Glasgow Airport Airspace Consultation

Main Consultation Document
Airspace Modernisation
ACP-2019-46

Consultation runs from:
20 October 2025 to 25 January 2026

GLASGOW AIRPORT

Table of Contents

Mark Beveridge,
Managing Director of Glasgow Airport

Foreword

Glasgow Airport plays a pivotal role in the social and economic development of the west of Scotland. It meets a variety of business and tourism needs whilst also being a lifeline for remote communities. We are one of the UK's busiest regional airports, and we are always striving to improve the airport – investing in responsible and sustainable ways to deliver better service to our passengers and strengthen relationships with our communities.

Airspace is like invisible motorway infrastructure in the sky. The design of the UK's airspace has remained largely unchanged since the 1950s and this means that aircraft today often fly routes which are inefficient, or which do not allow aircraft to climb or descend continuously, resulting in noise, greenhouse emission and capacity impacts.

An industry-wide drive led by the regulator, the Civil Aviation Authority (CAA), to create airspace infrastructure fit for the 21st century is now underway. This national airspace change programme aims to deliver the vision of the Government's Airspace Modernisation Strategy to deliver quicker, quieter, and cleaner journeys and more capacity for the benefit of those who use and are affected by UK airspace. A key element of the strategy is to introduce modern satellite-based navigation called Performance Based Navigation (PBN).

For Glasgow Airport, this means modernising our arrival and departure routes whilst also reviewing our Controlled Airspace structure to ensure we are using the minimum volume of airspace necessary. This offers opportunities for improvements to noise and Greenhouse Gas Emissions whilst also reducing passenger delay and improving access for airspace users.

Whilst our overall proposal provides a net benefit in as many areas as possible, we are aware that this proposal would result in changes to where aircraft fly today, and therefore there could be positive benefits and negative impacts in terms of noise to some areas surrounding Glasgow Airport. The information within this Consultation Document, and within our interactive tools on the Glasgow Airport consultation website, aims to help you understand what these proposals would mean for you.

We are committed to working with our industry, passengers, and neighbours throughout this process. At earlier stages of the airspace change process we held workshops to gain views on our Design Principles and options. We are now undertaking this consultation to gather as much feedback as possible to ensure everyone's views are given consideration.

Following this consultation, we will collate, review, and respond to feedback before developing the final Airspace Change Proposal and then submitting this to the CAA for formal approval.

Thank you in advance for your consideration of our proposals and we look forward to hearing from you before the consultation period ends on 25 January 2026 (23:59hrs).

1

Introduction

1

Introduction

1.1 Background to this Airspace Change Proposal

1.1.1 In 2017 the Department for Transport (DfT) notified aviation stakeholders that, as demand for aviation is forecast to continue growing, delays and environmental impacts are expected to increase if the UK's airspace is not upgraded to introduce additional capacity.

1.1.2 In response, the Civil Aviation Authority (CAA) was tasked to develop the UK Airspace Modernisation Strategy (AMS) which was first published in December 2018.

1.1.3 The overall programme of changes required to implement the AMS is considered one of the most significant airspace and Air Traffic Management (ATM) developments ever undertaken. Some of the most important changes described in the AMS concern the adoption of satellite based navigation technology, known as Performance Based Navigation (PBN).

Why must this change happen now and what does it aim to deliver?

1.1.4 Glasgow Airport Limited (referred to as 'Glasgow Airport', 'we' or 'our' throughout this document) must undertake this Airspace Change Proposal (ACP) to meet the requirements of the Government's AMS.

1.1.5 The key vision and objectives of the AMS are set out to the right hand side.

Airspace Modernisation Strategy

Vision

Deliver quicker, quieter and cleaner journeys and more capacity for the benefit of those who use and are affected by UK airspace.

Objectives

1 **Safety:**

Maintaining and, where possible, improving the UK's high levels of aviation safety has priority over all other 'ends' to be achieved by airspace modernisation.

2 **Integration of diverse users:**

Airspace modernisation should wherever possible satisfy the requirements of operators and owners of all classes of aircraft, including the accommodation of existing users (such as commercial, General Aviation, military, taking into account interests of national security) and new or rapidly developing users (such as remotely piloted aircraft systems, advanced air mobility, spacecraft, high-altitude platform systems).

3 **Simplification, reducing complexity and improving efficiency:**

Consistent with the safe operation of aircraft, airspace modernisation should wherever possible secure the most efficient use of airspace and the expeditious flow of traffic, accommodating new demand and improving system resilience to the benefit of airspace users, thus improving choice and value for money for consumers.

4 **Environmental sustainability:**

Environmental sustainability will be an overarching principle applied through all airspace modernisation activities. Modernisation should deliver the Government's key environmental objectives with respect to air navigation as set out in the Government's Air Navigation Guidance and, in doing so, will take account of the interests of all stakeholders affected by the use of airspace.

1.1.6 Our Airspace Change Proposal aims to modernise the airspace and to support the widespread introduction of new routes based on PBN, in order to meet the vision and objectives of the AMS. The airspace change will also take the opportunity to review the existing Controlled Airspace (CAS) boundaries and classifications to ensure that the future CAS is fit for purpose based on the proposed routes.

1.2 Scottish Airspace Modernisation and the coordinated consultation

Background

1.2.1 The Airspace Change Organising Group (ACOG) was formed in 2019 under the direction of the UK Government DfT and CAA, who co-sponsor and regulate airspace modernisation. ACOG is tasked with developing the UK Airspace Change Masterplan (the Masterplan), with oversight from an impartial Steering Committee of senior representatives drawn from across the aviation sector. More information is available on ACOG's website, www.acog.aero

1.2.2 The UK's airspace is being upgraded as part of the UK Government's airspace modernisation programme. This includes redesigning the arrival and departure routes that serve many of the UK's airports. Airspace modernisation will be delivered, in part, through a series of linked ACPs. Eighteen of the UK's airports are sponsoring ACPs to upgrade the arrival and departure routes that serve their operations in the lower airspace (below 7,000 ft). NATS, the UK's licensed Air Navigation Service Provider for en route operations, is currently sponsoring seven ACPs to upgrade the route network that sits above 7,000 ft, in busy portions of airspace where there are lots of climbing and descending flights, referred to as Terminal Control Areas (TMAs).

Figure 1: Four clusters of the Airspace Change Masterplan and airport sponsored Airspace Change Proposals

The Airspace Change Masterplan

1.2.3 Airspace modernisation is a complex programme, with many organisations working together on a single coordinated implementation plan out to 2040 – the Masterplan. The changes that make up the Masterplan will upgrade the UK's airspace and deliver the objectives of the Government's Airspace Modernisation Strategy.

1.2.4 The Masterplan is organised into four regional clusters (shown in figure 1 above) so that the simpler airspace changes can be deployed sooner, realising benefits earlier. The timelines for making airspace changes are generally shorter for the simpler clusters where there are fewer airports and less complex interdependencies between the airport Airspace Change Proposals.

Scottish Airspace Modernisation

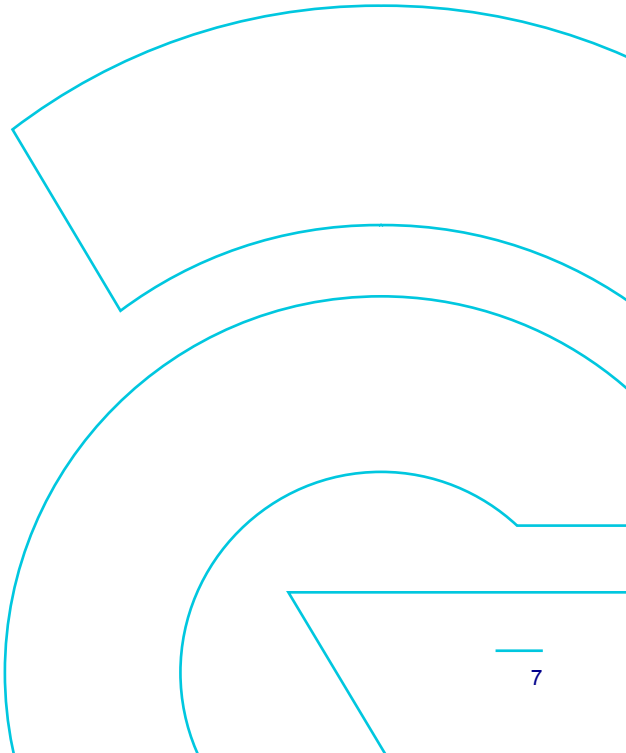
1.2.5 Glasgow Airport's ACP forms part of a wider Scottish Airspace Modernisation proposal. This is formed between Glasgow Airport, Edinburgh Airport and NATS En-Route Ltd (NERL). Within the Masterplan, it is referred to as the Scottish Terminal Control Area (ScTMA) cluster.

1.2.6 Glasgow Airport and Edinburgh Airport are responsible for the modernisation of their departure and arrival routes below 7,000ft and the airport's Controlled Airspace. NERL are responsible for connecting these routes into the network airspace, and the wider route network above 7,000ft.

1.2.7 The three ACPs are being progressed independently however there are design interdependencies between the proposals, i.e. a change to Glasgow Airport's design may result in a knock-on change for NERL and/or Edinburgh Airport.

1.2.8 This means that Glasgow Airport, Edinburgh Airport and NERL, coordinated by ACOG, have worked closely together to develop the Scottish Airspace Modernisation proposal. It also means that for some stakeholders, such as airlines and General Aviation, there will be coordinated consultation events to present the overall proposal.

1.2.9 This Main Consultation Document focuses on the proposed changes which form part of Glasgow Airport's proposals. However, ACOG has published a number of documents that present information about the development and outcomes of the system wide Scottish Airspace Modernisation proposal. As we progress through this document, we will provide information and links to the relevant ACOG documentation which shows how the Glasgow Airport proposal fits within the wider system design.



1.3 Airspace change process

1.3.1 Since January 2018 any changes to airspace are required to follow the CAA's CAP1616 regulatory guidance. CAP1616 outlines a 7-stage process for changing airspace design, including community engagement requirements.

Stage 1 – Define
Assess requirement
Design Principles
Define gateway

Stage 2 – Develop and Assess
Options development
Options appraisal
Develop and assess gateway

Stage 3 – Consult / Engage
Consultation / engagement preparation
Consult / engage gateway
Commence consultation / engagement
Collate & review responses

Stage 4 – Update and Submit
Update design
Submit proposal to CAA

Stage 5 – Decide
CAA assessment
CAA decision

Stage 6 – Implement
Implement

Stage 7 – PIR
Post implementation review

Figure 2: 7 stages of the CAP1616 Process (Edition 5). Source: www.caa.co.uk/CAP1616

1.3.2 A key principle of the airspace change process is that it is as transparent as possible throughout. Those potentially affected by an Airspace Change Proposal should feel confident that their voice has a formal place in the airspace change process[1].

1.3.3 The CAA monitors the progress of an Airspace Change Proposal against the requirements of the airspace change process at key defined points, called gateways. At each gateway, the CAA will assess whether the relevant airspace change process requirements have been met. The gateways are there to determine whether the airspace change process has been followed up to that point, and whether to approve the progress to the next stage[2].

1.3.4 In early 2023 the CAA conducted a public consultation on proposed changes to CAP1616 and Edition 5 of the document was published at the end of October 2023. In November 2023 the CAA wrote to Glasgow Airport to inform that Stage 3 of the CAP1616 should be carried out in accordance with Edition 5.

1.3.5 As such, all our Stage 3 documentation will be based on the guidance provided in Edition 5 of CAP1616 and CAP1616 f, Guidance on Airspace Change Process for Permanent Airspace Change Proposals.

[1] CAP1616 Edition 5 Page 14, Paragraph 1.30
[2] CAP1616 Edition 5 Page 20, Paragraphs 2.16–2.17

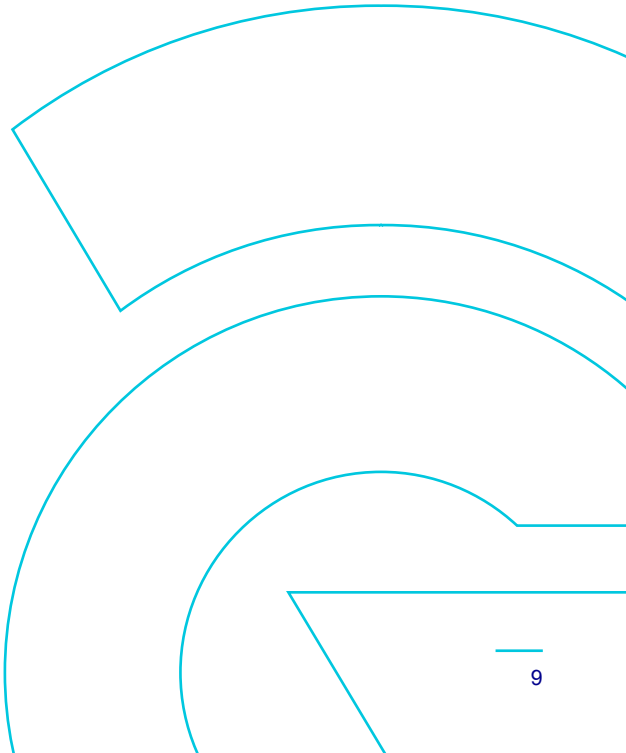
1.4 Glasgow Airport's Airspace Change Proposal

1.4.1 Glasgow Airport began the ACP-2019-46 to modernise our airspace in June 2019 and passed through Stage 1 of CAP1616 in December 2019. Shortly after this, the project and much of the wider UK programme to modernise airspace was paused due to the COVID-19 pandemic, whilst the Aviation Industry focussed on managing the pandemic, and its recovery from it.

1.4.2 The programme was remobilised in March 2021 and, following the provision of DfT grant funding, we recommenced the ACP in May 2021, passing through the Stage 2 Gateway in September 2022.

1.4.3 Table 1 over page summarises the CAP1616 stages already undertaken for this ACP and the stage where we are now. There are links to previous submission documents, held on the CAA's Airspace Change Portal, with further information.

1.4.4 Stages 1 and 2 were written in accordance with CAP1616 Edition 4, and Stage 3 onwards is written in accordance with CAP1616 Edition 5.



Airspace Change Stage	Summary	Link to documents Also available on the ACP portal
Stage 1A	In June 2019, Glasgow Airport submitted the following Statement of Need (SoN) to the CAA. Glasgow Airport participated in an assessment meeting with the CAA on 18 June 2019 as part of Step 1A of the CAP1616 process. The purpose of the assessment meeting is for the Change Sponsor to present and discuss the SoN and to enable the CAA to consider whether the proposal falls within the scope of the formal airspace change process.	Statement of Need Assessment meeting minutes
Stage 1B	At Stage 1B we developed a set of Design Principles through engagement with identified stakeholder representatives. The aim of the Design Principles is to provide high-level criteria that the proposed airspace design options should meet. They also provide a means of analysing the impact of different design options and a framework for choosing between or prioritising options.	Stage 1B Design Principle Submission Report
Stage 2A	In Stage 2A, we developed a Comprehensive List of Options that aimed to address the Statement of Need and align with the Design Principles developed in Stage 1. Those options were then shared with stakeholder representatives (the same ones engaged with on the Design Principles). Feedback from the engagement was then used to refine and/or generate further options where feasible. All options were then qualitatively assessed against the Design Principles and a Design Principle Evaluation was produced. Glasgow Airport's Comprehensive List of Options was then shortlisted before progressing to Stage 2B.	Stage 2A Main Document
Stage 2B	In Stage 2B we carried out an Initial Options Appraisal (IOA) of the airspace change options which proceeded from Stage 2A. The initial appraisal described the options under assessment and the baseline options, before explaining the methodology used to assess each option and the IOA outcome. Following this the document explained, based on the IOA, which options have been taken forward to Stage 3.	Stage 2B Initial Options Appraisal
Stage 3	Stage 3 is the Consult/Engage stage of the airspace change process. We initially worked with NERL and Edinburgh Airport to integrate our Stage 2B shortlisted designs within the wider Scottish Airspace before then undertaking a Full Options Appraisal (FOA). The FOA builds upon the work undertaken within the IOA and more details can be found here. Following the FOA, the option for consultation was identified and we then produced a Consultation Strategy and draft consultation materials which were submitted to the CAA for review. The CAA assessed the outputs and passed the gateway, which meant we could commence this consultation. Following the close of the consultation, the Sponsor must produce and publish a consultation response document before proceeding to Stage 4 of the process.	Where we are now

Table 1: Summary of ACP and engagement activity to date

1.5 This Consultation Document

1.5.1 This document is our Main Consultation Document which provides details of the background to this ACP and the proposed changes. It aims to explain the proposed changes in a way that those not familiar with aviation terminology can understand. To assist with this, we have produced a **Glossary and Terminology Explained Document**, which we recommend having open whilst reading this consultation document.

1.5.2 **This Consultation Document is broken down into 10 main sections.**

- **Section 1: Introduction**
  Introduces the background to this ACP and the work undertaken to date.
- **Section 2: Consultation Information**
  Provides an overview of the consultation, including details of the materials, our consultation events, and how you can feedback your comments.
- **Section 3: What is Performance Based Navigation (PBN)**
  Explains what PBN is and how it applies to how we are modernising Glasgow Airport's airspace.
- **Section 4: How We Developed These Proposals**
  Provides a summary of how the proposals have been developed since the start of the ACP.
- **Section 5: Proposed Departure Routes**
  Explains how aircraft depart from Glasgow Airport today and how they could in future.
- **Section 6: Proposed Arrival Routes**
  Explains how aircraft arrive at Glasgow Airport today and how they could in future.
- **Section 7: The Overall Proposal**
  Brings together the information about arrivals and departures to present the overall airspace proposal. This section includes information about where to find more details about the system wide Scottish Airspace Modernisation proposal.
- **Section 8: Benefits and Impacts of the Proposal**
  Provides a high-level summary of the Full Options Appraisal, so that consultees can understand the potential positive benefits and negative impacts of the proposal.
- **Section 9: Proposed Controlled Airspace (CAS)**
  Explains the current CAS arrangements at Glasgow Airport and how these arrangements could change in future. The section also contains information about the positive benefits and negative impacts of the proposed change.
- **Section 10: Responding to Our Consultation and What Happens Next**
  Describes the next stages of the CAP1616 process and explains how to respond to the consultation.
- **Appendix A: Feedback Form**
  A hard copy feedback form for those unable to respond to the consultation via the Citizen Space consultation website.
- **Appendix B: Selecting the option for Consultation**
  A summary of the Full Options Appraisal conclusion.
- **Appendix C: Noise mapping and data tables**
  High quality mapping and data tables about the proposed 'with airspace change' option compared against the 'without airspace change' scenario.
- **Annex 1: Technical details of the proposed procedures**
  Detailed aviation technical information about the proposed procedures.

Navigating this document

Throughout this Consultation Document there are interactive features to aide navigation.

Words in blue
These are included in the 'Terminology Explained' document.

Words in green
These link to sections or appendices that are related to this document.

Words in red
These link to external websites and documents.

2

Consultation information

2 Consultation information

2.1 Who are we consulting

2.1.1 This consultation aims to reach all stakeholders who may be impacted by the proposed changes. This includes Aviation Industry stakeholders, such as airlines and General Aviation, and communities who are either currently overflown by aircraft arriving or departing Glasgow Airport or who could be in the future.

2.1.2 Our Consultation Strategy includes more information about how we have identified our consultation audience, who our consultation audience are, and our approach to tailoring the consultation to different stakeholders.

2.2 Our Glasgow Airport consultation website

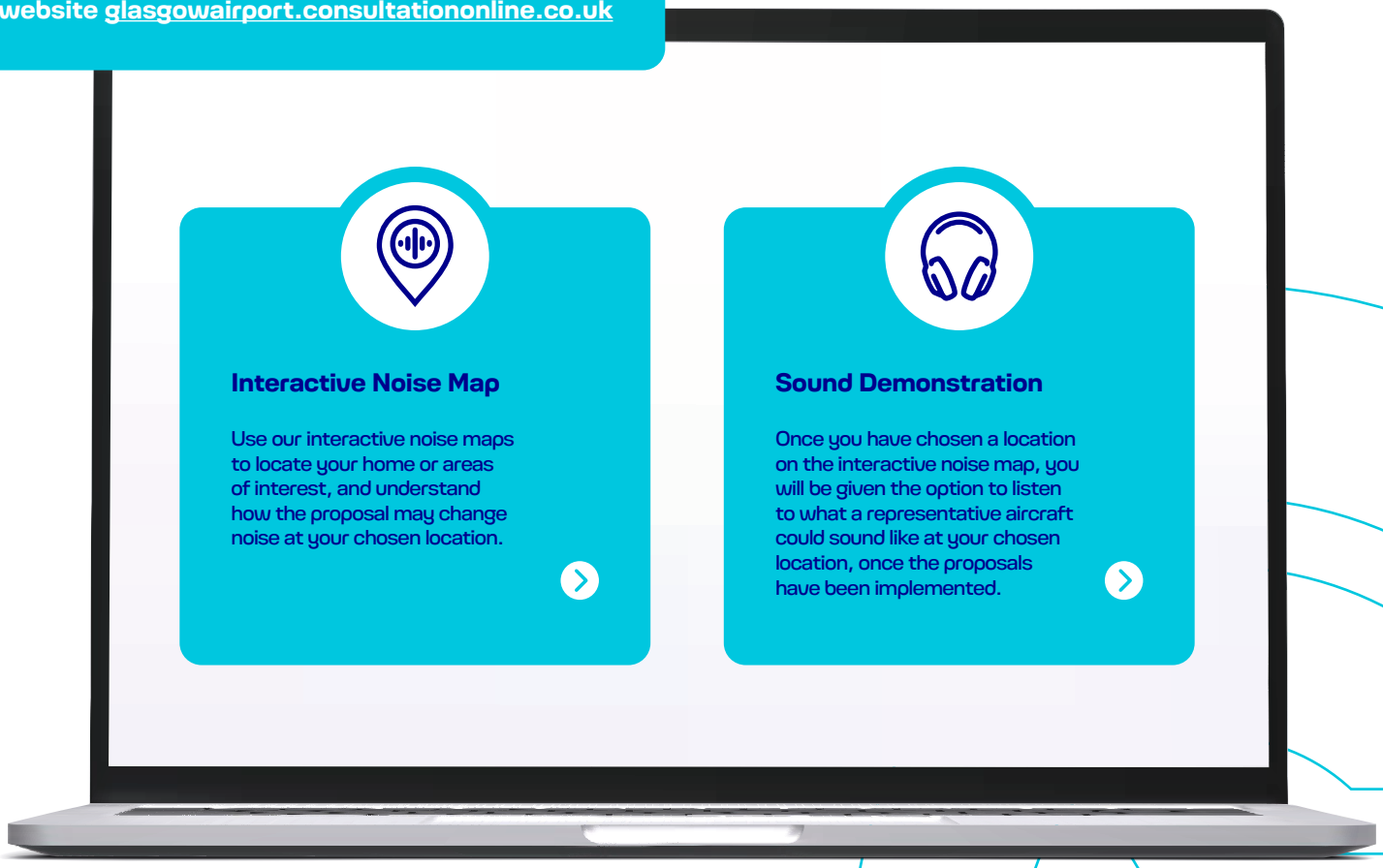
2.2.1 Glasgow Airport has a website dedicated to this consultation which can be found using the link: glasgowairport.consultationonline.co.uk

2.2.2 The Glasgow Airport consultation website contains accessible material and links to a set of online interactive tools where you can learn more about our proposals.

2.2.3 The material available on the Glasgow Airport consultation website is drawn from this consultation document.

2.2.4 Glasgow Airport highly recommends consultees utilise the website tools available, where you can interactively find out the potential impacts of our proposals on specific locations.

Two of the key tools available on our consultation website glasgowairport.consultationonline.co.uk



2.3 Consultation materials

2.3.1 A suite of consultation materials, presenting information at various technical levels has been created to aid stakeholders in understanding the context of this consultation and the scale of the proposed changes.

2.3.2 The materials are linked below, and you can also find links on our Glasgow Airport consultation website.

Consultation Summary Document

A short and easy to understand outline of the our proposal and our consultation with diagrams.

Main Consultation Document (this document)

A more detailed overview of the proposals including the background of the ACP and a summary of the outcomes of the Full Options Appraisal.

Full Options Appraisal

A document which describes in full technical detail the options and the positive benefits and negative impacts of the proposal compared against the 'without airspace change' pre-implementation baseline.

Frequently Asked Questions (FAQ) document

A FAQ document which will be updated as the consultation progresses, with any frequent questions that may arise either during the consultation events, or in consultation responses.

Glossary and Terminology explained

ACOG System Wide Description of the Scottish Airspace Modernisation Proposal

Consultation Strategy

A document which descibes our approach to Consultation.

2.4 Consultation events

2.4.1 If you are looking to find out more information about our consultation, we will be holding several events, both in-person and online, where the Glasgow ACP team will be available to answer any questions you may have about our proposals.

In-person drop in events

2.4.2 At these events, the consultation material will be available to view along with several tools which aim to provide all consultees with the information they will need to provide a response to the consultation.

2.4.3 Consultees will be able to use the following:

- **Interactive noise map** – Use our interactive noise maps to locate your home or areas of interest, and understand how the proposal may change noise at your chosen location.
- **Sound demonstration** – depending on the location chosen on the webmap, you may be given the option to listen to what a representative aircraft could sound like at your chosen location, once the proposals have been implemented.

2.4.4 Large scale printed maps will be available for consultees to view in detail the locations they are interested in, and which arrivals or departure routes my impact those locations.

2.4.5 Members of the Glasgow ACP team will be on-hand to answer any questions regarding the Glasgow proposals and members of the NERL ACP team will be invited to attend in-person events, to answer any questions consultees may have about their proposed changes.

Event Number	Date & Times	Tier	Location
November 2025			
1	Tuesday 4 November 2025 1400-2000hrs	2	**Kilmacolm** Kilmacolm Community Centre, Cargill Centre, Lochwinnoch Road, Kilmacolm, PA13 4LE
2	Wednesday 5 November 2025 1400-2000hrs	1	**Clydebank** Clydebank Town Hall, 5 Hall Street, Clydebank, G81 1UB
3	Thursday 6 November 2025 1400-2000hrs	2	**Beith** Beith Roebank Hotel, Roebank Road, Beith, KA15 2DX
4	Wednesday 19 November 2025 1400-2000hrs	2	**Uplawmoor** Mure Hall, 7 Tannoch Road, Uplawmoor, G78 4AD
5	Thursday 20 November 2025 1400-2000hrs	1	**Milgavie** St Joseph's Church, 3 Buchanan Street, Milngavie, G62 8DZ
6	Friday 21 November 2025 1400-2000hrs	1	**Drumchapel** Drumchapel St Mark's Church, 281 Kinfauns Drive, G15 7BD
7	Saturday 22 November 2025 1030-1430hrs	1	**Paisley** The Paisley Centre, 23 High Street, Paisley, PA21 2AQ
December 2025			
8	Wednesday 3 December 2025 1400-2000hrs	2	**Bridge of Weir** Cargill Hall, Lintwhite Crescent, Bridge of Weir, PA11 3LJ
9	Thursday 4 December 2025 1400-2000hrs	2	**Lennoxtown** Glazert Country House Hotel, 25 Milton Road, Lennoxtown, G66 7DJ
10	Saturday 6 December 2025 1030-1430hrs	3	**Glasgow city** 1599 at the Royal College, St Vincent Street, Glasgow, G2 5SG
11	Monday 15 December 2025 1400-2000hrs	1	**Bearsden** Boclair Community Church, Rannoch Drive, Bearsden, G61 5SG
12	Tuesday 16 December 2025 1400-2000hrs	1	**Johnstone** Brookfield Village Hall, 45 Woodside Road, Brookfield, Johnstone, PA5 8UB
January 2026			
13	Thursday 15 January 2026 1400-2000hrs	1	**Paisley** Paisley Town Hall, Abbey Close, Paisley, PA1 1JT
14	Saturday 17 January 2026 1030-1430hrs	1	**Clydebank** Clydebank Town Hall, 5 Hall Street, Clydebank, G81 1UB

Table 2: In-person drop-in events

Webinars

2.4.6 Glasgow Airport has scheduled several general webinars which will be open to all consultees. These will take place during the middle/end period of the consultation. The aim of the webinars is to provide consultees who are unable to attend and in-person session an avenue to engage directly with the Glasgow ACP team and ask questions regarding the proposals.

2.4.7 The information presented at all the general webinars will be the same. All webinars will be available for any person to join, and joining information will be available on our Citizen Space consultation website.

2.4.8 A recording of a webinar will be made available on the Citizen Space consultation website, for any stakeholder who is unable to attend, but who wishes to see the consultation material presented.

2.4.9 As well as the open to all webinars, a number of bespoke webinars have been scheduled to take place at the start of the consultation for Aviation Industry stakeholders, such as airlines, airports, General Aviation representatives and the military. These webinars are part of the coordinated consultation with NERL and Edinburgh Airport.

2.4.10 In addition to the general webinars, we will be hosting a webinar for General Aviation stakeholders which will focus on the Controlled Airspace (CAS) proposals. Details of this webinar can also be found in the table below.

Webinar Number	Dates & Times
1	Tuesday 11 November 2025 – 1600-1730hrs
2	Wednesday 12 November 2025 – 1800-1930hrs
3	Tuesday 25 November 2025 – 1000-1130hrs
4	Wednesday 10 December 2025 – 1500-1630hrs
5	Thursday 8 January 2026 – 1700-1830hrs
6	Tuesday 13 January 2026 – 1800-1930hrs
GA-focused webinar	Thursday 11 December 2025 – 1600-1730hrs

Table 3: Webinars

2.5 Further questions

2.5.1 If you have any further questions, please contact us using the below contact details. **Please note that all responses to the consultation must be submitted via the Citizen Space consultation website (see below for more information).**

airspace@glasgowairport.com

0800 066 8943

2.6 How to respond to the consultation

2.6.1 The consultation runs for 14 weeks from 00:01hrs on 20 October 2025 to 23:59hrs on 25 January 2026.

2.6.2 All responses to the consultation should be submitted online via the CAA's Citizen Space consultation website. This is available at https://consultations.airspacechange.co.uk/glasgow-airport/glasgow-airport-airspace-modernisation

2.6.3 If you need hard copy materials, you can contact the team either by email **airspace@glasgowairport.com** or call 0800 066 8943 and we will send you an information pack and feedback form by post, with a postage-paid envelope that you can return your completed form to us. A copy of the feedback form is also available at Appendix A of this document.

2.6.4 All responses to the consultation, including those received in hard copy form, will be published on the CAA's Citizen Space consultation website.

2.6.5 If you wish for your response to be published anonymously, there is an option to redact your personal details, and these will only be seen by Glasgow Airport and the CAA. If your feedback is relevant to one of the other Scottish Airspace Modernisation Sponsors (Edinburgh Airport and/or NERL) then your feedback and personal details will be shared with the applicable Sponsor(s).

2.6.6 Glasgow Airport will operate in compliance with the AGS Airports Ltd GDPR Policy in order to ensure lawful processing of personal data.

2.7 Analysis of your feedback

2.7.1 The consultation closes on Sunday 25 January 2026 (23:59hrs). Glasgow Airport will then collate, review and categorise the consultation responses. Responses will be categorised into those which present information that may lead to a change in design and those that would not.

2.7.2 We will then produce a Consultation Response Document that will summarise the consultation, the responses we received, and our response.

3

What is Performance Based Navigation?

3 What is Performance Based Navigation?

3.1 What is PBN?

3.1.1 The introduction of **Performance Based Navigation (PBN)** forms a key part of the Government's Airspace Modernisation Strategy (AMS). PBN improves the accuracy of where aircraft fly by using modern satellite navigation, rather than outdated ground-based navigation aids (conventional navigation).

3.1.2 The limitations with where conventional navigation aids can be located on the ground means that they constrain the areas where routes can be positioned, whereas PBN allows greater flexibility in route positioning:

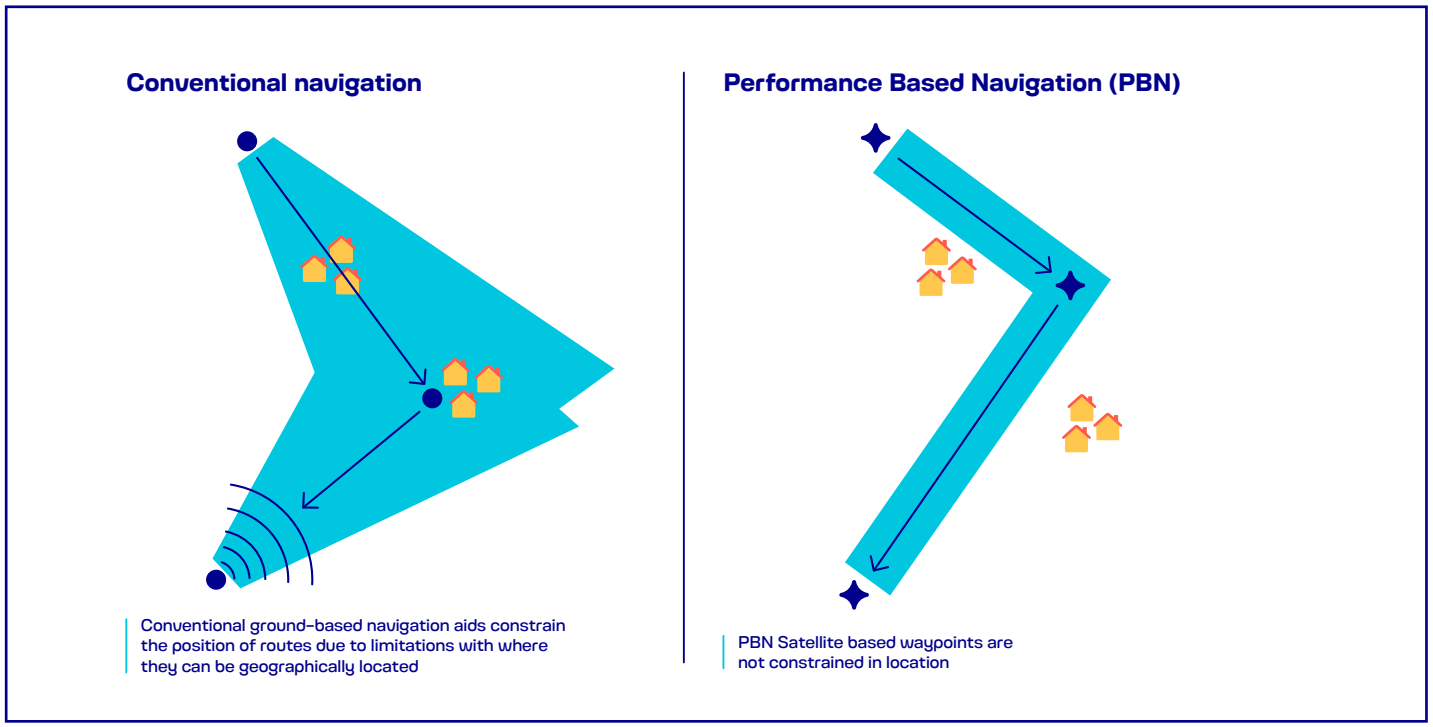


Figure 3: Conventional navigation vs PBN

3.1.3 At Glasgow Airport, the current departure routes are defined using conventional navigation aids however departures are also regularly **vectored**. There are no arrivals routes between the holding stacks and the final approach, and therefore arrivals are always **vectored**.

3.1.4 **Vectoring** is when **Air Traffic Control (ATC)** provide an instruction to pilots in the form of a direction (heading based on a compass bearing). ATC may also instruct pilots to climb or descend. ATC do this to ensure aircraft are safely separated and where possible are given the most efficient routes.

3.1.5 This vectoring creates **dispersion** across the airspace. This can be seen in the images below which show the typical swathes of flights to and from Glasgow Airport:

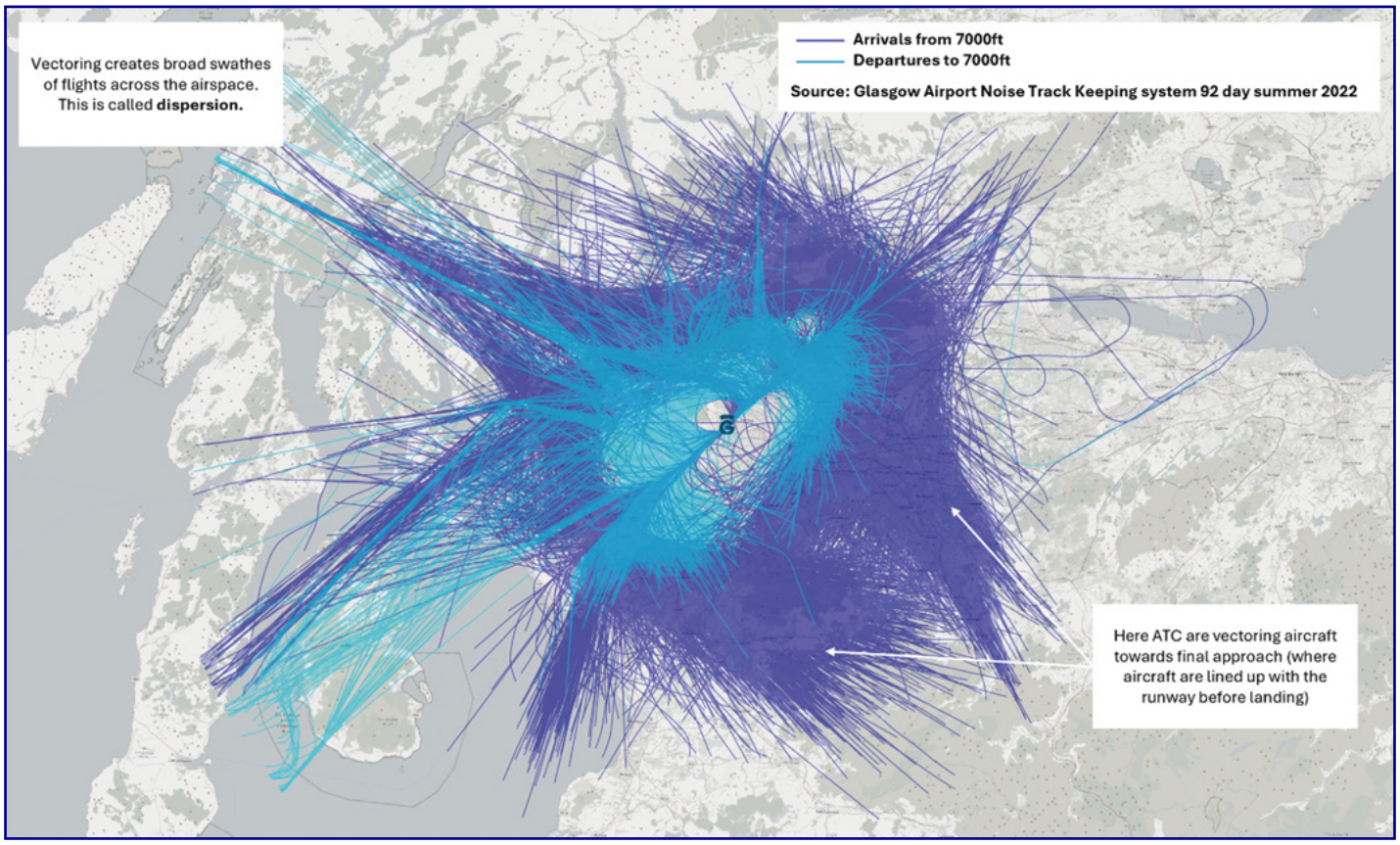


Figure 4: Typical swathes to and from Glasgow Airport. Basemap: ©OpenStreetMap

3.1.6 When aircraft fly along their routes, they are typically more **concentrated** over a narrower area compared to when they are vectored by ATC.

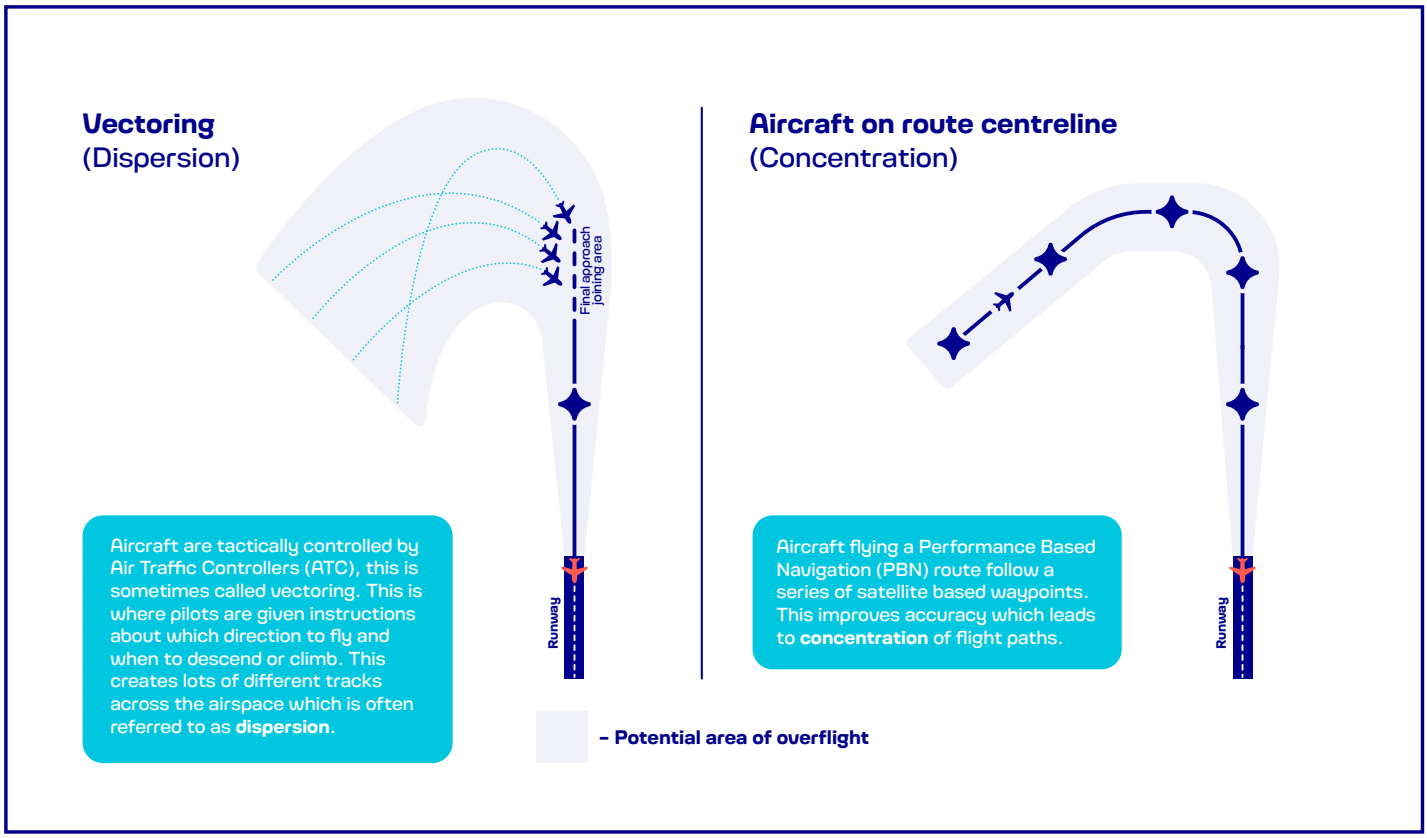


Figure 5: Example of vectoring compared to aircraft remaining on a route centreline

3.1.7 At the moment, PBN technology is not advanced enough to independently meet all of the needs of busy airspace. For arriving traffic, this is often when aircraft need to be safely sequenced and spaced before landing. For departing traffic, this is often when smaller, slower aircraft need to be safely separated from larger, quicker aircraft.

3.1.8 This means that often PBN routes are implemented alongside vectoring, so that ATC have the flexibility to continue to manage traffic within the airspace in order to minimise delays.

3.1.9 As part of the later sections of this document, we will describe how we anticipate the departure and arrival routes to be operated and what vectoring is expected to be seen alongside the PBN proposals.

3.2 The DVOR rationalisation project

3.2.1 Alongside the main driver of this airspace change, which is to meet the Government's Airspace Modernisation Strategy (AMS), Glasgow Airport are also required to remove dependency on conventional, ground based, navigation aids called **DVOR (Doppler VHF Omni Directional Range)** which are currently undergoing a rationalisation programme by NERL.

3.2.2 Glasgow Airport's current departure route procedures, and some arrival procedures, utilise DVORs and therefore one of the aims of this ACP is to reduce dependencies on ground-based navigation aid infrastructure, and move towards satellite-based navigation (PBN) which would remove the dependency on DVORs. There will still be an operational network of DVORs across the UK which remains to provide resilience to Global Navigation Satellite System (GNSS) outage.

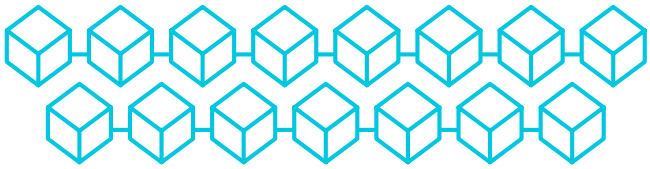
4

How we developed our proposal

A summary of how we developed our proposal

This section provides a one page overview of how we have developed our proposal with more information then available in the subsequent pages. Click here to skip straight to the next section about our proposed departure routes.

Stage 1



15 **Design Principles** were developed with stakeholder input, outlining the high-level criteria for airspace design.

Stage 2

1,000s of notional flight paths were analysed using computer modelling generated data.

30 options were developed from this data, based on the Design Principles.

The design options were tested with stakeholders, with two further options being developed.

28 options were taken forward after the Design Principle Evaluation.

These were assessed against noise, environmental, aviation, and cost impacts versus a 'without airspace change' scenario.

8 options were then shortlisted for Stage 3.

Stage 3

The **8 options were refined and integrated into the Scottish Airspace Modernisation proposal** through collaboration with Edinburgh Airport and NERL. They also underwent **detailed design development** to ensure their safety.

A detailed appraisal of the 8 options was conducted, analysing **noise, environmental, aviation, and cost impacts** versus a 'without airspace change' scenario. This **narrowed the options** down to the **one now being consulted on**.

Where we are now

We are consulting on our proposed design and **value your feedback** to help refine it. Glasgow Airport will review all input and document how it shapes the final proposal.

The following pages expand on the information provided in the above summary.
Click here to skip straight to the next section about our proposed departure routes.

Stage 1

Design Principles

We first started by engaging with representative stakeholders on our Design Principles.

These stakeholders included representatives for local communities, the Aviation Industry, military as well as political representatives and environmental groups.

Design principles are the high-level criteria which the airspace design should meet.

Working with these stakeholders, we developed 15 principles which are shown below.

We submitted details of the Design Principles and our engagement to the CAA, who approved us to move onto the next step of the process.

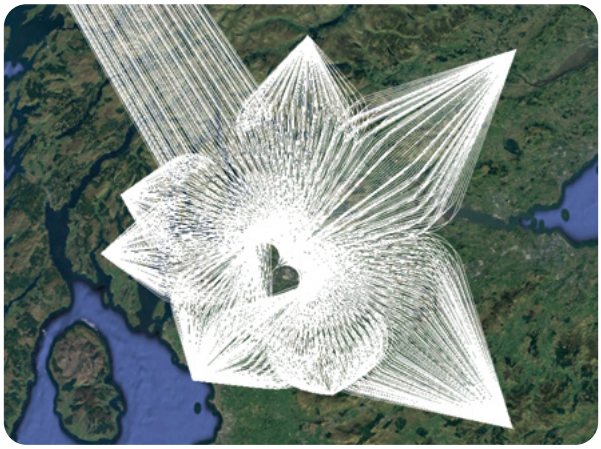
1. The airspace design and its operation must be as safe or safer than today.
2. Facilitate the growth in quicker, quieter and cleaner traffic by configuring the airspace to improve efficiency and meet the forecast demand for air transport.
3. Design the appropriate volume of Controlled Airspace to support commercial air transport, enable safe, efficient access for other types of operation and release Controlled Airspace that is not required.
4. Mitigate any future requirements for airborne holding for inbound traffic and holding on the ground pre-departure for outbound traffic.
5. Minimise the total adverse effects of aircraft noise and visual intrusion on physical and mental health and wellbeing.
6. Offer communities options for both noise concentration and noise dispersion through the use of predictable and transparent multiple route options and other respite methods that are possible within the technical ATC system, en-route network and procedural constraints.
7. The arrival and departure routes that serve Glasgow Airport below 7000ft should avoid noise sensitive areas and buildings, national parks, areas of outstanding natural beauty/National Scenic Areas and areas that are not currently affected by aircraft noise.
8. Mitigate the impacts on local communities that are currently affected by aircraft noise on final approach or the vicinity of the immediate climb out, where overflight is unavoidable.
9. Reduce complexity and bottlenecks in Controlled and Uncontrolled Airspace and contribute to a reduction in airspace infringements.
10. Collaborate with other Scottish airports and NATS to ensure that the airspace design options are compatible with the wider programme of lower altitude and network airspace changes being coordinated by the FASI North programme.
11. Routes to/from Glasgow and Edinburgh airports should be procedurally deconflicted from the ground to a preferred level in coordination with NATS Prestwick.
12. Minimise the growth in aircraft emissions, the further degradation in local air quality and adverse ecological impacts to address growing concerns about the impact of aviation on climate change.
13. Aircraft operating at Glasgow Airport should climb and descend continuously to/from at least 7000ft with a preference for the most environmentally beneficial option to be chose, if both cannot be achieved simultaneously.
14. Routes should be designed to meet a RNAV1 specification as a minimum in order to gain maximum benefit of the performance capabilities of the modern aircraft fleet operating at Glasgow Airport in line with the guidance provided in CAA CAP1385 on enhanced route spacing for PBN and provide sufficient resilience and redundancy against Global Navigation Satellite System (GNSS) failure.
15. The GLA ACP accords with the CAA's published Airspace Modernisation Strategy (CAP1711), any current or future plans associated with it and all other relevant policies and regulatory standards.

Stage 2

Option development

We then developed 30 design options based on these Design Principles. To do this, we used computer modelling to flood the airspace with thousands of notional flight paths.

We then generated noise and environmental data on those flight paths before using the Design Principles as a way of building these paths into options. As some of the Design Principles are in conflict with one another, a range of options were developed.



Example of the notional flight paths generated as part of the computer modelling.

At this point, the options were considered very early designs and therefore they were to be refined based on:

- Integration with the wider airspace network below and above 7,000ft
- Reacting to ongoing stakeholder engagement
- Increasing environmental and operational performance
- Accordance with more detailed instrument flight procedure (IFP) design and validation in Stages 3 and 4

Stakeholder engagement

We then tested the options with the same stakeholder representatives who helped us develop the Design Principles.

Those stakeholders gave us lots of useful feedback to use when evaluating and appraising the options.

The feedback also led us to develop two more departure options.

At this point we had what CAP1616 calls a 'Comprehensive List of Options' and we moved away from options creation and into options assessment.

Design Principle Evaluation

The first assessment was called a Design Principle Evaluation (DPE). This looks at how each option performs against each Design Principle.

The option was given a red, amber, green assessment based on whether it 'met', 'partially met' or 'not met' the Design Principle.

Options	DP1	DP2	DP3	DP4
X				
Y				
Z				

Indicative image of how the options were graded against our Design Principles

At the end of the DPE, we shortlisted the options based on their performance. Four options were discontinued and 28 were taken forward.

Initial Options Appraisal

The next assessment was called the 'Initial Options Appraisal'. It is the first of three phases of appraisal as part of the CAP1616 process.

With this assessment, we compared each option against a 'without airspace change' baseline to understand the positive benefits and negative impacts of the option.

This assessment was based on lots of different categories which are required by CAP1616, as seen below.

At the end of the assessment, further shortlisting of the options took place. This reduced the list from 28 options down to eight options.

Once this assessment was concluded, we documented the whole process from Options Development and submitted it to the CAA to ensure we were following the CAP1616 process in a clear and transparent way. The CAA reviewed our work and approved us to move to the next stage.

CAP1616 Options Appraisal assessment categories

- Safety
- Noise
- Greenhouse Gas Emissions
- Air quality
- Biodiversity
- Tranquility
- General Aviation
- Fuel burn
- Capacity
- Resilience
- Airline, airport, and ATC costs

Detailed design development of the options

We then needed to integrate the options with the wider Scottish Airspace Modernisation proposals from NERL and Edinburgh Airport.

This was a process which involved a lot of safety and operational viability assessments. The three ACP Sponsors collaborated with ACOG to refine and integrate the shortlisted options into an overall Scottish Airspace Modernisation proposal. This involved assessing the options when viewed as a collective.

For more information about the overall Scottish Airspace Modernisation proposal please see the ACOG Annex here.

A key goal of the Masterplan is to outline how the options in each ACP relate to one another (their interdependencies), including any design conflicts and the potential solutions. Interdependencies occur when the options from different ACPs are linked, for example when one Sponsor's designs affect the feasibility of another's. A design conflict arises if these options cannot coexist as they are. In such cases, ACP Sponsors must work together to modify or remove options to resolve the conflicts. Resolving conflicts often involves trade-offs, where different solutions lead to varying combinations of positive and negative impacts. These trade-offs reflect the compromises made to prioritise benefits in one area, sometimes at the expense of improvements in another, while always maintaining safety as the top priority.

For more information about the treatment of ACP interdependencies and design conflicts please see sections B3, B4 and B5 of the Masterplan Iteration 3 here.

ACOG has developed a Cumulative Analysis Framework (CAF) described in Appendix 1 of the Masterplan here, to guide ACP Sponsors in identifying interdependencies and resolving design conflicts through evidence-based trade-offs.

Glasgow Airport, Edinburgh Airport, and NERL collaboratively reviewed the ACPs using the CAF methodology, identifying 18 potential interdependencies. Eight of these arose from interactions between arrival and departure route options in the Glasgow and Edinburgh Airport ACPs. Further analysis confirmed that these interdependencies would not result in design conflicts, so no modifications to the designs were necessary.

The remaining ten interdependencies involved options for the position of the airborne holds included in the NERL ACP and their potential to interact with the route options included in the Airports' ACPs. Further analysis identified that two of these interdependencies may result in design conflicts between the Glasgow Airport ACP and the NERL ACP.

The first design conflict involved an option to locate a new hold to the west of Glasgow. This was resolved following a qualitative review of the potential solutions and trade-offs that demonstrated one solution – to discontinue the option for a new hold to the west of Glasgow – was clearly preferable.

The second design conflict involved options to replace the existing airborne holds to the north of Glasgow. Again, this was resolved following a qualitative review of the potential solutions and trade-offs that demonstrated one solution was clearly preferable – to propose a new hold in a similar location to the existing one that is realigned to better accommodate traffic inbound to Glasgow from the east.

Appendix 3 of the Masterplan Iteration 3 here provides a full description of all 18 interdependencies and the qualitative assessments of the two design conflicts, including the potential solutions and trade-offs.

Alongside integrating the options into the wider airspace network, we also needed to undertake very detailed design development to ensure the proposed routes were safe. Information about this is also contained within the 'evolution of the options' section of the Full Options Appraisal.

Full Options Appraisal

We then undertook a Full Options Appraisal, the second of the three phases of appraisal.

This is based on the same assessment categories as the Initial Options Appraisal (such as safety, noise, greenhouse gas etc) but the assessments are increased in detail and almost all the categories were quantitatively (data based) assessed rather than qualitatively assessed.

Just like in the Initial Options Appraisal, we assessed each option against a 'without airspace change' scenario to understand the positive benefits and negative impacts of each option. This was undertaken for 2027 (the expected year of implementation[3]) and 2036 (10 years following implementation).

8 options were assessed at Full Options Appraisal and the very detailed assessments gave us sufficient information to narrow down our options to our preferred option for this consultation. More details around this can be found in **Appendix B: Selecting the option for Consultation** and **Section 6 of our Full Options Appraisal document**.

Where we are now – this consultation

This brings us to where we are now – this consultation.

We are consulting on our proposed design which has been developed over the past four years. We have chosen to bring one option forward to consultation to be able to clearly present to consultees the very detailed information around how the proposal could benefit or impact compared to the 'without airspace change' scenario.

We want to hear from you – your feedback will be used to help shape our proposal and develop the final design. For example, you may tell us that it would be advantageous to move a route slightly to avoid a noise sensitive area, or a boundary of Controlled Airspace would benefit from a lateral change to better suit a visual reference point. All of your feedback will be considered by Glasgow Airport and we will document this process so that you can understand how your feedback has been considered as part of the final proposal.

Your feedback will also help us to further understand the benefits and impacts of the proposal and where possible we will incorporate this into future options appraisals.

Changes to the design could have knock-ons in the wider Scottish Airspace Modernisation airspace and therefore we will be working closely with Edinburgh Airport and NERL (coordinated by ACOG), to develop the final Scottish Airspace Modernisation proposal.

The full process will be documented so that you can see how your feedback has been considered and, if design trade-offs are required, how we have developed the final airspace design.

What if the design fundamentally changes following consultation?

Depending on the scale of the changes, we will either undertake targeted engagement or, if the design changes are significant, we will carry out further consultation activities.

[3] Implementation will be no earlier than 2027. Please note the expected implementation year may change. This depends on the UK Government's airspace modernisation priorities and the aviation industry's ability to manage major changes safely and efficiently.

System wide proposal for Scottish Airspace Modernisation

Scottish Airspace Modernisation

Glasgow Airport, along with Edinburgh Airport and NERL, has developed the overall proposal for the modernisation of Scottish Airspace. This is formed of three separate ACPs (one for each Sponsor) and these ACPs have followed CAP1616 to produce three separate Full Options Appraisal document sets.

Because these ACPs are all part of Scottish Airspace Modernisation, an additional document has been produced to capture the cluster wide performance for system comprising of the preferred option each Sponsor is taking to consultation (i.e. the overall impact from the three ACPs taken as a whole). This shows:

- The system wide design would provide regional benefit with regard to CO_2, fuel, delay reduction and overall monetised noise (some areas would be overflown less and others more, but overall monetised noise effects would be reduced).
- The net cluster-wide benefit (using the Government's method for monetising benefits) is c. £129,694,000.
- The document also identifies that there are no dependencies between, or cumulative effects from, the options being presented by each ACP at consultation, and so there are no trade-offs between the consultation options presented by different Sponsors.
- This document is referred to as CAF2 and is published on the airspace change portal.

5

Proposed departure routes

5 Proposed departure routes

5.1 How aircraft depart Glasgow Airport today

5.1.1 To fully describe the proposed changes, we first need to describe how aircraft depart Glasgow Airport today.

Runway direction

5.1.2 Glasgow Airport has one main runway, which can be operated in two directions. These runway directions are called Runway 23 and Runway 05.

5.1.3 Aircraft depart (take off) into the wind. This means that Glasgow Airport's runway direction depends on the wind direction.

5.1.4 Across an average year, 74% of aircraft take off on Runway 23 which means they take off to the south west towards Johnstone, and 26% of aircraft take off on Runway 05 to the north east towards Clydebank.

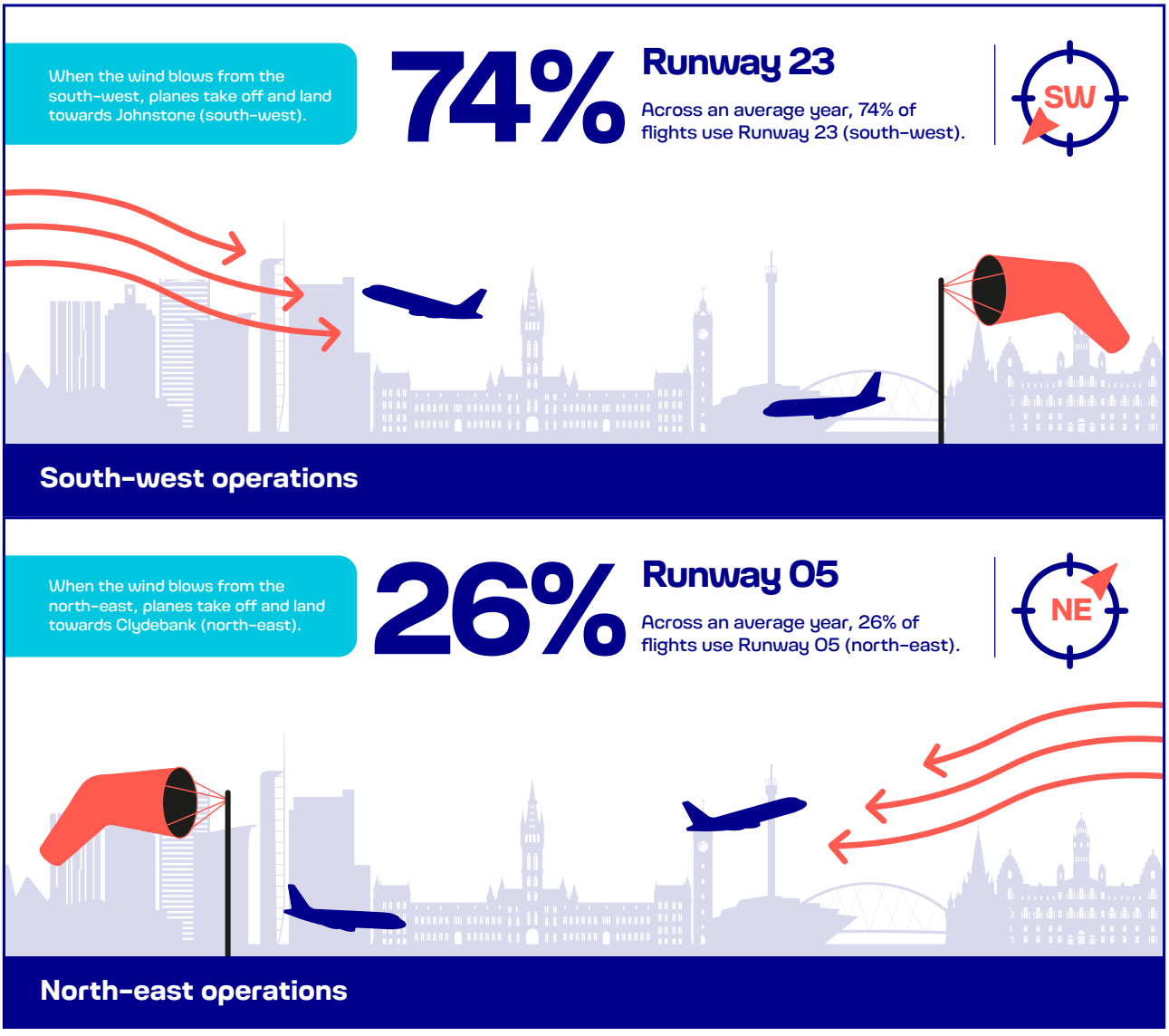


Figure 6: Glasgow Airport runways and usage

Glasgow Airport's departure routes and Noise Abatement Procedures

5.1.5 Most aircraft taking off from Glasgow Airport are initially required to follow specific flight paths called **Noise Abatement Procedures (NAPs)** unless directed otherwise by Air Traffic Control.

5.1.6 Noise Abatement Procedures (NAPs) are designed to minimise exposure of residential areas to aircraft noise, while ensuring safety of flight operations. The NAPs are not linked to any planning conditions.

5.1.7 These NAPs, as published in the **Aeronautical Information Publication (AIP)**, require aircraft to climb straight ahead, on the same heading as the runway, for at least 5nm (around 9.3km)[4] before turning. This applies to all departing jet aircraft and all other departing aircraft of more than 5,700kg Maximum Take-off Weight Authorised (MTWA). On some occasions aircraft are permitted to deviate from the NAPs when instructed by ATC or in the interests of safety.

5.1.8 Non-jet aircraft which are under the 5,700kg restriction, such as the **Twin Otter**, can be turned by ATC immediately after departure and do not have to fly straight ahead for 5nm. These aircraft are often smaller and slower than other aircraft and so ATC give them instructions to keep them safely separated from other arriving and departing traffic to help reduce delays. This means these aircraft do not follow the published departure routes and it often reduces track mileage compared to if they were to fly the published departure routes.

5.1.9 In addition to this, turbo prop aircraft under 23,000kg MTWA, such as the **ATR 72-600**, are also vectored off the routes by ATC. This is for similar reasons to what is described above; these aircraft are typically slower and by vectoring them away from the departure routes there is less delay and the aircraft fly more efficient routes. This vectoring practice is not formally published in Glasgow Airport's **AIP** but has routinely been undertaken by ATC for many years. The ACP provides an opportunity for the AIP to be updated to reflect the existing practice.

5.1.10 Glasgow's existing departure routes incorporate the NAPs, and so all of Glasgow's published departure routes (known as **Standard Instrument Departures or SIDs**) climb straight ahead for 5nm. As a result, the vast majority of departures fly over the same areas as the arrivals when the opposite runway is in use. An illustrative example of this is shown in Figure 7.

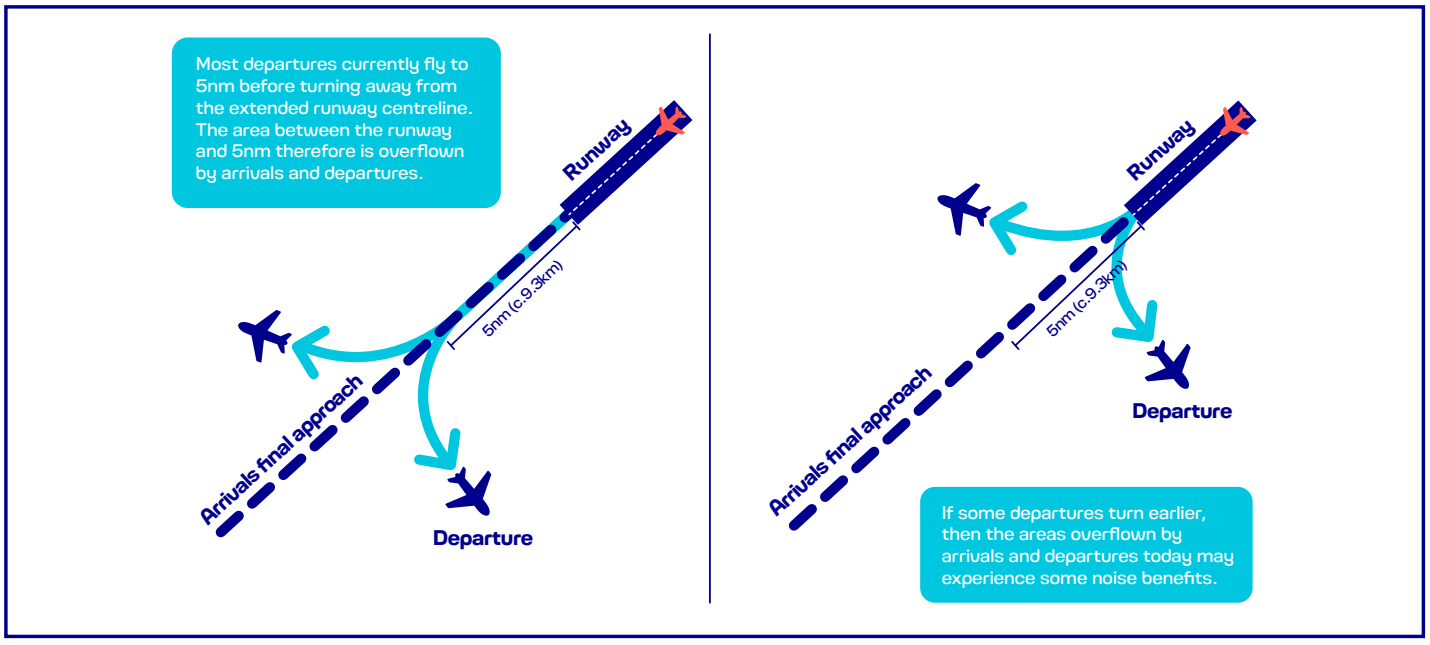


Figure 7: Explanation of overflight by arrivals/departures

[4] Nautical mile. 1 nautical mile = 1.15 miles or 1.85km

5.1.11 When aircraft take off, Air Traffic Control (ATC) have to wait a certain amount of time before the next aircraft can take off in order to keep the departing aircraft safely separated. This time varies depending on the aircraft type and the configuration of the departure routes (i.e. how soon do the routes turn away from each other).

5.1.12 As all of Glasgow's departure routes climb straight ahead for 5nm, this means that the minimum time interval between successive, departing aircraft following those routes is at least 2 minutes to ensure safe separation between each aircraft. The result is that during peak departure times, especially where those aircraft are all required to follow the departure routes (c.93% of all departures), aircraft are held on the runway and at the runway holding points, leading to increased emissions and delay.

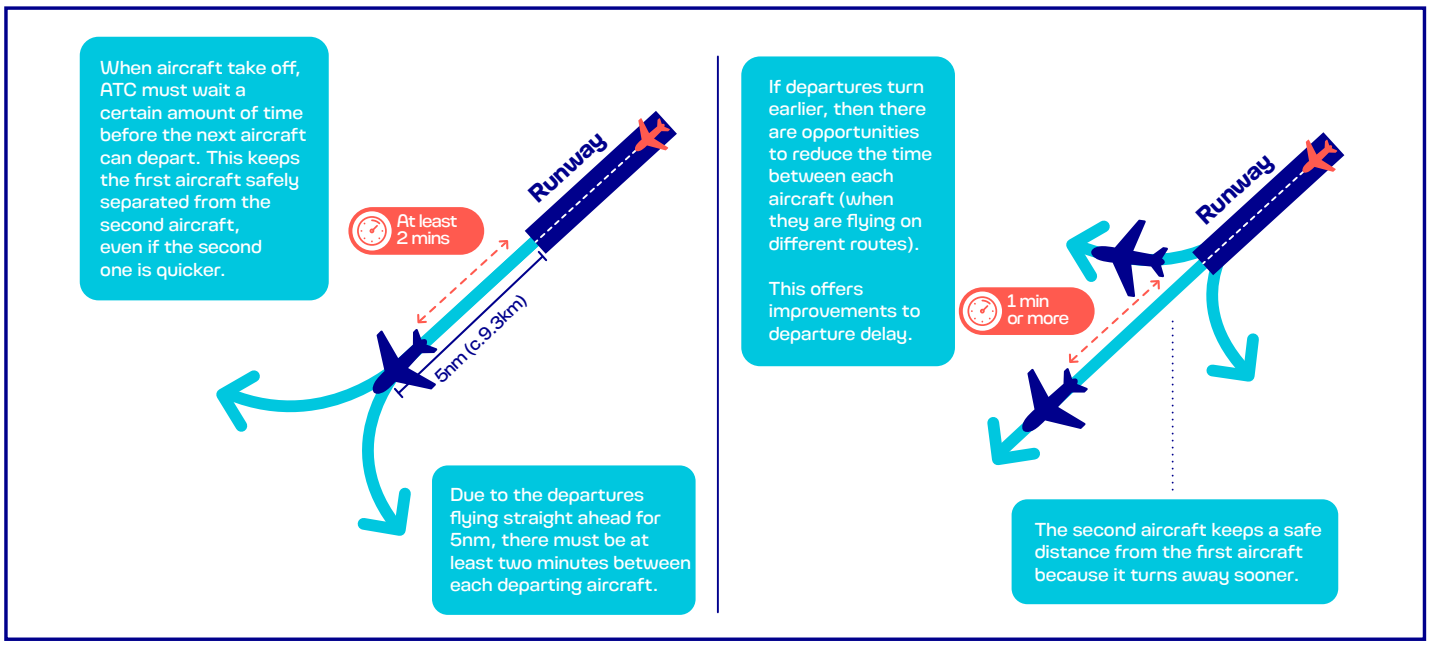


Figure 8: Explanation of departure separation

5.1.13 Once beyond 5nm, aircraft are routinely **vectored** by ATC. This means that rather than following the departure route, ATC direct aircraft where to fly using compass headings and climb instructions. ATC do this because there are lots of complex interactions within the airspace whereby arriving and departing aircraft need to be kept safely separated. It also sometimes means ATC are able to give departing aircraft a more direct route, which saves fuel and Greenhouse Gas Emissions.

Where aircraft fly today

5.1.14 Figures 9 and 10 show current departures from Glasgow Airport.

74% of departures take off to the south west on **Runway 23**

Runway 23 departures to 7000ft

Source: Glasgow Airport Noise Track Keeping system 92 day summer 2022 (6473 flights)

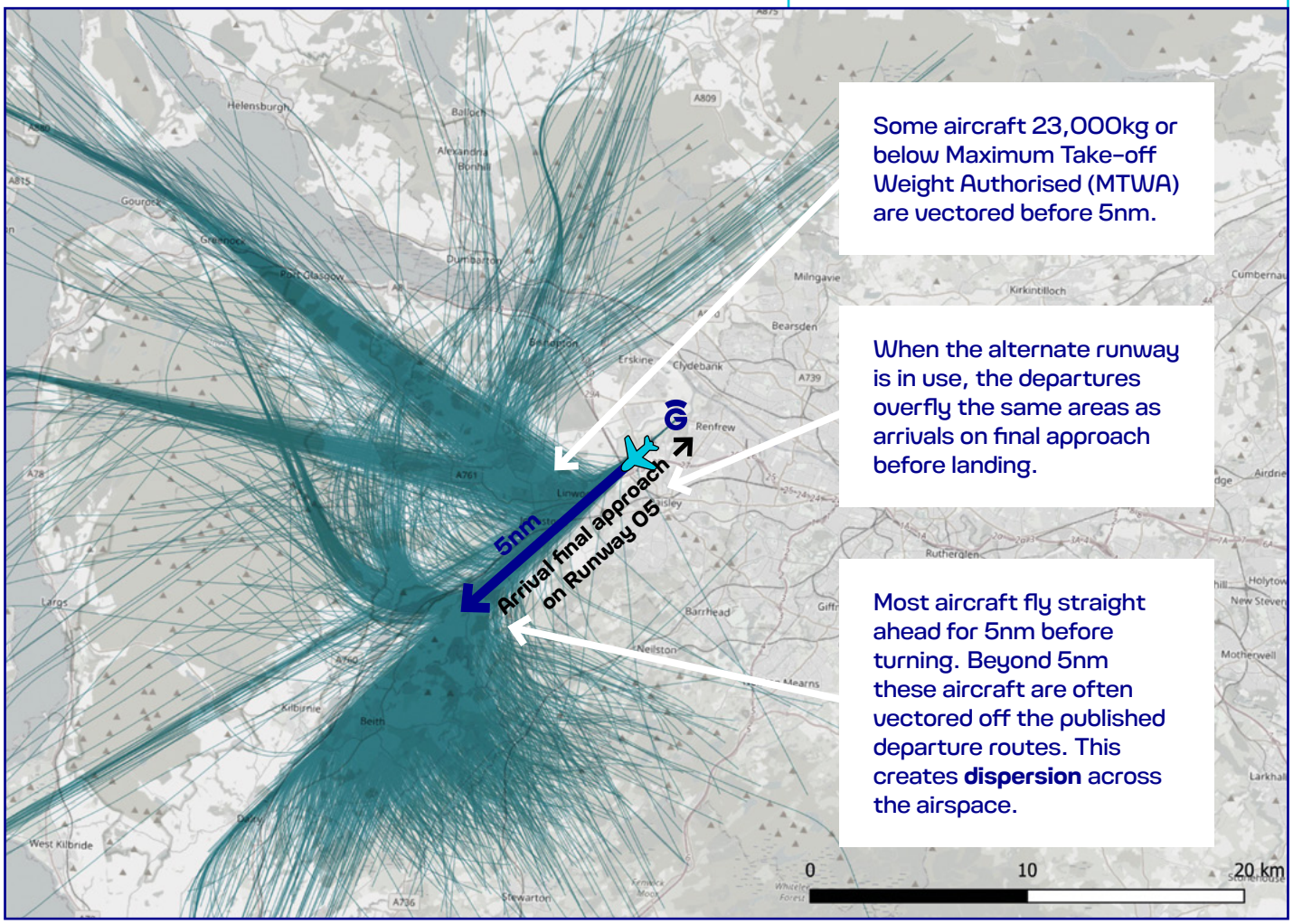


Figure 9: Current Glasgow Airport Runway 23 departures (Map: ©OpenStreetMap)

26% of departures take off to the north east on **Runway 05**

Runway 05 departures to 7000ft

Source: Glasgow Airport Noise Track Keeping system 92 day summer 2022 (2138 flights).

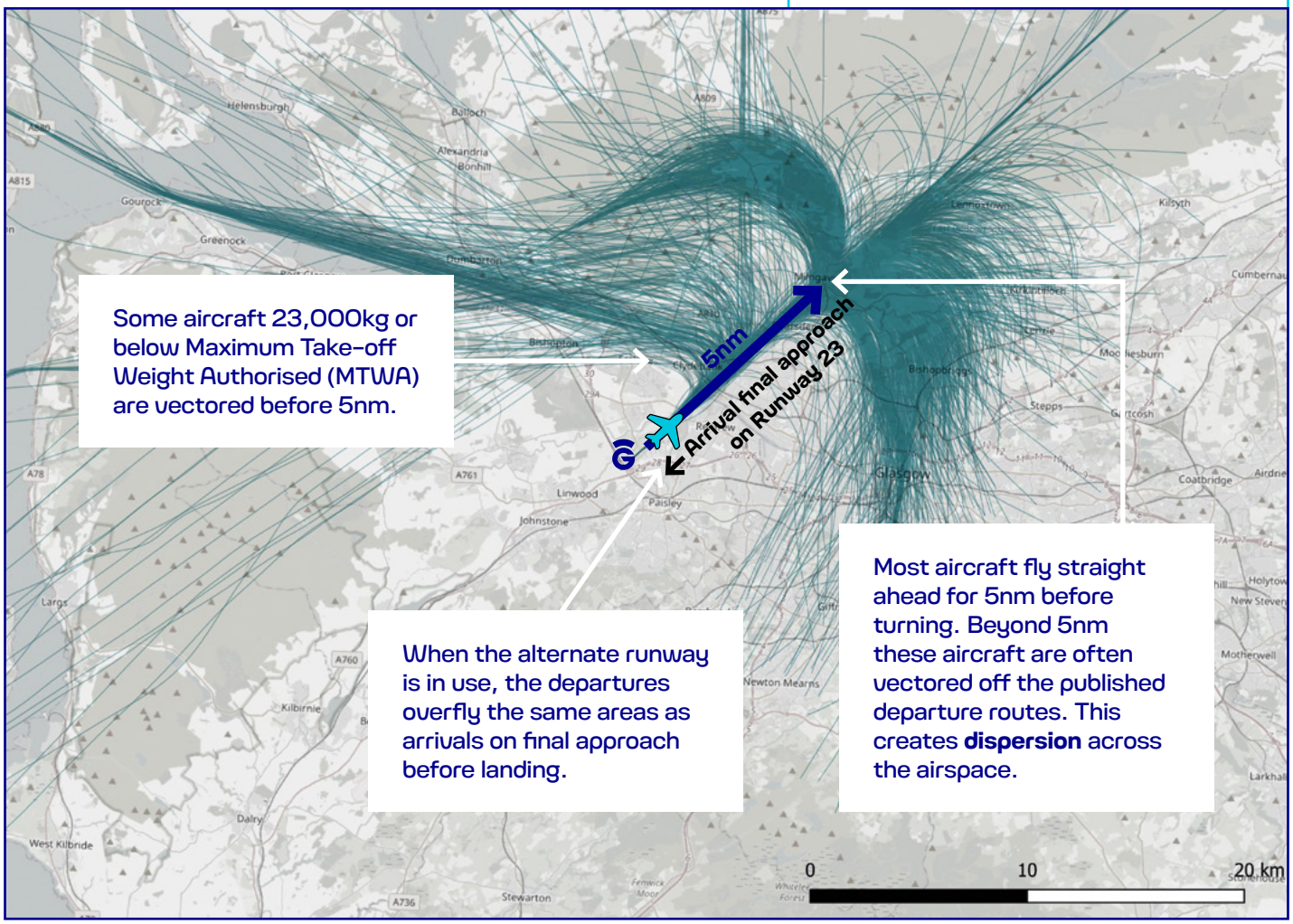


Figure 10: Current Glasgow Airport Runway 05 departures (Map: ©OpenStreetMap)

Why do ATC vector departures?

Complex interactions and climb performance

5.1.15 ATC vector departures because there are lots of complex interactions within the airspace, whereby arriving and departing aircraft need to be kept safely separated. It also sometimes means ATC are able to give departing aircraft a more direct route, which saves fuel and Greenhouse Gas Emissions.

5.1.16 Vectoring departures enables ATC to resolve the interactions between arrivals and departures by keeping aircraft a safe distance apart.

5.1.17 This often means that departures also get better climb performance as shown in Figure 11. There are a number of factors that can influence how well a departure climbs (known as continuous climb performance) including operational restrictions, interactions with other traffic flows to/from the same airport or another airport and also Controlled Airspace restrictions.

5.1.18 Understanding continuous climb performance is important because when aircraft do not climb continuously, there can be more noise, Greenhouse Gas Emissions, and other impacts for the period of level flight.

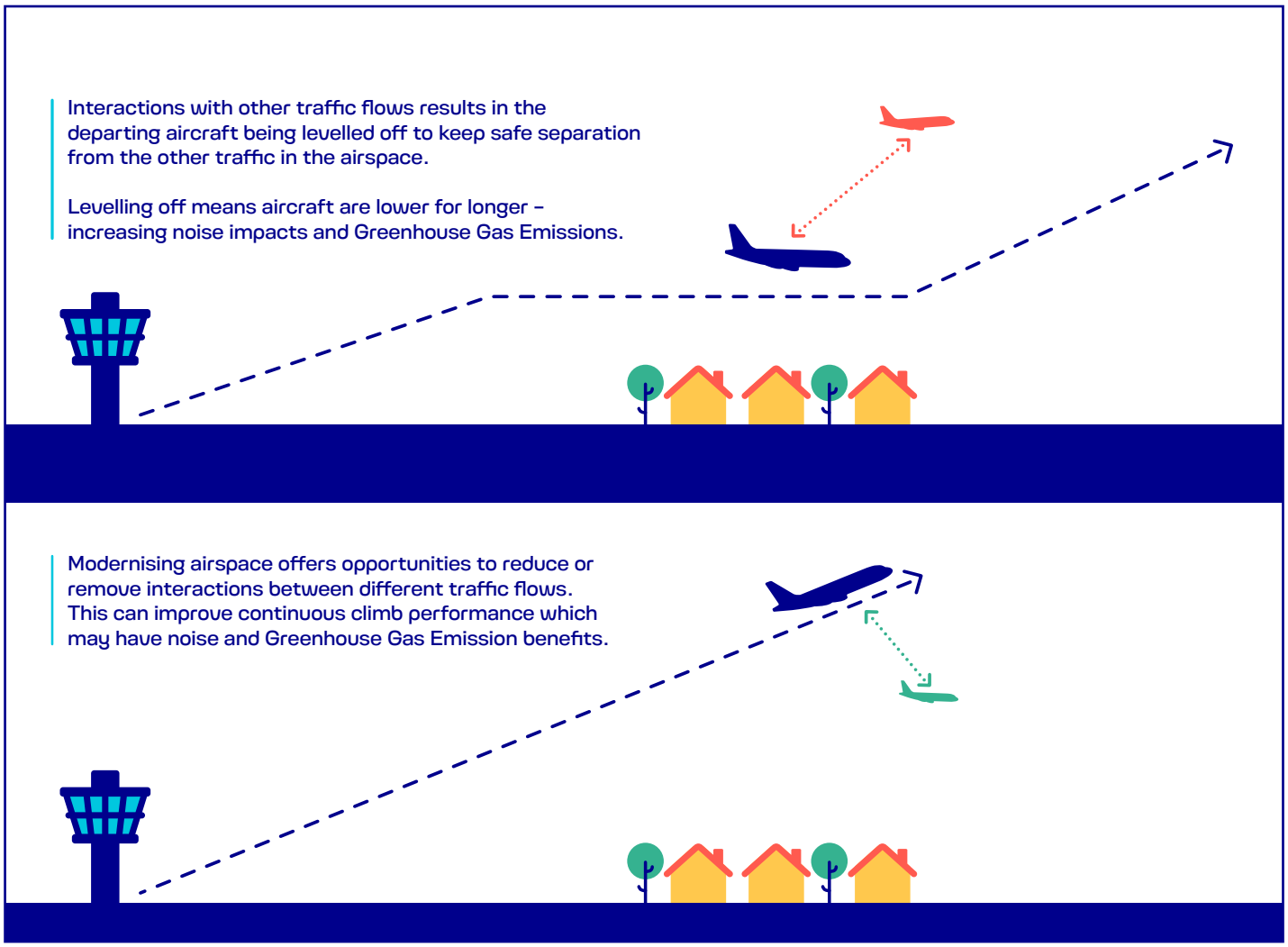


Figure 11: Levelling off vs continuous climb

5.1.19 One of the problems the modernisation of Scottish airspace tries to resolve is to remove some of the interactions and dependencies between flows of aircraft traffic. For example, today, on some occasions, Glasgow Airport's departure traffic cannot achieve continuous climb, due to interactions with some Edinburgh departures and interactions with Glasgow's own arrivals.

Where aircraft fly today

5.1.20 Figure 12 shows Glasgow Airport's current published departure routes alongside tracks of where departing aircraft fly today up to 7,000ft.

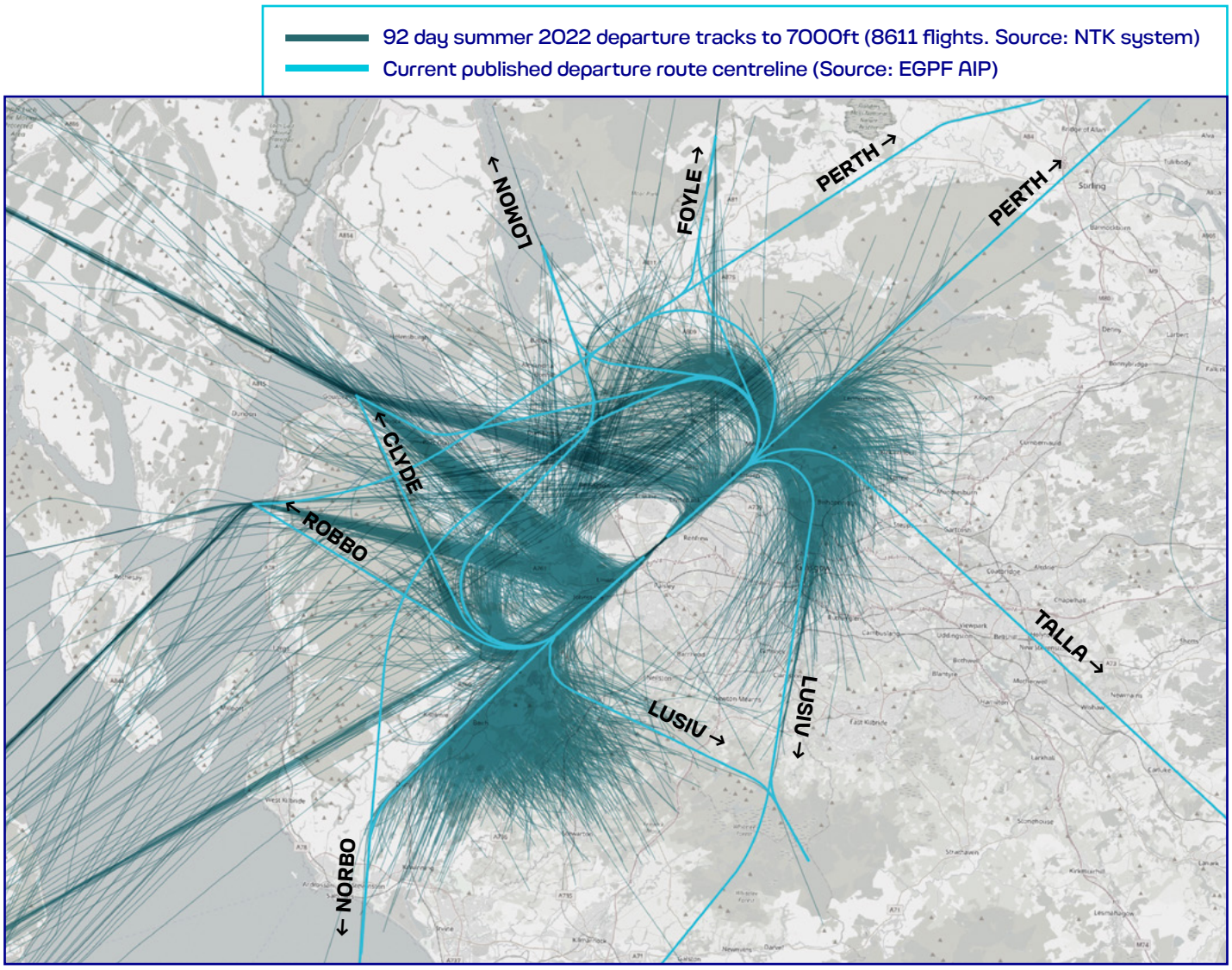


Figure 12: Current Glasgow Airport published departure routes overlaid on 92 summer 2022 departure track data (8,611 flights)

5.1.21 Glasgow Airport's current published departure routes utilise a ground-based navigation aids called **DVORs**.

5.2 Proposed departure routes: how aircraft could depart in the future

5.2.1 The proposed departure routes which form part of this consultation have been developed over the last four years. More information about the work to develop these routes can be found in the '**How we have developed these proposals**' section.

5.2.2 The following section describes these departure routes in more detail, before the 'What are the benefits and impacts of the proposals' section shows the outcome of the appraisal of the option.

5.2.3 For detailed aviation technical information about the proposed departure procedures, please see **Annex 1.**

How to read the operational diagrams

The images on the following pages display operational diagrams for two scenarios:

- **Without airspace change**
- **With airspace change**

They illustrate the proposed departure routes for Runway 23 and Runway 05, helping consultees understand where aircraft may fly in future.

What the images show

The first set of images shows an annotated map of the airspace which explains the various aircraft traffic flows today and how we expect traffic to route in future. Each route has been labelled with expected route usage on a busy day when only one runway direction is in operation.

Within the second set of images, each route has been labelled with information about its expected usage, including:

Average **annual percentage of departures expected to depart in that direction**
This is based on a day when only one runway direction is in operation

Average **annual daily arrivals**
This takes into account how often Runway 05 and Runway 23 are used

Average **daily arrivals on a summer day**
This takes into account how often Runway 05 and Runway 23 are used

Average **daily arrivals outside of the summer period**
This takes into account how often Runway 05 and Runway 23 are used

It is important to note that the information within the operational diagrams is indicative: the data has been generated based on averages and therefore there could be fluctuations in the number of aircraft arriving from each direction.

Identifying aircraft height

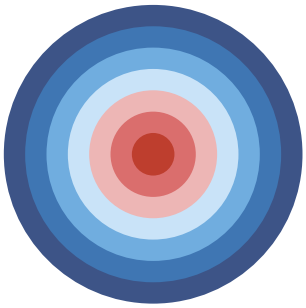
The proposed route centrelines are shown with a thick blue line with the section of the departure route up until 7,000ft shown as a continuous line. Above 7,000ft, we have shown how the route continues into the network airspace, which forms part of the NERL proposal, with a dashed line.

Indicates flightpath **below 7,000ft**

Indicates flightpath **above 7,000ft**

Areas with 5 or more aircraft per day up to 7,000ft

The geographical areas shown are based on only one runway in operation. The areas of overflight have been divided into seven 1,000ft sections based on expected, typical aircraft altitudes. Each 1,000ft band is given a colour to help identify what altitude aircraft may be at that point.



Different aircraft types climb at different rates and it is very difficult to articulate this within one image, without increasing the image's complexity. For the purposes of these diagrams, we have therefore shown indicative altitudes based on the average climb profile of an ATR turboprop aircraft: these are a common aircraft which depart from Glasgow Airport but most jet aircraft climb much more quickly than this.

What the shading means

The areas of overflight are shaded from light to dark to highlight the areas where we expect to see greater concentration. They have been informed by 100% mode **overflight contours** generated for our proposed option for 2036, as this is the busiest forecast year assessed. Based on the requirements of CAP1616, these overflight contours are only generated based on five or more flights per day, and so the information within the operational diagrams has been supplemented with additional information from Air Traffic Controllers about where aircraft may be vectored in future at rates of less than five a day.

Less than 5 aircraft per day up to 7,000ft

Less than 1 aircraft per day up to 7,000ft

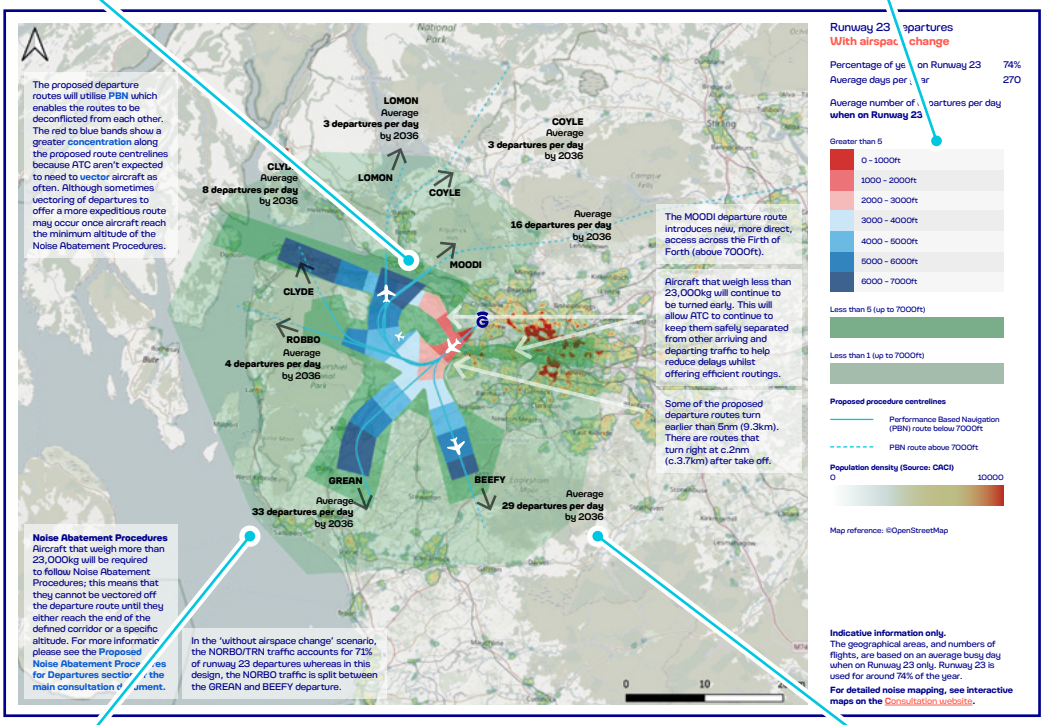
It is important to note that the areas of overflight within the operational diagrams is indicative, as it is very difficult to predict vectoring behaviours, which will still take place although to a lesser extent than today. Operational diagrams are also not measures of potential noise impacts; for detailed noise mapping please see the '**what are the benefits and impacts of the proposal**' section.

Understanding the operational diagrams

The operational diagrams are based on Glasgow Airport's forecast for the number of departures in 2036. 2036 was chosen because this is our busiest forecast year which was modelled as part of the **Full Options Appraisal**.

The proposed Performance Based Navigation (PBN) route centrelines up to 7,000ft are shown with a thick blue line. Above 7,000ft, we have shown how the route continues into the network airspace, which forms part of the NATS' proposal, with a dashed line.

We have shown indicative altitudes based on the average climb of an ATR turboprop aircraft. This is one of the slower climbing aircraft at Glasgow Airport, which means that jet aircraft are likely to be higher than the altitudes shown.



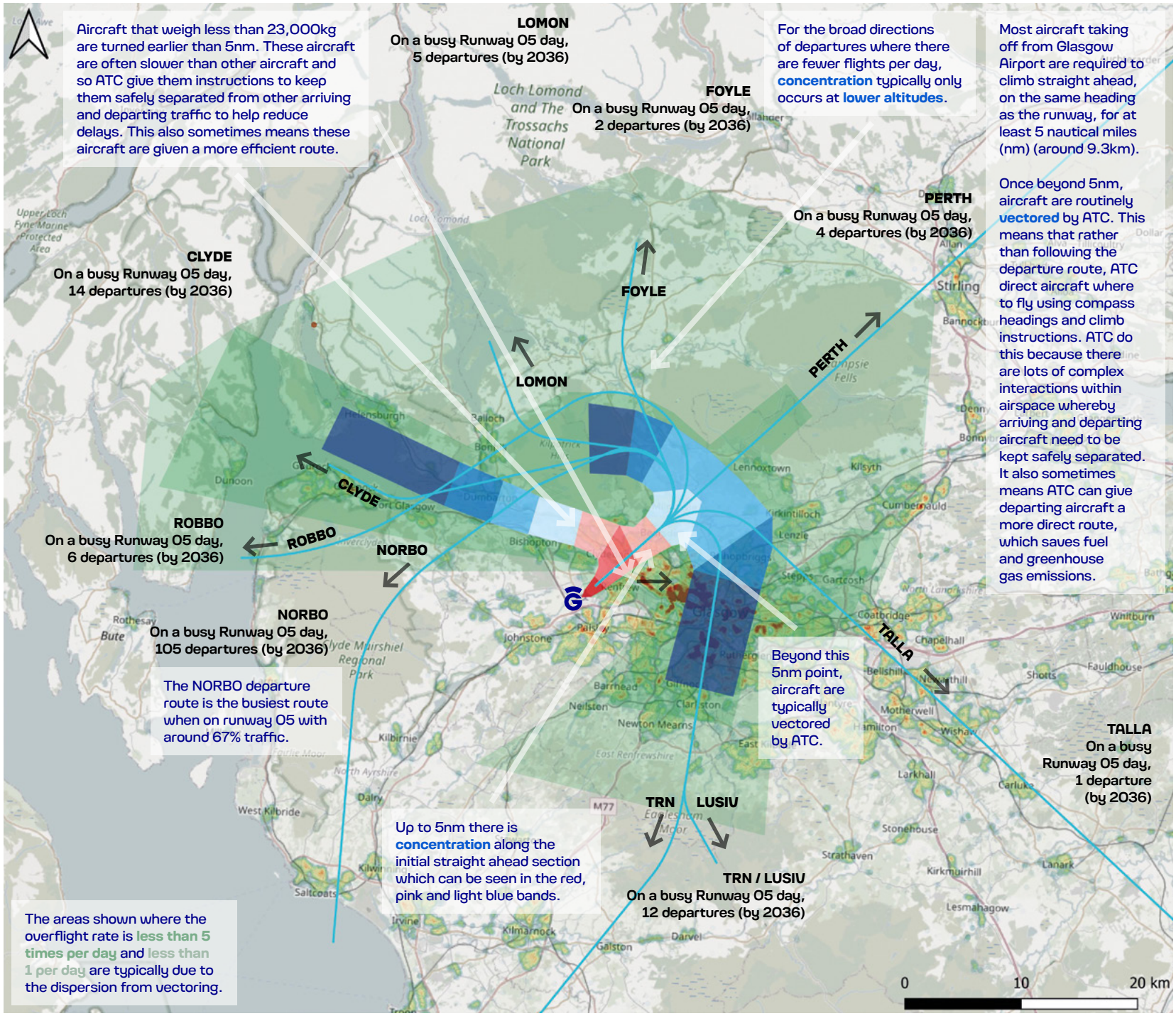
Each route has been labelled with expected route usage on a busy day when only one runway direction is in operation.

The areas of overflight shaded in different colours are based on a day when only one runway direction is in operation.

The areas from red to blue show where overflight is expected to be 5 times a day or greater and therefore where there is more **concentration**. The areas in green show where the overflight rate is either less than 5 times per day or less than 1 per day where there is typically more dispersion or overall fewer flights expected to be below 7,000ft in that area.

It is important to note that the information within the operational diagrams is indicative; the data has been generated based on future forecast averages and therefore there could be fluctuations in the number of aircraft using each departure route. It is also very difficult to predict vectoring behaviors.

Operational diagrams are not measures of potential noise impacts; for detailed noise mapping please use the interactive noise maps on our Glasgow Airport consultation website (glasgowairport.consultationonline.co.uk).



Runway 05 Departures
Without airspace change

Percentage of year on Runway 05	26%
Average days per year	95

Average number of departures per day **when on Runway 05 up to 7000ft**

Greater than 5
- 0 - 1000ft
- 1000 - 2000ft
- 2000 - 3000ft
- 3000 - 4000ft
- 4000 - 5000ft
- 5000 - 6000ft
- 6000 - 7000ft

Less than 5 (up to 7000ft)

Less than 1 (up to 7000ft)

Existing procedure centrelines

Existing departure routes

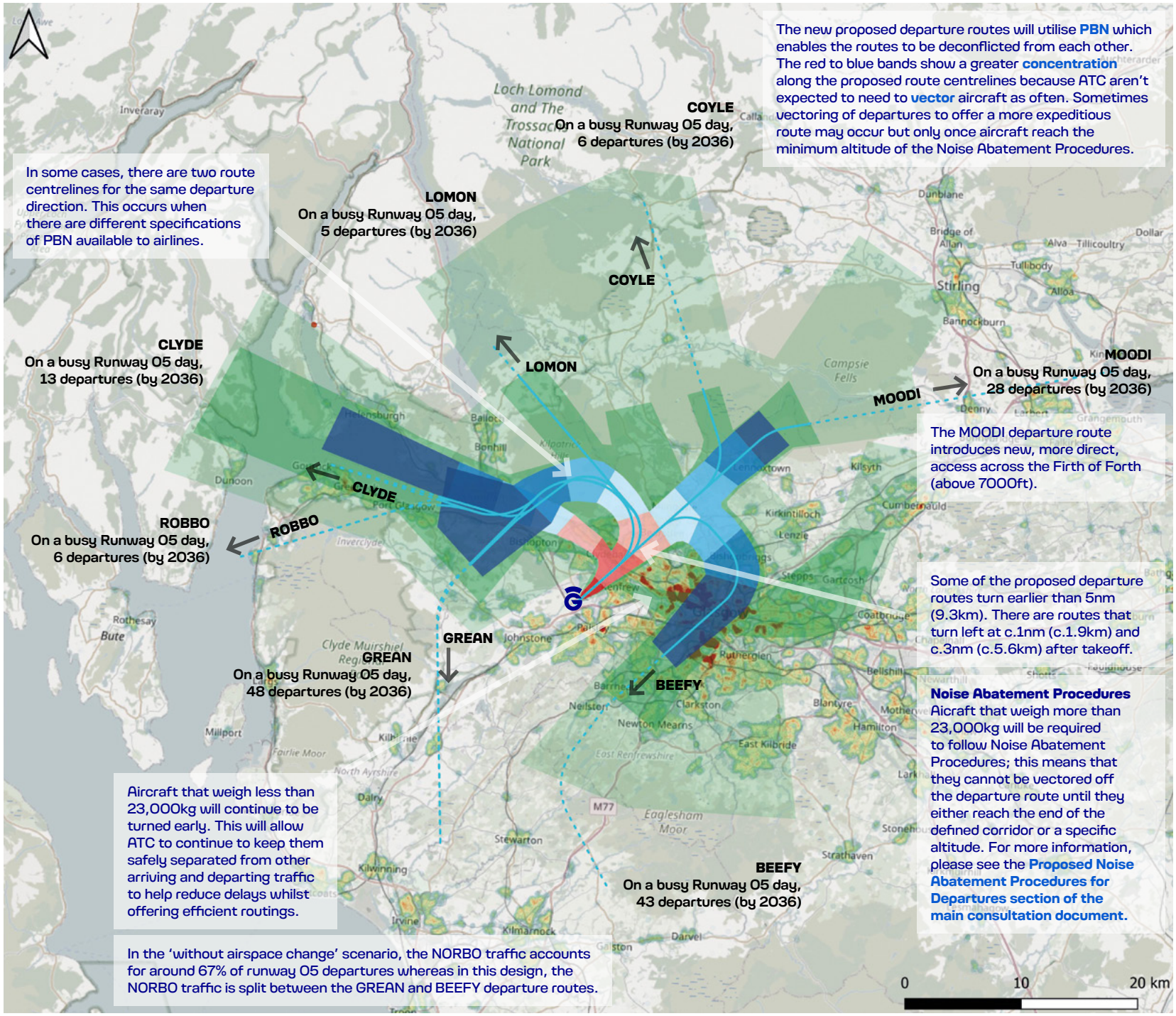
Population density (Source: CACI)

0 — 10000

Map reference: ©OpenStreetMap

Indicative information only.
The geographical areas, and numbers of flights, are based on an average busy day when on Runway 05 only. Runway 05 is used for around 26% of the year.

For detailed noise mapping, see interactive maps on the Consultation website.



Runway 05 Departures
With airspace change

Percentage of year on Runway 05	26%
Average days per year	95

Average number of departures per day **when on Runway 05 up to 7000ft**

Greater than 5
- 0 – 1000ft
- 1000 – 2000ft
- 2000 – 3000ft
- 3000 – 4000ft
- 4000 – 5000ft
- 5000 – 6000ft
- 6000 – 7000ft

Less than 5 (up to 7000ft)

Less than 1 (up to 7000ft)

Proposed procedure centrelines

New departure route 7000ft and below

Departure route above 7000ft

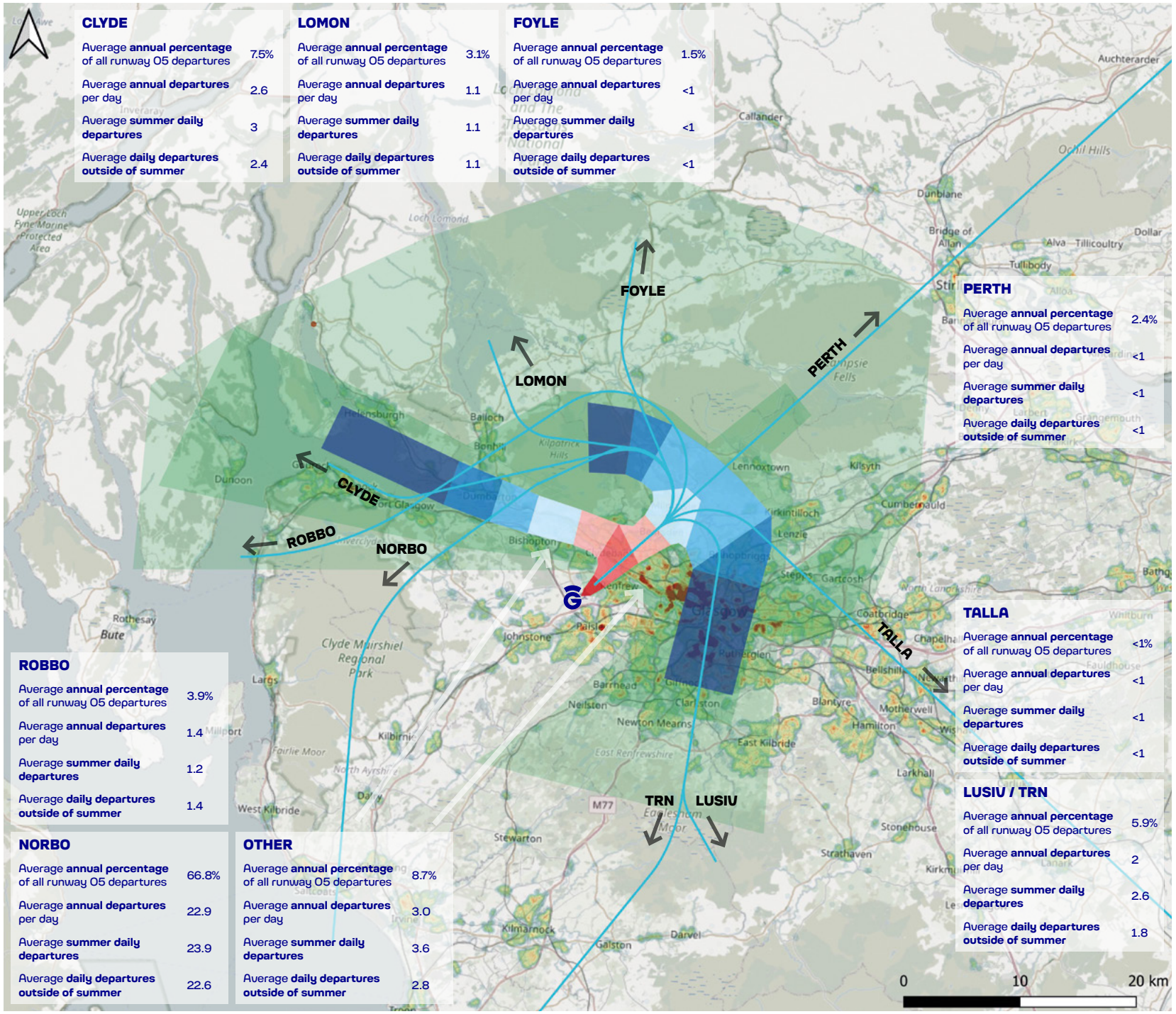
Population density (Source: CACI)

0 — 10000

Map reference: ©OpenStreetMap

Indicative information only.
The geographical areas, and numbers of flights, are based on an average busy day when on Runway 05 only. Runway 05 is used for around 26% of the year.

For detailed noise mapping, see interactive maps on the Consultation website.



Runway 05 Departures
Without airspace change

Percentage of year on Runway 05 26%

Average days per year 95

Average number of departures per day **when on Runway 05 up to 7000ft**

Greater than 5

- 0 – 1000ft
- 1000 – 2000ft
- 2000 – 3000ft
- 3000 – 4000ft
- 4000 – 5000ft
- 5000 – 6000ft
- 6000 – 7000ft

Less than 5 (up to 7000ft)

Less than 1 (up to 7000ft)

Existing procedure centrelines

Existing departure routes

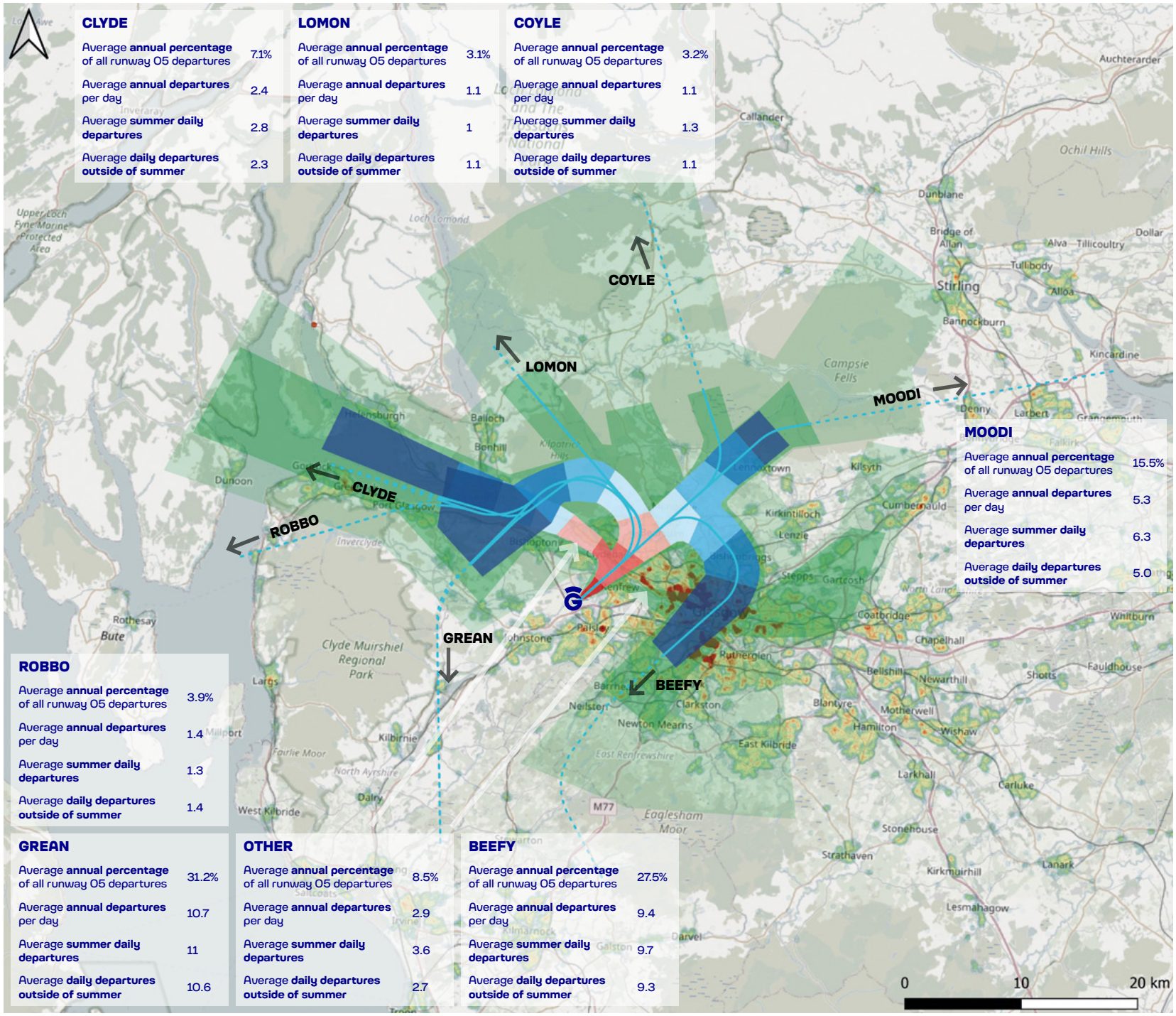
Population density (Source: CACI)

0 10000

Map reference: ©OpenStreetMap

Indicative information only.
Geographical areas based on an average day when only on Runway 05. The number of flights is based on overall annual average taking into account Runway 05 and Runway 23 operations.

For detailed noise mapping, see interactive maps on Consultation website.



Runway 05 Departures
With airspace change

Percentage of year on Runway 05 26%
Average days per year 95

Average number of departures per day **when on Runway 05 up to 7000ft**

Greater than 5
- 0 – 1000ft
- 1000 – 2000ft
- 2000 – 3000ft
- 3000 – 4000ft
- 4000 – 5000ft
- 5000 – 6000ft
- 6000 – 7000ft

Less than 5 (up to 7000ft)

Less than 1 (up to 7000ft)

Proposed procedure centrelines

New departure route 7000ft and below

Departure route above 7000ft

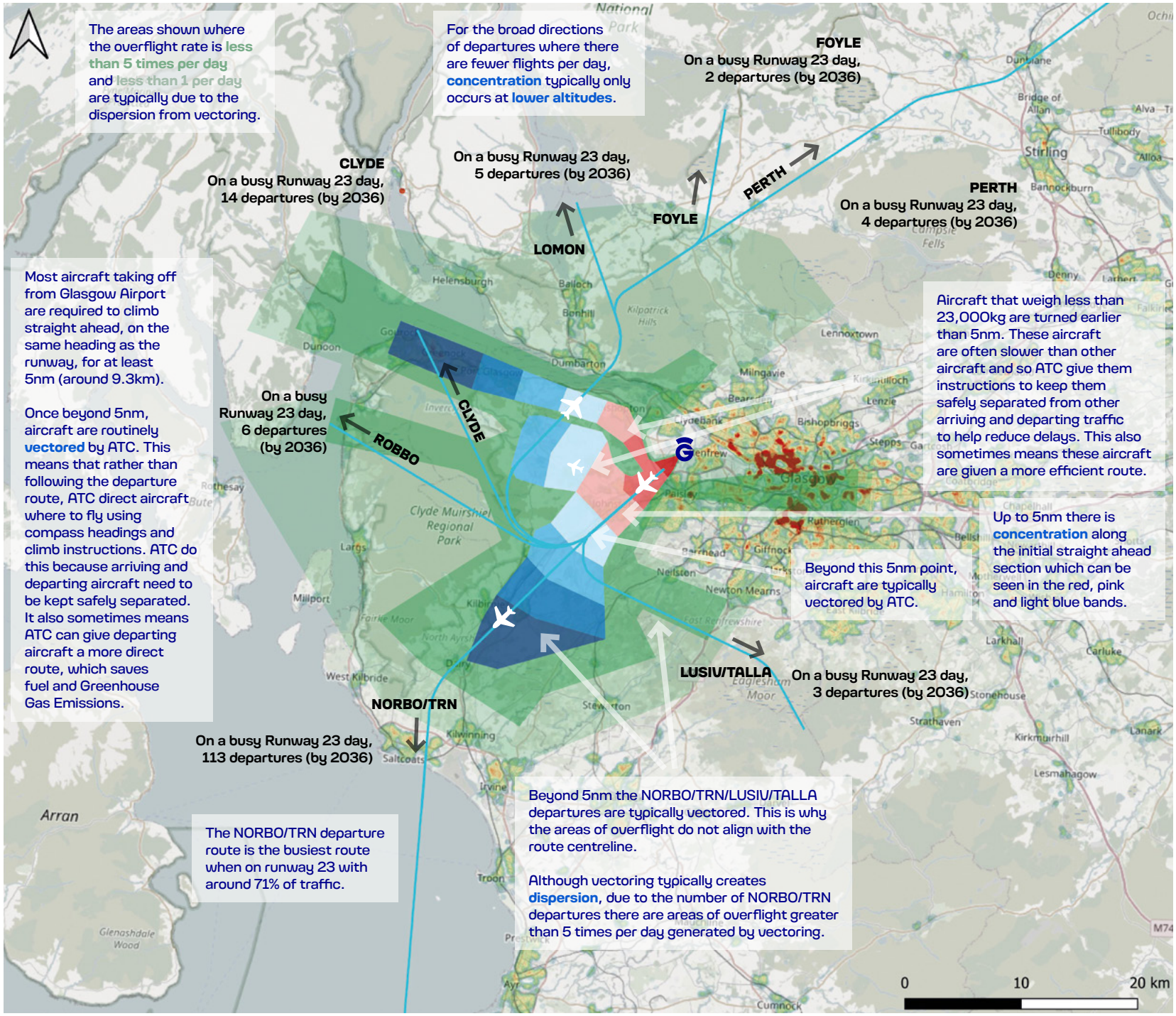
Population density (Source: CACI)

0 10000

Map reference: ©OpenStreetMap

Indicative information only.
Geographical areas based on an average day when only on Runway 05. The number of flights is based on overall annual average taking into account Runway 05 and Runway 23 operations.

For detailed noise mapping, see interactive maps on Consultation website.



Runway 23 Departures
Without airspace change

Percentage of year on Runway 23	74%
Average days per year	270

Average number of departures per day **when on Runway 23 up to 7000ft**

Greater than 5

- 0 – 1000ft
- 1000 – 2000ft
- 2000 – 3000ft
- 3000 – 4000ft
- 4000 – 5000ft
- 5000 – 6000ft
- 6000 – 7000ft

Less than 5 (up to 7000ft)

Less than 1 (up to 7000ft)

Existing procedure centrelines

Existing departure routes

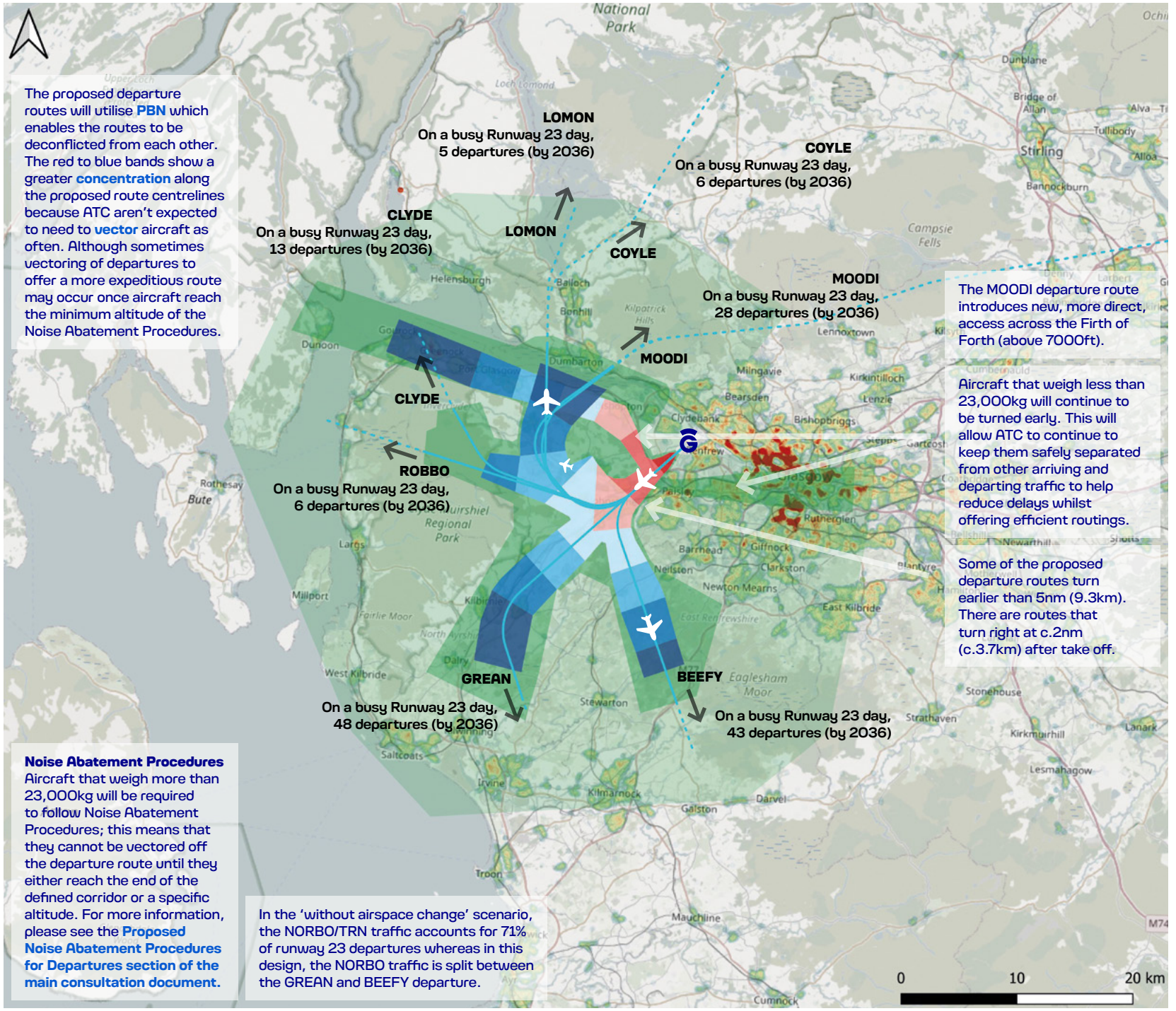
Population density (Source: CACI)

0 10000

Map reference: ©OpenStreetMap

Indicative information only.
The geographical areas, and numbers of flights, are based on an average busy day when on Runway 23 only. Runway 23 is used for around 74% of the year.

For detailed noise mapping, see interactive maps on the Consultation website.



Runway 23 Departures
With airspace change

Percentage of year on Runway 23	74%
Average days per year	270

Average number of departures per day **when on Runway 23 up to 7000ft**

Greater than 5

- 0 – 1000ft
- 1000 – 2000ft
- 2000 – 3000ft
- 3000 – 4000ft
- 4000 – 5000ft
- 5000 – 6000ft
- 6000 – 7000ft

Less than 5 (up to 7000ft)

Less than 1 (up to 7000ft)

Proposed procedure centrelines

- Performance Based Navigation (PBN) route below 7000ft
- PBN route above 7000ft

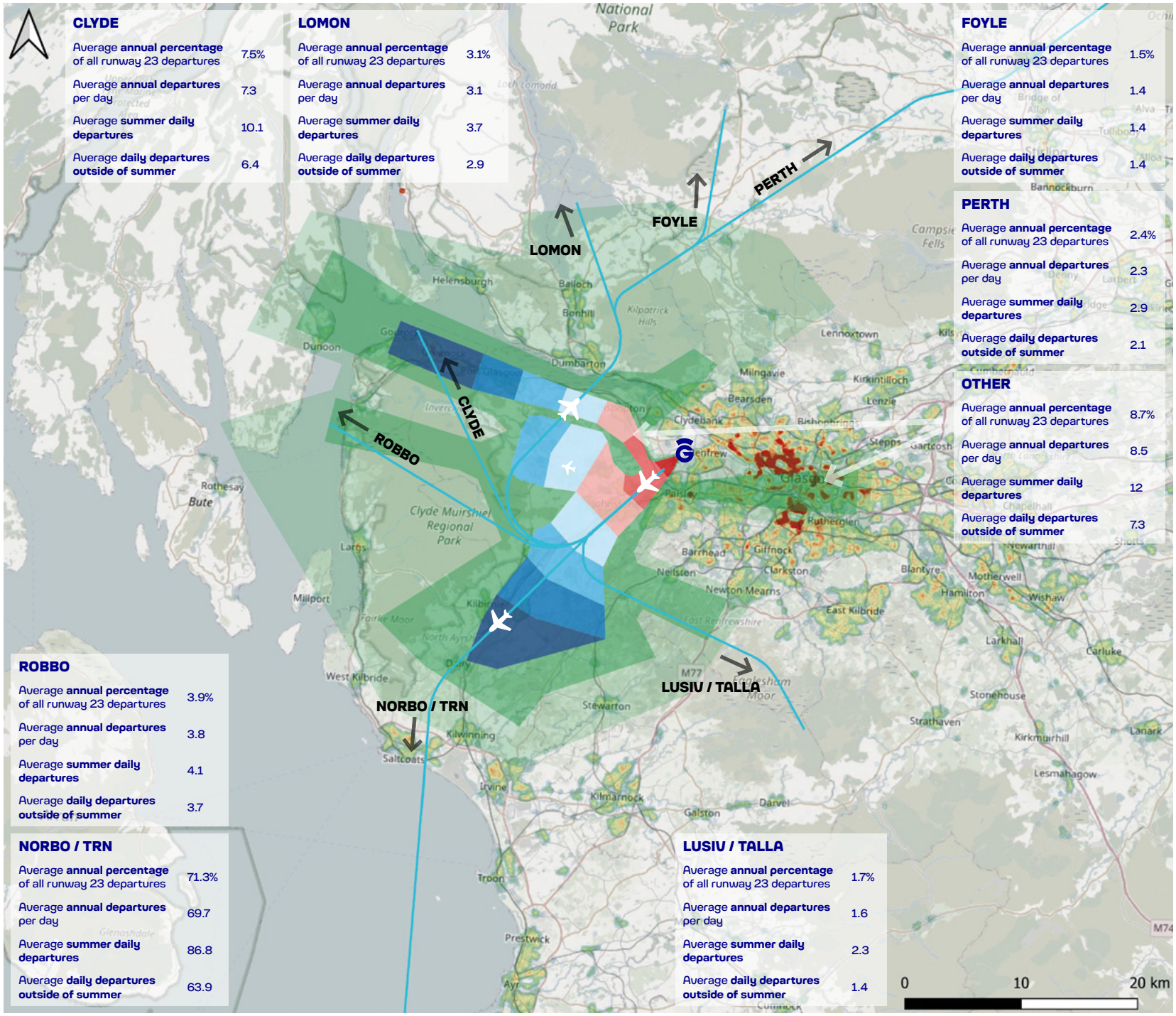
Population density (Source: CACI)

0 — 10000

Map reference: ©OpenStreetMap

Indicative information only.
The geographical areas, and numbers of flights, are based on an average busy day when on Runway 23 only. Runway 23 is used for around 74% of the year.

For detailed noise mapping, see interactive maps on the Consultation website.



Runway 23 Departures
Without airspace change

Percentage of year on Runway 23 74%
Average days per year 270

Average number of departures per day **when on Runway 23 up to 7000ft**

Greater than 5
- 0 - 1000ft
- 1000 - 2000ft
- 2000 - 3000ft
- 3000 - 4000ft
- 4000 - 5000ft
- 5000 - 6000ft
- 6000 - 7000ft

Less than 5 (up to 7000ft)

Less than 1 (up to 7000ft)

Existing procedure centrelines

Existing departure routes

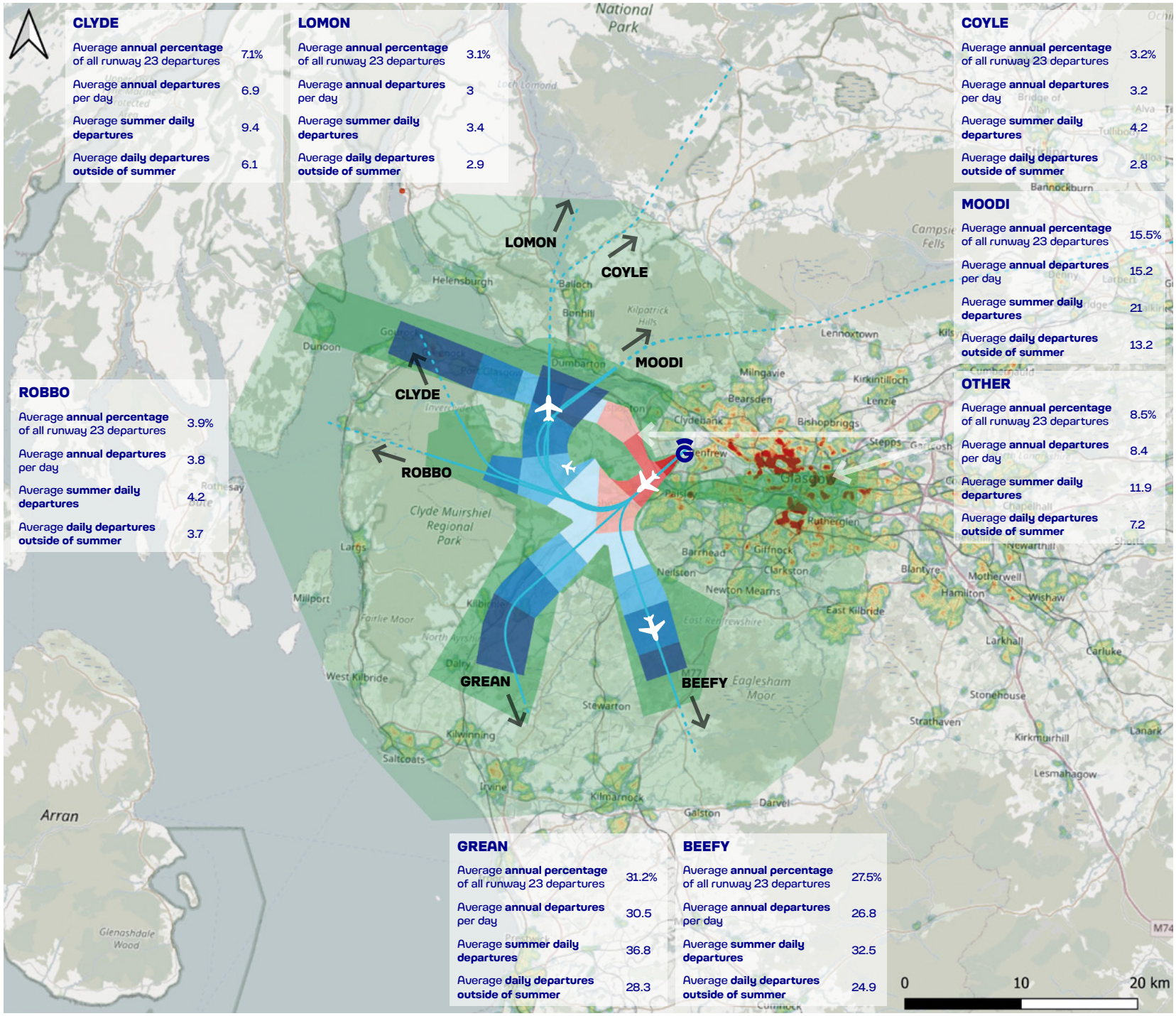
Population density (Source: CACI)

0 10000

Map reference: ©OpenStreetMap

Indicative information only.
Geographical areas based on an average day when only on Runway 23. The number of flights is based on overall annual average taking into account Runway 05 and Runway 23 operations.

For detailed noise mapping, see interactive maps on Consultation website.



Runway 23 Departures
With airspace change

Percentage of year on Runway 23	74%
Average days per year	270

Average number of departures per day **when on Runway 23 up to 7000ft**

Greater than 5

- 0 – 1000ft
- 1000 – 2000ft
- 2000 – 3000ft
- 3000 – 4000ft
- 4000 – 5000ft
- 5000 – 6000ft
- 6000 – 7000ft

Less than 5 (up to 7000ft)

Less than 1 (up to 7000ft)

Proposed procedure centrelines

- Performance Based Navigation (PBN) route below 7000ft
- PBN route above 7000ft

Population density (Source: CACI)

0 — 10000

Map reference: ©OpenStreetMap

Indicative information only.
Geographical areas based on an average day when only on Runway 23. The number of flights is based on overall annual average taking into account Runway 05 and Runway 23 operations.

For detailed noise mapping, see interactive maps on Consultation website.

5.2.4 The new proposed departure routes will utilise PBN which enables the routes to be deconflicted from each other whilst avoiding overflying population where possible. This means that we expect to see greater concentration along the route centrelines than we see today because ATC will not have to vector the aircraft as much.

5.2.5 Vectoring of departures to offer a more expeditious route may occur once aircraft reach the minimum altitude/end point of the Noise Abatement Procedures. The Noise Abatement Procedure corridors and the minimum altitude are shown below. Once aircraft reach either the minimum altitude or the end of the corridor, they can be vectored. Additionally, some vectoring of departures in the corridors may still occur if ATC need to take an aircraft off a route for safety reasons, for example to avoid bad weather.

5.2.6 In addition to this, it is proposed that aircraft weighing less than or equal to 5,700kg MTWA, such as the **Twin Otter**, would continue to be vectored like they are today and therefore they would not follow the PBN routes. This is because these aircraft are often smaller and slower than other aircraft and if they were to fly the PBN routes, other larger aircraft could 'catch up'. To avoid this, ATC would need to create bigger spaces between each aircraft departing which would result in increased delays and hence why it is preferred these aircraft continue to be vectored as they are today.

5.2.7 Along with this, it is proposed that during the daytime period only (07:00 – 23:00 local) turboprop aircraft which weigh less than or equal to 23,000kg MTWA would also continue to be vectored. An example of this type of aircraft is an **ATR 72-600**.

5.2.8 When we have assessed the benefits and impacts of our proposed option, these vectoring exemptions have been considered. This means our noise modelling takes this vectoring into account, as do the operational diagrams shown on previous pages.

Proposed Noise Abatement Procedures for departures

5.2.9 As explained in more detail in the section above, the following Noise Abatement Procedures are proposed for departures:

- Tactical vectoring of turboprop aircraft of less than or equal to <=23,000kg MTWA is permitted 07:00 – 23:00 local
- Tactical vectoring of aircraft less than or equal to 5,700kg MTWA is permitted at all times.
- All other aircraft are required to remain within 1.5km either side of the SID centrelines until the end of the corridor or following altitudes shown in Figure 13 and Figure 14.

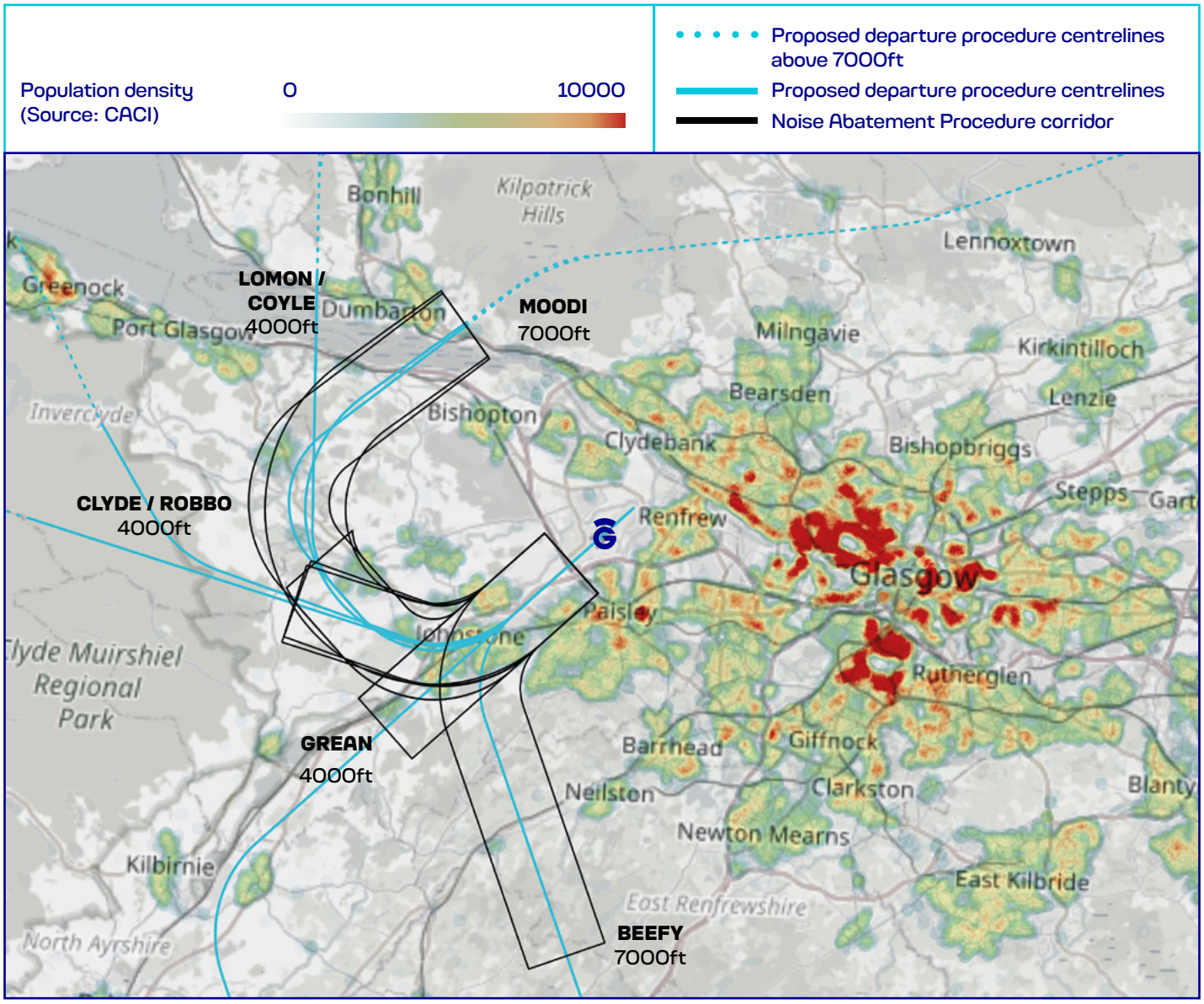


Figure 13: Proposed Noise Abatement Procedures corridors and minimum altitudes for departures from Runway 23

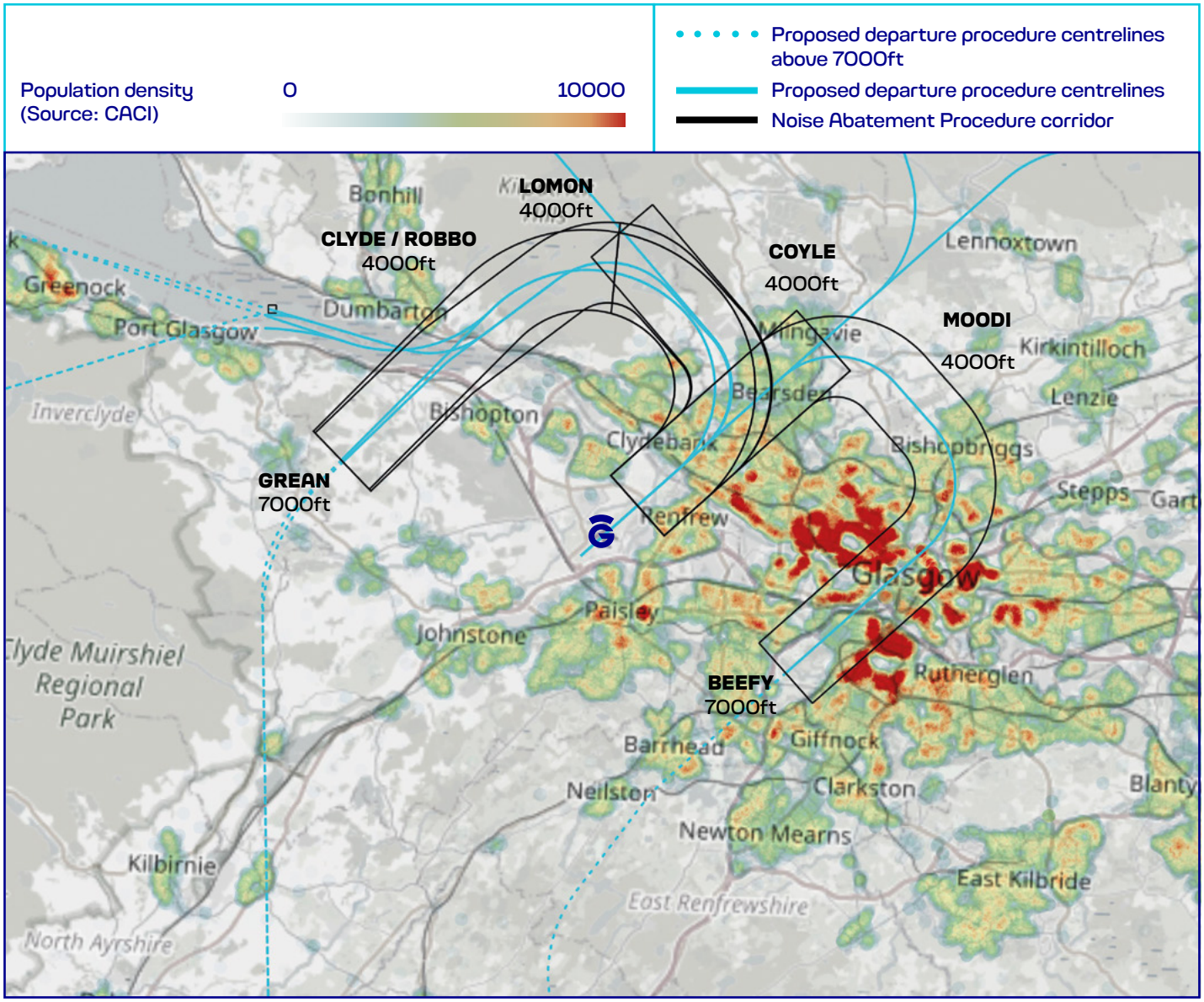


Figure 14: Proposed Noise Abatement Procedures corridors and minimum altitudes for departures from Runway 05

5.2.10 The Noise Abatement Procedures (NAPs) have been designed to minimise exposure of residential areas to aircraft noise, while ensuring safety of flight operations.

How do these departure routes fit into the wider Scottish Airspace Modernisation system design?

5.2.11 Glasgow Airport's departure procedures form part of the wider Scottish Airspace Modernisation design. To see how these procedures fit in with the overall design, please see the Scottish Airspace Modernisation website.

6

Proposed arrival routes

6 Proposed arrival routes

6.1 How aircraft arrive at Glasgow Airport today

6.1.1 To fully describe the proposed changes, we first need to describe how aircraft arrive at Glasgow Airport today.

6.1.2 When arriving at Glasgow Airport, aircraft land into the wind. This means that Glasgow Airport's runway direction depends on the wind direction.

6.1.3 Across an average year, 26% of aircraft land on Runway 05 which means they arrive from the south west over the areas around Johnstone, and 74% of aircraft land on Runway 23 which means they arrive from the north east over the areas around Clydebank.

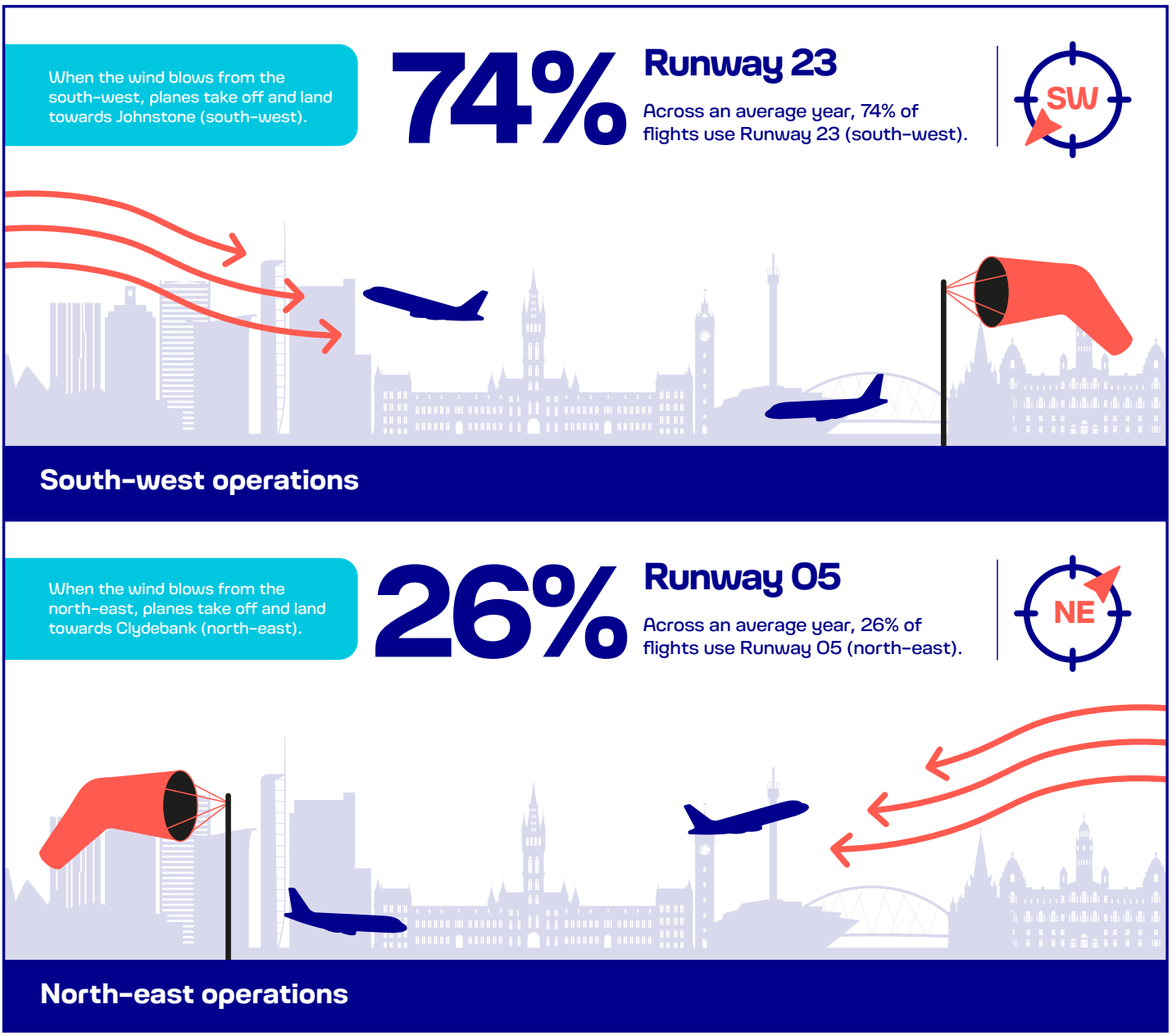


Figure 15: Glasgow Airport runways and usage

6.1.4 Below 7,000ft, there are no defined routes for aircraft arriving at Glasgow Airport until aircraft are established on final approach (the final part of the flight when aircraft are lined up with the runway and are undertaking a final descent before landing).

6.1.5 As there are no defined routes for aircraft between the network airspace above 7,000ft and the final approach, aircraft are **vectored** by ATC. Vectoring is where ATC direct aircraft where to fly using compass headings and descent instructions. ATC do this because there are lots of complex interactions within the airspace whereby arriving and departing aircraft need to be kept safely separated. In the case of arriving aircraft, ATC also need to ensure that arriving aircraft are safely spaced to allow enough time between each aircraft landing on the runway. This vectoring creates **dispersion** across the airspace, with this **dispersion** reducing the closer aircraft get to **final approach**.

74% **of arrivals land from the north east on Runway 23**

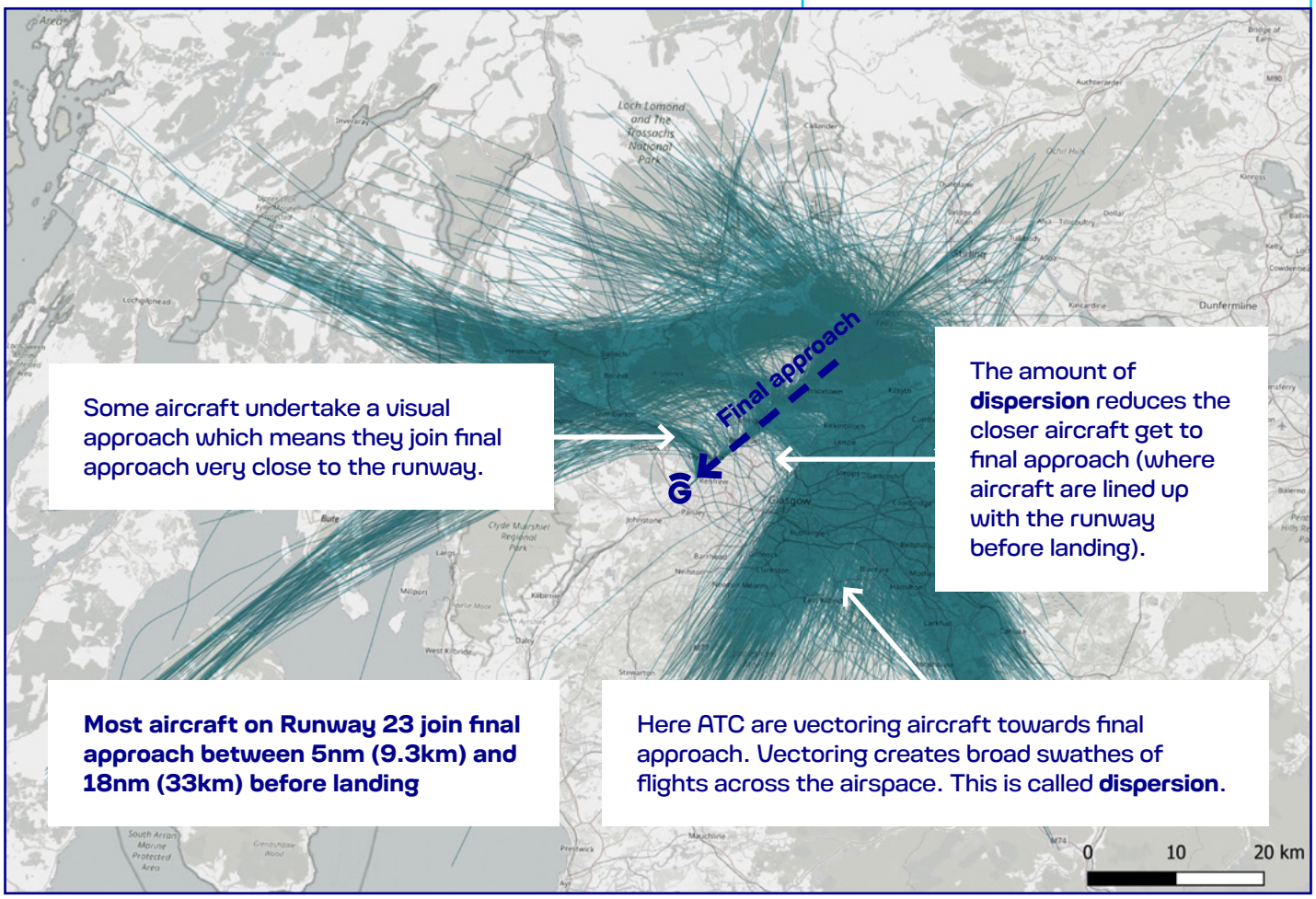


Figure 16: Current Glasgow Airport Runway 23 arrivals (Map: ©OpenStreetMap)

26% of arrivals land from the south west on **Runway 05**

Runway 05 Arrivals from 7000ft

Source: Glasgow Airport Noise Track Keeping system 92 day summer 2022 (2170 flights)

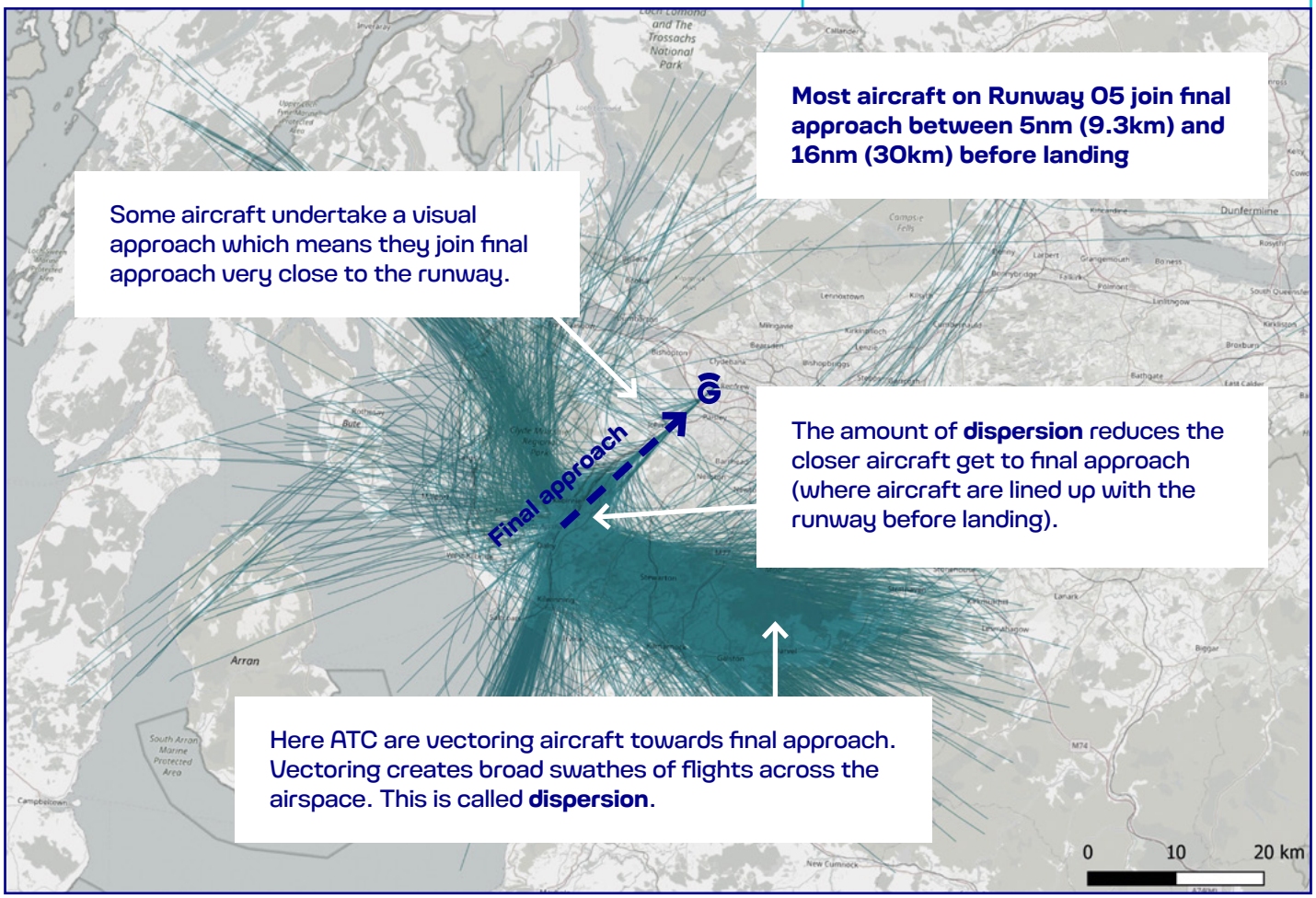


Figure 17: Current Glasgow Airport Runway 05 arrivals (Map: ©OpenStreetMap)

6.1.6 Final approach is the final part of the flight when aircraft are lined up with the runway and are undertaking a final descent before landing. At Glasgow Airport, there are various navigation aids aircraft can use when landing. Most aircraft use a navigation aid called an **Instrument Landing System (ILS)**.

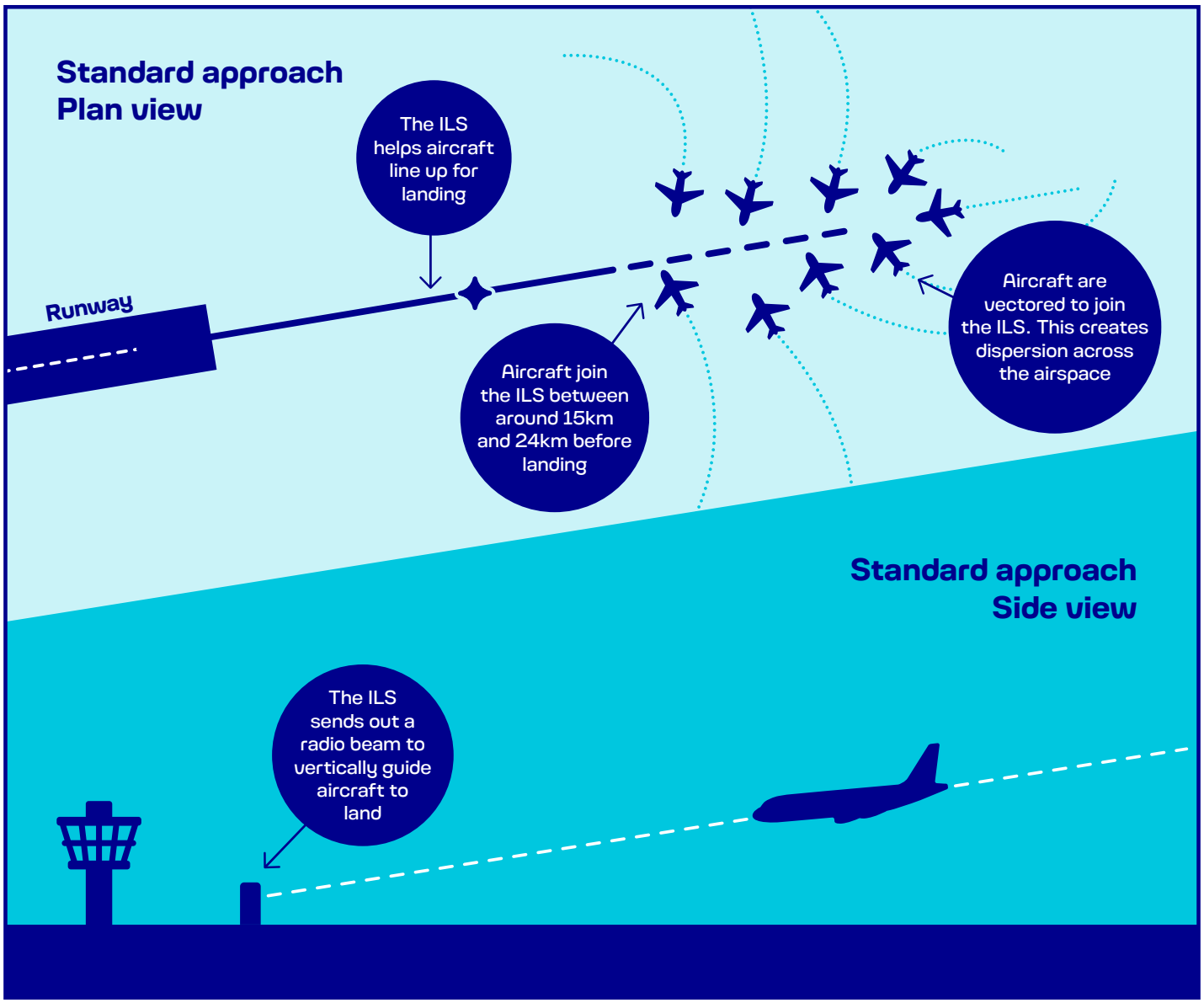


Figure 18: ILS diagram

6.1.7 When aircraft use the **ILS**, they follow a published approach procedure which is based around this navigation aid. As well as the **ILS**, Glasgow Airport also has a type of conventional approach called a **VOR/DME** approach and an **NDB/DME** approach. These approaches rely on groundbased navigation aids and are typically used when the **ILS** is out of service.

6.1.8 On some occasions, aircraft may also land visually without the use of navigation aids.

Noise Abatement Procedures for arriving aircraft

6.1.9 Aircraft arriving at Glasgow Airport are required to follow **Noise Abatement Procedures**. These are published in the **Aeronautical Information Publication (or AIP)** and therefore use technical language. Paragraphs 6.1.10–11 are a summary of the full descriptions, which are shown to the right.

6.1.10 For aircraft arriving to land on Runway 23 (from the north east), when using the ILS aircraft must not be below 2,000ft when turning to line up with the runway. If aircraft are using a different navigation aid, such as the VOR or NDB, then they must not descend below the profile of a 3° rate of descent.

6.1.11 For arriving to land on Runway 05 (from the south west), when using the ILS jet aircraft must not be below 2,000ft when turning to line up with the runway. Propellor aircraft, if instructed by ATC, may be allowed to turn at 1,600ft to line up with the runway. If aircraft are using a different navigation aid, such as the VOR or NDB, then they must not descend below the profile of a 3° rate of descent.

6.1.12 For aircraft arriving visually, and therefore not using navigation aids, any aircraft over 5,700kg must be at least 5nm from the runway before turning onto final approach and must remain above 1,500ft until lined up with the runway.

Noise Abatement Procedures for arrivals, as published in the AIP

For Runway 23, aircraft using the ILS (Instrument Landing System) shall not descend below 2,000ft QFE before intercepting the glidepath nor thereafter fly below it unless instructed by radar. Aircraft landing without assistance from the ILS or radar shall follow a descent path which will not result in their being at any time lower than an approach path consistent with a 3° glidepath.

For Runway 05, jet aircraft using the ILS shall not descend below 2,000ft QFE before intercepting the glidepath. Propeller driven aircraft may, when instructed by radar, be descended to 1,600ft QFE. Aircraft landing without the assistance of ILS or radar shall follow a descent path which will not result in their being at any time lower than an approach path consistent with a 3° glidepath.

For visual approaches to Runways 05 or 23 the following limitations will apply: All aircraft whose MTWA exceeds 5,700kg must route via 5nm from the runway threshold and maintain 1,500ft QFE until established on final approach.

Source: Glasgow Airport AIP EGPF Section 2.21 A. iii. – v.

Missed approaches

6.1.13 Missed approaches occur when it is judged that an approach cannot be continued to a safe landing. Aircraft may undertake a **missed approach** when the weather or visibility make it difficult to land, or when the aircraft is not correctly stabilised and aligned with the runway.

6.1.14 Sometimes missed approaches also occur if the runway is temporarily blocked, or it is unsafe to land. In the event of a missed approach, aircraft fly a defined procedure.

6.1.15 At Glasgow Airport there were 108 missed approaches in 2022 which is around 9 per month on average.

6.1.16 As missed approaches are operated on an unplanned basis and owing to the very small number of missed approaches per year, they do not form part of the main noise and environmental analysis of our proposal, however details of the current missed approaches and proposed future missed approaches are included in **Annex 1: Technical details of the proposed procedures**.

Arrivals and safety

6.1.17 When aircraft arrive on Runway 23 (from the north-east), the area of high ground called the 'Campsie line' can trigger a safety alert to aircraft called a Ground Proximity Warning Systems (GPWS) warning. This occasionally occurs when aircraft are below around 3,500ft and are descending from the west before turning to join final approach around 10nm from the runway. To prevent false GPWS warnings there are several rules that ATC must adhere to in this area. It is important to note that this is a false warning and aircraft are not in any imminent danger, however this airspace change provides an opportunity for us to potentially address this.

6.1.18 When designing potential arrival routes into Glasgow Airport on Runway 23, the Campsie line forms one of several constraints around where a flight path could be positioned.

Aircraft holds

6.1.19 Holds, or holding stacks, are procedures for arriving aircraft to fly in a racetrack pattern whilst waiting for instructions from ATC to begin their approach for landing. The proposed holds that form part of Scottish Airspace Modernisation are above 7,000ft and therefore form part of the NERL proposal. More information can be found **here**.

6.1.20 Glasgow Airport also has one contingency hold which is overhead the airport and below 7,000ft. This hold is not routinely used as its main purpose is for contingency procedures such as if there is an emergency, or if there is a radar outage which is very rare. Occasionally, the hold may be used if poor weather means the other holds around Glasgow are not usable.

6.1.21 Exact data for how often the contingency hold is used is not recorded however ATC estimate that it is used around once a month. For transparency, we have shown this contingency hold as part of the diagrams for what happens today and how aircraft could arrive in future. We expect usage of this hold to remain the same in future.

6.2 Proposed arrival routes: How aircraft could arrive in future

6.2.1 The proposed arrival routes which form part of this consultation have been developed over the last four years. More information about the work to develop these routes can be found in the '**How we have developed these proposals**' section.

6.2.2 The following section describes these arrival routes in more detail, before the '**What are the benefits and impacts of the proposals**' section shows the outcome of the appraisal of the option.

6.2.3 For detailed aviation technical information about the proposed arrival procedures, please see **Annex 1**.

How to read the operational diagrams

The images on the following pages display operational diagrams for two scenarios:

- **Without airspace change**
- **With airspace change**

They illustrate the proposed arrival routes for Runway 23 and Runway 05, helping consultees understand the potential future flight paths of aircraft.

What the images show

The first set of images shows an annotated map of the airspace which explains the various aircraft traffic flows today and how we expect traffic to route in future. Each route has been labelled with expected route usage on a busy day when only one runway direction is in operation.

Within the second set of images, each route has been labelled with information about its expected usage, including:

Average **annual percentage of arrivals expected to arrive in that direction**
This is based on a day when only one runway direction is in operation

Average **annual daily arrivals**
This takes into account how often Runway 05 and Runway 23 are used

Average **daily arrivals on a summer day**
This takes into account how often Runway 05 and Runway 23 are used

Average **daily arrivals outside of the summer period**
This takes into account how often Runway 05 and Runway 23 are used

It is important to note that the information within the operational diagrams is indicative: the data has been generated based on averages and therefore there could be fluctuations in the number of aircraft arriving from each direction.

Identifying aircraft height

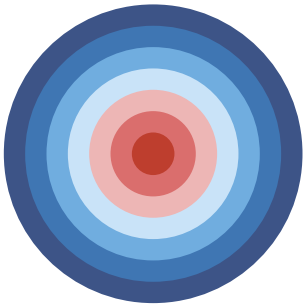
The proposed route centrelines are shown with a thick blue line with the section of the arrival route below 7,000ft shown as a continuous line. Above 7,000ft, we have shown where arrivals would route within the network airspace, which forms part of the NERL proposal, with a dashed line.

Indicates flightpath **below 7,000ft**

Indicates flightpath **above 7,000ft**

Areas with 5 or more aircraft per day up to 7,000ft

The geographical areas shown are based on only one runway in operation. The areas of overflight have been divided into seven 1,000ft sections based on expected, typical aircraft altitudes. Each 1,000ft band is given a colour to help identify what altitude aircraft may be at that point.



Arriving aircraft aim to undertake a continuous 3-degree descent profile although sometimes due to tactical reasons on the day, such as other aircraft in the airspace, this may not be possible.

What the shading means

The areas of overflight are shaded from light to dark to highlight the areas where we expect to see greater concentration. They have been informed by 100% mode **overflight contours** generated for our proposed option for 2036, as this is the busiest forecast year assessed. Based on the requirements of CAP1616, these overflight contours are only generated based on five or more flights per day, and so the information within the operational diagrams has been supplemented with additional information from Air Traffic Controllers about where aircraft may be vectored in future at rates of less than five a day.

Less than 5 aircraft per day up to 7,000ft

Less than 1 aircraft per day up to 7,000ft

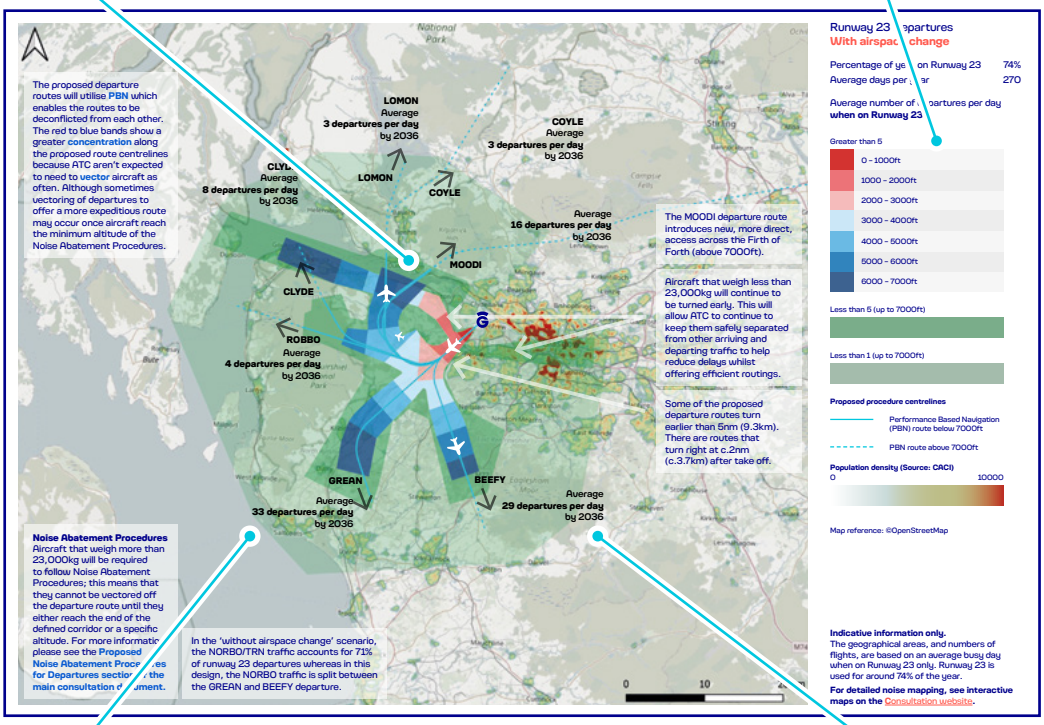
It is important to note that the areas of overflight within the operational diagrams is indicative, as it is very difficult to predict vectoring behaviours. Operational diagrams are also not measures of potential noise impacts; for detailed noise mapping please see the '**what are the benefits and impacts of the proposal**' section.

Understanding the operational diagrams

The operational diagrams are based on Glasgow Airport's forecast for the number of departures in 2036. 2036 was chosen because this is our busiest forecast year which was modelled as part of the **Full Options Appraisal**.

The proposed Performance Based Navigation (PBN) route centrelines up to 7,000ft are shown with a thick blue line. Above 7,000ft, we have shown how the route continues into the network airspace, which forms part of the NATS' proposal, with a dashed line.

We have shown indicative altitudes based on the average climb of an ATR turboprop aircraft. This is one of the slower climbing aircraft at Glasgow Airport, which means that jet aircraft are likely to be higher than the altitudes shown.



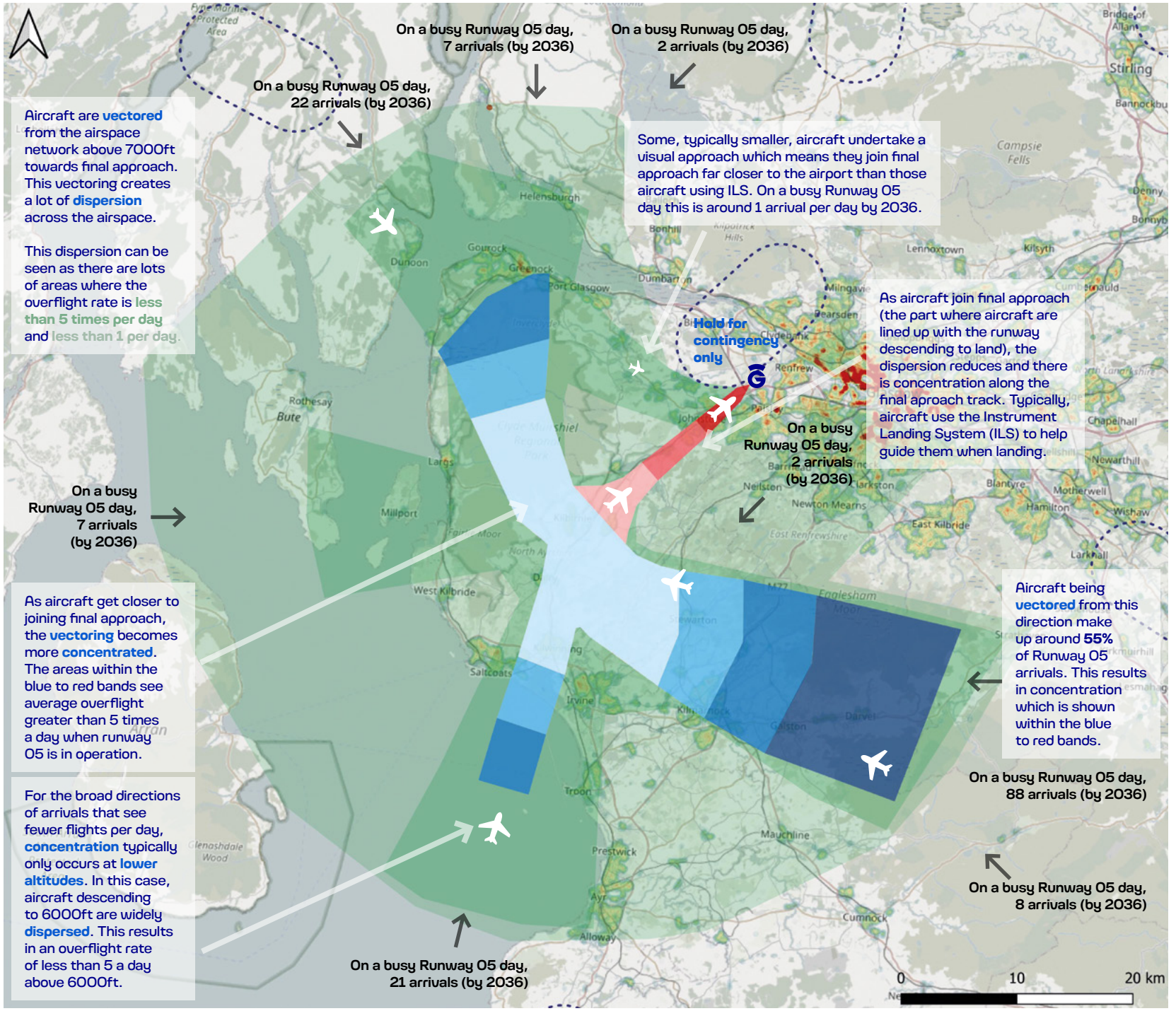
Each route has been labelled with expected route usage on a busy day when only one runway direction is in operation.

The areas of overflight shaded in different colours are based on a day when only one runway direction is in operation.

The areas from red to blue show where overflight is expected to be 5 times a day or greater and therefore where there is more **concentration**. The areas in green show where the overflight rate is either less than 5 times per day or less than 1 per day where there is typically more dispersion or overall fewer flights expected to be below 7,000ft in that area.

It is important to note that the information within the operational diagrams is indicative; the data has been generated based on future forecast averages and therefore there could be fluctuations in the number of aircraft using each departure route. It is also very difficult to predict vectoring behaviors.

Operational diagrams are not measures of potential noise impacts; for detailed noise mapping please use the interactive noise maps on our Glasgow Airport consultation website (glasgowairport.consultationonline.co.uk).



Runway 05 Arrivals
Without airspace change

Percentage of year on Runway 05	26%
Average days per year	95

Average number of arrivals per day **when on Runway 05 up to 7000ft**

Greater than 5

- 0 - 1000ft
- 1000 - 2000ft
- 2000 - 3000ft
- 3000 - 4000ft
- 4000 - 5000ft
- 5000 - 6000ft
- 6000ft+

Less than 5 (up to 7000ft)

Less than 1 (up to 7000ft)

Existing procedure centrelines

Existing holds

Contingency hold

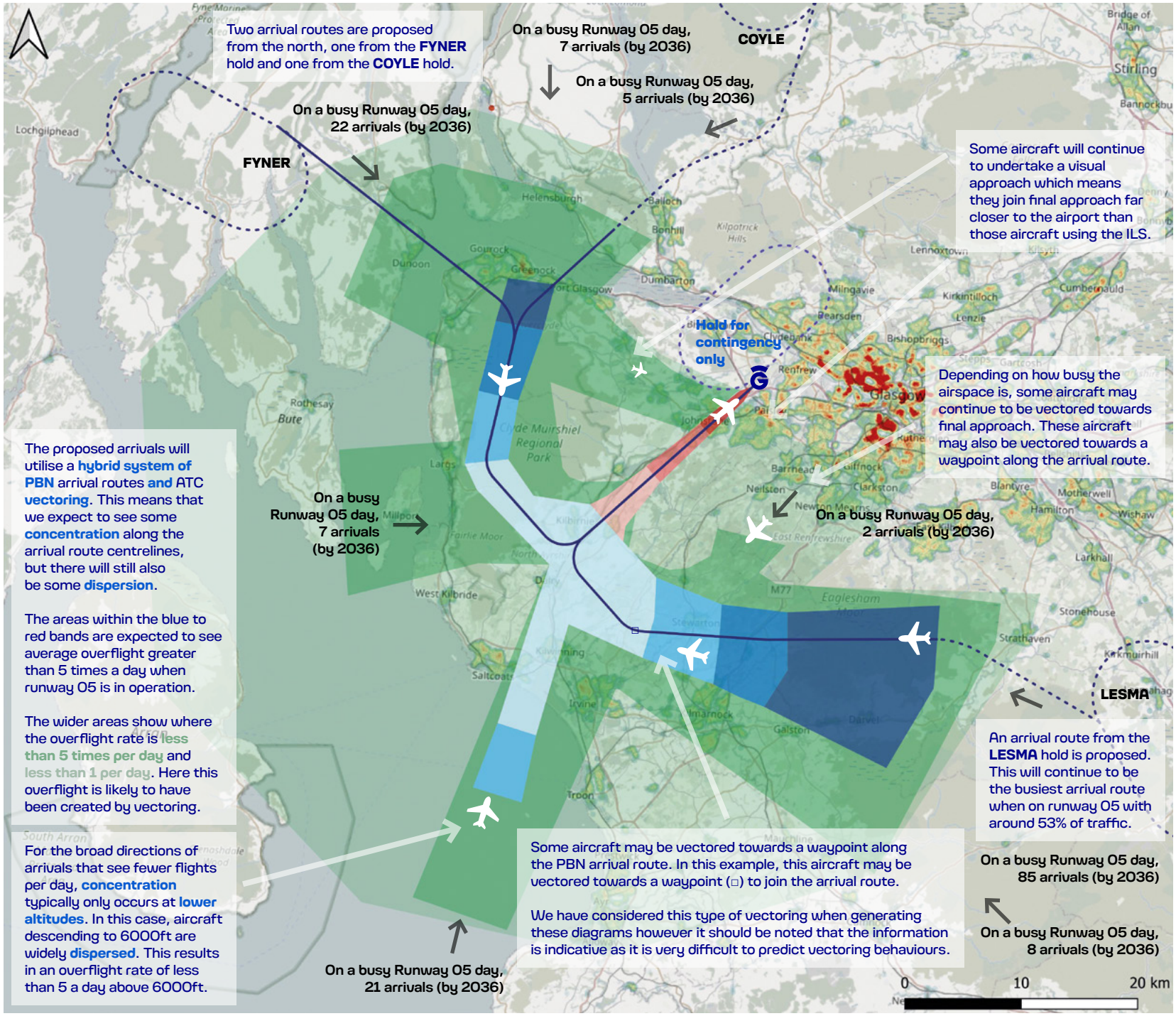
Population density (Source: CACI)

0 — 10000

Map reference: ©OpenStreetMap

Indicative information only.
The geographical areas, and numbers of flights, are based on an average busy day when on Runway 05 only. Runway 05 is used for around 26% of the year.

For detailed noise mapping, see interactive maps on the Consultation website.



Runway 05 Arrivals
With airspace change

Percentage of year on Runway 05	26%
Average days per year	95

Average number of arrivals per day **when on Runway 05 up to 7000ft**

Greater than 5
- 0 - 1000ft
- 1000 - 2000ft
- 2000 - 3000ft
- 3000 - 4000ft
- 4000 - 5000ft
- 5000 - 6000ft
- 6000 - 7000ft

Less than 5 (up to 7000ft)

Less than 1 (up to 7000ft)

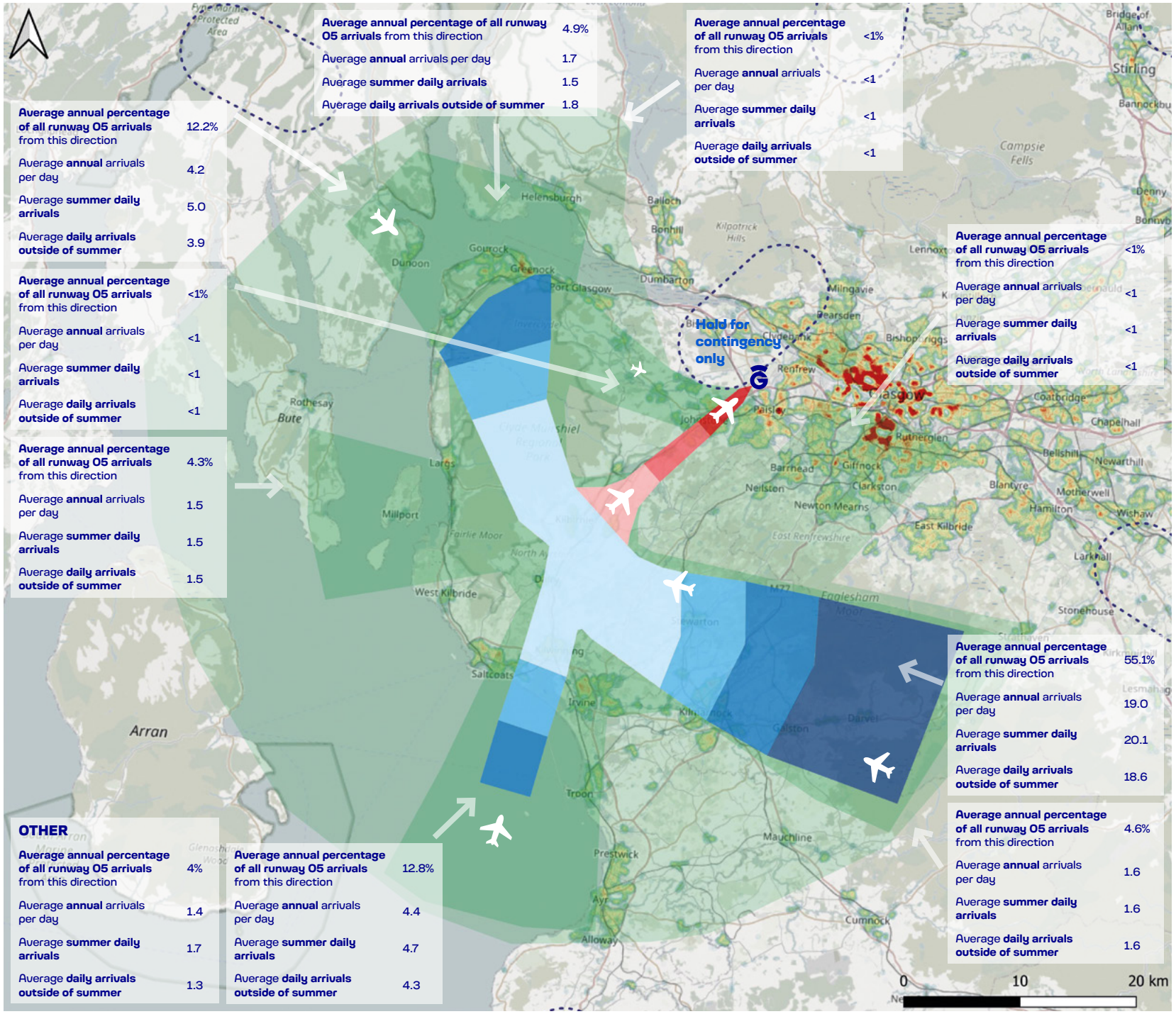
Proposed procedure centrelines
- Arrival route 7000ft and below
- Arrival route above 7000 ft
- NATS NERL proposed hold above 7000ft
- Contingency hold

Population density (Source: CACI)
0 — 10000

Map reference: ©OpenStreetMap

Indicative information only.
The geographical areas, and numbers of flights, are based on an average busy day when on Runway 05 only. Runway 05 is used for around 26% of the year.

For detailed noise mapping, see interactive maps on the Consultation website.



Runway 05 Arrivals
Without airspace change

Percentage of year on Runway 05	26%
Average days per year	95

Average number of arrivals per day **when on Runway 05 up to 7000ft**

Greater than 5

- 0 – 1000ft
- 1000 – 2000ft
- 2000 – 3000ft
- 3000 – 4000ft
- 4000 – 5000ft
- 5000 – 6000ft
- 6000ft+

Less than 5 (up to 7000ft)

Less than 1 (up to 7000ft)

Existing procedure centrelines

Existing holds

Contingency hold

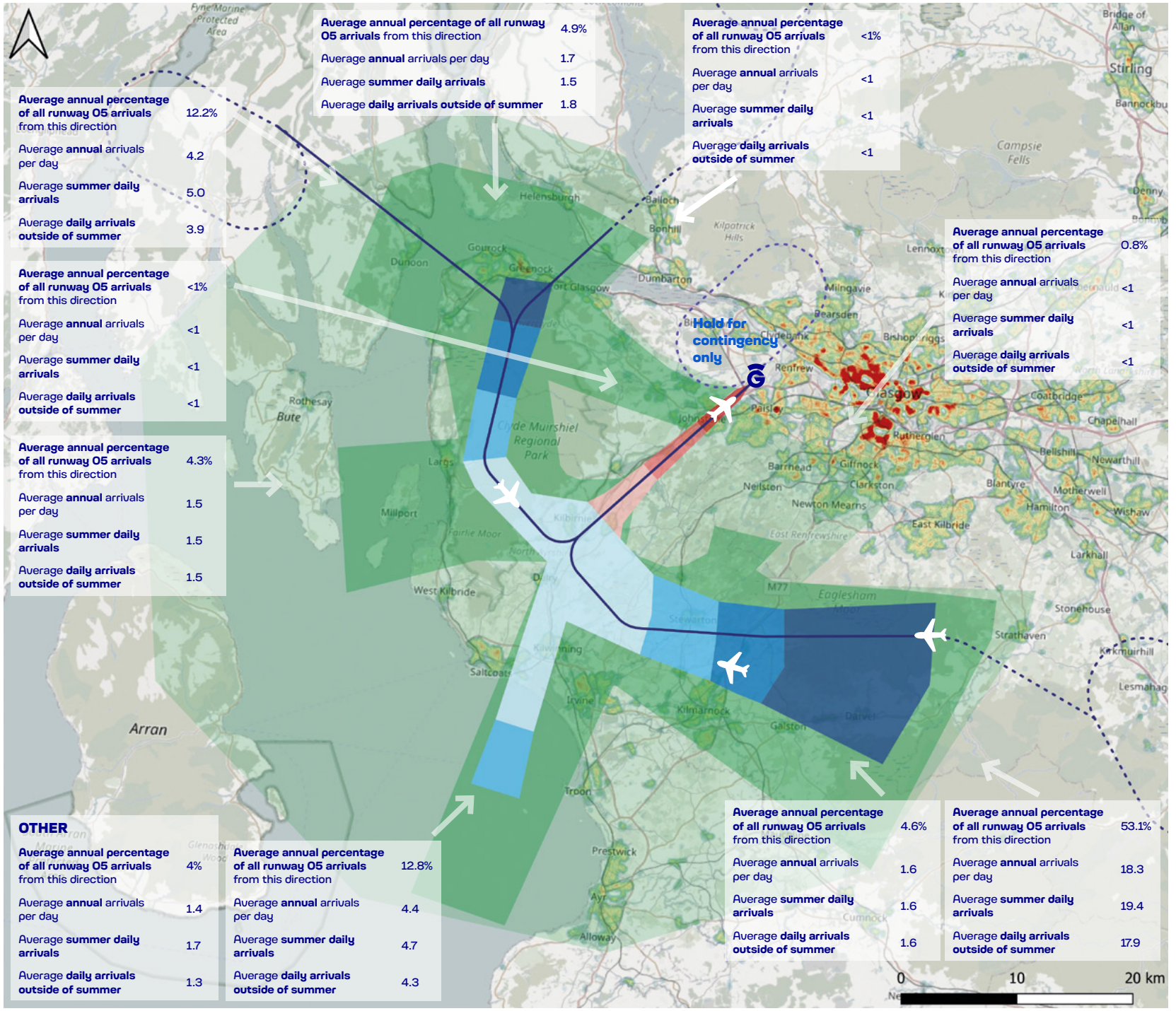
Population density (Source: CACI)

0 — 10000

Map reference: ©OpenStreetMap

Indicative information only.
Geographical areas based on an average day when only on Runway 05. The number of flights is based on overall annual average taking into account Runway 05 and Runway 23 operations.

For detailed noise mapping, see interactive maps on the Consultation website.



Runway 05 Arrivals
With airspace change

Percentage of year on Runway 05 26%
Average days per year 95

Average number of arrivals per day **when on Runway 05 up to 7000ft**

Greater than 5
- 0 – 1000ft
- 1000 – 2000ft
- 2000 – 3000ft
- 3000 – 4000ft
- 4000 – 5000ft
- 5000 – 6000ft
- 6000 – 7000ft

Less than 5 (up to 7000ft)

Less than 1 (up to 7000ft)

Proposed procedure centrelines

- Arrival route 7000ft and below
- Arrival route above 7000 ft
- NATS NERL proposed hold above 7000ft
- Contingency hold

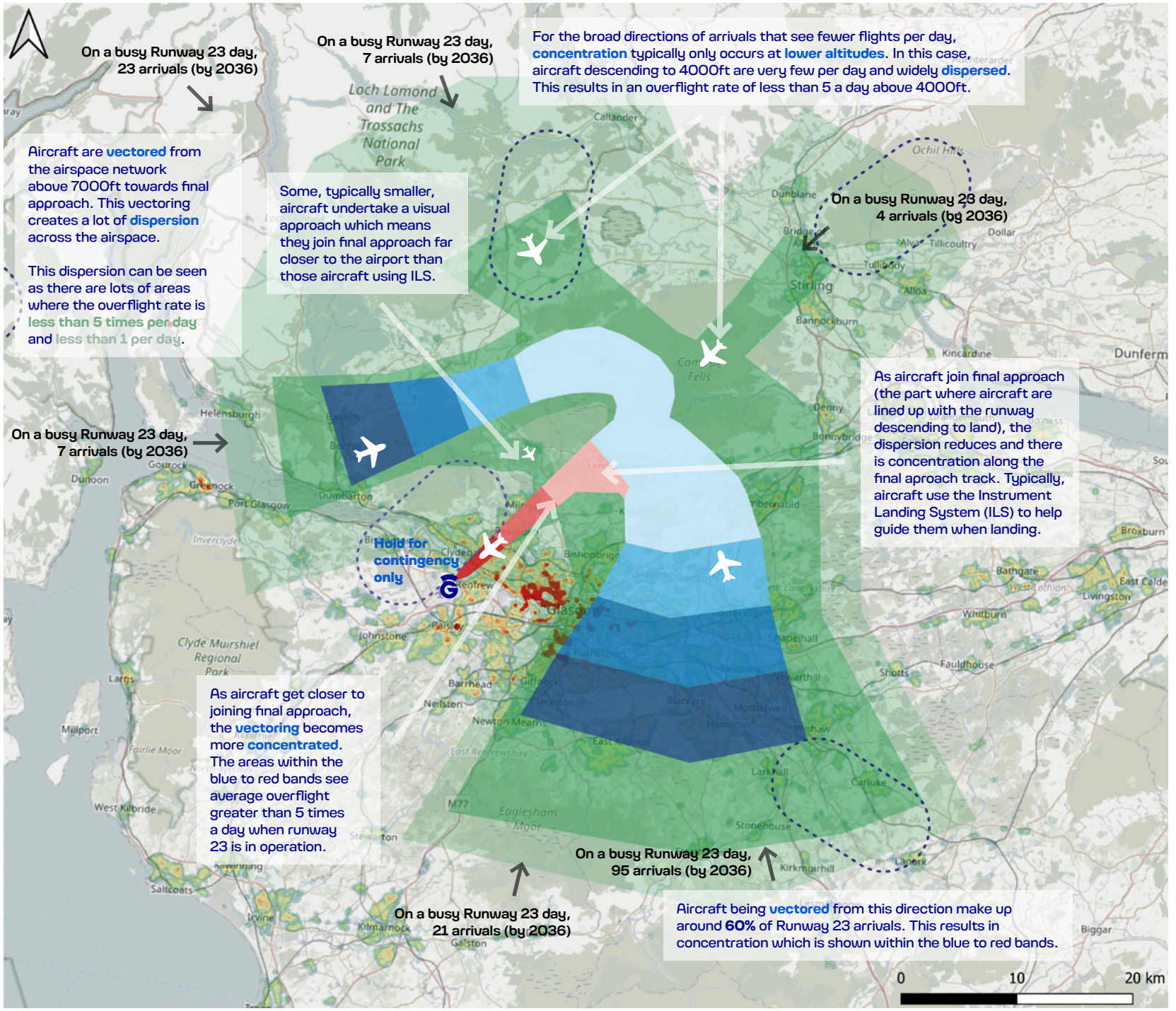
Population density (Source: CACI)

0 10000

Map reference: ©OpenStreetMap

Indicative information only.
Geographical areas based on an average day when only on Runway 05. The number of flights is based on overall annual average taking into account Runway 05 and Runway 23 operations.

For detailed noise mapping, see interactive maps on the Consultation website.



Runway 23 Arrivals
Without airspace change

Percentage of year on Runway 23	74%
Average days per year	270

Average number of arrivals per day **when on Runway 23 up to 7000ft**

Greater than 5

- 0 - 1000ft
- 1000 - 2000ft
- 2000 - 3000ft
- 3000 - 4000ft
- 4000 - 5000ft
- 5000 - 6000ft
- 6000 - 7000ft

Less than 5 (up to 7000ft)

Less than 1 (up to 7000ft)

Existing procedure centrelines

- Existing holds
- Contingency hold

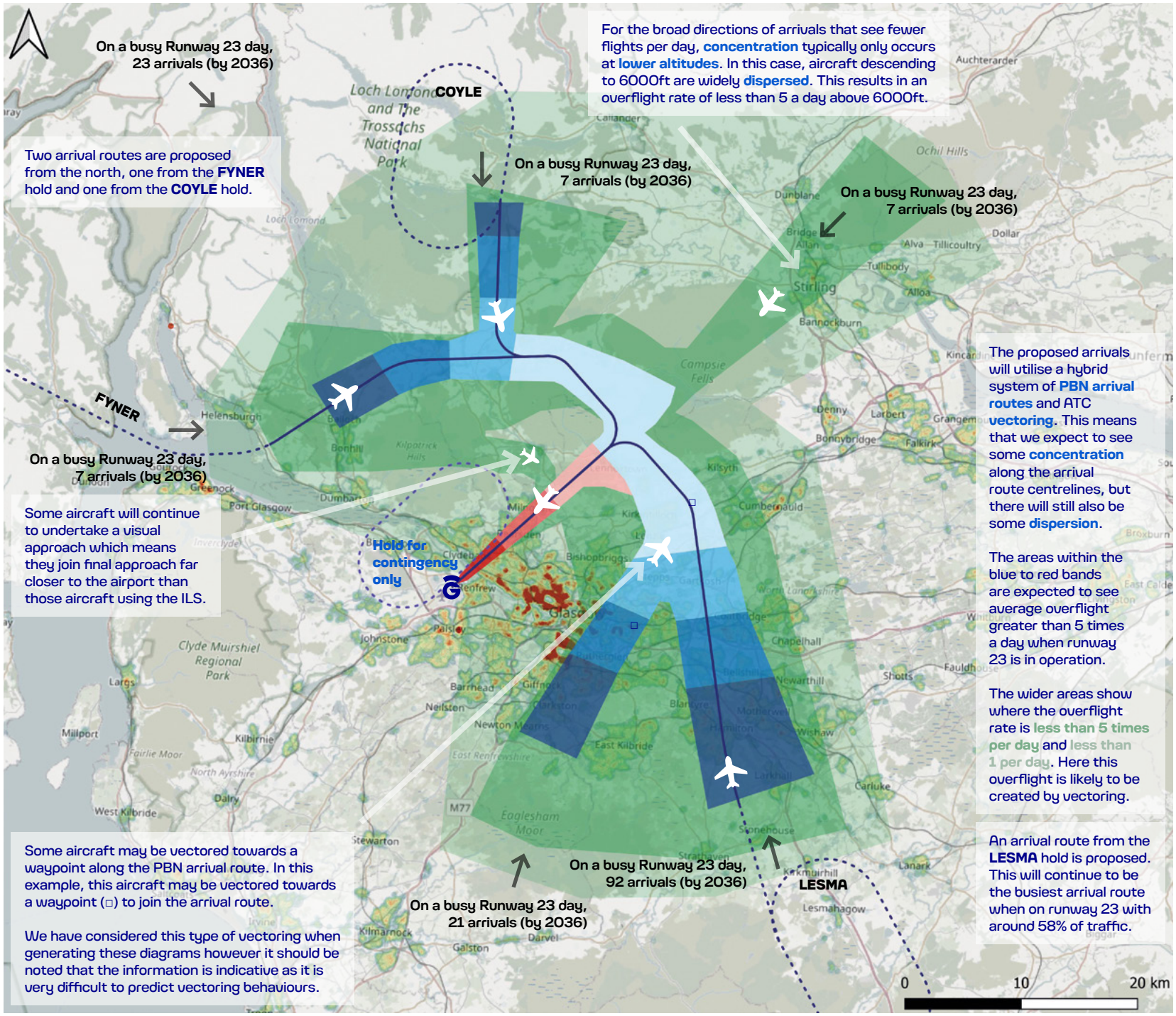
Population density (Source: CACI)

0 — 10000

Map reference: ©OpenStreetMap

Indicative information only.
The geographical areas, and numbers of flights, are based on an average busy day when on Runway 23 only. Runway 23 is used for around 74% of the year.

For detailed noise mapping, see interactive maps on the Consultation website.



Runway 23 Arrivals
With airspace change

Percentage of year on Runway 23	74%
Average days per year	270

Average number of arrivals per day **when on Runway 23 up to 7000ft**

Greater than 5

- 0 – 1000ft
- 1000 – 2000ft
- 2000 – 3000ft
- 3000 – 4000ft
- 4000 – 5000ft
- 5000 – 6000ft
- 6000 7000ft

Less than 5 (up to 7000ft)

Less than 1 (up to 7000ft)

Proposed procedure centrelines

- Performance Based Navigation (PBN) route below 7000ft
- PBN route above 7000ft
- NATS NERL proposed hold above 7000ft
- Contingency hold

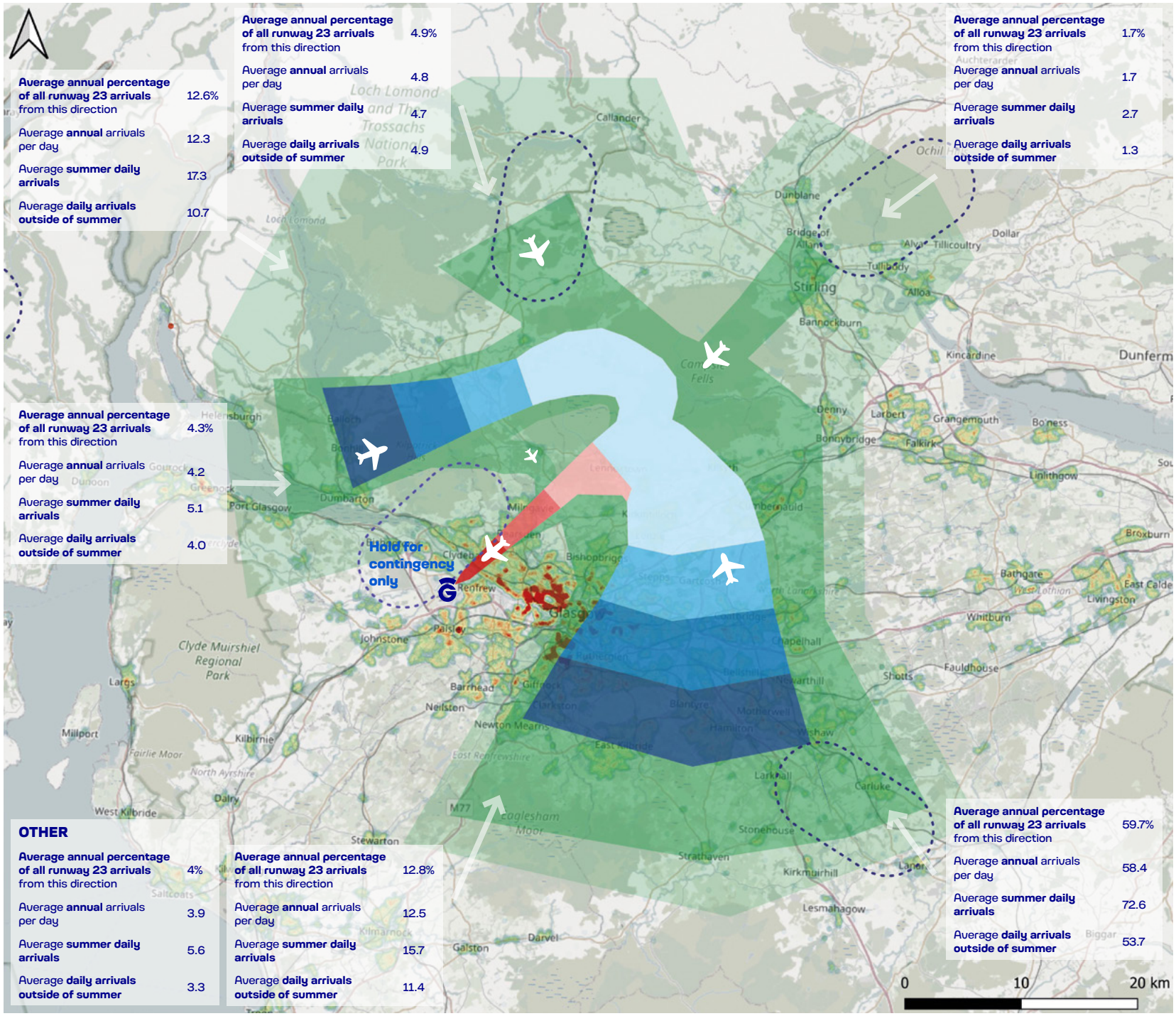
Population density (Source: CACI)

0 — 10000

Map reference: ©OpenStreetMap

Indicative information only.
The geographical areas, and numbers of flights, are based on an average busy day when on Runway 23 only. Runway 23 is used for around 74% of the year.

For detailed noise mapping, see interactive maps on the Consultation website.



Runway 23 Arrivals
Without airspace change

Percentage of year on Runway 23	74%
Average days per year	270

Average number of arrivals per day **when on Runway 23 up to 7000ft**

Greater than 5

- 0 – 1000ft
- 1000 – 2000ft
- 2000 – 3000ft
- 3000 – 4000ft
- 4000 – 5000ft
- 5000 – 6000ft
- 6000 – 7000ft

Less than 5 (up to 7000ft)

Less than 1 (up to 7000ft)

Existing procedure centrelines

Existing holds

Contingency hold

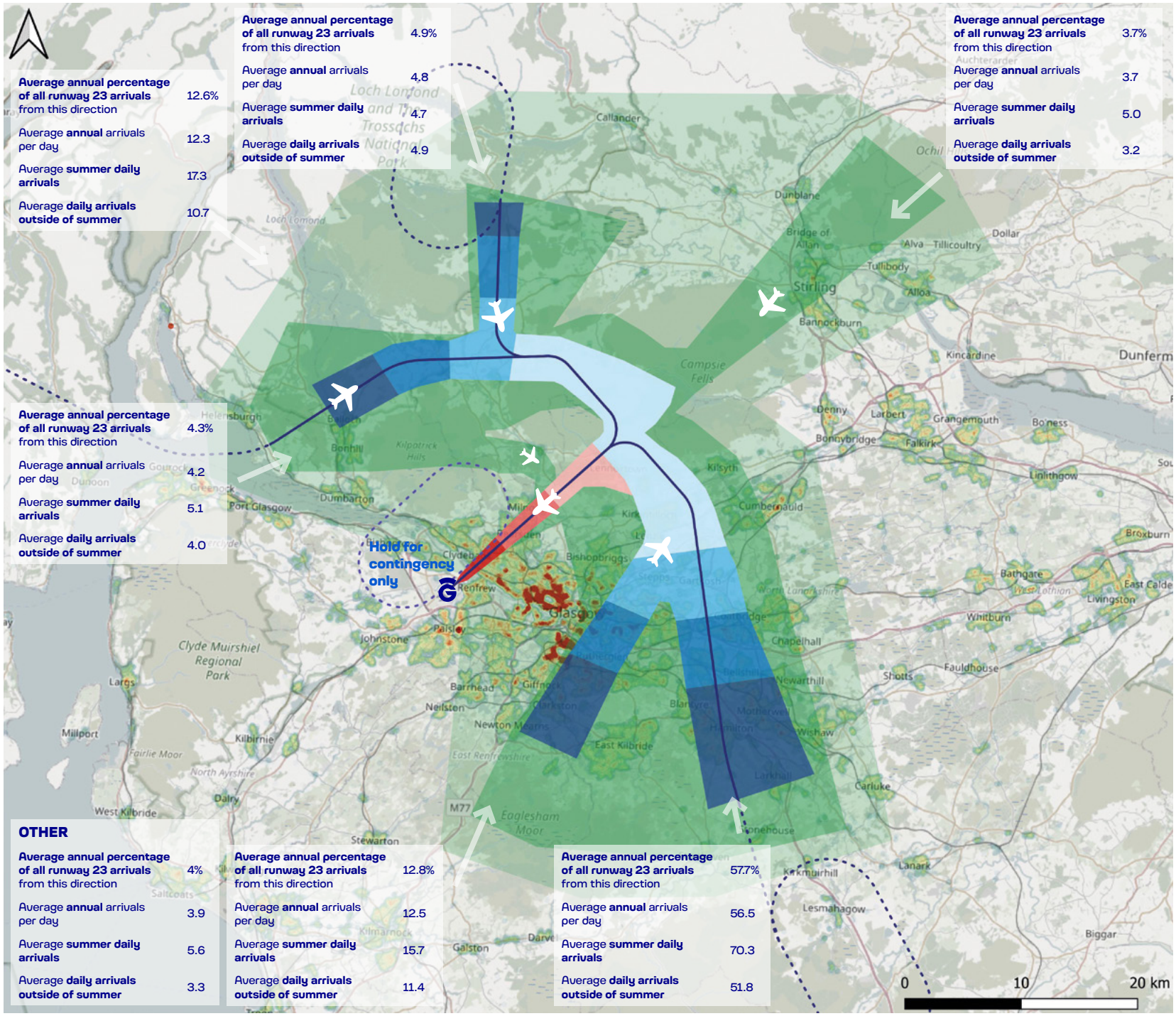
Population density (Source: CACI)

0 10000

Map reference: ©OpenStreetMap

Indicative information only.
Geographical areas based on an average day when only on Runway 23. The number of flights is based on overall annual average taking into account Runway 05 and Runway 23 operations.

For detailed noise mapping, see interactive maps on Consultation website.



Runway 23 Arrivals
With airspace change

Percentage of year on Runway 23 74%
Average days per year 270

Average number of arrivals per day **when on Runway 23 up to 7000ft**

Greater than 5
- 0 – 1000ft
- 1000 – 2000ft
- 2000 – 3000ft
- 3000 – 4000ft
- 4000 – 5000ft
- 5000 – 6000ft
- 6000 – 7000ft

Less than 5 (up to 7000ft)

Less than 1 (up to 7000ft)

Proposed procedure centrelines

- Performance Based Naviagtion (PBN) route below 7000ft
- PBN route above 7000 ft
- NATS NERL proposed hold above 7000ft
- Contingency hold

Population density (Source: CACI)

0 10000

Map reference: ©OpenStreetMap

Indicative information only.
Geographical areas based on an average day when only on Runway 23. The number of flights is based on overall annual average taking into account Runway 05 and Runway 23 operations.

For detailed noise mapping, see interactive maps on Consultation website.

6.2.4 The new proposed arrivals will utilise a hybrid system of arrival routes and ATC **vectoring**. This means that we expect to see some **concentration** along the arrival route centrelines, but there will still also be some **dispersion**.

6.2.5 The arrival routes have been designed in a way that means that aircraft will continue to be able to join the **ILS** when on final approach before landing, however there will also be an PBN approach available which follows the same lateral and vertical path as the existing ILS approach.

Future Noise Abatement Procedures for arriving aircraft

6.2.6 It is proposed that the arrivals Noise Abatement Procedures would remain broadly similar to those published today.

6.2.7 This means that aircraft arriving to land on Runway 23 (from the north east), would continue to not descend below 2,000ft before turning to join the ILS. When using a different approach such as the PBN approach, aircraft would not descent below the profile of a 3° rate of descent.

6.2.8 For aircraft arriving to land on Runway 05 (from the south west) when using the ILS, jet aircraft would not be below 2,000ft when turning to line up with the runway. Propellor aircraft, if instructed by ATC, may be allowed to turn at 1,600ft to line up with the runway. When using a different approach such as the PBN approach, aircraft would not descent below the profile of a 3° rate of descent.

6.2.9 For aircraft arriving visually, and therefore not using navigation aids, any aircraft over 5,700kg would continue to be at least 5nm from the runway before turning onto final approach and must remain above 1,500ft until lined up with the runway.

6.2.10 For detailed aviation technical information, please see **Annex 1**.

How do these arrival routes fit into the wider Scottish Airspace Modernisation system design?

6.2.11 Glasgow Airport's arrival procedures form part of the wider Scottish Airspace Modernisation design. As part of the operational diagrams above, we have shown parts of the design above 7,000ft with a dashed line however for details of the full system wide design, please see the **Scottish Airspace Modernisation website**.

Scottish Airspace Modernisation

7

The overall proposal for modernising Glasgow Airport's airspace

7 The overall proposal for modernising Glasgow Airport's airspace

7.1 Combining the proposed arrival and departure routes

7.1.1 When assessing the benefits and impacts of the proposed 'with airspace change' option against the 'without airspace change' baseline, CAP1616 requires us to look at the overall airport system performance, and hence it is important we show how the departure and arrival components work together ahead of explaining the outcomes of the Full Options Appraisal.

7.1.2 Section 5 and section 6 of this document provide a detailed breakdown of the proposed departure and arrival procedures for each runway end. This section brings this information together to present the overall system design for modernising Glasgow Airport's airspace. **We would encourage readers to review section 5 and section 6 before reading this section.**

7.1.3 The following images show all the proposed departure and arrival procedures overlaid on one image along with an overflight contour which shows an average summer day. As the contours have been generated for an **average** summer day, they take into account summer modal split which is 77% of the time Runway 23 is in use, and 23% of the time Runway 05 is in use.

7.1.4 Overflight contours are generated using the CAA's 48.5-degree definition of overflight as outlined in CAP1498, this means 'an aircraft in flight passing an observer at an elevation angle of 48.5° from the ground at an altitude below 7000ft'. Although overflight contours do not illustrate noise impacts, they do enable calculation of the number of times a location may be considered to be overflown.

7.1.5 This helps to show the areas that are overflown by the departure and arrivals procedures for both runway ends.

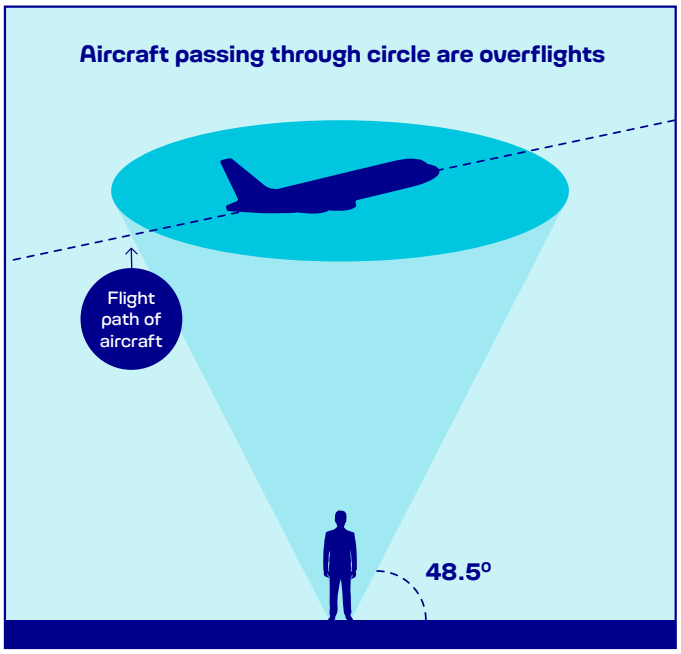
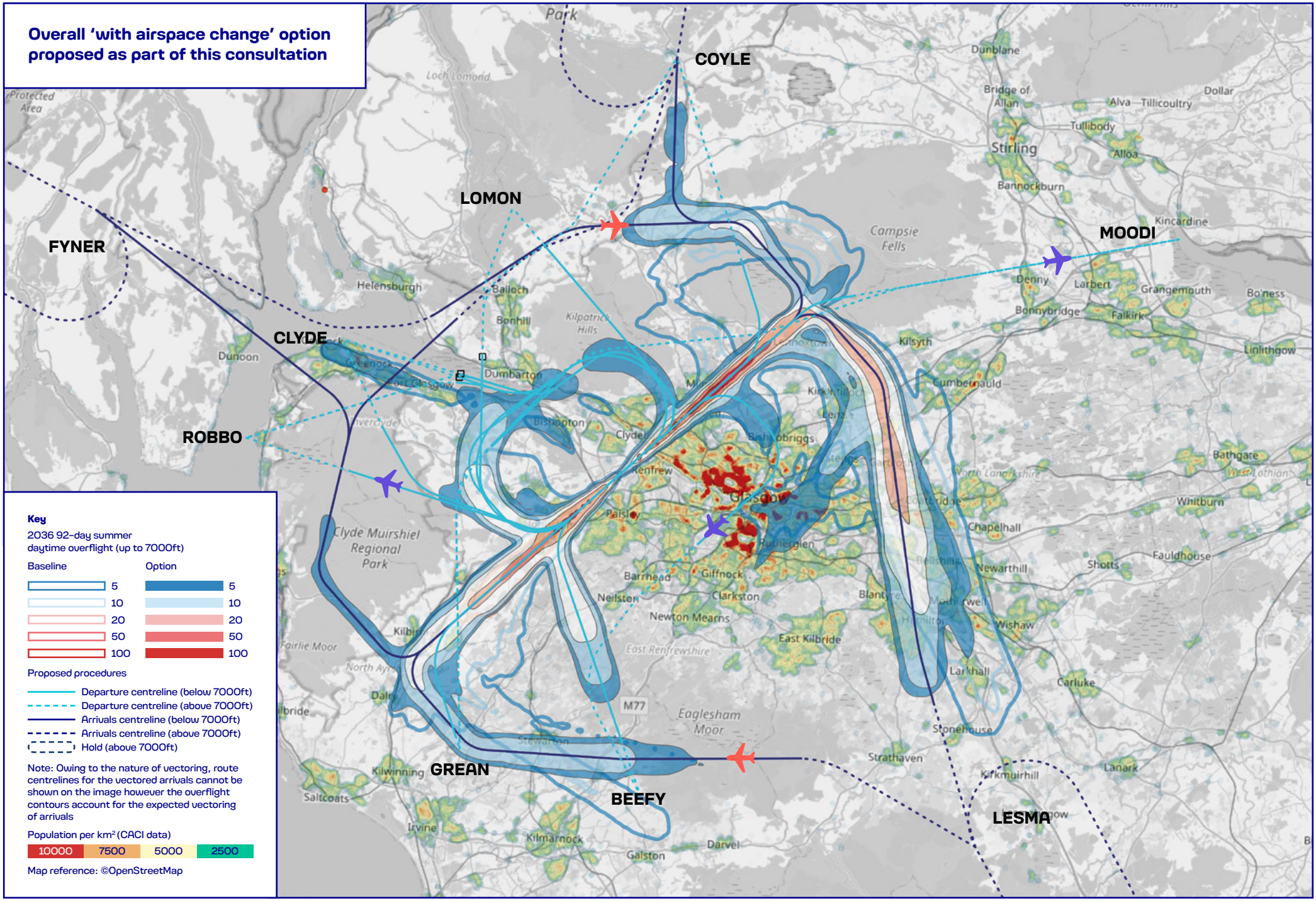


Figure 19: CAP1498 48.5 degree overflight

The map shown on the following page is also available as part of the interactive noise maps on our Glasgow Airport consultation website. This allows you to enter your address, or navigate to an area shown on the map, and see how the proposed option would benefit or impact you. **Click here** to go to the Glasgow Airport consultation website.


Overall 'with airspace change' option proposed as part of this consultation
COYLE
LOMON
FYNER
CLYDE
ROBBO
MOODI
GREAN
BEEFY
LESMA
Key
2036 92-day summer daytime overflight (up to 7000ft)
Baseline
Option
5
10
20
50
100
Proposed procedures
Departure centreline (below 7000ft)
Departure centreline (above 7000ft)
Arrivals centreline (below 7000ft)
Arrivals centreline (above 7000ft)
Hold (above 7000ft)
Note: Owing to the nature of vectoring, route centrelines for the vectored arrivals cannot be shown on the image however the overflight contours account for the expected vectoring of arrivals
Population per km² (CACI data)
10000
7500
5000
2500
Map reference: ©OpenStreetMap

7.1.6 For details about the broader Scottish Airspace Modernisation system wide proposal, which has been developed in collaboration between Glasgow Airport, Edinburgh Airport and NERL, please see Annex 2 – ACOG Description System Wide Scottish Cluster.

Movement information

7.1.7 The proposed 'with airspace change' option does not seek to increase movements at Glasgow Airport and therefore the traffic forecast applied 'without ACP' will remain the same 'with ACP'.

7.1.8 Table 4 provides an overview of these forecast movement numbers from the planned year of implementation (no earlier than 2027[5]) to 10 years following (2036). CAP1616 requires airspace Change Sponsors to assess both these years. Note that whilst the table presents annual movement numbers, the noise modelling is based on movement numbers within the 92-day summer period from 16 June to 15 September inclusive as required by CAP1616.

Forecast movement numbers based on the baseline for this assessment (2022), the planned year of implementation (2027)[5], to 10 years following (2036).

Year	Total movements per year (rounded to nearest 1,000)
2022 Current day	70,000
2023	80,000
2027	91,000
2028	91,000
2029	92,000
2030	93,000
2031	93,000
2032	94,000
2033	95,000
2034	95,000
2035	96,000
2036	96,000

7.1.9 The movement numbers in Table 4 are based on our 5-year long term business plan traffic forecast which includes business intelligence and information including frequency of route operated, new routes, stopping routes, anticipated changes in fleet mix and speed of covid recovery. Beyond 5 years, this forecast is grown by an annual average per annum, informed by previous years.

7.1.10 CAP1616 requires airspace Change Sponsors to assess the 'without airspace change' baseline and 'with airspace change' scenario for the year of implementation, which in this case is expected to be no earlier than 2027[5], and the year of implementation +10 years which is 2036.

7.1.11 **The future forecasts and the fleet mix forecasts (detailed in the next section) are based on the best and most up to date information available at the time of forecasting.**

7.1.12 Airport operations are continuously evolving with airline decisions around the introduction of new destinations, withdrawal existing destinations and changes fleet mix sometimes outside of the airports immediate control. As we progress through the airspace change process, we will continue to review the forecasts and update where necessary and appropriate to do so.

7.1.13 In table 4 on the left, the 'current day' scenario is based on 2022. This is because the Full Options Appraisal for the Stage 3 submission of this ACP was started in 2023 and we had to use a full years' worth of data to generate forecasts and undertake some of the assessments. Following completion of the assessments and drafting of this consultation material, Glasgow Airport, Edinburgh Airport and NERL then submitted their Stage 3 documents to the CAA in August 2024.

7.1.14 We recognise that this means the 'current year' is now a number of years in the past however this does not affect the main basis of the analysis which looks at the changes between the 'with airspace change' and 'without airspace change' scenarios in 2027 and 2036.

7.1.15 If you would like to see how movement numbers have changed since 2023, please see https://www.caa.co.uk/data-and-analysis/uk-aviation-market/airports/uk-airport-data/.

[5] Please note: The expected implementation year may change. This depends on the UK Government's airspace modernisation priorities and the aviation industry's ability to manage major changes safely and efficiently.

7.1.16 As part of Stage 4 of the airspace change process, we will undertake a Final Options Appraisal on the proposal developed following this consultation. At the point of undertaking this appraisal we will use the most up to date sources of data for all of the assessments within the appraisal.

Future fleet mix

7.1.17 When we're assessing the 'without airspace change' baseline and the 'with airspace change' proposal, we have considered how the fleet mix may change over time. Table 5 shows the actual fleet mix % in 2022 and the expected fleet mix by 2036.

7.1.18 The fleet mix at Glasgow airport is a mixture of jet and turboprop aircraft, with jet aircraft making up most of the fleet. The most common aircraft types include turboprop aircraft (50 – 70 seats), regional jets (50 – 90 seats), single-aisle 2 engine jets (125 – 180 seats) and twin-aisle jets (300 – 350 seats). Whilst the Airbus A380 (500 seat 4 engine jet) does operate at the airport, it accounts for less than 1% of the annual fleet.

7.1.19 For full details, please see the Full Options Appraisal document.

Aircraft type	% of annual fleet mix in 2022	% of annual fleet mix by 2036
Airbus A320	17%	8%
Boeing 737-800	16%	19%
Airbus A319	10%	4%
Embraer ERJ-145	7%	4%
Saab 340[6]	6%	6%
Airbus A320neo	5%	22%
De Havilland Canada DHC-6 Twin Otter	5%	5%
Embraer E190	4%	4%
Boeing 737 Max 8	4%	4%
ATR 72-600	4%	4%
Beechcraft King Air 200	3%	3%
Piper PA-28 Cherokee	2%	2%
Cessna 172	1%	1%
Airbus A321neo	1%	2%
Piper PA-38 Tomahawk	1%	1%
Boeing 777-300 ER	1%	<1%
De Havilland Canada Dash 8	1%	1%
Airbus A321	<1%	1%
All other aircraft types each contribute less than 1% to the total fleet		

Table 5: Glasgow Airport fleet mix in 2022 compared to 2036

[6] At the time of producing the forecasts for the FOA, the Saab 340 was the most common twin propellor aircraft operating at Glasgow Airport. Since that time, the Saab fleet has been retired in favour of ATR-72s, also a twin propellor aircraft. However, it is still considered that the Saab is a representative aircraft for this exercise and can be considered representative of other turboprop aircraft such as the ATR-72s which will now make up a larger proportion of the fleet.

Airport operations are continuously evolving with airline decisions around the introduction of new destinations, withdrawal existing destinations and changes fleet mix sometimes outside of the airports immediate control. Any further changes identified will be incorporated into the forecasting work undertaken in preparation for the Stage 4 Final Options Appraisal.

8

The benefits and impacts of our proposal

8 The benefits and impacts of our proposal

8.1 Benefits & impacts summary

8.1.1 As part of the work in preparation for this consultation, we undertook a very detailed assessment of 8 potential options, to understand the positive benefits and negative impacts, compared to a 'without airspace change' baseline. This is called the Full Options Appraisal. The outcome of the Full Options Appraisal was our proposed option to take to this consultation.

8.1.2 The section below provides a very high-level summary of the outcomes of the Full Options Appraisal for the proposed option. Following this section, there are sub-sections which explain how we assess each category and provide some further details about the outcomes of each assessment. You can use the links in the section to navigate directly to a category subsection.

8.1.3 For detailed analysis, please see the Full Options Appraisal (note our proposed option is called 'Option 5' within the FOA document).

High-level FOA summary

Noise

The noise assessment shows an overall **reduction in total adverse effects on health and quality of life from noise**.

It is important to note that in some areas the proposed option changes where aircraft fly compared to today. There could therefore be local positive benefits and negative impacts to some areas surrounding Glasgow Airport. These local impacts are fully explained in the Full Options Appraisal.

To further help communities understand the impacts to their area, we have created interactive noise maps which can be found on our Glasgow Airport consultation website. This interactive map allows you to enter your address, or navigate to an area shown on the map, and see how the proposed option would benefit or impact you.

Air quality

The proposal is predicted to have a **negligible impact on local air quality**.

Greenhouse Gas Emissions

The proposal is predicted to **reduce the total annual and per flight Greenhouse Gas Emissions**[7].

[7] Please refer to the FOA methodology section for Greenhouse Gas Emissions for contextual information on how the use of planned flight data in the NERL modelling may affect this result

Click to view category subsection

Tranquility

The proposed option is **not expected to result in a significant change to the perception of tranquillity** within the Loch Lomond National Scenic Area, the Loch Lomond and Trossachs National Park or any **Candidate Quiet Areas**.

There will be changes in the number and extent of overflight of some Candidate Quiet Areas, Country Parks and Gardens and Designated Landscapes, which could affect the acoustic character of these areas, but not to the extent that there is a change in quality of life.

Click to view category subsection

Biodiversity

No biodiversity impacts are expected to the European sites identified as part of the Habitats Regulatory Assessment screening. European sites are made up of Special Areas of Conservation (SAC) and possible SACs, Special Protection Areas (SPAs) and possible SPAs and Ramsar sites (wetlands of international importance) and proposed Ramsar sites.

There will be changes in the number and extent of overflight of some other biodiversity receptors such as Sites of Special Scientific Interest, National Nature Reserves and Local Nature Reserves, but there is no predicted impact to the biodiversity of these sites.

Click to view category subsection

Capacity

The proposed option is expected to **improve capacity** which will result in **fewer departure delays** at Glasgow Airport.

Click to view category subsection

Resilience

The introduction of modern satellite-based procedures (Performance Based Navigation) removes some of Glasgow's dependencies on outdated ground based navigation which **improves resilience**.

Click to view category subsection

General Aviation

The proposed option involves changes to the lateral boundaries and some classifications of Controlled Airspace. In places, these boundaries overlap between the Glasgow Airport, Edinburgh Airport and NERL proposals. Overall, there is a **net release of Controlled Airspace (CAS) below 7,000ft** which is expected to have positive benefits for General Aviation.

The CAS volume data suggests an overall improvement however it is important to note that in some areas additional CAS is required, and in other areas CAS is being released.There could therefore be positive benefits and negative impacts to some surrounding Glasgow Airport. Please see **section 9** for full details of the CAS proposals and the potential benefits / impacts to particular areas.

Economic impacts

It is expected there **will be economic benefits** as a result of **reduced departure delay**.

Click to view category subsection

Fuel burn

The proposal is predicted to **reduce the total annual and per flight fuel burn**[8].

Airline costs

It is not anticipated that the proposed option would result in any additional costs to airlines, such as training costs and other costs.

Airport and ANSP costs[9]

There is an **operational cost** for Glasgow Airport to maintain the Instrument Flight Procedures and our noise insulation scheme.

There will be a **cost** to Glasgow Airport and the Air Navigation Service Provider (ANSP) to modernise Glasgow's airspace which mainly involves training Air Traffic Controllers and assistants and updating ATC infrastructure.

Click to view category subsection

Safety

The safety assessments have indicated that the proposed option will **maintain and, in some areas, enhance safety** compared to the 'without airspace change' baseline.

Click to view category subsection

Airspace Modernisation Strategy

Our proposed option **aims to meet** the vision of the Airspace Modernisation Strategy by delivering quicker, quieter and cleaner journeys and more capacity for the benefit of those who use and are affected by UK airspace. As assessment against the objectives of the AMS is included in the section below.

[8] Please refer to the FOA methodology section for Greenhouse Gas Emissions for contextual information on how the use of planned flight data in the NERL modelling may affect this result

[9] The cost of development of the ACP, consultation and design are not included in assumptions of cost to Glasgow Airport

Monetised assessments within the Full Options Appraisal

8.1.4 As part of the Full Options Appraisal, we are also required to generate monetised costs and benefits for the airspace change options where possible to do so.

8.1.5 Within the Full Options Appraisal, the following categories have been monetised: noise, Greenhouse Gas Emissions, fuel burn, departure delay and operational costs.

8.1.6 A 'Net Present Value' (NPV) for each option was then generated using calculations as required by CAP1616. The noise and Greenhouse Gas Emissions monetisation is undertaken using calculations required by the government. For more information about NPV and Cost Benefit Analysis, please see the **Full Options Appraisal document**.

8.1.7 Overall, the monetised assessment has shown an **£57,545,676 benefit over 10 years** for the proposed option taking into account inflation and discounting using the Government's Social time Preference Rate.

Noise

How do we assess noise?

8.2.1 The noise assessment is based around the CAP1616 primary and secondary noise metrics. CAP1616[10] explains:

> When considering noise impacts, the CAA will weigh the outcomes from 'primary' metrics over 'secondary' metrics. Primary metrics will be those that are used to quantify significant noise impacts, such as WebTAG outputs. Secondary metrics will be those that are not being used to determine significant impacts but which are still able to convey noise effects, such as N65 contours and L_{max} levels. While not a noise metric, overflight contours will be a secondary metric for the purposes of decision-making.

Primary noise metrics: TAG

8.2.2 **Noise metrics are generated based on a 92-day summer period from** 16 June to 15 September inclusive. This means that the modal split applied when calculating the noise contours is generated from the 92-day average, taken across 20 years. This 92-day average is slightly different to the annual modal split average taken across the same 20-year period. For the purposes of the noise modelling, a modal split of Runway 05 being used 23% of the year, and Runway 23 being used 77% of the year has been applied.

Primary noise metrics: TAG

8.2.3 TAG (https://www.gov.uk/guidance/transport-analysisguidance-webtag) is the Department for Transport's suite of guidance on how to assess the expected impacts of transport policy proposals and projects. The TAG noise is a tool which assesses the impact of changes in noise exposure and can be used to monetise certain aspects of the noise impact. $L_{Aeq16hr}$ (daytime noise) and L_{Aeq8hr} (night-time noise) noise exposure data form the input into TAG.

8.2.4 The Department for Transport have published a guide to WebTAG Noise Appraisal for nonexperts which can be **viewed here**[11].

Primary noise metrics: L_{Aeq} contours

8.2.5 L_{Aeq} is the equivalent sound level of aircraft noise in dBA*. This is based on the daily average movements that take place in the 16-hour period (07:00-23:00 local time) or 8-hour period (23:00-07:00) during the 92-day period 16 June to 15 September inclusive. This metric is the measure of noise exposure adopted by UK Government for the purposes of considering adverse effects from aircraft noise. It forms the basis of the UK Government's policies in relation to aircraft noise.

[10] CAP1616 i 5.16

[11] https://assets.publishing.service.gov.uk/media/5a81fbe7ed915d74e34011b5/webtag-for-non-experts.pdf

* dBA means 'A-weighted decibels' and is often used in measurements of aviation noise.

8.2.6 $L_{Aeq16hr}$ and L_{Aeq8hr} noise exposure data has been generated for the baseline and for our proposed option. These have been used to calculate the population numbers within the specific contours, the area of the contours and the noise level change at individual postcodes.

8.2.7 The 51dB $L_{Aeq16hr}$ (daytime noise) and 45dB L_{Aeq8hr} (night-time noise) noise exposure level represent the daytime and night-time Lowest Observable Adverse Effect Level (LOAEL) contour defined in UK Government airspace policy. The LOAEL represents the noise exposure level above which adverse effects on health and quality of life can be observed.

8.2.8 The 63dB $L_{Aeq16hr}$ (daytime noise) and 55dB L_{Aeq8hr} (night-time noise) noise exposure level represent the daytime and night-time Significant Observed Adverse Effect Level (SOAEL). The SOAEL represents the noise exposure level above which significant adverse effects on health and quality of life can be observed. As part of the FOA noise summary tables below, there are columns which show the population within the LOAEL and the SOAEL. As well as the total populations within the LOAEL and SOAEL contours, we have also provided information on the locations where significant noise increases and decreases would occur.

Secondary noise metrics: Noise events above 65dB and 60 dB L_{ASmax} (N65 and N60)

8.2.9 N60 and N65 are noise metrics which respectively describe the number (N) of aircraft noise events above a noise level of 60dB L_{ASmax} in the night-time period and 65dB L_{ASmax} for the daytime period. These are event-based metrics, which can be used to better understand the number of noise events that occur and their location.

8.2.10 N65 and N60 contours have been generated for the baseline and for the proposed option. These have been used to calculate the population numbers within the contour and the area of the contour.

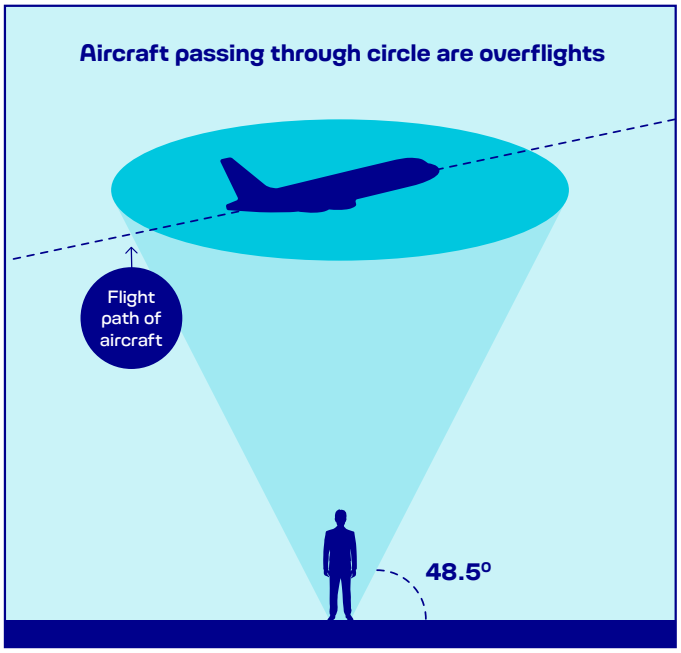


Figure 20: CAP1498 overflight

Secondary noise metrics: Overflight contours

8.2.11 Overflight contours are generated using the CAA's definition of overflight as outlined in CAP1498. Although overflight contours do not portray noise impacts, they do enable calculation of the number of times a location may be perceived to be overflown.

8.2.12 Overflight contours have been generated for the baseline and for each option up to an altitude of 7,000ft. These have been used to calculate the population numbers within the contour.

How did our proposal perform in terms of noise?

8.2.13 For ease of comparison, within this consultation document we have only provided data and figures for 2036 (year of implementation + 10 years). This is because this is Glasgow Airport's busiest schedule, and as the proposal does not influence the number of movements or the fleet mix, the relative performance of the option is the same in 2027 (year of implementation)[12] as it is in 2036.

8.2.14 **Along with this Consultation Document, Appendix C provides high resolution noise contour maps and full data tables for the year of implementation (2027)[12] and the future 10-year forecast (2036).** The below sections summarise the noise outcomes.

Primary noise metrics

8.2.15 The monetised noise assessment of our proposed option gives a **net present value (NPV) of noise changes of £10,676,929 (2024 prices). This positive value reflects a net benefit i.e. a reduction in total adverse effects on health and quality of life from noise.** The FOA document includes further details about the outcomes of the TAG assessment:

8.2.16 The 16h daytime and 8h nighttime contours reflected this overall benefit in terms of total adverse effects although there are some contour bands where there are some small increases in population. The following tables show our proposed option compared to the 'without airspace change' baseline:

Year	Metric	Contour	Area (km^2)	Total population
2036	$L_{Aeq16hr}$	51	-3.7	-1600
2036	$L_{Aeq16hr}$	54	-1.4	-3000
2036	$L_{Aeq16hr}$	57	-0.1	-600
2036	$L_{Aeq16hr}$	60	+<0.1	<100
2036	$L_{Aeq16hr}$	63	+<0.1	0

Table 7: $L_{Aeq16hr}$ daytime contour comparison between 'without airspace change' baseline and the proposed option 'with airspace change'

[12] Please note: The expected implementation year may change. This depends on the UK Government's airspace modernisation priorities and the aviation industry's ability to manage major changes safely and efficiently.

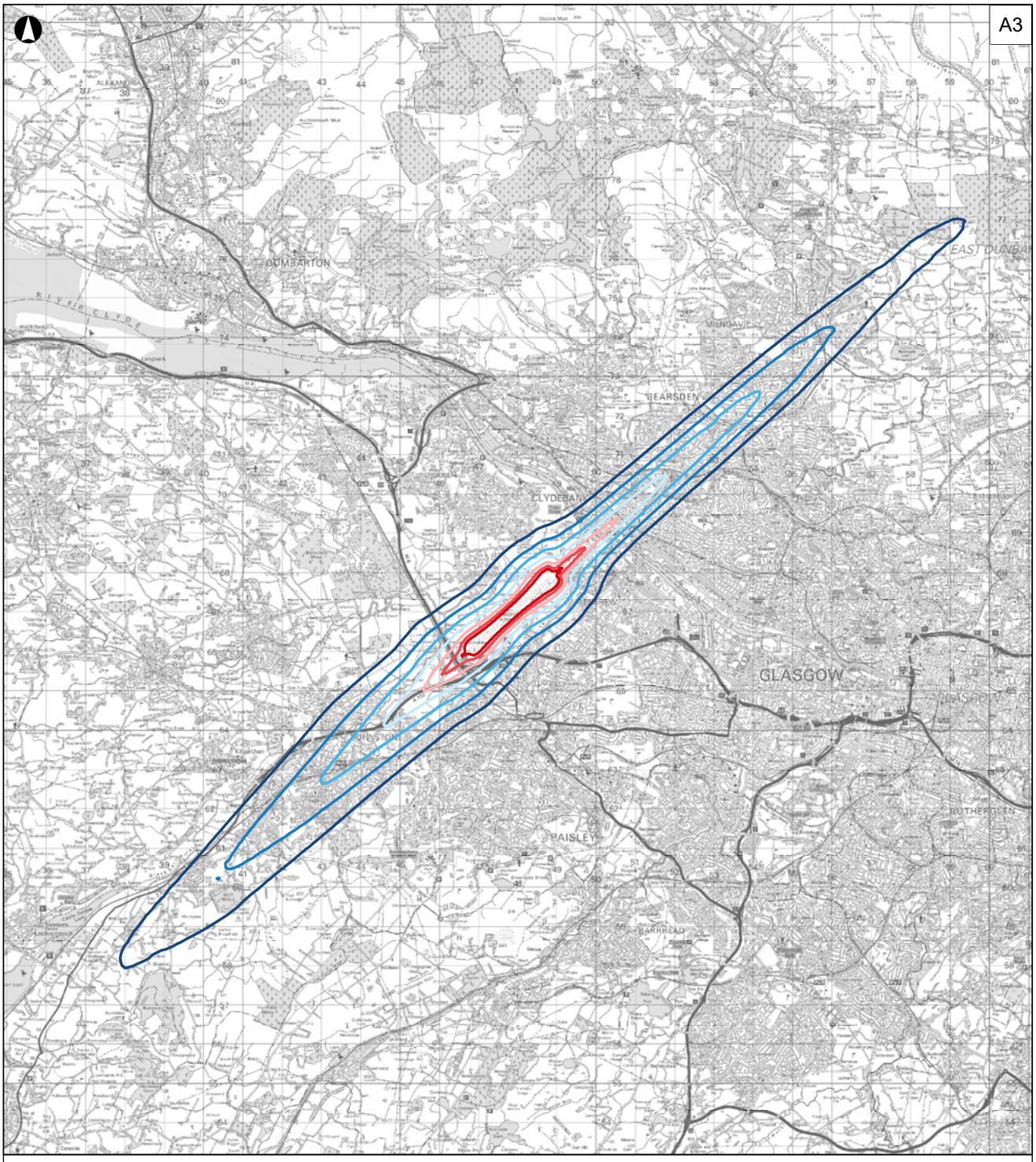
Year	Metric	Contour	Area (km²)	Total population
2036	L_{Aeq8hr}	45	-5.1	-300
2036	L_{Aeq8hr}	48	-5.3	-3000
2036	L_{Aeq8hr}	51	-1.4	-4100
2036	L_{Aeq8hr}	54	-0.1	-200
2036	L_{Aeq8hr}	55	<0.1	<100
2036	L_{Aeq8hr}	57	<0.1	<100

Table 8: L_{Aeq8hr} nighttime contour comparison between 'without airspace change' baseline and the proposed option 'with airspace change'

As part of our **Glasgow Airport consultation website** we have created interactive noise mapping. This tool provides an interactive map which shows the baseline 'without airspace change' noise contours and the proposed 'with airspace change' contours so that you can understand the changes within your area. To go to the interactive noise mapping please **click here**.

8.2.17 The following four pages show $L_{Aeq16hr}$ daytime and L_{Aeq8hr} nighttime contours for the baseline 'without airspace change' scenario and the proposed option 'with airspace change'. There are then two further pages which show difference contours which highlight where the main benefits and impacts occur.

8.2.18 **The maps can be viewed interactively on our Glasgow Airport consultation website. Alternatively, larger high-resolution versions of these contours are contained in Appendix C.** In Appendix C there are also further noise contour maps including 100% mode contours and L_{ASmax} contours.



Legend

- 51dB
- 54dB
- 57dB
- 60dB
- 63dB
- 66dB
- 69dB

Coordinate System: British National Grid

Rev	Date	By	Chkd	Appd	Authd
P01	02/08/24	GL	CS	DH	DH

Kilometers
0 1.25 2.5 5

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Drawing Title
Figure TA17: 2036 Without Airspace Change 92-day summer daytime $L_{Aeq16hr}$

Scale at A3
1:100,000

Suitability
Issue

Project Number
268771-00

Rev
P01

Figure 21: $L_{Aeq16hr}$ daytime 'without airspace change'

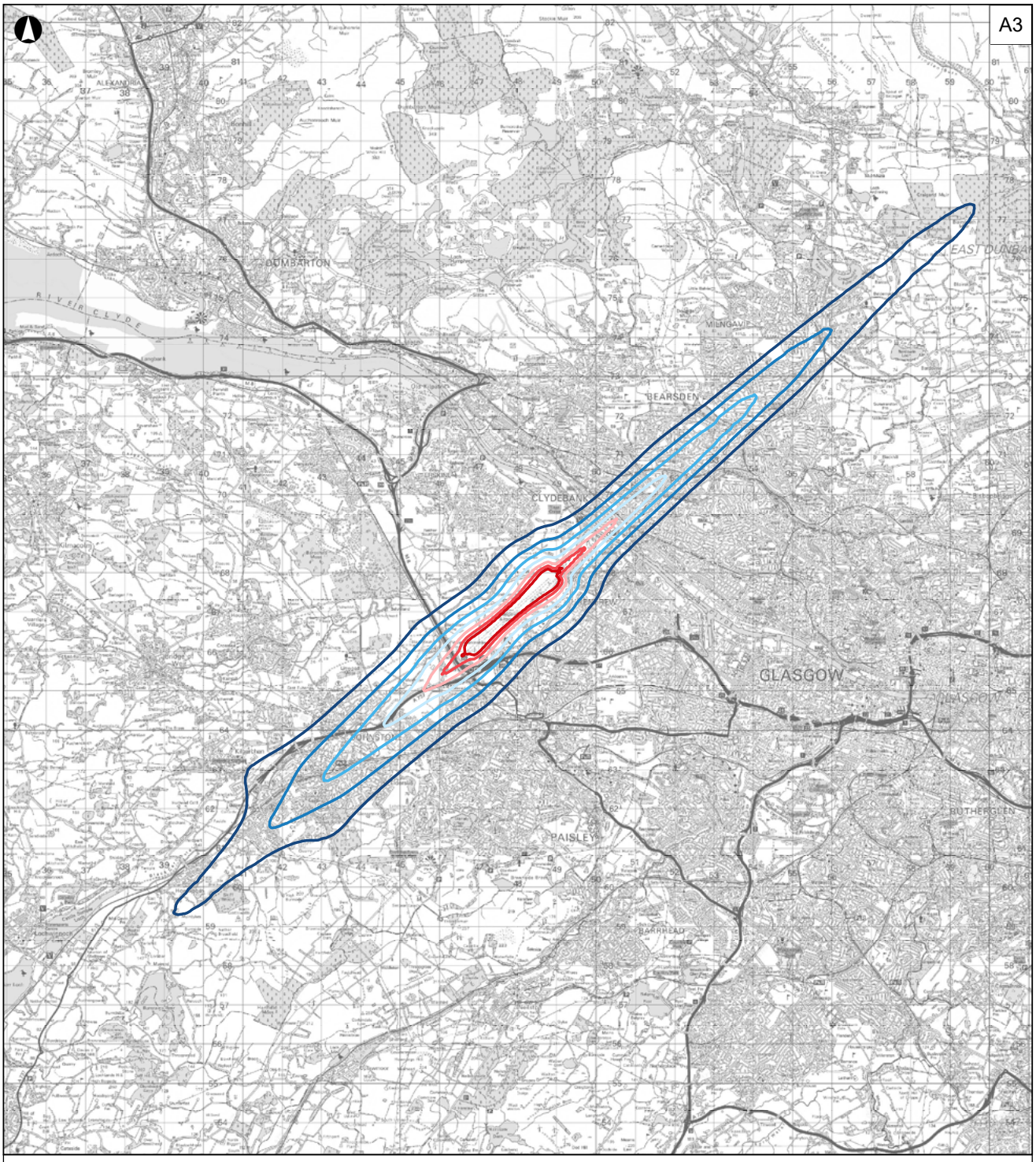


Figure 22: $L_{Aeq16hr}$ daytime 'with airspace change'

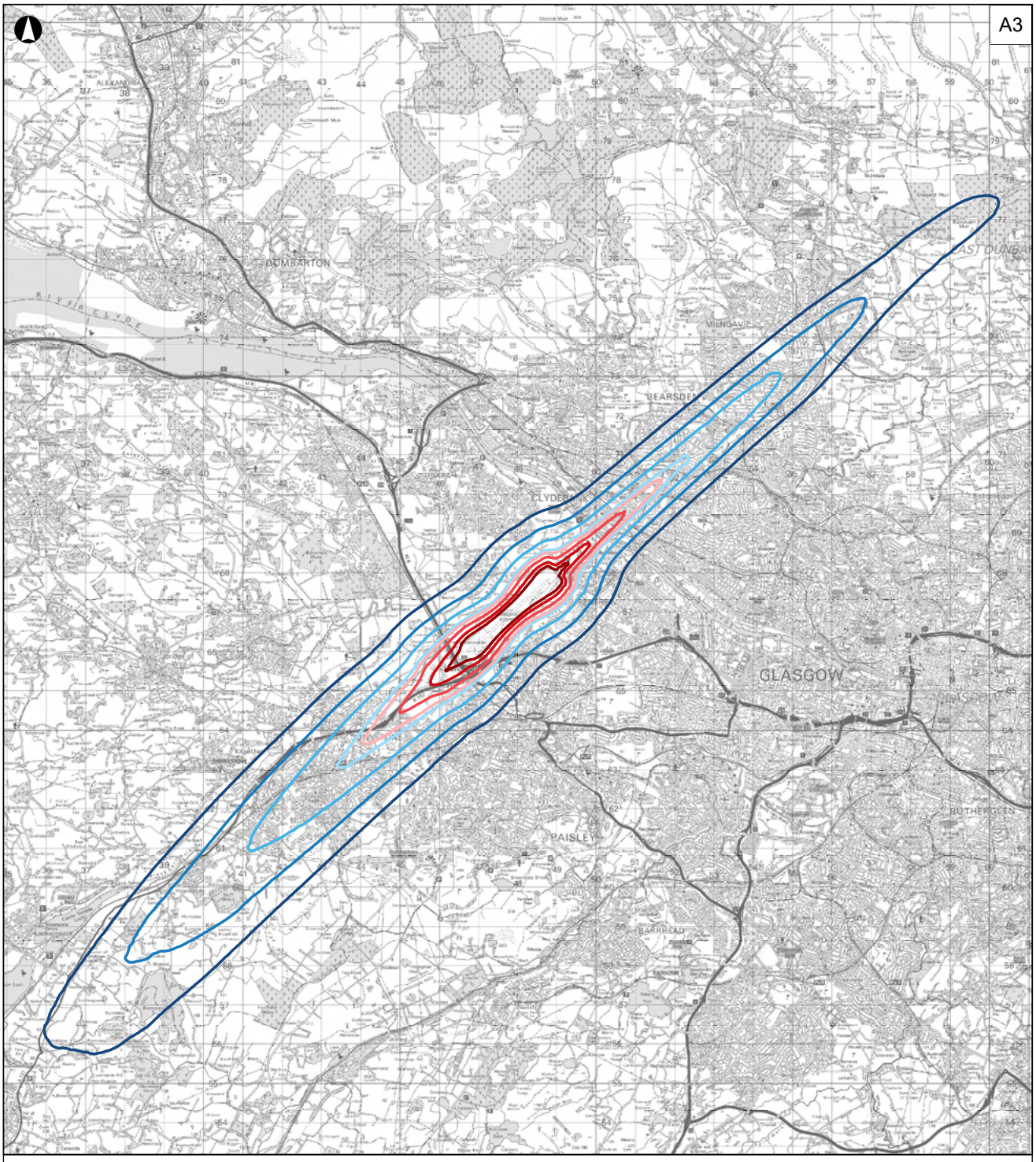


Figure 23: L_{Aeq8hr} nighttime 'without airspace change'

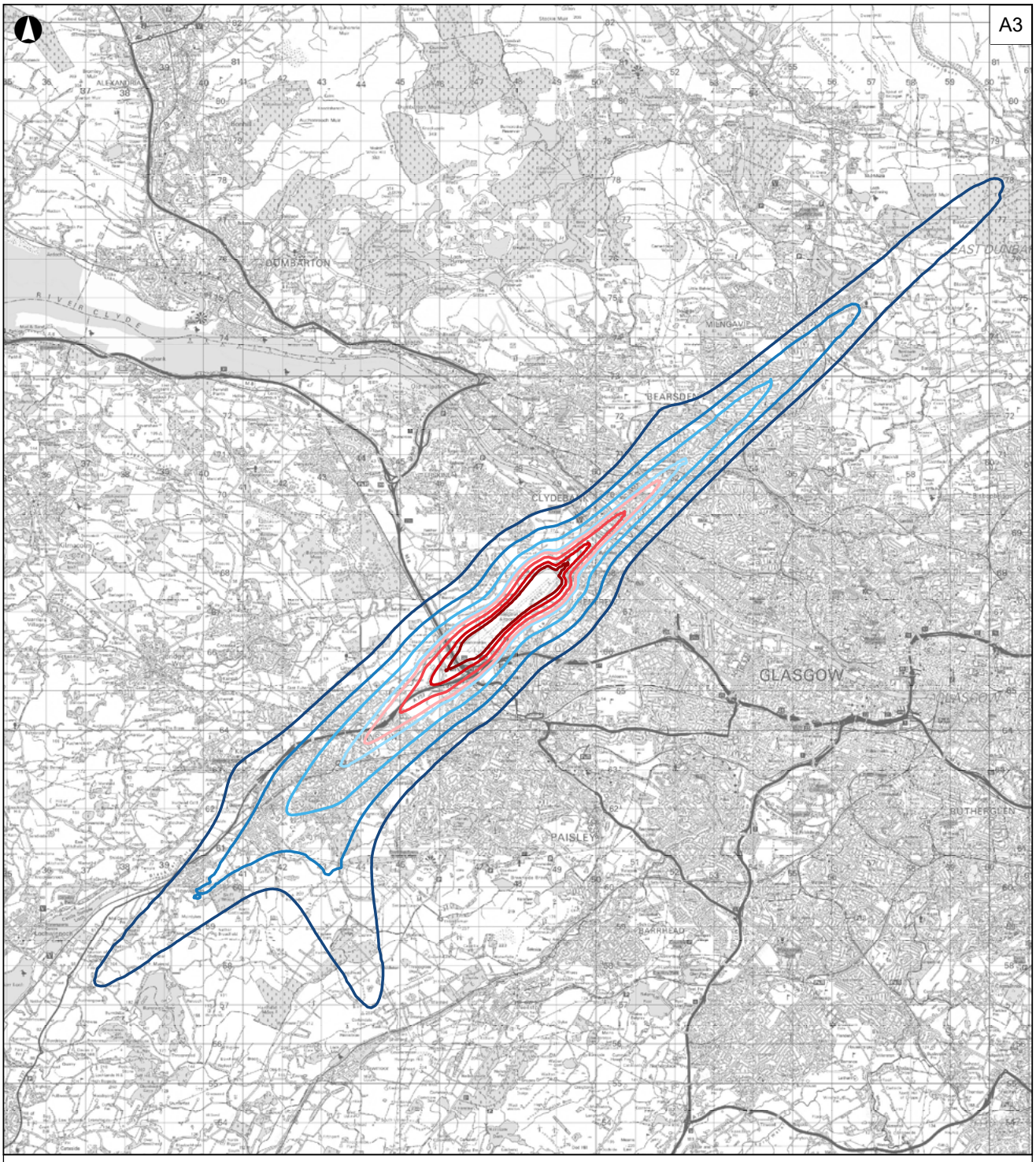
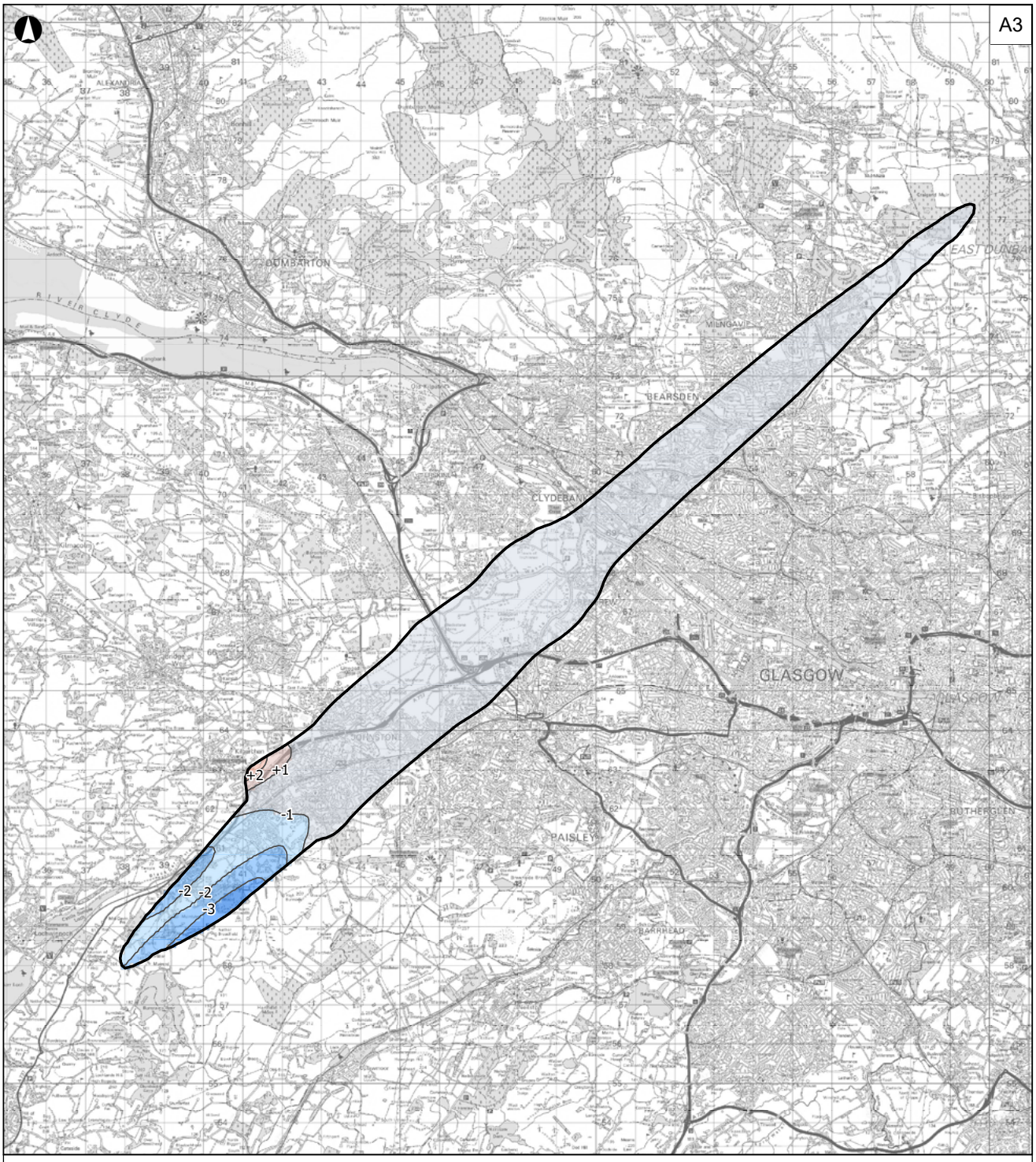


Figure 24: L_{Aeq8hr} nighttime 'with airspace change'



Legend

- < -3.0 dB
- -2.9 to -2.0 dB
- -1.9 to -1.0 dB
- -0.9 to +0.9 dB
- +1.0 to +1.9 dB
- +2.0 to +2.9 dB
- +3.0 to +5.9 dB
- +6.0 to +8.9 dB
- > +9.0 dB
- Outer extent of combined LOAEL contour

Coordinate System: British National Grid

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P01	02/08/24	GL	CS	DH	DH

Kilometers
0 1.25 2.5 5

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Drawing Title
Figure TA65: 2036 With Airspace Change Option 5 92-day summer difference daytime $L_{Aeq16hr}$

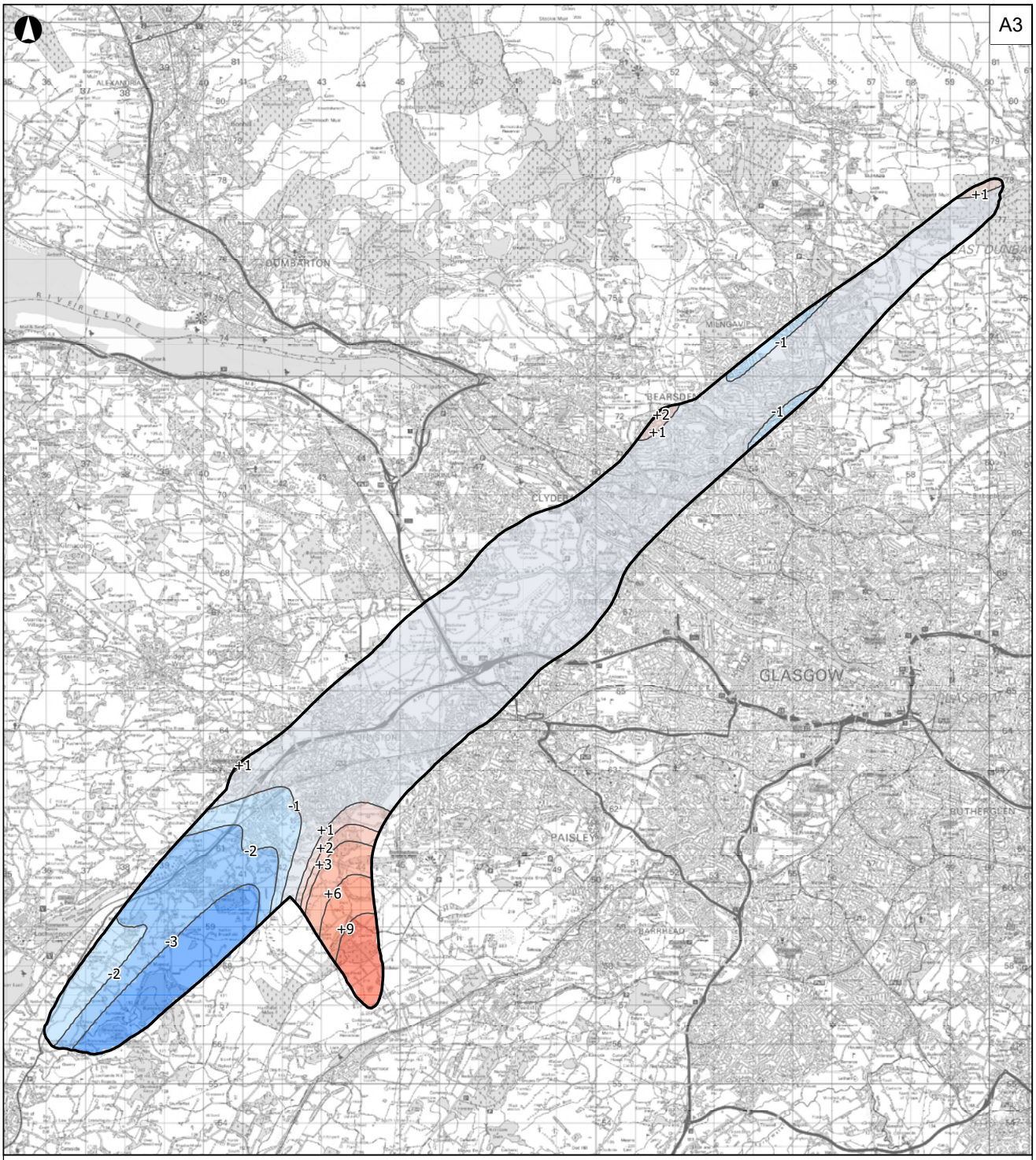
Scale at A3
1:100,000

Suitability
Issue

Project Number
268771-00

Rev
P01

Figure 25: $L_{Aeq16hr}$ Difference Contours



Legend

- < -3.0 dB
- -2.9 to -2.0 dB
- -1.9 to -1.0 dB
- -0.9 to 0.9 dB
- +1.0 to +1.9 dB
- +2.0 to +2.9 dB
- +3.0 to +5.9 dB
- +6.0 to +8.9 dB
- > +9.0 dB
- Outer extent of combined LOAEL contour

Coordinate System: British National Grid

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P01	02/08/24	GL	CS	DH	DH

Kilometers
0 1.25 2.5 5

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Project Name
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Drawing Title
Figure TA66: 2036 With Airspace Change Option 5 92-day summer difference night-time L_{Aeq8hr}

Scale at A3
1:100,000

Suitability
Issue

Project Number
268771-00

Rev
P01

Figure 26: L_{Aeq8hr} Difference Contours

2036 assessment of the LOAEL and SOAEL

8.2.20 As part of the FOA analysis (table 113 within the FOA document), we looked at how the total number of people exposed above the LOAEL and SOAEL changes when comparing the 'without airspace change' scenario to the 'with airspace change scenario in 2036. This showed:

- in 2036, during the daytime there is a **reduction** in the total number of people exposed between the LOAEL and SOAEL and **no change** in the total number of people exposed above the SOAEL; and
- in 2036, during the night-time there is **no change**[13] in the total number of people exposed between the LOAEL and SOAEL and a **reduction** in the total number of people exposed above the SOAEL.

8.2.21 This means that there is a reduction in the number of people experiencing adverse effects during the day, and a reduction in the number of people experiencing significant adverse effects during the night. This is consistent with the monetised TAG noise assessment which shows a reduction in the total adverse effects of on health and quality of life from noise.

Assessment of significant noise effects, residential receptors

8.2.22 Within the Full Options Appraisal, further analysis of the L_{Aeq} outcomes was undertaken to understand whether the changes in noise would be considered as likely significant effects due to noise changes (increases or decreases) of 3dB or more above LOAEL or 1dB or more above SOAEL. Table 9 summarises the outcome of this analysis and summarises where likely significant effects occur:

Time period (2036)	Likely significant beneficial effects	Likely significant adverse effects
Daytime (07:00- 23:00)	There are no likely significant beneficial effects due to noise decreases; all noise decreases are negligible or minor.	There are no likely significant adverse effects due to noise increases; all noise increases are negligible or minor.
Nighttime (23:00 - 07:00)	There are likely significant beneficial effects due to moderate noise decreases. This occurs to the southwest of the airport over **isolated properties to the south of Howwood, broadly between Lochlands Hill and Broadhead Hill (approximately 20 people).**	There are likely significant adverse effects due to moderate and major noise increases. This occurs to the south-west of the airport over **isolated properties to the south of Johnstone, broadly between Craigston Wood and Sergeant Law Road (approximately 25 people).**

Table 9: Moderate and major changes to noise within the L_{Aeq} contours

[13] When population is rounded to the nearest 100 as required by CAP1616i

As part of our Glasgow Airport consultation website we have created interactive noise mapping. This tool provides an interactive map which shows the baseline 'without airspace change' noise contours and the proposed 'with airspace change' contours so that you can understand the changes within your area. To go to the interactive noise mapping please **click here**.

8.2.23 For detailed analysis of the L_{Aeq} contours, please see our Full Options Appraisal document. Within this document, our proposed option is called option 5.

Secondary CAP1616 metrics

8.2.24 Within the secondary CAP1616 metrics, there is variation in performance across the N60, N65 and overflight contour bands. It is important to note that these metrics do not determine total adverse noise effects, but can be a useful metric in communicating noise effects and the perception of overflight. The following tables show the proposed option compared to the 'without airspace change' baseline for the N60 (nighttime), N65 (daytime) and overflight metrics. Maps for these contours are shown over the following pages.

Year	Metric	Contour	Area (km²)	Total population	Total households	Number of schools	Number of hospitals	Number of care homes	Number of places of worship
2036	N60	5	-10.1	-3400	-1600	-2	0	-2	-5
2036	N60	10	-18.3	-1400	-600	0	0	0	-2
2036	N60	20	+0.2	+<100	+<100	0	0	0	0

Table 10: N60 nighttime contour comparison between 'without airspace change' and the proposed option 'with airspace change'

Year	Metric	Contour	Area (km²)	Total population	Total households	Number of schools	Number of hospitals	Number of care homes	Number of places of worship
2036	N65	5	+42.6	+700	+500	-1	0	+5	+4
2036	N65	10	+7.7	+2200	+1000	+2	0	-3	+2
2036	N65	20	-3.9	+900	+500	0	0	0	-1
2036	N65	50	-4.9	-3000	-1400	-3	0	0	-2
2036	N65	100	-0.5	-1200	-500	-1	0	0	0
2036	N65	200	+0.3	0	0	0	0	0	0

Table 11: N65 daytime contour comparison between 'without airspace change' and the proposed option 'with airspace change'

Year	Metric	Contour	Area (km²)	Total population	Total households	Number of schools	Number of hospitals	Number of care homes	Number of places of worship
2036	Over-flights Day	5	-19.0	-78600	-35200	-28	-5	+1	-18
2036	Over-flights Day	10	+46.2	-27800	-13100	-20	-1	+6	-16
2036	Over-flights Day	20	+2.0	-67700	-31100	-34	-1	-10	-41
2036	Over-flights Day	50	+14.0	+9700	+4200	+2	0	+3	+3
2036	Over-flights Day	100	-0.5	-1400	-500	-2	0	-1	-2

Table 12: Overflight (day) comparison between 'without airspace change' and the proposed option 'with airspace change'

Year	Metric	Contour	Area (km²)	Total population	Total households	Number of schools	Number of hospitals	Number of care homes	Number of places of worship
2036	Over-flights Night	5	+37.6	+15500	+6600	+6	0	+2	-7
2036	Over-flights Night	10	-17.9	-9200	-4100	-5	0	0	-3
2036	Over-flights Night	20	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table 13: Overflight (night) comparison between 'without airspace change' and the proposed option 'with airspace change'

For high-resolution contour maps please see **Appendix C**.

As part of our Glasgow Airport consultation website we have created interactive noise mapping. This tool provides an interactive map which shows the baseline 'without airspace change' noise contours and the proposed 'with airspace change' contours so that you can understand the changes within your area. To go to the interactive noise mapping please **click here**.

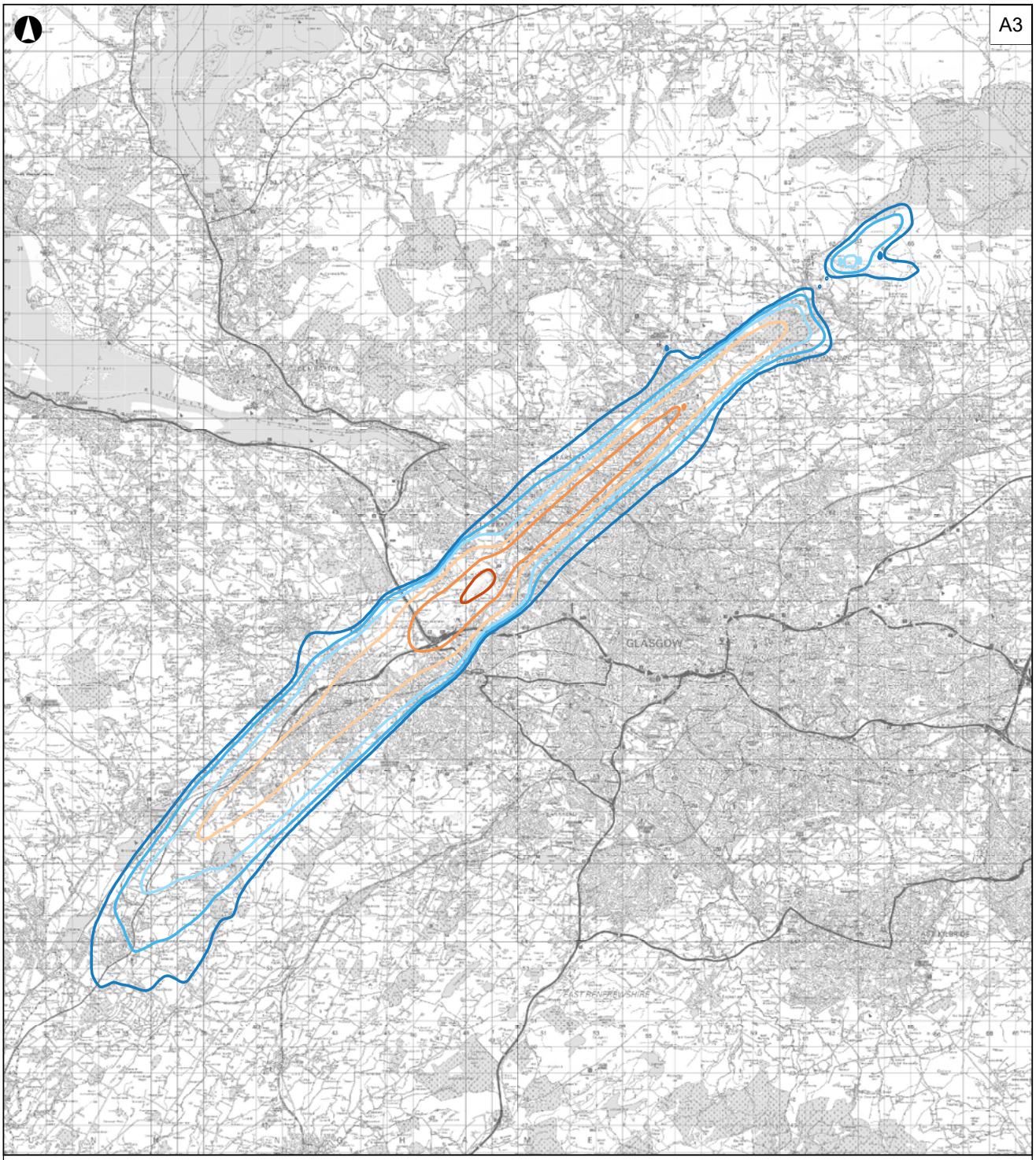
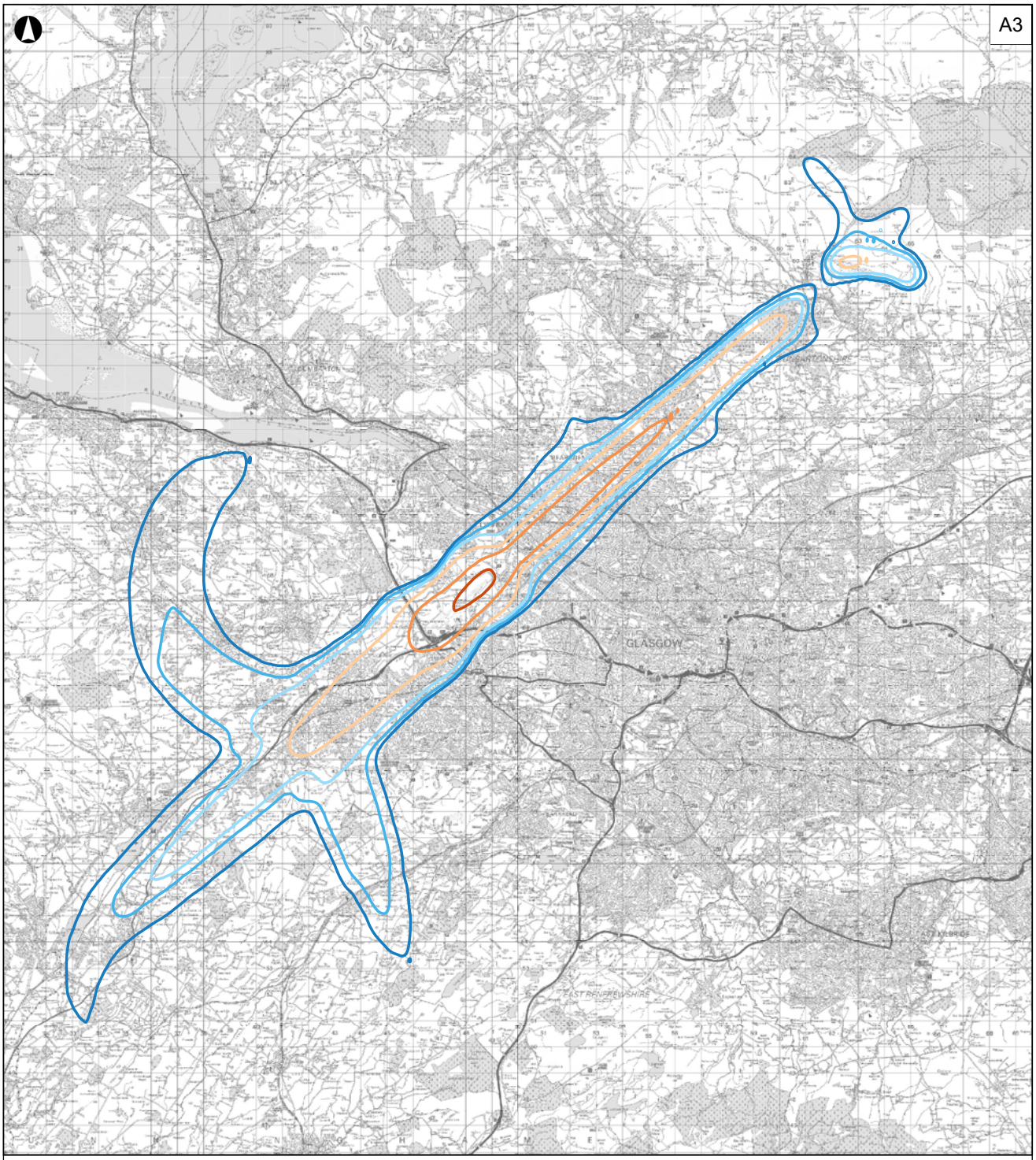


Figure 27: N65 daytime 'without airspace change'



Legend

- 5
- 10
- 20
- 50
- 100
- 200

Coordinate System: British National Grid

Rev	Date	By	Chkd	Appd	Authd
P01	02/08/24	GL	CS	DH	DH

Kilometers
0 2.5 5 10

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Drawing Title
Figure TA51: 2036 With Airspace Change Option 5 92-day summer daytime N65

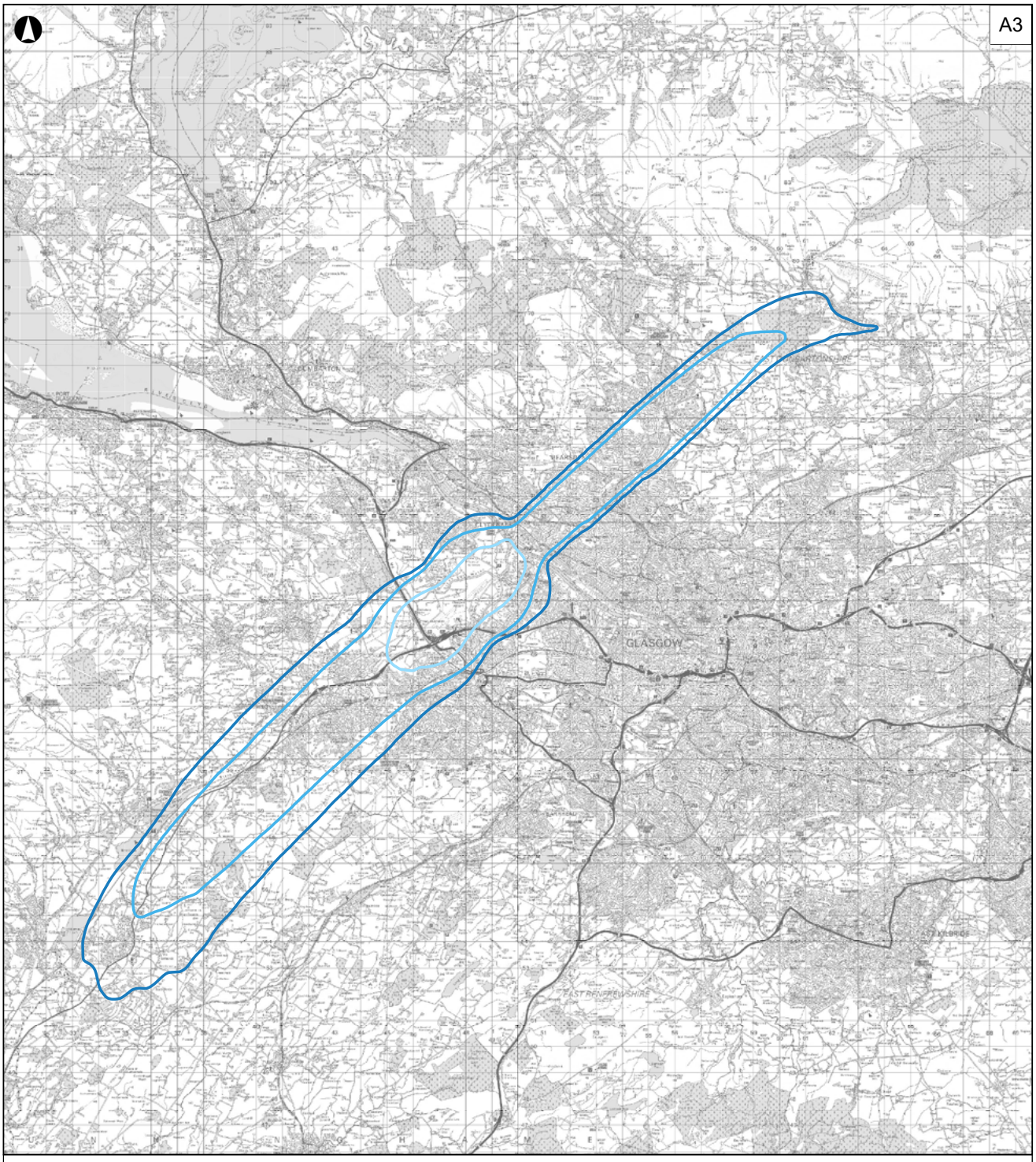
Scale at A3
1:150,000

Suitability
Issue

Project Number
268771-00

Rev
P01

Figure 28: N65 daytime 'with airspace change'



Legend

- 5
- 10
- 20

Coordinate System: British National Grid

Rev	Date	By	Chkd	Appd	Authd
P01	02/08/24	GL	CS	DH	DH

Kilometers
0 2.5 5 10

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Drawing Title
Figure TA20: 2036 Without Airspace Change 92-day summer night-time N60

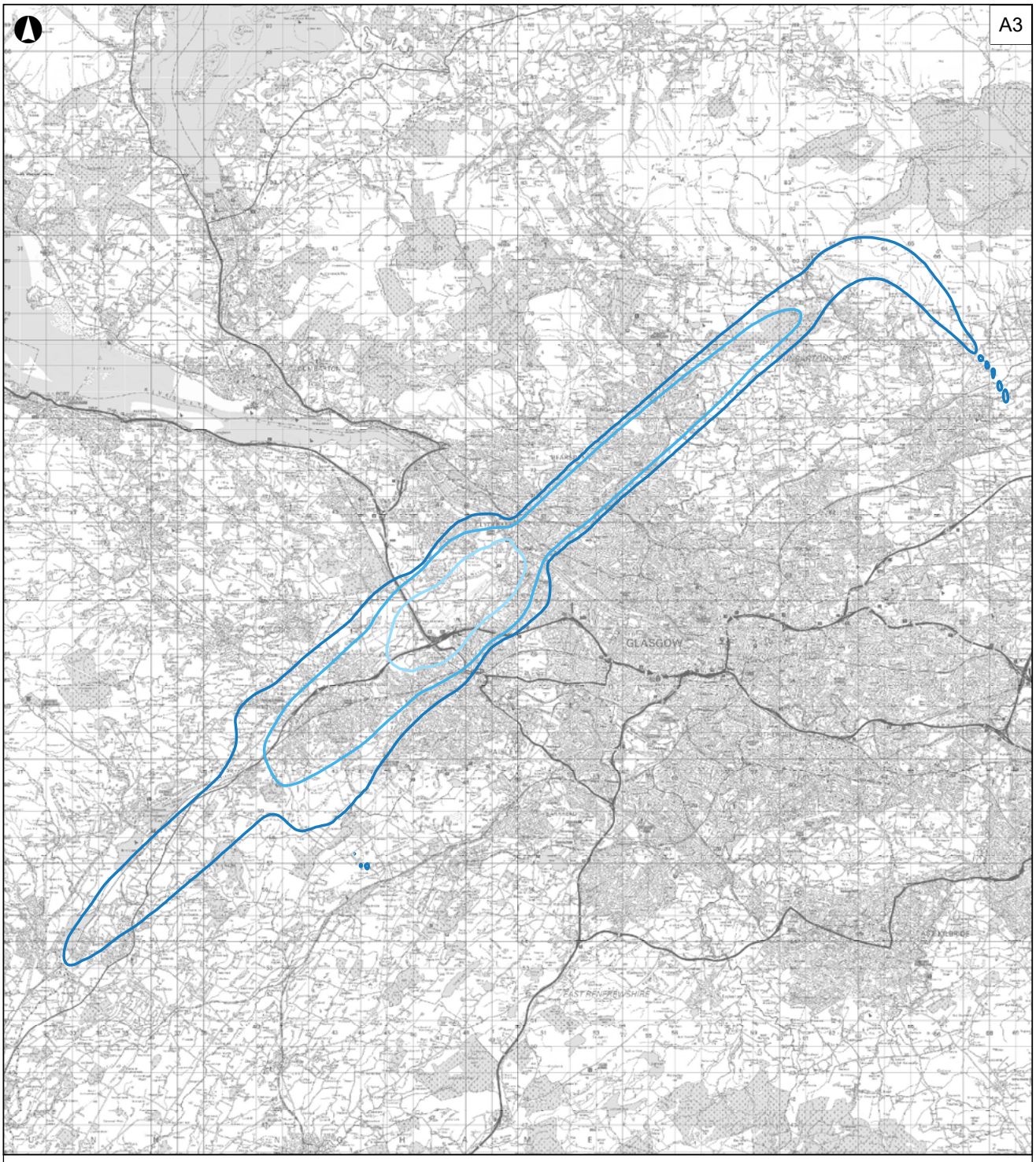
Scale at A3
1:150,000

Suitability
Issue

Project Number
268771-00

Rev
P01

Figure 29: N60 nighttime 'without airspace change'



Legend

5
10
20

Coordinate System: British National Grid

Rev	Date	By	Chkd	Appd	Authd
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Kilometers
0 2.5 5 10

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Project Name
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Drawing Title
Figure TA52: 2036 With Airspace Change Option 5 92-day summer night-time N60

Scale at A3
1:150,000

Suitability
Issue

Project Number
268771-00

Rev
P01

Figure 30: N60 nighttime 'with airspace change'

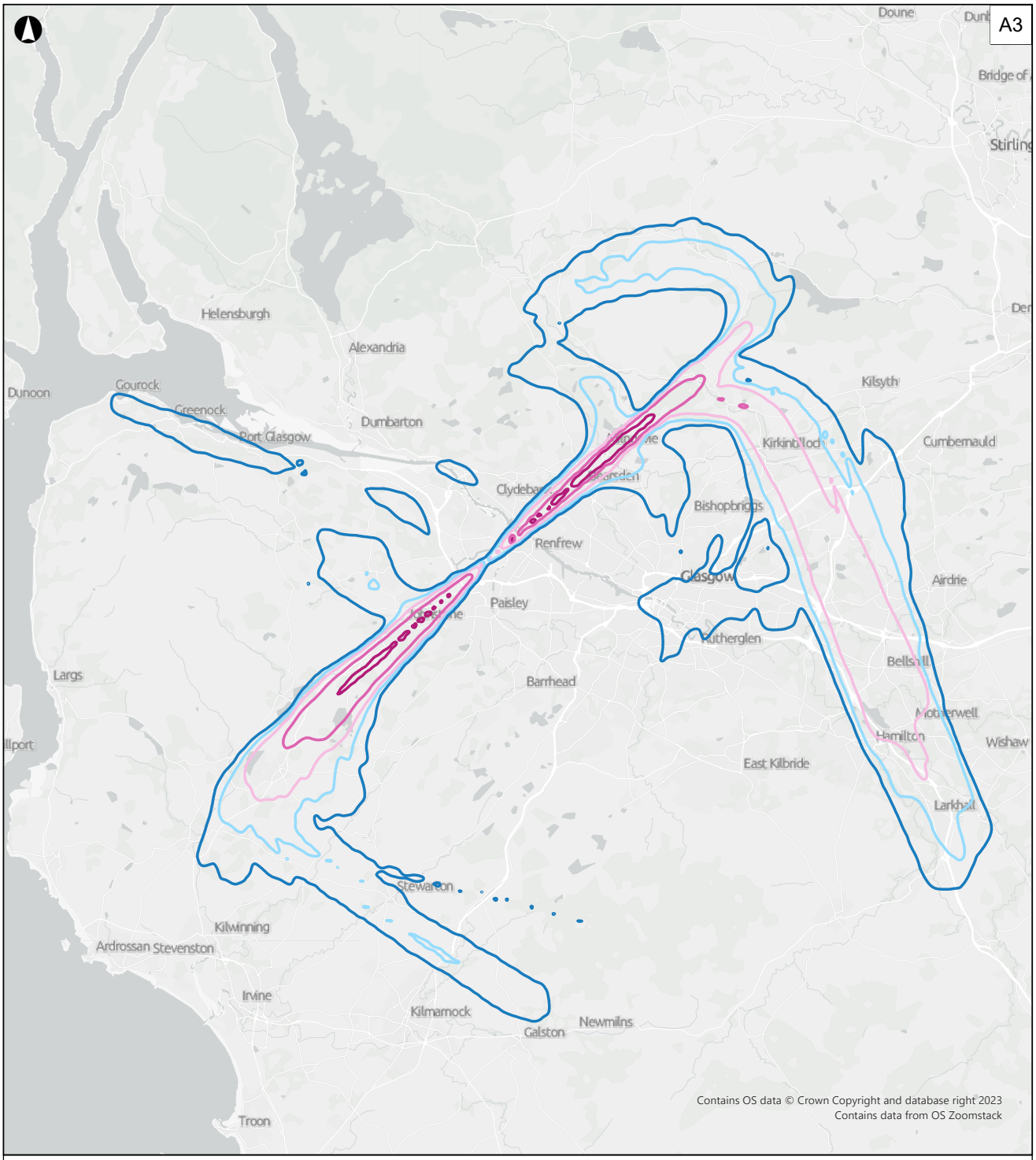


Figure 31: Overflight daytime 'without airspace change'

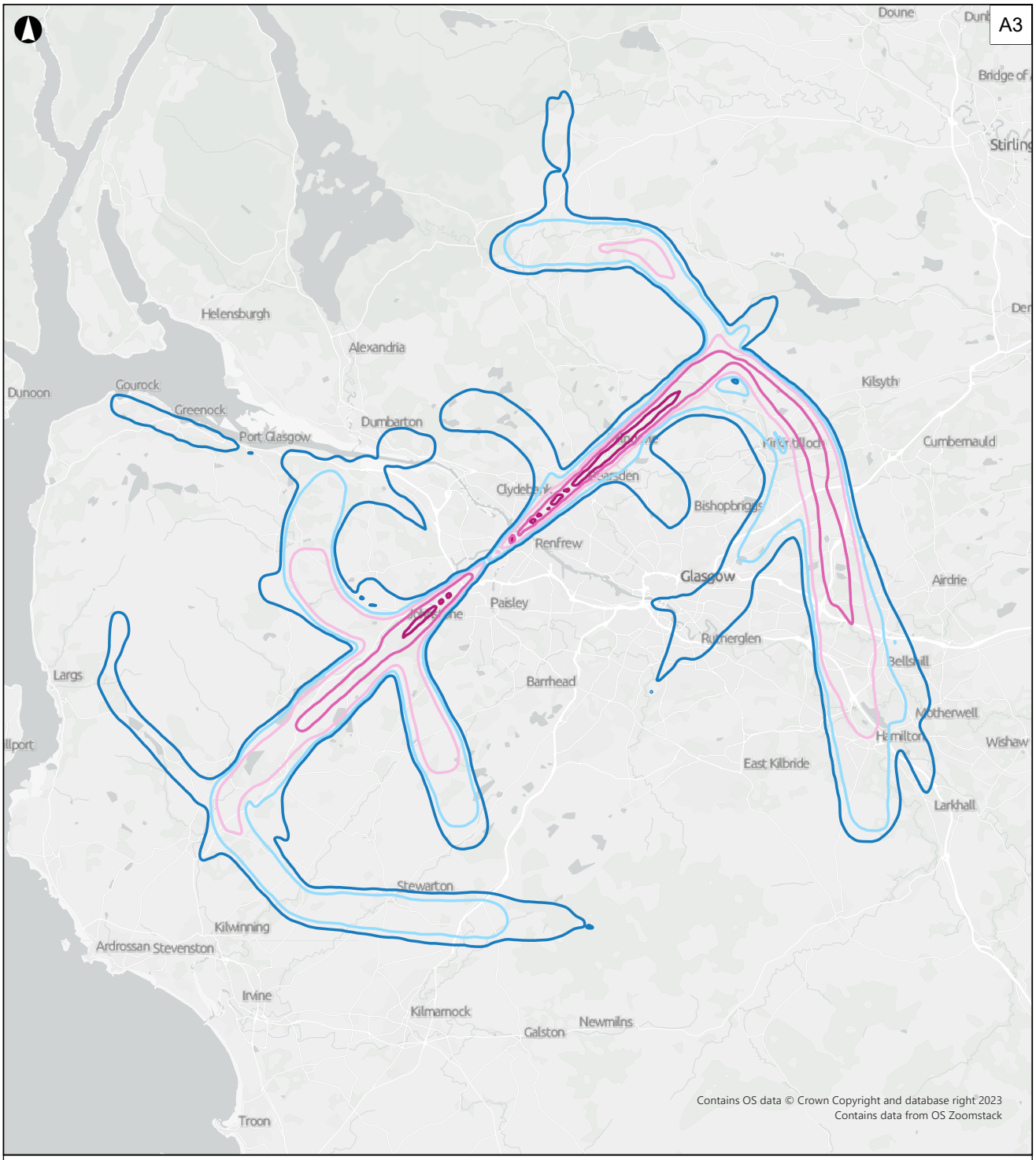
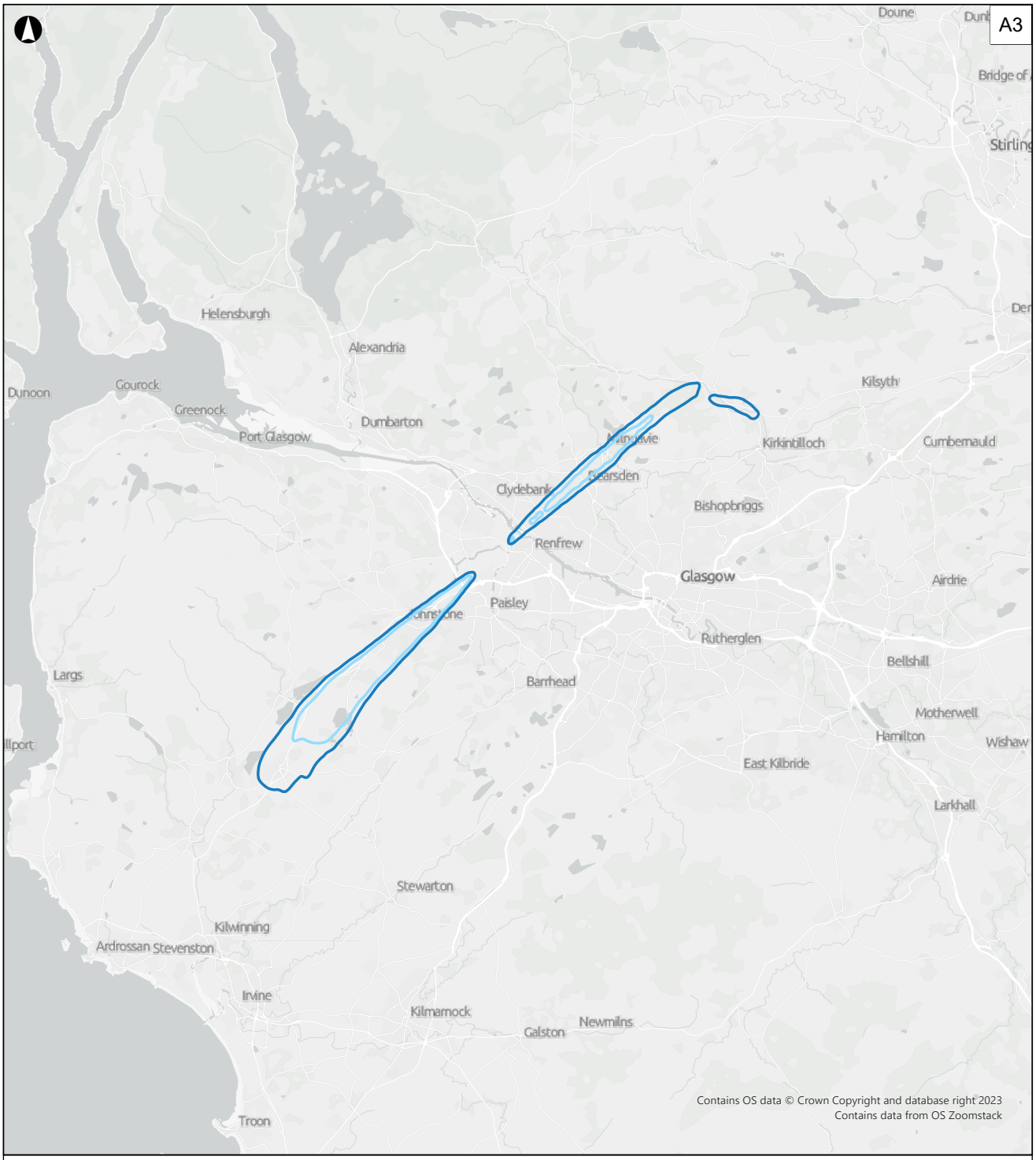


Figure 32: Overflight daytime 'with airspace change'



Legend

5

10

Coordinate System: British National Grid

Rev	Date	By	Chkd	Appd	Authd
P01	02/08/24	GL	CS	DH	DH

Kilometers

0 5 10 20

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Project Name

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Drawing Title

Figure TA22: 2036 Without Airspace Change 92-day summer night-time Overflights

Scale at A3

1:250,000

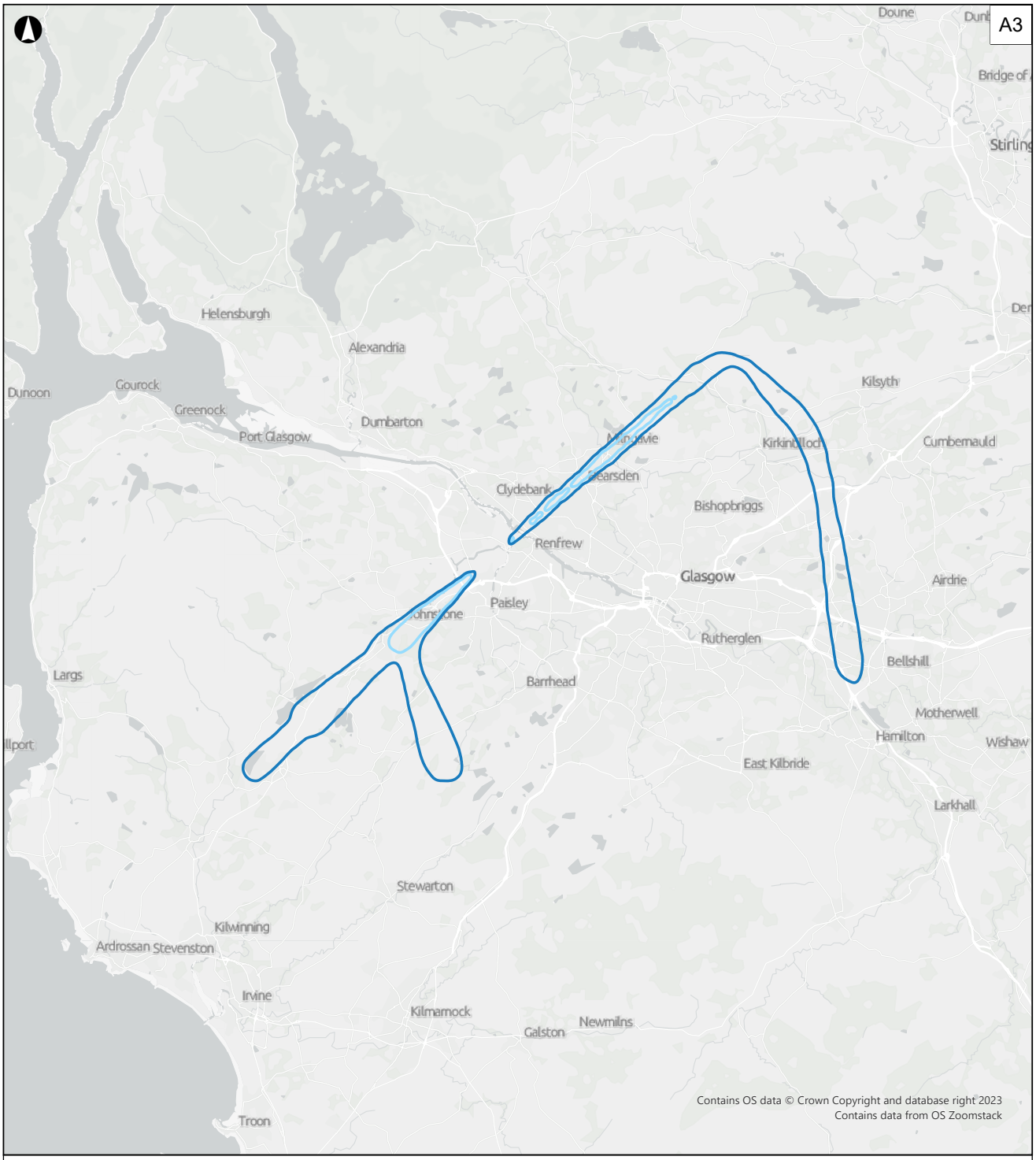
Suitability

Issue

Project Number **268771-00**

Rev **P01**

Figure 33: Overflight nighttime 'without airspace change'



Legend

5

10

Coordinate System: British National Grid

Rev	Date	By	Chkd	Appd	Authd
P01	02/08/24	GL	CS	DH	DH

Kilometers

0 5 10 20

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Drawing Title

Figure TA54: 2036 With Airspace Change Option 5 92-day summer night-time Overflights

Scale at A3

1:250,000

Suitability

Issue

Project Number **268771-00**

Rev **P01**

Figure 34: Overflight nighttime 'with airspace change'

Changes to noise distribution as a result of other airspace users

8.2.25 General Aviation (GA) are operations other than scheduled air services and non-scheduled air transport operations for remuneration or hire. The most common type of GA activity is recreational flying by private light aircraft and gliders, but it can range from paragliders and parachutists to microlights, balloons, helicopters and private corporate jet flights.

8.2.26 The reclassification of Controlled Airspace volumes as shown in **section 9** is likely to result in changes to traffic patterns of General Aviation aircraft. Any changes in noise from GA activity is unpredictable, not the responsibility of Glasgow ATC and are not as a result of scheduled aircraft arriving or departing from Glasgow Airport. It therefore does not form part of the quantified noise modelling.

8.2.27 Within the FOA, a qualitative assessment has been provided which explains that the increase in the volume of Class G airspace is likely to enable improved vertical and lateral profiles for some GA airspace users. Class G airspace is a type of airspace typically used by GA. There is a map of this airspace shown in Figure 40. The controlled airspace improvements may result in changes to where GA aircraft fly in the areas shown in Figure 40.

8.2.28 Whilst the airspace change proposal sees Glasgow's Control Zone (CTR), which is down to ground level, decrease in volume, there are some small extensions required to the north and west of Glasgow airport (see areas 4, 5 and 8 in Figure 39). The CTR is an area of airspace in the vicinity of Glasgow Airport which is typically used by aircraft arriving and departing from the airport. These extensions could see some changes in GA operations from area 8 into area 9 and from areas 4 and 5 into area 3. However, we are proposing areas 9 and 3 increase their existing bases by 500ft which would allow GA operators to be higher from the ground, should those airspace users wish to fly higher.

Air quality

How do we assess air quality?

8.3.1 CAP1616 requires us to consider whether local air quality could be impacted when developing airspace change proposals and to look at whether an option has the potential to create a change which would result in pollutants breaching legal limits or target values. The CAA deems that this is only likely to become a possibility where:

- there is likely to a change in aviation emissions (by volume or location) below 1,000ft, and
- the location of the emissions is within or adjacent to an identified AQMA.

8.3.2 The air quality assessment therefore looks at whether an option has the potential to change the lateral tracks of flight paths below 1,000ft, or if it would result in a change in the number of aircraft arriving or departing at the airport and hence the volume of flights. Whilst this does not occur for the proposed option, it does for some of the other options considered in the FOA, so we have undertaken a quantitative assessment of local air quality using dispersion modelling for any options that could result in a change to aviation emissions below 1,000ft.

How did the proposed option perform in terms of air quality?

8.3.3 The air quality assessment concluded that the proposed option is predicted to have a negligible **impact on local air quality**.

Tranquillity

How do we assess tranquillity?

8.4.1 Though it is no longer current, CAP1616a provides a helpful summary of the status of tranquillity assessment methodologies, noting that "In terms of portraying 'tranquillity' or any impacts upon it, there is no universally accepted metric by which tranquillity can be measured, although some attempts have been made." The Air Navigation Guidance 2017 states that "where practicable, it is desirable that airspace routes below 7,000 feet should seek to avoid flying over Areas of Outstanding Natural Beauty (AONB) and National Parks".

8.4.2 CAP1616 i states that "The consideration of impacts upon tranquillity for airspace change proposals is with specific reference to National Parks, Areas of Outstanding Natural Beauty (AONB), National Scenic Areas (NSA) (broadly equivalent to AONBs in Scotland), the Norfolk and Suffolk Broads, plus any local 'tranquil' areas that are identified through community engagement and are subsequently reflected within an airspace change proposal's design principles."

8.4.3 The assessment of tranquillity therefore focusses on overflight of National Scenic Areas and National Parks, supplemented by overflight and noise information for **Candidate Quiet Areas**, Country Parks, Gardens and Designated Landscapes.

8.4.4 In the context of this ACP, there is only one National Scenic Area (NSA) and one National Park that are within the scope of the proposed changes. This is the Loch Lomond NSA and the Loch Lomond and the Loch Lomond and Trossochs National Park. These two designated areas overlap with the Loch Lomond NSA sitting entirely within the area designated as the National Park.

8.4.5 In addition to this, the Glasgow Agglomeration Round 3 Action Plan identifies several Candidate Quiet Areas (CQA) and the Scottish Government's catalogue of spatial data provides information on the locations of country parks, gardens and designated landscapes.

8.4.6 As tranquillity receptors are outdoors, they are more frequently occupied during the daytime. The frequency of overflight is also greater during the daytime. The consideration of the impact of noise and overflight on tranquillity therefore focusses on potential daytime effects, but nighttime data is provided in the Technical Appendix for information. (for more details, please see the Noise section above).

How did the proposed option perform in terms of tranquillity?

8.4.7 The following tables show how the proposed option performs compared to the 'without airspace change' scenario. For maps of the proposed option overlaid over areas of tranquillity, please see **Appendix C**.

			National Scenic Area		National Parks		Candidate Quiet Area		Country Parks		Gardens and Designated Landscapes	
Year	Metric	Contour	Total	Area (km²)	Total	Area (km²)	Total	Area (km²)	Total	Area (km²)	Total	Area (km²)
2036	Over-flights Day	5	0	0	+1	+2.7	+2	+0.3	0	-2.3	-2	-0.9
2036	Over-flights Day	10	0	0	+1	+0.5	-2	-0.3	0	-0.9	0	-0.3
2036	Over-flights Day	20	0	0	0	0	-3	-0.2	0	-0.9	0	-0.4
2036	Over-flights Day	50	0	0	0	0	0	<0.1	+1	+1.8	0	<0.1
2036	Over-flights Day	100	0	0	0	0	0	+<0.1	0	0	0	0

Table 14: Daytime overflight data for areas of tranquillity compared to the 'without airspace change' baseline

			National Scenic Area		National Parks		Candidate Quiet Area		Country Parks		Gardens and Designated Landscapes	
Year	Metric	Contour	Total	Area (km²)	Total	Area (km²)	Total	Area (km²)	Total	Area (km²)	Total	Area (km²)
2036	Over-flights Night	5	0	0	0	0	0	-0.1	+1	+1.8	0	<-0.1
2036	Over-flights Night	10	0	0	0	0	-1	<-0.1	0	0	-1	<-0.1
2036	Over-flights Night	20	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table 15: Nighttime overflight data for areas of tranquillity compared to the 'without airspace change' baseline

8.4.8 The assessment identified that there could be small areas of the Loch Lomond & The Trossachs National Park (shown in purple on Figure 33) which experiences a small increase in overflight at a rate of 5 times a day. The overflight 5 times a day contour is shown in blue, and the image shows the two small areas of overlap between the National Park and the overflight contour.

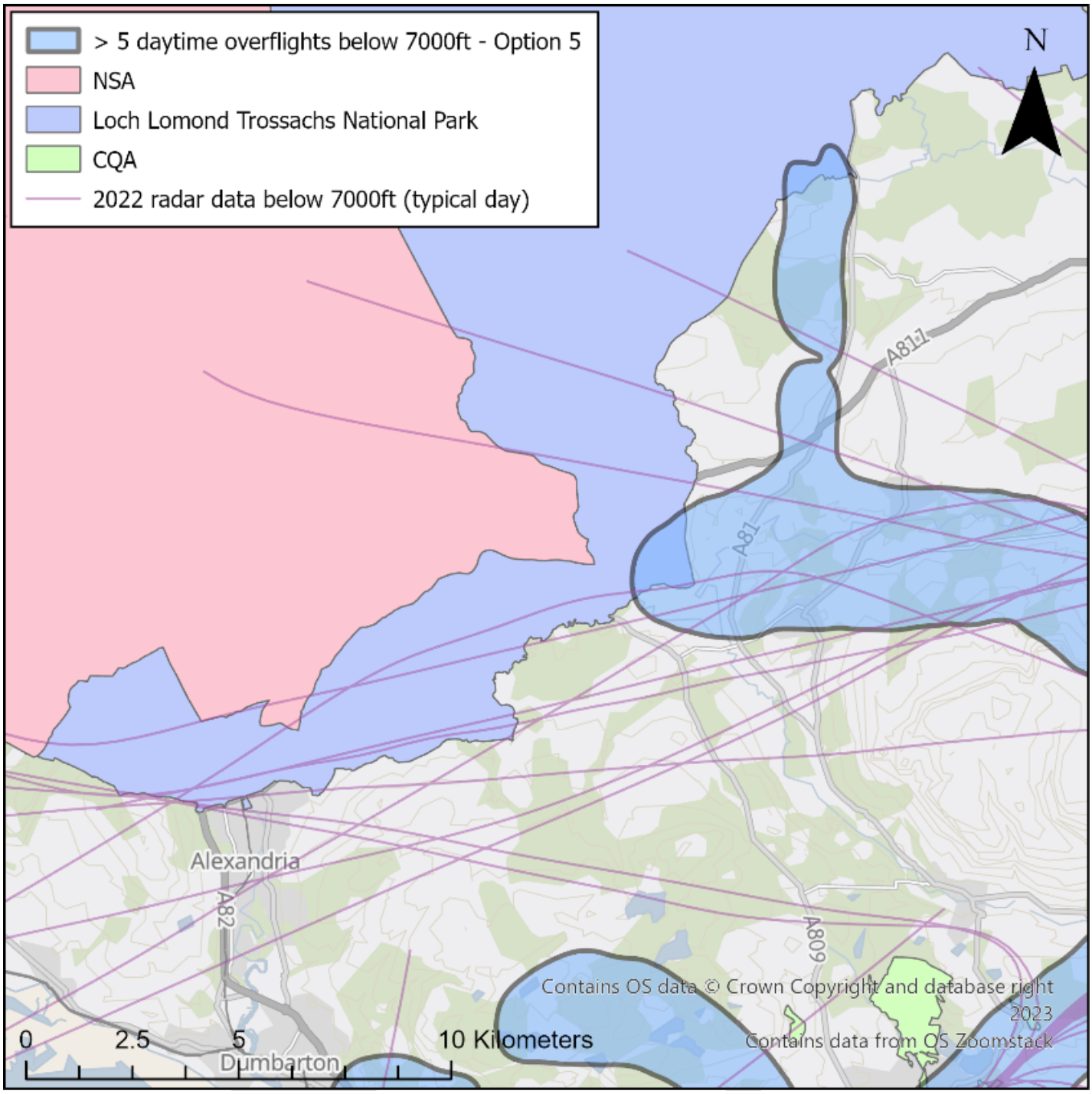


Figure 35: Area of the Loch Lomond & The Trossachs National Park intersected by the 2036 'with airspace change' scenario daytime overflight contour

8.4.9 From the 2022 radar data we can see that the National Park is already overflown today however it is dispersed and therefore at a lower rate. In future, the small areas shown on the image could be overflown at a slightly higher rate; however, the overall area of National Park overflown would reduce. The assessment concluded that this was not expected to result in a significant change to the perception of tranquillity within the Loch Lomond & The Trossachs National Park.

8.4.10 The data in Table 14 and Table 15 showed some positive benefits and negative impacts to Candidate Quiet Areas. Table 16 provides some further details around these:

	Year 2027	Year 2036
Number of CQAs newly overflown (5 times per day or more) in the 'with airspace change' scenario	5	5
Description of CQAs newly overflown (5 times per day or more) in the 'with airspace change'scenario	Bothwell Castle Grounds Possil Marsh Cardowan Moss High Bardrain Wood, Bardrain Wood, Gleniffer Braes Country Park Near Cochno Burn	King's Park Bothwell Castle Grounds Cardowan Moss High Bardrain Wood, Bardrain Wood, Gleniffer Braes Country Park Near Cochno Burn
Number of CQAs no longer overflown (5 times per day or more) in the 'with airspace change' scenario	5	4
Description of CQAs no longer overflown (5 times per day or more) in the 'with airspace change' scenario	Skellyton Woods Carbarns Wood Orchardbank Craigends Highmainshead Wood	Skellyton Woods Carbarns Wood Orchardbank Highmainshead Wood

Table 16: Overflight of Candidate Quiet Areas compared to the 'without airspace change' future baseline scenario

8.4.11 For detailed analysis of tranquillity, please see our Full Options Appraisal document. Within this document, our proposed option is called option 5.

Biodiversity

How do we assess biodiversity?

8.5.1 Airspace Change Sponsors are required to undertake a Habitats Regulations Assessment (HRA) screening assessment of European Sites potentially affected by the Airspace Change Masterplan. This is outlined in CAP2527. The assessment involves looking at any sites which are within 18km of the aerodrome, where aircraft are typically below 3,000ft, and assessing whether the change has the potential to impact these.

8.5.2 The receptors that must be considered in the HRA screening are Special Areas of Conservation (SAC) and possible SACs, Special Protection Areas (SPAs) and possible SPAs and Ramsar sites (wetlands of international importance) and proposed Ramsar sites. These receptors are collectively known as European Sites and are protected by the Habitats Regulations. These sites have been identified using the Scottish Government's catalogue of spatial data. CAP1616i also requires that Compensatory habitats (areas secured to compensate for damage to SACs, SPAs and Ramsar sites) are considered but notes that there is no publicly available database for these sites and therefore recommends contacting the Statutory Nature Conservation bodies to enquire about compensatory habitats. Glasgow Airport contacted NatureScot who confirmed that they were not aware of any areas of compensatory habitats within the zone of influence.

How did the proposed option perform in terms of biodiversity?

8.5.3 The outcome of the assessment concluded that it is considered that there are no biodiversity impacts on any European Sites. One Special Protection Area (SPA), called Black Cart SPA, was highlighted as part of the process however it was concluded that there would be no changes in lateral tracks, vertical profiles, number of movements and frequency of overflight as a result of the airspace change. It is therefore considered that there are no relevant changes for the Black Cart SPA, and therefore no impact, and the HRA for the Black Cart SPA can be screened out.

8.5.4 For further details about the HRA assessment we would recommend reading the biodiversity methodology section of our Full Options Appraisal document.

Fuel burn and Greenhouse Gas Emissions

How do we assess fuel burn and Greenhouse Gas Emissions?

8.6.1 The fuel burn and Greenhouse Gas Emissions assessment is undertaken through complex computer modelling. As flight paths extend above 7,000ft, the overall system wide modelling was undertaken by NERL. We then undertook our own modelling to look at the variation between the different options which were assessed as part of the Full Options Appraisal.

8.6.2 This modelling relies on a number of inputs and assumptions as it is not proportionate to try and anticipate the behaviour of all aircraft in terms of climb / descent rate and lateral variation due to vectoring. More details around the modelling are provided in the Full Options Appraisal.

8.6.3 The outcome of the modelling is an 'enabled benefit' that is then input into the Government's TAG workbook in order to monetise the Greenhouse Gas Emission benefits. An enabled benefit is one that relates to the fuel saving resulting from more efficient flight planned routes. This is not an exact representation of the actual change in fuel burn and CO2e emissions. The actual impact can only be calculated following implementation of the change. This will allow a direct comparison between the pre-implementation trajectory data and actual trajectory data following the change. This will be provided within the Post Implementation Review of the Airspace Change.

How did the proposed option perform in terms of fuel burn and Greenhouse Gas Emissions?

8.6.4 The proposal is predicted to reduce the total annual and per flight Greenhouse Gas Emissions[14].

8.6.5 Table 17 shows the difference in enabled fuel burn between the 'without airspace change' and the 'with airspace change' scenario:

Difference			
Year	Annual total fuel burn (t)	Total annual fuel cost (£)	Average fuel burn per flight (kg)
2027	-3,024	-2,074,771	-33
2036	-3,792	-2,601,589	-39

Table 17: Enabled fuel burn 'without airspace change' and 'with airspace change'

TAG outcomes

8.6.6 TAG has been used to assess the greenhouse gas impact over a 10-year appraisal period. The change in CO2e emissions over the 10-year appraisal period is a reduction of 108,390t, of which 87,859t is traded in the UK ETS. This results in a monetised net present value (NPV) benefit of £ 24,069,202.

8.6.7 Table 18 shows the difference in enabled Greenhouse Gas Emissions between the 'without airspace change' and the 'with airspace change' after scenario:

Difference		
Year	Annual total GHG emissions (tCO_2e)	Average GHG emissions per flight ($kgCO_2e$)
2027	-9,618	-106
2036	-12,060	-125

Table 18: Greenhouse Gas Emissions (GHG) 'without airspace change' and 'with airspace change'

Changes to fuel burn for other airspace users

8.6.8 The proposed reclassification of airspace volumes, shown in section 9, results in an overall increase in the volume of Class G airspace to the north, west of south of the Control Zones (CTR) (see Figure 39) along with higher base levels. Higher base levels are expected to offer more efficient routes and profiles for General Aviation (GA) traffic which enables fuel burn benefits.

8.6.9 Any changes in fuel burn from GA activity is unpredictable, not the responsibility of Glasgow ATC and are not as a result of scheduled aircraft arriving or departing from Glasgow Airport. It therefore does not form part of the quantified fuel burn modelling.

8.6.10 Overall, the option sees an increase in the volume of Class G airspace to the north, west of south of the CTR (see Figure 39) and therefore this is likely to enable improved vertical and lateral profiles by some GA airspace users.

8.6.11 Whilst this option sees Glasgow's CTR, which is down to ground level, decrease in volume, there are some small extensions required in areas 4, 5 and 8 (see Figure 38). These extensions could see some displacement of GA operations from area 8 into area 9 and from areas 4 and 5 into area 3. However, we are proposing areas 9 and 3 increase their existing bases by 500ft which would allow GA operations to be higher from the ground, should those airspace users wish to fly higher.

[14] Please refer to the FOA methodology section for Greenhouse Gas Emissions for contextual information on how the use of planned flight data in the NERL modelling may affect this result

Capacity / resilience

How do we assess capacity?

8.7.1 An airport's capacity is based around the number of aircraft which can arrive and depart at the airport within a given timeframe.

8.7.2 The modernisation of Glasgow Airport's airspace does not seek to *increase* capacity at the airport, i.e. there will not be an increase in the number of arrivals and departures as a direct result of the ACP; however modernising the airspace does offer opportunities to reduce delays which could *improve* capacity.

8.7.3 Within our Full Options Appraisal, we have assessed departure delay which is sometimes known as ground delay. This assessment looks at the departure route configuration and the time separation needed between aircraft in order to maintain a safe distance between them. It then takes a forecast schedule and applies the separations in order to understand whether there would be benefits or impacts to delay based on the configuration of the option.

8.7.4 The calculated outcome of this assessment is the number of minutes of departure delay per year. We then monetise this assessment to understand the economic benefits.

8.7.5 Airbourne delay, which usually is caused by aircraft being held in 'holds' or 'stacks' forms part of the NERL ACP as NATS is responsible for the holds and holding procedures. For more information about improvements to airborne delay, please see the NERL ACP here.

How did the proposed option perform in terms of capacity?

8.7.6 The proposed option sees the departure routes splitting (turning away from the extended runway centreline) sooner than they do today. This is expected to improve capacity and reduce delays compared to the 'without airspace change' baseline as aircraft will be able to depart in intervals 1 minute apart (subject to safety case approvals).

8.7.7 Table 19 shows the outcome of the departure delay analysis:

Number of minutes of departure delay per year			
Option	**2023**	**2027**	**2036**
Without airspace change	18114	46988	62320
With airspace change	13801	35772	52337
Reduction	-4313	-11217	-9983
£ (in 2024 prices)	-£249,660	-£649,307	-£577,921

Table 19: Departure delay analysis

How do we assess resilience?

8.7.8 When assessing resilience, we have looked at how our proposal and the introduction of PBN routes would benefit or impact Glasgow Airport. This assessment was undertaken by aviation experts such as Air Traffic Controllers and aviation safety experts. As any impacts or benefits to resilience would not be experienced on a routine basis they have not been monetised.

How did the proposed option perform in terms of resilience?

8.7.9 The introduction of PBN departures removes Glasgow Airport's dependency on conventional ground-based navigation aids called DVORs. This equipment is due to be decommissioned as part of a NERL UK-wide programme under the Airspace Modernisation programme. There is currently no long-term resilience for Glasgow's departure procedures when NERL decommissions these navigation aids.

8.7.10 The introduction of PBN approaches will **improve** Glasgow Airport's resilience, as following the decommission of the VORs, Glasgow Airport will only have an ILS precision approach and NDB and visual non precision approaches available. The introduction of PBN approaches provides Glasgow Airport with an additional precision approach alongside the ILS.

General Aviation

8.8.1 Controlled Airspace (CAS) is airspace of defined dimensions within which Air Traffic Control (ATC) service is provided in accordance with the airspace classification. Its purpose is to create a known air traffic environment to achieve the objectives of the ATC service to prevent collisions between aircraft and to expedite and maintain an orderly flow of air traffic.

8.8.2 In the next section (**section 9**) we have included full details of our Controlled Airspace (CAS) proposal and the potential benefits and impacts to General Aviation. For detailed information we would therefore recommend reading **section 9**.

How do we assess impacts to General Aviation?

8.8.3 Glasgow Airport has worked with NERL and Edinburgh Airport to define the CAS volume required to safely contain the proposed departure and arrival procedures which form part of Scottish Airspace Modernisation.

8.8.4 The volume of this proposed airspace has then been assessed against the existing CAS to understand changes to the volume and classification of the airspace.

8.8.5 Broadly speaking, the release of Controlled Airspace or airspace which is designated to a lower classification is considered a beneficial change, and an increase in CAS, or an increase in classification, is considered a negative impact.

How did the proposal perform in terms of General Aviation?

8.8.6 The overall Scottish Airspace Modernisation requires many changes to the lateral extents and classifications of CAS. More details can be found in **section 9**. Overall, there will be an **increase** in the CAS volume required, however this mainly occurs in the NERL proposal above 7,000ft.

8.8.7 When looking at the overall Scottish Airspace Modernisation proposal but for CAS with a base of 7,000ft or lower, the combined Glasgow Airport, Edinburgh Airport and NERL design will result in a **reduction of 616.1 nm^3 of CAS** where bases are below 7,000ft.

8.8.8 For full details, including annotated charts, please see **section 9**.

Safety

How do we assess safety?

8.9.1 Air Traffic Controllers (ATC) and airspace experts undertake detailed safety assessments, including simulations, to understand whether there are any positive benefits or negative impacts compared to the baseline 'without airspace change' scenario.

8.9.2 The safety assessment also looks at the design of the arrival procedure, and whether the specification of PBN used offers any safety advantages compared to the baseline 'without airspace change' scenario.

How did the proposal perform in terms of safety?

8.9.3 The safety assessments have indicated that the proposed option will maintain and, in some areas, enhance safety compared to the 'without airspace change' baseline.

8.9.4 The introduction of PBN departure and arrival routes offers **reduced workload for ATC and pilots** compared to the reliance on vectoring which occurs within the 'without airspace change' scenario today. This is because PBN routes reduce the number of times Air Traffic Controllers have to provide pilots with instructions.

8.9.5 In addition to this, the introduction of a PBN arrival route to Runway 23 may make a **small enhancement to safety**, although it should be noted that the existing arrivals to Runway 23 today are considered safe.

8.9.6 Overall, the safety assessment work to date has identified some hazards that require further mitigation however these are expected to be resolved at the time of project implementation. Further safety assessments and justifications will be submitted in Stage 4.

How does the proposed option meet the Government's Airspace Modernisation Strategy?

8.10.1 We have assessed the proposed option against the objectives of the Government's Airspace Modernisation Strategy (AMS) which is the key driver for this airspace change. The vision of the AMS is to deliver quicker, quieter and cleaner journeys and more capacity for the benefit of those who use and are affected by UK airspace. Table 20 (below) provides the objective of the AMS with information about how the proposed option aligns with these objectives.

Objective of the Government's Airspace Modernisation Strategy (AMS)	How this proposal aligns with the AMS
Safety Maintaining and, where possible, improving the UK's high levels of aviation safety has priority over all other 'ends' to be achieved by airspace modernisation.	The safety assessments have indicated that the proposed option will maintain and, in some areas, enhance safety compared to the 'without airspace change' baseline.
Integration of diverse users Airspace modernisation should wherever possible satisfy the requirements of operators and owners of all classes of aircraft, including the accommodation of existing users (such as commercial, General Aviation, military, taking into account interests of national security) and new or rapidly developing users (such as remotely piloted aircraft systems, advanced air mobility, spacecraft, high-altitude platform systems).	The proposed option is expected to meet the requirements of existing airspace users such as commercial airlines. The airspace will be classified to support access to users as appropriate. General Aviation and new and rapidly developing users are expected to benefit from the overall release of CAS volumes below 7,000ft. There is no expected conflict with national security requirements.
Simplification, reducing complexity and improving efficiency Consistent with the safe operation of aircraft, airspace modernisation should wherever possible secure the most efficient use of airspace and the expeditious flow of traffic[15], accommodating new demand and improving system resilience to the benefit of airspace users, thus improving choice and value for money for consumers.	The capacity and resilience assessments within the FOA have shown that the proposed option would offer benefits helping to reduce delays. The proposed designs will efficiently use the airspace to enable the expeditious flow of traffic, including all classes of aircraft across the commercial, General Aviation and military sectors.
Environmental sustainability Environmental sustainability will be an overarching principle applied through all airspace modernisation activities. Modernisation should deliver the Government's key environmental objectives with respect to air navigation as set out in the Government's Air Navigation Guidance and, in doing so, will take account of the interests of all stakeholders affected by the use of airspace.	The proposed option offers a net benefit, i.e. a reduction in total adverse effects on health and quality of life from noise. The proposed option also offers an expected improvement in Greenhouse Gas Emissions.

Table 20: Objectives of the Airspace Modernisation Strategy (AMS) and how this proposal aligns with the AMS

[15] most efficient use of airspace' and 'expeditious flow' are defined at the foot of page 22 of CAP1711

8.11 Your feedback

8.11.1 We are seeking your feedback on the arrivals and departures proposal as well as the Controlled Airspace proposal explained in the next section of this document.

8.11.2 There are three main questions we are asking for each component of the design:

Q. How do you feel about the proposed arrivals/departures to Runway 23/Runway 05? (Mandated)

- I strongly support
- I support
- Neither support nor oppose
- I oppose
- I strongly oppose
- Not applicable

Q. Please select the main reason(s) why you have chosen this response. (Mandated – select all which apply)

- Noise
- Greenhouse Gas Emissions / fuel burn
- Tranquillity (Overflight of tranquil areas, such as National Scenic Areas, National Parks, Candidate Quiet Areas etc)
- Biodiversity (Overflight of areas of biodiversity such as Sites of Special Scientific Interest (SSI), Special Protected Areas (SPAs) etc)
- Capacity (including passenger delay)
- Safety
- Airspace access
- Airline and operational procedures
- Other (Please specify below)

Q. Please provide any further details about why you have selected this response.

8.11.3 To find out how to respond to our consultation, please see Section 10 of this document.

8.12 Scottish Airspace Modernisation benefits

8.12.1 The Glasgow Airport proposal forms part of the wider Scottish Airspace Modernisation proposal along with Edinburgh Airport and NERL. The Airspace Change Organising Group (ACOG) have produced the CAF2 document which provides information on how the options presented by the ACP sponsors for consultation work together as a system. This has shown that the overall net cluster-wide benefit (using the Government's method for monetising benefits) across the 10 year assessment period is c. £129,694,000. For more information, please see ACOG's CAF2 document.

8.12.2 Table 21 provides an overview of the overall expected Scottish Airspace Modernisation benefits. This table is taken from the ACOG CAF2 document.

Stakeholder Group	Expected benefits of airspace modernisation
For local communities	The priority for airspace modernisation at lower altitudes is to limit and, where possible, reduce the total adverse effects of aircraft noise on people. Modernisation is expected to deliver an overall reduction in adverse effects from noise by moving flight paths to where they effect fewer people. However, as this overall benefit can only be achieved by the redistribution of noise between different areas, it may lead to disruption for some communities living under new flight paths.
For the environment	Airspace modernisation is expected to reduce the average environmental impact of each flight in the ScTMA. This is to help the UK to move towards its commitment to net zero emissions while maintaining the aviation sector in Scotland. The Government set out its proposed approach to reach net zero aviation by 2050 in its 2021 Jet Zero consultation and expects a significant proportion of the required emissions reductions will come from improving the efficiency of the existing aviation system, including aircraft, airports as well as airspace.
For airlines	Additional airspace capacity will accommodate predicted growth with less delay, while maintaining and enhancing high levels of safety. Modernisation will also improve flight efficiency, enabling the airlines to capitalise on the performance of their modern fleets of aircraft.
For airports	Modernisation is expected to reduce delays on the ground pre-departure caused by capacity constraints in the airspace and for Glasgow Airport to increase runway throughput during busy periods.
For passengers and the wider economy	Fewer flight delays and service disruptions are expected to save time and improve the passenger experience. The capacity to accommodate predicted growth with less delay will lead to more choice, better value, and enhanced global connections.
For other airspace users	Modernisation offers opportunities for other airspace users to access volumes of airspace that are not required by commercial air transport through the reclassification of unused controlled airspace as uncontrolled, and by more effective airspace sharing.
For the Military	Airspace modernisation will continue to ensure that Military operators have access to suitably sized and sited areas of airspace to fulfil defence and national security objectives, recognising that new Military aircraft and weapons platforms often require larger volumes of airspace in which to train and maintain operational readiness.

Table 21 Expected benefits of Scottish airspace modernisation organised by stakeholder group (Source: ACOG CAF2)

8.12.3 For more information about the NERL proposal, which includes the route network above 7,000ft and interfaces with Glasgow and Edinburgh arrival and departure routes below 7,000 ft, please see: ACP-2019-74.

8.12.4 For more information about the Edinburgh Proposal, which includes the arrival and departure routes serving Edinburgh Airport and the controlled airspace that contains them below 7,000 ft, please see: ACP 2019 32.

9

Proposed Controlled Airspace (CAS)

9 Proposed Controlled Airspace (CAS)

9.1 What is Controlled Airspace (CAS)?

9.1.1 Controlled Airspace (CAS) is airspace of defined dimensions within which Air Traffic Control (ATC) service is provided in accordance with the airspace classification. Its purpose is to create a known air traffic environment to achieve the objectives of the ATC service to prevent collisions between aircraft and to expedite and maintain an orderly flow of air traffic.

9.1.2 Different types of airspace are classified by a lettering system specified by ICAO. Class A to E airspace is known as "Controlled Airspace"; Class G airspace is "Uncontrolled Airspace". The airspace classification type establishes the extent to which airspace users must comply with various regulations (embracing, for example, aircraft equipage, pilot qualification and applicable Rules of the Air) and the types of air traffic services that are provided in the airspace.

9.1.3 In the UK, Controlled Airspace is established primarily to protect commercial air transport passenger flights from other flights and is where ATC needs to have positive control over aircraft flying in the airspace in order to maintain safe separation between them. Uncontrolled Airspace is airspace where aircraft are able to fly freely without being constrained by instructions from ATC, unless they request such a service.

9.1.4 Controlled Airspace contains the network of corridors (known as Airways or the Route Network) which link the busy airspace surrounding the major airports. The Controlled Airspace around the major airports is designated variously as Control Zones (CTR), from the ground upwards to a specified upper limit; Control Areas (CTA), from a specified base level and Terminal Control Areas (TMA) which are larger CTAs normally encompassing a number of airports and extend from a specified base level above the ground to a specified upper limit. This can be seen in Figure 36.

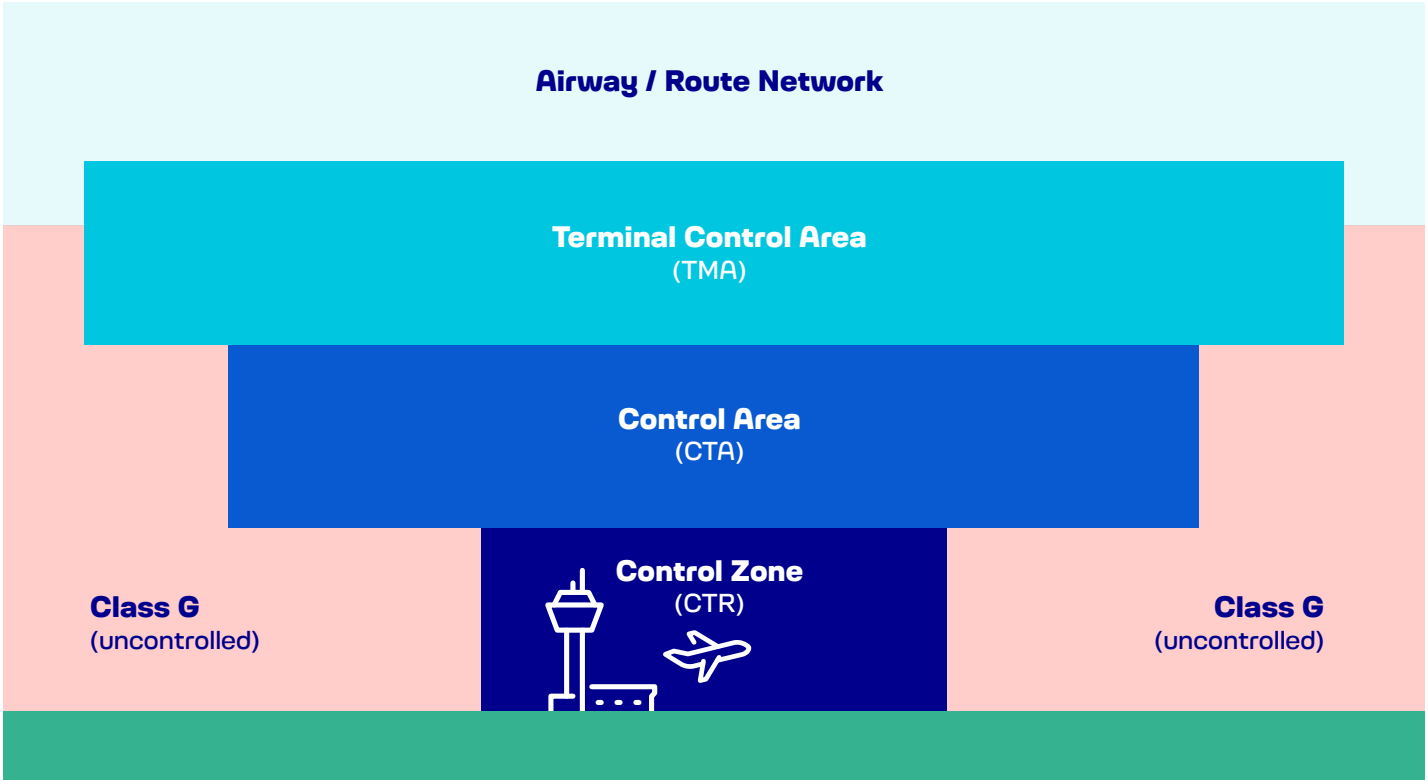


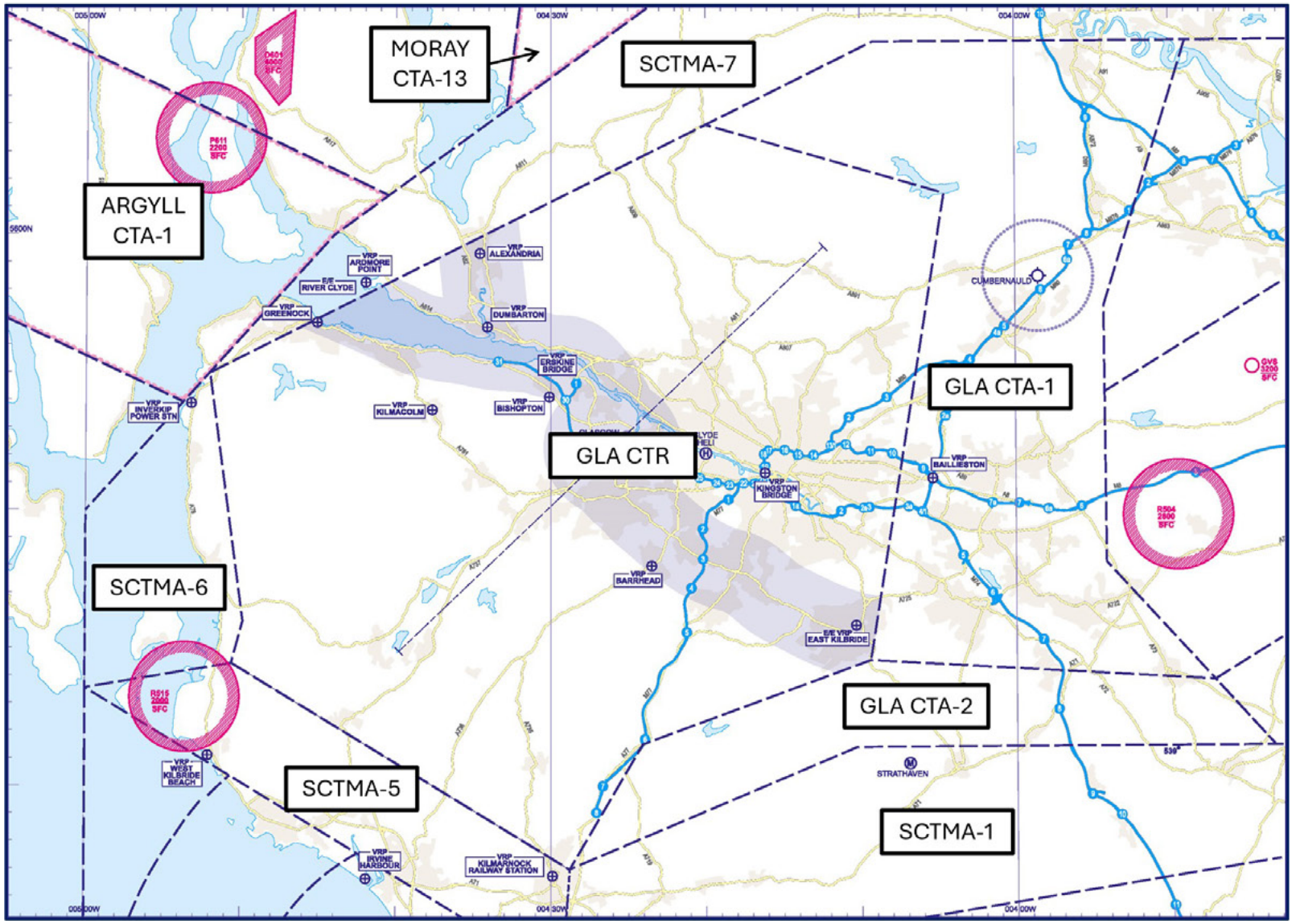
Figure 36: Illustrative example of CAS structures

9.1.5 The following section outlines the proposed changes to Controlled Airspace. We recognise that not all consultees may be interested in this section and if you would like to go to the next section please click here.

9.1.6 The following section sometimes uses technical language to help describe the CAS proposal. All consultees are welcome to review the information and we would recommend referring to our terminology explained document to understand some of the technical language used.

9.2 The Controlled Airspace around Glasgow Airport today

9.2.1 The chart on the following page shows the existing CAS surrounding Glasgow Airport. The source of this information is the AIP AD2 EGPF.



Without Airspace Change		
Designation	**Class**	**Base (ft)**
GLA CTR	D	SFC
GLA CTA-1	D	3000
GLA CAT-2	D	3500
SCTMA-1	D	4500
SCTMA-5	D	3500
SCTMA-6	E	3000
SCTMA-7	E	4000
ARGYLL CTA-1	E	5500
MORAY CTA-13	E	5500

Figure 37: CAS without airspace change. Chart source UK AIP AD 2.EGPF-4-1

9.3 Developing the Controlled Airspace for our proposals

9.3.1 Glasgow Airport's ACP requires wholesale changes to Controlled Airspace (CAS) volumes and classifications. In determining the CAS requirements, there are several key CAA documents that all feed in to determining an appropriate volume of airspace. Note the extant CAS arrangements surrounding Glasgow Airport pre-date many of these policy documents:

- Policy for the Design of Controlled Airspace Structures, 11 Aug 2022
- Policy for the Classification of UK Airspace, 12 Oct 2023
- CAP 778 Policy and Guidance for the Design and Operation of Departure Procedures in UK Airspace, 1 Nov 2012
- Performance-Based Navigation (PBN): Enhanced Route Spacing Guidance CAP 1385, Dec 2022

9.3.2 In the UK, the guiding principle in establishing a volume of CAS is that Sponsors must seek to ensure that the amount of Controlled Airspace is the minimum required to maintain a high standard of air safety and, subject to overriding national security or defence requirements, that the needs of all airspace users is reflected on an equitable basis. This has led to the adoption that the least restrictive classifications of airspace should be the norm in UK airspace design.

9.3.3 Controlled Airspace in the vicinity of an aerodrome consists of **Control Zone (CTR), Control Areas (CTA)** and may include **Terminal Control Areas (TMA)**.

9.3.4 The CAS volumes and classifications proposed by our ACP are designed to meet all aspects of CAA policy. The following, non-exhaustive, list summarises some of the key requirements:

- CAS containment that provides sufficient airspace to contain instrument approach and departure procedures (including holding and missed approach procedures) and the area in which aircraft receive vectoring instructions to join the final approach track:
    - The term 'sufficient airspace' is considered to mean that the volume of CAS should safely contain the primary areas of these procedures and permit compliance with Air Traffic Management procedures for the tactical handling of flights to achieve a safe and efficient volume of traffic.
    - Where competing airspace requirements preclude containment by primary area, containment of the nominal track defined by the procedures may be less but should not be less than 3nm from the lateral limit of CAS.
    - SIDs and approach transitions should remain wholly within CAS where the nominal track should not be less than 2nm from the edge of CAS on straight or RF legs or 3nm on non-straight legs.
    - Vertical containment that ensures the flight profile remains at least 500ft above the lower limit of CAS.
    - Sponsors may present proposals for a CAS design that results in less lateral containment than this, subject to an acceptable safety assessment.
- The lower limit of a CTA shall not be less than 700ft AGL.
- Where practicable the lower limit of a CTR joining a CTR should be no lower than 1,500ft AGL. The use of an expanded CTR to permit higher CTA base levels is preferable.

- Those portions of airspace where an Air Traffic Control service will be provided to UFR flights shall be Class B, C or D airspace. Class D is the minimum classification notified where a known traffic environment is necessary in both Visual Meteorological Conditions (VMC) and Instrument Meteorological Conditions (IMC). Though in CTAs where airspace classes A–D cannot be justified, Class E may be notified. The classification depends on consideration of multiple factors including the type and density of air traffic, specifically, the presence of commercial air transport flights involving the movement of passengers on a scheduled journey, the number and frequency of IFR flights and the complexity.

- Instrument Flight Procedure (IFP) design criteria, Flight Management Computer (FMC) coding and the 6,000ft Transition Altitude (TA) limit where waypoints can be placed and what/where altitude/Flight Level restrictions can be assigned.

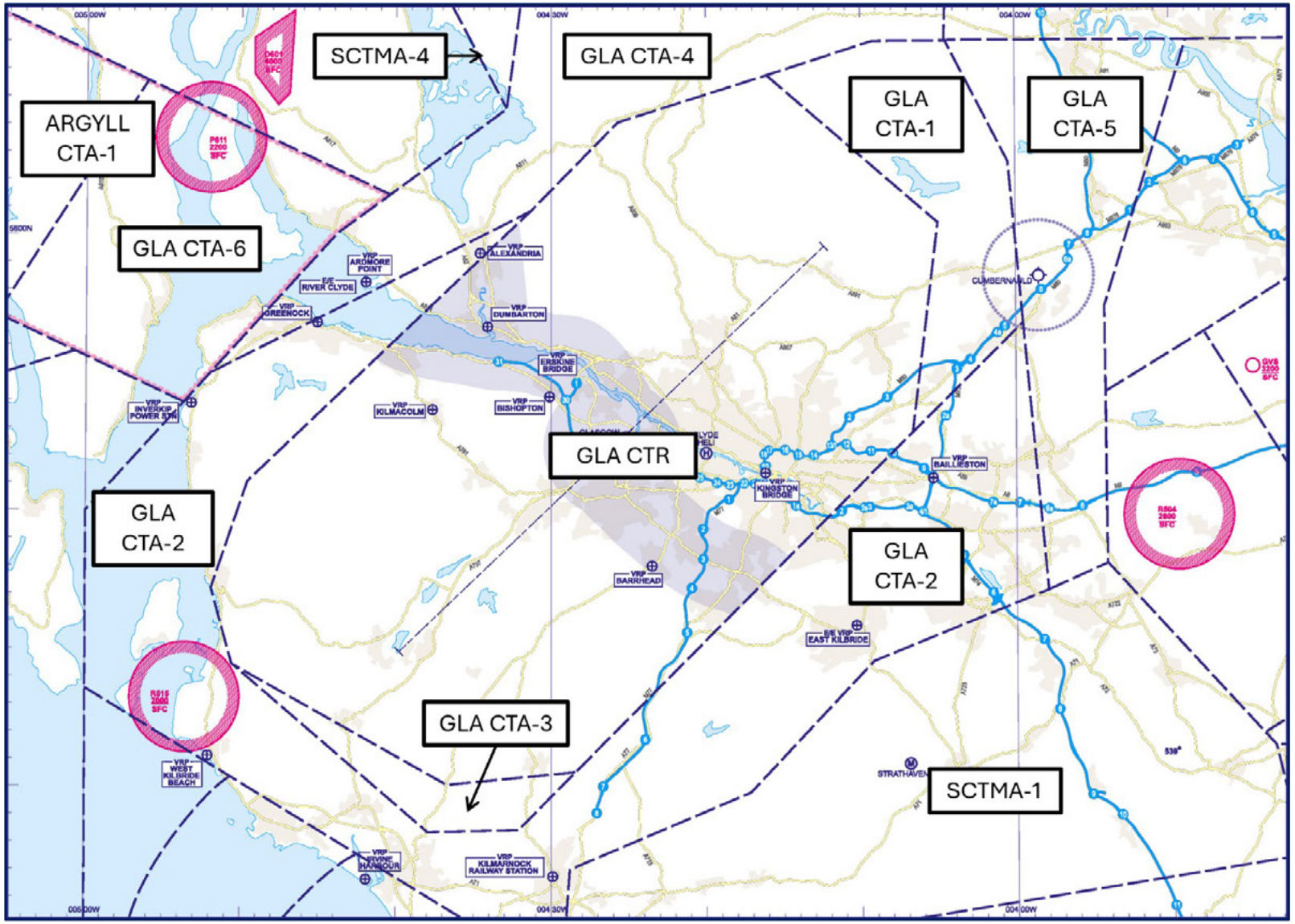
9.4 Proposed Controlled Airspace

9.4.1 Figure 38 on the next page shows the overall proposed Controlled Airspace arrangements in and around Glasgow Airport.

The following sub sections then provide a breakdown of the sections of airspace where there are potential areas of benefit and impacts.

9.4.2 For details of the wider CAS proposed as part of Scottish Airspace Modernisation, please see the **ACOG CAF 2 Document**.

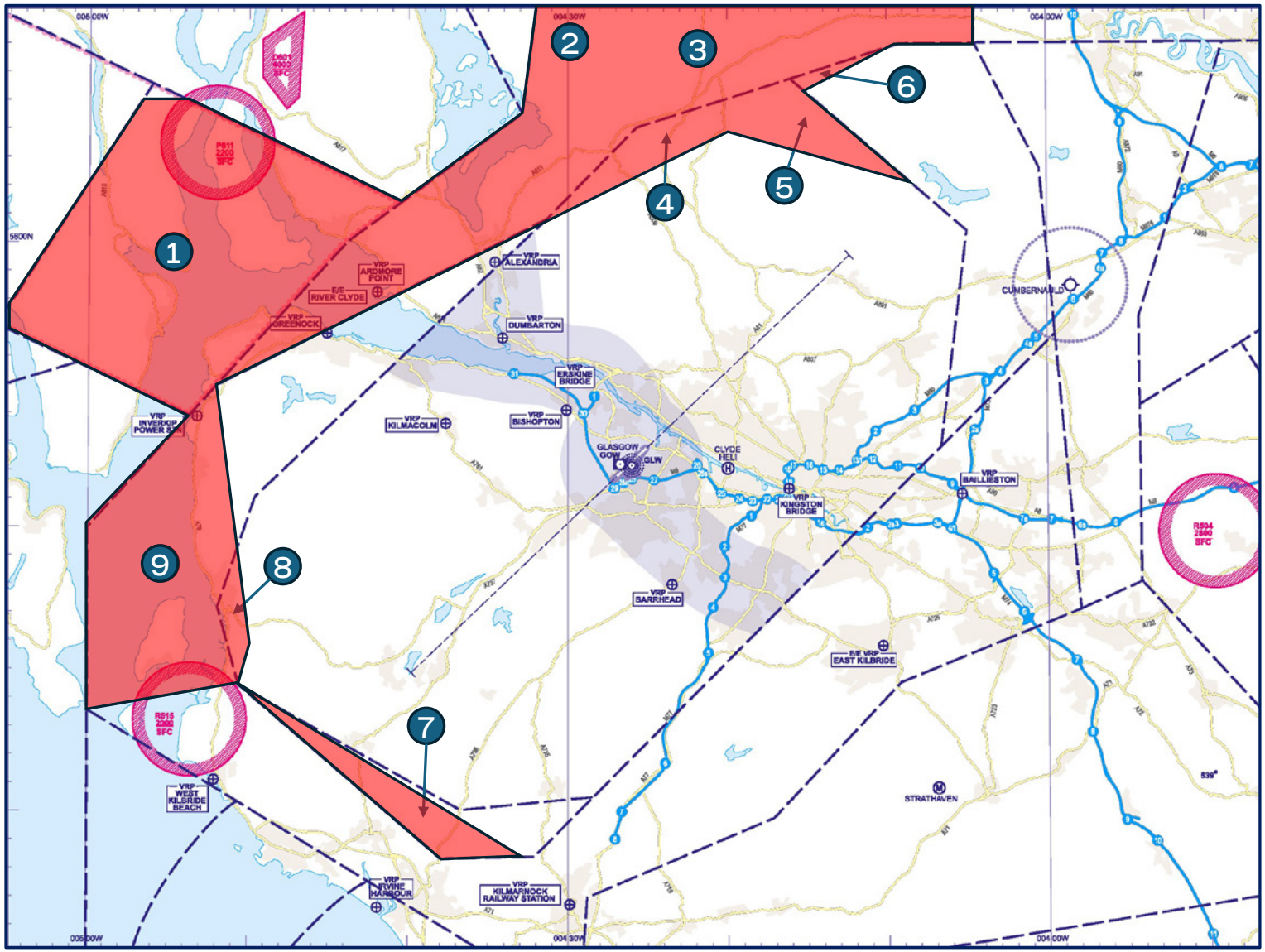
Proposed Airspace (Draft Chart)



Proposed		
Designation	**Class**	**Base (ft)**
GLA CTR	D	SFC
GLA CTA-1	D	3000
GLA CAT-2	D	3500
GLA CAT-3	D	2500
GLA CAT-4	D	4500
GLA CAT-5	D	4500
GLA CAT-6	D	4500
SCTMA-1	D	4500
SCTMA-4	D	5500
ARGYLL CTA-1	E	5500

Figure 38: CAS with airspace change. Map underlay sourced from existing AD 2.EGPF-4-1 and overlaid with proposed future airspace

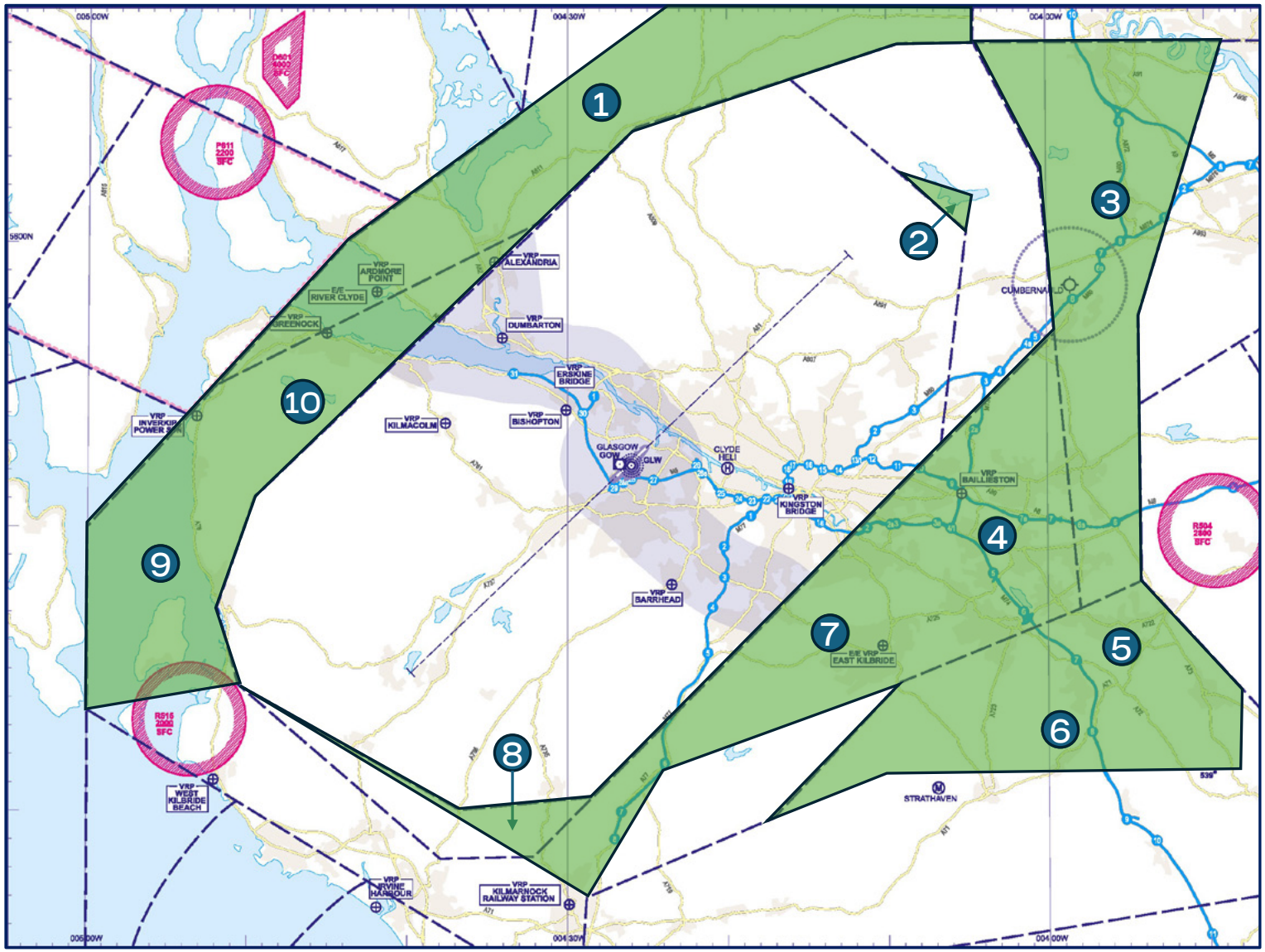
CAS Increase and/or Higher Classification



	Currently	Proposed
1	ARGYLL CTA-1 Class E 5500ft	GLA CTA-6 Class D 4500ft
2	MORAY CTA-13 Class E 5500ft	GLA CTA-4 Class D 4500ft
3	SCTMA-7 Class E 4000ft	GLA CTA-4 Class D 4500ft
4	SCTMA-7 Class E 4000ft	GLA CTR Class D SFC
5	GLA CTA-1 Class D 3000ft	GLA CTR Class D SFC
6	SCTMA-7 Class E 4000ft	GLA CTA-1 Class D 3000ft
7	SCTMA-5 Class D 3500ft	GLA CTA-3 Class D 2500ft
8	SCTMA-6 Class E 3000ft	GLA CTR Class D SFC
9	SCTMA-6 Class E 3000ft	GLA CTA-2 Class D 3500ft

Figure 39: Potential areas of impact (proposed increases and/or higher classifications of CAS compared to the 'without airspace change' scenario).
Map underlay sourced from existing AD 2.EGPF-4-1 and overlaid with proposed future airspace

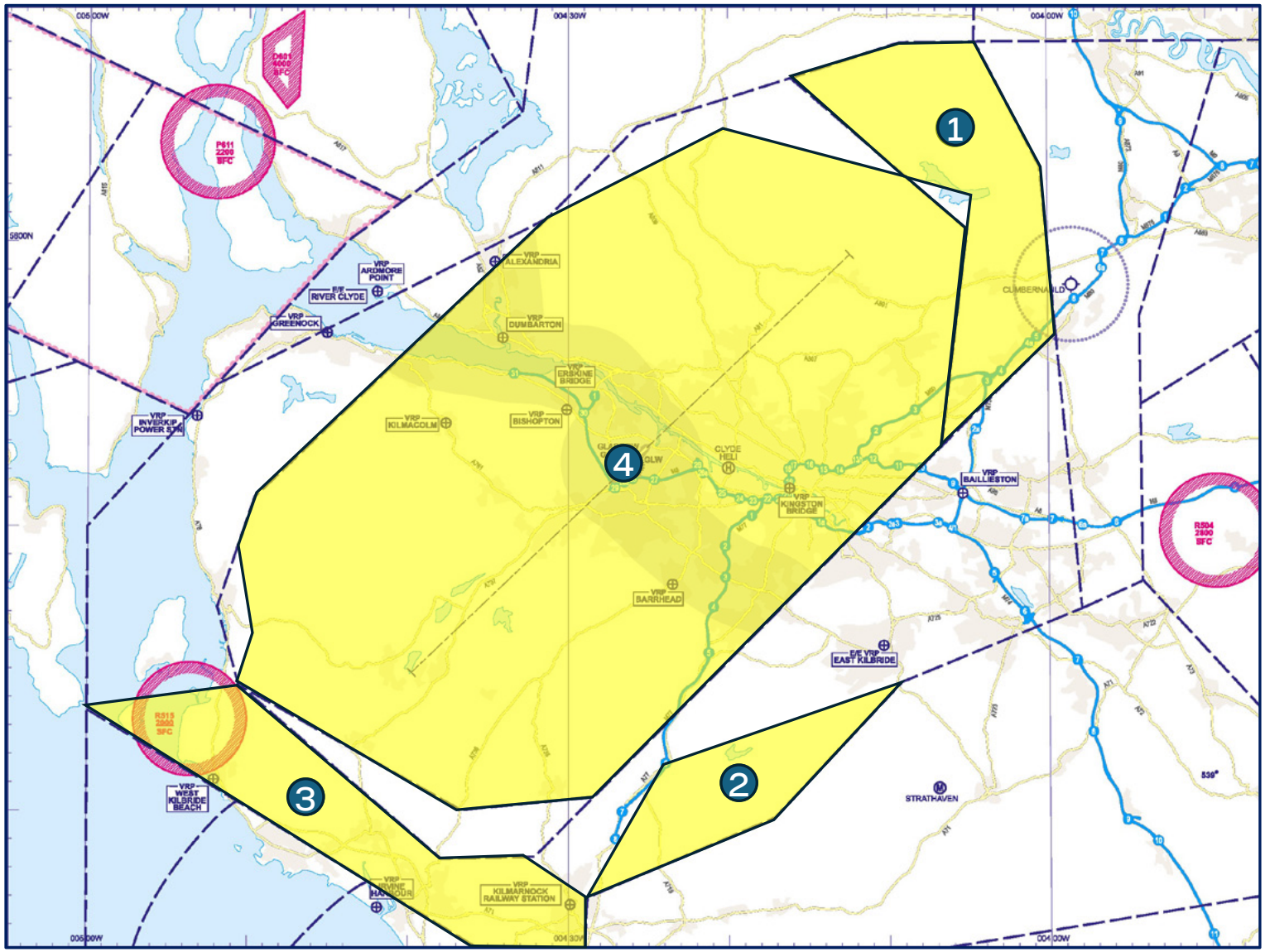
CAS Decrease and/or Lower Classification



	Currently	Proposed
1	SCTMA-7 Class E 4000ft	GLA CTA-4 Class D 4500ft
2	GLA CTR Class D SFC	GLA CTA-1 Class D 3000ft
3	GLA CTA-1 Class D 3000ft	GLA CTA-5 Class D 4500ft
4	GLA CTA-1 Class D 3000ft	GLA CTA-2 Class D 3500ft
5	GLA CTA-1 Class D 3000ft	SCTMA-1 Class D 4500ft
6	GLA CTA-2 Class D 3500ft	SCTMA-1 Class D 4500ft
7	GLA CTR Class D SFC	GLA CTA-2 Class D 3500ft
8	GLA CTR Class D SFC	GLA CTA-3 Class D 2500ft
9	SCTMA-6 Class E 3000ft	GLA CTA-2 Class D 3500ft
10	GLA CTR Class D SFC	GLA CTA-2 Class D 3500ft

Figure 40: Potential areas of benefit (proposed decreases and/or lower classifications of CAS compared to the 'without airspace change' scenario).
Map underlay sourced from existing AD 2.EGPF-4-1 and overlaid with proposed future airspace

No Change to Base or Classification



	Currently	Proposed
1	GLA CTA-1 Class D 3000ft	GLA CTA-1 Class D 3000ft
2	GLA CTA-2 Class D 3500ft	GLA CTA-2 Class D 3500ft
3	SCTMA-5 Class D 3500ft	GLA CTA-2 Class D 3500ft
4	GLA CTR Class D SFC	GLA CTR Class D SFC

Figure 41: Neutral impacts/benefits (No change to Controlled Airspace compared to the 'without ACP' scenario).
Map underlay sourced from existing AD 2.EGPF-4-1 and overlaid with proposed future airspace

Volume of Controlled Airspace

9.4.3 Table 21 shows the total change in volume of airspace types and classifications for the combined Glasgow Airport, Edinburgh Airport and NERL ACPs. Overall, the proposed, combined design will require an additional 658.8 nm^3 of CAS. However, in isolation, 1193.0 nm^3 of new CAS is required by NERL above 7,000ft to provide more efficient en-route connectivity which demonstrates that a substantial airspace release has been achieved in the remainder of the design. In addition to the CAS release, the classification of a substantial volume of CAS is proposed to be lowered increasing accessibility to all airspace users.

Airspace Type	Baseline Volume (nm^3)	Option Volume (nm^3)	Volume Change (nm^3)
CTR	773.2	737.6	-35.5
CTA	26129.4	26778.7	+649.3
TMA	9467.3	9512.3	+45.1
Total	36369.8	37028.7	+658.8

Airspace Classification	Baseline Volume (nm^3)	Option Volume (nm^3)	Volume Change (nm^3)
Class A	6714	1417.8	-5296.2
Class C	0	3713.2	+3713.2
Class D	17691.7	19307.5	+1615.8
Class E	11964.2	12590.1	+626
Total	36369.8	37028.7	+658.8

Table 21: Volume of each type and classification of CAS in the baseline and proposed, combined Glasgow, Edinburgh and NERL ACPs.

9.4.4 For details of the wider CAS proposed as part of Scottish Airspace Modernisation please see the ACOG system wide description document.

9.4.5 Table 22 below presents the same data as in Table 21 but for CAS with a base of 7,000ft or lower. Overall, the proposed, combined design will result in a reduction of 601.7 nm^3 of CAS where bases are below 7,000ft.

Airspace Type	Baseline Volume (nm^3)	Option Volume (nm^3)	Volume Change (nm^3)
CTR	773.2	737.6	-35.5
CTA	7667.8	7100.1	-567.7
TMA	9467.3	9468.8	+1.5
Total	17908.2	17306.5	-601.7

Airspace Classification	Baseline Volume (nm^3)	Option Volume (nm^3)	Volume Change (nm^3)
Class A	404.4	95.2	-309.2
Class C	N/A	N/A	N/A
Class D	13389	13566.8	+177.8
Class E	4114.9	3644.6	-470.3
Total	17908.2	17306.5	-601.7

Table 22: Volume of each type and classification of CAS in the baseline and proposed, combined Glasgow, Edinburgh and NERL ACPs 7,000ft and below only

9.4.6 The changes to Glasgow Airport and Edinburgh Airport's proposed CTR volumes are unrelated to each other. Table 23 presents the proposed change in volume of just Glasgow's CTR.

Airspace Type	Baseline Volume (nm^3)	Option Volume (nm^3)	Volume Change (nm^3)
GLA CTR	464.1	398	-66.1

Table 23: Proposed change in volume of Glasgow's CTR

9.4.7 In terms of the overall value to General Aviation (GA), previous engagement with GA stakeholders as part of Stage 2 highlighted that there was a desire to release as much CAS as possible and, broadly speaking, less CAS results in improved access for General Aviation. As outlined in the section above, whilst overall there is a CAS release benefit below 7,000ft, including a release for the GLA CTR, there are some areas which will be negatively impacted and other areas which will see improvements. We are aware of the value of Controlled Airspace to glider pilots in the 'Cumbernauld gap'[16] and this has been considered as part of the CAS development.

9.4.8 We have included detailed information on proposed CAS dimensions, and we look forward to feedback from all GA on the proposals, specific to their operations throughout the consultation process.

[16] The Cumbernauld gap is also referred to as the Edinburgh – Glasgow gap. It is a volume of airspace which allows GA traffic passage between the Class D Edinburgh and Glasgow airspace. This area is used by GA traffic transiting north – south to/from central Scotland, southern Scotland, Northern Ireland, and England, as well as for local pilots visiting Cumbernauld and Strathaven.

New and rapidly developing airspace users

9.4.9 The Government's AMS requires us to also consider the benefits and impacts to new or rapidly developing users such as remotely piloted aircraft systems, advanced air mobility, spacecraft, high-altitude platform systems.

9.4.10 We are not aware of any permanent proposals for airspace change in the vicinity of Glasgow's CAS boundaries concerning remotely piloted aircraft systems, advanced air mobility, spacecraft, high-altitude platform systems. Neither have we had any requests from new airspace users to release airspace in specific geographic regions to support their ambitions.

9.4.11 For the purposes of Scottish Airspace Modernisation we have therefore assumed that the release of CAS in terms of volume or lower classification could benefit new and rapidly developing airspace users. We are interested to hear from new and developing airspace users as to whether our proposals for changes to Controlled Airspace can benefit them or if there are any specific requests to support firm aspirations.

9.5 Your feedback

9.5.1 We are seeking your feedback on the proposed CAS structure to understand the benefits and impacts to General Aviation.

9.5.2 There are three main questions we are asking around the CAS arrangements:

Q. How do you feel about the proposed CAS structure in the vicinity of Glasgow Airport?

Q. We recognise that the CAS spans a wide area and there may be some areas where consultees are supportive of the proposed changes, and other areas where consultees are in opposition. Within the questionnaire there is a table which asks you to identify which areas contributed to your response to the previous question. (Please select all which apply).

Q. Please provide any further details about why you have selected this response.

9.5.3 To find out how to respond to our consultation, please see Section 10 of this document.

10

Responding to our consultation & what happens next

10 Responding to our consultation & what happens next

10.1 Responding to the consultation

10.1.1 Thank you for your consideration of our proposals. If you have any questions, please contact us via email at **airspace@glasgowairport.com** or by phone at 0800 066 8943.

10.1.2 To respond to the consultation, visit our Citizen Space website at https://consultations.airspacechange.co.uk/glasgow-airport/glasgow-airport-airspace-modernisation

10.1.3 If you need hard copy materials, you can contact the team using the details below and we will send you an information pack and feedback form by post, with a postage-paid envelope, so that you can return your completed form to us. A copy of the feedback form is also available at Appendix A of this document.

10.1.4 All responses to the consultation, including those received in hard copy form, will be published on the CAA's Citizen Space consultation website. If you wish for your response to be published anonymously, there is an option to redact your personal details, and these will only be seen by Glasgow Airport and the CAA. If your feedback is relevant to one of the other Scottish Airspace Modernisation Sponsors (Edinburgh Airport and/or NERL) then your feedback and personal details will be shared with the applicable Sponsor(s).

10.1.5 The consultation closes on Sunday 25 January 2026 (23:59hrs). Glasgow Airport will then collate, review and categorise the consultation responses. Responses will be categorised into those which may lead to a change in the design and those that would not.

10.1.6 We will then produce a Consultation Response Document which summarises the consultation and our response to the feedback raised.

10.1.7 The CAA will review our Consultation Response Document and it will then be published on the CAA Portal and our ACP will move into Stage 4.

10.2 The next stages of the CAP1616 process

10.2.1 At Stage 4 we will review how the option(s) could be amended in light of consultation responses and carry out the third appraisal, the Final Options Appraisal.

10.2.2 We will then submit our Airspace Change Proposal to the CAA and upload the final submission to the CAA Portal.

10.2.3 As part of Stage 5, the CAA will then make a decision on the ACP.

10.2.4 Subject to CAA decision, the ACP would then move onto Stage 6 – Implementation.

10.2.5 A year after implementation, a Stage 7 Post Implementation Review (PIR) is undertaken to ensure the ACP is meeting the objectives.

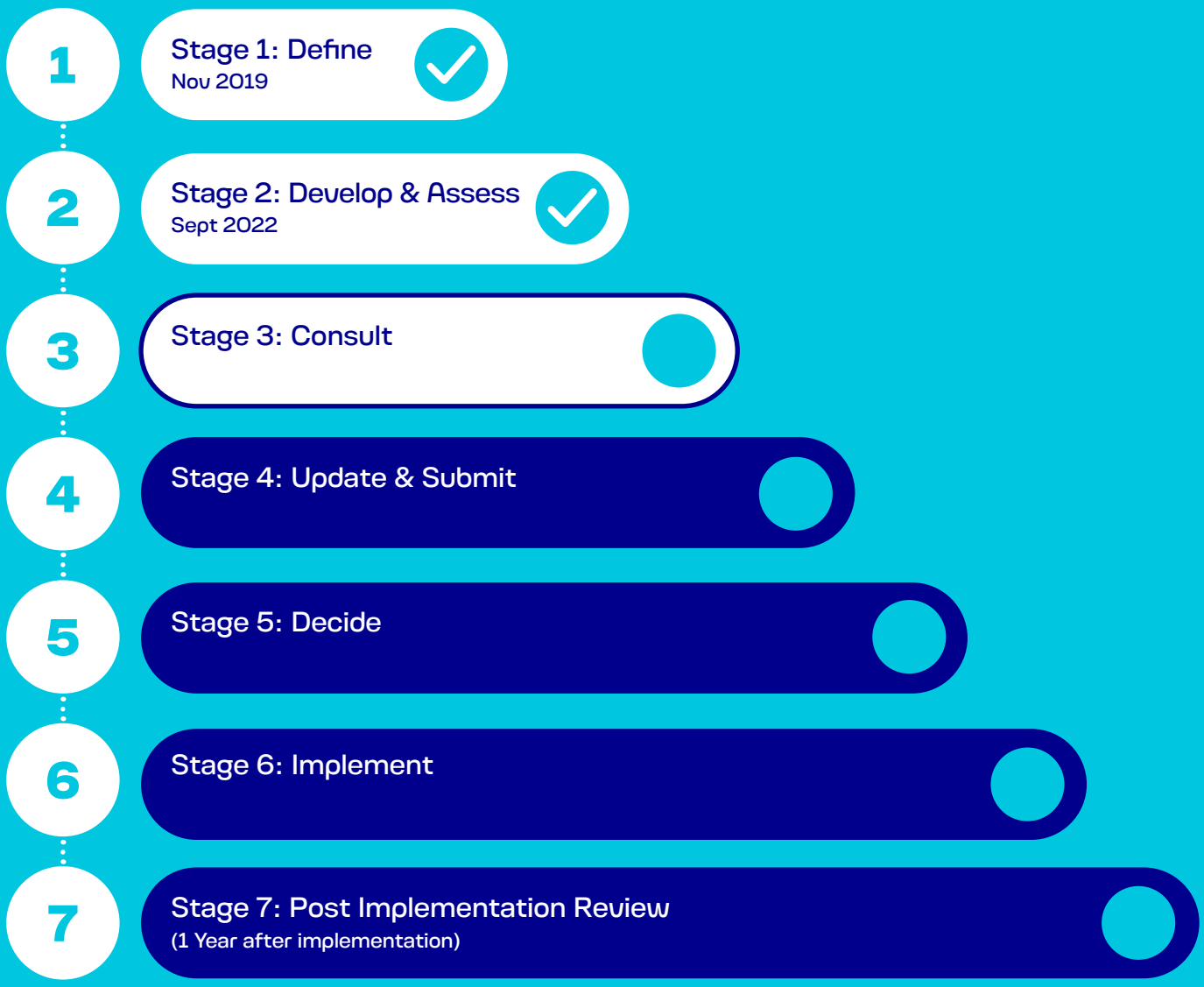


Figure 42: ACP timeline

10.3 Reversion Statement

10.3.1 CAP1616 requires Sponsors to be clear with stakeholders the extent to which the proposed airspace change, once implemented, is reversible if it does not meet the objectives it is designed to achieve as part of the Post Implementation Review at Stage 7.

10.3.2 In the unlikely event the proposal requires reversal once approved and implemented, permanent reversion to the pre-implementation state would be complex and very difficult due to the significant changes proposed to the airspace structure, the scale of change and the interdependencies between the Glasgow Airport, NERL and Edinburgh Airport airspace changes.

10.3.3 If one airspace change is required to revert then it is highly likely that the other two airspace changes would also be required to revert. Large scale airspace changes are implemented a maximum of four times a year due to the lengthy lead times to allow for testing and preparation activities to take place. The feasibility and time period for determining reversion would also be influenced by the time needed to update multiple safety critical systems simultaneously alongside the appropriate training of Air Traffic Controllers.

Appendix A: Feedback form

Airspace modernisation

How to have your say

Glasgow Airport is consulting on an Airspace Change Proposal to modernise its arrival and departure routes and the surrounding airspace. The consultation runs for **14 weeks from 20 October 2025 to 25 January 2026.**

To respond to this consultation, please use our Citizen Space consultation website:
https://consultations.airspacechange.co.uk/glasgowairport/glasgow-airport-airspace-modernisation

If you are unable to respond online, please use the form below to answer the questions and return it to:

Glasgow Airport Consultation,
C/O Cavendish Consulting
220 St Vincent Street
Glasgow G2 5SG

Responses must be received by 23:59hrs on 25 January 2026.

We recommend reviewing the Consultation Summary Document and consultation materials which are available on the Citizen Space webpage before completing this form. If you require hard copies of these documents, please email **airspace@glasgowairport.com** or phone 0800 066 8943. Alternatively, you can write to the above address.

All responses will be transcribed and uploaded onto the Citizen Space consultation website.

Select below if you would prefer that your response is published anonymously.

- ○ YES – publish my details with my response
- ○ NO – publish my response anonymously

The consultation runs for **14 weeks from 20 October 2025 to 25 January 2026.**

For more information, please go to our consultation website:
glasgowairport.consultationonline.co.uk

About you

Name:

Email address:

Postcode:

Please categorise your interest in the Glasgow Airspace Proposal
(tick all that are relevant)

- ○ Airport/airfield
- ○ Airspace user – airline
- ○ Airspace user – commercial/ business aviation
- ○ Airspace user – GA/private pilot
- ○ Airspace user – other (e.g. ATC)
- ○ Airspace user – new/developing user (e.g. drone operator/remote pilot)
- ○ ANSP
- ○ NSA/AONB representative
- ○ Community council member/Ward Councillor
- ○ Environmental group
- ○ Local authority/council officer
- ○ Local business
- ○ Local resident
- ○ Member of NATMAC
- ○ MP/MSP
- ○ Other (please specify)

Other (if required):

Are you responding as an individual or on behalf of an organisation?

- ○ Individual
- ○ On behalf of an organisation

Name of organisation (if relevant):

Our proposals for consultation

This consultation is split into two main sections. You can give feedback on one or both sections.

1 Our proposal to modernise our departure and arrival routes at Glasgow Airport.

2 Our proposal to modernise the airspace surrounding Glasgow Airport.

We recognise that not all stakeholders are interested in both parts of this consultation, therefore, if you are only interested in the proposed changes to the airspace surrounding Glasgow Airport, please go straight to Question 14 on page 9 of this document.

We recommend you review the diagrams in the Consultation Summary Document, on our website, or Main Consultation Document prior to responding to the questions.

1. How do you feel about the overall principle of modernising Glasgow Airport's airspace?

- ○ I strongly support
- ○ I support
- ○ Neither support nor oppose
- ○ I oppose
- ○ I strongly oppose
- ○ Not applicable

Runway 23 arrivals: questions

For more information about our arrivals routes, please see our consultation website or our Main Consultation Document.

2. How do you feel about the proposed arrivals to Runway 23?

- ○ I strongly support
- ○ I support
- ○ Neither support nor oppose
- ○ I oppose
- ○ I strongly oppose
- ○ Not applicable

3. Please select the main reason(s) why you have chosen your response to Question 2. (Select all which apply)

- ○ Noise
- ○ Greenhouse Gas Emissions
- ○ Tranquillity (overflight of NSAs/NPs etc)
- ○ Biodiversity (overflight of SSSIs/SPAs etc)
- ○ Capacity (including passenger delay)
- ○ Safety
- ○ Airspace access
- ○ Airline and operational procedures
- ○ Other (please specify)

Other (if required):

4. Please provide any further details about why you have selected this response.

Runway 05 arrivals: questions

5. How do you feel about the proposed arrivals to Runway 05?

- ○ I strongly support
- ○ I support
- ○ Neither support nor oppose
- ○ I oppose
- ○ I strongly oppose
- ○ Not applicable

For more information about our arrivals routes, please see our consultation website or our Main Consultation Document.

6. Please select the main reason(s) why you have chosen your response to Question 5. (Select all which apply)

- ○ Noise
- ○ Greenhouse Gas Emissions
- ○ Tranquillity (overflight of NSAs/NPs etc)
- ○ Biodiversity (overflight of SSSIs/SPAs etc)
- ○ Capacity (including passenger delay)
- ○ Safety
- ○ Airspace access
- ○ Airline and operational procedures
- ○ Other (please specify)

Other (if required):

7. Please provide any further details about why you have selected this response.

Runway 23 departures: questions

8. How do you feel about the proposed departure routes from Runway 23?

- ○ I strongly support
- ○ I support
- ○ Neither support nor oppose
- ○ I oppose
- ○ I strongly oppose
- ○ Not applicable

For more information about our departure routes, please see our consultation website or our Main Consultation Document.

9. Please select the main reason(s) why you have chosen your response to Question 8. (Select all which apply)

- ○ Noise
- ○ Greenhouse Gas Emissions
- ○ Tranquillity (overflight of NSAs/NPs etc)
- ○ Biodiversity (overflight of SSSIs/SPAs etc)
- ○ Capacity (including passenger delay)
- ○ Safety
- ○ Airspace access
- ○ Airline and operational procedures
- ○ Other (please specify)

Other (if required):

10. Please provide any further details about why you have selected this response.

Runway 05 departures: questions

11. How do you feel about the proposed departure routes from Runway 05?

- ○ I strongly support
- ○ I support
- ○ Neither support nor oppose
- ○ I oppose
- ○ I strongly oppose
- ○ Not applicable

For more information about our departure routes, please see our consultation website or our Main Consultation Document.

12. Please select the main reason(s) why you have chosen your response to Question 11. (Select all which apply)

- ○ Noise
- ○ Greenhouse Gas Emissions
- ○ Tranquillity (overflight of NSAs/NPs etc)
- ○ Biodiversity (overflight of SSSIs/SPAs etc)
- ○ Capacity (including passenger delay)
- ○ Safety
- ○ Airspace access
- ○ Airline and operational procedures
- ○ Other (please specify)

Other (if required):

13. Please provide any further details about why you have selected this response.

Proposal to modernise the airspace surrounding Glasgow Airport

We recognise that not all stakeholders are interested in the airspace surrounding Glasgow Airport, therefore if you do not wish to respond to this section, please go directly to Question 17, on Page 10.

We recommend you review the diagrams in the Consultation Summary Document, on our website, or Main Consultation Document prior to responding to the questions.

For more information about the Controlled Airspace proposal, please see our consultation website or our Main Consultation Document.

14. How you feel about the proposed Controlled Airspace Structure in the vicinity of Glasgow Airport?

- ○ I strongly support
- ○ I support
- ○ Neither support nor oppose
- ○ I oppose
- ○ I strongly oppose

15. We recognise that the Controlled Airspace Structure spans a wide area, and there may be some areas where consultees are supportive of the proposed changes, and other areas where the consultees are in opposition. Within the following question, please identify which areas contributed to your response to Question 14. (Please tick all which apply).

	GLA CTR	GLA CTA-1	GLA CTA-2	GLA CTA-3	GLA CTA-4	GLA CTA-5	GLA CTA-6	SCTMA-1	SCTMA-4	ARGYLL CTA-1
Strongly support	○	○	○	○	○	○	○	○	○	○
Support	○	○	○	○	○	○	○	○	○	○
Neither support nor oppose	○	○	○	○	○	○	○	○	○	○
Do not support	○	○	○	○	○	○	○	○	○	○
Strongly oppose	○	○	○	○	○	○	○	○	○	○

16. Please provide any further details about why you have selected this response. We would be particularly interested to gather feedback from any new/developing airspace users (e.g. drone/remote pilots) on our Controlled Airspace Structure proposals. Please continue overleaf if required.

Final thoughts

17. Would you like to provide any further feedback about the Glasgow Airport proposals? Please let us know any other factors we should take into account.

The Glasgow Airport Airspace Change Proposal (ACP) forms part of a wider project to modernise Scottish Airspace. As part of the development of the ACP, we have worked with NATS and Edinburgh Airport to design the system wide airspace. More information can be found at scottishairspacemodernisation.co.uk.

18. If you have any feedback on the system wide proposal, please use the box below to give us your thoughts.

Thank you for taking the time to share your views. Please return your written response to:
Glasgow Airport Consultation, C/O Cavendish Consulting, 220 St Vincent Street, Glasgow G2 5SG

The consultation runs for **14 weeks from 20 October 2025 to 25 January 2026.**
For more information, please go to our consultation website: glasgowairport.consultationonline.co.uk

Appendix B: Selecting the option for consultation

Airspace modernisation ACP-2019-46

Appendix B: Selecting the option for consultation

11.1.1 A key part of the CAP1616 process is transparency to allow consultees to understand how our proposals have developed along the CAP1616 process. A lot of this development and refinement work is documented as part of the Stage 3 Full Options Appraisal (FOA), however we are aware that the FOA document is a large and technical document.

11.1.2 The following appendix aims to provide an easy-to-read summary that demonstrates the conclusions by which Glasgow Airport narrowed down the 8 options which remained at the end of Stage 2, to the single option being consulted on. For full details of this work please see the Full Options Appraisal, section 5.3 and 5.4.

11.1.3 At the beginning of the FOA there were 8 options assessed. Each of the 8 options was made up of arrivals and departures components to both Glasgow runways which were based on the outcomes of the Stage 2 work. The components and options are shown in Table 24 with further details about the components described in the below subsections. You can read more about these options as part of section 2 of the FOA.

Option name	Runway 05 arrivals	Runway 23 arrivals	Runway 05 departures	Runway 23 departures
Option 1	Vectoring only	Vectoring only	Straight ahead (no offset) departures	Straight ahead (no offset) departures
Option 2	Vectoring only	Vectoring only	Offset departures	Straight ahead (no offset) departures
Option 3	Vectoring only	Vectoring only	Straight ahead (no offset) departures	Offset departures
Option 4	Vectoring only	Vectoring only	Offset departures	Offset departures
Option 5	PBN and vectoring	PBN and vectoring	Straight ahead (no offset) departures	Straight ahead (no offset) departures
Option 6	PBN and vectoring	PBN and vectoring	Offset departures	Straight ahead (no offset) departures
Option 7	PBN and vectoring	PBN and vectoring	Straight ahead (no offset) departures	Offset departures
Option 8	PBN and vectoring	PBN and vectoring	Offset departures	Offset departures

Table 24: Component parts of the 8 options for the FOA

What do we mean by 'vectoring only' and 'PBN and vectoring'?

11.1.4 In terms of arrivals, the vectoring only options mean that there is no set route flown between the holding stacks which form part of the NATS NERL ACP, and the final approach procedures. The final approach is where aircraft descend along the extended runway centreline in preparation for landing. Rather than a route, aircraft would always be vectored by Air Traffic Control, this means that pilots are given instructions about where to fly based on compass headings and descent / climb instructions. Vectoring of arrivals is what happens today and typically leads to lots of dispersion across the airspace.

11.1.5 When referring to PBN and vectoring, this means there is now a PBN arrival route between the holding stack and the final approach. This typically leads to concentration of flight paths along the PBN route; however sometimes, in order to achieve safe separation and optimum spacing between aircraft, ATC will still be required to vector aircraft. This means there is a hybrid combination of the use of PBN routes and vectoring. On some occasions ATC may also look to utilise certain waypoints on the PBN route to position aircraft directly to those points.

What do we mean by 'offset departures' and 'straight ahead (no offset) departures'?

11.1.6 As part of Stage 2, we developed some options which use 'offset departures'. This means that when the aircraft reach 500ft on departure, the aircraft would undertake a 'track adjustment' which is a very small turn of an angle of no more than 15 degrees. This means that aircraft are offset slightly compared to a straight ahead take off, where aircraft continue straight ahead along the extended runway centreline.

11.1.7 Straight ahead departures do not undertake a track adjustment and instead after take-off they continue in a straight line before either being vectored by ATC or following the departure route procedure. This is what happens today.

11.1.8 In the case of the options for the FOA, the routes for the offset departures compared to the straight ahead departures varied at lower levels but beyond c.5,000ft the routes were the same for all options.

How did we assess the options?

11.1.9 At Stage 3 CAP1616 requires Sponsors to carry out a full assessment of the benefits and impacts of each option, tested against the 'without airspace change' scenario. The purpose of the Full Options Appraisal (FOA) is to highlight the change to Sponsors, stakeholders, and the CAA and set out, the relative differences between the impacts, both positive and negative, of each option.

11.1.10 The assessment criteria shown in Table 25 below were categorised based on the requirements outlined in CAP1616f (page 36 – 40). An additional category called 'Airspace Modernisation Strategy' was added to satisfy the indicators that the CAA will use to assess whether this Stage 3 submission accords with the AMS including iteration 3 of the Masterplan.

11.1.11 More information about how we have assessed the options against each of these categories can be found in section 8 of this document, or within section 3.3 of the FOA.

Group	Impact	Type of assessment
All	Safety	Qualitative conclusions determined following detailed safety assessments
Communities	Noise	Quantitative (data based) assessment based on the primary and secondary metrics required by CAP1616.
	Air Quality	Quantitative (data based) assessment
Wider society	Greenhouse Gas Emissions	Quantitative (data based) assessment
	Tranquillity	Quantitative (data based) assessment
	Biodiversity	Quantitative (data based) assessment
	Capacity / resilience	Quantitative (data based) assessment
General Aviation	Access	Quantitative (data based) assessment which looked at the volumes of Controlled Airspace (CAS) required
General Aviation / commercial airlines	Economic impact from increased effective capacity	Quantitative (data based) assessment
	Fuel burn	Quantitative (data based) assessment
Commercial airlines	Training costs	Assessment of potential costs incurred by airlines, the ANSP, or Glasgow Airport
	Other costs	
Airport / Air Navigation Service Provider (ANSP)	Infrastructure costs	
	Operational costs	
	Deployment costs	
	Other costs	
All	Airspace Modernisation Strategy (AMS) (CAP1711)	A qualitative assessment against the objectives of the AMS

Table 25: FOA assessment categories (as per CAP1616f page 36-40)

11.1.12 At the end of the FOA, all categories that could be monetised were combined to produce a Cost Benefit Analysis (CBA) which looks at the monetised costs associated with the ACP and produces a Net Present Value (NPV) for each option.

How did we draw conclusions on which option to take forward to this consultation?

11.1.13 When determining which option(s) to take to consultation, Glasgow Airport considered the outcomes of the cost benefit analysis and the detailed assessments undertaken against each FOA category to understand the options positive benefits and negative impacts.

11.1.14 In some cases, if multiple options perform similarly against the 'without airspace change' baseline, we also looked at the comparative performance of each option. It's really important to note that the threshold for discontinuing an option cannot be based on quantitative assessments alone but must also come down to the qualitative appraisals and professional judgment, as there are many factors and FOA categories to balance.

11.1.15 When considering the environmental assessments within the FOA, we have looked to the Air Navigation Guidance (ANG) 2017 (https://www.gov.uk/government/publications/uk-air-navigation-guidance-2017). The ANG is guidance to the CAA on its environmental objectives when carrying out its air navigation functions, and to the CAA and wider industry on airspace and noise management. The ANG outlines the Government's altitude based priorities for consideration of the environmental impacts arising from airspace change proposals.

Altitude based priority (See B29, CAP1616 and ANG 2017)	**How it is considered when shortlisting**
In the airspace from the ground to below 4,000 feet, the Government's environmental priority is to limit and, where possible, reduce the total adverse noise effects on people.	The FOA quantified total adverse noise effects for each option and the 'without airspace change' baseline. We considered how each option performs against the 'without airspace change' baseline, and how the options comparatively perform amongst each other.
Where options for route design from the ground to below 4,000 feet are similar in terms of the number of people affected by total adverse noise effects, preference should be given to that option which is most consistent with existing published airspace arrangements.	When options perform similarly in terms of total adverse noise effects, we considered how options compare against the 'without airspace change' baseline airspace arrangements in terms of significant noise effects and the secondary noise metrics of overflight, N65 and N60.
In the airspace at or above 4,000 feet to below 7,000 feet, the environmental priority should continue to be minimising the impact of aviation noise in a manner consistent with the Government's overall policy on aviation noise, unless the CAA is satisfied that the evidence presented by the Sponsor demonstrates this would disproportionately increase CO_2 emissions.	When options perform similarly in terms of total adverse noise effects, we considered the greenhouse gas assessments to understand whether any option would result in disproportionately higher levels of Greenhouse Gas Emissions.

Table 26: ANG priorities when shortlisting

11.1.16 Alongside the ANG2017, we also looked to the **Airspace Modernisation Strategy (AMS)** which is the main driver behind the overall Scottish Airspace Modernisation change. The AMS has an overall vision to *'Deliver quicker, quieter and cleaner journeys and more capacity for the benefit of those who use and are affected by UK airspace'* and four objectives:

11.1.17

Safety: Maintaining and, where possible, improving the UK's high levels of aviation safety has priority over all other 'ends' to be achieved by airspace modernisation.

Integration of diverse users: Airspace modernisation should wherever possible satisfy the requirements of operators and owners of all classes of aircraft, including the accommodation of existing users (such as commercial, General Aviation, military, taking into account interests of national security) and new or rapidly developing users (such as remotely piloted aircraft systems, advanced air mobility, spacecraft, high-altitude platform systems).

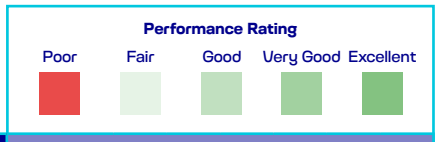
Simplification, reducing complexity and improving efficiency: Consistent with the safe operation of aircraft, airspace modernisation should wherever possible secure the most efficient use of airspace and the expeditious flow of traffic, accommodating new demand and improving system resilience to the benefit of airspace users, thus improving choice and value for money for consumers.

Environmental sustainability: Environmental sustainability will be an overarching principle applied through all airspace modernisation activities. Modernisation should deliver the Government's key environmental objectives with respect to air navigation as set out in the Government's Air Navigation Guidance (ANG) and, in doing so, will take account of the interests of all stakeholders affected by the use of airspace.

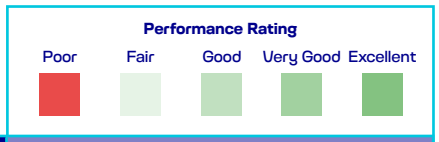
11.1.18 When determining which option(s) to take to consultation, Glasgow Airport considered the outcomes of the cost benefit analysis and the detailed assessments undertaken against each FOA category to understand the option's positive benefits and negative impacts.

Summary of the Full Options Appraisal conclusion

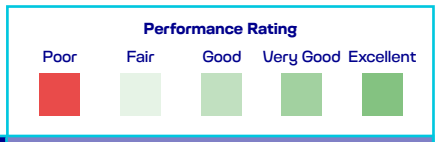
11.1.19 Within the following diagram we have summarised the outcome of the FOA conclusion. For full details, please see the Full Options Appraisal, section 5.3 and 5.4.



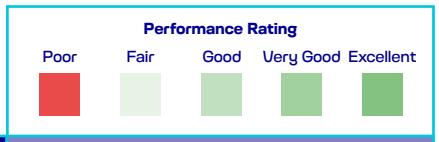
Conclusion assessment	Option
Air Navigation Guidance (ANG) 2017	
In the first instance, as per the Government's altitude based priorities and CAP1616 requirements, we looked at each option's performance in terms of the total adverse noise effects on people. This told us that all 8 options resulted in a substantial reduction of total adverse effects compared to the 'without airspace change' baseline. Total adverse effects are determined from adverse effects, significant adverse effects, beneficial effects and significant beneficial effects and so the next step was to look in detail at these assessments, particularly around the adverse and significantly adverse noise effects. All options showed similar performance in terms of significant adverse effects and adverse effects, and therefore we looked to the second section of the altitude based priorities; where options for route design from the ground to below 4,000 feet are similar in terms of the number of people affected by total adverse noise effects, preference should be given to that option which is most consistent with existing published airspace arrangements. To assess this, we calculated data which helped us to understand the scale of the noise change experienced at individual postcodes and community areas. This showed that the options with offset departures were the least consistent with the existing published airspace arrangements. What this meant was options more consistent with the existing airspace arrangements result in people who are already impacted today continuing to be impacted in future, whereas options that use the offset departures may offer a slightly better overall benefit, but there is significant change in order to do this. This means communities impacted today may see significant benefits (large noise decreases), but this comes at the cost of significant impacts (large noise increases) over new communities in future. When this is weighed up against the small differences in overall benefits, the ANG points to keeping routes as consistent with current day as possible. In addition to the noise assessment above, we also considered the other benefits and/or impacts below 4,000ft as part of the discontinuing process. This found that in the other assessment categories, such as air quality and biodiversity there were no differences between the options. The tranquillity assessment reflected similar outcomes to the noise assessment above with the straight ahead departures being more consistent with what happens today. The fuel burn and CO2 assessment showed very marginal difference between the options of around 0.2%.	1 2 3 4 5 6 7 8



Conclusion assessment	Option							
	1	2	3	4	5	6	7	8
Considering all this in combination, it was found that Options 1, 2, 5, and 6 were more consistent with the existing published airspace arrangements, whereas Options 3, 4, 7, and 8 were the least consistent. Therefore, on the basis of the ANG2017 and how the options performed in terms of both total adverse noise affects and community adverse noise effects and consistency with the existing airspace arrangements, we discontinued options 3, 4, 7 and 8. There were no other specific assessments (such as safety, capacity, Controlled Airspace, etc) below 4,000ft which would differentiate between the four options discontinued, and the four taken forward for further consideration at this stage. In terms of Controlled Airspace (CAS), although options 3 and 4 require less CAS than options 5 and 6, Options 1 and 2 have the same CAS volumes as 3 and 4 and Options 5 and 6 have the same CAS volumes as 7 and 8. Therefore by progressing options 1,2,5, and 6 we are still considering the larger and smaller CAS volumes possible.								
The next step was to look at the objectives of the AMS:								
AMS objective: Safety								
All the remaining options at least maintain safety but the options with PBN arrivals transitions offer improved safety performance compared to the 'without airspace change' baseline. This meant that options 5 and 6, which have PBN arrivals transitions and vectoring, offer marginally more benefits than options 1 and 2 which only use vectoring for arrivals. At this stage, options 1 and 2 were not discontinued but their performance was balanced against the other objectives of the AMS.	1	2			5	6		
AMS objective: Integration of diverse users								
When considering integration of diverse users, we looked to the General Aviation and Controlled Airspace assessments. All options offered a reduction in the volume of CAS required which is an improvement compared to the 'without airspace change' scenario. Although all options offered less CAS than today, options 5 and 6 require slightly more airspace than options 1 and option 2. At this stage, options 5 and 6 were not discontinued but their performance was balanced against the other objectives of the AMS as, for example, the safety assessment above had highlighted that they offered opportunities for improvement to safety.	1	2			5	6		



Conclusion assessment	Option							
AMS objective: Simplification, reducing complexity & improving efficiency								
All options offer improvements to capacity and aim to simplify and reduce complexity in the airspace compared to the 'without airspace change' scenario. The departure delay analysis showed that option 1 and option 5 offer fewer delay minutes per annum than options 2 and 6. Just like with the safety and CAS assessments above, this didn't mean options 2 and 6 were immediately discontinued, but we balanced the outcomes of this assessment against the other objectives of the AMS.	**1**	**2**			**5**	**6**		
AMS objective: Environmental sustainability – Greenhouse Gas Emissions								
In terms of fuel burn and Greenhouse Gas Emissions, there is a very small difference of around 0.2% between the best and worst performing option (all options improved compared to the 'without airspace change' scenario). The ANG 2017 says: *In the airspace at or above 4,000 feet to below 7,000 feet, the environmental priority should continue to be minimising the impact of aviation noise in a manner consistent with the Government's overall policy on aviation noise, unless the CAA is satisfied that the evidence presented by the Sponsor demonstrates this would disproportionately increase CO2 emissions.* Based on the greenhouse gas assessment, we knew that none of the options would result in a disproportionate increase in CO2 emissions and therefore we looked to the secondary noise assessments.	**1**	**2**			**5**	**6**		
AMS objective: Environmental sustainability – secondary noise metrics								
In the case of the N60 and N65 noise metrics, there were very small differences between the options. In the case of N65 (daytime), all options were within c.1% of each other. In the case of N60 (nighttime) all options were within <1% of each other. There was however more differentiation between the options when looking at the overflight metrics. Here there were two key metrics; total population overflown and population newly overflown for both daytime and nighttime. **Option 1** had the second highest population overflown in total and the second highest population newly overflown (considering day and night together). **Option 2** had the highest population overflown in total and the highest population newly overflown (considering day and night together). **Option 5** has the lowest population overflown in total and the lowest population newly overflown (considering day and night together). **Option 6** has the second lowest population overflown in total and the second lowest population newly overflown (considering day and night together).	**1**	**2**			**5**	**6**		



Conclusion assessment	Option
Overall	

When taking the various conclusions above into account and balancing how the options performed against the objectives of the AMS, Glasgow Airport elected to take option 5 through to consultation.
This was because:

- **Option 5 provides a reduction in the total adverse effects of noise:** a reduction in adverse noise effects, significant adverse noise effects and the total adverse noise effects as measured by the TAG methodology. It is acknowledged that option 5 was not the highest performing option when looking at the TAG valuation. However, it is important to note that this valuation effectively adds all of the noise effects (adverse effects, significant adverse effects, beneficial effects and significant beneficial effects) into a single value, so it is necessary to look in more detail at the noise effects using the L_{Aeq} metrics to understand the balance of positive and negative effects and their significance. The options with the larger TAG valuations (3,4, 7 and 8) are driven by a very large number of negligible to minor noise changes and a number of moderate to major noise changes that would result in significant adverse effects for thousands of people. By contrast, option 5 has a lower TAG valuation but results in significant adverse effects for less than 100 people. This is explained in detail in FOA paragraphs 5.4.7 to 5.4.18.

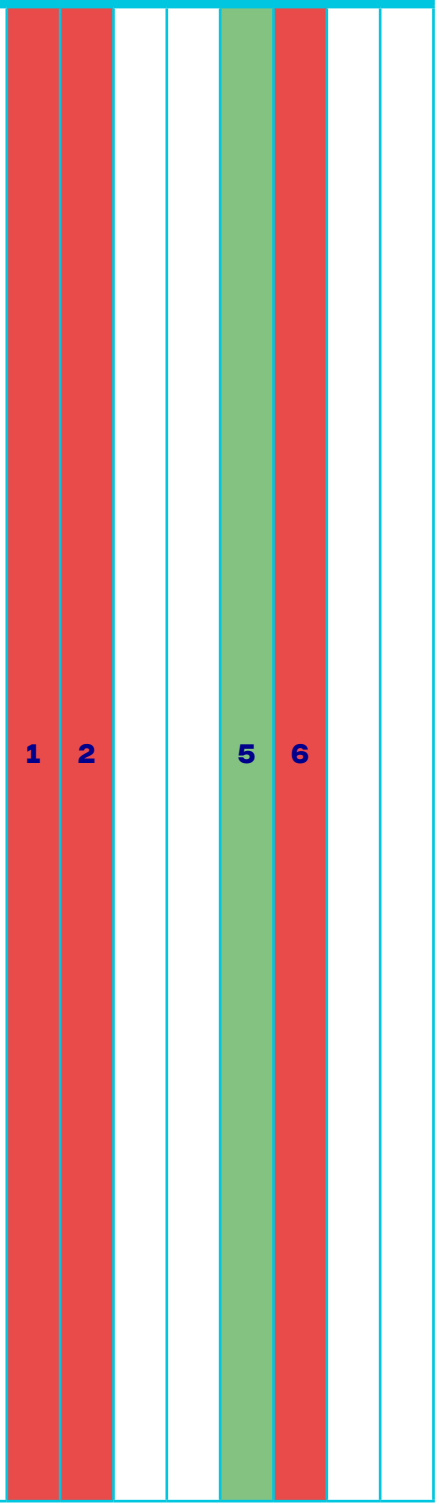
- When looking at the secondary noise metrics for overflight, option 5 was the top performing option with the **lowest population overflown in total and the lowest population newly overflown** (considering day and night together).

- Option 5 offers **a Greenhouse Gas Emissions reduction** compared to the 'without airspace change' scenario and provides the second greatest reduction in emissions across the options.

- This option offered **improvements to safety** which is a key objective of the AMS.

- In terms of integration of diverse users, **option 5 would require less CAS than today**. It is acknowledged that option 5 would require 14.4nm3 of extra Controlled Airspace compared to option 1 and option 2 which is due to a combination of optimal PBN flight path positioning for environmental and operational purposes and adherence to the CAA Policy for the Design of Controlled Airspace Structures, however overall, the option still offers a CAS benefit compared to the 'without airspace change' baseline and the option offers benefits in several other AMS objective areas.

- Option 5 offered high performance in departure delay minutes and was joint highest performing for simplification, reducing complexity & improving efficiency, another key objective of the AMS.



Why has Glasgow Airport only presented one option for consultation and how can I shape the proposal if there is only one option?

11.1.20 The outcomes of the FOA summarised above resulted in option 5 being identified as the preferred option. Glasgow Airport then carefully considered whether to take any of the other options forward to consultation.

11.1.21 We recognise that airspace is a complex topic to understand and there is lots of information we are required to present as part of the CAP1616 airspace change process. We decided to bring only one option forward to be able to present to consultees the very detailed information around how the proposal could benefit or impact compared to the 'without airspace change' scenario as clearly and transparently as possible.

11.1.22 Most importantly, presenting one option at consultation does not limit the opportunities for the proposal to be shaped by the consultation process. For example, you may tell us that it would be advantageous to move a route slightly to avoid a noise sensitive area, or a boundary of Controlled Airspace would benefit from a lateral change to better suit a visual reference point.

11.1.23 All your feedback will be considered by Glasgow Airport, and we will document this process so that you can understand how your feedback has been considered as part of the final proposal.

11.1.24 Your feedback will also help us to further understand the benefits and impacts of the proposal and where possible we will incorporate this into future options appraisals.

11.1.25 The full process will be documented so that you can see how your feedback has been considered and how we have developed the final airspace design.

Appendix C: Noise mapping and data tables

Due to final size, this document is published separately. Please follow the link here.

End of Consultation Document

GLASGOW AIRPORT