Appendix 10A

AI BRIDGES AVIATION REPORT

Report

Brittas Wind Farm

Aviation Review Statement

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Executive Summary

Ai Bridges Ltd have been commissioned to review the possible impacts of the proposed wind farm on aviation systems in the vicinity of the proposed wind farm development at Brittas. As part of the review, the following subjects were considered:

- Annex 14 - Obstacle Limitation Surfaces (OLS)
- Annex 15 – Aerodrome Surfaces
- Minimum Sector Altitudes (MSA)
- Instrument Flight Procedures
- Permitted Wind Farms in vicinity of Proposed Wind Farm
- Communications, Navigation and Radar Surveillance Systems Safeguarding
- Flight Inspection and Calibration
- Aeronautical Obstacle Warning Light Scheme
- Irish Air Corps / Department of Defence (DoD) Safeguarding

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 Airport, Waterford Airport and Moyne Airfield 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 Surfaces and there are 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, Waterford Airport or Moyne Airfield.

Annex 15 - Aerodrome Surfaces

Following a review of ”Terrain and obstacle requirements Area 1” 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 an 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 wind farm be permitted, the turbines would be outside 45km of Shannon and Waterford Airport ARPs but would be greater than 100m in height. Therefore the turbines would be required to be included in the IAA Electronic Air Navigation Obstacle Dataset.

Minimum Sector Altitudes (MSA)

The Minimum Sector Altitudes (MSA) is the lowest altitude which may be used that will provide a minimum obstacle clearance of 1000ft above all obstacles within a sector of 25 nautical miles (46km) from the VOR/DME at Shannon Airport and the NDB at Waterford Airport. As the proposed wind farm is located outside the MSA Sectors for Shannon and Waterford Airports, there should be no impact on the published MSA altitudes.

Instrument Flight Procedures

There are 13 published Instrument Flight Procedures for flights to/from Shannon and Waterford Airports. Due to the distance of the proposed wind farm from the airports, and as there are existing obstacles nearer to the airports than the proposed development, there should be no impacts to these flight procedures.

Communications, Navigation and Surveillance System Safeguarding

As the proposed wind farm is more than 70km from the Localizer and transmitting antenna at Shannon and Waterford Airports, it is very unlikely that the proposed wind farm will have any impact on these ATS communications and radio navigational aids.

For Radar Surveillance Systems, EUROCONTROL Guidelines require a 16km safe distance from the surveillance radar system (SSR), for a "*Zone 4 - No Assessment*" condition. It has been highlighted in the analysis that turbines located at the proposed farm would be located at a minimum distance of 60 km from the radar stations at Shannon Airport and Woodcock Hill and in Assessment Zone 4 of the EUROCONTROL Guidelines. As turbines at the proposed development would be located in Assessment Zone 4, a detailed impact assessment on Radar Surveillance Systems will not be required by the IAA.

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 approved Flight Inspection Service Provider. The checks are carried out during annual inspections consisting of radial and orbital test flights around Shannon and Waterford Airports for calibration of instrument landing systems.

Flight Inspection Procedures will not be impacted as the proposed wind farm is sufficiently far from the airport runways and the flight inspection procedures should already account for the existing obstacles (e.g. terrain and existing wind farms).

Aeronautical Obstacle Warning Light Scheme

In the event of a grant of planning consent the IAA are likely to request lighting of the proposed wind turbines in the interest of aviation safe-guarding 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.

Sections

1. Introduction 6
1.1 Wind Farm Site Information 6
1.2 Shannon Airport 7
1.3 Waterford Airport 8
1.4 Moyne Aerodrome 9
2. Aviation Review 11
2.1 Annex 14 Obstacle Limitation Surfaces (OLS) 12
2.2 Annex 15 Aerodrome Surfaces 14
2.3 Minimum Sector Altitudes 16
2.4 Instrument Flight Procedures 17
2.5 Permitted Wind Farms in vicinity of Proposed Wind Farm 18
2.6 Communication Navigation and Surveillance Systems 19
2.6.1 Communications and Navigation Systems 19
2.6.2 Radar Surveillance Systems 19
2.7 Flight Inspection and Calibration 23
2.8 Aeronautical Obstacle Warning Light Scheme 24
2.9 Irish Air Corps / DoD Safeguarding 25
3. Summary 27

Appendices

Appendix A – ICAO Annex 15 Area 1 and Area 2 Surfaces……..... 28

1. Introduction

This section provides a brief summary of the proposed wind farm development at Brittas and of the nearest significant aviation installations at Shannon Airport, Waterford Airport and Moyne Aerodrome*.

1.1 Wind Farm Site Information

The proposed wind farm development is located in County Tipperary approximately 4 km north of Thurles. Figure 1 shows the proposed wind farm site with respect to Shannon Airport, Waterford Airport, Moyne Aerodrome and the IAA radar stations at Woodcock Hill and Shannon.

Figure 1. Location of proposed wind farm at Brittas

** Field And Desktop Survey findings indicate that Moyne Aerodrome is no longer an operational Aerodrome. Although the aerodrome is unlikely to be still operational, it has been considered in this study for completeness.*

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	ARP Distance to Proposed Wind Farm
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).	74 km

Table 1. Shannon Airport Details

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

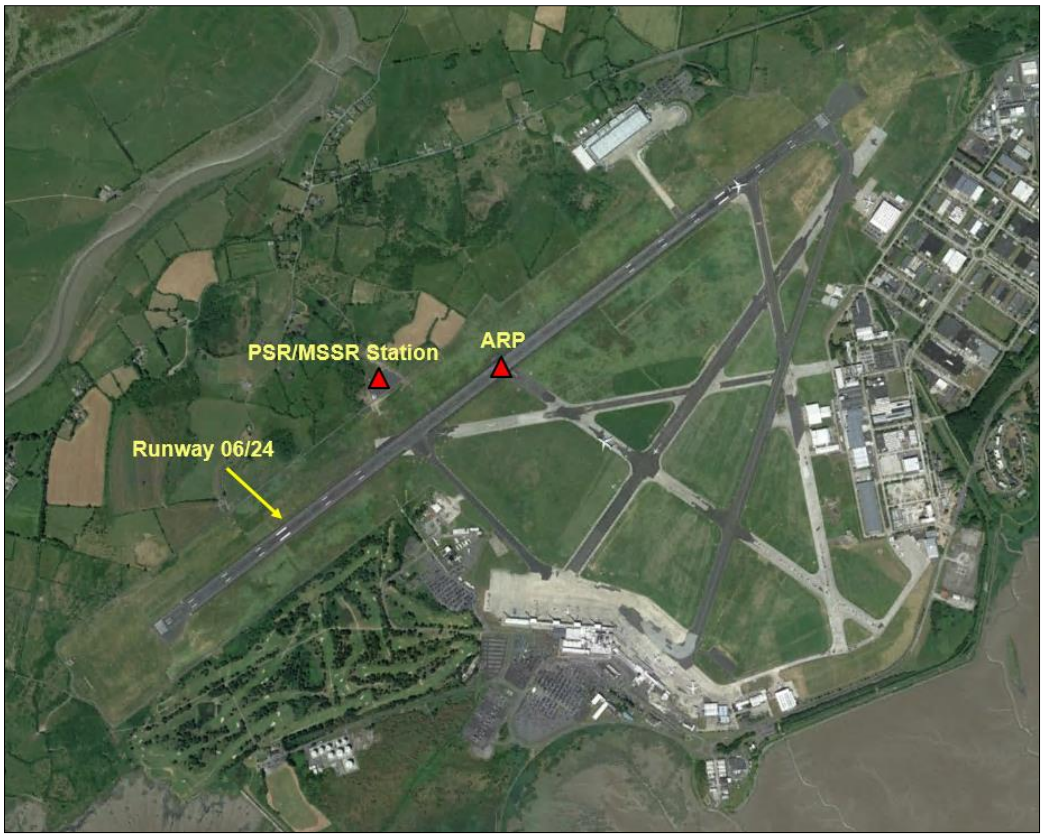


Figure 2. Shannon International Airport

1.3 Waterford Airport

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

Location	Installation	Description	Airport Ref. Point ARP	ARP Distance to Proposed Wind Farm
Kilowen, Co Waterford	International Airport	Single Asphalt Runway Airspace: Class G	52 11 14 N 07 05 13 W (Mid-point of Runway 06/24).	75 km

Table 2. Waterford Airport Details

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

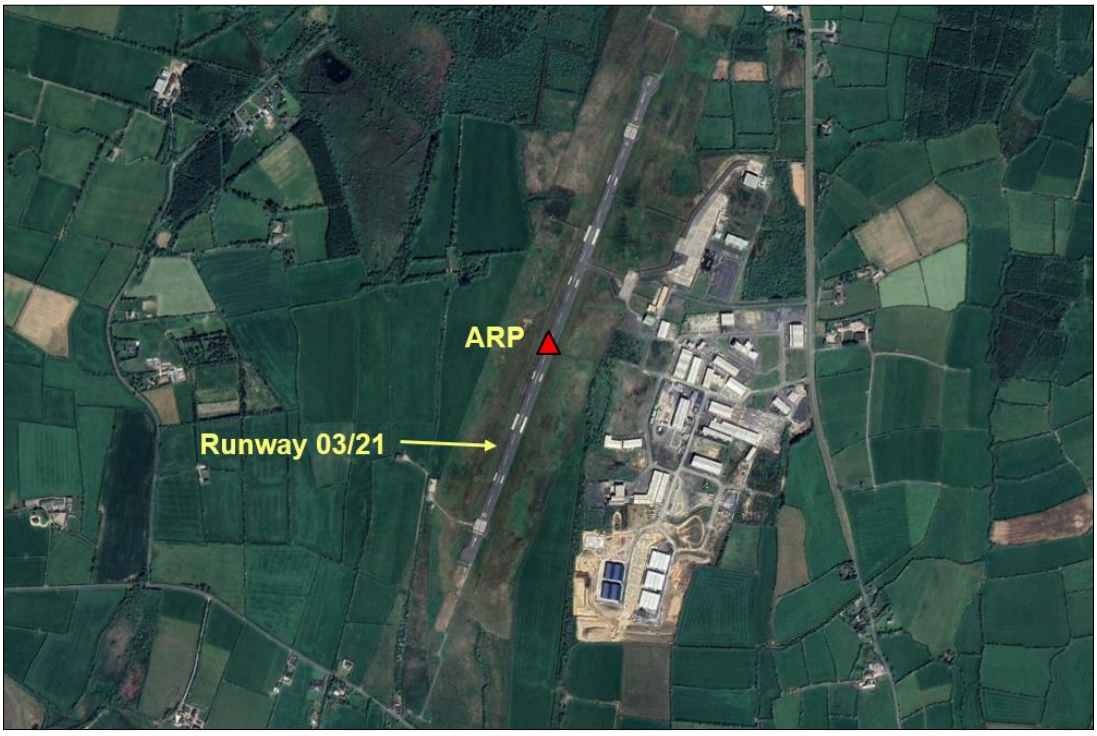


Figure 3. Waterford International Airport

1.4 Moyne Aerodrome

Table 3 below shows the co-ordinates of Moyne Aerodrome and the distance from the Airport reference Point (ARP) to the proposed wind farm site. The aerodrome operates in Class G uncontrolled airspace.

This airstrip is not licensed by the IAA and contact details for the Airstrip operator are not publicly available. It should also be noted that the aerodrome at Moyne is probably no longer in use. Although the aerodrome is listed in some aeronautical material, satellite imagery shows no evidence of an existing runway (Figure 5). In addition, on the day of Field Survey, the aerodrome site was covered by a crop of grain (Figure 6).

Location	Installation	Description	Airport Ref. Point ARP	ARP Distance to Proposed Wind Farm
Moyne, Co Tipperary	Private Unlicensed Airstrip	Single Grass-strip Runway (Code 1) Airspace: Class G	52 42 10 N 07 42 19 W (Mid-point of Runway).	5.8 km

Table 3. Moyne Aerodrome Details

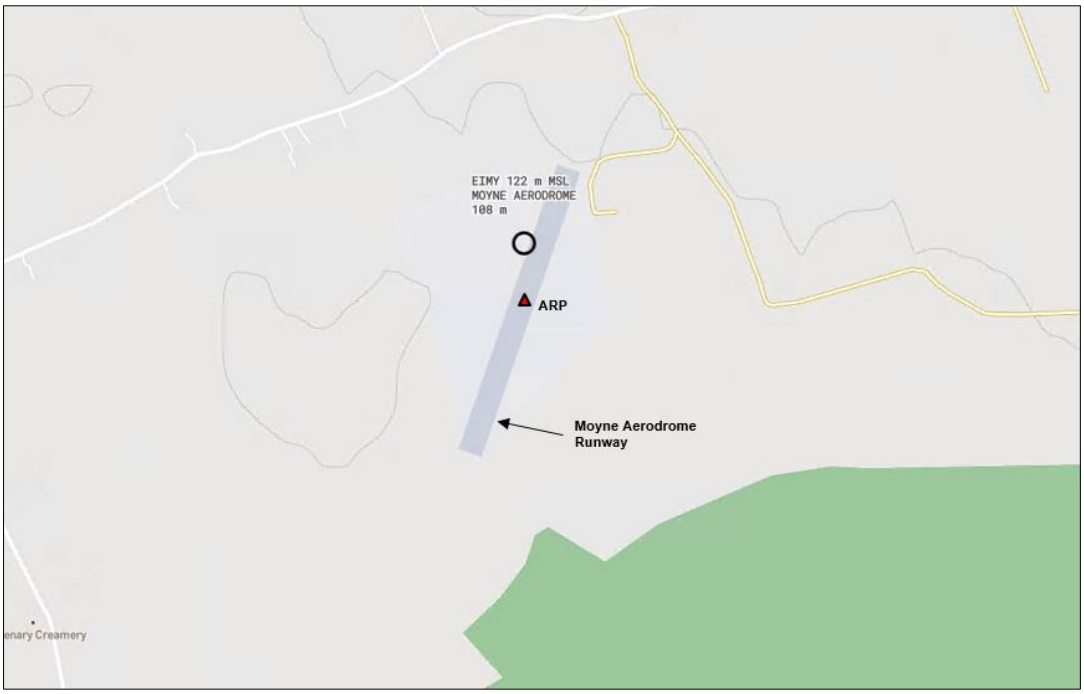


Figure 4. Moyne Aerodrome

Figure 5. Moyne Aerodrome – Satellite View (showing no evidence of existing runway)

Figure 6. Moyne Aerodrome – Roadside View (showing no evidence of existing runway)

2. Aviation Review

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

- Annex 14 - Obstacle Limitation Surfaces (OLS)
- Annex 15 – Aerodrome Surfaces
- Minimum Sector Altitudes (MSA)
- Instrument Flight Procedures
- Permitted Wind Farms in vicinity of proposed Wind Farm
- Communications, Navigation and Radar Surveillance Systems Safeguarding
- Flight Inspection and Calibration
- Aeronautical Obstacle Warning Light Scheme
- Irish Air Corps / Department of Defence (DoD) Safeguarding

2.1 Annex 14 Obstacle Limitation Surfaces (OLS)

A review of the Annex 14 Obstacles Limitation Surfaces (OLS) was first was carried out by first plotting the proposed wind farm location and the airport obstacle surfaces. The obstacle limitation surfaces for aerodromes 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 7 below shows the Shannon, Waterford and Moyne OLS surfaces in relation to the proposed wind farm.

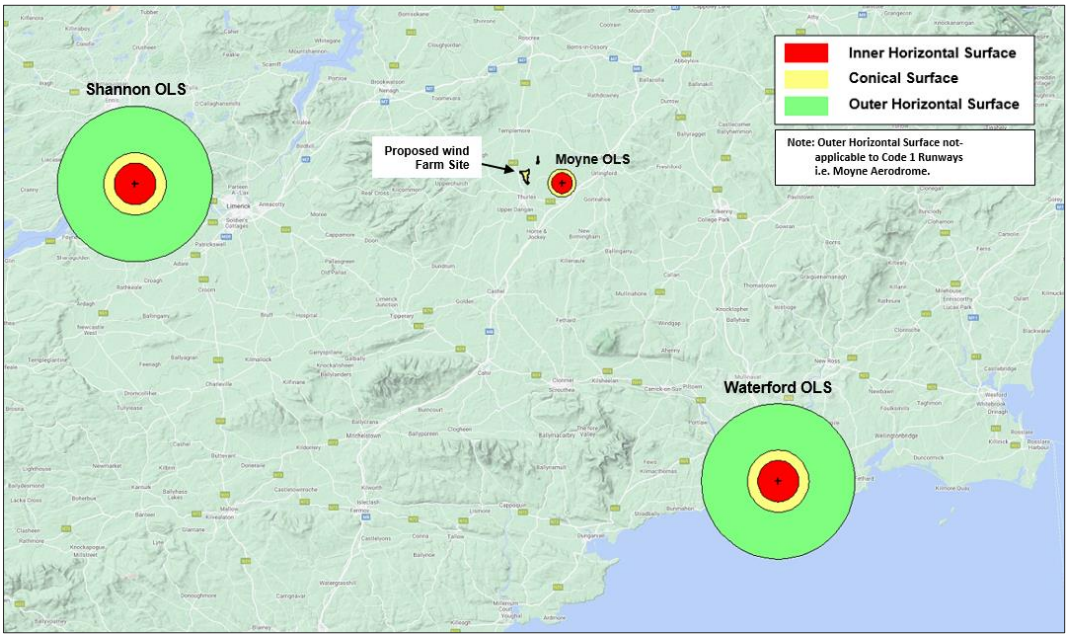


Figure 7. Brittas Wind Farm in relation to Aerodrome OLS Surfaces.

Aerodrome	Runway Code	Outer Horizontal Surface Applicable	Clearance Distance to Aerodrome OLS Surface
Shannon Airport	Runway Code 4	Y	59 km
Waterford Airport	Runway Code 4	Y	60 km
Moyne Airfield	Runway Code 1	N	3.1 km

Table 4. Clearance Distances to Aerodrome OLS Surfaces

For large aerodromes with Code 4 runways, the OLS consists of an Inner Horizontal Surface, a Conical Surface and an Outer Horizontal Surface which extend to 15km from the ARP.

For small aerodromes with Code 1 non-instrument runways, an Outer Horizontal Surface is not applicable. The Obstacle Free Zone for a Code 1 non-instrument runway extends 2.7km from the aerodrome's ARP (Inner Horizontal Surface (2km) + Conical Surface (0.7km)). It should

also be noted that the OLS constraints outlined above are IAA safeguarding limits to ensure safe aviation activities; however, from consultations with pilots who fly to/from small aerodromes, pilots use an area of approximately 1 mile (1.6km) around the runway to ascend and descend.

This 1 mile area is not limited to the take-off and approach surfaces, as pilots sometimes conduct a low-level flyover across the aerodrome to carry out a visual inspection of the wind-sock to assess wind conditions prior to landing. This flyover can occur from any direction relative to the runway (i.e. not just on the take-off and ascend surfaces). The proposed wind farm site is more than 1 mile from the airfield at Moyne.

The analysis of the OLS plots indicate that turbines at the proposed wind farm would not penetrate the OLS surfaces of Shannon Airport, Waterford Airport or Moyne Airfield.

2.2 Annex 15 Aerodrome Surfaces

Turbines at the proposed wind farm would not 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 up to 45km from the Aerodrome ARP. (An illustration of ICAO Annex 15 Area 1 and Area 2 Surface is provided in Appendix A).

As the nearest turbine at the proposed wind farm would be more than 45km from the ARP at Shannon and Waterford Airports, there will be no penetration of the Annex 15 surface for the Aerodromes. All obstacles, if they are more than 100 meters above terrain for a distance of up to 45km from the ARP, need to be registered in the IAA Air Navigation Obstacle Data Set. This area is known as the TMA area i.e. Terminal Maneuvering Area and is used for en-route circling and maneuvering and is shown in Figure 8.

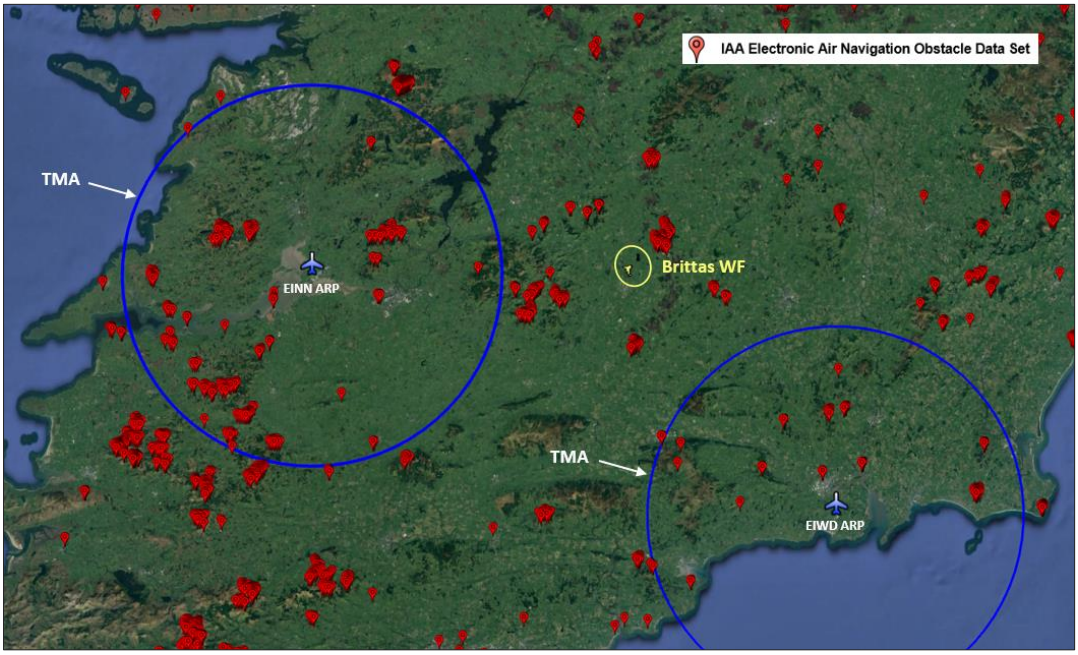


Figure 8. Annex 15 Aerodrome Surface and IAA Electronic Air Navigation Obstacle Data Set

It should also be noted that there are other existing tall structures (obstacles) nearer to the airports, e.g. the existing wind farms at Ballybay, Foyle, Kill Hill, Glenough, Garracummer, Cappawhite, Hollyford, Mienvee and Knockastanna.

These existing obstacles would shield any potential impacts from the proposed wind farm at Brittas. The IAA Electronic Air Navigation Obstacle Data Set permitted obstacles are shown relative to the proposed wind farm in Figure 9.

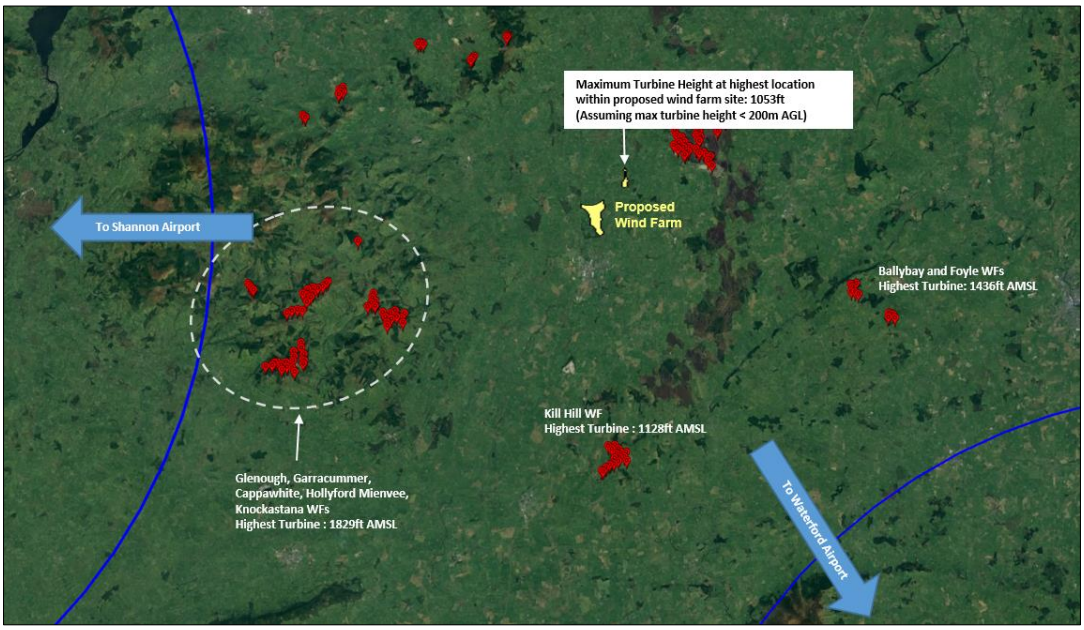


Figure 9. Permitted Obstacles in vicinity of Brittas Wind Farm

Although there are other obstacles closer to the airport than 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.

2.3 Minimum Sector Altitudes

A review of the Minimum Sector Altitudes (MSA) shows that the proposed wind farm is not within 25 nautical miles from the VOR/DME at Shannon, or 25 nautical miles from the NDB at Waterford. The MSA provides a minimum obstacle clearance of 1000 ft above the highest obstacle within specified quadrants

The proposed wind farm site is located more than 25NM from the VOR/DME/NDBs as shown in Figure 10. Therefore, the MSAs will not be affected and there will be no impact on the published MSA altitude figures.

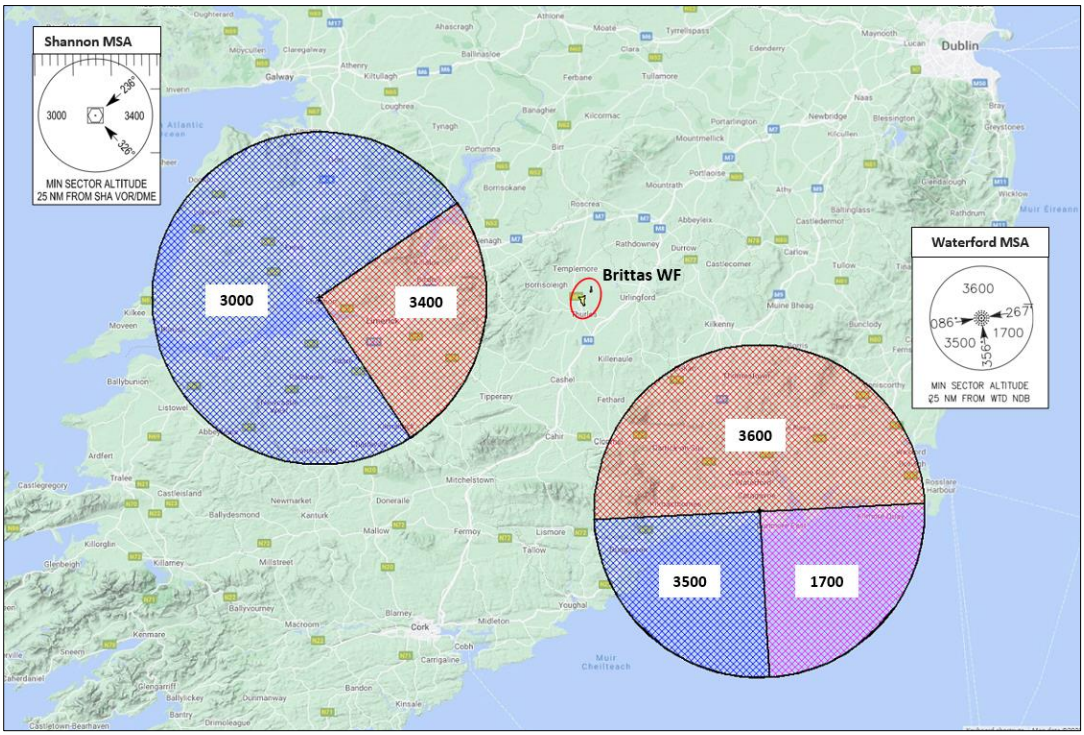


Figure 10. Minimum Sector Altitudes – Shannon, and Waterford Airports

2.4 Instrument Flight Procedures

There are 13 published Instrument and Visual Flight Procedures for arrivals to and departures from Shannon and Waterford Airports.

Due to the distance of the proposed wind farm from Shannon and Waterford Airports (and as there are existing obstacles adjacent to the proposed wind farm, it is unlikely that there will be any impacts on the Instrument Flight Procedures for flights to/from Shannon and Waterford Airports. Table 5 below lists the Instrument Flight Procedures for Shannon and Waterford Airports.

Aerodrome	Aerodrome Procedure	Chart ID	Wind Farm Impacts
Shannon	RNAV Standard Instrument Departure Chart RWY 06	EINN AD 2.24-5	No Impacts.
Shannon	RNAV Standard Instrument Departure Chart RWY 24	EINN AD 2.24-6	No Impacts.
Shannon	RNAV Standard Arrival Chart RWY 06	EINN AD 2.24-7	No Impacts.
Shannon	RNAV Standard Arrival Chart RWY 24	EINN AD 2.24-8	No Impacts.
Shannon	Instrument Approach Chart ILS or LOC RWY 06	EINN AD 2.24-10	No Impacts.
Shannon	Instrument Approach Chart VOR RWY 06	EINN AD 2.24-11	No Impacts.
Shannon	Instrument Approach Chart ILS CAT I & II or LOC 24	EINN AD 2.24-13	No Impacts.
Shannon	Instrument Approach Chart VOR RWY 24	EINN AD 2.24-14	No Impacts.
Shannon	Visual Approach Chart – ICAO	EINN AD 2.24-15	No Impacts.
Waterford	Instrument Approach Chart ILS/NDB/DME RWY 21 – ICAO	EIWF AD 2.24-3.1	No Impacts.
Waterford	Instrument Approach Chart NDB/DME RWY 21 – ICAO	EIWF AD 2.24-5	No Impacts.
Waterford	Instrument Approach Chart NDB/DME RWY 03 – ICAO	EIWF AD 2.24-6.1	No Impacts.
Waterford	Visual Approach Chart – ICAO	EIWF AD 2.24-6.7	No Impacts.

Table 5. Instrument and Visual Flight Procedures – Shannon and Waterford Airports

2.5 Permitted Wind Farms in vicinity of Proposed Wind Farm

The Planning References for the permitted wind farms in the vicinity of the proposed wind farm are shown below in Table 5. None of these wind farms required a Full Assessment of Instrument Flight Procedures.

Wind Farm	Planning Reference	Description
Ballybay	TBC	Operational Wind Farm
Foyle	TBC	Operational Wind Farm
Kill Hill	TBC	Operational Wind Farm
Glenough	TBC	Operational Wind Farm
Garracummer	TBC	Operational Wind Farm
Cappawhite	TBC	Operational Wind Farm
Hollyford	TBC	Operational Wind Farm
Mienvee	TBC	Operational Wind Farm
Knockastanna	TBC	Operational Wind Farm

Table 6. Permitted Wind Farms in vicinity of Proposed Wind Farm

2.6 Communication Navigation and Surveillance Systems

In this section the possible impact of the proposed wind farm on the Communication, Navigation and Radar Surveillance Systems for the aerodrome at Shannon Airport is assessed.

2.6.1 Communications and Navigation Systems

The AIP documents EINN AD 2-18/19 and EIWF AD 2-18/19 provides the information for communication and navigation facilities for Shannon and Waterford Airports respectively. The table below shows the channel frequencies for the ATS communications Facilities and the Radio Navigation and Landing Aids for each airport.

Aerodrome	ATS communications Facilities Channel Frequency	Radio Navigation and Landing Aids Channel Frequency	Approximate Distance to Localizer and Transmitting antennas	Impacts of wind fam
Shannon	118MHz –130MHz	339KHz – 330MHz	74 km	No impacts
Waterford	121MHz -130MHz	110KHz – 331MHz	75 km	No impacts

Table 7. Impacts on Communications and Navigation Systems

As the proposed wind farm is over 70km 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.

2.6.2 Radar Surveillance Systems

The tables below show the Irish Aviation Authority Assessment Zone arrangement for the two types of aviation radar surveillance systems; Primary Surveillance Radar (PSR) and Secondary Surveillance Radar (SSR).

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

Table 8. PSR Zone Arrangements

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

Table 9. SSR Zone Arrangements

The EUROCONTROL Guidelines require a 16km safe distance for a "Zone 4 - No Assessment" condition and detailed assessments are required for any proposed wind within 16km of a secondary surveillance radar.

It should be noted that in the UK, NATS (Air Traffic Control) safeguards SSR to a distance of 10km. The guidelines used by NATS (*CAP 764: Chapter 2: Impact of wind turbines on aviation*) state that:

> *"Wind turbine effects on SSR are traditionally less than those on PSRs but can be caused due to the physical blanking and diffracting effects of the turbine towers, depending on the size of the turbines and the wind farm. These effects are typically only a consideration when the turbines are located very close to the SSR i.e. less than 10 km."*

2.6.2.1 Irish Aviation Authority (IAA) Radar Surveillance Sensors

To determine which Assessment Zones are applicable to the proposed wind farm a desktop assessment was carried out. The nearest radar surveillance sites to the proposed wind farm development are at Shannon Airport and Woodcock Hill.

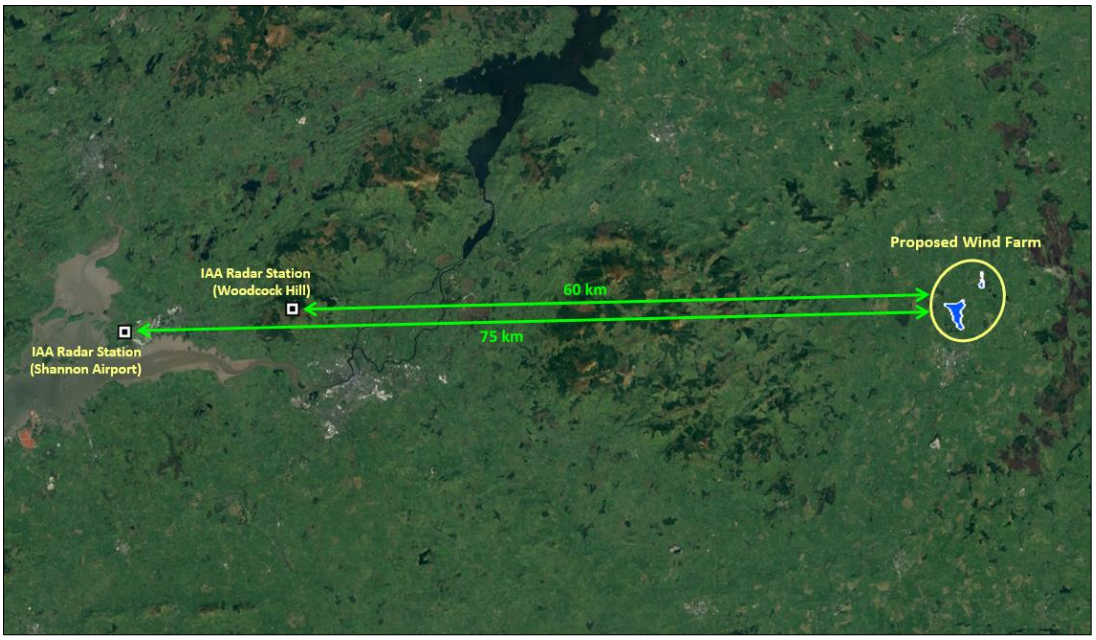


Figure 11. Radar Surveillance Sites relative to Brittas Wind Farm.

2.6.2.1.1 Shannon Airport Radar Assessment

The radar surveillance site at Shannon Airport consists of a PSR and a SSR. The PSR and the SSR antennas are co-located on the same structure at Shannon Airport (Figure 12).

Figure 12. Shannon Airport Radar Station

Table 10 below shows the (EuroControl & NATS) assessment zone applicable to the nearest point where a turbine could potentially be located. The applicable assessment zone has been based on distance from the Radar Station and whether a radar line-of-sight condition exists.

Wind Farm ID	Distance to PSR/SSR Radar Station	Radar LOS Assessment (EuroControl Guidelines)	Radar LOS Assessment (NATS Guidelines – UK)
Brittas	75 km	Detailed Assessment Not Required	Detailed Assessment Not Required

Table 10. EuroControl / UK Safeguarding Guidelines – Shannon Airport Radar Station

As the table above show, the proposed wind farm is within Assessment Zone 4 as specified by the EUROCONTROL guidelines, which would indicate that a detailed technical assessment would not be required for the impact on the PSR/SSR radar station at Shannon Airport.

2.6.2.1.2 Woodcock Hill Radar Assessment

The radar surveillance site at Woodcock Hill consists of a SSR system housed in the dome-shaped structure shown in Figure 13.

Figure 13. Woodcock Hill Radar Station

Table 11 below shows the (EuroControl & NATS) assessment zone applicable to the nearest point where a turbine could potentially be located. The applicable assessment zone has been based on distance from the Radar Station and whether a radar line-of-sight condition exists.

Wind Farm ID	Distance to PSR/SSR Radar Station	Radar LOS Assessment (EuroControl Guidelines)	Radar LOS Assessment (NATS Guidelines – UK)
Brittas	60 km	Detailed Assessment Not Required	Detailed Assessment Not Required

Table 11. EuroControl / UK Safeguarding Guidelines – Woodcock Hill Radar Station

As the table above show, the proposed wind farm is within Assessment Zone 4 as specified by the EUROCONTROL guidelines, which would indicate that a detailed technical assessment would not be required for the impact on the SSR radar station at Woodcock Hill.

2.7 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 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.

It is unlikely that the Flight Inspection Procedures will be impacted as the proposed wind farm is sufficiently far from the airport runways and the flight inspection procedures should already account for the existing obstacles (e.g. terrain and existing wind farms).

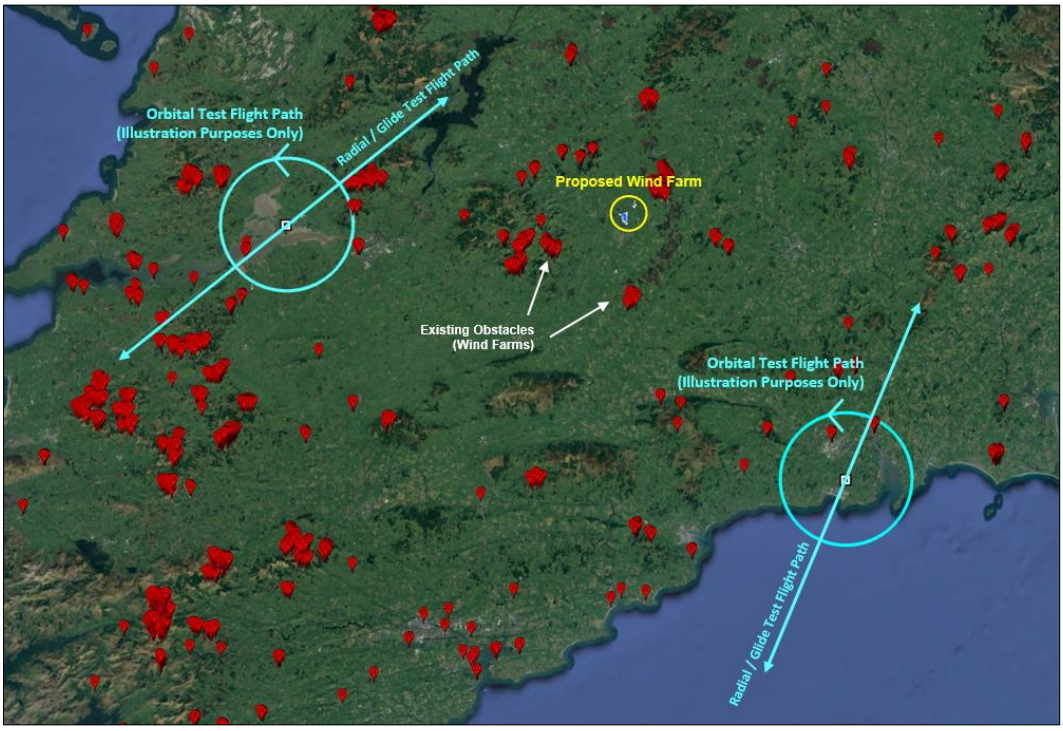


Figure 14. Flight Inspection and Calibration Test Procedures should account for existing obstacles (e.g. terrain and existing wind farms)

2.8 Aeronautical Obstacle Warning Light Scheme

In the event of a grant of planning consent the IAA-ANSP 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

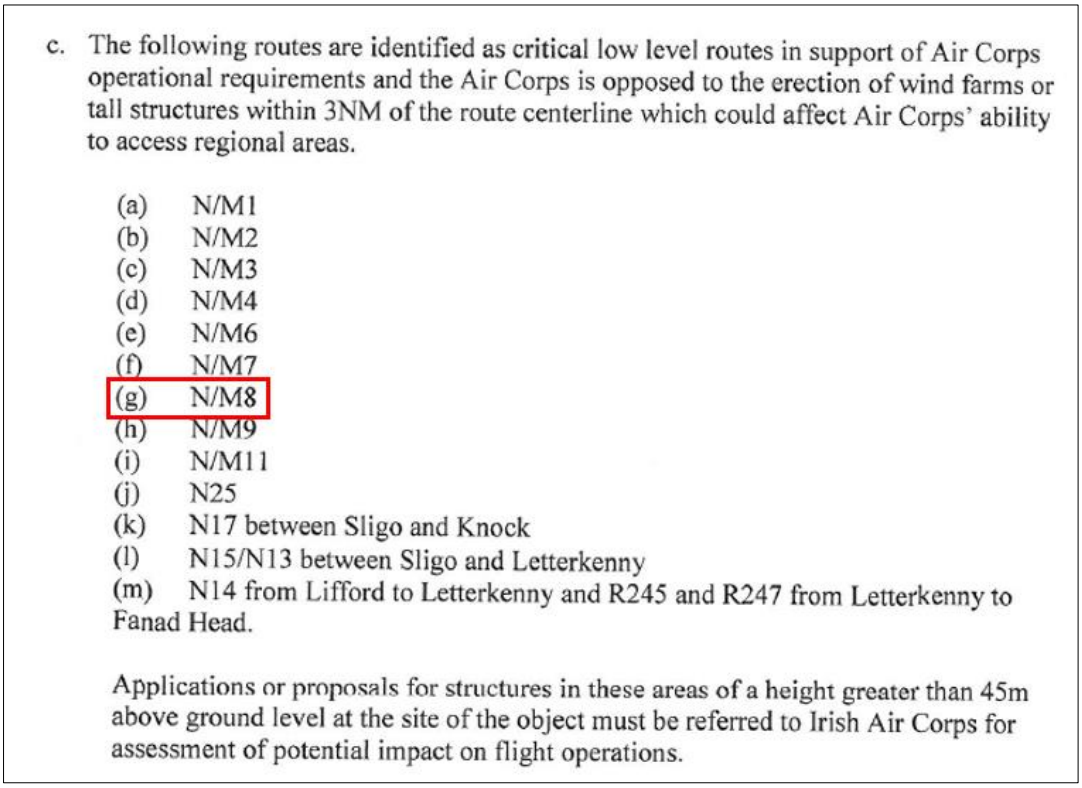
> *"Applicability: When considered as an obstacle a wind turbine should be marked and/or lighted."*

2.9 Irish Air Corps / DoD Safeguarding

The Irish Air Corps 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.
- Low Flying Area – LFTA WEST.
- A distance of 5NM or less from military installations.
- Critical low level flying routes in support of Air Corps operation requirements.

The nearest of the Air Corps restricted areas to the proposed wind farm is the low level flight route around the M8 motorway. The proposed wind farm site is 3.6 NM (6.6 km) from the M8 and is outside the 3 NM restricted area. As the proposed wind farm is located outside the restricted area, there should be no impacts on Irish Air Corps activities.



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 15. Irish Air Corps – Critical Low Level Routes

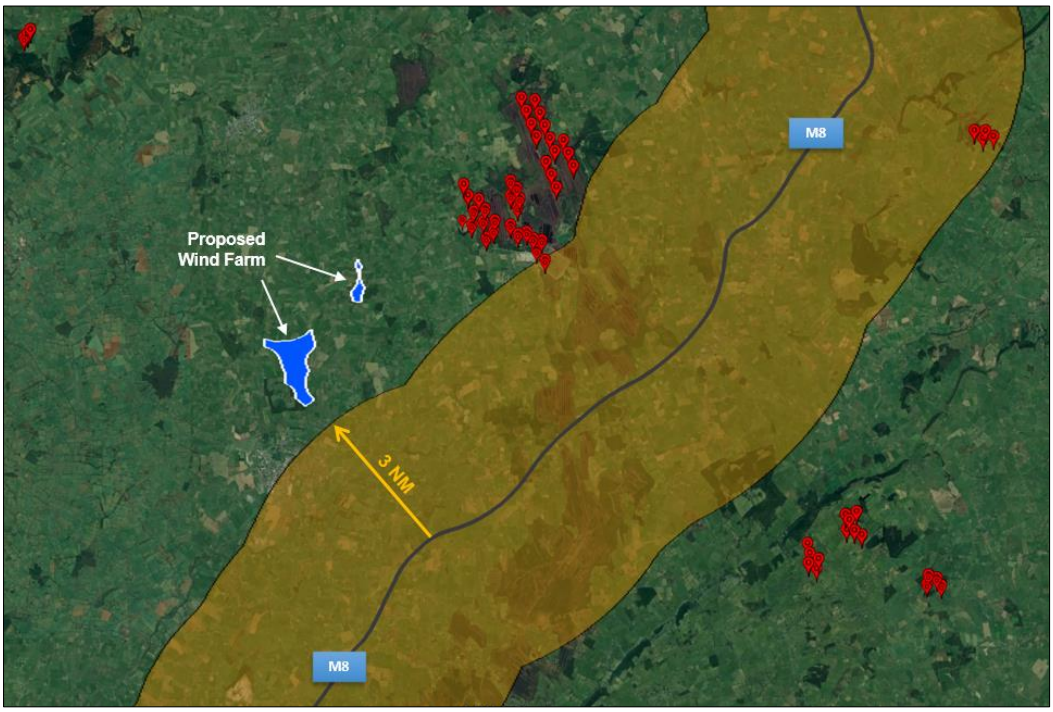


Figure 16. Proposed Wind Farm relative to Critical Low Level Flight Route (M8)

3. Summary

A summary of the aviation review for the proposed wind farm at Brittas is provided in Table 12 below.

Item	Impact	Summary
Annex 14 - Obstacle Limitation Surfaces (OLS)	None	Turbines at the proposed wind farm would be outside the Obstacle Limitation Surfaces for Shannon Airport, Waterford Airport and Moyne Airfield.
Annex 15 - Aerodrome Surfaces	None	Turbines at the proposed wind farm would not penetrate the ICAO Annex 15 Aerodrome Surface for Shannon or Waterford Airports. All obstacles, if more than 100 meters above terrain for a distance of 45km from center point of Shannon Airport, need to be registered in the IAA Air Navigation Obstacle Data Set. The IAA may request that the turbines be included in the IAA Aeronautical Electronic Obstacle Data Sets. It should be noted that other existing tall structures nearer to Shannon and Waterford Airports (e.g. Ballybay, Foyle, Kill Hill, Glenough, Garracummer, Cappawhite, Hollyford etc.) are also located within the ICAO Annex 15 Aerodrome Surface and are already listed in the IAA Aeronautical Electronic Obstacle Data Sets.
Minimum Sector Altitudes (MSA)	None	A review of the Minimum Sector Altitudes (MSA) shows that the proposed wind farm is outside 25 nautical miles from the VOR/DME at Shannon and Waterford Airports. Therefore the MSA of the relevant sectors will not be affected and there will be no impact on the published MSA altitude figures.
Instrument Flight Procedures	None	A review shows that the proposed wind farm site is sufficiently far from Shannon and Waterford Airports that the instrument flight procedures for approach and departure flights to/from the airports are unlikely to be impacted for precision aircraft
Communication and Navigation Systems	None	As the proposed wind farm is over 70 km from the Localizers and transmitting antennas at Shannon and Waterford Airports, it is very unlikely that the proposed development will have any impact on these ATS communications and radio navigational aids.
Radar Surveillance Systems Safeguarding	None	The proposed wind turbines would be located in Assessment Zone 4 (EuroControl guidelines) for SSR and PSR instruments and a detailed Impact Assessment will not be required
Flight Inspection and Calibration	None	The annual Flight Inspection Procedures will not be impacted by the proposed wind farm as the proposed site is sufficiently far from the ARPs at Shannon and Waterford Airports that there would be no impacts.
Aeronautical Obstacle Warning Light Scheme	TBC	It is possible that the IAA may request that the wind farm, if permitted, would be fitted with Aeronautical Obstacle Warning Lights in accordance to industry standards. Subject to further consultation with the IAA.
Irish Air Corps / DoD Safeguarding	None	The proposed wind farm is located outside the Irish Air Corps Restricted Areas.

Table 12. Brittas Wind Farm – Aviation Review Summary

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

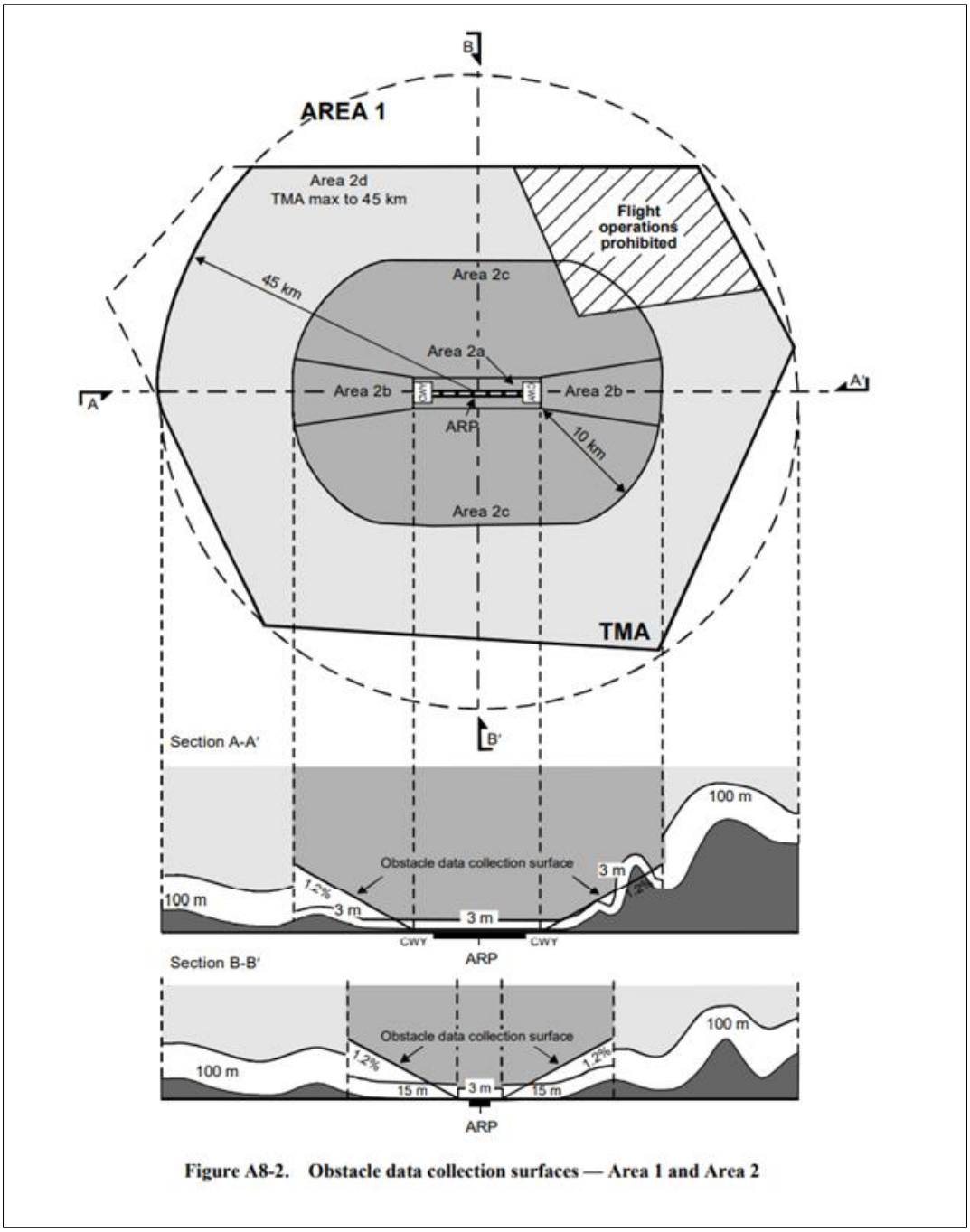


Figure A8-2. Obstacle data collection surfaces — Area 1 and Area 2

ICAO Annex 15 Area 1 and Area 2 Surfaces.