.89°)	> 4500 ft	> 3000 ft

Table 8. Climb Gradient Clearance Calculations

As calculations indicate that the obstacle clearance altitude over the proposed wind farm is over 3000 ft above the highest turbine, there is no infringement and there should be no impact to the published Instrument Flight Procedure.

IFP Review	Mitigation Measure Action	Residual Impact
RNAV Standard Instrument Departure Chart RWY 06 (EINN AD 2.24-5)	No action	None

Table 9. IFP Review - RNAV Standard Instrument Departure Chart RWY 06

2.5.2 RNAV Standard Instrument Departure Chart RWY 24 (EINN AD 2.24-6)

The proposed wind farm location is shown below in Figure 9 in relation to Shannon Airport's instrument departure chart for Runway 24 (Ref. EINN AD 2.24-6). The departure flight path to waypoint "*UNBEG 3A*" passes over/near the proposed wind farm site. The procedure also specifies that the climb gradient for obstacle clearance is 3.3%.

Following the flight path from Runway 24 northwest towards UNBEG (as specified in this IFP), the flight distance from the runway to the Cahermurphy area would be 28 km. An aircraft with a minimum climb gradient of 3.3% (for obstacle clearance) would have an altitude of over 3000 ft as it passes over the Cahermurphy area. At this altitude there would be no impact due to the proposed development.

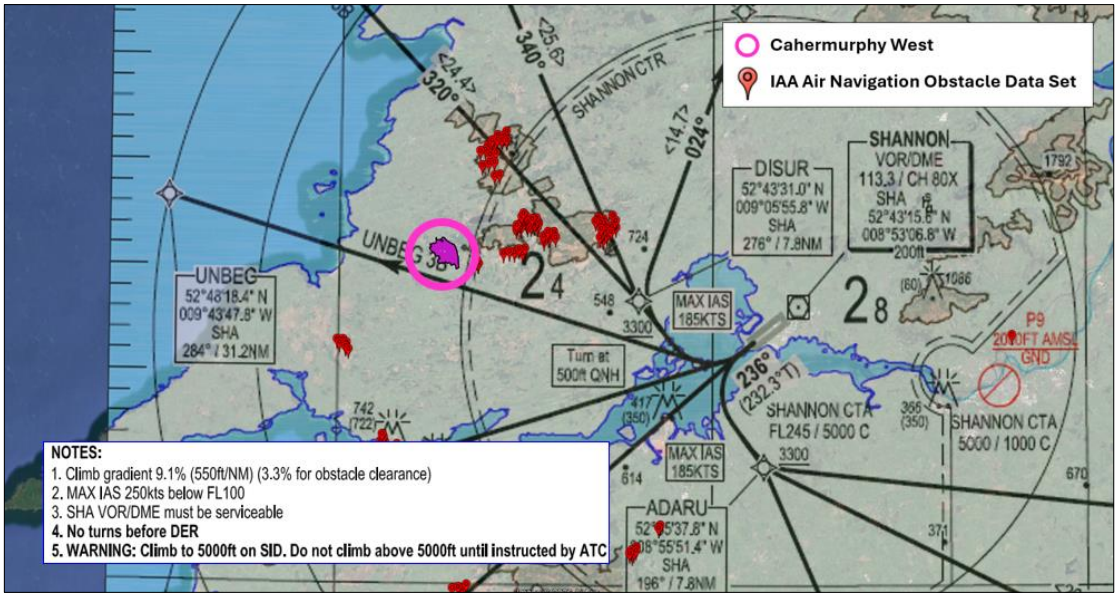


Figure 9. EINN AD 2.24-6 – Standard Instrument Departure Chart RWY 24

Obstacle Clearance Climb Gradient	Altitude over Cahermurphy West (ft AMSL)	Clearance to highest of proposed turbines (T05) (ft AMSL)
3.3% (1.89°)	> 3000 ft	> 2000 ft

Table 10. Climb Gradient Clearance Calculations

As calculations indicate that the obstacle clearance altitude over the proposed wind farm is over 2000 ft above the highest turbine, there is no infringement and there should be no impact to the published Instrument Flight Procedure.

IFP Review	Mitigation Measure Action	Residual Impact
RNAV Standard Instrument Departure Chart RWY 24 (EINN AD 2.24-6)	No action	None

Table 11. IFP Review - RNAV Standard Instrument Departure Chart RWY 06

2.5.3 RNAV Standard Arrival Chart RWY 06 (EINN AD 2.24-7)

The proposed wind farm location is shown below in Figure 10 in relation to Shannon Airport's instrument arrival chart for Runway 06 (Ref. EINN AD 2.24-7). The arrival flight path from waypoint "*MOIMMIN*" to waypoint "*TERDU*" passes over the proposed wind farm site.

The IFP states that the minimum altitudes along this route are 8000 ft over MOMIN and 6000 ft over TERDU. At these altitudes there would be no impact due to the proposed development.

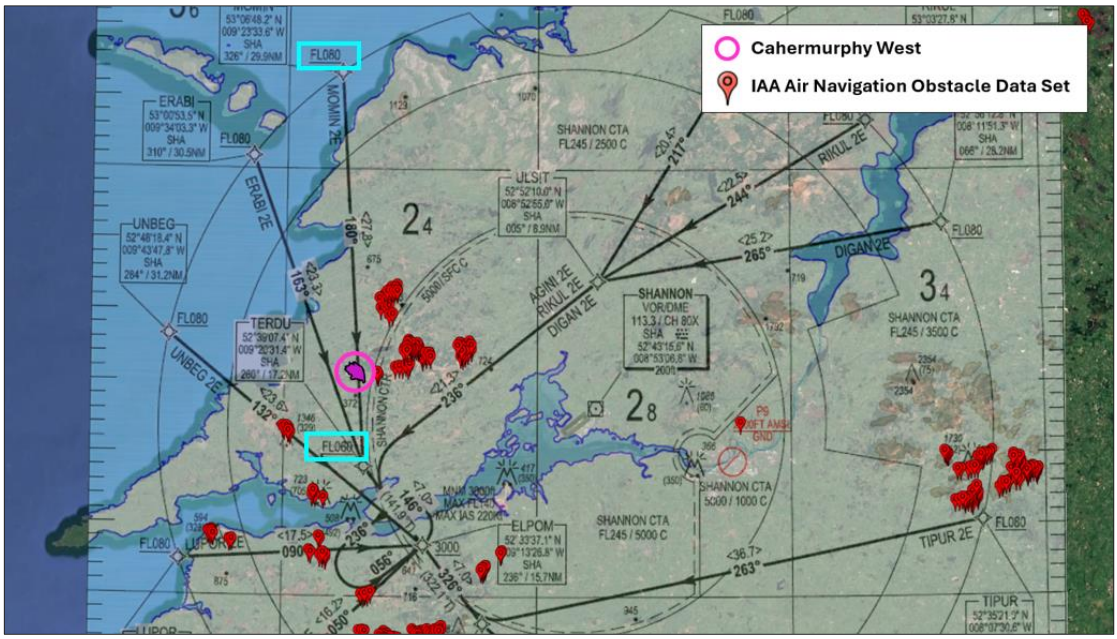


Figure 10. EINN AD 2.24-7 – RNAV Standard Arrival Chart RWY 06

The chart indicates that the obstacle clearance altitude over the proposed wind farm is over 5000 ft above the highest turbine at Cahermurphy West. At this distance there would be no impact to the published Instrument Flight Procedure.

IFP Review	Mitigation Measure Action	Residual Impact
RNAV Standard Arrival Chart RWY 06 (EINN AD 2.24-7)	No action	None

Table 12. IFP Review - RNAV Standard Instrument Departure Chart RWY 06

2.5.4 RNAV Standard Arrival Chart RWY 24 (EINN AD 2.24-8)

The proposed wind farm location is shown below in Figure 10 in relation to Shannon Airport's instrument arrival chart for Runway 24 (Ref. EINN AD 2.24-8). The arrival flight path from waypoint "*LUPOR*" to waypoint "*EKNIS*" passes over/near the proposed wind farm site.

The IFP states that the minimum altitudes along this route are 8000 ft over LUPOR and 3500 ft over EKNIS. At these altitudes there would be no impact due to the proposed development.

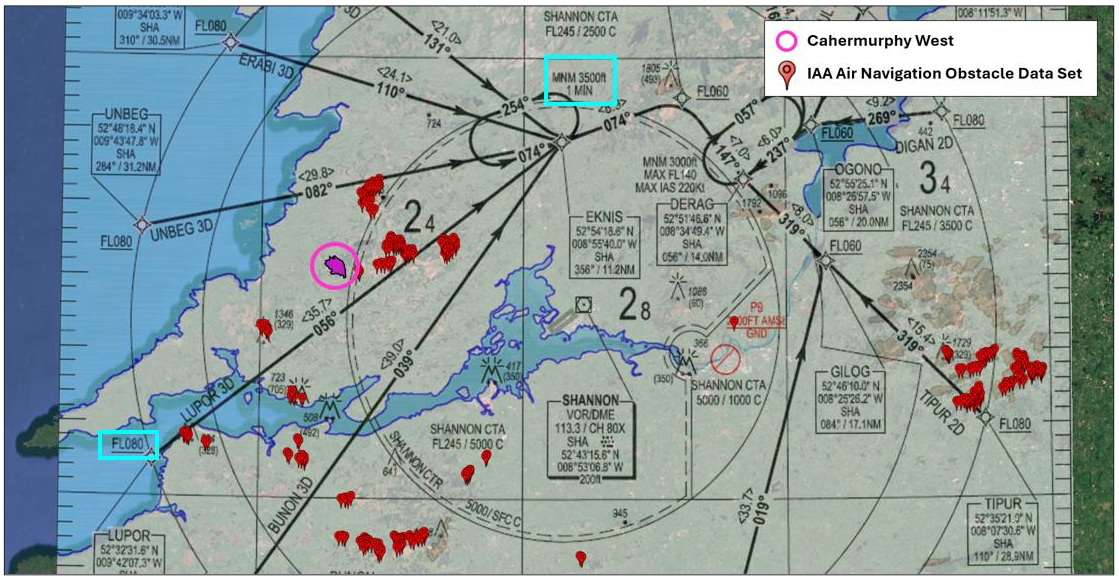


Figure 11. EINN AD 2.24-8 – RNAV Standard Arrival Chart RWY 24

The chart indicates that the obstacle clearance altitude over the proposed wind farm is over 2000 ft above the highest turbine at Cahermurphy West. At this distance there would be no impact to the published Instrument Flight Procedure.

IFP Review	Mitigation Measure Action	Residual Impact
RNAV Standard Arrival Chart RWY 24 (EINN AD 2.24-8)	No action	None

Table 13. IFP Review - RNAV Standard Instrument Departure Chart RWY 24

2.6 Permitted Wind Farms in vicinity of Proposed Wind Farm

The Planning References for the operational / permitted wind farms in the vicinity of the proposed wind farm are shown below in Table 14.

Wind Farm	Planning Reference	Description
Booltiagh Phase I	00/567 or PL03.120616	Operational Wind Farm
Booltiagh Phase II	07/2900	Operational Wind Farm
Letteragh	11/361	Operational Wind Farm
Glenmore	http://www.eplanning.ie/ClareCC/AppFileRefDetails/20824/0 (14/575 or PL03.245392)	Operational Wind Farm
Brookfield/ Kilmaley	15/860 or PL03.248008	Planning Submission
Cahermurphy I	http://www.eplanning.ie/ClareCC/AppFileRefDetails/19159/0	Operational Wind Farm
Slieve Callan	http://www.eplanning.ie/ClareCC/AppFileRefDetails/109/0	Operational Wind Farm
Tullabrack	https://www.eplanning.ie/ClareCC/AppFileRefDetails/03908/0	Operational Wind Farm
Moneypoint	https://www.eplanning.ie/ClareCC/AppFileRefDetails/011538/0	Operational Wind Farm
Crossmore	P09/123	Operational Wind Farm

Table 14. Permitted Wind Farms in vicinity of proposed Wind Farm

2.7 Communication and Navigation Systems

The AIP document EINN AD 2-18/19 provides the information for communication and navigation facilities for Shannon Airport. Table 10 below shows the channel frequencies for the ATS communications Facilities and the Radio Navigation and Landing Aids at the airport.

Aerodrome	ATS Communications Facilities Channel Frequency	Radio Navigation and Landing Aids Channel Frequency	Approximate Distance of proposed wind farm to Localizer and Transmitting antennas	Impacts of wind farm
Shannon	118 MHz –130 MHz	339 KHz – 330 MHz	29 km	No impacts

Table 15. Impacts on Communications and Navigation Systems

As the proposed wind farm is approximately 29 km from the Localizers and transmitting antennas, it is very unlikely that turbines at the proposed wind farm will have any impact on these ATS communications and radio navigational aids. Typically, interference to VHF communications systems will only occur when obstacles are in close proximity to the VHF transmitter. e.g. less than 500m.

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Communication and Navigation Systems	No action	None

Table 16. Aviation Impact Review - Communication and Navigation Systems

2.8 Radar Surveillance Sensors

The nearest radar surveillance sensor sites to the proposed wind farm are the AirNav Radar Stations at Shannon Airport and at Woodcock Hill. Both AirNav radar sites are shown relative to the proposed wind farm in Figure 12 below.

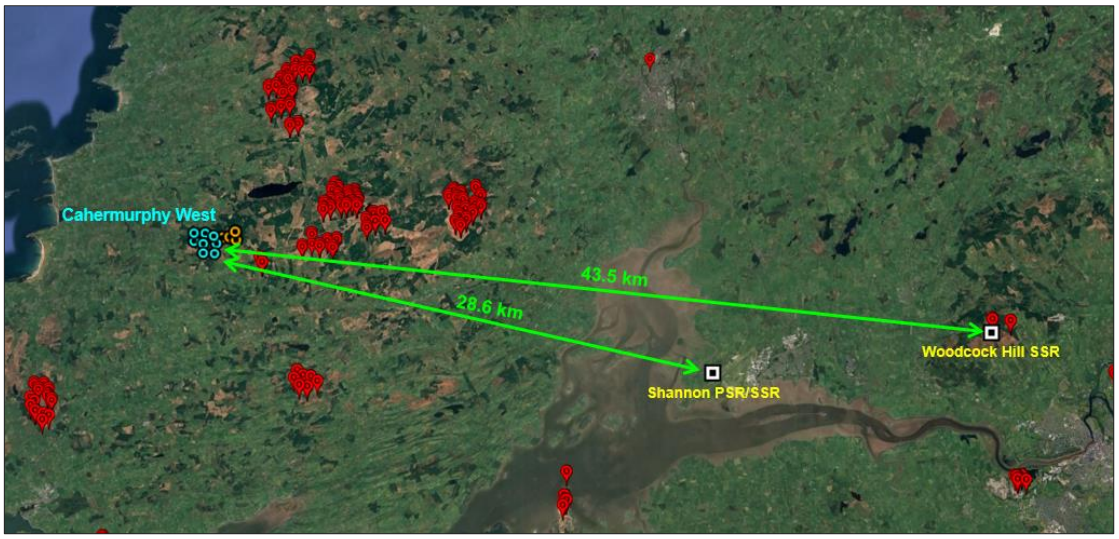


Figure 12. AirNav Radar Surveillance Sites shown relative to proposed wind farm development.

At these radar sites there are three radar sensor systems:

- Shannon Airport: Primary Surveillance Radar (PSR)
- Shannon Airport: Secondary Surveillance Radar (SSR)
- Woodcock Hill: Secondary Surveillance Radar (SSR)

A brief overview of each radar system is provided in Sections 2.8.1 to 2.8.3 that follow.

2.8.1 Shannon Airport - Primary Surveillance Radar Sensor

The primary surveillance radar sensor (PSR) at Shannon Airport consists of a Thales STAR 2000 radar system. The PSR antenna is installed on the structure shown below in Figure 13. The PSR is 28.6 km from the nearest of the proposed turbines at Cahermurphy West.

Figure 13. Shannon Airport – Primary Surveillance Radar (PSR)

2.8.2 Shannon Airport – Secondary Surveillance Radar Sensor

The secondary surveillance radar sensor (SSR) at Shannon Airport consists of a Monopulse Secondary Surveillance Radar (MSSR) system and is co-located on the same structure as the PSR. The SSR antenna is shown below in Figure 14. The SSR is 28.6 km from the nearest of the proposed turbines at Cahermurphy West.

Figure 14. Shannon Airport - Secondary Surveillance Radar (SSR)

2.8.3 Woodcock Hill Airport - Secondary Surveillance Radar Sensor

The radar surveillance site at Woodcock Hill consists of a Thales RSM970 Monopulse Secondary Surveillance Radar (MSSR) system which is housed in the dome-shaped structure shown below in Figure 15. The SSR is 43.5 km from the nearest of the proposed turbines at Cahermurphy West.

Figure 15. Woodcock Hill Airport - Secondary Surveillance Radar (SSR)

2.9 EuroControl Guidelines – Radar Surveillance Sensors

The Eurocontrol Guidelines for Assessing the Potential Impact of Wind Turbines on Surveillance Sensors specify different requirements for both types of radar systems (PSR and SSR). The recommended Eurocontrol Zone arrangements are described below in Section 2.9.1 and 2.9.2.

2.9.1 EuroControl Guidelines - PSR Assessment

For Primary Surveillance Radar systems, the EUROCONTROL Guidelines specify four assessment zones, as shown below in Table 12. The guidelines recommend that for a detailed radar assessment is required for wind turbines that are within 15 km of the PSR and are in radar line of sight.

Zone	Description	Assessment Requirements
Zone 1	0 - 500m	Safeguarding
Zone 2	500 m – 15 km and in radar line of sight	Detailed Assessment
Zone 3	Further than 15 km but within maximum instrumented range and in radar line of sight	Simple Assessment
Zone 4	Not in radar line of sight	No Assessment

Table 17. PSR Zone Arrangements

2.9.2 EuroControl Guidelines – SSR Assessment

For Secondary Surveillance Radar systems, the EUROCONTROL Guidelines specify three assessment zones, as shown below in Table 13. The guidelines recommend that for a detailed radar assessment is required for wind turbines that are within 16 km of the SSR and in radar line of sight.

Zone	Description	Assessment Requirements
Zone 1	0 - 500m	Safeguarding
Zone 2	500 m – 16 km but within maximum instrumented range and in radar line of sight	Detailed Assessment
Zone 4	Further than 16 km or not in radar line of sight	No Assessment

Table 18. SSR Zone Arrangements

When further than 16 km from an SSR the impact of a wind turbine (3-blades, 30-200 m height, and horizontal rotation axis) is considered by the Eurcontrol guidelines to be tolerable, and a detailed radar assessment is not required.

2.10 Shannon Airport - PSR Assessment / Analysis

An initial review of the PSR Radar Surveillance Sensor Station at Shannon Airport has been conducted based on the EuroControl Guidelines and is presented below.

Analysis shows that there would be partial radar line-of-sight (RLOS) from the PSR at Shannon Airport to the turbines at Cahermurphy West. However, none of the proposed turbines would be located within 15 km of the PSR radar station.

As all of the turbines would be more than 15 km from the PSR, it is unlikely that there would be any significant impact to the operation of the PSR, and a detailed technical assessment should not be required.

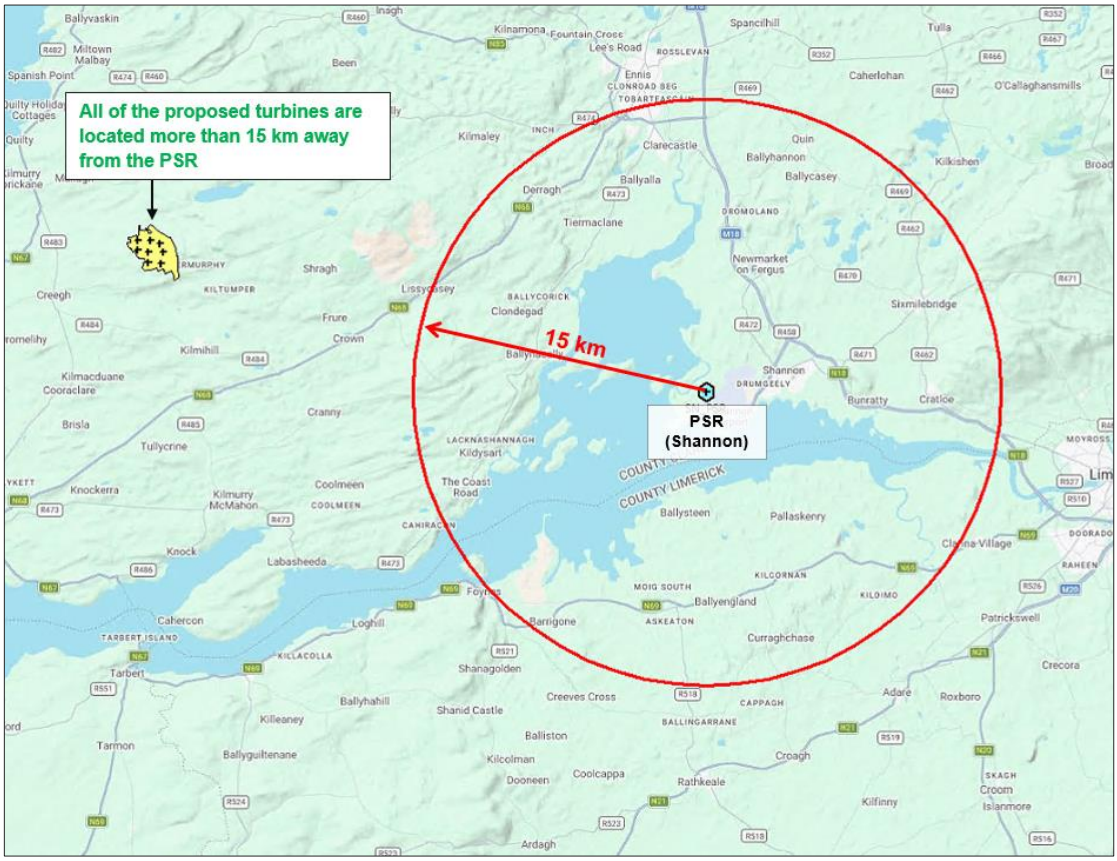


Figure 16. Turbines within 15 km of Shannon PSR (None)

Aviation Impact Review	Mitigation Measure Action (EuroControl Guidelines)	Residual Impact
Shannon Primary Surveillance Radar	Simple Assessment Only. (No mitigation measures expected.)	None

Table 19. Aviation Impact Review - Shannon Primary Surveillance Radar

2.10 Shannon Airport - SSR Assessment / Analysis

An initial review of the SSR Radar Surveillance Sensor Station at Shannon Airport has been conducted based on the EuroControl Guidelines and is presented below.

Analysis shows that none of the proposed turbines at Cahermurphy West would be located within 16 km of the SSR at Shannon Airport. As all of the turbines would be more than 16 km from the SSR, it is unlikely that there would be any significant impact to the operation of the SSR, and a detailed technical assessment should not be required.

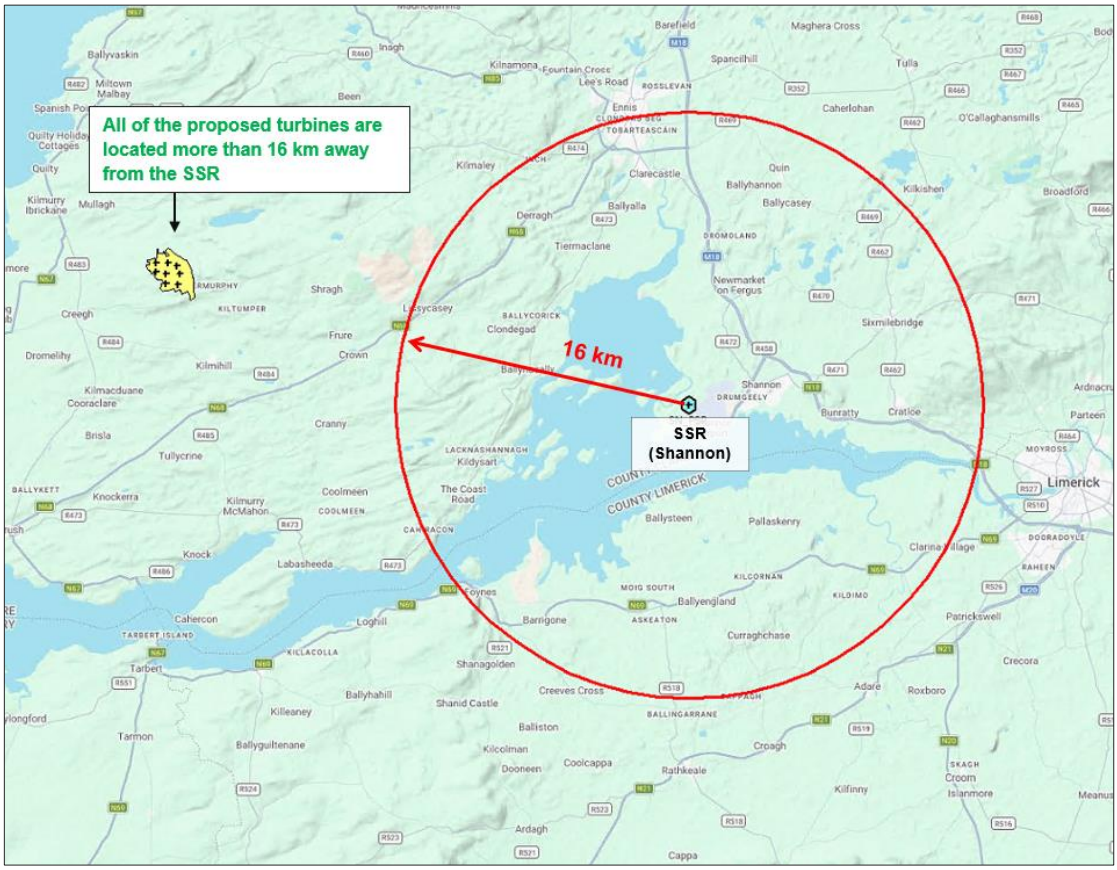


Figure 17. Turbines within 16 km of Shannon SSR (None)

Aviation Impact Review	Mitigation Measure Action (EuroControl Guidelines)	Residual Impact
Shannon Secondary Surveillance Radar	No action.	None

Table 20. Aviation Impact Review – Shannon Secondary Surveillance Radar

2.11 Woodcock Hill - SSR Assessment / Analysis

An initial review of the SSR Radar Surveillance Sensor Station at Woodcock hill has been conducted based on the EuroControl Guidelines and is presented below.

Analysis shows that none of the proposed turbines at Cahermurphy West would be located within 16 km of the SSR at Woodcock Hill. As all of the turbines would be more than 16 km from the SSR, it is unlikely that there would be any significant impact to the operation of the SSR, and a detailed technical assessment should not be required.

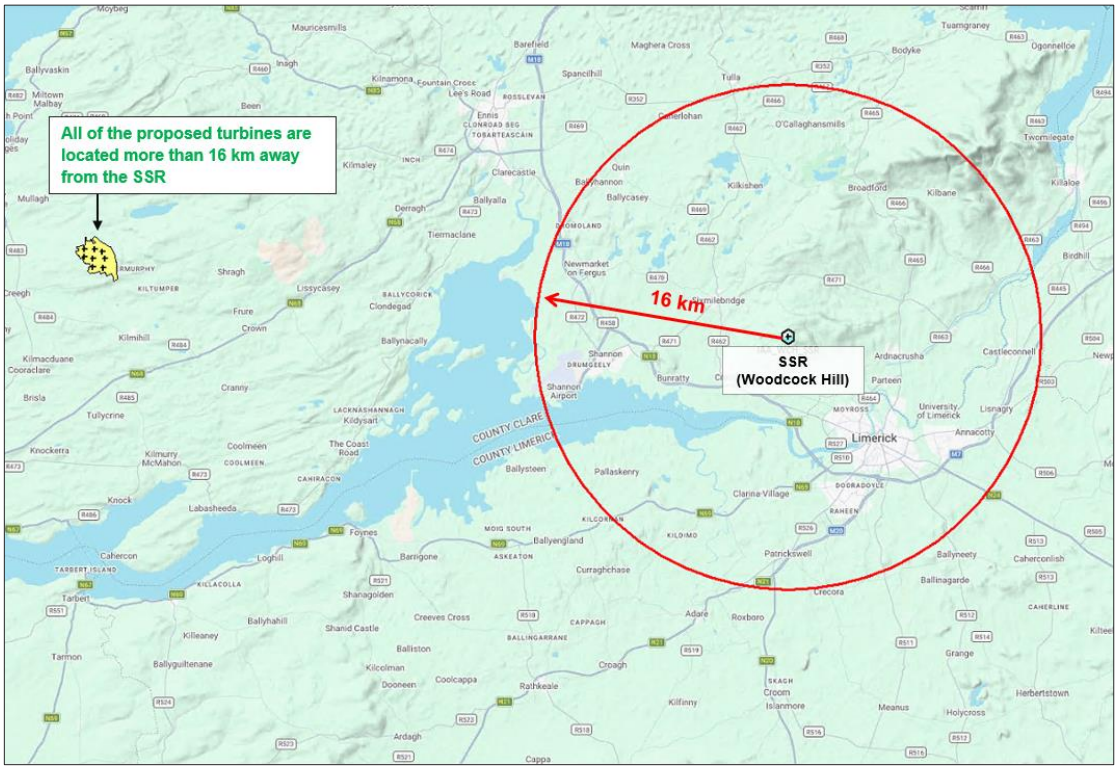


Figure 18. Turbines within 16 km of Woodcock Hill SSR (None)

Aviation Impact Review	Mitigation Measure Action (EuroControl Guidelines)	Residual Impact
Woodcock Hill Secondary Surveillance Radar	No action.	None

Table 21. Aviation Impact Review – Woodcock Hill Secondary Surveillance Radar

2.12 Flight Inspection and Calibration

Flight checks are conducted annually to ensure that flight procedures and associated navigational aids are safe and accurate. These flight checks are carried out by an AirNav approved Flight Inspection Service Provider (FCSL). The checks are carried out during annual inspections consisting of radial and orbital test flights around Shannon Airport for calibration of instrument landing systems (ILS). Test flights are done for inspection and calibration of the ILS Localiser Lateral Coverage Sector and the ILS Glide Path Sector.

2.12.1 ILS Localiser Lateral Coverage Sector

Figure 19 shows the ILS Localiser Lateral Coverage Sector, as defined in ICAO Annex 10. Figure 20 shows the proposed wind farm site relative to the ILS Localiser Lateral Coverage Sector for Shannon Airport RWY06.

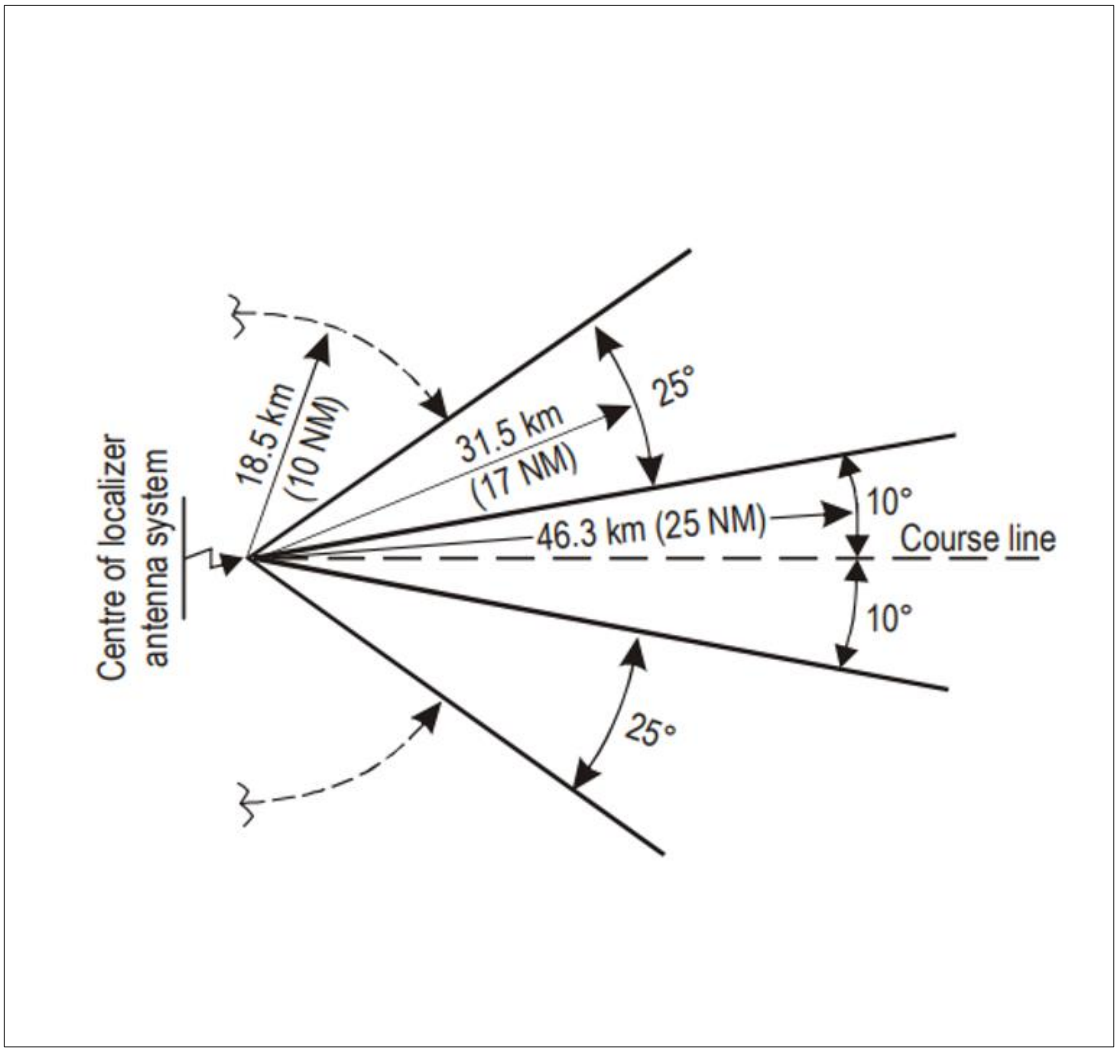


Figure 19. ILS Localiser Lateral Coverage Sector (as defined in ICAO Annex 10)

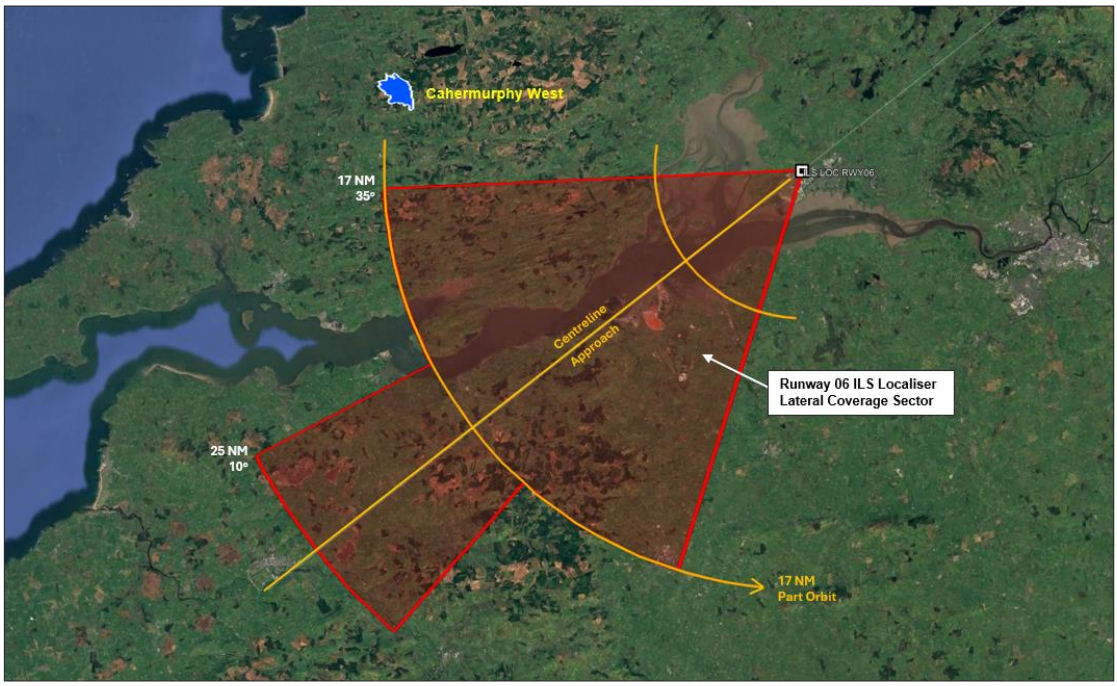


Figure 20. SNN RWY06 ILS Localiser Lateral Coverage Sector

As Figure 20 shows, the proposed wind farm site is located outside the ILS Localiser Lateral Coverage Sector for SNN RWY06 and is not expected to have any impact on the ILS. However, as previously mentioned, inspections of the ILS Localiser facilities are done by orbital and radial flights around the airport by an AirNav approved Flight Inspection Service Provider (FCSL). The flight path of the latest publicly available FCSL Inspection/Calibration flight is shown below in Figure 21.

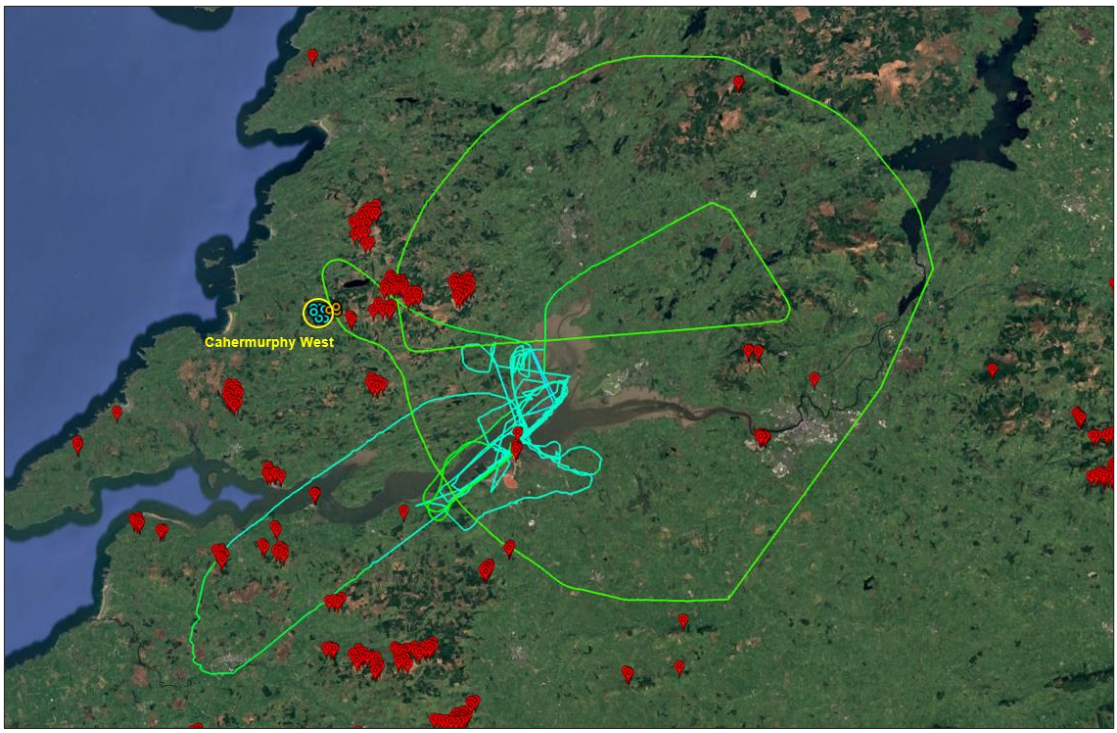


Figure 21. FCSL Flight Route - 21st March 2025

As can be seen in Figure 21 part of the FCSL flight route did pass over the Cahermurphy area. To further assess the FCSL flight route, the test aircraft altitude has been plotted in 3D and shown relative to the proposed turbines at Cahermurphy West.

Figure 22 below shows a 3-dimensional view of the FCSL aircraft on its orbital flight around Shannon Airport. The altitude of the aircraft as it passes over the proposed wind farm is 4375ft. This distance is over 3000 ft higher than any of the maximum turbine tip heights of the proposed turbines at Cahermurphy West. At this distance it is highly unlikely that there would be any impact to the Inspection/ Calibration Test Flights.

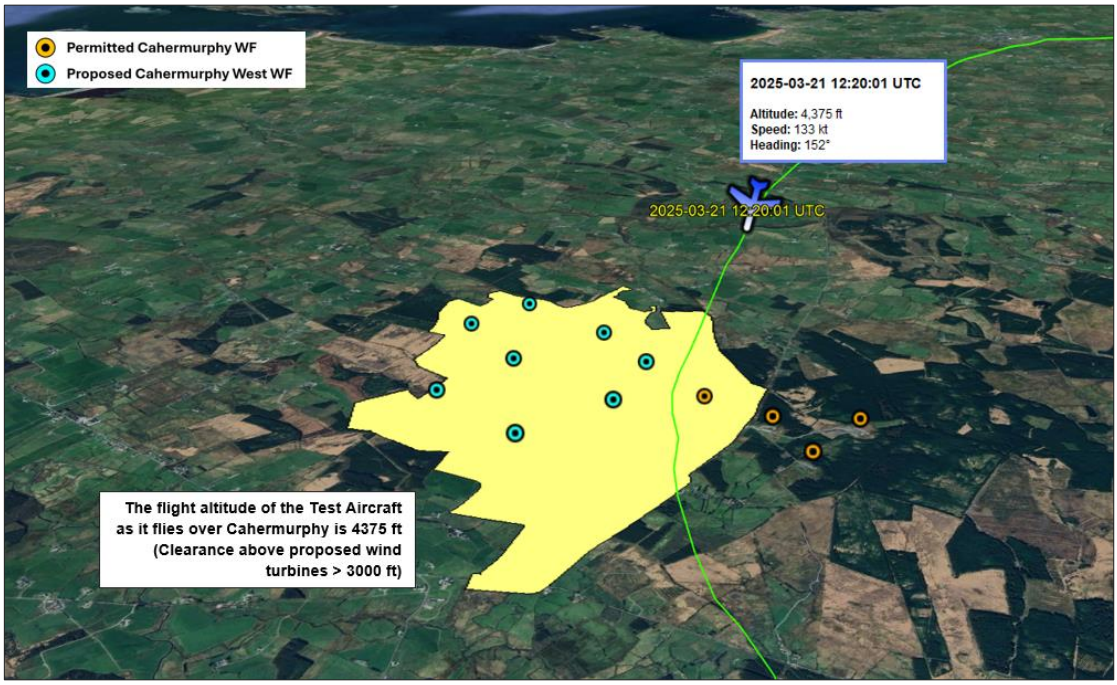


Figure 22. Altitude of FCSL Flight Route – 21st March 2025

2.12.2 ILS Glide Path Sector

Figure 23 shows the ILS Glide Path Coverage Sector, as defined in ICAO Annex 10. Glide Path flight inspection procedures include checks below the sector to assure a safe flight path area between any obstacles on the approach path and the bottom edge of the Glide Path Sector.

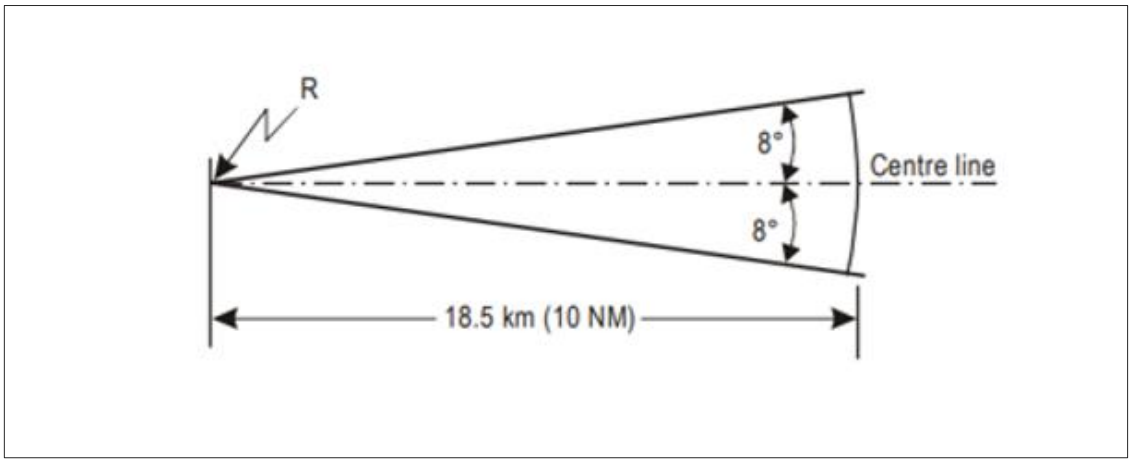


Figure 23. ILS Glide Path Coverage Sector (as defined in ICAO Annex 10)

The Glide Path slice flight profiles (i.e. 8° of centre line) must therefore ensure that the test aircraft clears obstacles by at least 500 ft in Visual Meteorological Conditions (VMC) and by at least 1000 ft in Instrument Meteorological Conditions (IMC).

Figure 24 shows the proposed wind farm site relative to the ILS Glide Path Coverage Sector for Shannon Airport RWY06. As shown in the figure, the proposed wind farm site is over 10 km from the left-hand slice. At this distance there would be no impact on the Glide Path Inspection/ Calibration Flight Procedures for RWY06.

Figure 24. SNN RWY06 ILS Glide Path Lateral Coverage Sector

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Flight Inspection and Calibration	No Mitigation Measure Actions are expected.	None

Table 22. Aviation Impact Review - Flight Inspection and Calibration

2.13 Aeronautical Obstacle Warning Light Scheme

In the event of a grant of planning consent the ANSP (AirNav) would require the lighting of the proposed wind turbines in the interest of aviation safe-guarding as the proposed development may be considered as an en-route obstacle. The developers of the proposed turbines would intend to implement an aeronautical obstacle warning light.

It is recommended that lighting requirements should be in accordance with Chapter Q – Visual Aids for denoting Obstacles; CS ADR.DSN.Q.851 and GM.ADR.DSN.Q.851 (Pages 729/730) of the EASA Easy Access Rules for Aerodromes (Reg (EU) No. 139/2014) where it states that

> *"Applicability: When considered as an obstacle a wind turbine should be marked and/or lighted."*

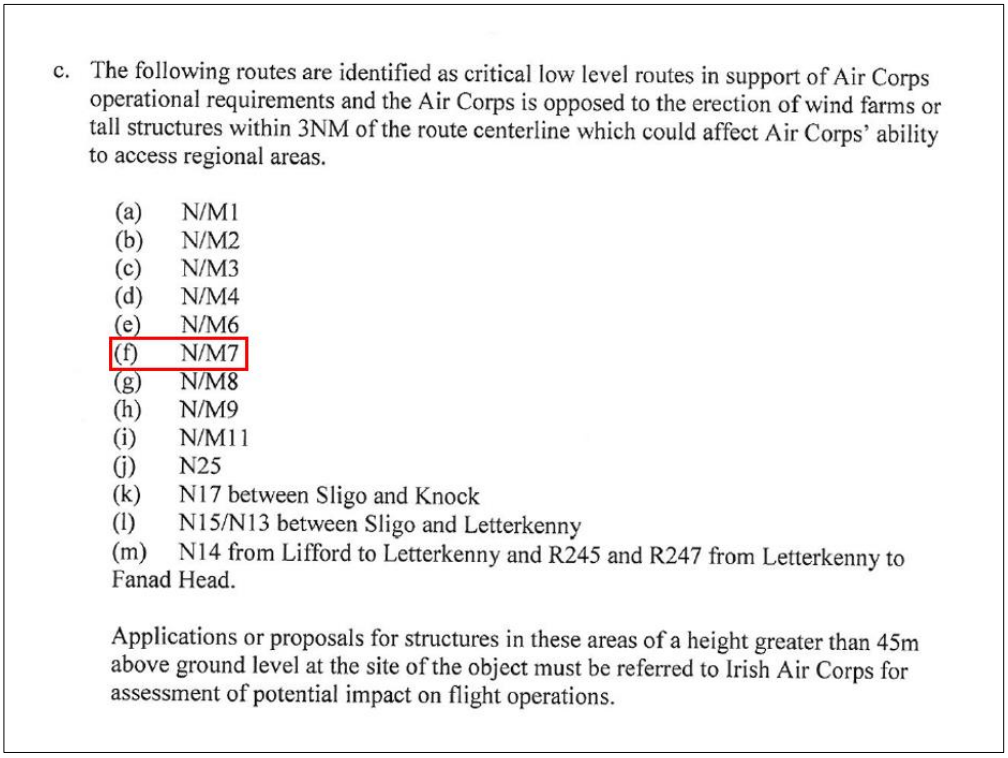
Aviation Impact Review	Mitigation Measure Action	Residual Impact
Aeronautical Obstacle Warning Light Scheme	It is likely that the AirNav would request that the wind farm, if permitted, would be fitted with Aeronautical Obstacle Warning Lights in accordance with industry standards. Subject to further consultation with the AirNav.	None

Table 23. Aviation Impact Review - Aeronautical Obstacle Warning Light Scheme

2.14 Irish Air Corps / DoD Safeguarding

The Irish Air Corps (IAC) Position Paper "*Air Corps Wind Farm/ Tall Structures Position Paper*" published on 08th August 2014, states that the Air Corps are likely to oppose any wind farm / tall structure in the following restricted areas:

- Lands underlying military airspace for flying activity. (Areas contained in Danger Areas EI-D1, EI-D5, EI-D6, EI-D13, EI-D14, Restricted Areas EI-R15, EI-R16 within 20 NM of Baldonnel, MOAs 3 and 4 within 20 NM of Baldonnel.
- Low Flying Training Areas within MOA 4 in the areas of; Blessignton, Edenderry/Allenwood/Rathangan, Kilmeague/Newbridge.
- Low Flying Training Area West – LFTA WEST.
- A distance of 5 NM or less from military installations.
- Critical low level flying routes in support of Air Corps operation requirements as described in Figure 25 below.



c. The following routes are identified as critical low level routes in support of Air Corps operational requirements and the Air Corps is opposed to the erection of wind farms or tall structures within 3NM of the route centerline which could affect Air Corps' ability to access regional areas.

(a) N/M1
(b) N/M2
(c) N/M3
(d) N/M4
(e) N/M6
(f) N/M7
(g) N/M8
(h) N/M9
(i) N/M11
(j) N25
(k) N17 between Sligo and Knock
(l) N15/N13 between Sligo and Letterkenny
(m) N14 from Lifford to Letterkenny and R245 and R247 from Letterkenny to Fanad Head.

Applications or proposals for structures in these areas of a height greater than 45m above ground level at the site of the object must be referred to Irish Air Corps for assessment of potential impact on flight operations.

Figure 25. Irish Air Corps – Critical Low-Level Routes

In addition to the restricted areas, as outlined above, the IAC have specific aviation lighting requirements for wind farm developments. In Section 2.14.1 and Section 2.14.2 that follow, reviews of the IAC Restricted Areas, and the Military Aviation Lighting requirements are provided.

2.14.1 IAC Safeguarding Areas

Based on the current published aeronautical information there should be no impacts to the safeguarding of the Military Operating Areas, Restricted Areas, Low-Flying Training Areas and Prohibited Areas on Irish Air Corps activities. Also as shown in Figure 26 below there is no impact to the 3NM route centreline of the M7 motorway as documented in the Irish Air Corps (IAC) Position Paper "*Air Corps Wind Farm/ Tall Structures Position Paper*" published on 08th August 2014.

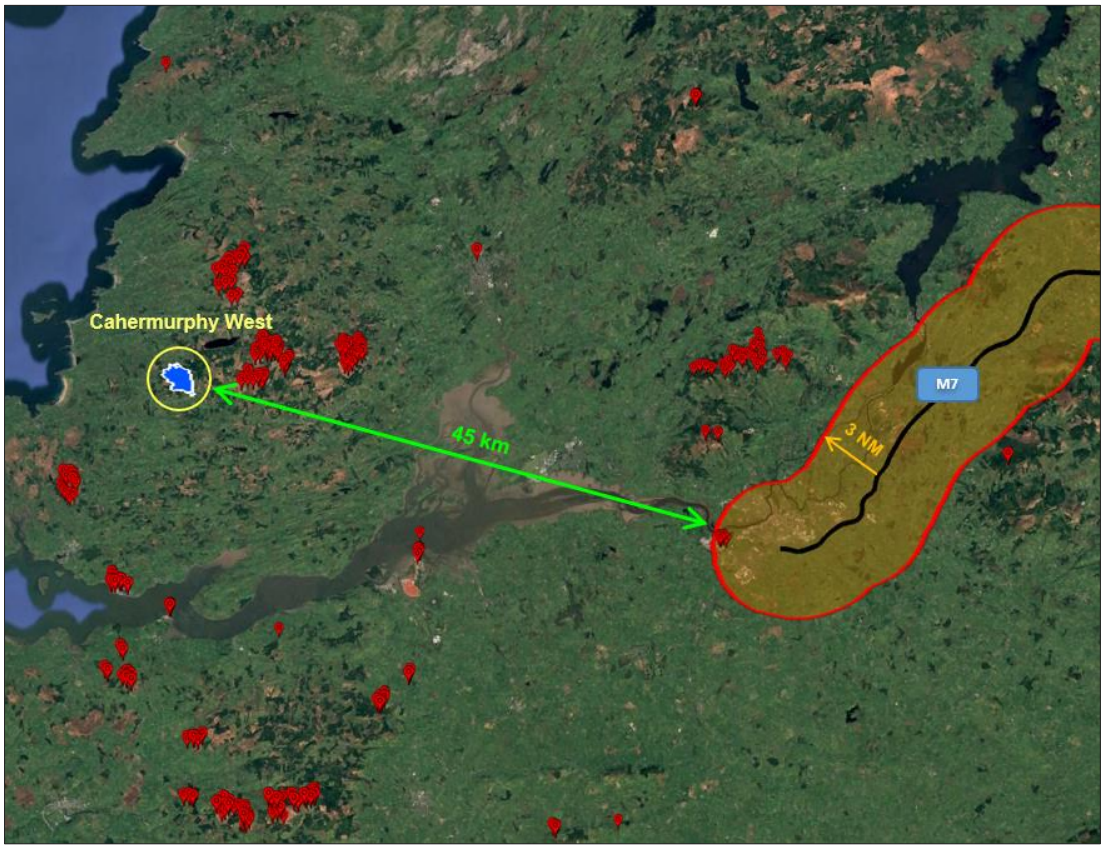


Figure 26. Proposed Wind Farm sites relative to IAC Critical Low-Level Flight Routes

2.14.2 Military Aviation Lighting

In the consultation response received by the EIAR Consultants from the Department of Defense (received on 17/04/24 Ref Appendix D), the DoD made observations regarding military aviation lighting requirements…

All turbines should be:

- Illuminated by Type C, Medium intensity, Fixed Red obstacle lighting with a minimum output of 2,000 candela to be visible in all directions of azimuth
- Operational H24/7 days a week.
- Obstacle lighting should be incandescent or, if LED or other types are used, of a type visible to Night Vision equipment.
- Obstacle lighting used must emit light at the near Infra- Red (IR) range of the electromagnetic spectrum, specifically at or near 850 nanometres (nm) of wavelength. Light intensity to be of similar value to that emitted in the visible spectrum of light.

The DoD also requested that they be kept informed of any progress relating to the proposed development, in particular if the development was to progress to the pre-planning stage.

It is recommended is to engage with the DoD at the early stage in a consented development (subject to planning conditions), to agree on the details relating to the lighting requirements for the IAC.

Aviation Impact Review	Observations
Irish Air Corps / Department of Defence Safeguarding	The desktop screening indicates that wind turbines at the proposed development would not be located in an IAC restricted area and would not have any impacts on Irish Air Corps activities. Regarding Military Aviation Lightning, the recommendation is to engage at the early stage in a consented development (subject to planning conditions), to agree on the details relating to the lighting requirements for the IAC.

Table 24. Aviation Impact Review - Irish Air Corps / Department of Defence Safeguarding

2.15 Garda Air Support Unit (GASU) and Emergency Aeromedical Service (EAS)

The standard concerns that are being raised in recent consultations with the Air Corps also highlight the potential for obstacles that could impact the operations of the Garda Air Support Unit (GASU) and the Emergency Aeromedical Service (EAS). The excerpt below is taken from a response received from the IAC in relation to a third-party wind farm project:

> "*Having consulted with the subject matter experts in the Irish Air Corps, the Department of Defence wishes to make the following observations:*
>
> - *The Department of Defence cannot support, based on military advises, the erection of wind farms or other tall structures within 3 NM of roads identified as critical low level routes in support of operational requirements. The erection of obstacles within low-level helicopter routes could affect the Irish Air Corps ability to access regional areas and to fulfil its role.*
> - *If this proposed development was to go to the planning stage, the Department of Defence would be obligated to raise the following concerns and advise the planning authorities that the proposed windfarm*
>
> *a) lies wholly within 3 nautical miles of the [Motorway/National Road] which is identified as a critical low level route used by state aircraft on operational taskings. A windfarm or any other tall structures within a low-level route will be an obstacle to state aircraft not operating within the civil rules of the air;*
>
> *b) The [Motorway/National Road] low level route requires protection from obstacles for low level state aircraft on operational tasking's such as:*
>
> *(i) The Garda Air Support Unit (GASU)*
> *(ii) The Emergency Aeromedical Service (EAS)"*

An assessment of the possible impacts of the proposed wind farm on the Garda Air Support Unit and the Emergency Aeromedical Service operations is provided in Sections 2.16.1 and 2.16.2 that follow. The review shows that GASU and EAS operations are unlikely to be impacted by the proposed development.

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Garda Air Support Unit (GASU) and Emergency Aeromedical Service (EAS)	No action	None

Table 25. Aviation Impact Review - Garda Air Support Unit (GASU) and Emergency Aeromedical Service (EAS)

2.15.1 The Garda Air Support Unit (GASU)

The Garda Air Support Unit is based at Casement Aerodrome, Baldonnel and is typically deployed to incidents in the following cases:

- Immediate threat to life
- Incidents of a criminal, terrorist or other nationally important nature
- Immediate threat of serious public disorder
- Tasks leading to the prevention or detection of crime
- Evidence gathering
- Intelligence gathering
- Photographic tasks
- Traffic Management/Monitoring

The unit consists of one fixed-wing aircraft (de Havilland Canada-6 Twin Otter Guardian 400 aircraft) and two helicopters (Eurocopter EC 135 T2).

Figure 27. GASU - de Havilland Canada-6 Twin Otter Guardian 400 aircraft

Figure 28. GASU - Eurocopter EC135 T2

The proposed wind farm is located in an area that is sparsely populated and on forested / boggy terrain. For these reasons, it is highly unlikely that the proposed wind farm development would have any significant impacts on GASU operations.

In the unlikely event of GASU operations in the general area, it should be noted that all modern aircraft are equipped with a range of Global Navigation Satellite Systems (GNSS), e.g. GPS, GLNASS, Galileo, etc. These GNSS systems provide pilots with accurate navigation information including data to avoid obstacles during VFR operations. Should the proposed wind farms be permitted the associated turbine locations would be submitted to AirNav and aviation charts and GNSS databases would be updated accordingly.

GASU Aircraft	Impact of proposed wind farms - Opinion
Fixed-wing Airplane (de Havilland Canada-6 Twin Otter Guardian 400 aircraft)	Low – Fixed-wing aircraft are unlikely to be deployed in low level activity in the subject areas. In addition, the aircraft would be equipped with modern communications systems and navigational equipment. Should the wind farm be permitted, the turbines would be fitted with aeronautical lighting and would be clearly marked in aviation charts.
Helicopter (Eurocopter EC135 T2)	Low – Helicopter landings in the subject area would not occur as the proposed wind farm located in forested / boggy terrain. In addition, the aircraft would be equipped with modern communications systems and navigational equipment. Should the wind farm be permitted, the turbines would be fitted with aeronautical lighting and would be clearly marked in aviation charts.

Table 26. Impact of proposed wind farm on GASU Operations

2.15.2 The Emergency Aeromedical Service (EAS)

The air ambulance service in Ireland is known as the Emergency Aeromedical Service (EAS). The EAS crew (which include National Ambulance Service (NAS) paramedics) deal with time-critical emergency callouts to major emergencies such as road collisions and urgent medical events. The EAS currently operate two air ambulance helicopters operating from two bases:

- Custume Barracks, Athlone, Co Westmeath.
- Rathcoole Aerodrome, Rathcoole, Mallow, Co Cork.

The two helicopter borne emergency air ambulances consist of an Air Corps operated aircraft based at Custume Barracks in Athlone, and an aircraft located at Rathcoole Aerodrome in North County Cork (Figure 29).

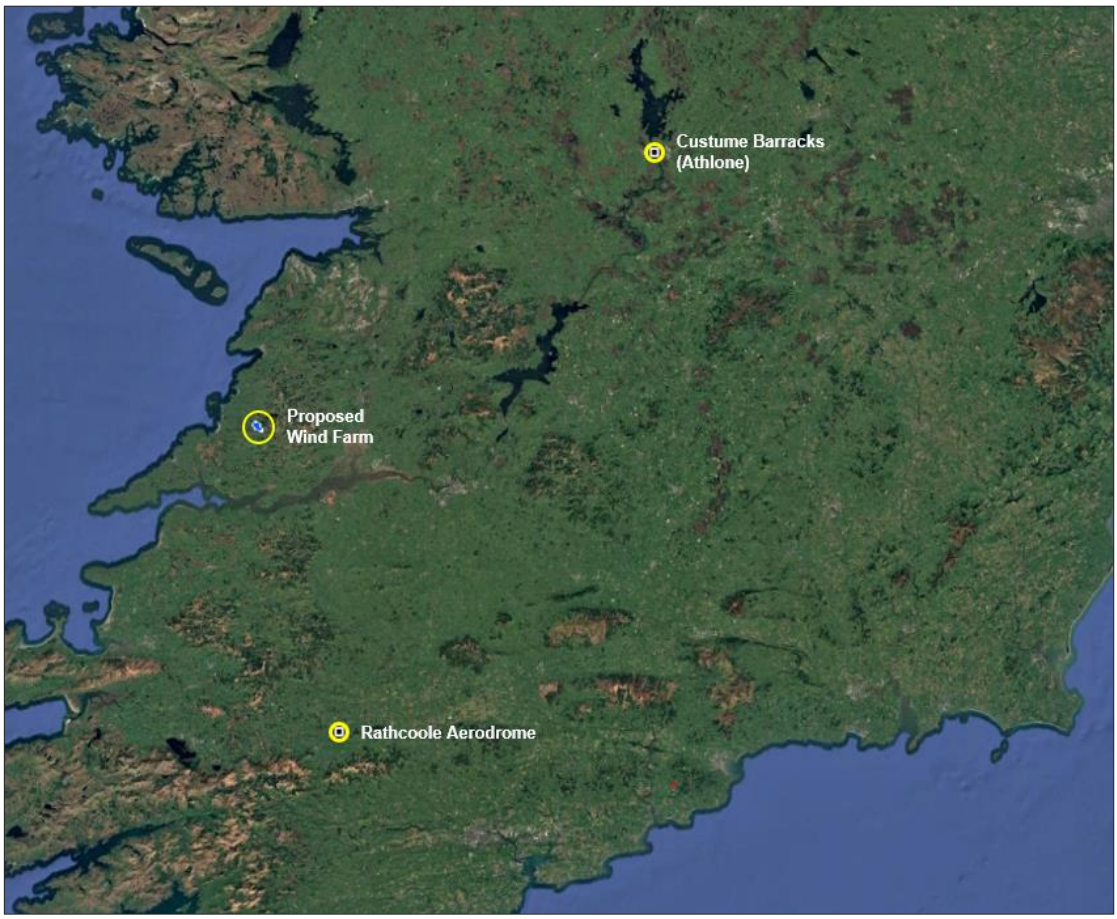


Figure 29. Emergency Aeromedical Service (EAS) Bases

The proposed wind farm site is located in an area that is sparsely populated. Helicopter landings are highly unlikely to occur in the subject area due to the forested/ boggy terrain of the proposed site.

Also, should the proposed wind farms be permitted the associated turbine locations would be submitted to AirNav and aviation charts and GNSS databases would be updated accordingly. EAS helicopters would also be fitted with GNSS systems which would clearly identify any potential objects in the operational area (e.g. wind turbines).

In addition, the footprint of the proposed wind farm development is relatively small and any flight diversions for EAS operations would have negligible time impacts. For these reasons, turbines at the proposed wind farm should have no impact on EAS flights from Athlone or from Rathcoole.

EAS Aircraft	Impact of proposed wind farms – Opinion
Helicopter (AgustaWestland AW139 / Airbus H135)	Low – Helicopter landings at the subject area are highly unlikely to occur as the proposed wind farm site is in an area that is sparely populated and is located on forested / boggy terrain. In addition, the aircraft would be equipped with modern communications systems and navigational equipment. Should the wind farm be permitted, the turbines would be fitted with aeronautical lighting and would be clearly marked in aviation charts.

Table 27. Impact of proposed wind farm on EAS Operations

3. Summary

A summary of the aviation review for the proposed wind farm at Cahermurphy West is provided in Table 28 below.

Item	Impact	Summary
Annex 14 - Obstacle Limitation Surfaces (OLS)	None	All of the turbines at the proposed development would be located outside the OLS Surfaces for Shannon Airport.
Annex 15 - Aerodrome Surfaces	None.	On Planning Consent agreement, details of the proposed wind turbines (i.e. turbine coordinates and turbine heights) would be submitted to AirNav Ireland for inclusion in their Aeronautical Electronic Obstacle Data Set. When included and promulgated in the Aeronautical Electronic Obstacle Data Set there would be no impact to the Annex 15 Aerodrome Surfaces.
Building Restricted Areas	None	A review shows that Cahermurphy West is over 20 km from the BRAs at Shannon Airport. At this distance there would be no impact due to the proposed wind farm.
Minimum Sector Altitudes (MSA)	None	A review of the Minimum Sector Altitudes (MSA) shows that the proposed wind farm is within 25 nautical miles of the VOR/DME at Shannon Airport. The maximum allowable structure in the applicable sector is 2000ft (AMSL). Turbines at the proposed wind farm would not exceed the 2000 ft threshold, therefore the MSA of the applicable sector will not be affected and there will be no impact on the published MSA altitude figures.
Instrument Flight Procedures	Observ	An initial screening review shows that the instrument flight procedures for Shannon Airport are unlikely to be impacted.
Communication and Navigation Systems	None	As the proposed wind farm is approximately 29 km from the Localizer and transmitting antenna at Shannon Airport, it is very unlikely that the proposed development will have any impact on these ATS communications and radio navigational aids.
Shannon PSR	None	All of the turbines at the proposed development would be more than 15 km from the PSR at Shannon Airport and would be in Assessment Zone 3 (EuroControl Guidelines). i.e. Detailed Assessment not required.
Shannon SSR	None	All of the turbines at the proposed development would be more than 16 km from the SSR at Shannon and would be in Assessment Zone 4 (EuroControl Guidelines). i.e. No Assessment required.
Woodcock Hill SSR	None	All of the turbines at the proposed development would be more than 16 km from the SSR at Woodcock Hill and would be in Assessment Zone 4 (EuroControl Guidelines). i.e. No Detailed Assessment required.
Flight Inspection and Calibration	None.	A review of the Flight Inspection Procedures indicates that there will be no impact due to the proposed wind farm.
Aeronautical Obstacle Warning Light Scheme	None	It is possible that AirNav Ireland may request that the wind farm, if permitted, would be fitted with Aeronautical Obstacle Warning Lights in accordance with industry standards. Subject to further consultation with AirNav Ireland.
Irish Air Corps / DoD Safeguarding	None	The proposed wind farm is located outside the Irish Air Corps Restricted Areas. Regarding Military Aviation Lightning, the recommendation is to engage at the early stage in a consented development (subject to planning conditions), to agree on the details relating to the lighting requirements for the IAC.
Garda Air Support Unit and Emergency Aeromedical Service	None	An assessment of GASU and EAS operations indicates that they are unlikely to be impacted by the proposed wind farm development.

Table 28. Cahermurphy West Wind Farm – Aviation Review Summary

APPENDIX A - ICAO Annex 15 Area 1 and Area 2 Surfaces.

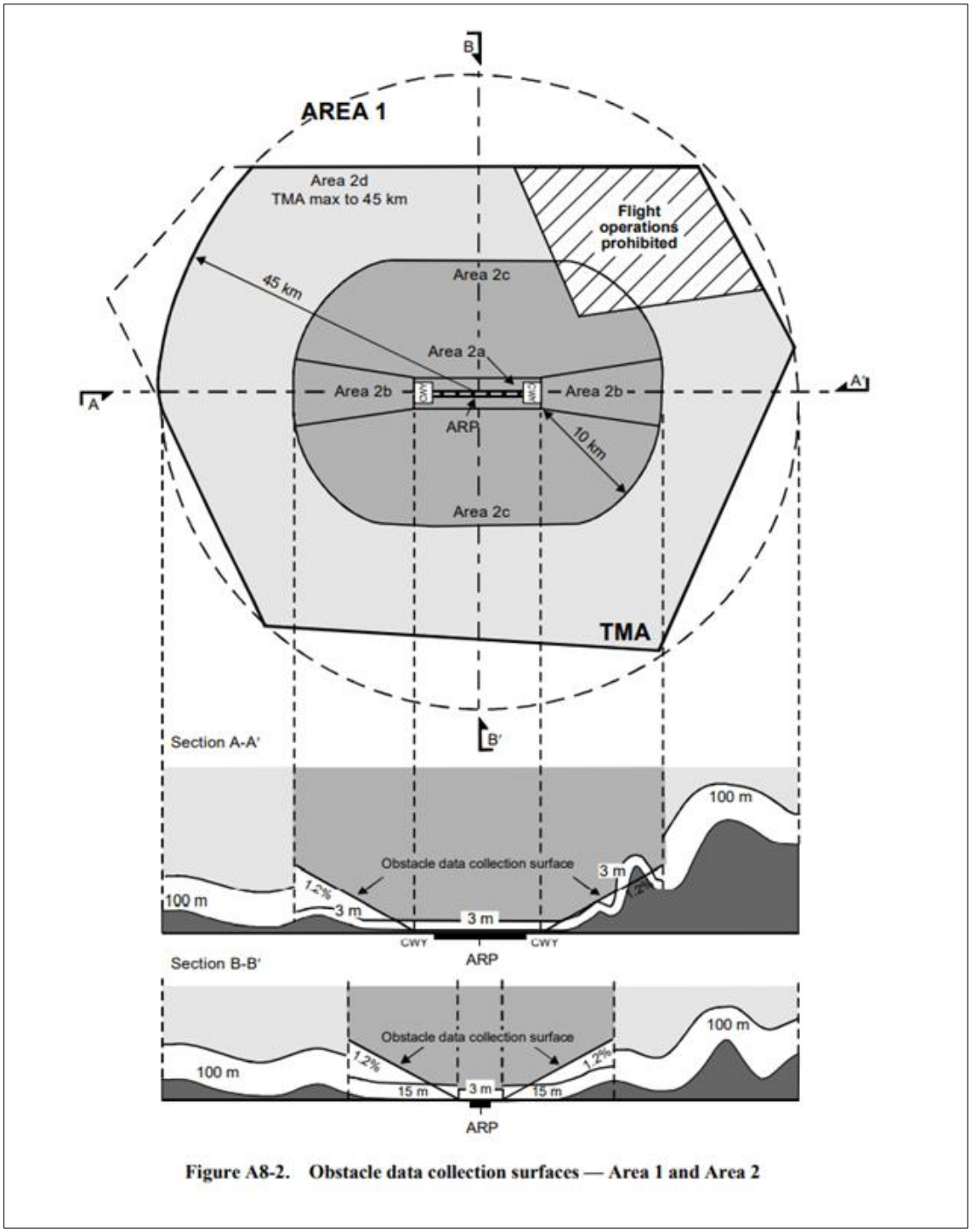
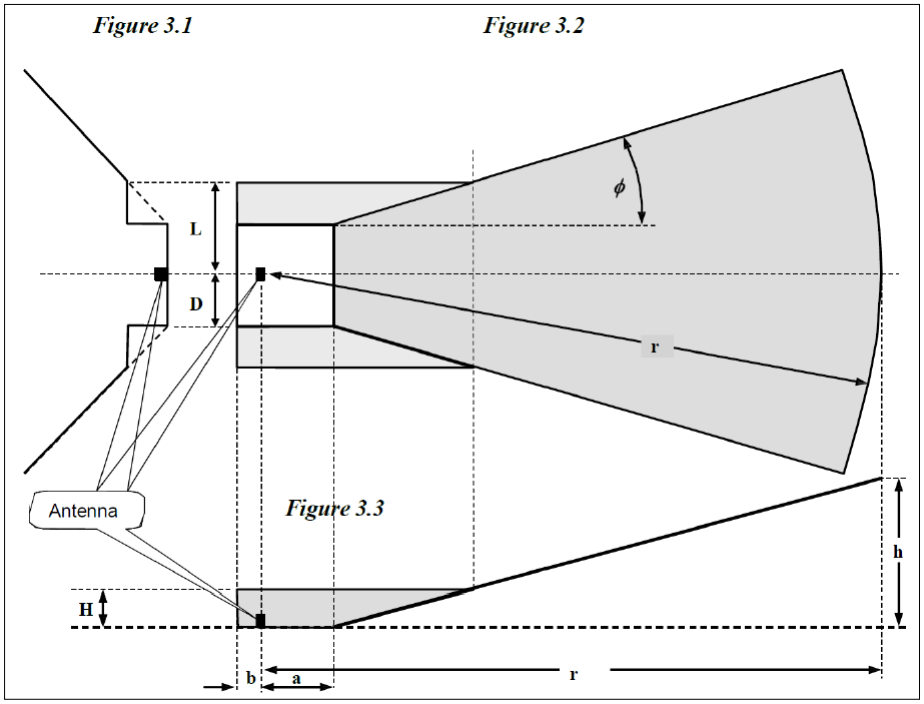


Figure A8-2. Obstacle data collection surfaces — Area 1 and Area 2

Figure A1 -ICAO Annex 15 Area 1 and Area 2 Surfaces.

APPENDIX B - ICAO Building Restricted Areas

Figure B1 below shows an example BRA shape for directional facilities. Table B1 provides harmonized guidance figures for the directional navigational facilities in accordance with Figure B1.



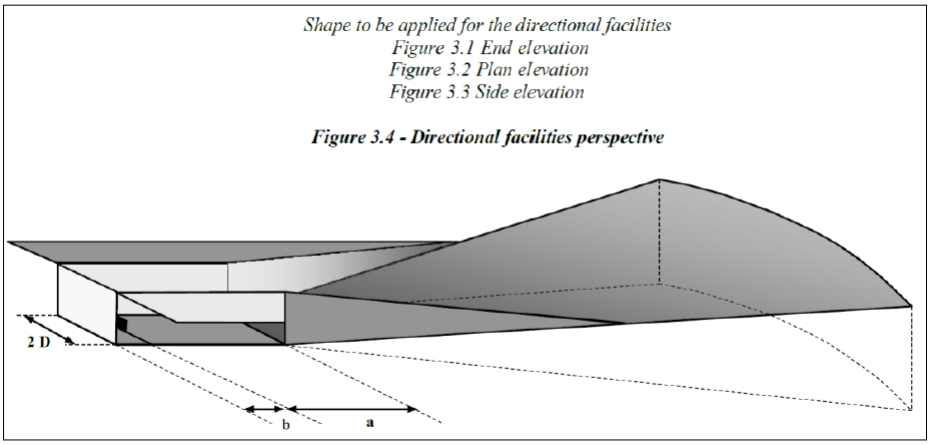


Figure B1 - Example BRA shape for directional facilities (ICAO EUR DOC 015 Figures 3.1-3.4)

*Type of **navigation** facilities*	***A*** *(m)*	***b*** *(m)*	***h****(m)*	***r*** *(m)*	***D*** *(m)*	***H*** *(m)*	***L*** *(m)*	***ϕ*** *(°)*
ILS LLZ (medium aperture single frequency)	Distance to threshold	500	70	a+6000	500	10	2300	30
ILS LLZ (medium aperture dual frequency)	Distance to threshold	500	70	a+6000	500	20	1500	20
ILS GP M–Type (dual frequency)	800	50	70	6000	250	5	325	10
MLS AZ	Distance to threshold	20	70	a+6000	600	20	1500	40
MLS EL	300	20	70	6000	200	20	1500	40
DME (directional antennas)	Distance to threshold	20	70	a+6000	600	20	1500	40

Table B1 - Harmonized guidance figures for the directional navigational facilities (ICAO EUR DOC 015 Table 2)

APPENDIX C – Consultations with IAA / Shannon Airport Group

The consultations between the EIAR Consultants (MKO) and the IAA / Shannon Airport Group are provided below.

C.1 Consultation Response #1 - April 5th 2024 – Email from MKO to the IAA

From: Natalia Stolarska <nstolarska@mkoireland.ie>
Sent: Friday, April 5, 2024 4:14 PM
To: Planning <planning@iaa.ie>
Cc: Jack Smith <jsmith@mkoireland.ie>; Christophe O'BRIEN <Christophe.O'BRIEN@IAA.ie>
Subject: 230843: EIA Scoping Request for Proposed Cahermurphy 2 Wind Farm Development, Co. Clare

* This message originated from outside the Irish Aviation Authority. Please treat hyperlinks, attachments and instructions in this email with caution. *

To whom it may concern,

MKO is preparing an Environmental Impact Assessment Report (EIAR) and Natura Impact Statement (NIS) to accompany a planning application, on behalf of Cahermurphy Renewables DAC, for a proposed wind farm development located at Cahermurphy and surrounding townlands, approximately 25km southwest of Ennis, Co. Clare.

The proposed project will likely encompass up to 8 no. wind turbines, access roads and entrance(s), electricity substation and wind farm control buildings, borrow pit(s), electrical cabling for grid connection, temporary construction compound and a permanent meteorological mast. It is anticipated the development will meet the Strategic Infrastructure Development (SID) thresholds of 25 no. turbines or 50 Megawatts (MW) for wind energy as set out in the 7th Schedule of the Planning and Development Act 2000, (as amended).

Please see attached a Cover Letter and Scoping Document providing details of the proposed project. As part of the EIA process, we would welcome any comments that you might have in relation to the Proposed Development, including baseline data, survey techniques or potential impacts that should be considered as part of the assessment process and in the preparation of the EIAR. If you could return any comments or suggestions at your earliest convenience, it would be much appreciated.

If you require any further information, please do not hesitate to contact me.

Kind regards,
Natalia.

Natalia Stolarska
Graduate Environmental Scientist
MKO

C.2 Consultation Response #2 - April 17th 2024 - Email from the IAA to MKO

From: Christophe O'BRIEN <Christophe.O'BRIEN@IAA.ie>
Sent: Wednesday 17 April 2024 10:36
To: Natalia Stolarska
Cc: Jack Smith; Planning
Subject: RE: 230843: EIA Scoping Request for Proposed Cahermurphy 2 Wind Farm Development, Co. Clare

Follow Up Flag: Follow up
Flag Status: Completed

Caution: This is an external email and may be malicious. Please take care when clicking links or opening attachments.

Good morning Natalia,

As no proposed turbine locations or specific blade tip heights appear to be provided in the documentation, the IAA can only offer very high-level comments at this time.

As identified in the list of consultees and given the relative distance to the centroid coordinate provided identifies Shannon Airport as being 30km West of the proposed site, Air Nav Ireland (listed as Aviation Navigation Ireland in Table-1?) and Shannon Airport (Shannon Airport Authority) should both be consulted in relation to the proposal for the potential impact on both Shannon Airport and en route communication, navigation and surveillance aids.

Please contact: planning@airnav.ie & paul.hennessy@snnairportgroup.ie

In general terms, the IAA has no specific requirements for inclusion in the scoping reports based on the very high-level information presented. More formal observations can be provided when an indicative scheme of turbine coordinates and positions / blade tip heights are available.

If a formal planning application is progressed, subject to Air Nav Ireland and Shannon Airport Authority advising no concerns over the proposed wind farm, it is likely that the following general observations would be proffered by the Authority during the planning process:

In the event of planning consent being granted, the applicant should be conditioned to contact the Irish Aviation Authority to:

(1) agree an aeronautical obstacle warning light scheme for the wind farm development,
(2) provide as-constructed coordinates in WGS84 format together with ground and blade tip height elevations at each wind turbine location and
(3) notify the Authority of intention to commence crane operations with at least 30 days prior notification of their erection.

Best Regards,

Christophe

Christophe O'Brien
Aerodromes Inspector

C.3 Consultation Response #3 - April 17th 2024 - Email from MKO to Shannon Airport Group

From: Natalia Stolarska
Sent: Wednesday 17 April 2024 14:37
To: paul.hennessy@snnairportgroup.ie
Cc: Jack Smith <jsmith@mkoireland.ie>
Subject: 230843: EIA Scoping Request for Proposed Cahermurphy 2 Wind Farm Development, Co. Clare

Good Afternoon Paul,

MKO is preparing an Environmental Impact Assessment Report (EIAR) and Natura Impact Statement (NIS) to accompany a planning application, on behalf of Cahermurphy Renewables DAC, for a proposed wind farm development located at Cahermurphy and surrounding townlands, approximately 25km southwest of Ennis, Co. Clare.

The proposed project will likely encompass up to 8 no. wind turbines, access roads and entrance(s), electricity substation and wind farm control buildings, borrow pit(s), electrical cabling for grid connection, temporary construction compound and a permanent meteorological mast. It is anticipated the development will meet the Strategic Infrastructure Development (SID) thresholds of 25 no. turbines or 50 Megawatts (MW) for wind energy as set out in the 7th Schedule of the Planning and Development Act 2000, (as amended).

Please see attached a Cover Letter and Scoping Document providing details of the proposed project. As part of the EIA process, we would welcome any comments that you might have in relation to the Proposed Development, including baseline data, survey techniques or potential impacts that should be considered as part of the assessment process and in the preparation of the EIAR. If you could return any comments or suggestions at your earliest convenience, it would be much appreciated.

If you require any further information, please do not hesitate to contact me.

Kind regards,
Natalia.

Natalia Stolarska
Graduate Environmental Scientist
MKO

C.4 Consultation Response #4 - 26th Jan 2026 - Email from MKO to Shannon Airport Group

From: Micheal Cahill <mcahill@mkoireland.ie>
Sent: 26 January 2026 11:53
To: Paul Hennessy <paul.hennessy@snnairportgroup.ie>
Cc: Eoin McCarthy <emccarthy@mkoireland.ie>
Subject: [External] FW: 230843: EIA Scoping Request for Proposed Cahermurphy 2 Wind Farm Development, Co. Clare

Caution:
This email originated outside of the organisation. Do not click on links or open attachments unless you recognise the sender's email address and know the content is safe. If for any reason you are suspicious, please use the 'Analysis' button in Outlook or forward this email to spam@snnairportgroup.ie.

Hi Paul,

I just wanted to follow up on the below to welcome any comment or requirements that Shannon Airport may have as this project nears submission to An Coimsiúin Pleanála. Please also see below the final turbine coordinates in ITM.

Turbine No.	Irish Transverse Mercator Co-ordinates		Top of Foundation Elevation (m OD)
	Easting (m)	Northing (m)	
1	507772	669761	89.5m
2	508411	669739	100.5m
3	507788	669301	115m
4	508308	669151	112m
5	508887	669573	133m
6	509055	669148	122m
7	508309	668624	116.5m
8	508942	668587	113.5m

Le meas,
Michéal.

08th Feb 2026 - Email from Shannon Airport Group to MKO

From: Paul Hennessy <paul.hennessy@snnairportgroup.ie>
Sent: 08 February 2026 19:08
To: Micheal Cahill <mcahill@mkoireland.ie>
Subject: RE: [External] FW: 230843: EIA Scoping Request for Proposed Cahermurphy 2 Wind Farm Development, Co. Clare
Importance: High

Caution: This is an external email and may be malicious. Please take care when clicking links or opening attachments.

Hi Michael,

The locations of the turbines are approx. 6km from the perimeter of our safeguarding boundary. Therefore technically they are not impacting the Obstacle Limitational Surfaces (OLS). The closest area within that boundary has a height restriction of between 15m and 45m.

This is only one aspect of a combined required assessment process and consideration of potential impacts on Instrument Flight Procedures (IFP's) and NAVAIDS/Radar is also required. You should make contact with Air Nav Ireland Ltd. to seek their perspective. As previously indicated, Cathal MacCriostail is their point of contact (Cathal.MacCriostail@airnav.ie).

C.5 Consultation Response #5 - 09th Feb 2026 - Email from MKO to Shannon Airport Group

Micheal Cahill

From: Micheal Cahill
Sent: 09 February 2026 12:03
To: 'Paul Hennessy'
Subject: RE: [External] FW: 230843: EIA Scoping Request for Proposed Cahermurphy 2 Wind Farm Development, Co. Clare

Thanks for the below Paul.

Le meas,
Michéal.

Michéal Cahill
Environmental Scientist
MKO

APPENDIX D – Consultations with Department of the Defence

The consultations between the EIAR Consultants (MKO) and the Department of Defence (DoD) are provided below.

D.1 Consultation Response #1 - April 5th 2024

From: Natalia Stolarska <nstolarska@mkoireland.ie>
Sent: Friday 5 April 2024 15:59
To: Defence Property Management Planning <PropertyManagementPlanning@defence.ie>
Cc: Jack Smith <jsmith@mkoireland.ie>
Subject: 230843: EIA Scoping Request for Proposed Cahermurphy 2 Wind Farm Development, Co. Clare

To whom it may concern,

MKO is preparing an Environmental Impact Assessment Report (EIAR) and Natura Impact Statement (NIS) to accompany a planning application, on behalf of Cahermurphy Renewables DAC, for a proposed wind farm development located at Cahermurphy and surrounding townlands, approximately 25km southwest of Ennis, Co. Clare.

The proposed project will likely encompass up to 8 no. wind turbines, access roads and entrance(s), electricity substation and wind farm control buildings, borrow pit(s), electrical cabling for grid connection, temporary construction compound and a permanent meteorological mast. It is anticipated the development will meet the Strategic Infrastructure Development (SID) thresholds of 25 no. turbines or 50 Megawatts (MW) for wind energy as set out in the 7th Schedule of the Planning and Development Act 2000, (as amended).

Please see attached a Cover Letter and Scoping Document providing details of the proposed project. As part of the EIA process, we would welcome any comments that you might have in relation to the Proposed Development, including baseline data, survey techniques or potential impacts that should be considered as part of the assessment process and in the preparation of the EIAR. If you could return any comments or suggestions at your earliest convenience, it would be much appreciated.

If you require any further information, please do not hesitate to contact me.

Kind regards,
Natalia.

D.2 Consultation Response #2 - April 8th 2024

From: Defence Property Management Planning
Sent: Monday 8 April 2024 10:18
To: 'Natalia Stolarska' <nstolarska@mkoireland.ie>
Cc: Jack Smith <jsmith@mkoireland.ie>; Don Watchorn (Defence) <Don.Watchorn@defence.ie>; Sarah Kelly (Defence) <Sarah.Kelly@defence.ie>
Subject: RE: 230843: EIA Scoping Request for Proposed Cahermurphy 2 Wind Farm Development, Co. Clare

Dear Ms. Stolarska,

The Department of Defence wishes to acknowledge receipt of your email below re: the proposed Cahermurphy 2 Wind Farm, Co. Clare

The Department is currently consulting with the Defence Forces subject matter experts and we will revert in due course.

Kind Regards,
Gillian

D.3 Consultation Response #3 - April 17th 2024

From:	Defence Property Management Planning <PropertyManagementPlanning@defence.ie>
Sent:	Wednesday 17 April 2024 10:15
To:	Natalia Stolarska
Cc:	Jack Smith; Don Watchorn (Defence); Sarah Kelly (Defence)
Subject:	RE: 230843: EIA Scoping Request for Proposed Cahermurphy 2 Wind Farm Development, Co. Clare
Attachments:	2024-04-17 Observation Letter for Cahermurphy Windfarm.pdf
Follow Up Flag:	Follow up
Flag Status:	Flagged

Caution: This is an external email and may be malicious. Please take care when clicking links or opening attachments.

Dear Ms. Stolarska,

Re: Proposed Cahermurphy 2 Windfarm Development

With reference to your e-mail below and your letter dated 05 April 2024, please see attached response from the Department.

Kind Regards,
Gillian

Gillian Holden

Property Management Branch

—

An Roinn Cosanta

Department of Defence

An Roinn Cosanta
Department of Defence

MKO,
Tuam Road,
Galway
H91 VW84

08 April 2024

Re: the Environmental Impact Assessment for the proposed Cahermurphy 2 windfarm Co. Clare.

Dear Ms. Stolarska,

I refer to your letter dated 05 April 2024, in relation to the propsed Chaermurphy 2 windfarm located in Co. Clare.

I wish to advise at the outset that any determination in relation to a planning consent is solely a matter for the planning authorities and/or ABP, as appropriate. Therefore, the following observation is made on a non-prejudicial basis, and is not intended to be used to rely on for a prospective planning application, nor is this observation to be relied on in the event of any commercial transaction pertaining to such lands and it is not to be relied on in the event of any contract exchange pertaining to same.

As a matter of practice, the Department of Defence does not provide observations or advice in the scoping process, except where the relevant parties have been directed by a planning authority to seek the Department's views.

Based on the information supplied and following consultations with the subject matter in the Irish Air Corps, the Department of Defence wishes to make the following observations:

- All turbines should be illuminated by Type C, Medium intensity, Fixed Red obstacle lighting with a minimum output of 2,000 candela to be visible in all directions of azimuth and to be operational H24/7 days a week. Obstacle lighting should be incandescent or, if LED or other types are used, of a type visible to Night Vision equipment. Obstacle lighting used must emit light at the near Infra-Red (IR) range of the electromagnetic spectrum, specifically at or near 850 nanometres (nm) of wavelength. Light intensity to be of similar value to that emitted in the visible spectrum of light.

Bóthar an Stáisiúin, An Droichead Nua, Contae Chill Dara, W12 AD93.
Station Road, Newbridge, Co.Kildare, W12 AD93.
T +353 45 492000 | customer@defence.ie
www.defence.ie

Any Irish Air Corps (IAC) requirements for are separate to Irish Aviation Authority (IAA) require

We would appreciate if you could keep us informed on any progress relating to this proposed development.

Nothing in the above observation shall be taken as a binding response by the Minister for Defence in the event that a planning application is made. The Minister reserves the right to comment on an actual planning application as and when it is submitted in accordance with the provisions of the planning regulatory code.

Please contact me if you have any queries in this regard.

Yours faithfully,

Sent via e-mail

Don Watchorn
Property Management Branch
Department of Defence
Station Road
Newbridge
Co. Kildare W12 AD93
045 452199 don.watchorn@defence.ie

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