

16 Aviation

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16. Aviation

16.1. Summary

- 16.1.1. This Chapter of the EIA Report describes the likely effects of the Proposed Varied Development on aviation stakeholder interests and reports on consultation and potential mitigation solutions. It outlines that the only aviation issues that will need to be addressed are the effects on the NATS En Route (NERL) Lowther Hill radar and on Ministry of Defence (MOD) low flying.
- 16.1.2. When considering a comparison of aviation effects between the Consented Development and the Proposed Varied Development, it is considered that there is very little difference except for the requirement for aviation lighting which is addressed within **Appendix 16.1: Aviation Lighting and Mitigation Report**.

Table 16.1 – Summary of Conclusions – Proposed Varied Development and Consented Development

2018 Section 36 Application, supported by Additional Environmental Information I (2019) and Additional Environmental Information II (2021) - the Consented Development	2026 Section 36C Application - the Proposed Varied Development
The EIA concluded that radar mitigation for the NATS Lowther Hill radar would be required through the use of a radar blank.	The mitigation required for the Proposed Varied Development as agreed with NATS is for the turbine effects to be mitigated through the use of technical capabilities built into the Indra Lanza radar now operational at Lowther Hill. The Applicant will be signing a radar mitigation contract with NATS.
The EIA concluded that the only aviation lighting required was for infra-red lighting to fulfil the MOD requirement.	Aviation lighting will be required as defined in the Aviation Lighting and Mitigation Report in Appendix 16.1 .

16.2. Introduction

- 16.2.1. This Chapter presents the findings of the assessment of effects of the Proposed Varied Development in relation to aviation. 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.

- 16.2.2. 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.
- 16.2.3. This assessment should be read in conjunction with **Appendix 16.1: Wind Farm Aviation Lighting and Mitigation Report**, as well as Chapter 16: Aviation of the Environmental Impact Assessment (EIA) Report (Infinergy, 2018), and Chapter 16: Aviation of the Additional Environmental Information (AEI) Report (Infinergy, 2019) for the Consented Development.
- 16.2.4. 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.

16.3. Legislation, Policy and Guidelines

- 16.3.1. 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 (2025) Policy and Guidance on Wind Turbines Version 7, 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 (2025). Manual of Air Traffic Services, Part 1, Ed 12.0, 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 (2025). Licensing of Aerodromes, Version 13, 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).

16.3.2. The above noted publications have also been considered in the aviation lighting assessment.

16.4. Consultation

16.4.1. **Table 16.2** provides details of consultation undertaken with relevant regulatory bodies, together with action undertaken by the Applicant in response to consultation comments.

Table 16.2 – Consultation

Consultee	Key Consultee Comments	Application Action
MOD DIO 18347 Scoping Response (22 August 2024)	MOD raised concerns relating to physical obstruction for low flying.	MOD require IR lighting and CAA lighting. The Aviation Lighting Report included as Appendix 16.1 addresses this issue. A copy of the Lighting Report has been sent to the MOD.
Edinburgh Airport Scoping Response (07 August 2024)	The Proposed Varied Development falls outwith the aerodrome safeguarding zone. No objection.	No action required.
Glasgow Airport GLA4514 Scoping Response (12 August 2024)	The site is outwith the radar and physical safeguarding areas but an Instrument Flight Procedure (IFP) assessment will be required.	The Applicant has contacted Glasgow Airport, however, the Proposed Varied Development is located 71 km to the south, and it is unlikely that a full IFP assessment will be required. Additional consultation with Glasgow Airport has taken place and the Applicant is awaiting a response on their position at the time of writing (May 2026).
Glasgow Prestwick Airport Scoping Response (29 July 2024)	The site remains heavily terrain shielded from the radars at Glasgow Prestwick Airport and well below any protected surfaces. No objection.	No further action required.

Consultee	Key Consultee Comments	Application Action
NATS Scoping Response (30 July 2024) TOPA SG36361	The Lowther Hill and Great Dun Fell radars will be affected which is considered unacceptable by the Prestwick ATC Centre.	Mitigation has been agreed with NATS utilising the wind farm mitigation capabilities of the Indra Lanza radar now installed at Lowther Hill.

16.5. Assessment Methodology and Significance Criteria

Study Area

- 16.5.1. 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 (m) – 17 km;
 - Non radar licensed aerodrome with a runway of less than 1100 m – 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 m – 4 km;
 - Unlicensed aerodromes with runways of less than 800 m – 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.
- 16.5.2. 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.
- 16.5.3. The assessment is desk based, drawing largely from published guidance and data.
- 16.5.4. It is necessary to take into account the aviation and air defence activities of the MOD as safeguarded by the DIO.

- 16.5.5. It is also necessary to take into account the possible effects of wind turbines upon the NERL communications, navigation and surveillance (CNS) systems – a network of primary and secondary radars and navigation facilities around the country.
- 16.5.6. In addition to examining the technical impact of wind turbines on 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 Varied Development.

Radar Modelling Methodology

- 16.5.7. 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 Varied 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

- 16.5.8. 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 para 2.36 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.”

- 16.5.9. 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 focused on identifying potential impacts and agreeing mitigation with aviation stakeholders as required.

16.6. Baseline Conditions

- 16.6.1. The Proposed Varied Development is located 40 km to the south-east of Glasgow Prestwick Airport and over 70 km to the south of Glasgow Airport and Edinburgh Airport. The location is therefore remote from any significant aviation facilities and lies under Class G unregulated airspace which extends upwards to 5500 ft above mean sea level (AMSL). Above that the airspace changes to Class D regulated airspace designed for the protection of aircraft operating in and out of Glasgow, Edinburgh and Glasgow Prestwick Airports.

16.7. Assessment of Effects

Effects Scoped Into the Assessment

- 16.7.1. The turbine layout of the Proposed Varied Development has changed slightly since Scoping and when initial consultation was completed. It is therefore essential to reassess what the effect of the Proposed Varied Development's 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

- 16.7.2. There are no radar equipped CAA licensed aerodromes within consultation distance of the Proposed Varied Development, the closest is Glasgow Prestwick Airport 40 km to the north-west. Radar modelling against both the existing primary surveillance radar (PSR) and the Terma Scanner 4002 Windfarm Radar has been undertaken with the results showing that there is no possibility of the Proposed Varied Development affecting either radar at Glasgow Prestwick Airport. The airport was consulted and confirmed that the turbines will be screened by terrain and also confirmed that there will be no effect on the Instrument Flight Procedures and they have no objection to the Proposed Varied Development
- 16.7.3. Radar modelling was also undertaken against the radars at Glasgow and Edinburgh Airports. Again, it is clear that none of the turbines will be visible to the radars at either airport. The location of the Proposed Varied Development is also well beyond the distance within which an assessment of any effects on Instrument Flight Procedures is usually required. Edinburgh Airport have confirmed they have no objection to the Proposed Varied

Development and Glasgow Airport have confirmed that they will not be objecting on radar grounds but have requested an IFP Assessment be undertaken, however as the airport is over 70 km to the north of the Proposed Varied Development this is considered unnecessary and the airport have been reconsulted and provided with calculations showing the turbines will not affect the ATC Surveillance Minimum Altitude Chart (ATCSMAC) requirements.

Non-Radar Equipped CAA Licensed Aerodromes

- 16.7.4. There are no non-radar equipped CAA licensed aerodromes within or even close to consultation distance of the Proposed Varied Development, the closest is at Campbeltown, over 100 km to the west. Campbeltown's operations will be unaffected.

Unlicensed Aerodromes, Gliding and Micro-light Sites

- 16.7.5. There are no unlicensed aerodromes, gliding or micro-light sites within consultation distance of the Proposed Varied Development, the closest marked on aviation charts is at Glenswinton, over 23 km to the south. Consultation is not required and there will be no effect on aerodrome operations.

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

- 16.7.6. There are two radars with low level coverage in this location, Lowther Hill and Great Dun Fell. Radar modelling has been undertaken which indicates that the turbines will be visible to both radars. Consultation with NATS has confirmed via email (dated 23/12/24, refer to **Table 16.2**) that the mitigation scheme previously agreed for the Consented Development will also provide suitable technical mitigation for the Proposed Varied Development. A mitigation contract will be agreed between the applicant and NATS which will enable NATS to withdraw their objection.

Ministry of Defence ATC and Air Defence Radar

- 16.7.7. Radar modelling shows that there are no affected radars, the closest is at RAF Spadeadam, over 100 km to the south-east. The MOD have confirmed that no radars will be affected by the Proposed Varied Development.

Ministry of Defence Low Flying

- 16.7.8. The MOD stated that the Proposed Varied Development had the potential to introduce a physical obstruction to low flying aircraft operating in the area, however, the Consented Development would have had a very similar effect. The MOD withdrew their objection to the Consented Development provided that suitable infra-red aviation lighting was installed. As the Proposed Varied Development is planned to have taller turbines, the aviation lighting mitigation scheme now includes both infra-red and visible red lights. The proposed lighting scheme has been provided to the MOD, however as it is intended to install an infra-red light on every turbine, there will be no requirement for any concession from the MOD.

16.8. Potential Effects

Construction

- 16.8.1. 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*'.

Operation

- 16.8.2. Moving turbine blades have the potential to effect the performance of the NATS Lowther Hill radar, however this will be mitigated through the use of technical capabilities built into the radar specifically to enable wind turbine effects to be overcome. No other operational technical effects are anticipated.

Decommissioning

- 16.8.3. 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*', as noted above.

16.9. Additional Mitigation and Enhancement

Aviation Lighting

- 16.9.1. 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 has provided a reduced lighting scheme that fulfils the requirements for flight safety whilst minimising environmental (visual) effects and has gained approval from the CAA for the design (see **Appendix 16.1** 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 Landscape and Visual Impact Assessment (refer to **Chapter 8**) 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. As noted above, each turbine will be fitted with MOD specification IR lighting to mitigate effects on military low flying. 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.

16.10. Summary

- 16.10.1. The Proposed Varied Development has been assessed from an aviation perspective and the likely effects of the Proposed Varied Development on aviation operations are very limited. There are no affected civil or military airfields, and the only technical effects are on the NERL radar for which a mitigation scheme has been identified and agreed with NATS. From a military perspective the only minor effect is on military low flying, and this can be mitigated through the installation of infrared lights. Some turbines will also need to have medium intensity aviation obstruction lighting installed as the turbines will be in excess of 150 m to tip. With the exception of the requirement for aviation lighting, this presents very little difference to the assessment findings for the Consented Development.

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 (2025) Policy and Guidance on Wind Turbines Version 7, 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 (2025). Manual of Air Traffic Services, Part 1, Ed 12.0, CAP 493 CAA;
- Civil Aviation Authority (2021). UK Flight Information Services, Ed 4, CAP 774 CAA;
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- Civil Aviation Authority (2021): Guidance to crane users on aviation lighting and notification' CAP 1096 Version 2.2 CAA:
- Infinergy (2018). Shepherds' Rig Wind Farm Environmental Impact Assessment Report. Available at: <https://www.shepherdsrigwindfarm.co.uk/downloads/>
- Infinergy (2019). Shepherds' Rig Additional Environmental Information Report I. Available at: <https://www.shepherdsrigwindfarm.co.uk/downloads/>
- Ministry of Defence (MoD) (2022). Military Aviation Authority Regulatory Article 2330 (Low Flying).

Abbreviations

Abbreviations	Definition
AGL	Above Ground Level
ANO	Air Navigation Order
AMSL	Above Mean Sea Level
ATCSMAC	ATC Surveillance Minimum Altitude Chart
ATC	Air Traffic Control
CAA	Civil Aviation Authority
CNS	Communications, Navigation and Surveillance Systems

DIO	Defence Infrastructure Organisation
IR	Infra-Red
MOD	Ministry of Defence
NATS	National Air Traffic Services Ltd
NERL	NATS En Route Ltd