Clash Gour Wind Farm ACP-2021-046

Initial Options Appraisal

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Glossary of Terms

Acronym/Term	Definition
ACP	Airspace Change Proposal
ADS-B	Automatic Dependent Surveillance - Broadcast
agl	Above Ground Level
amsl	Above Mean Sea Level
ANSP	Air Navigation Service Provider
AONB	Area of Outstanding Natural Beauty
AQMA	Air Quality Management Area
ATC	Air Traffic Control
ATS	Air Traffic Service
CAA	Civil Aviation Authority
CAP	Civil Aviation Publication
CGH	Clash Gour Holdings
CO_2	Carbon Dioxide
dB	Decibel
DP	Design Principle
DPE	Design Principles Evaluation
EDFER	EDF Energy Renewables Limited
EIA	Environmental Impact Assessment
FLARM	FLight AlaRM
FOA	Full Options Appraisal
GA	General Aviation
GNSS	Global Navigation Satellite System
HazID	Hazard Identification
IOA	Initial Options Appraisal
m	Metre
MATZ	Military Air Traffic Zone
MoD	(UK) Ministry of Defence
MLAT	MultiLATeration
NM	Nautical Mile

NO_2	Nitrogen Dioxide
NP	National Park
NSA	National Scenic Area
OGN	Open Glider Network
RAF	Royal Air Force
RAG	Range Azimuth Gating
SAC	Special Area of Conservation
SoN	Statement of Need
SPA	Special Protection Area
TMZ	Transponder Mandatory Zone
UK AIP	UK Aeronautical Information Publication

Table 1 Glossary of Terms

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1 Introduction

1.1 Project Overview

Force9 Energy (Force9), jointly with EDF Energy Renewables Limited (EDFER) is developing the Clash Gour Wind Farm (Clash Gour) in the name of its wholly owned subsidiary Clash Gour Holdings (CGH). Clash Gour will be a substantial onshore windfarm which will be located in the Moray Council Area, approximately 13 Nautical Miles (NM) southwest of Royal Air Force (RAF) Lossiemouth and 15 NM southeast of Inverness Airport. Clash Gour will consist of 48 wind turbines with a maximum blade tip height of 180 metres (m) above ground level (agl). Figure 1 below provides the location of the three individual wind turbine array areas which will comprise Clash Gour.

Figure 1 Clash Gour Wind Farm Location

This ACP is linked to a wind farm development which required a detailed Environmental Impact Assessment (EIA) to be undertaken as part of the Section 36 Electricity Act application process. Consequently, there is a wealth of baseline environmental information available to support any environmental assessments, noting that the EIA for the wind farm focuses on the environmental impacts of the wind farm itself rather than the specific impact of any proposed airspace solution. As part of the EIA a Carbon Balance Assessment was undertaken which concluded that the overall development would be carbon positive [Ref 1], which should be considered, on balance, with any potential adverse impacts on aviation.

1.2 Document Purpose and Scope

In developing the Clash Gour Wind Farm, Force9 have initiated an Airspace Change Proposal (ACP) under the process defined in Civil Aviation Publication (CAP) 1616 [Ref 2], regulated and approved by the UK Civil Aviation Authority (CAA).

The overall purpose of this document is to provide a narrative, explaining the steps, rationale, and outcomes of Step 2B, the Initial Options Appraisal (IOA). It must be highlighted that this document does not contain a detailed IOA analysis of each option. Full analysis can be found in the IOA Full Analysis Table, alongside this document on the CAA Airspace Change Portal, available via the link below.

https://airspacechange.caa.co.uk/PublicProposalArea?pID=403

This document includes the methodology, baseline definition and results summary of the detailed IOA analysis, along with supporting appendices, and is structured as follows:

1. Introduction (this section)
2. Initial Options Appraisal Methodology
3. Baseline Definition
4. Qualitative Safety Assessment
5. Initial Options Appraisal Results
6. Design Options Shortlist
7. References

In addition, this document also includes the following Appendix:

1. Initial Options Appraisal Full Analysis Table Extract (Appendix A1)

Please note, it is highly recommended that readers review this document either before or alongside the IOA Full Analysis Table (Appendix A1) to provide additional context, clarification, and rationale. In addition, it should be noted that all aviation specific altitudes referred to within this document are based on height Above Mean Sea Level (amsl) rather than Above Ground Level (agl).

Please note that this is Issue 3 of the IOA document, which has been updated and re-issued following feedback from the CAA Stage 2 Gateway. As such, this document (Issue 3) supersedes the previous iterations (Issues 1 and 2).

1.3 CAP 1616 Airspace Change Process

In designing and implementing airspace changes, change sponsors are subject to the process described in CAP 1616 [Ref 2]. This is a seven-stage process, published by the CAA, which also provides guidance to those seeking to change the way in which airspace is used and managed. The seven-stage process is depicted in Figure 2 below.

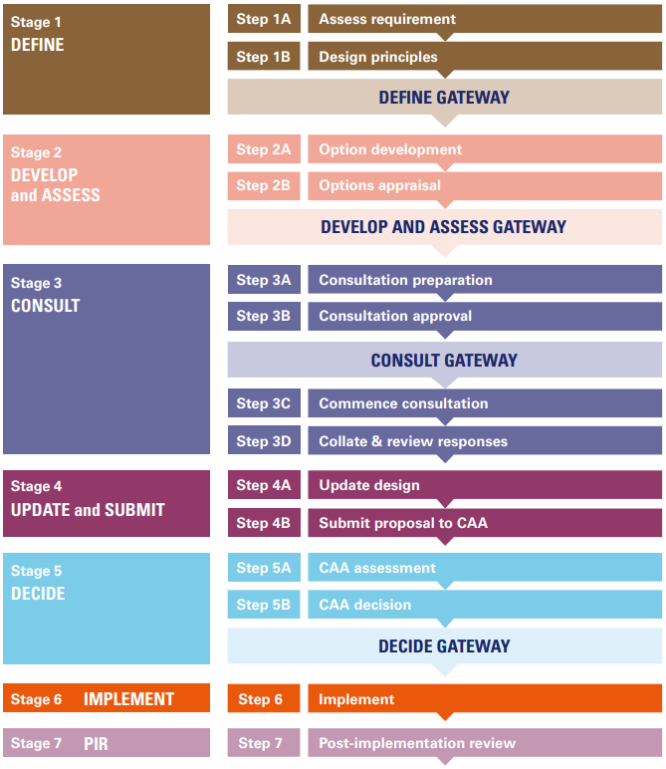

Figure 2 CAP 1616 High-level Process

1.3.1 Progress So Far

As per the defined process, the change sponsor has completed a Statement of Need (SoN) submitted as part of Stage 1 (Define). The SoN is shown in Figure 3 below.

Current situation:
EDF Energy Renewables Limited (EDFER), jointly with Force 9 Energy is planning to developing Clash Gour Wind Farm in the name of its wholly owned subsidiary, Clash Gour Holdings Limited (CGH); Clash Gour will be a substantial onshore wind farm which will be located approx 13 nm southwest of Royal Air Force (RAF) Lossiemouth and 15 nm southeast of Inverness Airport.

Issue:
As part of the planning process, EDFER/CGH have engaged with all relevant aviation stakeholders to determine the impact of Clash Gour's wind turbines on aviation radar systems and operations. In particular, the Ministry of Defence (MoD) has confirmed that the development will have an adverse impact on their ability to provide Air Traffic Services (ATS) due to interference caused by wind turbine generators to the Primary Surveillance Radar at RAF Lossiemouth. As a result, EDFR/CGH have agreed with MoD that the planned wind farm development should not be built until a suitable mitigation solution has been established.

Action:
EDFER/CGH have employed Coleman Aviation Ltd to investigate potential impacts of wind turbines on MoD and other aviation stakeholder operations. Discussion with MoD has suggested that the Airspace Change Process (CAP 1616) should be initiated in order to manage the development of airspace-related mitigation options.

Clash Gour Wind Farm will be a strategically important onshore wind farm development and EDFER/CGH require the mitigation options to be investigated and understood prior to a funding decision in Q3 2022. As a result, EDFR/CGH are keen that the Airspace Change Process is initiated as soon as possible.

Figure 3 Clash Gour Statement of Need

Following the submission of the SoN and the CAA Assessment Meeting, a number of Design Principles (DPs) were developed. As required by CAP 1616, stakeholders

were engaged to provide feedback on the DPs during Stage 1. The finalised list of DPs is shown below.

Design Principle	Description
DP 1: Safety	Ensure an acceptable level of safety for aircraft within and displaced by any proposed airspace solution.
DP 2: Operational (Resilience)	Minimise negative impact on all airspace users.
DP 3: Operational	Airspace change shall have no impact on operations/capacity of airport operators and Air Navigation Service Providers (ANSPs).
DP 4: Operational	Maintain operational resilience of the Air Traffic Control network.
DP 5: Environmental	Minimise environmental impacts to stakeholders on the ground.
DP 6: Economic	Endeavour to minimise economic impact on aircraft operators.
DP 7: Technical	Base the airspace change on the latest technology available. • This technology could relate to navigation, radar enhancements or radar data processing etc. • The volume of airspace affected should be the minimum necessary to deliver requirements, whilst providing optimal safety buffer. • Seek to create simple, easily definable solution.

Table 2 Finalised Design Principles

On successful completion of Stage 1, the ACP moved into Stage 2 (Develop & Assess) which is broken down into two steps:

1. Step 2A – Options Development
2. Step 2B – Initial Options Appraisal

1.3.2 Step 2A – Options Development

Within Step 2A the change sponsor is required to develop a comprehensive list of design options to address the issues identified in the SoN. For more information, please refer to the Design Options Engagement Document [Ref 3], available on the CAA Airspace Change Portal. In addition, the change sponsor is required to evaluate the proposed design options against the DPs established at Stage 1 in what is known

as the Design Principles Evaluation (DPE) [Ref 4]. For more information, please refer to the DPE Document, available on the CAA Airspace Change Portal.

1.3.3 Step 2B – Initial Options Appraisal

At Step 2B, a change sponsor is required to conduct an IOA (this document). During the IOA, options that are assessed as viable within the DPE (the Comprehensive List of Viable Options) are assessed against a defined baseline with specific reference to defined criteria within CAP 1616, Appendix E, Table E2 [Ref 2], with the addition of qualitative assessments of noise, tranquillity, biodiversity, and safety impacts, as this ACP is currently considered to be a Level 1 airspace change.

The methodology used to carry out the IOA is described in Section 2 of this document. Furthermore, a summary of the IOA results can be found in Section 5. Please note, an extract of the more detailed analysis can be found as an Appendix (Appendix A1) to this document. The complete IOA Full Analysis Table can be found as a stand-alone document on the CAA Airspace Change Portal.

The main output of the IOA, is a Short List of options (including preferred options[s]) which can be found in Section 6 of this document.

2 Initial Options Appraisal Methodology

2.1 CAP 1616 Options Appraisal Requirements

The Options Appraisal process was carried out in accordance with the guidance in CAP 1616, and in conjunction with UK Governments 'The Green Book' [Ref 5] and the Department of Transport's WebTAG [Ref 6], which constitute best practice in options appraisal.

Whilst best practice documents have been adhered to in this appraisal process, it is noted that this ACP, relating as it does to a proposed development on the ground unrelated directly to aviation activities, is relatively unique. Best practice guidance tends to focus on ACPs associated with existing airports and advice has therefore been adapted as necessary to fit with the circumstances of the proposal.

Options Appraisal is used as an iterative tool throughout the CAP 1616 [Ref 2] process to help refine the options from an initial Comprehensive List of Viable Options, down to a Short List (including preferred option[s]).

The appraisal process typically consists of the following elements:

- High-level objectives and assessment criteria.
- Baseline definition – usually today's operations.
- Comprehensive List of Viable options (including a do-nothing/minimum option[s]).
- Shortlist of options.
- Preferred or final option(s).

The Options Appraisal requirement of CAP 1616 [Ref 2] evolves through three iterations with the CAA reviewing at each phase as follows:

1. 'Initial' Options Appraisal at Step 2B with the CAA review at the Stage 2, as part of the Develop and Assess gateway.

2. 'Full' Options Appraisal (FOA) at Step 3A with the CAA review at Step 3B and the subsequent Consult gateway.

3. 'Final' Options Appraisal at Step 4A, with the CAA review after the formal submission of the Airspace Change Proposal at the end of Stage 4.

The remainder of this section of the document focusses on the definition of the 'high-level objective and assessment criteria' and the assessment method.

2.2 IOA Minimum Requirements

CAP1616 prescribes that the following should be included within an IOA as a minimum:

- A Comprehensive List of Viable Options (including the 'Do Nothing/Minimum' option which will act as a baseline for analysis).
    - A description of the change proposal.
    - An indicator of likely noise impacts.
    - A high-level assessment of benefits and costs involved.

- The criteria for assessing the list of options and the application of these criteria to determine a shortlist of options.
- What evidence the change sponsor will collect, and how it will be collected in order to fill in its evidence gaps and to develop the FOA, during Stage 3. (See Section 2.3)

2.3 FOA Evidence Capture

Consistent with the requirements of CAP1616, the IOA is a qualitative analysis of each option against a defined baseline. This is expanded on within the FOA, which is conducted at Stage 3, to include quantitative analysis. The FOA, requires change sponsors to assess each of the design options against each other in relation to the criteria defined in CAP1616, Appendix E using primarily quantitative metrics. These metrics include the assessment of the environmental impacts of the proposed change.

As defined in CAP1616a [Ref 7], the FOA requires change sponsors to collect quantitative environmental metrics that describe the baseline scenario and conduct a series of modelling activities for each of the design options, to enable an environmental comparison. The required metrics include:

- 10-year traffic forecasts
- Standard noise metrics:
    - LAeq noise contours
    - 100% noise mode contours
    - Nx contours
    - Difference contours
    - Lmax spot point levels
    - Operational diagrams
    - Overflight (based on the CAA definition of overflight found in CAP1498 [Ref 8])

The modelling is intended to provide a comparison between today's operation (the baseline), in order to show the impact of the proposed change at the point of implementation and also 10 years post-implementation. Modelling is also required to show the situation at the proposed implementation date and 10 years post-implementation without applying the proposed change. However, the change sponsor believes that it is not appropriate to provide these metrics in Stage 3. Following CAA feedback, this rationale is explained in Section 2.3.1 below.

It is the view of the change sponsor that not all of the defined metrics are relevant to this particular airspace change and as such, it is unlikely that all the metrics listed above will be collected during Stage 3. This is due to the unique circumstances of this ACP, where very limited information is available as this development does not relate to an airport. Following feedback from the CAA regarding noise assessment, the change sponsor has provided a detailed traffic survey (see Section 2.3.1 to 2.3.6 below) and explains (see Section 2.3.7 below) as to why it is not appropriate to collect the above metrics and conduct a full noise assessment in Stage 3.

2.3.1 Traffic Survey

The site of the proposed Clash Gour Wind Farm is located within Class G airspace, which is established from ground level to Flight Level 195 (approximately 19,500 feet (ft)). Within uncontrolled airspace there is uncontrolled access to air systems of all types. An initial qualitative traffic assessment conducted by the change sponsor concluded that the area in question featured low traffic levels in the area involving users such as local general aviation (GA) traffic; gliding; recreational and leisure aircraft; military transit and training traffic; as well as infrequent off-route commercial air traffic.

Following feedback from the CAA, the change sponsor has conducted a more detailed quantitative analysis of traffic within the area surrounding the proposed wind farm development. Full details of the methodology of the change sponsors traffic survey and analysis is explained in the following sub-paragraphs. Appendix A2 provides the traffic analysis data.

2.3.2 Aim

To determine the type and density of transiting traffic in the area and estimate the number of aircraft potentially affected by the proposed airspace solutions.

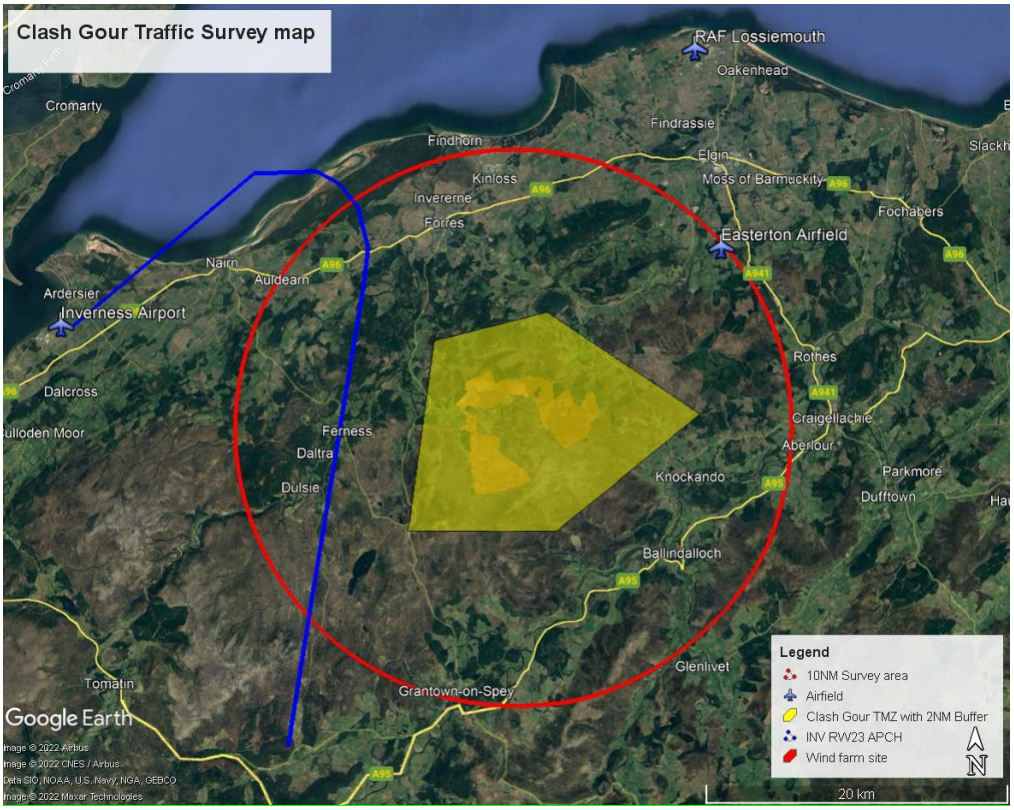

Figure 4 Traffic survey map

2.3.3 Method

- FlightRadar24 (FR24).com was chosen as the most appropriate data source. It takes aircraft position data from ADS-B, MLAT, FLARM and OGN. It is one of the most comprehensive aircraft tracking sites available.

- The FR24 playback function was used for this survey. The start date and time was specified, then the target geographical region was brought into view and the traffic movements were played back at a specified speed.
- For this survey the time surveyed was a two-week period between 0000 06/08/2022 and 2359 19/08/2022.
- The volume surveyed was a 10 NM circle centred on 57°29'15.20''N 3°52'15.14''W; the middle of the Clash Gour Wind Farm site (Red circle in Figure 4), at or below 12,000ft.
- Aircraft remaining in the circuit at Easterton Airfield were excluded from the survey since it lies at the very extremity of the surveyed area.

2.3.4 Results

- At Appendix A1 is a table of all the aircraft movements collected.
- 200 movements transited the surveyed volume, averaging 14.28 movements per day. The most movements on a single day was 29 on the 10/08/22. The least was 3 on the 13/08/22.
- 50 of the movements were aircraft inbound to Inverness Airport and were concentrated on a path in the western side of the surveyed area that went from south to north to make a left turn for Runway 23 (Blue line in Figure 4).
- 62 of the movements were Single Engine Piston (SEP), Twin Engine GA, Gliders or Other GA aircraft.

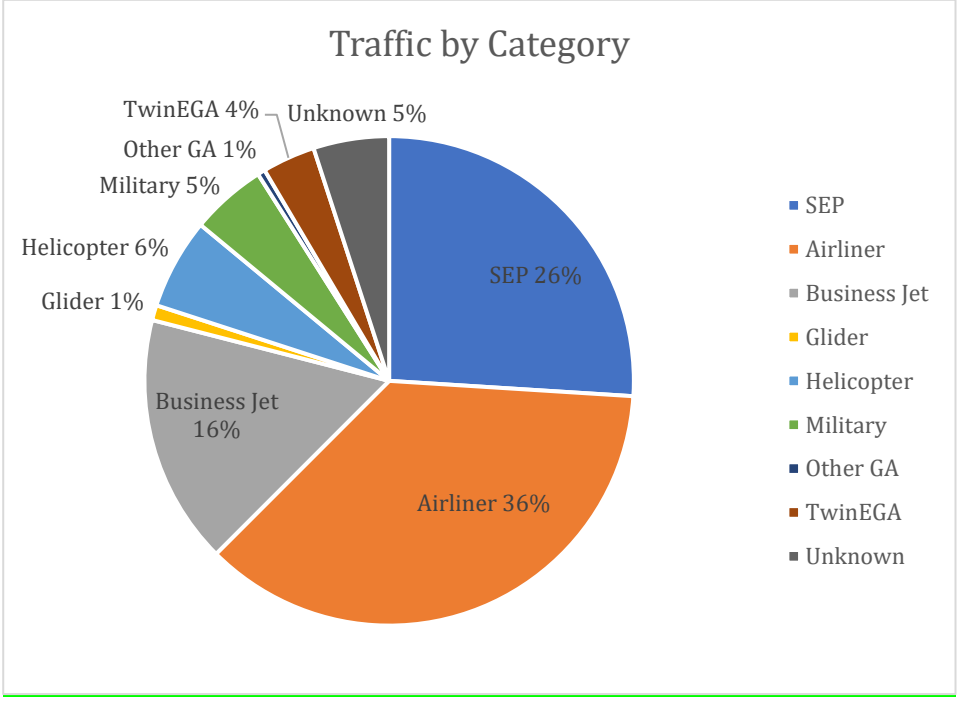

Figure 5 Aircraft traffic by category

2.3.5 Analysis

To estimate the maximum potential effect of the development, a scaling factor should be applied to the GA traffic data. This survey requires aircraft have suitable equipment (eg, ADS-B) on board to be registered on FR24, however, it is not

mandatory in the UK for all aircraft to have such equipment. Therefore, movements in the area (particularly GA) may have occurred that have not appeared in the survey. To compensate, the following scaling calculation has been made:

Open-source research suggests that 44% of GA aircraft have ADS-B fitted, so 62 ÷ 0.44 = **140.9 GA aircraft movements** over the two weeks surveyed. This averages approximately 10 movements per day and considering that the survey took place at the height of summer, when GA traffic is busiest, this is likely to be an upper estimate compared to the rest of the year. Of note, the CAA has a scheme that incentivises the installation of Electronic Conspicuity devices (Transponders and ADS-B) in GA aircraft with an aim that Airprox incidents are likely to reduce with time in uncontrolled airspace such as that above the Clash Gour Wind Farm.

2.3.6 Conclusion

From this traffic survey we can conclude from the previous qualitative statements and this quantitative survey, that the airspace above the wind farm is a low-density air traffic environment. Notwithstanding the caveats to this survey, the evidence suggests that the sponsor would be unable to provide any meaningful noise measurement in Stage 3.

2.3.7 Noise Metrics

In assessing the potential for any of the options to make a difference to extant noise levels, the change sponsor has assessed that the low population numbers in the vicinity of Clash Gour mean that the number of residents affected at the lowest observed adverse effect level (LOAEL) would be minimal. Furthermore, we have transposed the assessed noise contours for a UK commercial airport of approx. 60,000 movements per year (comprising 35,000 ATM, 19,000 GA and 2,000 Business aviation plus 3,000 other movements), on RAF Lossiemouth[1], to provide a comparative example of the most likely effect that similar assessed noise levels could have upon the local population. That showed the representative 51dB LAeq 16 hour (hr) (daytime) noise contour extended no further than 4 NM from the runway, hence is contained within the MATZ (Military Air Traffic Zone) of RAF Lossiemouth. The civilian airport 45dB LAeq 8hr (night-time) noise contour extended further from the airport than the daytime noise contour, but we do not anticipate RAF Lossiemouth night flying creating the same impact, hence we have used the daytime noise contour (the night-time one would only extend a further 800m to the south-west, so would still be contained in their MATZ). The conclusion from this is that the low traffic levels in the vicinity of the proposed Clash Gour Wind Farm and any of the associated airspace options would not produce adverse noise levels (daytime noise annoyance at 51dB LAeq, 16h and night-time noise at 45dB LAeq, 8h) nor would they necessitate in conducting a quantified noise modelling assessment.

The sponsor has also considered any commensurate changes to noise levels as a result of aircraft not electing, or being unable, to fly through the proposed airspace described in the options. For example, in the case of a potential TMZ option, a non-transponding aircraft may elect to not use their radio (if available) to transit through the TMZ (with the controlling authority's agreement) and elect to alter their course to avoid the TMZ. By doing so, other traffic, such as an aircraft positioning for an instrument approach into runway 05 at RAF Lossiemouth, may then alter their course commensurately although any change in traffic pattern due to avoidance of

[1] Assessed noise levels data is not available for RAF Lossiemouth.

airspace should have no impact on 51 dB noise contour. This could change the noise levels over the ground for both of the aircraft in this example but this hypothetical scenario, whilst feasible, is not measurable and again does not necessitate a quantified noise modelling assessment.

The combination of the comparison analysis, above, and the traffic survey, leads the sponsor to conclude that it is not appropriate to collect the standard noise metrics and conduct a full noise assessment in Stage 3.

2.4 High-level Objectives & Assessment Criteria

For an airspace change, the criteria against which appraisal options are assessed is defined within CAP 1616, Appendix E, Table E2 [Ref 2]. These criteria are described in Table 3 below. Additionally, Safety Assessment, Tranquillity and Biodiversity (as defined in CAP 1616, Appendix B [Ref 2]) have been added at the bottom. It is worth stressing that the IOA normally provides a qualitive assessment only, this document (Issue 3) now includes some quantitative assessment in the traffic survey (see Section 2.3.1) however, no noise contour analysis has been conducted at this stage. This approach has been chosen because of the relatively small scale of the proposed change compared to other in progress ACPs along with the minimal population in the vicinity, nature of the light aircraft operations in the area and expected limited environmental impacts, and it is therefore deemed proportionate. The change sponsor will be conducting more detailed quantitative analysis in the FOA as part of subsequent stages of the process.

Affected Group	Impact	Description
Communities	Noise impact on health and quality of life	Requires consideration of noise impact on communities including residents, schools, hospitals, parks, and other sensitive areas.
	Air Quality	Any change in air quality is to be considered[2].
Wider Society	Greenhouse Gas impact	Assessment of changes in greenhouse gas levels in accordance with WebTAG is required.
	Capacity and resilience	A qualitative assessment of the impact on overall UK airspace structure.
General Aviation (GA)	Access	A qualitative assessment of the effect of the proposal on the access to airspace for GA users.
GA/commercial airlines	Economic impact from increased effective capacity	Forecast increase in air transport movements and estimated passenger numbers or cargo tonnage carried.

[2] Air Quality assessments are only applicable below 1,000 feet and includes the consideration of Air Quality Management Areas (AQMAs).

Affected Group	Impact	Description
	Fuel burn	The change sponsor must assess fuel costs based on its assumptions of the fleets in operation.
Commercial airlines	Training costs	An assessment of the need for training associated with the proposal.
	Other costs	Where there are likely to be other costs imposed on commercial aviation, these should be described.
Airport/Air Navigation Service Provider	Infrastructure costs	Where a proposal requires a change in infrastructure, the associated costs should be assessed.
	Operational costs	Where a proposal would lead to a change in operational costs, these should be assessed.
	Deployment costs	Where a proposal would lead to a requirement for retraining and other deployment, the costs of these should be assessed.
Safety Assessment	Safety Assessment	CAP 1616 requires a safety assessment of the proposal to be undertaken in accordance with CAP 760 (Guidance on the Conduct of Hazard Identification, Risk Assessment, and the Production of Safety Cases: For Aerodrome Operators and Air Traffic Service Providers) [Ref 9].
Wider Society	Tranquillity	The impact upon tranquillity need only be considered with specific reference to Areas of Outstanding Natural Beauty (AONB)[3] and National Parks (NPs) unless other areas for consideration are identified through community engagement.
	Biodiversity	The variability among living organisms from all sources including, inter alia, terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.

Table 3 IOA Assessment Criteria

[3] AONBs are not applicable in Scotland and the equivalent designation is a National Scenic Areas which shall be assessed instead. See Section 5.2.3 for more details.

2.5 Method

The IOA was carried out by comparing all the options side by side against the CAP 1616 [Ref 2] criteria in tabular form. The Appraisal also included the results of a Qualitative Safety Assessment (as described in Section 4), and the noise impact for communities was supported by a qualitative noise assessment methodology (as described in Section 5.2.1). An extract of the full analysis of all the options is described in Appendix A1 and included as a separate document, which can be accessed via the CAA Airspace Change Portal.

Each option was compared against the 'Do Nothing baseline' which was established as the baseline for this ACP. This is explored further in Section 3 of this document.

2.5.1 Shortlisting

Once all the options had been assessed against the criteria, the list of options was refined to identify the Short List to be taken forward to Stage 3. The Short List is contained in Section 6, which also specifies the preferred options.

3 Baseline Definition

3.1 Baseline Overview

In accordance with CAP 1616 [Ref 2], a baseline is required for the IOA along with subsequent environmental assessments. CAP 1616, Appendix J [Ref 2] defines the baseline as:

"Scenario in analysis of different options where the impacts of the change not being implemented are analysed (also known as 'do nothing' or 'do minimum' option)"

An established baseline will allow the change sponsor to conduct an assessment to understand the current impacts so that a comparison can be made with the impacts of the proposed options.

3.2 Baseline Rationale

As the change sponsor, Force9 Energy has established a baseline scenario against which each proposed option will be compared.

CAP 1616, Appendix E, Paragraph E20 states:

"*The change sponsor must do an assessment to understand its current impacts so that a comparison can be made with the impacts of the options – the baseline for the appraisal from which the change is assessed. In most cases this baseline will also be the 'do nothing' option*." [Ref 2]

As specified in the statement above, in most cases, 'Do Nothing' is the most appropriate baseline to assess against within the IOA. Therefore, the change sponsor has concluded in order to best reflect the current impacts, the Do-Nothing scenario (Option 0) shall be the current situation today, in which the Clash Gour Wind Farm has not been constructed[4]. It must however be acknowledged that there are wind farms already established in the immediate vicinity of the proposed Clash Gour Wind Farm (i.e., Berryburn) which shall be included within the baseline scenario. As specified in the DPE (Issue 2), Option 0 remains an unviable option but shall be used as the baseline for comparative purposes.

3.3 'Do Nothing Baseline' Summary

To summarise, the change sponsor has elected to proceed with the IOA using Option 0 as a 'Do Nothing Baseline'. The scenario within 'Do Nothing Baseline' reflects todays operation in which Clash Gour Wind Farm does not exist and as such has no impact on local ANSPs, airspace users, local communities (noise and air quality) or Tranquillity/Biodiversity receptors.

[4] The Do-Nothing baseline scenario has changed in Issue 2 of the IOA following feedback from the CAA, who indicated that the baseline should be a scenario in which the wind farm is not built.

4 Qualitative Safety Assessment

4.1 CAP 1616 Safety Assessment Requirements

A qualitative Safety Assessment is required for all options identified during Step 2A, and a detailed final safety assessment must be completed by the change sponsor prior to submission in Step 4B. The change sponsor is carrying out the safety assessment activities in accordance with CAP 760 [Ref 9], the separate guidance provided by the CAA for safety assessment.

The change sponsor is developing a full four-part Safety Case iteratively throughout the CAP 1616 [Ref 2] process which will be submitted to the CAA at Step 4B.

4.2 Safety Assessment Method

The Qualitative Safety Assessment uses the results of a formal Hazard Identification (HazID) workshop held in February 2022 during which the hazards, causes and consequences relating to each of the options (within the Comprehensive List of Viable Options) were identified.

The HazID comprised a structured sequence of "Sessions", as follows.

- Session 1: Hazards Implicit in Baseline Service Capability.
- Session 2: Hazards Due to Clash Gour Wind Turbines.
- Session 3: Hazards Implicit in Airspace Design Concept.
- Session 4: Airspace Design Concept Implementation Functional Hazards.

With reference to the above sessions, Sessions 3 and 4 are most applicable to the options which make up the Comprehensive List of Viable Options.

4.3 Safety Assessment Results – Non-Technical Summary

The safety work to date implies that all the options in the Comprehensive List of Viable options will meet acceptable levels of flight safety while acknowledging that existing hazards (e.g., loss of surveillance, loss of Global Navigation Satellite System (GNSS) signal in space) will remain.

Table 4 below describes the high-level safety assessments for the Comprehensive List of Viable Options.

Option No	Option Description	High-level Safety Assessment
7C	Placement of a TMZ over the wind farm array locations including the use of RAG blanking to remove associated wind turbine induced radar clutter from RAF Lossiemouth and	The management and integration of GA traffic (including gliders) is a potential hazard associated with this option as GA aircraft may be required to route around the proposed TMZ, which may cause 'choke points', however, this is mitigated by airspace design constraints and tactical management of traffic by ATC. To avoid

Option No	Option Description	High-level Safety Assessment
	Inverness ATC displays but without a buffer.	the development of 'choke points' and need for tactical management, there will be clear designation and promulgation of the TMZ within the UK AIP. It is acknowledged that any tactical management may cause a slight increase in controller workload, however, due to the low traffic flows of light aircraft within the area, this is expected to be minimal. Furthermore, within Class G airspace, the pilot is ultimately responsible for collision avoidance. It is recognised that adverse weather conditions may hamper a pilot's ability to maintain visual separation with the turbines. This is mitigated through the effective use of flight planning by pilots. Furthermore, loss of communication with non-transponding aircraft is acknowledged but is an existing hazard which is not impacted by the establishment of a TMZ, especially within Class G airspace. Having said that, the size and shape of this proposed TMZ option would add additional complexity for both pilots and controllers, leading to increased workload. A potential loss of the TMZ boundary (as displayed on the controllers display) is also acknowledged, however this is an unlikely failure mode which may have more serious consequences for factors that do not relate to the establishment of TMZ and as such is an existing hazard, which can be mitigated procedurally. It is worth noting that during stakeholder engagement, both Inverness Airport and RAF Lossiemouth agreed that it would be possible to mitigate the impacts of Clash Gour wind farm on their radar systems and thereby mitigate any operational impact on the service they provide." On the basis they agreed that it would be possible to control impacts on their operations through a suspensive condition attached to the grant of any consent of the wind farm. The wording for

Option No	Option Description	High-level Safety Assessment
		such conditions was agreed with both RAF Lossiemouth and Inverness Airport.
7D	Placement of a TMZ over the wind farm array locations including the use of RAG blanking to remove associated wind turbine induced radar clutter from RAF Lossiemouth and Inverness ATC displays with a 2 NM buffer.	The management and integration of GA traffic (including gliders) is a potential hazard associated with this option as GA aircraft may be required to route around the proposed TMZ, which may cause 'choke points', however, this is mitigated by airspace design constraints and tactical management of traffic by ATC. To avoid the development of 'choke points' and need for tactical management, there will be clear designation and promulgation of the TMZ within the UK AIP. It is acknowledged that any tactical management may cause a slight increase in controller workload, however, due to the low traffic flows of light aircraft within the area, this is expected to be minimal. In the case of this option, an additional mitigation is the 2 NM buffer which will give the controller additional warning of an unauthorised aircraft entering the TMZ. Furthermore, within Class G airspace, the pilot is ultimately responsible for collision avoidance. It is recognised that adverse weather conditions may hamper a pilot's ability to maintain visual separation with the turbines. This is mitigated through the effective use of flight planning by pilots. Furthermore, loss of communication with non-transponding aircraft is acknowledged but is an existing hazard which is not impacted by the establishment of a TMZ, especially within Class G airspace. Having said that, the size and shape of this proposed TMZ option would add additional complexity for both pilots and controllers, leading to increased workload. A potential loss of the TMZ boundary (as displayed on the controllers display) is also acknowledged, however this is an unlikely failure mode which may have more serious consequences for factors that do not relate to the establishment of TMZ and as

Option No	Option Description	High-level Safety Assessment
		such is an existing hazard, which can be mitigated procedurally. It is worth noting that during stakeholder engagement, both Inverness Airport and RAF Lossiemouth agreed that it would be possible to mitigate the impacts of Clash Gour wind farm on their radar systems and thereby mitigate any operational impact on the service they provide." On the basis they agreed that it would be possible to control impacts on their operations through a suspensive condition attached to the grant of any consent of the wind farm. The wording for such conditions was agreed with both RAF Lossiemouth and Inverness Airport.
7E	Placement of a TMZ over the windfarm area (simplified shape) including the use of RAG blanking to remove associated wind turbine induced radar clutter from RAF Lossiemouth and Inverness ATC displays.	The management and integration of GA traffic (including gliders) is a potential hazard associated with this option as GA aircraft may be required to route around the proposed TMZ, which may cause 'choke points', however, this is mitigated by airspace design constraints and tactical management of traffic by ATC. To avoid the development of 'choke points' and need for tactical management, there will be clear designation and promulgation of the TMZ within the UK AIP. It is acknowledged that any tactical management may cause a slight increase in controller workload, however, due to the low traffic flows of light aircraft within the area, this is expected to be minimal. Furthermore, within Class G airspace, the pilot is ultimately responsible for collision avoidance. It is recognised that adverse weather conditions may hamper a pilot's ability to maintain visual separation with the turbines. This is mitigated through the effective use of flight planning by pilots. Furthermore, loss of communication with non-transponding aircraft is acknowledged but is an existing hazard which is not impacted by the establishment of a TMZ, especially within Class G airspace. The size and shape of

Option No	Option Description	High-level Safety Assessment
		this proposed option is simpler than some others meaning it is easier for both pilots and controllers to interpret/manage. A potential loss of the TMZ boundary (as displayed on the controllers display) is also acknowledged, however this is an unlikely failure mode which may have more serious consequences for factors that do not relate to the establishment of TMZ and as such is an existing hazard, which can be mitigated procedurally. It is worth noting that during stakeholder engagement, both Inverness Airport and RAF Lossiemouth agreed that it would be possible to mitigate the impacts of Clash Gour wind farm on their radar systems and thereby mitigate any operational impact on the service they provide." On the basis they agreed that it would be possible to control impacts on their operations through a suspensive condition attached to the grant of any consent of the wind farm. The wording for such conditions was agreed with both RAF Lossiemouth and Inverness Airport.
7F	Placement of a TMZ over the windfarm area (simplified shape) including the use of RAG blanking to remove associated wind turbine induced radar clutter from RAF Lossiemouth and Inverness ATC displays with a 2 NM buffer.	The management and integration of GA traffic (including gliders) is a potential hazard associated with this option as GA aircraft may be required to route around the proposed TMZ, which may cause 'choke points', however, this is mitigated by airspace design constraints and tactical management of traffic by ATC. To avoid the development of 'choke points' and need for tactical management, there will be clear designation and promulgation of the TMZ within the UK AIP. It is acknowledged that any tactical management may cause a slight increase in controller workload, however, due to the low traffic flows of light aircraft within the area, this is expected to be minimal. In the case of this option, an additional mitigation is the 2 NM buffer which will give the controller additional warning of an unauthorised aircraft entering the

Option No	Option Description	High-level Safety Assessment
		TMZ. Furthermore, within Class G airspace, the pilot is ultimately responsible for collision avoidance. It is recognised that adverse weather conditions may hamper a pilot's ability to maintain visual separation with the turbines. This is mitigated through the effective use of flight planning by pilots. Furthermore, loss of communication with non-transponding aircraft is acknowledged but is an existing hazard which is not impacted by the establishment of a TMZ, especially within Class G airspace. The size and shape of this proposed option is simpler than some others meaning it is easier for both pilots and controllers to interpret/manage. A potential loss of the TMZ boundary (as displayed on the controllers display) is also acknowledged, however this is an unlikely failure mode which may have more serious consequences for factors that do not relate to the establishment of TMZ and as such is an existing hazard, which can be mitigated procedurally. It is worth noting that during stakeholder engagement, both Inverness Airport and RAF Lossiemouth agreed that it would be possible to mitigate the impacts of Clash Gour wind farm on their radar systems and thereby mitigate any operational impact on the service they provide." On the basis they agreed that it would be possible to control impacts on their operations through a suspensive condition attached to the grant of any consent of the wind farm. The wording for such conditions was agreed with both RAF Lossiemouth and Inverness Airport.

Table 4 High-level Safety Assessment

5 Initial Options Appraisal Results

5.1 Introduction

This section provides some additional clarification to assist the reader in understanding the rationale behind the IOA Results, which are presented in full, at the end of this section. The Results Summary, presented in Section 5.4 is a high-level extract of the Full Analysis Table, which is on the airspace change portal as a separate document. It is highly recommended that this section should be read before proceeding to read the Full Analysis Table (found in Appendix A1) to provide context and to understand the terminology used.

5.2 IOA Considerations

5.2.1 Qualitative Noise Assessment Methodology

To support the assessment of the noise related criteria in Stage 2, the change sponsor has carried out a qualitative assessment of the likely noise impacts of each option on people on the ground. Within the IOA, consideration has also been given to the overflight of National Scenic Areas (NSAs) and National Parks (NPs) and Biodiversity receptors, as described below. It should be noted that guidance points to consideration of impact on AONB, which is a designation which does not exist in Scotland. This assessment therefore considers impact on NSAs in place of AONBs as the equivalent designation in Scotland. Reference from herein is therefore to NSAs, rather than AONBs[5],

Please note, at this stage no quantitative analysis has been carried out with regards to track mileage or noise contouring. As per the CAP 1616 process, environmental assessments.

As explained in Section 0, the change sponsor believes it is inappropriate to conduct a quantitative noise assessment at Stage 3.

As part of the ACP process, change sponsors are required to consider the noise modelling throughout the lifecycle of the proposed change. At Stage 2 of the CAP 1616 process, the change sponsor is required to provide the CAA with an indication as to what level of noise modelling, they feel is applicable as defined in Tables 4.1 and 4.2 within CAP 2091 [Ref 10].

Based on the noise assessment rationale described in Section 0, the change sponsor shall not be conducting quantitative noise assessments, as such the requirements within CAP 2091 [Ref 10], which define the categories of noise modelling sophistication would not be applicable.

With specific reference to population data, in their Mid-2020 Population Estimates (Scotland) report published on 25 Jun 21[Ref 11], National Records of Scotland identified that population density in the vicinity of the Clash Gour Wind Farm was, on average, fewer than 50 people per square kilometre and the population of the nearby

[5] See Section 5.2.3 for details.

Highlands region was, on average, 9 people per square kilometre. This would fall into Noise Category E as defined in CAP 2091 Table 4.1.

5.2.2 Track Mileage

Please note, this sub-section is for information only. No quantitative comparison of track milage has been carried out as part of the IOA. Such analysis will be conducted in subsequent environmental assessment throughout the CAP 1616 process.

As no quantitative analysis has been carried out at this stage, it is not possible to determine the specific track mileage applicable to any aircraft that may be required to route around a proposed TMZ, located above the wind farm. Having said that, due to the small scale of this change (in terms of TMZ dimensions) any re-routing by light aircraft is unlikely and in the remote eventuality it did occur then this would be expected to have a minimal impact.

In addition, as part of the IOA, track mileage has been used as a substitute for assessing greenhouse gas emmisions and fuel burn. The logic being that the greater number of track miles flown, the more fuel burn required and therefore, more greenhouse gas emmisions are released. It must be stressed that a detailed EIA has been conducted as part of the wind farm development consent process [Ref 1]. The EIA included a carbon balance assessment, which considered the manufacture, construction and transportation of turbine components against its operation, showing the development is carbon positive for the majority of its operational period. Any additional greenhouse gas emmisions caused by the re-routing of light aircraft must be balanced against the fact that this ACP facilitates a carbon positive development.

5.2.3 Tranquillity

As defined in Table 3 (see Section 2.4), CAP 1616, Appendix B [Ref 2] requires change sponsors to consider the impact of the proposed change on levels of Tranquillity with specific reference to AONBs (NSAs) and NPs. Please note, there were no additional areas identified through community engagement.

When compared to the proposed location of the Clash Gour Wind Farm, it can be seen that the site is well outside the Cairngorm Mountains and Dornoch Firth NSAs by approximately 20 NM and 23 NM respectively [Ref 12]. As such, it is anticipated that any ACP solution will have no impact on either NSAs. In addition, should aircraft be required to route around the wind farm, there is ample space between the wind farm and the two closest NSAs, meaning aircraft would not be required to overfly any NSAs as a result of re-routing.

There are currently only two NPs in Scotland. Loch Lomond & the Trossachs NP (located on the western side of Scotland) and the Cairngorms NP (located on the eastern side of Scotland). Figure 6 below shows the location of the Cairngorms NP. Like the Cairngorm Mountains NSA mentioned above, the proposed wind farm is located outside the Cairngorms NP boundary by approximately 3.2 NM due northeast [Ref 12]. As such, it is anticipated that any ACP solution will have a limited impact on NPs, especially given light aircraft operations in the area. In addition, it should be noted that the Cairngorms NP Authority did not object to the wind farm application and expressed no immediate concerns during initial stakeholder engagement.

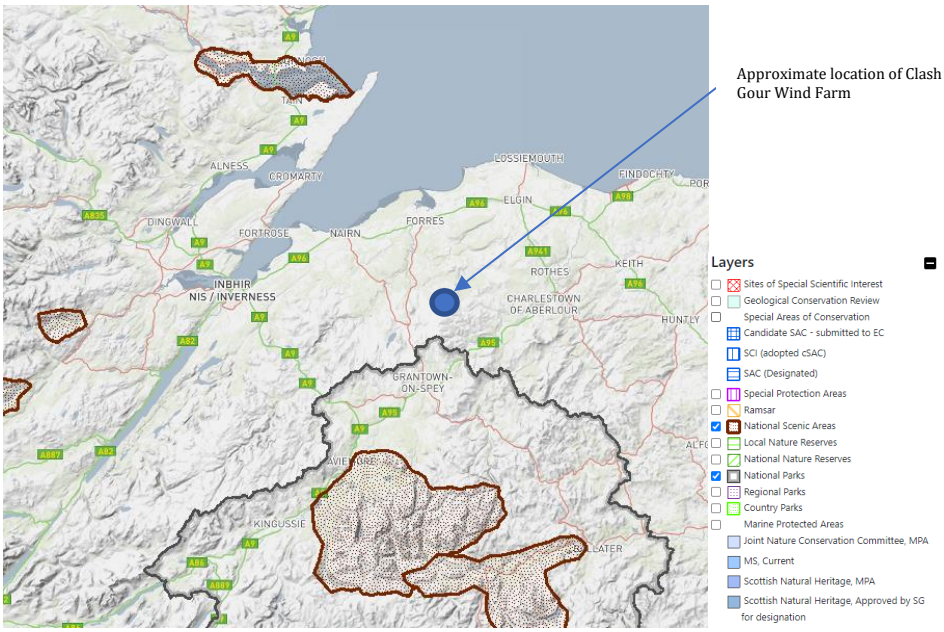

Figure 6 National Scenic Areas and National Parks near Clash Gour (Source: NatureScot)

5.2.4 Biodiversity

As defined in Table 3 (see Section 2.4), CAP 1616 [Ref 2] requires change sponsors to consider the impact the proposed change may have on biodiversity within the vicinity of the change. CAP 1616, Appendix B, Paragraph B80 states "*In general, airspace change proposals are unlikely to have an impact upon biodiversity because they do not involve ground-based infrastructure*" [Ref 2]. It is acknowledged that the development of the proposed wind farm may have an impact on biodiversity but as detailed in the EIA [Ref 1], the potential for significant effects has been identified and mitigation and enhancement measures proposed which will mean the development has no significant effects on habitats and species. When the proposed airspace solution is considered in isolation, it is not expected to have a significant impact on biodiversity. Any consideration of the impact on biodiversity specific to the construction of the wind turbines is considered within the Section 36 consent process and is therefore outside the scope of this ACP.

Nevertheless, the change sponsor has investigated "terrestrial, marine and other aquatic ecosystems" that may be impacted, as per CAP 1616, Appendix B, Paragraph B79 [Ref 2].

With regards to maritime and other aquatic ecosystems, none of the proposed options within this ACP pass over any major water courses such as major rivers, lakes, or reservoirs. Consequently, it is deemed that the impact of this ACP on water-based ecosystems is the same as the baseline scenario ('Do Nothing baseline'), of which there is currently no known adverse impact. This is reflected in the Full Analysis Table (as shown in Appendix A1).

The change sponsor acknowledges that any proposed airspace solution is likely to be directly above the Moidach More Special Area of Conservation (SAC). This particular

designation specifically refers to the conservation of an area of blanket bog, which is subject to negative pressures such as burning or water management issues. [Ref 13] and is therefore unlikely to be impacted by any adverse effects from aircraft with regards to air quality. The wind farm proximity to the Moidach More SAC was considered as part of the EIA and Section 36 application and specifically refers to a ground-based eco-system. As such this ACP is expected to have a very minimal impact as the effects of fuel dispersion and mixing above 1,000ft are unlikely to cause an impact on local air quality in this area [Ref 2].

As specified in CAP 1616, Appendix B, Paragraph B80 [Ref 2], change sponsors are required to consider the impact of the change on any European Protected Species as defined in the Conservation of Habitats and Species Regulations 2010 [Ref 14]. Following the legislative changes associated with Brexit, European protected sites are now recognised in Scotland as Special Protection Areas (SPAs) and SACs [Ref 15]. Figure 7 shows the closest SPAs and SACs to the proposed Clash Gour Wind Farm development [Ref 12]. As part of the Section 36 application process, the wind farm development has been subject to a Habitats Regulations Appraisal in respect of its potential impacts on the Darnaway and Lethan Forest SPA which is designated for its population of breeding Capercaillie. A decision on this has not yet been reached, but early indications from NatureScot, in their response to Scottish Ministers is that the applicant had provided sufficient evidence to Ministers to take a decision that there should be no significant effect on the integrity of the designation. Consequently, any airspace solution contained within this ACP is not expected to have an adverse impact on biodiversity (including European protected specifies).

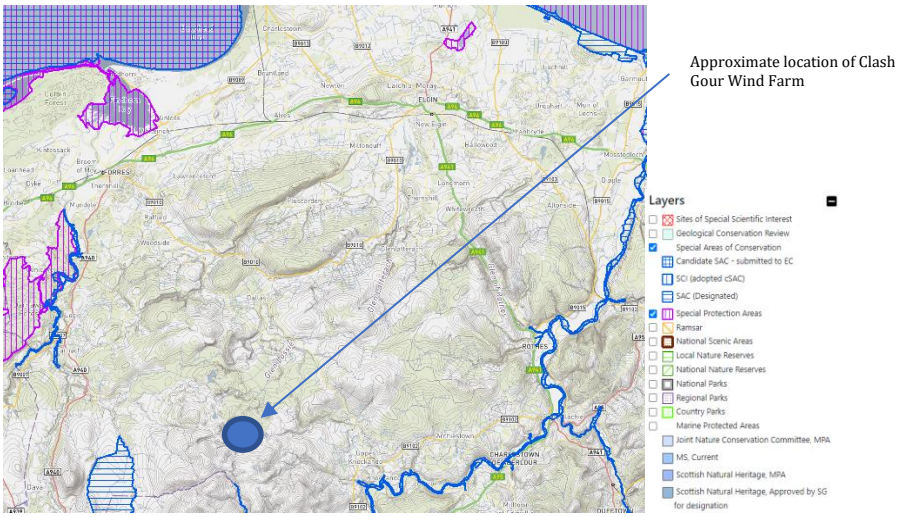

Figure 7 Special Protection Areas and Special Areas of Conservation near Clash Gour (Source: NatureScot)

5.2.5 Air Quality Management Areas

Like, AONBs (NSAs) and NPs, CAP 1616 [Ref 2] requires change sponsors to consider the impact of proposed changes on Air Quality Management Areas (AQMAs). AQMAs are areas within which local authorities are required to measure, review, and assess the impact of air quality on people's health and the environment [Ref 16]; most are associated with road traffic emissions.

With reference to Clash Gour, Figure 8 below shows that there are no AQMAs in the area surrounding the proposed wind farm [Ref 17]. Therefore, there is expected to be no impact on AQMAs as a result of this ACP.

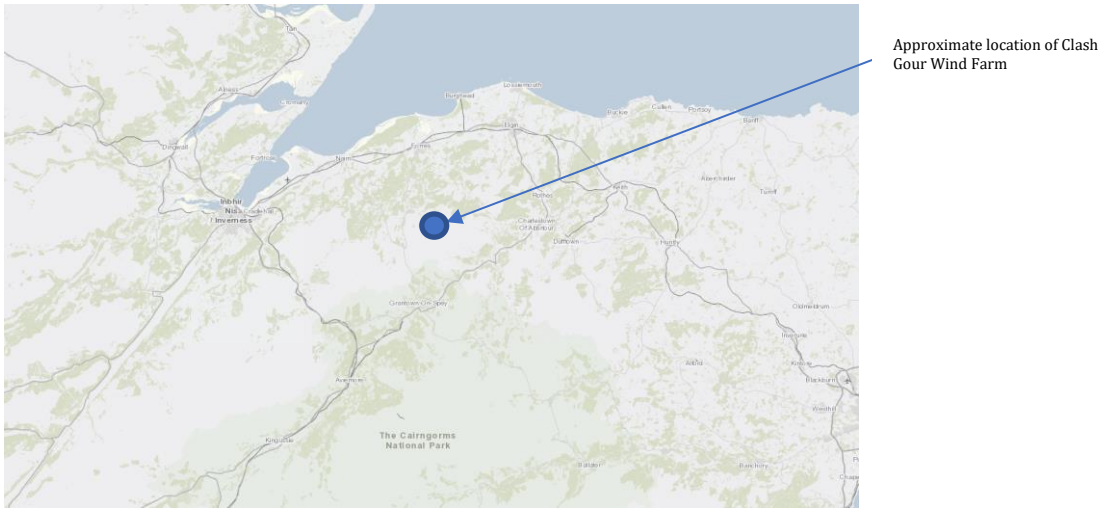

Figure 8 Air Quality Management Areas near Clash Gour (Source: UK DEFRA)

In addition, with regards to air quality, it is likely that the majority of aircraft would operate above 1,000ft to avoid nearby terrain and the proposed wind farm. Due to the effects of mixing and dispersion, there is therefore unlikely to be an impact on local air quality within the immediate vicinity of the proposed development, which is specifically attributed to aircraft movements. This is aligned with CAP 1616, Appendix B, Paragraph B74 [Ref 2].

5.3 Comprehensive List of Viable Options

Table 5 below provides a basic description of the Comprehensive List of Viable Options that was established after the DPE [Ref 4]. Please note that no discontinued or rejected options appear in Table 5 below.

Option No	Variation	Basic Description
7	C	Placement of a TMZ over the windfarm array locations including the use of RAG blanking to remove associated wind turbine induced radar clutter from RAF Lossiemouth and Inverness ATC displays but without a buffer.
	D	Placement of a TMZ over the windfarm array locations including the use of RAG blanking to remove associated wind turbine induced radar clutter from RAF Lossiemouth and Inverness ATC displays with a 2 NM buffer.

	E	Placement of a TMZ over the windfarm area (simplified shape) including the use of RAG blanking to remove associated wind turbine induced radar clutter from RAF Lossiemouth and Inverness ATC displays.
	F	Placement of a TMZ over the windfarm area (simplified shape) including the use of RAG blanking to remove associated wind turbine induced radar clutter from RAF Lossiemouth and Inverness ATC displays with a 2 NM buffer.

Table 5 Comprehensive List of Viable Options

A more detailed comprehensive list of viable options, including map overlays is published on the CAA airspace change portal as part of Step 2A.

5.4 Results Summary

This section provides a high-level summary of the IOA. An extract of the full analysis table is available in Appendix A1. The complete table can be found on the CAA airspace change portal.

Table 6 below outlines the colour coding scheme used in the subsequent table (Table 7) to distinguish between which options will be carried forward and which have not.

Colour Key	
Preferred Option	Meets objectives, insignificant impact, and is one of the Short-Listed options and is the most favourable.
Carry Forward	Meets objectives, insignificant impact, and is one of the Short-Listed options.
Not Carried Forward	Meets objectives or has an insignificant impact but is less attractive than other options.
Reject	Fails to meet one or more objectives or has a significant impact that cannot be effectively mitigated.
Baseline – Previously Rejected	Included for completeness.

Table 6 Results Summary Colour Key

Table 7 (the Comprehensive List of Viable Options) below contains a high-level summary of the IOA results, broken down by option number and variation. For details on the full analysis, please refer to the separate Appendix on the CAA airspace change portal, as detailed in Appendix A1 of this document. Please note, the same colour key is applicable to the Full Analysis Table (as shown in Appendix A1). A copy of Table 6 is included on the Full Analysis Table, when accessed as a separate document via the CAA airspace change portal.

Option No	Variation	Status
0	N/A	Baseline – Previously rejected – For comparative purposes only.
7	C	Not Carried Forward – Based on its performance in the IOA, Option 7C has not been carried forward on the basis that it does meet the objectives of the SoN but does not include an additional safety buffer. In addition, this option is a complicated shape which would cause unnecessary complexity for both controllers and pilots.
	D	Not Carried Forward – Based on its performance in the IOA, Option 7D has not been carried forward on the basis that it does meet the objectives of the SoN but is a complicated shape which would cause unnecessary complexity for both controllers and pilots.
	E	Carry Forward – Based on its performance in the IOA, Option 7E has been carried forward. This is on the basis that it meets the objectives of the SoN but also provides a simpler airspace solution when compared to Options 7C and 7D, leading to reduced complexity. However, Option 7E does not include an additional 2 NM safety buffer.
	F	Preferred Option – Based on its performance in the IOA, Option 7F has been selected as the Preferred Option. This is on the basis that this option meets the objectives of the SoN and provides a simpler airspace solution when compared to Options 7C and 7D, leading to reduced complexity. In addition, Option 7F includes an additional 2 NM safety buffer which further enhances safety when compared to Option 7E.

Table 7 IOA Results Summary

6 Design Options Shortlist

6.1 Shortlist of Options Taken Forward

Table below presents the Short List of options carried forward to Stage 3 along with a summary of the Initial Appraisal Outcome for that option.

The IOA has shown that all of the options (within the Comprehensive List of Viable Options) have the same or minimal impact when compared to the Do-Nothing baseline, mainly due to the small scale of any of the proposed TMZ options. The change sponsor acknowledges that for all TMZ options, a small number of aircraft (that are not fitted with a transponder and are not in communication with ATC) may be required to route around any TMZ solution. Having said that, due to the geographic location and scale of the proposed options, any re-routing of light aircraft is expected to be minimal, reducing any adverse impacts such as greenhouse gas emissions, fuel burn and associated costs.

Shortlist Option	Initial Appraisal Outcome
7E – Carry Forward	Based on its performance in the IOA, Option 7E has been carried forward. This is on the basis that it meets the objectives of the SoN but also provides a simpler airspace solution when compared to Options 7C and 7D, leading to reduced complexity. However, Option 7E does not include an additional 2 NM safety buffer.
7F – Preferred Option	Based on its performance in the IOA, Option 7F has been selected as the Preferred Option. This is on the basis that this option meets the objectives of the SoN and provides a simpler airspace solution when compared to Options 7C and 7D, leading to reduced complexity. In addition, Option 7F includes an additional 2 NM safety buffer which further enhances safety when compared to Option 7E.

Table 8 Shortlist of Options Taken Forward

7 References

Ref No	Source	Link
1	Force9	http://www.force9energy.com/projects/current/clash-gour
2	CAA	https://publicapps.caa.co.uk/modalapplication.aspx?appid=11&mode=detail&id=8127
3	CGH	https://airspacechange.caa.co.uk/PublicProposalArea?pID=403
4	CGH	https://airspacechange.caa.co.uk/PublicProposalArea?pID=403
5	UK Government	https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-governent
6	UK Government	https://www.gov.uk/government/publications/webtag-transport-appraisal-process-may-2018
7	CAA	https://publicapps.caa.co.uk/modalapplication.aspx?appid=11&mode=detail&id=8128
8	CAA	http://publicapps.caa.co.uk/modalapplication.aspx?appid=11&mode=detail&id=7749
9	CAA	https://publicapps.caa.co.uk/modalapplication.aspx?appid=11&mode=detail&id=2119
10	CAA	https://publicapps.caa.co.uk/modalapplication.aspx?appid=11&mode=detail&id=10124
11	National Records of Scotland	https://www.nrscotland.gov.uk/files/statistics/population-estimates/mid-20/mid-year-pop-est-20-report.pdf
12	NatureScot	https://sitelink.nature.scot/map
13	NatureScot	https://sitelink.nature.scot/site/8318
14	UK Government	https://www.legislation.gov.uk/uksi/2010/490/contents/made
15	NatureScot	https://www.nature.scot/professional-advice/protected-areas-and-species/protected-areas/international-designations/european-sites
16	UK Government (DEFRA)	https://uk-air.defra.gov.uk/aqma/

Ref No	Source	Link
17	UK Government (DEFRA)	https://uk-air.defra.gov.uk/aqma/maps/

Table 9 References

A1 Initial Options Appraisal Full Analysis Table Extract

Figure 9 below presents an extract of the IOA Full Analysis Table. The full analysis of the options is contained in the Initial Options Appraisal Full Analysis Table, which can be found in PDF format alongside this document on the CAA Airspace Change Portal.

CLASH GOUR WIND FARM ACP - INITIAL OPTIONS APPRAISAL - FULL ANALYSIS TABLE

Initial Options Appraisal Appendix A1 Issue 3

Group	Impact	Level of Analysis	Option 0 - 'Do Nothing Baseline' - Wind Farm not constructed (Current Situation)	Option 7C - RAG blanking and TMZ over the proposed wind farm array locations
Communities	Noise impact on health and quality of life	Initial Options Appraisal: Qualitative	In the 'Do Nothing Baseline' scenario, aircraft movements (and therefore noise) are exactly the same as they are today. In this scenario, aircraft operating in the vicinity of the proposed development site are able to fly anywhere within the realms of Glass G airspace and are not mandated to carry a transponder or communicate with ATC unless they wish to enter the Aerodrome Traffic Zone (ATZ) at Inverness or the Military Air Traffic Zone (MATZ) at RAF Lossiemouth. As such, aircraft noise within this scenario is the same as it is today and may be widely dispersed. However, due to the limited population density in the area, the impact of aircraft noise on local communities is likely to be minimal.	Like the Do Nothing scenario, due to the limited population density within the vicinity of the wind farm development, there is expected to be a very limited impact by light aircraft (which are not equipped with a transponder or in communication with ATC) re-routing around the proposed TMZ, simply because of the minimal number of people within the area. However, it is acknowledged that aircraft may not be as widely dispersed as they are in the baseline scenario, especially if they are not equipped with a transponder or are not in communication with ATC.
Communities	Air Quality	Initial Options Appraisal: Qualitative	In the 'Do Nothing baseline' scenario, it is unlikely that local air quality is impacted by aircraft movements. The rationale being that to avoid terrain and nearby existing operational turbines, aircraft operating in the vicinity of the Clash Gour development are likely to be above 1,000ft. As a result, there is unlikely to be an impact on local air quality due the effects of mixing and dispersion above 1,000ft as per CAP 1616, Appendix B, Para B74. It should also be noted that there are no AQMAs in the area of the proposed development.	Like the Do Nothing scenario, to avoid nearby terrain/existing turbines and the proposed turbines, it is likely that any aircraft that overfly the area within the vicinity of the proposed wind farm would be above 1,000ft. Therefore, as per CAP 1616, Appendix B, Para B74, there is unlikely to be an impact on local air quality due to the effects of mixing and dispersion. In addition, any aircraft flying within the proposed TMZ or those required to re-route to avoid the turbines would not overfly an AQMA.
Wider Society	Greenhouse Gas impact	Initial Options Appraisal: Qualitative	In the 'Do Nothing baseline' scenario, aircraft operating in the vicinity of the proposed development are able to operate anywhere within Class G airspace. The greenhouse gas impact of the current situation is likely to be minor due to the fact that only a limited number of aircraft operate in the area.	As part of this option, it is acknowledged that some light aircraft may have to re-route around the proposed wind farm in this scenario. Within this option, re-routing would likely only be required by a very small percentage of aircraft, who do not have a transponder or who are not in communication with ATC. As a result, the majority of aircraft should not require a re-route, but it is noted that a small percentage may do so, which will lead to increased track mileage and therefore increased greenhouse gas emissions. However, due to the small scale of the proposed TMZ this is expected to be minimal when compared to the baseline scenario. It is also worth noting that a detailed Environmental Impact Assessment (EIA) has been carried out on the development as a whole as part of the development consent process. The EIA concluded that the overall development would be carbon positive, which should be considered, in balance against any adverse greenhouse gas emissions caused by the re-routing of aircraft.

Figure 4 IOA Full Analysis Table Extract

A2 Traffic Analysis Data

Below is a table of the traffic data collected during the traffic survey. The methodology, results and discussion are in Sections 2.3.1 to 2.3.6.

Date	Time	Reg	Type	Category	Altitude	MIL/INV
06/08/2022	01:44:00	G-LMRY	ATR-72	Airliner	2900	to INV
06/08/2022	06:52:00	G-IZZI	C182	SEP	3200	
06/08/2022	07:32:00	G-EZAY	A319	Airliner	5500	to INV
06/08/2022	09:01:00	G-LGNG	Saab 340B	Airliner	11000	
06/08/2022	09:51:00	G-EZBJ	A319	Airliner	3200	to INV
06/08/2022	10:31:00	D-FMCP	SOCATA TBM-930	Other GA	8000	
06/08/2022	12:11:00	G-BEZV	C172	SEP	3200	
06/08/2022	13:01:00	G-CCTT	C172	SEP	2200	
06/08/2022	13:51:00	CS-LAS	680A CITATION	Business Jet	5200	
06/08/2022	14:11:00	PH-EXW	E175	Airliner	3300	
06/08/2022	14:41:00	G-ETBT	PA-38	SEP	2000	
06/08/2022	15:01:00	G-CCTT	C172	SEP	3200	
06/08/2022	15:02:00	G-LAZL	PA-28	SEP	2800	
06/08/2022	15:21:00	G-SAJC	ERJ-145	Airliner	3300	
06/08/2022	16:16:00	OK-PHE	PHENOM 300	SEP	6400	to INV
06/08/2022	17:11:00	G-CCTT	C172	SEP	2700	
06/08/2022	19:46:00	G-DBCC	A319	Airliner	4000	to INV
06/08/2022	20:26:00	G-EZDL	A319	Airliner	2700	to INV
07/08/2022	08:46:00	G-CCTT	C172	SEP	2900	
07/08/2022	08:46:00	G-SAJC	ERJ-145	Airliner	4900	
07/08/2022	09:06:00	G-EUUG	A320	Airliner	3600	to INV
07/08/2022	09:18:00	G-ETBT	PA-38	SEP	3000	
07/08/2022	09:58:00	G-LMRX	ATR-72	Airliner	6500	
07/08/2022	10:10:00	G-IMAB	EUROPA XS	SEP	2500	
07/08/2022	10:20:00	G-KION	525 CITATION	Business Jet	6200	
07/08/2022	10:24:00	Unknown	CITATION ALS	Business Jet	7400	
07/08/2022	10:49:00	G-EZIY	A319	Airliner	7500	to INV
07/08/2022	11:29:00	PH-EXC	E190	Airliner	9200	to INV
07/08/2022	11:29:00	G-ETBT	PA-38	SEP	3700	
07/08/2022	12:21:00	G-EZGY	A320	Airliner	5500	to INV
07/08/2022	12:25:00	G-SAJC	ERJ-145	Airliner	4400	to INV
07/08/2022	13:29:00	G-EZDA	A319	Business Jet	4500	to INV
07/08/2022	14:05:00	G-CLWP	GLIDER	Glider	5300	

Date	Time	Reg	Type	Category	Altitude	MIL/INV
07/08/2022	14:13:00	G-EZUL	A320	Airliner	3700	to INV
07/08/2022	14:53:00	Unknown	AW189	Helicopter	2500	
07/08/2022	15:13:00	G-EZDF	A319	Airliner	3000	
07/08/2022	15:52:00	G-LMRX	ATR-72	Airliner	9000	
07/08/2022	19:52:00	G-EUPR	A319	Airliner	3700	
07/08/2022	20:20:00	G-EZDF	A319	Airliner	6000	to INV
07/08/2022	20:32:00	YL-LDN	A320	Airliner	3900	to INV
08/08/2022	09:03:00	G-FHFX	PRAETOR 600	Business Jet	3600	
08/08/2022	09:03:00	G-OWTN	ERJ-145	Airliner	9000	
08/08/2022	09:59:00	OO-SLM	560XL CITATION	Business Jet	8100	
08/08/2022	10:03:00	F-HBZA	550 CITATION	Business Jet	5400	
08/08/2022	10:11:00	G-OWTN	ERJ-145	Airliner	6600	
08/08/2022	11:03:00	PH-EXM	E175	Airliner	3200	to INV
08/08/2022	11:23:00	G-LGNJ	Saab 340B	Airliner	8500	
08/08/2022	11:27:00	2-RTBS	FALCON	Business Jet	5200	to INV
08/08/2022	11:43:00	G-EZIY	A319	Airliner	3700	to INV
08/08/2022	11:47:00	G-SAJC	ERJ-145	Airliner	4400	
08/08/2022	12:23:00	G-SASC	KING AIR	TwinEGA	6200	
08/08/2022	12:47:00	G-EZAG	A319	Airliner	8300	to INV
08/08/2022	12:55:00	G-ZNTJ	LEARJET 75	Business Jet	6600	to INV
08/08/2022	13:07:00	G-TTNE	A320	Airliner	7500	to INV
08/08/2022	13:19:00	G-LGNG	Saab 340B	Airliner	7000	
08/08/2022	13:47:00	N378FJ	LANCAIR	SEP	2800	
08/08/2022	14:07:00	PH-EXW	E175	Airliner	4100	to INV
08/08/2022	14:55:00	N444R	FALCON	Business Jet	11600	to INV
08/08/2022	15:07:00	A6-CPC	LEGACY 600	Business Jet	5500	
08/08/2022	16:28:00	G-KVAN	FLIGHT DESIGN CTSW	SEP	3000	
08/08/2022	16:41:00	G-SAJC	ERJ-145	Airliner	3100	
08/08/2022	16:59:00	G-EZAI	A319	Airliner	2400	
09/08/2022	01:50:00	G-LMRX	ATR-72		10000	
09/08/2022	02:09:00	G-LMRY	ATR-72		10000	
09/08/2022	06:54:00	G-SCAP	AW109	Helicopter	3200	
09/08/2022	08:34:00	G-SAJC	ERJ-145		2700	
09/08/2022	10:51:00	PH-EXU	E175		3000	
09/08/2022	12:48:00	G-EZAO	A319		5300	to INV
09/08/2022	13:04:00	G-ISAS	H145	Helicopter	700	

Date	Time	Reg	Type	Category	Altitude	MIL/INV
09/08/2022	13:39:00	G-BMKR	PA-28	SEP	6000	
09/08/2022	13:56:00	ZM336	PHENON T1	Military	1375	
09/08/2022	14:02:00	ZM335	PHENON T1	Military	2700	
09/08/2022	14:12:00	G-EZDI	A319	Airliner	5500	to INV
09/08/2022	14:15:00	PH-EXP	E175	Airliner	6500	to INV
09/08/2022	15:20:00	G-ISAS	H145	Helicopter	1700	
09/08/2022	15:25:00	G-LOGN	PA-28	SEP	3000	
09/08/2022	16:49:00	G-MIRV	RV-8	SEP	1600	
09/08/2022	17:01:00	G-SAJC	ERJ-145	Airliner	2500	to INV
09/08/2022	17:29:00	ZZ418	Shadow R1	Military	4700	
09/08/2022	19:54:00	G-EUYI	A320	Airliner	9100	to INV
09/08/2022	20:30:00	G-SAJC	ERJ-145	Airliner	3000	
10/08/2022	01:47:00	G-LMRY	ATR-72	Airliner	7000	to INV
10/08/2022	09:39:00	G-LAZL	PA-28	SEP	2800	
10/08/2022	09:55:00	G-EZAO	A319	Airliner	4000	to INV
10/08/2022	09:59:00	G-ZENS	LEARJET 45	Business Jet	3600	
10/08/2022	10:03:00	G-BNRU	ROBIN DR400	SEP	5800	
10/08/2022	10:28:00	G-MIRV	VAN'S RV8	SEP	1700	
10/08/2022	10:54:00	PH-EXW	E175	Airliner	3400	
10/08/2022	12:12:00	G-DSAJC	ERJ-145	Airliner	4000	to INV
10/08/2022	12:27:00	G-KVAN	FLIGHT DESIGN CTSW	SEP	3400	
10/08/2022	12:27:00	G-NESE	P2002	SEP	2500	
10/08/2022	12:27:00	G-LAZL	PA-28	SEP	2800	
10/08/2022	12:42:00	G-EZBE	A319	Airliner	7900	
10/08/2022	13:07:00	Unknown	Unknown		1600	
10/08/2022	13:17:00	N135GB	CIRRUS SR20	SEP	9000	
10/08/2022	13:37:00	G-EUYF	A320	Airliner	4700	
10/08/2022	13:52:00	G-NJAB	560XL CITATION	Business Jet	4000	
10/08/2022	14:02:00	PH-EXJ	E175	Airliner	11200	
10/08/2022	15:02:00	G-EZAX	A319		5600	to INV
10/08/2022	15:34:00	PH-SPF	PA-28	SEP	3800	
10/08/2022	15:58:00	Unknown	AW189	Helicopter	900	
10/08/2022	16:02:00	EI-GRY	MOONEY M-20R	SEP	8500	
10/08/2022	16:03:00	EJ-ROXY	CHALLENGER 605	Business Jet	7000	to INV
10/08/2022	16:19:00	Unknown	AW189	Helicopter	1750	
10/08/2022	17:43:00	Unknown	510 CITATION	Business Jet	6800	to INV
10/08/2022	19:03:00	Unknown	510 CITATION	Business Jet	10000	

Date	Time	Reg	Type	Category	Altitude	MIL/INV
10/08/2022	19:03:00	ZK376	TYPHOON	Military	4000	
10/08/2022	19:47:00	G-SAJC	ERJ-145	Airliner	9000	to INV
10/08/2022	20:11:00	G-EZAB	A319	Airliner	6000	to INV
10/08/2022	20:19:00	G-TTNL	A320	Airliner	4800	to INV
11/08/2022	08:08:00	G-EUUX	A320	Airliner	3600	to INV
11/08/2022	08:37:00	G-SAJC	ERJ-145	Airliner	3600	to INV
11/08/2022	10:20:00	G-VBDT	CESSNA 172	SEP	5200	
11/08/2022	10:41:00	EJ-ROXY	BOMBARDIER 605	Business Jet	9300	
11/08/2022	13:41:00	G-BEZC	AA-5	SEP	4700	
11/08/2022	14:31:00	G-ETBT	PA-28	SEP	1675	
11/08/2022	14:41:00	G-CCTT	CESSNA 172	SEP	5500	
11/08/2022	15:21:00	G-ETBT	PA-38	SEP	2700	
11/08/2022	15:31:00	G-EGWN	AUORA	SEP	4000	
11/08/2022	16:49:00	N-23VK	CESSNA 501	Business Jet	8000	to INV
11/08/2022	19:09:00	G-EZUZ	A320	Airliner	3750	to INV
12/08/2022	11:00:00	G-CCTT	C172	SEP	3100	
12/08/2022	11:00:00	G-ETBT	PA-38	SEP	3600	
12/08/2022	11:00:00	G-BRLP	PA-38	SEP	3200	
12/08/2022	11:00:00	G-LAZL	PA-38	SEP	2800	
12/08/2022	23:00:00	G-SASC	KING AIR	TwinEGA	7000	
13/08/2022	09:10:00	PH-NXF	E190	Airliner	5200	
13/08/2022	11:01:00	G-SUEG	DA40	SEP	5900	
13/08/2022	15:09:00	G-SJMW	SD-1	SEP	900	
14/08/2022	09:03:00	G-IMAB	EUROPA	SEP	1800	
14/08/2022	10:10:00	G-CFVR	EUROPA	SEP	1500	
14/08/2022	10:10:00	G-CHY	Unknown		300	
14/08/2022	10:15:00	130602	C130 HERCULES	Military	7700	
14/08/2022	10:38:00	G-BTDA	SLINGSBY MG	SEP	1700	
14/08/2022	10:44:00	G-IDFE	Unknown	Helicopter	2200	
14/08/2022	12:12:00	G-CILB	GLIDER	Glider	2900	
14/08/2022	15:24:00	G-EZDR	A319	Airliner	6200	to INV
14/08/2022	16:39:00	G-SAJC	ERJ-145	Airliner	3000	to INV
14/08/2022	17:39:00	G-FHFB	Other	Business Jet	11400	to INV
14/08/2022	19:51:00	G-SAJC	ERJ-145	Airliner	9500	
15/08/2022	07:12:00	N1033Q	MOONEY M20-R	SEP	9100	
15/08/2022	09:18:00	OK-AST	CESSNA 560XL	Business Jet	5000	
15/08/2022	09:18:00	D-CWPS	PHENOM 300	Business Jet	11900	

Date	Time	Reg	Type	Category	Altitude	MIL/INV
15/08/2022	09:30:00	G-LGNA	Saab 340B	Airliner	8000	
15/08/2022	09:36:00	G-LGNJ	Saab 340B	Airliner	11700	
15/08/2022	13:10:00	G-LGNJ	Saab 340B	Airliner	4200	
15/08/2022	16:39:00	G-LGNC	Saab 340B	Airliner	12000	
16/08/2022	11:18:00	G-NICB	KING AIR	TwinEGA	10000	
16/08/2022	13:16:00	N599JT	CHALLENGER 350	Business Jet	9000	
16/08/2022	14:36:00	Unknown	CHALLENGER 601	Business Jet	10000	
16/08/2022	15:14:00	Unknown	AW189	Helicopter	600	
16/08/2022	15:26:00	ZK313	TYPHOON	Military	5000	
16/08/2022	16:13:00	CS-PHT	PHENOM 300	Business Jet	12000	
16/08/2022	18:53:00	BS058	TYPHOON	Military	3400	
16/08/2022	23:07:00	140115	CP140	Military	3700	
17/08/2022	09:25:00	Unknown	GULFSTREAM G500	Business Jet	7000	
17/08/2022	09:33:00	G-OWTN	ERJ-145	Airliner	8000	
17/08/2022	10:01:00	G-ZAHS	FALCON 900LX	Business Jet	3000	
17/08/2022	10:13:00	G-BGLG	C152	SEP	3000	
17/08/2022	10:50:00	Unknown	Unknown	Unknown	3000	
17/08/2022	11:00:00	G-CCTT	C172	SEP	3000	
17/08/2022	13:41:00	CS-DXQ	CITATION 56OXL	Business Jet	10000	
17/08/2022	15:27:00	G-BEZB	C172	SEP	3200	
17/08/2022	15:50:00	G-BEZB	C172	SEP	3000	
17/08/2022	15:58:00	OY-JSW	CITATION 525A	Business Jet	10000	
17/08/2022	17:05:00	Unknown	Unknown	Unknown	2000	
18/08/2022	01:25:00	Unknown	AW189	Helicopter	1700	
18/08/2022	05:27:00	Unknown	AW189	Helicopter	1500	
18/08/2022	08:26:00	G-EUUX	A320	Airliner	3000	to INV
18/08/2022	09:22:00	G-CCTT	C172	SEP	2500	
18/08/2022	10:14:00	PT-RBZ	Other	Business Jet	3700	to INV
18/08/2022	11:10:00	PH-EXN	E175	Airliner	5000	to INV
18/08/2022	11:37:00	G-SAJC	ERJ-145	Airliner	5000	to INV
18/08/2022	12:49:00	N508RA	CIRRUS CR22	SEP	2400	
18/08/2022	13:00:00	G-EZDH	A319	Airliner	5300	to INV
18/08/2022	13:54:00	08-6205	MC-130J	Military	10000	
18/08/2022	14:00:00	G-BRLP	PA-38	SEP	3500	
18/08/2022	14:10:00	PH-EXV	E175	Airliner	3700	to INV
18/08/2022	15:47:00	G-ETDC	C172	SEP	5500	

Date	Time	Reg	Type	Category	Altitude	MIL/INV
18/08/2022	21:03:00	G-EZDL	A319	Airliner	5200	to INV
19/08/2022	07:27:00	G-EZOU	A320	Airliner	7000	to INV
19/08/2022	08:40:00	Unknown	AW189	Helicopter	1300	
19/08/2022	09:19:00	G-SAJC	ERJ-145	Airliner	4000	to INV
19/08/2022	09:33:00	G-CTNG	CIRRUS SR20	SEP	2700	
19/08/2022	09:35:00	F-HBZA	CITATION 550 II	Business Jet	4000	to INV
19/08/2022	09:54:00	SE-DJI	FALCON 7X	Business Jet	3500	
19/08/2022	10:02:00	Unknown	AW189	Helicopter	1100	
19/08/2022	10:50:00	PH-EXO	E175	Airliner	7100	to INV
19/08/2022	11:30:00	Unknown	CITATION 510	Business Jet	7000	
19/08/2022	12:43:00	D-CWPS	PHENOM 300	Business Jet	3500	
19/08/2022	12:47:00	N4297A	PA-39	TwinEGA	9000	to INV
19/08/2022	13:03:00	G-EZGN	A319	Airliner	5000	to INV
19/08/2022	13:03:00	G-EZAX	A319	Airliner	10300	
19/08/2022	13:51:00	G-VIPA	C182	SEP	3400	
19/08/2022	15:31:00	G-SASC	KING AIR	TwinEGA	6400	
19/08/2022	15:55:00	G-EZBW	A319	Airliner	6500	to INV
19/08/2022	19:43:00	G-EUPO	A319	Airliner	7100	
19/08/2022	20:47:00	G-SASC	KING AIR	TwinEGA	3500	
19/08/2022	22:23:00	G-SASC	KING AIR	TwinEGA	10000	
19/08/2022	23:19:00	ZP805	POSEIDON MRA1	Military	9500	