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14.0 Aviation

14.1 Introduction

This chapter considers the likely significant effects on aviation associated with the construction, operation and decommissioning of the proposed development. The specific objectives of the chapter are to:

- describe the current baseline;
- describe the assessment methodology and significance criteria used in completing the impact assessment;
- describe the potential effects, including direct, indirect and cumulative effects;
- describe the mitigation measures proposed to address the likely significant effects; and
- assess the residual effects remaining following the implementation of mitigation measures.

The assessment has been carried out by Malcolm Spaven of Gladhouse Planning Ltd (trading as Aviatica). Aviatica is a specialist aviation consultancy with over 25 years of experience assessing the impacts of wind energy developments on aviation. This has included the preparation of more than one hundred Environmental Impact Assessment (EIA) chapters for projects across the UK and assessment of six previous wind farm developments in Moray.

The chapter is supported by:

- **Technical Appendix 14.1: Reduced Lighting Scheme**

14.2 Legislation, Policy and Guidance

Legislation relevant to the potential aviation effects of wind energy developments includes:

- the Air Navigation Order (ANO) 2016; and
- The Town and Country Planning (Safeguarded Aerodromes, Technical Sites and Military Explosives Storage Areas) (Scotland) Direction 2016.

Civil Aviation Authority (CAA) policy on wind turbines is set out in Civil Aviation Publication (CAP) 764. This contains the CAA's position on the impacts of wind turbines on radar, radio navigation aids, physical obstacle hazards to aircraft and turbulence; describes a range of mitigations that may be applied; and outlines the process of assessing the aviation impacts of wind energy developments in the planning system. The current edition of CAP 764 is dated 2016. A revised version is being drafted and is expected to be published in 2023 but has not been published at the time of writing.

CAA policy on the requirements for lighting of onshore wind turbines with blade tip heights of 150m or more is set out in a Policy Statement published in June 2017. This expands on the requirements set out in the Air Navigation Order (ANO) Article 222. The main requirements are as follows:

- a medium intensity (2000 candela) steady red light on the nacelle of each turbine;
- low intensity (32 candela) lights at the midpoint on the turbine tower;
- lights to be switched on and off by an appropriate control device such as a timer;
- 2000 candela lights may be dimmed to 10% of peak intensity (i.e. to an intensity of 200 candela) when the meteorological visibility exceeds 5km.

Alternative schemes of aviation lighting on onshore wind turbines may be approved by the CAA under the terms of Articles 222(6) and 222(7) of the ANO.



14.3 Scope and Consultation

14.3.1 Consultation

Consultations with aviation stakeholders have been completed as shown in **Table 14.1**.

Table 14.1: Aviation consultations

| Consultee | Response | Applicant's response |
|--|---|---|
| Aberdeen Airport (21 December 2021) | The proposed site is located within the wind farm consultation zone for Aberdeen Airport and as such aviation impacts should be considered as part of the EIA. It is also within the Instrument Flight Procedure safeguarding area and this should be considered as part of the EIA. | Impacts on Aberdeen Airport have been considered in this Chapter. |
| Highlands & Islands Airports Ltd (HIAL) (21 December 2021) | Our calculations show that, at the given position the proposed wind farm redesign would not infringe the safeguarding criteria for the following: Obstacle Limitation Surfaces, Instrument Flight Procedures and ATC Surveillance Minima Chart for Inverness Airport. However, Highlands and Islands Airports Ltd requests that an Aviation Study is undertaken to determine if there would be an impact to the Primary Surveillance Radar at Inverness Airport due, including a line-of-sight assessment, by the proposed wind farm redesign. In addition, details of any proposed aviation lighting should also be included in the study. | An Aviation Study is being commissioned for the proposed development. |
| Ministry of Defence (MoD) (17 December 2021) | The turbines will be 27.9km from, detectable by, and will cause unacceptable interference to the ATC radar used by RAF Lossiemouth. The turbines will be 28.5 km from, detectable by, and will cause unacceptable interference to the PAR at RAF Lossiemouth. The development proposed will cause a potential obstruction hazard to military low flying training activities. To address this impact, it would be necessary for the development to be fitted with MOD accredited aviation safety lighting in accordance with the Civil Aviation Authority, Air Navigation Order 2016. | An assessment of the likely operational effects of the proposed development has been undertaken, and mitigation proposed as required. The turbines will be fitted with appropriate MOD aviation safety lighting. |
| NATS En Route Ltd (NERL) (2 December 2021) | The proposed development has been examined from a technical safeguarding aspect and does not conflict with our safeguarding criteria. Accordingly, NATS (En Route) Public Limited Company ("NERL") has no safeguarding objection to the proposal. | Noted. |

14.3.2 Effects Scoped Out

Potential effects on Meteorological Office radars, aeronautical radio navigation aids and unlicensed aerodromes have been scoped out of the assessment because there are no such facilities within the study areas.



14.4 Approach and Methodology

14.4.1 Scope of Assessment

This chapter considers all potentially significant effects on aviation. Review of the aviation baseline and the responses to scoping consultation identified the following aviation receptors as potentially subject to significant effects:

- the RAF Lossiemouth primary surveillance radar (PSR);
- the RAF Lossiemouth precision approach radar (PAR);
- the air defence PSR at Remote Radar Head (RRH) Buchan;
- the Inverness Airport PSR;
- the instrument flight procedures (IFPs) associated with Aberdeen Airport, Inverness Airport and RAF Lossiemouth; and
- military aircraft flying at low level.

14.4.2 Baseline Characterisation

14.4.2.1 Study Area

The study areas for the aviation assessment were selected using the recommended distances set out in CAA guidance (CAP 764), modified to ensure that all radars with the range to detect wind turbines are included. The distances used are radii from the centre of the Site, as follows:

- 150 km for air traffic control and air defence primary surveillance radars;
- 30 km for Meteorological Office rainfall radars;
- 20 km for secondary surveillance radars and aeronautical radio navigation aids;
- 30 km for licensed, certificated and Government aerodromes;
- 60 km for IFPs;
- 10 km for unlicensed aerodromes, airstrips and gliding sites.

The determination of the aviation baseline has also been informed by consultation responses from aviation stakeholders.

14.4.2.2 Information and Data Sources

The aviation baseline assessment was carried out by consulting the UK Aeronautical Information Publication (AIP), the UK Military AIP, civil and military aeronautical charts, published MoD and NERL radar coverage charts and Aviatica in-house databases of aviation infrastructure and assets. The determination of the aviation baseline has also been informed by consultation responses from aviation stakeholders.

14.4.2.3 Assessment Methods

The aviation assessment has followed the CAA guidance in CAP 764. Radar line of sight has been modelled using Global Mapper software supplemented with digital terrain data at an appropriate resolution. Effects on IFPs have been assessed by comparing the maximum heights of turbines with published and proposed minimum procedure altitudes. Effects on military low flying have been assessed by reviewing the proposed development against airspace boundaries, existing terrain and obstacle constraints.



14.4.2.4 Assumptions, Limitations and Confidence

Assessment of the effects on the RAF Lossiemouth PSR has been limited by the fact that data on the radar’s performance against wind turbines since it entered service is not in the public domain. However, manufacturer’s trials data has been used in carrying out the assessment.

Assessment of the effects on the RAF Lossiemouth PAR has been limited by the fact that data on the radar’s performance against wind turbines is not available due to US trade restriction regulations. However, data on trials of the PAR against wind turbines at RAF Lossiemouth and RAF Marham in 2009 have been used in carrying out the assessment.

14.4.3 Significance Criteria

Significance criteria for assessment of impacts on aviation, unlike those for environmental effects, are not based on the sensitivity of the receptor. Further, while magnitude of impact can be determined in some circumstances, it typically does not provide a standardised metric on which to measure the significance of any effects. In this context, the significance of effects on aviation has been determined in this chapter by application of professional judgement, underpinned by consideration of the magnitude of impact (where measurable), the regulations and procedures in place for ensuring that aviation infrastructure meets required performance standards, the safeguarding policies and practices in use by specific aviation stakeholders, and the consultation responses from those stakeholders.

Residual adverse effects of the proposed development on aviation are described as either nil, negligible, minor, moderate or major. Nil, negligible or minor impacts are categorised as not significant. Moderate or major effects are categorised as significant. The definitions of these criteria are shown in **Table 14.2**.

Table 14.2: Significance criteria

| Significance of Effect | Description |
|------------------------|---|
| Major | Regular, frequent or permanent effects which require changes to existing operational and/ or technical practice in order to mitigate adequately, or which are not capable of being mitigated adequately; and/or the owner of the affected aviation asset requires mitigation; and/or mitigation is required by law. |
| Moderate | Periodic effects experienced which may require alterations to existing operational practice; and/or the owner of the affected aviation asset requires mitigation; and/or mitigation is required by law. |
| Minor | Occasional effects experienced which do not require any alteration of existing operational and technical practice. |
| Negligible | Normally no measurable change from baseline conditions; occasional, fleeting or very short term effects experienced which do not require any alteration of existing operational and technical practice. |
| None | No measurable change from baseline conditions. |

14.5 Aviation Baseline and Potential Sources of Impact

14.5.1 Current Baseline

The Site is located in uncontrolled (Class G) airspace extending from ground level to Flight Level (FL) 195 (approximately 19,500ft above mean sea level (ams)). The Site is beyond the Area of



Operational Responsibility (AOR) of air traffic control (ATC) at Aberdeen Airport. Lower Airspace Radar Services (LARS) are provided in the area by RAF Lossiemouth ATC.

Above FL195 is the Class C controlled airspace of the Scottish Flight Information Region and Upper Information Region, where air traffic services are provided by NERL using PSRs located at Perwinnes, near Aberdeen Airport, and Allanshill, near Fraserburgh.

The controlled airspace above FL195 over the Site is part of the Scottish Temporary Reserved Area (Gliding) (North), where gliders may gain access to controlled airspace under specified conditions, up to FL270.

The Site is within the daytime military Low Flying Area (LFA) 14, where fixed wing aircraft are permitted to fly no lower than 250ft Minimum Separation Distance (MSD). For night low flying the Site is located in Allocated Region 1D, which covers north east Scotland.

Aberdeen Airport is 61km south east of the Site. Inverness Airport is 64km west of the Site. RAF Lossiemouth is 24km north west of the Site. There are no Meteorological Office radars, aeronautical radio navigation aids or unlicensed aerodromes within the study areas.

14.5.2 Future Baseline

There are no proposed changes to the structure or classification of the airspace over the Site. HIAL has a current Airspace Change Proposal for controlled airspace and associated IFPs around Inverness Airport. However, these do not extend closer than 39km from the Site. There are also impending changes to the IFPs associated with Aberdeen Airport but these are not expected to extend to the airspace over the Site.

14.5.3 Potential Sources of Impact

The following aviation receptors have been identified as potentially subject to significant effects:

- the RAF Lossiemouth primary surveillance radar (PSR);
- the RAF Lossiemouth precision approach radar (PAR);
- the air defence PSR at Remote Radar Head (RRH) Buchan;
- the Inverness Airport PSR;
- the instrument flight procedures (IFPs) associated with Aberdeen Airport, Inverness Airport and RAF Lossiemouth; and
- military aircraft flying at low level.

14.6 Assessment of Potential Effects

14.6.1 Construction Effects

Potential effects on radar occur only when the turbine blades are rotating. These effects do not occur during the construction phase.

14.6.1.1 Aberdeen Airport

The Site lies between 26.8 and 29.1nm from the Aberdeen Doppler VOR (DVOR) radio beacon and is therefore within the 30nm radius area where effects on Aberdeen Airport IFPs based on the Aberdeen DVOR must be assessed.

The Site is located well beyond the area depicted on the Aberdeen Airport ATC Surveillance Minimum Altitude Chart (ATCSMAC) and therefore in an area where the Minimum Sector Altitude (MSA) applies. In the sector containing the Site the MSA is 4100ft above mean sea level (amsl). This is designed to provide a minimum of 1000ft vertical clearance over any terrain or obstacles. Since the highest turbine blade tips of the proposed development will be 1615ft amsl there will be no effects on the Aberdeen Airport ATCSMAC or MSA.



14.6.1.2 Inverness Airport

The Site is 34.3nm from the Inverness DVOR which is the Initial Approach Fix (IAF) for all of Inverness Airport's current IFPs. It is therefore beyond the area within which effects on IFPs must be assessed and will have no effect on those IFPs.

Inverness Airport has submitted an Airspace Change Proposal (ACP) to the CAA for controlled airspace and Performance-Based Navigation (PBN) instrument approach procedures (IAPs). The preliminary design of the PBN approach to runway 23 has an IAF located between 26.4 and 29.8nm west of the Site, which places the proposed development within the IFP assessment area. The preliminary design has a Terminal Arrival Altitude (TAA) for the sector encompassing the Site of 3900ft amsl. TAAs, like the ATCSMAC and MSAs, are designed to provide a minimum of 1000ft vertical clearance over terrain and obstacles. Since the highest turbine blade tips of the proposed development will be 1615ft amsl there will be no effects on the proposed Inverness Airport PBN IAPs.

The Inverness Airport ACP also includes proposals for Standard Terminal Arrival Routes (STARs) and Standard Instrument Departures (SIDs). SIDs and STARs must be wholly contained within controlled airspace. The closest boundary of the proposed Inverness controlled airspace is in excess of 21nm west of the nearest turbine in the proposed development. Consequently the proposed SIDs and STARs will be unaffected by the proposed development.

14.6.1.3 RAF Lossiemouth

The Site is located some 14nm south east of RAF Lossiemouth and is therefore within the area where effects on that airfield's IFPs must be assessed.

RAF Lossiemouth has Military Instrument Departure (MID) routes for each of its four runways. The Runway 10 MID 10 Alpha requires aircraft to climb on the runway heading to 3850ft amsl. The Obstacle Identification Surface (OIS) for a MID extends to 15° either side of the departure track. This encompasses the eastern group of turbines in the proposed development, the highest of which will have a tip height of 1516ft amsl. Review of the obstacle clearance requirements for a MID has calculated that the proposed development will have no impact on the RAF Lossiemouth MID 10 Alpha.

The Site is located in the southern sector of the Minimum Sector Altitude (MSA) for all of RAF Lossiemouth's IFPs. The MSA in this sector is 3800ft. The proposed development will have no effect on this or any other MSAs.

The Site is located in a sector of the current RAF Lossiemouth ATCSMAC where the minimum altitude to be allocated by controllers is 2300ft amsl. The proposed development would require this to be raised to 2600ft or 2700ft amsl. This is unlikely to generate significant operational effects but would require revision of the ATCSMAC. It is concluded that this effect will be of **minor** significance.

14.6.1.4 Military Low Flying

Wind turbines may pose an obstacle hazard to low flying military aircraft. These effects come into play during the construction phase as cranes are active on the Site and the towers are erected. The locations and heights of all tall structures are required to be notified to the MoD and the CAA prior to construction so that they can be marked on aeronautical charts and taken into account in pre-flight planning. The nature and scale of any effects on low flying aircraft depend on the location and height of the development relative to existing terrain and other obstacles; proximity to narrow valleys where flight paths are constrained; and the volume of traffic at low level.

The proposed development is located on terrain approximately 1000ft above sea level, with valleys some 500ft lower to the north, south, east and west. In addition, while most military low flying in this area is undertaken by aircraft based at, or operating to or from RAF Lossiemouth, pilots using RAF Lossiemouth are instructed not to fly below 1000ft Minimum Separation Distance within 15nm



of RAF Lossiemouth.¹ The Site is located between 13.0 and 15.9nm from RAF Lossiemouth, therefore it can be expected that most military aircraft are not flying at heights that might be affected by the proposed development. Consequently, the effects on military low flying are assessed as being of **negligible** significance.

14.6.2 Operational Effects

Modelling of the radar line of sight from the RAF Lossiemouth PSR has determined that all proposed turbines will be within line of sight and may generate returns on the radar display. These returns may appear similar to those of an aircraft, requiring controller action, and may reduce the radar's probability of detecting real aircraft targets in the airspace overhead the proposed development. The RAF Lossiemouth PSR is a Thales STAR-NG digital plot-extracted radar, installed in 2022. Its design incorporates advanced processing to filter out unwanted returns from wind turbines. Data on its actual performance against the numerous existing wind farms within its line of sight is not in the public domain. Formal trials of its performance against onshore and offshore wind farms are due to take place in 2023-24. In view of the uncertainty of the radar's performance the effects of the proposed development on the RAF Lossiemouth PSR are assessed as being of **moderate** significance.

The RAF Lossiemouth PAR is aligned to provide coverage out to 15° either side of the approach track to the runway in use, to a maximum range of 20nm. When runway 28 is in use (approaches from the east), Turbines 6 to 15 of the proposed development will be within the +/-15° coverage of the radar. Turbine 16 will be outside the +/-15° arc but will be within the +/-20° arc which the MoD applies for safeguarding of PARs against wind turbines. Turbines 1-5 will be outside both the +/-15° and the +/-20° areas.

The RAF Lossiemouth PAR coverage when aligned with runway 28 is constrained by the structures of a number of Hardened Aircraft Shelters (HASs) located on the south side of the airfield. Radar line of sight modelling has determined that the line of sight from the PAR to all of Turbines 6 to 15 is constrained by the structure of HAS 22 and, in the case of T7, T9, T14 and T15, the HAS completely blocks line of sight to all parts of the turbine. In the case of Turbines 6, 8 and 10 to 13, the structure significantly blocks the radar beam to the extent that the maximum theoretical visibility of the turbine blades varies from 4m to 21m.

Data on the technical parameters and performance of the RAF Lossiemouth PAR is restricted by the US International Traffic in Arms Regulations (ITAR). Therefore, it is not possible to definitively determine what effect turbines with a visibility of between 4 and 21m would have on the detection and tracking performance of the radar. However, evidence from other UK military airfields with wind turbines within their PAR coverage indicates that no adverse effects have been experienced from those wind farm developments. In view of these uncertainties the significance of the potential effects of the proposed development on the RAF Lossiemouth PAR is assessed as **minor to moderate**.

Modelling of the radar line of sight from the Inverness Airport PSR has determined that one of the proposed turbines - T3 - will be within line of sight of the PSR. The bare earth model of the line of sight to T3 calculates that the radar beam will clear the bare earth terrain by 0.4m at Mains of Moyness, 3.5km south east of Auldearn. This would translate to an estimated 1.4m of the blade tips of T3 being within line of sight of the radar when they are at their maximum vertical extent. However, photography of the Mains of Moyness area shows that the location of minimum terrain clearance is occupied by buildings with roof ridge lines estimated to be 7m agl. It is concluded that, even assuming no buildings constraining the line of sight, the probability of the Inverness PSR detecting and displaying T3 of the proposed development is negligible. Consequently the significance of the potential effects of the proposed development on the Inverness Airport PSR is assessed as **negligible**. An aviation study setting out these findings has been submitted to HIAL for consideration.

¹ UK MIL AIP EGQS AD 2.21 paragraph 2a, 23 February 2023.



Modelling of the radar line of sight from the Buchan air defence PSR has determined that between two and four of the proposed turbines - Turbines 2, 3, 4 and 5 - will be within theoretical line of sight of the PSR. MoD operational assessments of the effects of wind farm developments on air defence radar are based on a number of factors including the detectability of the turbines; the position of the development; the quantity of turbines within the development; other developments within the vicinity; and loss of coverage due to the development's electromagnetic shadow. The significance of any effects is determined by whether the number and extent of turbines visible to the radar exceeds cumulative effect thresholds. In the case of the proposed development:

- there are no other existing or proposed wind farm developments visible to the Buchan radar within 20km of the Site;
- the number and extent of turbine visibility is small; and
- the MoD response to the scoping layout, which had 180m turbines in similar positions, did not object on grounds of effects on the Buchan radar, indicating that any visibility of 200m turbines is marginal.

It is concluded that the effects of the proposed development on the Buchan air defence radar are of **minor** to **moderate** significance.

Radar services to air traffic using Aberdeen Airport are provided using the NERL PSRs at Perwinnes and Allanshill. Radar modelling and NERL consultation responses have determined that neither the Perwinnes nor the Allanshill radar have any line of sight to the proposed development. Therefore, the proposed development will have no impact on the provision of air traffic radar services at Aberdeen Airport.

The effects of the operational phase of the proposed development on the IFPs for Aberdeen and Inverness Airports and RAF Lossiemouth will be the same as those during the construction period.

The effects on military low flying in the operational phase will be the same as during the construction phase.

14.6.3 Decommissioning Effects

Potential effects on radar occur only when the turbine blades are rotating. These effects do not occur during the decommissioning phase.

The effects of the decommissioning phase of the proposed development on the IFPs for Aberdeen and Inverness Airports and RAF Lossiemouth will be the same as those during the construction phase.

The effects on military low flying in the decommissioning phase will be the same as during the construction phase.

14.7 Mitigation

14.7.1 Radar

Trials to be undertaken at RAF Lossiemouth in winter 2023-24 will test whether the Thales STAR-NG meets MoD requirements for mitigation of the effects of wind turbines. These trials will include assessment of the Wind Farm Filter, an additional Thales radar data processing product. The Applicant is willing to agree to a suitably worded planning condition providing for a radar mitigation scheme to be submitted, approved and implemented prior to erection of the turbines. If these trials produce results acceptable to the MoD the residual effects of the proposed development on the RAF Lossiemouth PSR would be of **minor** significance.

The radar trials to be undertaken at RAF Lossiemouth in winter 2023-24 will also test whether the PAR is affected by wind turbines located outside its nominal +/-15° azimuth coverage but within its safeguarded +/-20° arc.



Notwithstanding the lack of evidence that wind turbines within partial line of sight from a PAR cause significant adverse effects, the Applicant has proposed a mitigation scheme to the MoD that would consist of slewing the azimuth orientation of the RAF Lossiemouth PAR, when runway 28 is in use, to an angle that would place all of the turbines in the proposed development outside of the radar's azimuth coverage arc. Slewing of PARs to avoid adverse effects from buildings and other obstructions is an established measure in use at a number of UK military airfields. It would also be facilitated by a revised Defence Standard issued in 2019 which defines the required azimuth coverage of PAR to a 20° arc (nominally 10° either side of the final approach track).

The Applicant has also proposed to the MoD that mitigation of the effects of the proposed development on the RAF Lossiemouth PAR could be achieved by installation of an Instrument Landing System (ILS) serving runway 28.

Implementation of either of the two proposed mitigations would reduce the residual effects of the proposed development on the RAF Lossiemouth PAR to **minor** significance.

Should the effects of the proposed development on the Buchan air defence radar be determined to be unacceptable, a standard method of mitigation is available in the shape of a Non-Auto Initiation Zone (NAIZ) applied to the airspace overhead the wind farm. Within a NAIZ, targets that are first detected within the zone are not displayed on the radar, whereas targets that first appeared outside the zone but subsequently track into it will continue to be tracked and displayed as they cross through the zone. This has the effect of eliminating all wind turbine returns from the display while continuing to track aircraft that have originated outside the NAIZ. There is a small residual effect of delays in the radar displaying aircraft that have first been detected when within the NAIZ. The residual effects of the proposed development on the Buchan air defence radar would be of **minor** significance.

14.7.2 Reduced Lighting Scheme

A reduced lighting scheme has been submitted to and approved by the CAA. The lighting scheme consists of:

- 2000 candela steady red lights on Turbines 1, 2, 3, 5, 6, 8, 13, 15 and 16;
- MoD-specification infra-red lights (not visible to the naked eye) on all turbines except T10; and
- no mid-tower lighting.

The lighting system will dim the 2000 candela lights to 10% of their full intensity when a visibility sensor measures the in-flight visibility to be in excess of 5km.

The lighting scheme has been approved by the CAA and the MoD. The proposed reduced lighting scheme and its CAA acceptance are found in **Technical Appendix 14.1: Aviation Lighting Scheme**.

14.8 Assessment of Cumulative Effects

There are six existing or consented wind farms within 20km of the proposed development and also within line of sight of the RAF Lossiemouth PSR:

- Boyndie;
- Cairnborrow;
- Edintore;
- Hill of Towie I;
- Hill of Towie II; and
- Lurg Hill.

Of these, Boyndie, Cairnborrow, Edintore and Hill of Towie I were deemed acceptable by the MoD and have no mitigation applied. However all are expected to be fully mitigated by the advanced



processing capacity of the Thales STAR-NG at RAF Lossiemouth, which is designed to be a solution applicable across the radar’s coverage.

The Lurg Hill and Hill of Towie II consents are subject to a suspensive condition requiring a radar mitigation scheme to address effects on the RAF Lossiemouth PSR. The radar mitigation schemes submitted by the developers of these two developments and accepted by the MoD are not based on the data processing capabilities of the Thales STAR-NG radar and would be entirely separate from any mitigation based on the latter. However, in the event that the radar mitigation schemes for these two projects is changed to using the inherent capabilities of the Thales STAR-NG, it is expected that it will satisfactorily mitigate those two developments.

It is concluded that the cumulative effects of the proposed development on the RAF Lossiemouth PSR will be of **minor** significance.

There are no other existing or consented wind turbines within the safeguarded area for the RAF Lossiemouth PAR when in use for runway 28. Consequently, there can be no cumulative effects of the proposed development on the RAF Lossiemouth PAR.

There are no existing or consented wind farms within 20km of the proposed development and also within line of sight of the Buchan air defence radar. Consequently, there can be no cumulative effects of the proposed development on the Buchan air defence radar.

Assessment of the cumulative effects of the proposed development on the RAF Lossiemouth ATCSMAC has considered other wind farm developments within or adjacent to the 2300ft sector of the ATCSMAC to the south east of the airfield. The consented Lurg Hill wind farm is within the buffer zone of that sector. With estimated maximum tip heights of 1410ft amsl it will require the minimum altitude in that sector to be raised from 2300ft to either 2400 or 2500ft. Thus, the cumulative impact of the proposed development on the RAF Lossiemouth ATCSMAC will be less than its stand-alone impact but is assessed as continuing to be of **minor** significance.

14.9 Summary

The residual effects of the proposed development on aviation are summarised in **Table 14.3**.

Table 14.3: Summary of Residual Effects

| Likely Significant Effect | Mitigation Measures | Means of Implementation | Residual Effect |
|---|--|--|-----------------|
| Unwanted returns on RAF Lossiemouth PSR display (moderate significance) | Thales STAR-NG processing capacity. | Planning condition requiring a radar mitigation scheme | Minor |
| Unwanted returns on RAF Lossiemouth PAR display (minor to moderate significance) | (1) Slewing of PAR when in use on runway 28; (2) Installation of Instrument Landing System for runway 28. | Planning condition requiring a radar mitigation scheme | Minor |
| Unwanted returns on Buchan air defence radar display (minor to moderate significance) | Non-Auto Initiation Zone. | Planning condition requiring a radar mitigation scheme | Minor |

