Chapter 13: Aviation

Contents

13.1	Executive Summary	13-1
13.2	Introduction	13-1
13.3	Legislation, Policy and Guidelines	13-1
13.4	Consultation	13-2
13.5	Assessment Methodology and Significance Criteria	13-2
13.6	Baseline Conditions	13-4
13.7	Potential Effects	13-4
13.8	Effects Scoped Out of the Assessment	13-5
13.9	Potential Construction Effects	13-5
13.10	Potential Decommissioning Effects	13-5
13.11	Additional Mitigation and Enhancement	13-5
13.12	Summary	13-6
13.13	References	13-6

13 Aviation

13.1 Executive Summary

13.1.1 Wind turbines have the potential to affect civil and military aviation. This chapter presents the methodology used to undertake the aviation safeguarding assessment, lists the aviation references used and describes the aviation baseline condition, consultation requirements and mitigations to be applied, if required.

13.1.2 The likely effects of the turbines within the Proposed Development on aviation interests were assessed against standard guidance and consultation with stakeholders.

13.1.3 It shows that the only aviation issues that will need to be addressed are those associated with radar visibility of some turbines from Glasgow Airport and the NATS radar at Lowther Hill.

13.1.4 Glasgow Airport have undertaken their own assessment of the potential effect on their Primary Surveillance Radar and the Terma radar and The Applicant is in discussions with them on the radar mitigation scheme to be applied They have also undertaken an assessment of any effects of the Proposed Development on the safeguarding of the Instrument Flight Procedures and confirmed that none will be affected.

13.1.5 Discussions are on-going with NERL for a radar mitigation scheme for Lowther Hill.

13.2 Introduction

13.2.1 This chapter presents the findings of the assessment of effects of the proposed Giant's Burn Wind Farm (the 'Proposed Development') in relation to aviation and defence. The assessment considers potential effects on the aviation and air defence activities of the Ministry of Defence (MOD) as safeguarded by the Defence Infrastructure Organisation (DIO). It also considers the possible effects of wind turbines upon the National Air Traffic Services En Route Ltd (NERL) communications, navigation and surveillance (CNS) systems which consist of a network of primary and secondary radars and navigation facilities around the country. Finally, it considers the possible effects on airport radars and any other aviation stakeholder interests. The aviation assessment was undertaken by WPAC Ltd.

13.2.2 As well as examining the technical impact of wind turbines on Air Traffic Control (ATC) facilities, it is also necessary to consider the physical safeguarding of ATC operations to determine whether a development will breach obstacle clearance criteria.

13.2.3 This assessment should be read in conjunction with Appendix 13.1: Wind Farm Aviation Lighting and Mitigation Report.

13.3 Legislation, Policy and Guidelines

13.3.1 There are a number of aviation publications relevant to the interaction of wind turbines and aviation containing guidance and legislation, which cover the complete spectrum of aviation activity in the UK, as listed below:

- Civil Aviation Authority (2020). Safeguarding of Aerodromes, Version 3, CAP738 CAA;
- Civil Aviation Authority (2010). Safe Operating Practices at Unlicensed Aerodromes, Ed 1, CAP 793 CAA;
- Civil Aviation Authority (2016) Policy and Guidance on Wind Turbines Version 6, CAP764 CAA;
- Civil Aviation Authority (2017). CAA Policy Statement: Lighting of Onshore Wind Turbine Generators in the United Kingdom with a maximum blade tip height at or in excess of 150m Above Ground Level CAA;
- Civil Aviation Authority (2023). Manual of Air Traffic Services, Part 1, Ed 11.0, CAP 493 CAA;
- Civil Aviation Authority (2021). UK Flight Information Services, Ed 4, CAP 774 CAA;
- Civil Aviation Authority (2019). ATS Safety Requirements, Version 3, CAP 670 CAA;
- Civil Aviation Authority (2022). Licensing of Aerodromes, Version 12, CAP 168 CAA;
- Civil Aviation Authority (2020). Parachuting, Ed 5, CAP660 CAA;
- Civil Aviation Authority (2022). Implementation of Safeguarding of Instrument Flight Procedures (IFPs) in the UK, Ed 2, Version 2, CAP 785B CAA;

- Civil Aviation Authority (2021) 'Guidance to crane users on aviation lighting and notification' CAP 1096 CAA: and
- Ministry of Defence (MoD) (2022). Military Aviation Authority Regulatory Article 2330 (Low Flying).

13.3.2 The above noted publications have also been considered in the aviation lighting assessment (Appendix 13.1).

13.4 Consultation

13.4.1 Initial consultation responses were received from aviation stakeholders as a result of EIA Scoping, with further consultation carried out as required. These are reported in Table 13.1.

Table 13.1 – Consultation

Consultee and Date	Consultation Response	Applicant Response
Glasgow Airport 21 March 2024 Scoping Response	The Airport provided a holding response which confirms that the site is outwith the obstacle limitation surfaces for Glasgow Airport but within the radar and flight procedures safeguarding areas. Detailed assessments may be required. The airport will only provide a detailed response once the layout is finalised	– Glasgow Airport were provided with details of the finalised layout on 13/05/25
Glasgow Airport 09/06/25 email response	Glasgow Airport Safeguarding confirmed that there will be no impact upon Instrument Flight Procedures but there will be an effect on radar which can be mitigated through the use of the Terma Scanter 4002 Radar	– The Applicant has engaged with Glasgow Airport to agree the terms of a radar mitigation scheme
NATS En Route Ltd (NERL) March 2024 Scoping Response	NERL confirms that the turbines will be visible to the Lowther Hill and Glasgow Airport radars and that the effect would be unacceptable.	– NERL were reconsulted on 13/05/25 and the applicant has been engaged for some time discussing mitigation options
NATS En Route Ltd (NERL) SG37013 dated 30/05/25	A radar mitigation scheme has been agreed, the applicant has been advised to contact the Renewables Team to progress to contract.	– The applicant continues to engage with NATS and will sign a mitigation contract
MOD DIO 10061845 dated 08 March 2024 Scoping Response	The MOD *'has concerns'* due to the potential physical obstruction the turbines will create and will require aviation lighting	– The applicant has provided a detailed aviation lighting and mitigation report which will satisfy the requirements of the MOD. This report is included in the EIA as a Appendix 13.1 and has been provided to the MOD.
Glasgow Prestwick Airport 05 March 2024 Scoping Response	'*The proposed development is terrain shielded and well clear of all instrument approach procedures. Consequently we would have no comment or valid objection to make'*	– No further action required

13.5 Assessment Methodology and Significance Criteria

Study Area

13.5.1 The assessment of effects of the proposed turbines is based upon the guidance outlined in CAP 764. Consultation criteria for aviation stakeholders is defined in Chapter 4 of CAP764. The following distances inform the size of the study area and have been adopted in undertaking this assessment which comprise:

- Airfield with a surveillance radar – 30 km;
- Non radar licensed aerodrome with a runway of more than 1100 metres – 17 km;
- Non radar licensed aerodrome with a runway of less than 1100 metres – 5 km;
- Licensed aerodromes where the turbines would lie within airspace coincidental with any published Instrument Flight Procedure (IFP);
- Unlicensed aerodromes with runways of more than 800 metres – 4 km;
- Unlicensed aerodromes with runways of less than 800 metres – 3 km;

- Gliding sites – 10 km; and
- Other aviation activity such as parachute sites and microlight sites within 3 km – in such instances developers are referred to appropriate organisations.

13.5.2 CAP 764 further states that these distances are for guidance purposes only and do not represent ranges beyond which all wind turbine developments will be approved, or within which they will always be objected to. These ranges are intended as a prompt for further discussion between developers and aviation stakeholders; which are reported upon in this chapter. For example, Glasgow Prestwick Airport have stated a requirement to be consulted in relation to wind farms out to the maximum range of their radars and Instrument Flight Procedures.

13.5.3 The assessment is desk based, drawing largely from published guidance and data.

13.5.4 It is necessary to take into account the aviation and air defence activities of the Ministry of Defence (MOD) as safeguarded by the Defence Infrastructure Organisation (DIO).

13.5.5 It is also necessary to take into account the possible effects of wind turbines upon the National Air Traffic Services En Route Ltd (NERL) communications, navigation and surveillance (CNS) systems – a network of primary and secondary radars and navigation facilities around the country.

13.5.6 In addition to examining the technical impact of wind turbines on Air Traffic Control (ATC) facilities, it is also necessary to consider the physical safeguarding of ATC operations, using the criteria laid down in CAP 168 Licensing of Aerodromes, to determine whether a proposed development will breach obstacle clearance criteria. In this case, there are no physical safeguarding issues associated with the Proposed Development.

Assessment Methodology

13.5.7 The radar calculation results referred to in this chapter were produced using specialist propagation prediction software (RView Version 5). Developed over a number of years by WPAC, it has been designed and refined specifically for the task. RView is used to identify potential aviation effects of the Proposed Development. The results are then used as a basis for consultation and liaison with relevant aviation bodies, as detailed below. RView models terrain using the Ordnance Survey (OS) Terrain 50 digital terrain model, which has a post spacing of 50 m and has a root mean square (RMS) error of 4 m. The results are verified using the Shuttle Radar Topography Mission (SRTM) dataset, a separate smoothed digital terrain model with data spacing of 3 arc seconds. By using two separate and independently generated digital terrain models, anomalies are identified and consistent results assured. Rview models the refractive effects of the atmosphere on radio waves and the First Fresnel Zone. A feature of RView is that as well as performing calculations in the manner believed to be most appropriate, it also allows comparison with results from simpler models. For example, RView can perform calculations using the true Earth Radius at the midpoint between the radar and the wind turbine or the simplified 4/3 Earth Radius model. If needed, Rview is also capable of modelling a range of atmospheric refractive conditions. RView models the trajectory of radar signals at different elevations allowing modelling of both volume surveillance and pencil beam radars as well as the effects of angular sterilisation as applied, for example, in Met Office radars.

Assessing Significance

13.5.8 There is no agreed or mandated definition of significance when assessing development proposals for wind farms in relation to aviation. Whilst technical effects on communications, navigation and surveillance (CNS) systems are simple to identify and evaluate, operational and flight safety effects can be subjective and are often challenged by third parties. It is sufficient in this context to identify any technical effects and then, taking into account the statements in CAP 764 regarding the status of aviation stakeholders, in general to accept the judgement of those stakeholders in assessing the significance of the effects. For example CAP 764 states:

"*Where an ANSP determines that it is likely that a planned wind turbine development would result in any of the above effects on their CNS infrastructure, this may not, in itself, be sufficient reason to justify grounds for rejection of the planning application. The ANSP must determine whether the effect on the CNS infrastructure has a negative impact on the provision of the ATS. The developer should pay for an assessment of appropriate mitigating actions that could be taken by the ANSP and/or wind energy developer to deal with the negative impact. The position of an ANSP at inquiry would be significantly degraded if they had not considered all potentially appropriate mitigations.*"

13.5.9 Therefore, it is not considered to be appropriate for the Applicant to make an assessment of the significance of an effect in relation to aviation interests. Also, it is often the case that different Air Navigation Service Providers (ANSP) take a different view of the same scenario and may disagree with the assessment findings; this can require further post submission consultation, to confirm the findings of the assessment and/or agree to the need for and extent of mitigation. Therefore, this assessment does not make a judgement of significance, but is focussed on identifying potential impacts and agreeing mitigation with aviation stakeholders as required.

13.6 Baseline Conditions

13.6.1 The Proposed Development is located 35 km to the north-west of Glasgow Airport and 9 km to the west of the western boundary of Class D regulated airspace designated as the Glasgow Control Zone (CTR) and the Scottish Terminal Area (TMA). It is located within Class G unregulated airspace which extends upwards to 5500 ft above mean sea level (AMSL) above which is Class E regulated airspace in the form of a corridor used by traffic transiting from Glasgow to Tiree and beyond. The only other airspace constraint in the area is Prohibited Area P611, 8 km to the north-east, established to protect Faslane and Coulport. From a military perspective, the Proposed Development is remote from any military units or airspace.

13.7 Potential Effects

13.7.1 The turbine layout of the Proposed Development has changed slightly since Scoping and initial consultation was completed and it is, therefore, essential to reassess what the effect of the application layout will be on aviation and defence. The following section assesses the effect on both radar and non-radar facilities, in accordance with the guidance in CAP 764.

Radar Equipped CAA Licensed Aerodromes

13.7.2 The only such facility within consultation distance is Glasgow Airport. As already agreed with Glasgow, the Proposed Development is beyond the distance within which physical safeguarding will be required. Radar modelling against both the Glasgow Primary Surveillance Radar (PSR) and the Terma Scanter 4002 wind farm mitigation radar have been undertaken with the results in Tables 13.2 and13.3 below.

Table 13.2 Glasgow Airport PSR Radar Line of Sight Results

Turbine	Distance (km)	Radar Line of Sight (m AGL)
1	35.238	204.1
2	35.067	185.7
3	35.226	174.7
4	35.614	188.9
5	34.991	147.4
6	35.216	172.3
7	35.628	180.6

Table 13.3 Glasgow Airport Terma Scanter 4002 Radar Line of Sight Results

Turbine	Distance (km)	Radar Line of Sight (m AGL)
1	35.107	185.3
2	34.937	248.8
3	35.098	188.7
4	35.487	233.2
5	34.864	195
6	35.09	163.8
7	35.502	166.4

13.7.3 The results show that when a 200 m tip height turbine is being assessed, there is marginal visibility of the turbines from the PSR for six out of seven locations, with T1 being completely screened by terrain and the remainder partially screened. For the Terma radar the results are similar with two turbines being screened by terrain and five visible. There is the potential for the turbines within the Proposed Development to be visible to the PSR and create radar clutter on the displays at Glasgow Airport. Discussions with Glasgow Airport safeguarding staff have determined that the effect t will require mitigation, the Terma radar will need to be configured to manage the effect and then capable of providing such mitigation. The Applicant has engaged with Glasgow Airport to agree terms to undertake the required mitigation and this issue can therefore be managed through the imposition of a suitably worded planning condition to protect the interests of the airport.

13.7.4 **Instrument Flight Procedures** – Glasgow Airport have undertaken their own assessment of the effect on Instrument Flight Procedures and determined that the Proposed Development will have no effect on the Instrument Flight Procedures.

Non-Radar CAA Licensed Aerodromes

13.7.5 None within or close to consultation distance

Unlicensed Aerodromes, Gliding and Micro-light Sites

13.7.6 None marked on aviation charts or known within or close to consultation distance

NATS En Route (NERL) Communications, Navigation and Surveillance (CNS) Systems

13.7.7 The NATS scoping response stated that the Proposed Development would affect two radars, Lowther Hill and Glasgow Airport PSR. In the case of Glasgow this should not affect NERL operations as it is understood that they now take a feed from the Glasgow Terma and not the PSR. Further discussions with NERL have confirmed their position that they now take a data feed from the Terma Radar which will require a blank.In the case of the Lowther Hill radar, radar line of sight results are shown in Table 13.4.

Table 13.4 NERL Lowther Hill Radar Line of Sight Results

Turbine	Distance (km)	Radar Line of Sight (m AGL)
1	100.57	46.7
2	100.602	32.9
3	100.929	33.5
4	101.372	86.7
5	100.872	128.9
6	101.23	188.6
7	101.681	181.3

13.7.8 These results confirm that every turbine will be visible to the Lowther Hill radar and have the potential to create unwanted 'radar clutter' and possible obscuration effects. The Applicant has engaged with NERL to discuss a radar mitigation scheme; they have proposed that the required mitigation will be to blank out the resultant clutter within the radar system as there is already sufficient overlapping unaffected radar coverage available from other radars within the system, specifically the Tiree radar. It is therefore appropriate to agree a mitigation scheme with NERL and protect their interests through the imposition of a suitably worded planning condition.

Ministry of Defence ATC Radars

13.7.9 In this case there are no affected MOD ATC radars as confirmed by MOD DIO at scoping

Ministry of Defence Low Flying

13.7.10 The Applicant will provide the MOD with a comprehensive lighting report which will detail the arrangement and specification of MOD standard infra-red lighting.

13.8 Effects Scoped Out of the Assessment

13.8.1 There is no requirement to consider the effects on Met Office radars as the closest radar is at Holehead, north of Glasgow and in excess of 48 km from the Proposed Development. The Met Office only require to be consulted in relation to wind turbine proposals within 20 km of their weather radar facilities.

13.9 Potential Construction Effects

13.9.1 There are no technical effects on aviation interests during construction. The only aviation issues are those associated with the operation of large cranes which will be the subject of standard conditions for crane operations as laid down in CAA CAP1096 'Guidance to crane users on aviation lighting and notification'.

13.10 Potential Decommissioning Effects

13.10.1 There are no technical effects on aviation interests during decommissioning. The only aviation issues are those associated with the operation of large cranes which will be the subject of standard conditions for crane operations as laid down in CAA CAP1096 'Guidance to crane users on aviation lighting and notification'.

13.11 Additional Mitigation and Enhancement

13.11.1 Wind turbines with a tip height in excess of 150 m are required to be illuminated with medium-intensity red aviation obstruction lights installed on the turbine hub in accordance with the Civil Aviation Authority Policy Statement: 'Lighting of Onshore Wind Turbine Generators in the United Kingdom with a maximum blade tip height at or in excess of 150 m Above Ground Level'. The Applicant provided a reduced lighting scheme that fulfils the requirements for flight safety whilst minimising environmental (visual) effects and gained approval from the CAA for the design (see Appendix 13.1 for details of the proposed mitigation). This sets out the arrangement of the aviation lights, together with an assessment of the intensity of the visible lights at selected viewpoints assessed in the LVIA (see Chapter 5: Landscape and Visual Impact Assessment) and provides an estimate of the percentage of time that the lights will be at full power and at 10% intensity based on historical Met Office records of visibility and cloudbase in the region. Each turbine will be fitted with MOD specification infra-red lighting to mitigate effects on military low flying, these will not be visible to the human eye. The implementation of the proposed lighting scheme (both visible and infra-red) will be subject to a suspensive planning condition to the consent if granted.

Statement of Competence

13.11.2 The Aviation Chapter has been written by Cdr John Taylor RN (Ret) of Wind Power Aviation Consultants Ltd (WPAC). John has over 35 years of experience as an Air Traffic Controller, Fighter Controller and Aviation Regulator and was head of Air Traffic Control for the Royal Navy. His responsibilities included responding to wind farm consultations on and offshore. Since 2008, WPAC has provided advice on the interaction between wind turbines and aviation, including assessing over 3000 wind turbine proposals and has given evidence at over 20 Public Inquiries and appeals in England and Scotland. He has also advised a number of Local Authorities on aviation related issues. WPAC has expertise in a number of areas including radar propagation and modelling, general aviation operations, turbine induced turbulence, aviation lighting and low flying operations.

13.12 Summary

13.12.1 The Proposed Development is located in an area that is relatively remote from significant aviation constraints. The turbines will be visible to the Primary Surveillance Radar at Glasgow Airport and the NATS radar at Lowther Hill. There are technical mitigations available for both radars. In addition, aviation lighting will be installed to satisfy both the requirements of the MOD and the Civil Aviation Authority (CAA) as detailed in the aviation lighting technical appendix.

13.13 References

Civil Aviation Authority (2020). Safeguarding of Aerodromes, Version 3, CAP738 CAA;

Civil Aviation Authority (2010). Safe Operating Practices at Unlicensed Aerodromes, Ed 1, CAP 793 CAA;

Civil Aviation Authority (2016) Policy and Guidance on Wind Turbines Version 6, CAP764 CAA;

Civil Aviation Authority (2017). CAA Policy Statement: Lighting of Onshore Wind Turbine Generators in the United Kingdom with a maximum blade tip height at or in excess of 150m Above Ground Level CAA;

Civil Aviation Authority (2023). Manual of Air Traffic Services, Part 1, Ed 11.0, CAP 493 CAA;

Civil Aviation Authority (2021). UK Flight Information Services, Ed 4, CAP 774 CAA;

Civil Aviation Authority (2019). ATS Safety Requirements, Version 3, CAP 670 CAA;

Civil Aviation Authority (2022). Licensing of Aerodromes, Version 12, CAP 168 CAA;

Civil Aviation Authority (2020). Parachuting, Ed 5, CAP660 CAA;

Civil Aviation Authority (2022). Implementation of Safeguarding of Instrument Flight Procedures (IFPs) in the UK, Ed 2, Version 2, CAP 785B CAA;

Civil Aviation Authority (2021) : Guidance to crane users on aviation lighting and notification' CAP 1096 Version 2.2 CAA:

Ministry of Defence (MoD) (2022). Military Aviation Authority Regulatory Article 2330 (Low Flying).