Airspace Change Proposal: Step 2b

Initial Options Appraisal

Leeds Bradford Airport FASI(N)

1 Jun 2023

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www.cyrrus.co.uk

info@cyrrus.co.uk

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Document title	Airspace Change Proposal: Step 2b
Author	
Reviewed by	
Produced by	Cyrrus Projects Limited Cyrrus House Concept Business Court Allendale Road Thirsk North Yorkshire YO7 3NY T: +44 (0) 1845 522 585 F: +44 (0) 8707 622 325 E: info@cyrrus.co.uk W: www.cyrrus.co.uk
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Executive Summary

Leeds Bradford Airport passed the CAA CAP 1616 Stage 1 Gateway in March 2022 and commenced Stage 2 activities. A comprehensive list of design options was subsequently developed through internal workshops and targeted stakeholder engagement in accordance with the CAA's CAP1616 process. These options were subsequently evaluated against the Design Principles that were developed during Stage 1.

The comprehensive list of design options, developed for this Airspace Change Proposal, together with the results of the Design Principle Evaluation, was provided in the 'Options Development and Design Principle Evaluation' document which can be found on the ACP Portal. It served as the submission for the first part of the Stage 2 process (Step 2a).

This document forms the second part of the Stage 2 submission (Step 2b) and details the Initial Options Appraisal. This Initial Options Appraisal sets out to assess the twenty-four departure swathes and five arrival system design options, put forward following the Design Principle Evaluation, against a set of high-level objectives and assessment criteria. Ultimately, the aim being to refine the list of design options to a shortlist for progression to Stage 3.

The document is structured in such a way as to remind the reader of the progress made to date and provides an explanation of the methodology and criteria used for the assessment. This is followed by a re-affirmation of the 'baseline'. The baseline is critical as it is the bar against which potential changes can be measured. It is important to understand that the Initial Options Appraisal that follows has been done as a 'Qualitative Assessment' vice a 'Quantitative Assessment'. This has been done as there is insufficient detail in the design options to assess them mathematically or scientifically; accordingly, the assessment is subjective and based on professional judgement. Every effort has been made to maintain a level and standardised approach to the assessment and the decision-making process of retaining or rejecting design options is explained. A 'Quantitative Assessment' will be conducted against the more mature design options developed within Step 3a.

Through this Initial Options Appraisal, thirteen departure swathe and three arrival system design options have been identified as worthy of further development at Step 3a. These retained design options are detailed in the table at the end of the document along with an identification of the 'Preferred Option' for each objective at this stage. It is entirely possible that the preferred option may change as the process continues towards public consultation.

Abbreviations

ACOG	Airspace Change Organising Group
ACP	Airspace Change Proposal
AMS	Airspace Modernisation Strategy
ANSP	Air Navigation Service Provider
AONB	Area of Outstanding Natural Beauty
ATC	Air Traffic Control
ATM	Air Traffic Management
CAA	Civil Aviation Authority
CAP	Civil Aviation Publication
CAT	Commercial Air Transport
CCO	Continuous Climb Operations
CDO	Continuous Descent Operations
CTA	Control Areas
CTR	Control Zones
dB	Decibels
DfT	Department for Transport
DME	Distance Measuring Equipment
DO	Design Option
DP	Design Principle
DPE	Design Principle Evaluation
DSA	Doncaster Sheffield Airport
DVOR	Doppler VHF Omni-Directional Range
EU	European Union
FAS	Future Airspace Strategy
FASI-S	Future Airspace Implementation South
FASI-N	Future Airspace Implementation North
GA	General Aviation
GNSS	Global Navigation Satellite Systems
hPA	Hectopascals
IAF	Initial Approach Fix
IAP	Instrument Approach Procedure
IFP	Instrument Flight Procedure
ICAO	International Civil Aviation Organisation

IOA	Initial Options Appraisal
LPA	Local Planning Authority
METAR	Meteorological Actual Report
NAP	Noise Abatement Procedures
NERL	National Air Traffic Services En-Route Limited
NP	National Park
NPR	Noise Preferential Route
NTMS	Noise and Track Monitoring System
PBN	Performance-Based Navigation
PBN IR	Performance-Based Navigation Implementing Regulation
RNAV	Area Navigation
RVR	Runway Visual Range
RW	Runway (when followed by runway designator numbers e.g. RW32)
SID	Standard Instrument Departures
STAR	Standard Arrival
TDZ	Touchdown Zone
UK	United Kingdom

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1. Introduction

1.1. AMS and the Regulatory Requirement for Change

1.1.1. The Civil Aviation Authority (CAA) published its Airspace Modernisation Strategy (AMS) in December 2018. This Strategy was developed in response to the Department for Transport (DfT), tasking the CAA with preparing and maintaining a co-ordinated plan for the use of the United Kingdom (UK) Airspace up to 2040, including modernisation.

1.1.2. The AMS, which replaced the Future Airspace Strategy (FAS), sets out the ways, the means and ends of modernising airspace through 15 initiatives intended to modernise the Design, Technology and Operations of airspace. Amongst other initiatives, this includes a fundamental redesign of the terminal route network using precise and flexible satellite navigation vice conventional navigation.

1.1.3. The UK's Airspace was originally designed decades ago; it has evolved over time to manage the increasing volumes of climbing and descending aircraft travelling to and from the various airports all within close proximity. This complex evolution has resulted in an environmentally inefficient and overly complicated design that places a burden on Air Traffic Controller Officers (ATCOs) and limits airspace capacity. Whilst COVID-19 has undoubtedly had a significant impact upon the aviation and travel industries, if the airspace is not modernised, the potential benefits of reduced carbon emissions and noise reduction may not be realised.

1.1.4. The Airspace Change Organising Group (ACOG) was established in 2019, as a fully independent organisation within NATS, under the direction of the DfT and CAA, to coordinate the delivery of key aspects of the AMS.

1.1.5. The requirement for ACOG is to coordinate the delivery of two major national airspace change programmes known as Future Airspace Implementation South (FASI-S) and Future Airspace Implementation North (FASI-N). FASI-N is a complete redesign of the existing airspace structure in Northern England and Scotland. LBA is one of nine airports included within this programme.

1.1.6. ACOG, in collaboration with NATS En-Route Limited (NERL) and each of the Airports, must deliver a Masterplan that provides detailed information on the Airspace Design options. The Masterplan must consider potential areas of overlap between individual Airspace Change Proposals (ACPs), along with the compromises and trade-offs that may need to be made to integrate them effectively.

1.1.7. LBA, just as with all the airports affected, must ensure that their modernisation proposals are aligned with neighbouring airports and connect efficiently with the network above. The FASI(N) airports are responsible for modernising or upgrading their individual arrival and departure routes up to 7,000ft. NERL are responsible for redesigning the route network above 7,000ft.

1.1.8. For more information, including a brief video, on the importance of modernising UK airspace, see https://www.ourfutureskies.uk/why-modernise/

1.1.9. One of the major aims of the AMS is to optimise future airspace designs to take account of modern aircraft performance and functional capabilities and make them more efficient, saving time, fuel and reducing emissions.

1.1.10. The key to achieving this is through the application of Performance-Based Navigation (PBN). In parallel, the UK navigation infrastructure can also be optimised to take advantage of the lateral navigation accuracy from Global Navigation Satellite Systems (GNSS), while retaining adequate conventional ground-based navigation aids to ensure both resilience and contingency measures.

1.1.11. PBN is being adopted world-wide. Airspace will be modernised through International, Regional and State level initiatives, including regulations. It impacts both the high-level airways and the lower-level arrival and departure routes into and out of airports and Instrument Approach Procedures (IAPs).

1.1.12. European-wide legislation: Commission Implementing Regulation EU 2018/1048, PBN-IR was developed to drive the deployment of PBN in the European region to meet the international vision laid down by the International Civil Aviation Organisation (ICAO).

1.2. Where is LBA in the CAP1616 Process?

1.2.1. CAA regulation CAP1616 defines the ACP process. The ACP is designed to be transparent, comprehensible, and proportionate. It is aligned to the Government's Policy on managing airspace.

1.2.2. The 7-stage process contains 14 ‘Steps’ and 4 ‘Gateways’. The Change Sponsor must satisfy the CAA at each of these ‘Gateways’ that it has fully followed the process. Failure to do so results in the need to conduct further work until such time as the CAA is satisfied.

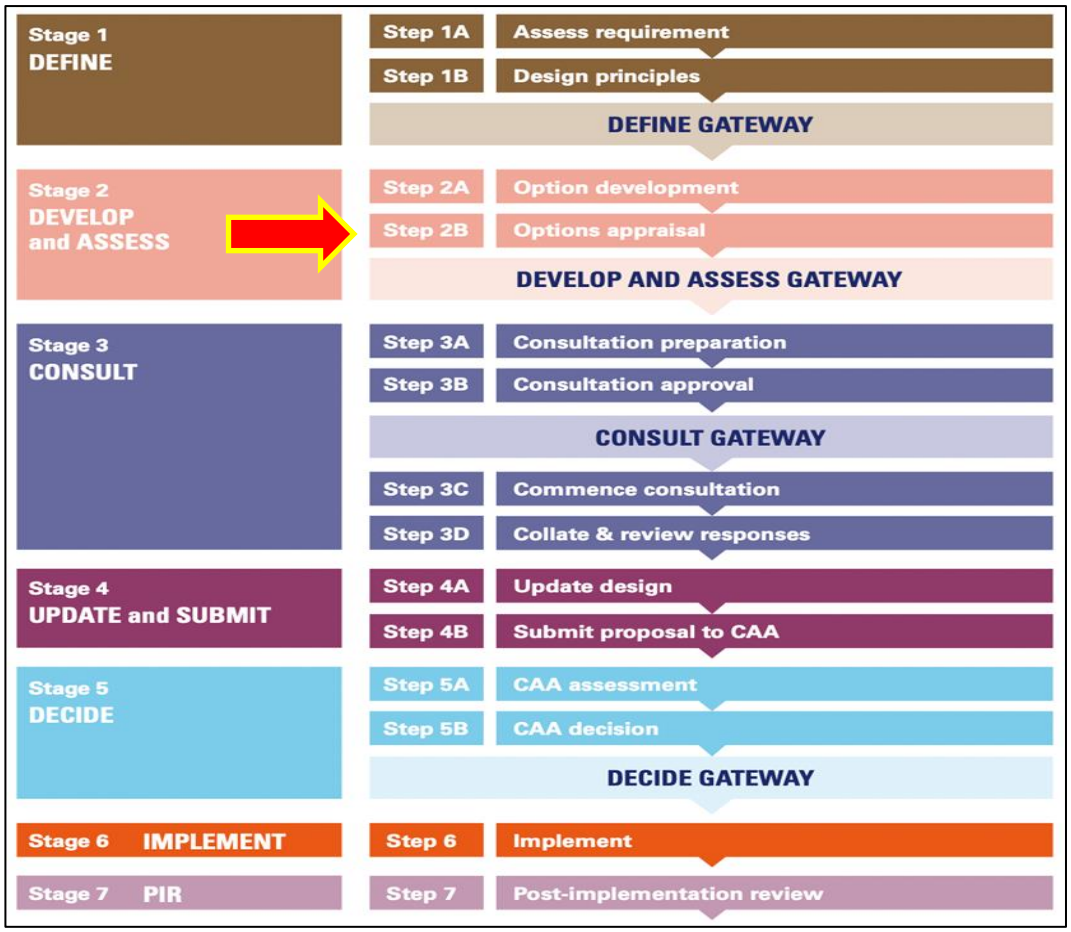


Figure 1: CAP1616 Process

1.2.3. LBA has completed the activities associated with Step 2a of the process having developed a long list of Design Options (DOs) for evaluation against the agreed Design Principles (DPs) in conjunction with key identified stakeholders at a representative level.

1.2.4. This report forms the latter part of the Stage 2 submission (Step 2b) and details the Initial Options Appraisal (IOA) and Initial Safety Assessment (ISA).

1.3. The story so far

1.3.1. LBA passed the CAA CAP 1616 Stage 1 Gateway in March 2022 and commenced Stage 2 activities. A Comprehensive List of DOs were developed through internal workshops and stakeholder engagement. These DOs were assessed against the Design Principles (DPs) developed during Stage 1 of this ACP process.

1.3.2. Workshops were held in July 2022 which introduced the list of DOs to the stakeholders and our assessment of the DOs against the design principles they helped us develop. Following these workshops stakeholders were invited to take part in an online survey which ran from mid-July 2022 to late-August 2022. This survey asked whether the stakeholders felt we had applied the DPs correctly and consistently to each of our DOs. It provided an opportunity to comment on areas they felt this may not have been the case.

1.3.3. Following a period of reflection, and in response to some stakeholder feedback, a series of additional departure DOs were conceived along with a revised array of arrival system DOs. These DOs were shared with the same set of stakeholders throughout April 2023 through a presentation sent out via email. The presentation was accompanied by an online survey and again sought feedback on whether stakeholders felt we had applied the DPs correctly and consistently to each of our DOs.

1.3.4. This report forms the latter part of the Stage 2 submission (Step 2b) whilst the accompanying report details the Step 2a activity including a Comprehensive List of DOs that were developed for this ACP and associated the Design Principle Evaluation (DPE).

1.3.5. The IOA is intended to fulfil the requirements of Step 2b and completes the steps within Stage 2 of the process.

2. Options Appraisal Criteria and Methodology

2.1. CAP1616 Requirements – Step 2b

2.1.1. Change Sponsors are required to complete an Options Appraisal process to assess the potential impacts (positive and negative) of the various DOs as compared to the baseline scenario (the Do Nothing).

2.1.2. The minimum requirement at Step 2b is to identify the Assessment Criteria and conduct a Qualitative Assessment of each DO against the baseline scenario. This Initial Options Appraisal (IOA) process facilitates the determination of a 'Shortlist of Options' including the 'Preferred Options' for a more thorough Quantitative Assessment later in the process once DOs have been sufficiently developed.

2.1.3. A Full Options Appraisal (FOA) is conducted at Step 3a followed by a Final Options Appraisal at Step 4a.

2.2. High Level Objectives and Assessment Criteria

2.2.1. At Step 2b options are assessed against the criteria contained in Appendix E (Table E2) of CAP1616 with the addition of Tranquillity and Safety.

Group	Impact	Qualitative Assessment
Communities	Noise impact on health and quality of life	A qualitative assessment of changes to the noise impact for each option when compared to the Baseline option.
	Air Quality	A qualitative assessment of changes to the local air quality for each option when compared to the Baseline option. This has been done using high level overflight assessments of each option.
Wider society	Greenhouse gas impact	A qualitative assessment of changes to the greenhouse gas impact for each option when compared to the Baseline. This has been done by considering the difference in track miles to give an indication of the overall impact.
	Capacity/ resilience	A qualitative assessment of changes to airspace capacity and resilience for each option when compared to the Baseline option.

Group	Impact	Qualitative Assessment
	Tranquillity	A qualitative assessment of changes to the tranquillity impact for each option when compared to the Baseline option. This has been done paying particular attention to the Nidderdale AONB and the Yorkshire Dales and Peak District National Parks.
General aviation	Access	A qualitative assessment of changes to the General Aviation (GA) access to airspace for each option when compared to the Baseline option.
General aviation/ commercial airlines	Economic impact from increased effective capacity	A qualitative assessment of the economic impact for GA and commercial airlines from changes to capacity for each option when compared to the Baseline option.
	Fuel-burn	A qualitative assessment of changes to the impact to fuel-burn for GA and commercial airlines for each option when compared to the Baseline option. This has been done by considering the difference in track miles to give an indication of the overall impact.
Commercial airlines	Training costs	A qualitative assessment of changes to commercial airline training costs for each option when compared to the Baseline option.
	Other costs	A qualitative assessment of changes to additional commercial airline costs for each option when compared to the Baseline option.
Airport/ Air navigation service provider	Infrastructure costs	A qualitative assessment of changes to infrastructure costs for the Airport and/or Air Navigation Service Provider (ANSP) for each option when compared to the Baseline option.
	Operational costs	A qualitative assessment of changes to operational costs for the Airport and/or ANSP for each option when compared to the Baseline option.
	Deployment costs	A qualitative assessment of deployment costs for the Airport and/or ANSP for each option when compared to the Baseline option.

Group	Impact	Qualitative Assessment
All	Safety	A qualitative safety assessment for each option when compared to the Baseline option.

Table 1: CAP1616 Assessment Criteria

2.3. Methodology

2.3.1. The development and evolution of the DOs was explained in the 'Options Development & Design Principle Evaluation' document that accompanies this in the Stage 2 Gateway submission. Each of the DOs that were retained following DPE are now further assessed against the criteria listed in Table 1 as compared with the 'Do Nothing' baseline detailed in Section 3.

2.4. Shortlisting

2.4.1. As each DO is assessed in turn, a qualitative determination will be made as to whether it should be carried forward to Stage 3 or not. Each DO will be categorised as follows:

Carry Forward	Meets objectives with insignificant negative impact and is the Preferred Option for this procedure
Carry Forward	Meets objectives but is less attractive due to potential impacts that require mitigation
Reject	Fails to meet one or more objectives or has a significant impact that cannot be effectively mitigated

Table 2: Shortlisting Description

2.5. Further Options Appraisal (FOA) - Step 3a and Step 4a

2.5.1. The FOA[1] requires Change Sponsors to conduct a quantitative analysis of the DOs shortlisted for consultation and to do this, Change Sponsors must collect quantitative environmental metrics on the baseline scenario. Additionally, the DOs need to be modelled to facilitate an environmental comparison. LBA will gather the following metrics for the FOA[2][3]:

- 10-year traffic forecasts (including all the years in between in order to facilitate a comparison between today's operation and 10 years hence, with or without implementation post the intended implementation date);
- CO_2 emissions and fuel-burn assessment (using WebTAG);
- Local air quality assessment (using WebTAG);

[1] Full Options Appraisal at Step 3a and Final Options Appraisal at Step 4a.
[2] See Appendix B, Page 162 of CAP1616 4th Edition
[3] For a thorough explanation of some of the applicable Noise Metrics, see CAP1616A

- Operational diagrams;
- Overflight metrics (as per CAP1498).
- Standard noise metrics:
    - Equivalent Continuous Sound Level (L_{Aeq}) noise contours.
    - 100% mode noise contours.
    - Nx contours.
    - Difference contours.
    - Maximum Sound Level (L_{max}) spot point levels.

2.5.2. In addition, there will be explicit consideration of any changes to routes and/or traffic patterns that may affect an Area of Outstanding Natural Beauty (AONB), such as Nidderdale, or a National Park (NP) such as The Yorkshire Dales or The Peak District. It should be noted that given the finite amount of airspace available in the UK and the fixed location of airports and NPs or AONBs, it will not always be practical to completely avoid overflying them and there are no legislative requirements to do so, as this would be impractical. Nevertheless, Change Sponsors must show how they have considered and taken account of this impact as part of their option development and final design.

2.5.3. The Government's Transport Analysis Guidance (WebTAG) has not been used within this IOA but will be used alongside the guidance within the Government's 'Green Book' during the FOA.

2.6. Altitude-Based Priorities for Environmental Impacts

2.6.1. The Government's priorities for consideration of the environmental impacts arising from airspace change proposals are set out in its Air Navigation Guidance. For the purposes of assessing environmental impacts of ACPs the CAA should apply the following altitude-based priorities:

- 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 effects on people;
- 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;
- 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;

- in the airspace at or above 7,000 feet, the CAA should prioritise the reduction of aircraft CO^2 emissions and the minimising of noise is no longer the priority;
- where practicable, it is desirable that airspace routes below 7,000 feet should seek to avoid flying over AONB and NPs; and,
- all changes below 7,000 feet should take into account local circumstances in the development of the airspace design, including the actual height of the ground level being overflown, and should not be agreed to by the CAA before appropriate community engagement has been conducted by the sponsor.

2.6.2. This ACP concerns changes being made from the surface to 7,000 feet and accordingly, five of the above bullets apply.

3. Reminder of 'The Baseline'

3.1. CAP1616 Requirement for a Baseline

3.1.1. CAP1616 requires airspace change sponsors to identify a baseline to facilitate environmental evaluation of the DOs. It explains that this will be a 'Do Nothing' scenario and will largely reflect the current-day scenario, although taking due consideration of known or anticipated factors that might affect that baseline, for example any significant planned housing developments close to an airport, forecast growth in air traffic, or expected changes in airlines' fleet mix. Therefore, all environmental assessments must illustrate the difference between a pre-implementation ('Do Nothing') scenario and a post-implementation scenario, ensuring that the periods are comparable.

3.2. The Do-Nothing Scenario

3.2.1. CAP1616 acknowledges that in certain cases, doing nothing is not a feasible option in reality[4]. In such cases, in addition to the 'Do Nothing' baseline, Change Sponsors are required to set out an informed view of the future and the minimum changes required to address the identified issues, i.e. the 'Do Minimum' option.

3.2.2. LBA has not got the option to 'Do Nothing' owing to the Airport's reliance on ground-based navigational aids known as Doppler VHF (Very High Frequency) Omni-Directional Range (DVOR) beacons that are being decommissioned as part of the wider plans to modernise UK airspace as set out in the AMS. The DVOR beacons at Pole Hill (POL) and Gamston (GAM) are fundamental to LBA's departure procedures, and the GAM (amongst many others) is being withdrawn by NERL in favour of a more efficient satellite-based navigational system, known as Global Navigation Satellite System (GNSS).

3.2.3. Four of LBA's departure procedures (SIDs) are predicated on radials and ranges from the GAM DVOR but aircraft will soon be left without this navigational aid from which to obtain these radials and ranges.

3.2.4. As this ACP will not be complete before these DVORs are decommissioned, a temporary solution has been applied for through a CAA process detailed in CAP1781[5]. LBA has submitted an Impact Assessment for a CAP1781 application to substitute the affected SIDs with Area Navigation (RNAV) overlays. RNAV Substitution is not an alternative to either deleting procedures or replacing conventional procedures with RNAV procedures when a dependent navigation aid is removed but, subject to certain conditions, it can provide an interim step which gives procedure owners additional time to plan and implement their RNAV strategy, including any consultation required by the ACP, without preventing the navigation aid rationalisation programme from continuing. The conclusion of this ACP may not be until as late as 2027 but the Airport needs to continue to function.

3.2.5. As CAP1781 is not intended as a long-term solution, an 'airspace modernisation' ACP (this project) is required to develop options for the future operations at the Airport. It may not

[4] CAP 1616 Appendix E paragraph E21.
[5] CAP1781 DVOR/DME/NDB Rationalisation: Guidance for the use of RNAV Substitution Version 2 dated 4th Aug 22.

be possible to entirely replicate the procedures that exist today, nor is that necessarily desirable either operationally or environmentally. It is important to take a fresh look at the airspace and its operation in the spirit of modernisation.

3.2.6. On leaving the European Union, the UK Government did not retain all elements of the Performance-Based Navigation Implementing Regulation (PBN IR). Industry awaits what form of legislation for PBN is developed in the UK however, the goals of the AMS will most likely be aligned with the European Regulations and it is entirely realistic to expect an exclusive use of PBN in UK airspace in the 2030 timeframe.

3.2.7. The implementation of PBN approach and departure procedures as part of this ACP, which is unlikely to conclude until 2027 at the earliest, is appropriate and therefore it is not feasible to 'Do Nothing'. There is however scope to 'Do Minimum' and the DOs closest to the baseline are identified in Section 4 of this document. The nature of the departure swathes and arrival system descriptions is that they are vague enough to allow for detailed designs that will bear relatively close resemblance to today's procedures should that be favoured.

3.3. The Arrivals Baseline

3.3.1. Inbound aircraft to LBA largely follow the routings depicted in the UK Aeronautical Information Publication (AIP). LBA does not have designed and published Standard Arrival Routes (STARs) or Arrival Transitions. Aircraft that are inbound from the Route Network are typically issued tactical headings prior to transfer from Scottish Control to LBA radar descending to an agreed level through a 'gate'. The UK AIP details the routings off the various routes on the Network. The AIP also states: 'Aircraft likely to be issued tactical headings prior to transfer from Scottish Control to EGNM RAD'.

3.3.2. Figure 2 gives an idea of how that gate system looks. The orange arrows show traffic leaving the Route Network and generally heading towards a gate (pink lines) in the descent to FL80 (8,000ft). Aircraft are then either vectored by Leeds Radar to 10nm finals on the extended centreline of the runway in use or they are sent to the LBA hold (overhead the Airport) until such time as it is possible to accommodate their approach.

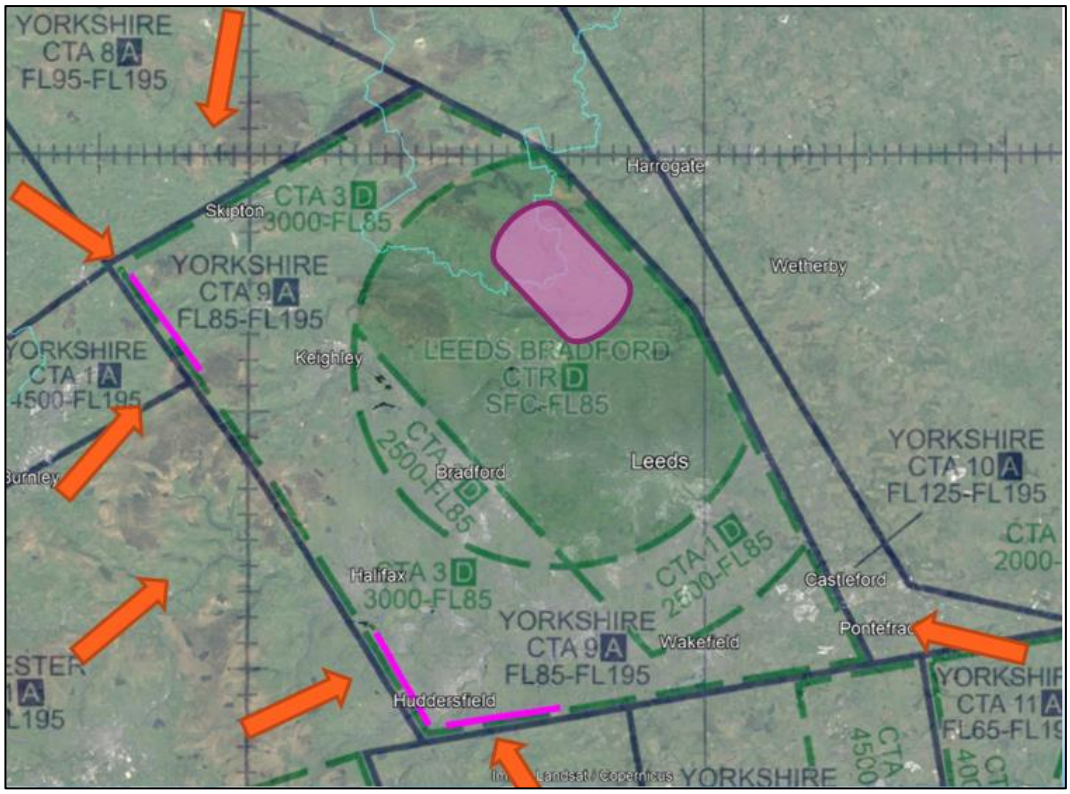


Figure 2: Baseline Gate and Single Hold System

3.3.3. Arrivals to LBA are predominantly from the South, East and West with only a small number arriving from the North and North-West. Using actual track data from LBA's Noise and Track Monitoring System (NTMS), the existing baseline of arrival swathes can be determined. A sample was taken for the week commencing 1st August 2022 and this can be seen at Figure 3.

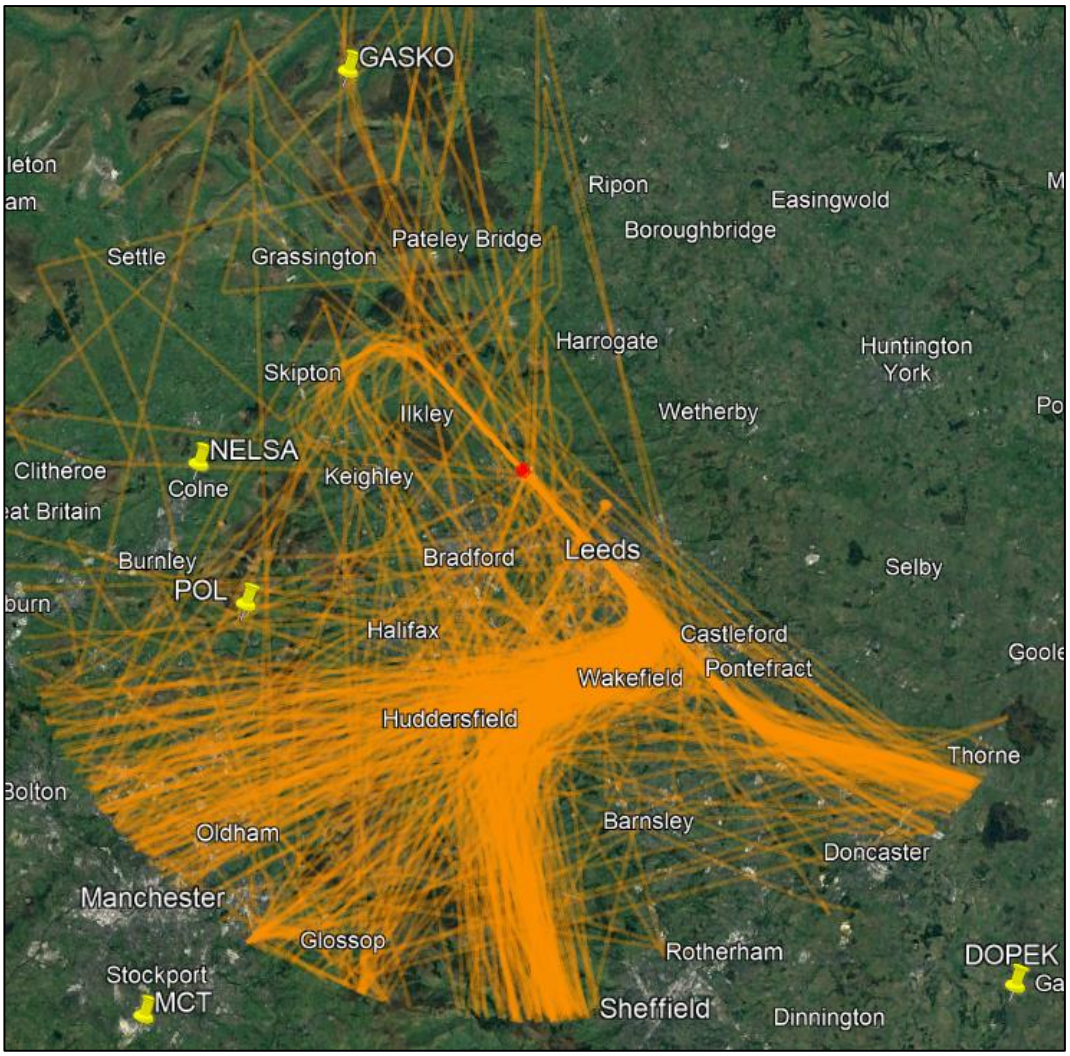


Figure 3: Arrivals to LBA - NTMS Track Data for the period 1-8 August 2022

3.3.4. Trends for RW32 can be clearly seen and these have been translated into swathes to establish a baseline. Arrivals from the NW are not evident and there are very few from the NE making it difficult to identify swathes from those directions. The hold is not visible on the sample as it wasn't used. The swathes considered as the baseline are shown in red on Figure 4 starting from the edge of the LBA delegated airspace.

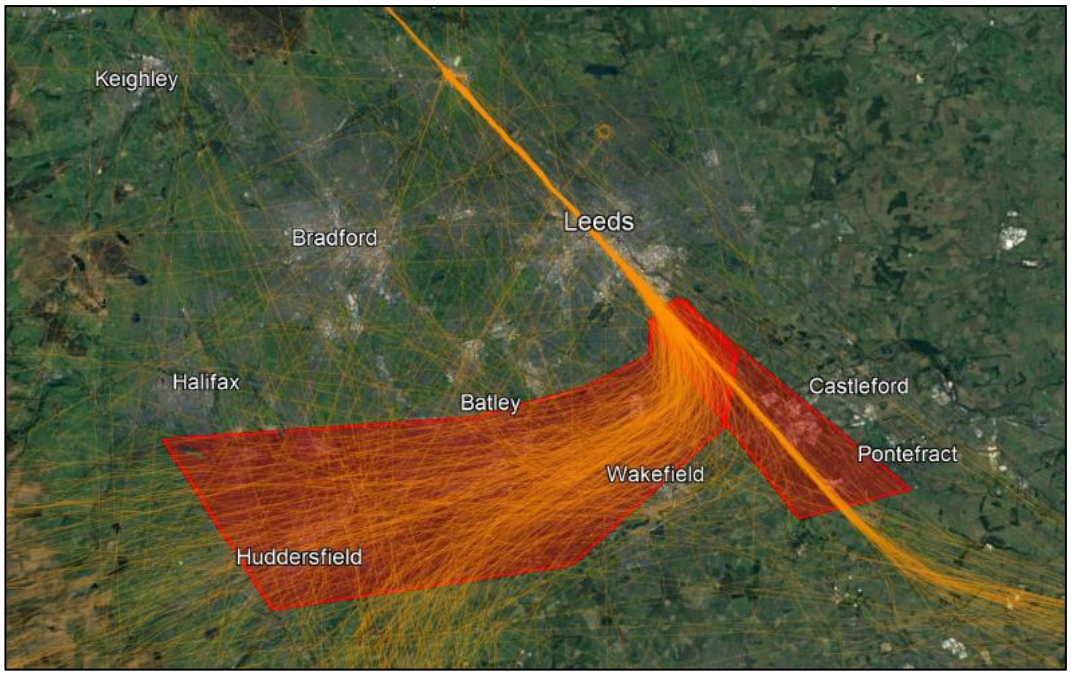


Figure 4: Baseline Arrival Swathes Runway 32 with NTMS Data for the period 1-8 August 2022

3.3.5. The same exercise was followed for RW14 arrivals using a NTMS sample from October 2022. From this data sample, arrivals swathes can be identified as a baseline and the hold is clearly visible as it was used a little during this timeframe. As before, there are very few arrivals from the NE or NW making it difficult to identify a pattern. See Figure 5 for the track data and Figure 6 shows the baseline swathes identified in red starting from the edge of the LBA delegated airspace.

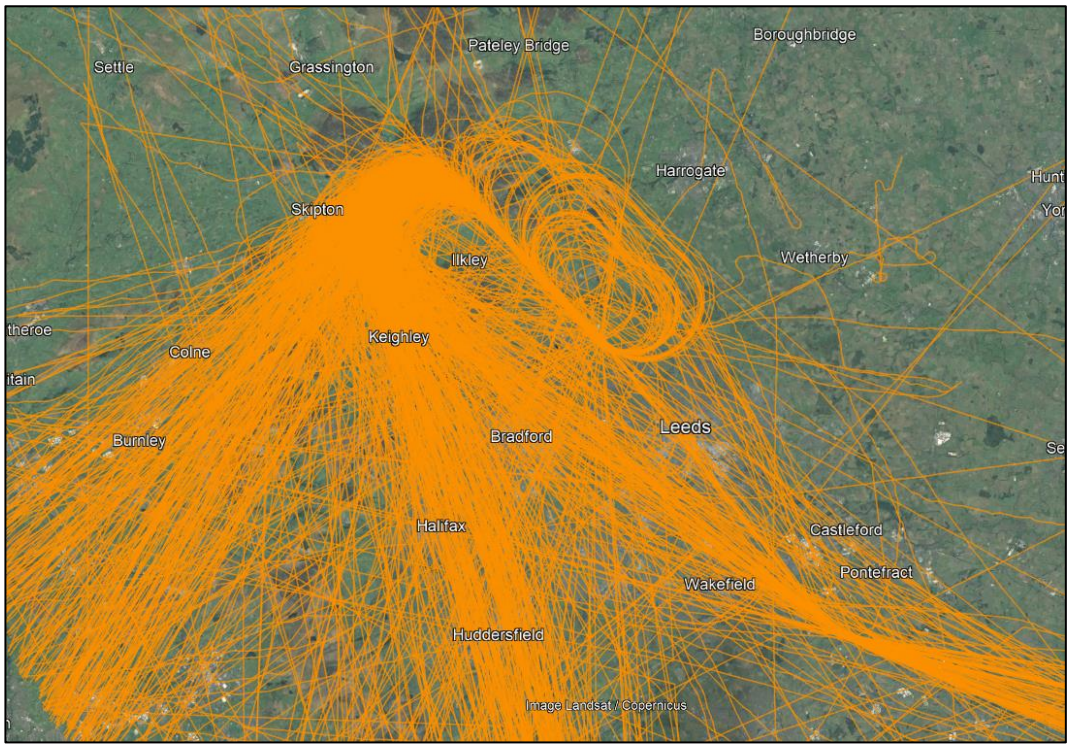


Figure 5: Arrivals to RW14 at LBA - NTMS Track Data from October 2022

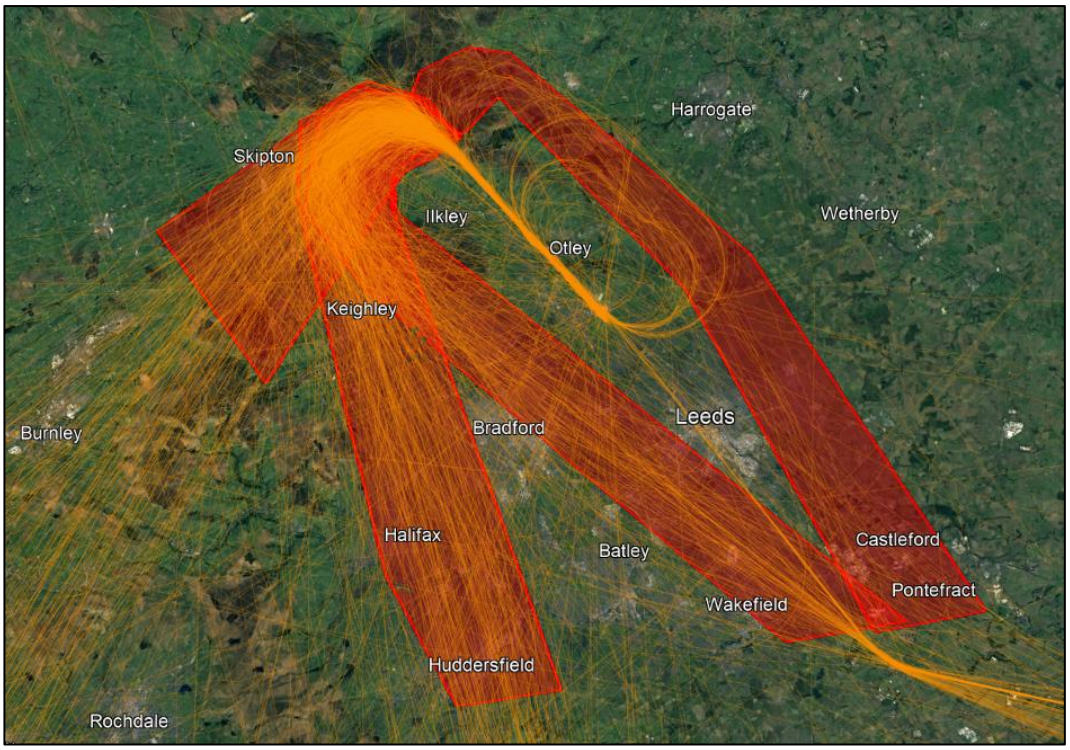


Figure 6: Baseline Arrival Swathes RW14 with NTMS Data for October 2022

3.4. Holding

3.4.1. LBA has a single arrival hold (also used as the Missed Approach Hold) associated with the Non-Directional Beacon (NDB) known as the LBA. It is roughly situated in the overhead of the Airport (to the North-East of the runway) and can roughly be seen on the track data in Figure 5 and Figure 6.

3.4.2. The LBA hold is used very infrequently as an arrival hold and even less frequently as a Missed Approach Hold. Holding for weather would only realistically happen for extremely strong crosswinds or if the visibility were below the minimum allowable for aircraft to make an approach. The Runway Visual Range (RVR) within the Touchdown Zone (TDZ) would need to drop below 200m for this to be the case for the majority of the fleet mix operating at the Airport. Meteorological Actual Reports (METARs) taken over a 12-month period at the Airport show that an average RVR below 200m only happens 0.21% of the time. This is shown by hour of the day in the chart at Figure 7.

3.4.3. Holding due to traffic congestion is equally highly unlikely under current traffic levels and therefore, unless the runway has been blocked or damaged by another aircraft or vehicle, the LBA is rarely in use.

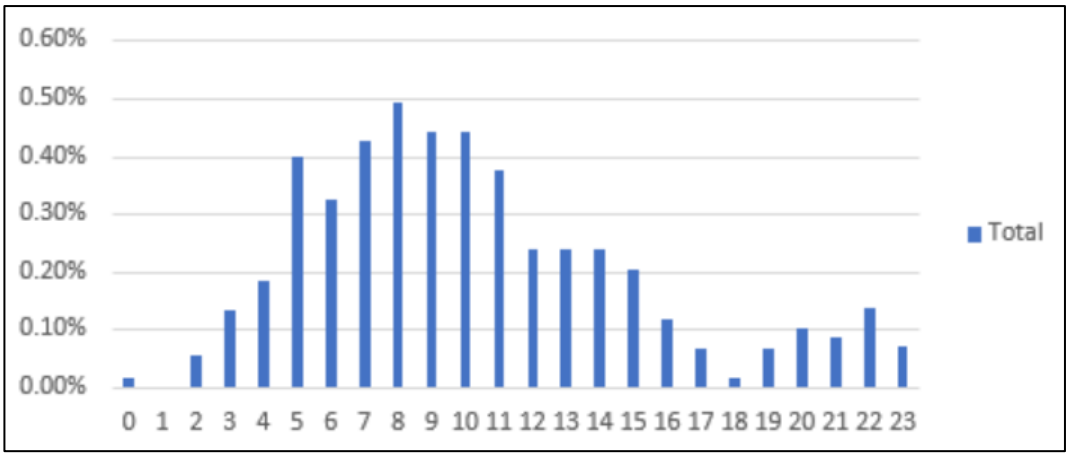


Figure 7: Percentage of METARs that contain TDZ RVR below 200m over a 12-month period.

3.5. The Departures Baseline

3.5.1. LBA has Noise Preferential Routings (NPRs) to supplement the 'Selective Runway Procedure'. These are to be found in the UK AIP and are listed as follows:

a) *Runway 14 – After take-off maintain runway heading to 'I LBF' DME 2 before setting course;*

b) *Runway 32 – Climb straight ahead. At 1181 FT QNH (500 FT QFE) or I-LF D0.5, whichever is the later, turn left to track 311° MAG. At 'I LF' DME 2.1 *535340N 0014258W reduce to minimum safe power settings and turn left to make good a track of 272° MAG. Maintain this track until 'I LF' DME 3.5 *535405N 0014521W before setting course*

c) *Turbo-prop: After take-off make good a track of 311° MAG and at DME 2.1 turn onto course.*

Note: The above routeings are compatible with normal ATC practice. In individual cases they may be varied owing to operational circumstances. The use of the Noise Preferential Routeings specified above is supplementary to the noise abatement take-off techniques as used by piston-engined, turbo-prop and turbo-jet aircraft.

3.5.2. The NPRs can be visualised in Figure 8 **Error! Reference source not found.**and Figure 9. It should be noted that these are flown using conventional navigation (vice satellite navigation) and as such, they are not flown as accurately as the thin lines depicted, particularly where a turn is involved.

Figure 8: NPR RW14 against Google Earth

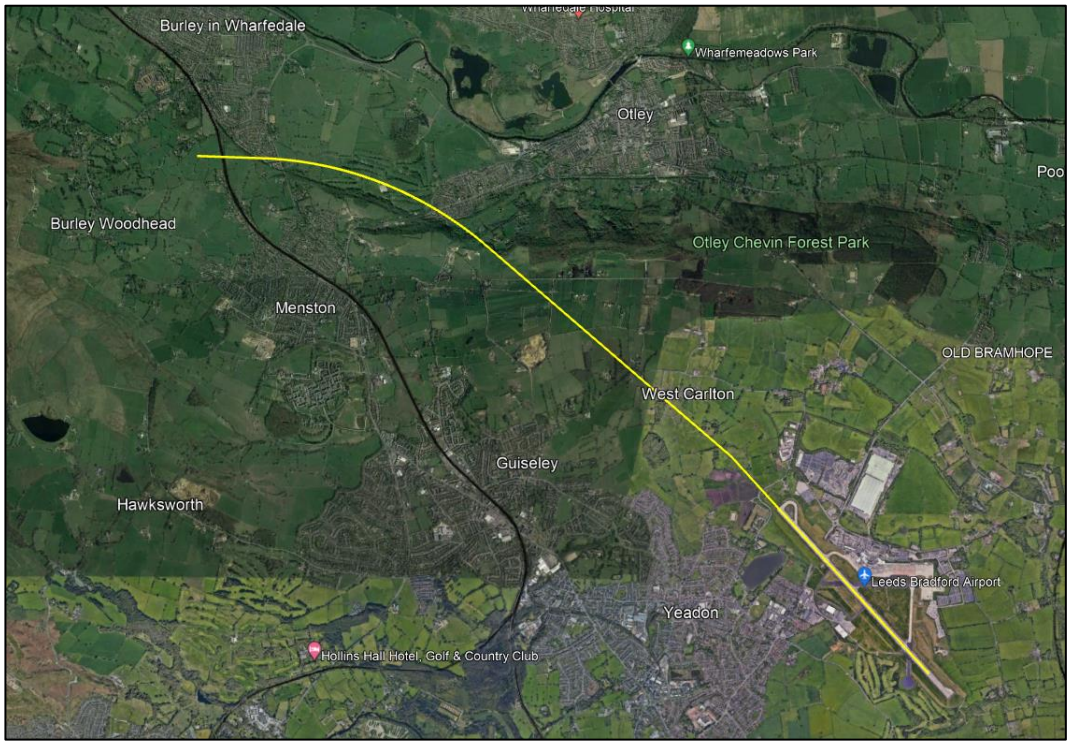


Figure 9: NPR RW32 against Google Earth

3.5.3. It may be necessary to modify the description of the NPRs if they cannot adequately contain the preferred DOs following the next stage of the consultation process. It is necessary within

the CAP 1616 process to confirm with the relevant LPA whether the NPRs may be varied because, if not the extant NPRs effectively become hard design criteria that greatly limit the options that can be considered. Leeds City Council are not averse to the idea of the NPRs changing if it can be proven that there will be a net environmental benefit. However, it is far from a foredrawn conclusion that changes to the NPRs will be made; the DOs that have been conceived have been done so with a blank sheet of paper in mind to encourage freedom of thought and not to stifle creativity.

3.5.4. LBA has two SIDs off each runway. These are depicted at Figure 10 and Figure 11 and consist of the NELSA/POLEHILL (for west and south-west bound traffic depending on runway in use) and the DOPEK/LAMIX (for south-east and eastbound traffic).

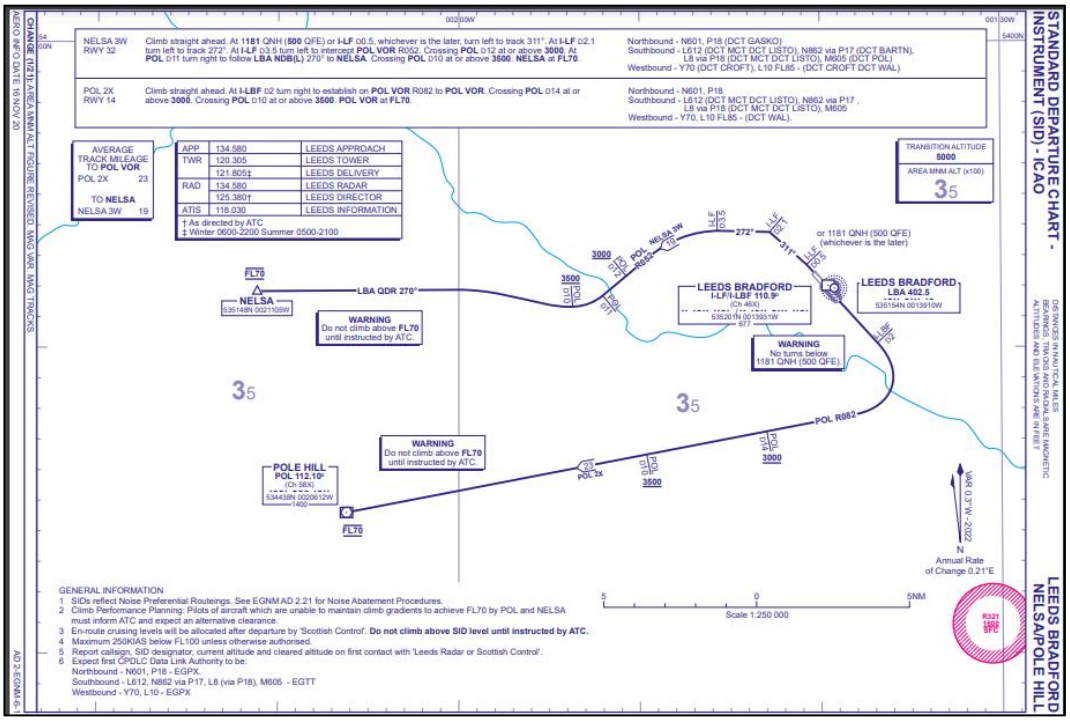


Figure 10: NELSA/POLEHILL SID

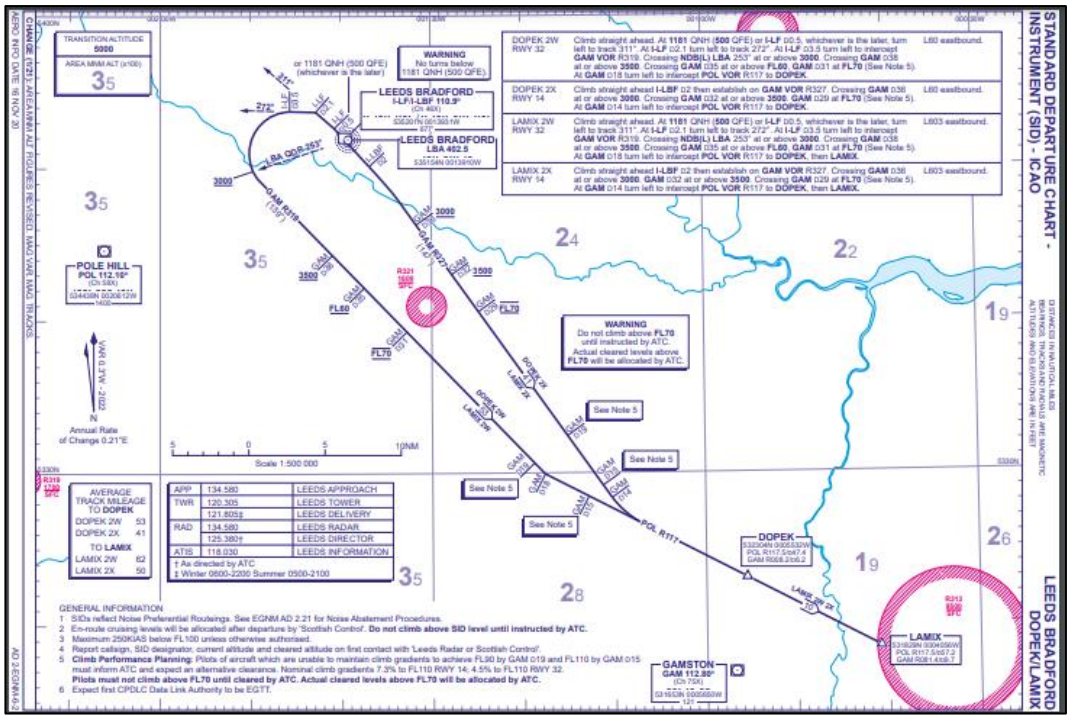


Figure 11: DOPEK/LAMIX SID

3.5.5. These SIDs do not cater for every departure direction and as conventional navigational means is the basis for these departures, the actual flight path varies from flight to flight particularly once best efforts have been made to adhere to the NPRs. Satellite navigational means (PBN) would be far more consistent and repeatable.

3.5.6. Using actual track data from LBA's NTMS, the existing baseline of departure swathes can be determined. A sample was taken from the week commencing 1st August 2022. Figure 12 shows all the departures from that week against a Google Earth background. LBA is in the red circle on the graphic.

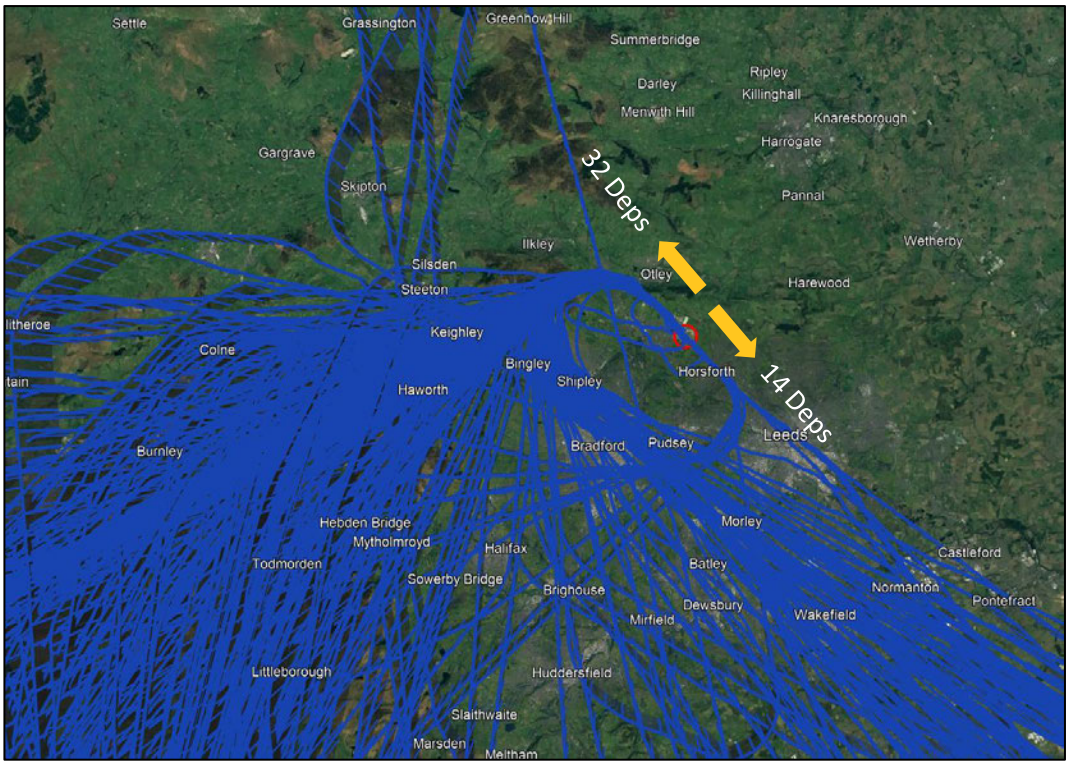


Figure 12: LBA Departure Tracks from NTMS week commencing 1st August 2022

3.5.7. To establish the baseline, swathes were drawn around the tracks where they appeared most densely concentrated. The following two graphics (Figure 13 and Figure 14) show the baseline as established for comparison with the options. There were no flights departing to the North-West off RW14 in the sample data. However, in consultation with LBA ATC, it was established that the swathe would look as depicted in the orange-coloured swathe if there had been departures routing in that direction.

3.5.8. These baseline swathes were then used by our environmental consultants to compare against the option swathes whilst conducting their qualitative impact assessment.

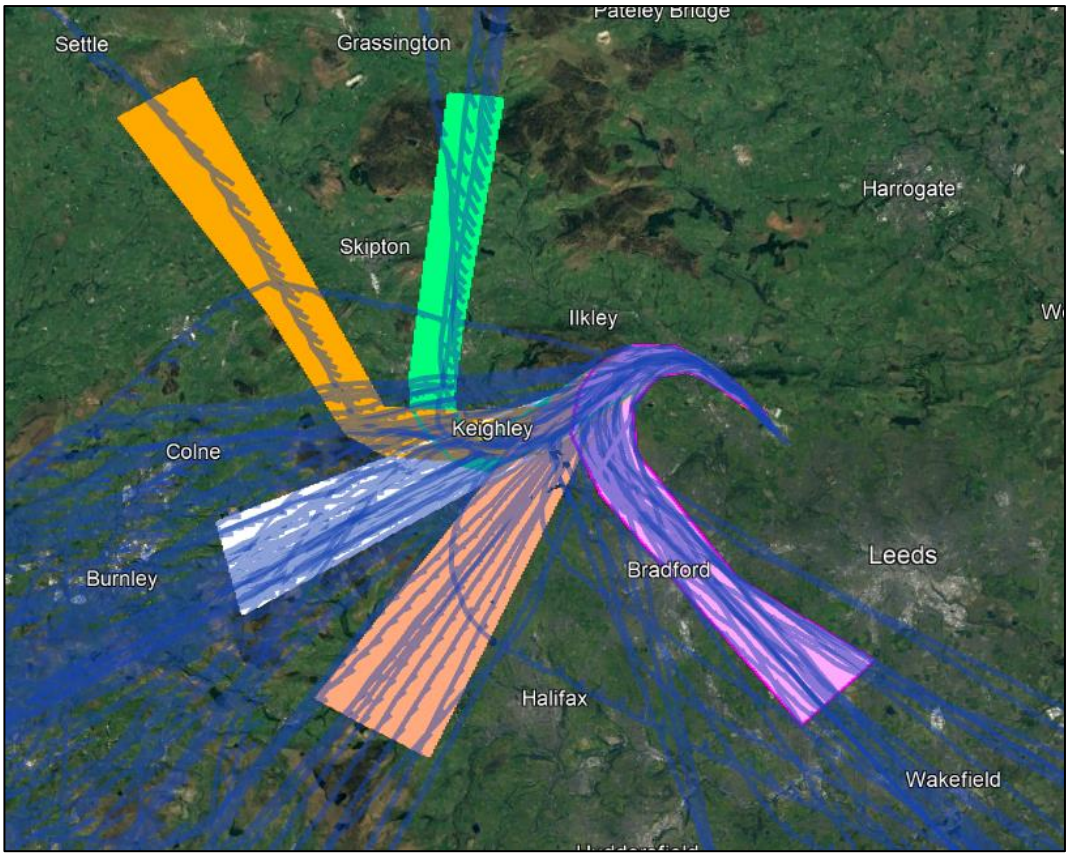


Figure 13: Runway 32 Baseline Swathes with NTMS Track Data

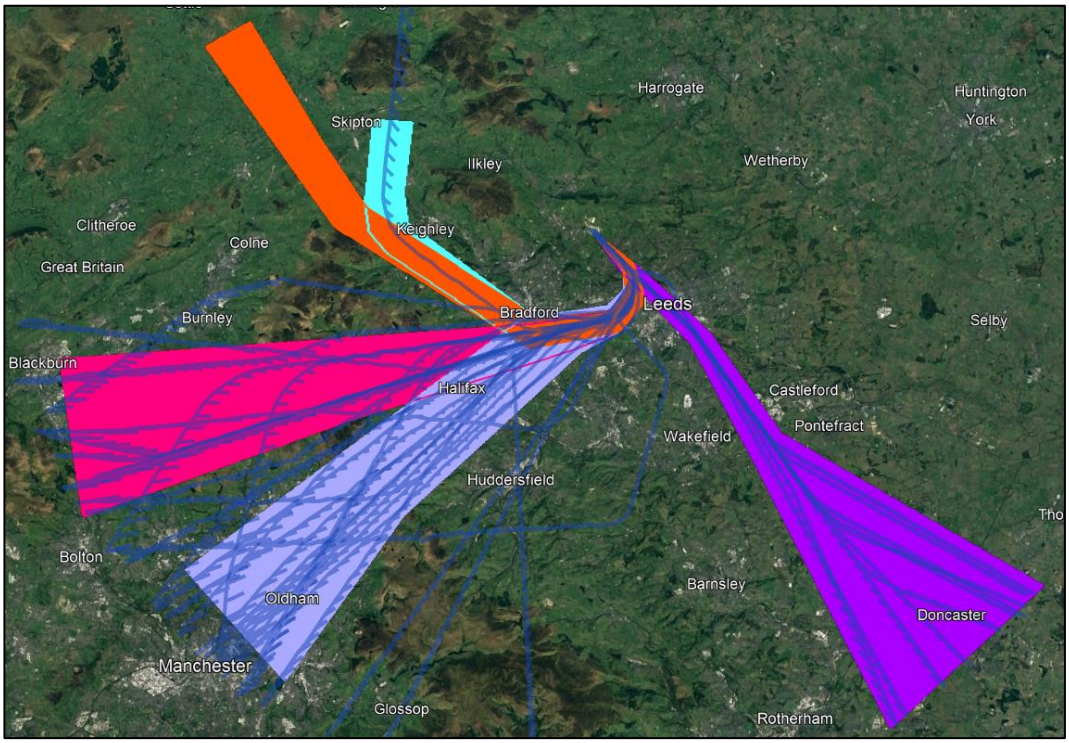


Figure 14: Runway 14 Baseline Swathes with NTMS Track Data

3.6. Airspace Configuration

3.6.1. LBA has a Control Zone (CTR) that extends from the surface to Flight Level (FL) 85 (8,500ft), it has three associated Control Areas (CTAs). CTA 1 extends from 2,500ft to FL85 (south of the Airport), CTA 2 (due west of the Airport) has the same vertical extent as CTA 1 and CTA 3 which surrounds the Airport from the South, through West to the North, extends from 3,000ft to FL85. The CTR and the CTAs are all classified as Class D airspace (controlled airspace or CAS). Above this sits the Yorkshire CTA, another form of CAS, namely Class A airspace that extends to FL195.

3.6.2. The LBA and Yorkshire CTAs sit adjacent to the Manchester Terminal Manoeuvring Area (MTMA). The MTMA is the subject of another ACP (ACP-2019-77), an ACP which encompasses the LBA region and is inextricably linked. It is part of a regional cluster of ACPs[6] all associated to the Future Airspace Implementation (North) (FASI(N) initiative. Aircraft typically pass through the MTMA on the way in and the way out of LBA and it is critical that this interface (the locations and altitudes and which aircraft are transferred from one agency to the other) is designed in a coordinated fashion. Accordingly, these ACPs are running in tandem. More detail on the FASI(N) MTMA ACP, sponsored by NATS, can be found on the Airspace Change Portal.

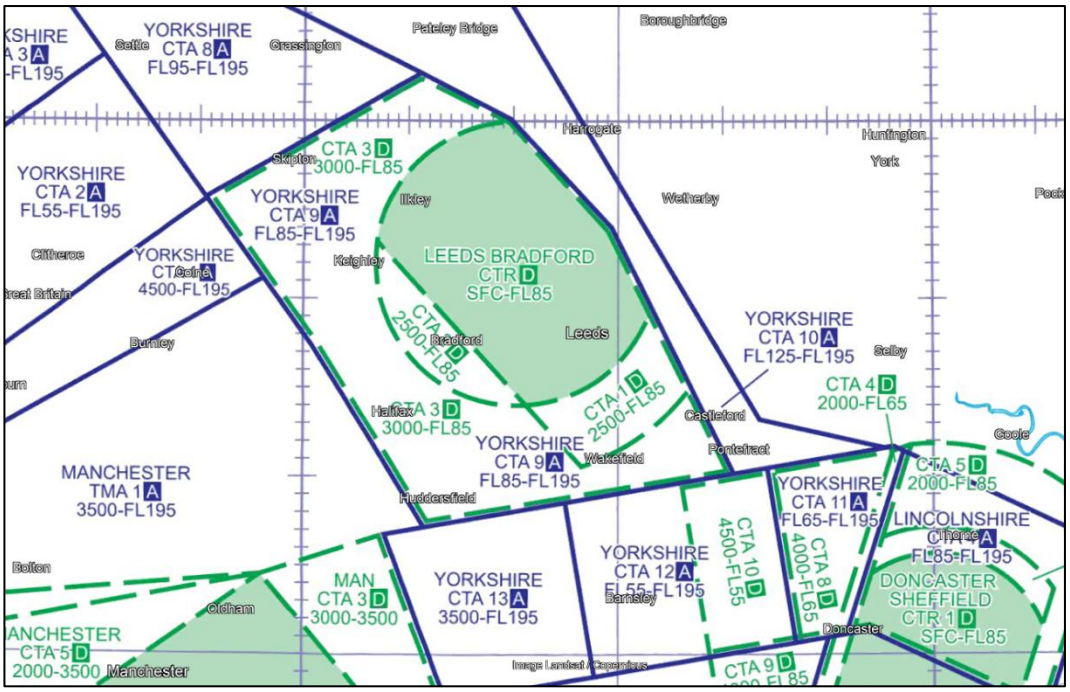


Figure 15: Airspace Configuration

3.6.3. The airspace immediately east of the CTR consists of uncontrolled airspace (Class G) from the surface up to FL125 (12,500ft). The Yorkshire CTA (Class A airspace) then extends from FL125 to FL195. This absence of CAS due east of LBA at the lower levels is problematic as it gives the controllers very little room for manoeuvre to keep aircraft from straying into uncontrolled airspace. Accordingly, the departure procedures are all designed to keep aircraft in CAS and as such these are not able to turn right off RW32 or left off RW14. This

[6] Includes Liverpool, Manchester, Leeds Bradford and MTMA ACPs.

constraint is equally pertinent in relation to arrivals as there is very little room to vector aircraft in round to the east of the Airport or to hold them in that area.

3.6.4. The Class G airspace over the Vale of York is relatively busy and contains the activities of multiple General Aviation airfields, RAF Leeming and Teesside International Airport and military fast jets and helicopters from Lincolnshire and further south.

3.6.5. Whilst Doncaster Sheffield Airport (DSA) has closed, and the airspace has been suspended, it is unclear whether this is the final outcome. When the DOs were first being developed for this ACP, DSA was still a going concern and accordingly the DOs that were developed assumed LBA would need to deconflict their activities with those of DSA. By the time the second round of DO conception was underway, DSA had closed and as such consideration was given to some options that might utilise some airspace adjacent to airspace previously used by DSA.

3.6.6. It should be noted that LBA utilised some of DSA's delegated airspace for some arrivals into LBA as part of a local agreement between the two airports. The suspension of this airspace has resulted in changes to how LBA manages the descent of the inbounds from the East but it has had no significant impact on the operation.

3.7. Current Noise Impact

3.7.1. Airport Operators in the UK are obliged to review and revise (if necessary) their Noise Action Plan every 5 years or sooner where a major development occurs. The last Action Plan with meaningful data and contours contained within it was produced based upon data collected in 2016. The data collection in 2021 was skewed significantly by COVID-19 as it impacted the number of aircraft movements as might be expected. Accordingly, the 2022 Noise Action Plan and the noise contours contained therein is not a helpful benchmark to use as a baseline. LBA also had some noise contours developed in 2018 in support of a planning application. This 2018 data is representative of the baseline for movements and fleet mix. **The data and contours developed from 2018 data is therefore set as the baseline.**

3.7.2. The following table shows the estimated number of people and dwellings experiencing average noise levels above 51 decibels (dB) during the average summer day in 2018; this is the average noise level produced by aircraft over the 16-hour daytime period (07:00 to 23:00) for the 92-day "summer", defined as 16th June to 15th September inclusive.

Noise Level (dB)	Population	Dwellings
≥ 51 LOAEL	52000	21300
≥ 54	16400	7450
≥ 57	2800	1100
≥ 60	900	350
≥ 63	200	100
≥ 66	0	0
≥ 69	0	0

Table 3: Estimated total number of people and dwellings above various noise levels, LAeq 16h in the vicinity of LBA, 2018

3.7.3. The following chart shows where these noise contours lie in relation to the Airport. The outer contour is the 51dB contour as referred to in Table 3.

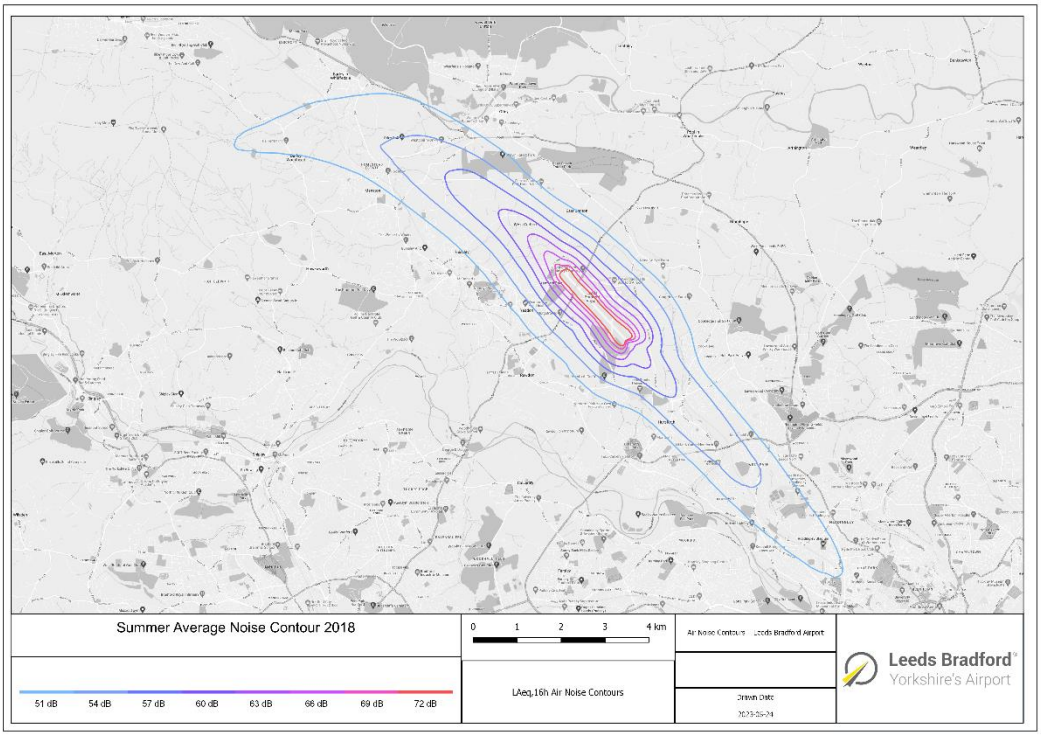


Figure 16: 2018 LBA Average Summer Day LAeq 16h

3.7.4. The next table shows the estimated number of people and dwellings experiencing average noise levels above 45 dB during the average summer night in 2018; this is the average noise level produced by aircraft over the 8-hour night-time period (23:00 to 07:00).

Noise Level (dB)	Population	Dwellings
≥ 45 LOAEL	115200	45950
≥ 48	55900	21950
≥ 51	13400	6100
≥ 54	1500	600
≥ 55	1100	450
≥ 58	200	100
≥ 61	0	0

Table 4: Estimated total number of people and dwellings above various noise levels, LAeq 8h in the vicinity of LBA, 2018

3.7.5. The following chart shows where these noise contours lie in relation to the Airport. The outer contour is the 45dB contour as referred to in Table 4.

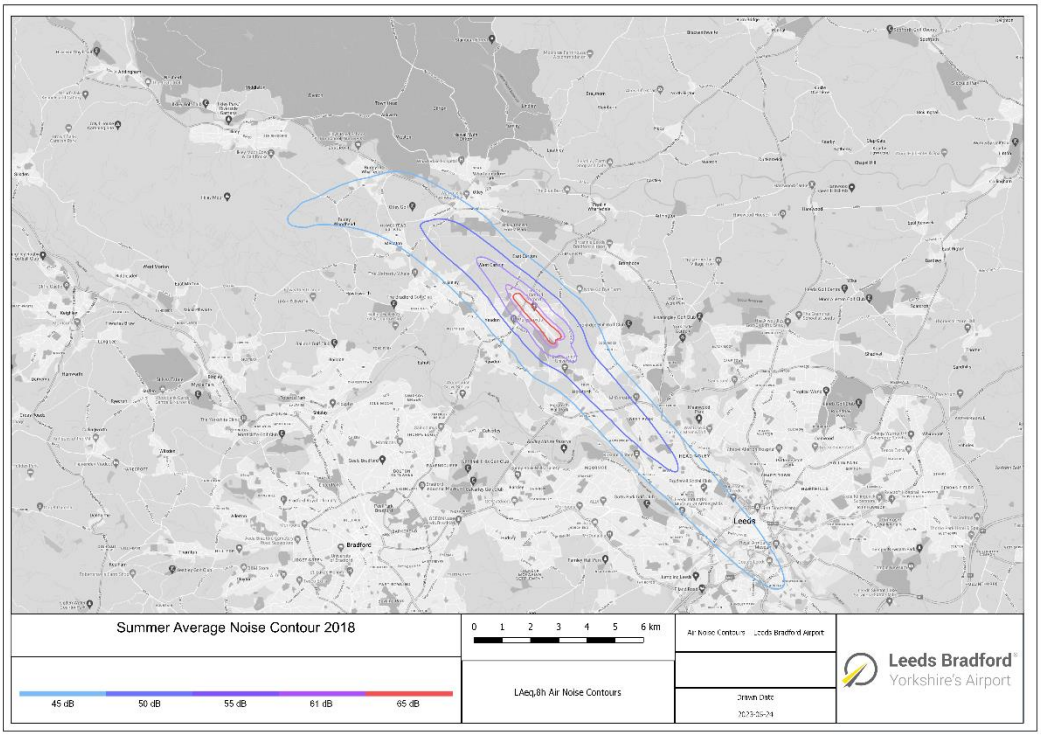


Figure 17: 2018 LBA Average Summer Night LAeq 8h

3.8. Future Noise Impact (Do-Nothing Scenario)

3.8.1. CAP1616 requires ACP Sponsors to consider the forecast growth of their operation in terms of the forecast number of movements and passengers (affected by the fleet mix owing to the varying passenger capacity). This forecast should not only consider growth between now and implementation of the proposed changes, but it should also consider the potential growth to 10 years beyond the implementation date. If it is assumed that no changes will be made until 2027 at the earliest, then 10 years beyond this is 2037.

3.8.2. Our Noise Consultants have modelled the effect of the forecast growth in the operation at LBA out to 2030 on the assumption that the operation continues to function in the same way as the baseline described i.e. Do-Nothing. 2030 may be seven years short of the year stated above however, it is not currently considered feasible for the operation to grow beyond handling 7 million passengers per annum with the current planned terminal expansion. By 2030, the Airport is forecasting to handle 6.8 million passengers per annum and the noise modelling was done on this assumption.

3.8.3. The following tables and figures show the estimated number of people and dwellings expected to experience average noise levels above 51 dB and 45 dB during the average summer day or night respectively in 2030. The associated contours are also shown.

3.8.4. The population and dwellings affected by noise equal to or greater than the 51dB (day) and 45dB (night) contours decreases by 2030 due to a significant change in fleet mix to aircraft with quieter engines. See paragraph 3.22 for more detail on Fleet Mix.

Noise Level (dB)	Population	Dwellings
≥ 51 LOAEL	35600	14700
≥ 54	10200	4550
≥ 57	1800	700
≥ 60	100	50
≥ 63	<100	<50
≥ 66	0	0
≥ 69	0	0

Table 5: Estimated total number of people and dwellings above various noise levels, LAeq 16h in the vicinity of LBA, 2030

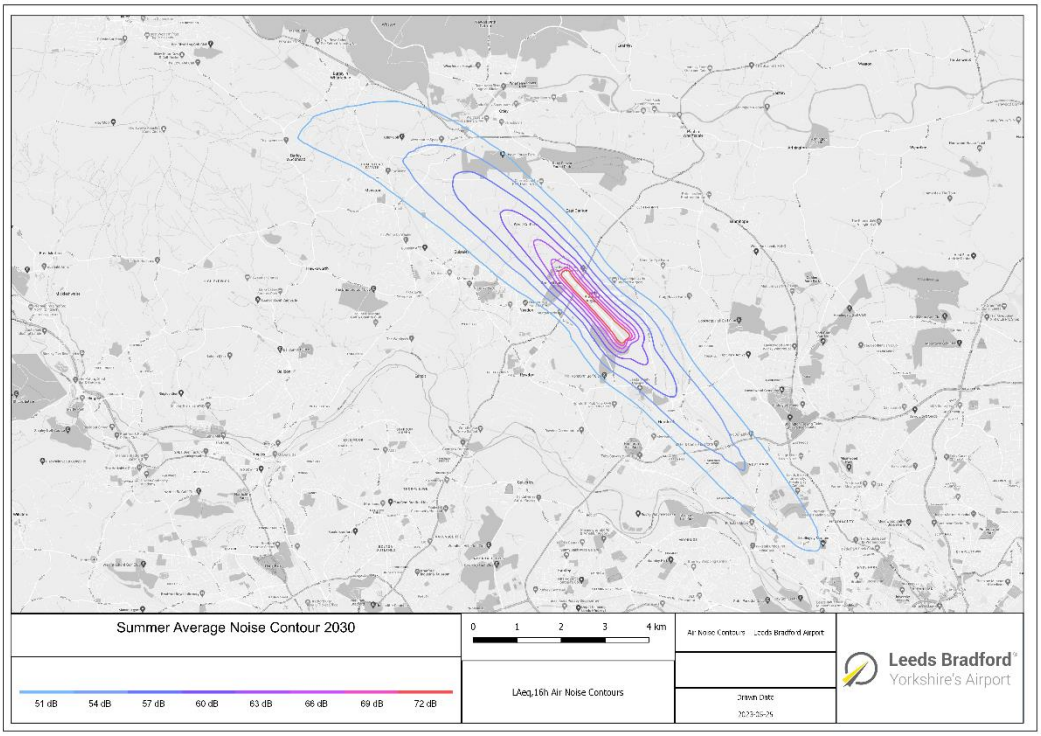


Figure 18: LBA Average Summer Day LAeq 16h, 2030

Noise Level (dB)	Population	Dwellings
≥ 45 LOAEL	86300	35000
≥ 48	25200	11000
≥ 51	5200	2250
≥ 54	800	300
≥ 55	300	100
≥ 58	<100	<50
≥ 61	0	0

Table 6: Estimated total number of people and dwellings above various noise levels, LAeq 8h in the vicinity of LBA, 2030

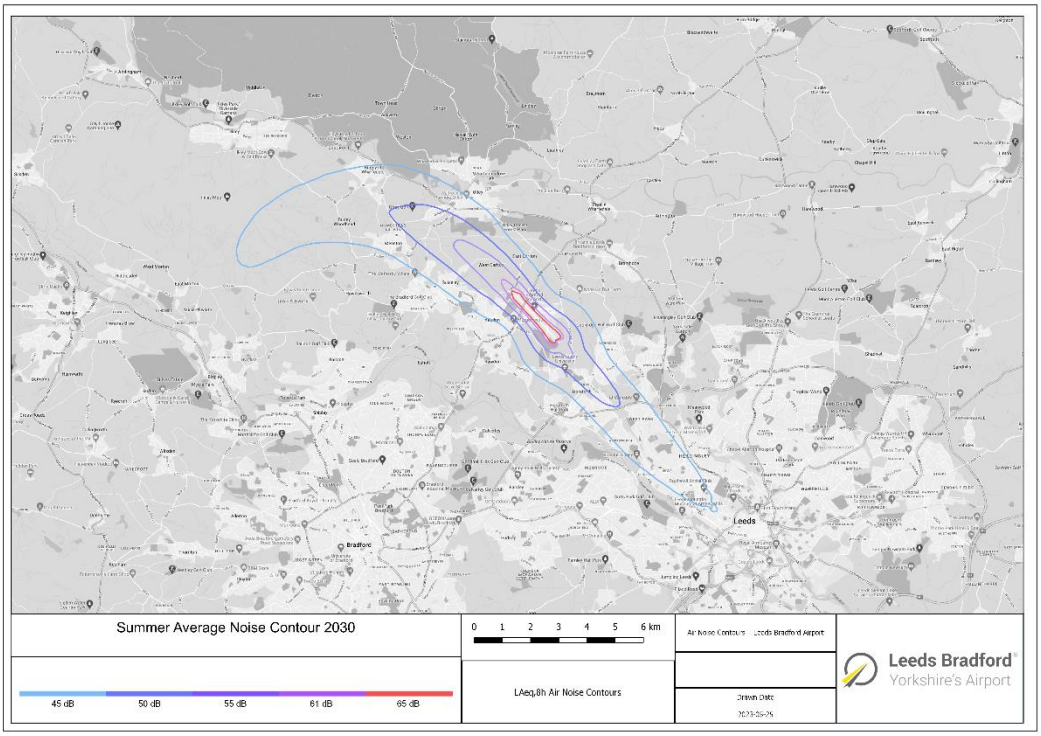


Figure 19: LBA Average Summer Night LAeq 8h, 2030

3.9. Noise Modelling Category

3.9.1. CAP2091, CAA Policy on Minimum Standards for Noise Modelling[7], require Change Sponsors to determine and declare what Noise Modelling Category they consider is appropriate for the ACP consultation. The minimum level of sophistication of the modelling process should depend on the size of the current or proposed noise effect of the airport on its local community. The category of noise modelling required by the CAA is based on the number of residents in the $51dB_{LAeq16h}$ day or $45dB_{LAeq,8h}$ night contours either before or after the proposed change, whichever is greater.

3.9.2. It is assessed that the appropriate Noise Modelling Category is for this ACP is **Category C**.

3.10. Air Quality

3.10.1. LBA undertakes monthly air quality monitoring, measuring NOx, using diffusion tubes. The Airport has been conducting this both inside and outside of the Airport's boundary since 1994 and NOx readings have always been well below the national air quality standards.

3.11. Emissions

3.11.1. It is entirely possible that the existing conventional procedures that require a significant degree of controller intervention through vectoring and through the stepping of climbs and descents, are not the most environmentally efficient. These factors result in more track miles being flown at potentially inefficient altitudes and may also require higher engine power

[7] CAP2091, CAA Policy on Minimum Standards for Noise Modelling, dated Jan 2021

settings. Procedures that do not support the optimum performance of aircraft are going to involve greater fuel-burn and by extension, greater emissions.

3.12. Capacity and Resilience

3.12.1. It is likely that in the short-medium term, LBA would maintain current capacity with the existing procedures however, as already stated, with the DVOR rationalisation and the short-term fix of the RNAV substitution there would be insufficient resilience to the operation. Fundamentally, LBA must modernise in accordance with the AMS.

3.13. General Aviation Access

3.13.1. LBA recognises that GA has a requirement for access to enter/cross CAS. LBA has always facilitated this access, subject to flight safety considerations, and has no intention of changing this going forward. The existing configuration of the airspace in the vicinity of LBA may need to be changed to accommodate changes to the Airport's procedures however, this will also be consulted on as part of the ACP at Stage 3.

3.14. Economic Impact: Commercial Airliners and GA

3.14.1. The cost of fuel continues to rise, and the existing suite of procedures results in inefficient climb and descent profiles that burn greater levels of fuel. This additional fuel cost has an economic impact on the airlines and ultimately the passengers who use them.

3.15. Fuel-burn: Commercial Airliners and GA

3.15.1. In a similar vein to the assessment of emissions, the continued use of the current departure and arrival systems is less predictable than the proposed PBN procedures and likely to result in greater fuel-burn. The lack of predictability results in poor fuel planning for the operators meaning they carry greater fuel than is necessary, also increasing fuel-burn.

3.16. Infrastructure Costs

3.16.1. Maintenance of aging navigational facilities such as the LBA NDB is expensive (prohibitively so in some cases) and due to obsolescence can be technologically infeasible. Were the Airport to pay NERL to continue to maintain the service provided by the DVORs that are being rationalised, this would come at a significant cost to the Airport. Repairs may be required as would the flight calibration all at the Airport's expense. Ultimately the continued use of the GAM DVOR, for any longer than necessary is economically unviable.

3.17. Operational Costs

3.17.1. Other than the costs associated with maintaining infrastructure, it is hard to see any additional costs being associated with continued operation of the extant procedures.

3.18. Training Costs

3.18.1. There are no training costs identified to maintaining the extant procedures.

3.19. Other Costs

3.19.1. There are no other costs identified to maintaining the extant procedures.

3.20. Deployment Costs

3.20.1. There are no deployment costs identified to maintaining the extant procedures.

3.21. Safety Assessment

3.21.1. It is a key assumption that the baseline operation is safe and is operated in accordance with extant regulations.

3.22. Growth and Fleet Mix Forecast

3.22.1. The Airport expects to handle 4.5 million passengers this financial year. LBA 5-Year Plan forecasts that in the financial year of 2028 the Airport will handle 6.5 million passengers. This is an increase of circa 45% over the next five years. By 2030, this figure is expecting to rise to 6.8 million passengers and the capacity of the current planned terminal extension is assumed to be 7 million.

3.22.2. As for the fleet mix, LBA has a mixture of turbo-prop and jet operators and the ratio of propulsion types is unlikely to change dramatically over the next 10-15 years. This ratio is currently at 1 turbo-prop to every 10 jet aircraft (1:10). Figure 20 shows the fleet mix during 2022 taken from the Airport's NTMS. The vast majority of aircraft operating at LBA are made up of Boeing 737-800 and 300 variants.

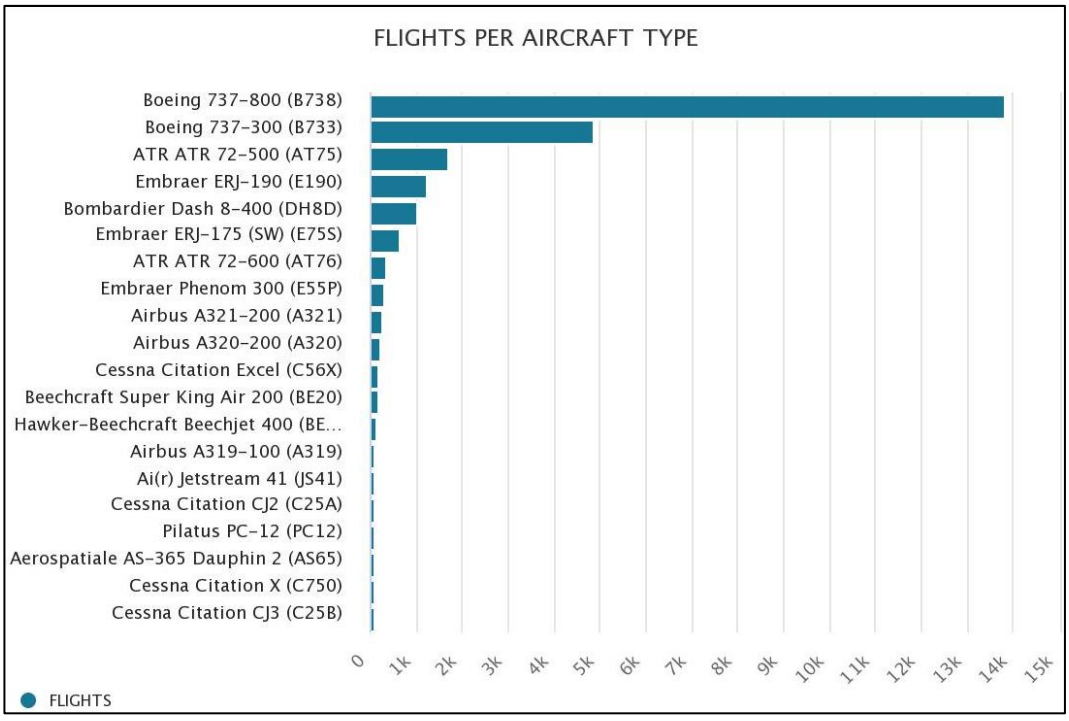


Figure 20: 2022 LBA Fleet Mix

3.22.3. The Airport is expecting to see the introduction of more modern, and quieter new generation jet aircraft with Jet2 acquiring A321 Neos and Ryanair recently announcing they are acquiring B737-Max 10's.

3.22.4. The following table details the Fleet Mix used for the 2018 Noise Contours and the assumed Fleet Mix that was used for the 2030 Noise Contours.

2018 Fleet Mix			
Cessna 525A Citation Jet CJ2	Embraer Phenom 100	Learjet 45	Piaggio P.180 Avanti
Cessna 560 Citation Excel/XLS/XLS+	de Havilland Canada DHC-8-400 Dash 8	Cessna 525B Citation Jet CJ3	Gulfstream G350/400/450 (GIV/GIVSP)
Boeing 737-800	Embraer E175 (short wing)	de Havilland DH.125 Jet Dragon	Gulfstream G550 (C-37B, GVSP)
Learjet 60	Embraer E170	Boeing 737-300	Dassault Falcon 900
Cessna 750 Citation X	Embraer E190	B757-200	Bombardier BD-100 Challenger 300
Embraer EMB-505 Phenom 300	Embraer E195	Boeing 737-400	Pilatus PC-12
Gulfstream G200 (IAI Galaxy)	Saab 2000	Jetstream 41	Cessna F406 Vigilant
Beechcraft Model 90 King Air	Beechcraft Premier I	Hawker 4000	Hawker 750 / 800 / 850 / 900 / XP
Swearingen SA-227 Merlin 4	Airbus A320	Piper PA-31 Navajo	British Aerospace BAe-146-300
Cessna 510 Citation Mustang	Embraer ERJ 145	Cessna 421 Golden Eagle	Airbus A321
ATR-72-500	Beechcraft Super King Air	Bombardier Challenger 600	Fokker 100
ATR-42-500	Dassault Falcon 2000	Cessna 680 Citation Sovereign	Gulfstream G100/150 (IAI Astra)

2018 Fleet Mix			
Boeing 757-200	Beechcraft Model 400 Beechjet	Saab 340	Bombardier Global Express
Boeing 737-500	Airbus A319	Learjet 31	Diamond DA-42 Twin Star
Canadair CRJ200	Cessna 525C Citation Jet CJ4	Cessna 550 Citation II	
Learjet 35/36	Cessna 525 Citation Jet CJ1	Embraer ERJ 135	

Table 7: 2018 Fleet Mix

Assumed 2030 Fleet Mix
Boeing 737 MAX 8
Boeing 737-800
Boeing 787-8
Airbus A320 Neo
ATR 72
Embraer E195
Airbus A320

Table 8: Assumed 2030 Fleet Mix

3.23. Proposed Local Developments

3.23.1. Local Planning Authorities (LPAs) have 'Development Plans' in which they identify proposed land usage for the future. Figure 21 below has been compiled from data contained within the Leeds City Council Site Allocations Plan that was adopted on 10th July 2019[8]. The main sites identified for housing in the immediate proximity to the LBA runway (in the centre) have been labelled such that they can be identified by the reader and the Number of Units planned on that site can be seen in Table 9. LBA will endeavour, where possible, to take account of these new housing developments during Stage 3 of the CAP1616 process. It should be noted that not all LPA Development Plans are as accessible as the Leeds City

[8] Leeds City Council Site Allocations Plan adopted 10th July 2019

Council example and, it is not a simple task to filter out the useful information from the not so useful. LBA will endeavour to engage with the neighbouring LPAs to resolve this and gain a clearer picture on development plans.

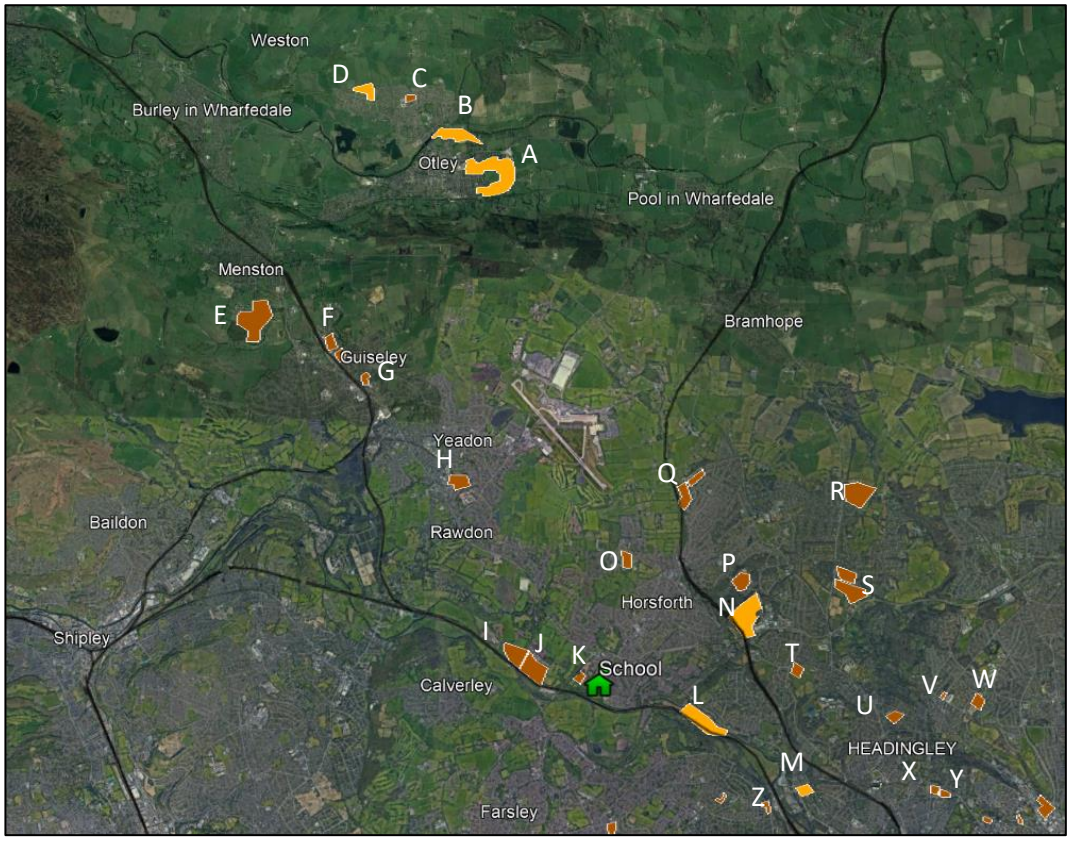


Figure 21: Leeds City Council Development Plans against a Google Earth Background

Label	Development Name	Housing Units
A	Otley East	550 Units
B	Mill Lane	245 Units
C	Wharfedale General Hospital	62 Units
D	Rumplecroft	135 Units
E	Bradford Road, High Royds	349 Units
F	Netherfield Road	214 Units
G	Springfield Road	54 Units
H	Green Lane	171 Units
I	Low Hall Road	131 Units
J	Calverley Lane	331 Units
K	Horsforth Campus	72 Units
L	Abbey Road	1385 Units
M	Kirkstall District Cent	55 Units
N	Ringroad West Park	485 Units

Label	Development Name	Housing Units
O	Westbrook Lane	75 Units
P	Cookridge Hospital	326 Units
Q	Moseley Wood Gardens	198 Units
R	Church Lane	104 Units
S	Otley Road	256 Units
T	West Park Centre	69 Units
U	Moor Road	68 Units
V	Meanwood Road	54 Units
W	Beckhill Approach	79 Units
X	Victoria House	124 Units
Y	Leeds Girl's High School	105 Units
Z	Canal Wharf	84 Units

Table 9: Leeds City Council Development Plan Housing and Schools

3.23.2. It is accepted that not all the sites depicted on the map are labelled and that there will be others associated to other LPAs that are not plotted.

4. Initial Options Appraisal Results

4.1. Introduction

4.1.1. This section provides a summary of the DOs carried forward from the DPE, identifies those that could be described as the 'Do Minimum' and qualitatively assesses each DO against the criteria detailed in Section 2 as compared against the baseline described in Section 3.

4.2. Proposed Options and Do Minimum Options

4.2.1. The following RW32 Departure DOs have been 'Retained' for the IOA (the DO with the greatest similarity to the identified Baseline, the 'Do Minimum', has an asterisk (*)):

North-West	South-East	South & West
32NWA*	32SEB	32S&WA
32NWB	32SEC	32S&WB*
	32SED*	32S&WC
	32SEF	32S&WD
	32SEG	32S&WF
		32S&WG
		32S&WH

Table 10: RW32 Departure DOs

4.2.2. The following RW14 Departure DOs have been 'Retained' for the IOA (the DO with the greatest similarity to the identified Baseline, the 'Do Minimum', has an asterisk (*)):

North-West	South-East	South & West
14NWA	14SEA	14S&WA
14NWB	14SEB*	14S&WB*
14NWD*		14S&WC
		14S&WD
		14S&WE

Table 11: RW14 Departure DOs

4.2.4. The following Arrival System DOs have been 'Retained' for the IOA (the DO with the greatest similarity to the identified Baseline, the 'Do Minimum', has an asterisk (*)):

Arrival Options
Option 1 – LBA or the 'Do Minimal' Option*
Option 2 – NELSA/GOLES
Option 3 – AIREY/WORTH
Option 4 – AIREY/WORTH/LBA
Option 5 – NELSA/GOLES/UDDER

Table 12: Arrival System DOs

4.4. RW32 NW Departures

4.4.1. The following figure shows the DOs as compared to the Baseline against population density mapping[9].

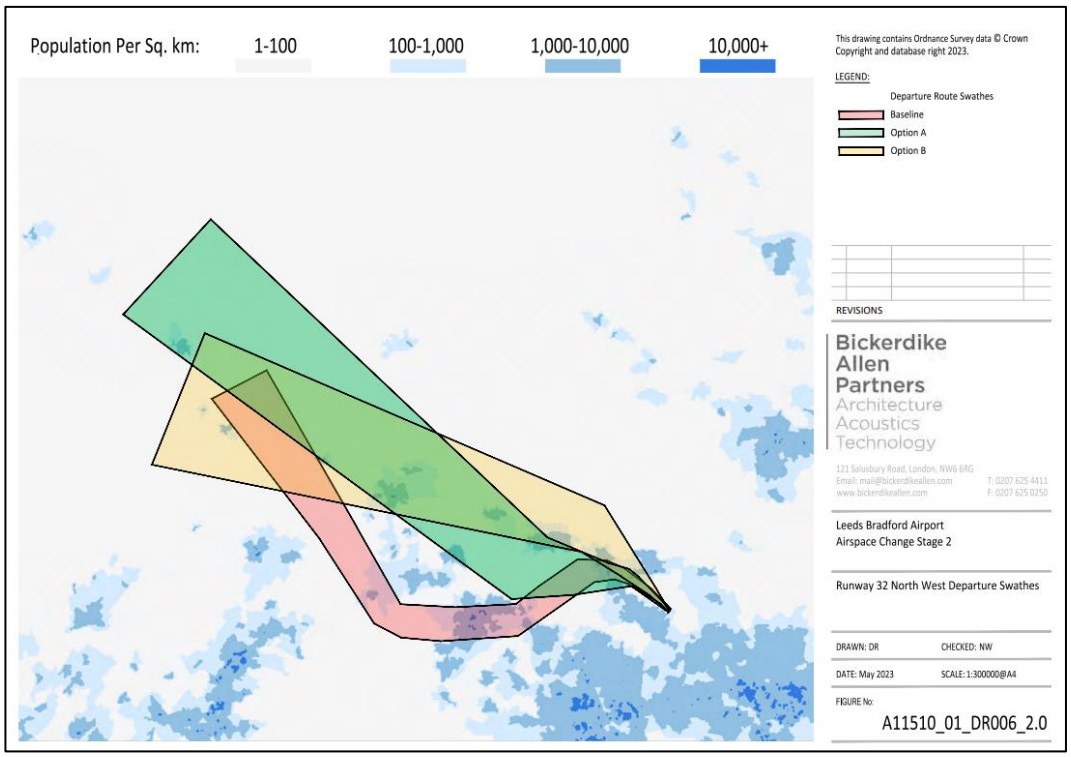


Figure 22: Runway 32 North West Departure Swathes

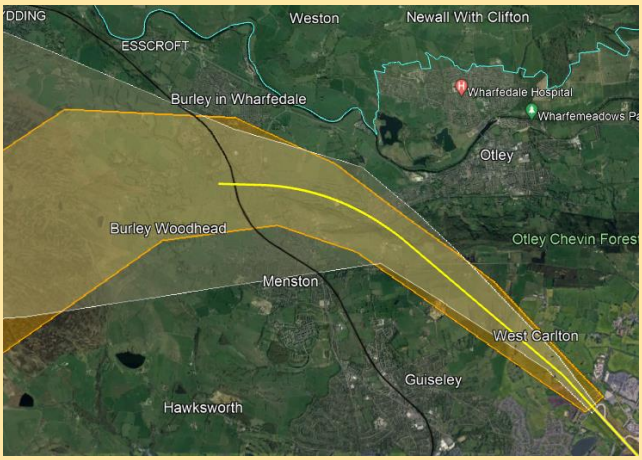
4.5. RW32 NW Baseline

4.5.1. There isn't a North-Westerly SID currently and aircraft wishing to depart in this direction do so tactically. However, NTMS data shows that aircraft departing to the North-West follow the Noise Preferential Route (NPR) turning initially left and overflying Keighley and then turn right. In the later stages the areas overflown are generally sparsely populated.

[9] The population density data has been derived from data provided by the ONS.

4.7. 32NWA

4.7.1. This DO is initially similar to the baseline (turning left and following the existing NPR) but turns right again earlier avoiding overflying Keighley. This results in this DO overflying parts of Ilkley and the surrounding areas. In the latter stages the areas overflown are generally sparsely populated.

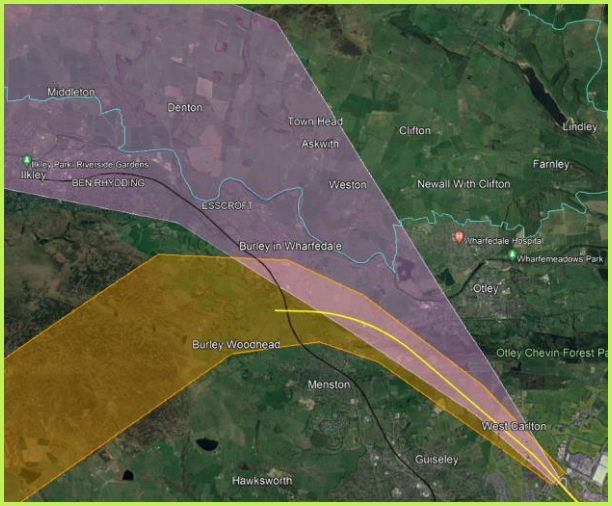
Group	Impact	Qualitative Assessment
Communities	Noise impact on health and quality of life	The newly overflown areas would generally be of a lower population density compared to those overflown in the baseline at lower altitudes. At higher altitudes areas of similar population density would be overflown.  In this screenshot, the baseline is the orange swathe. The screengrab above shows the NPR (yellow line) and the 32NWA DO swathe (grey) allows for the design of a procedure that adheres to this should that be determined as the optimal design for environmental reasons.
	Air Quality	Insignificant change below 1,000ft and therefore it is assessed that there would be insignificant impact on air quality.
Wider society	Greenhouse gas impact	Less track miles as compared to the baseline, therefore a slight improvement.
	Capacity/ resilience	More direct routing getting aircraft away from the busy NELSA/POL area quicker. An improvement on the baseline.

Group	Impact	Qualitative Assessment
	Tranquillity	Just as with the baseline, Ilkley Moor is overflown. There is a potential for the southern Yorkshire Dales NP to be affected by aircraft between 5,000-7,000ft climbing whereas the baseline avoids it below 7,000ft.
General aviation	Access	It is likely that a lowering of the base of CAS would be required to the detriment of Class G and the glider community.
General aviation/ commercial airlines	Economic impact from increased effective capacity	Routing to the North-West quicker is a positive change for the airline operators with no significant economic impact upon the GA community.
	Fuel-burn	Reduced fuel-burn as compared to the baseline.
Commercial airlines	Training costs	Very minimal training adapting to an amended departure profile.
	Other costs	No other costs have been identified.
Airport/ Air Navigation Service Provider	Infrastructure costs	Removal of reliance on ground-based navigational aids reduces cost as compared to the baseline.
	Operational costs	No operational costs have been identified.
	Deployment costs	Other than the cost of conducting the ACP there are minimal deployment costs.
All	Safety	The DPE assessed this DP as Amber due to lack of CAS containment. This can be mitigated by lowering the base of the CAS to the North.

4.7.2. Carried forward to Stage 3 but considered less attractive than 32NWB.

4.8. 32NWB

4.8.1. This DO initially routes straight ahead turning left later than the baseline. It overflies areas around Ilkley relatively early on but avoids more densely populated areas such as Keighley. In the later stages the areas overflown are generally sparsely populated.

Group	Impact	Qualitative Assessment
Communities	Noise impact on health and quality of life	The newly overflown areas would generally be of a lower population density compared to those overflown in the baseline at lower altitudes. At higher altitudes areas of similar population density would be overflown.  In this screenshot, the baseline is the orange swathe. It shows that the existing NPR is largely contained within the 32NWB swathe (pink), however, as the NPR veers left earlier it exits the swathe over the southern side of Burley-in-Wharfedale. Routing through the gap between Otley and Burley-in-Wharfedale and turning North-West to the North of Ilkley may be an improvement from a noise perspective.
	Air Quality	Insignificant change below 1,000ft and therefore it is assessed that there would be insignificant impact on air quality.
Wider society	Greenhouse gas impact	Less track miles as compared to the baseline, therefore a slight improvement.

Group	Impact	Qualitative Assessment
	Capacity/ resilience	More direct routing getting aircraft away from the busy NELSA/POL area quicker. An improvement on the baseline.
	Tranquillity	Unlike the baseline, Ilkley Moor is not overflown however, the Nidderdale AONB is. There is a potential for the southern Yorkshire Dales NP to be affected by aircraft between 5,000-7,000ft climbing whereas the baseline avoids it below 7,000ft.
General aviation	Access	It is likely that a lowering of the base of CAS would be required to the detriment of Class G and the glider community.
General aviation/ commercial airlines	Economic impact from increased effective capacity	Routing to the North-West quicker is a positive change for the airline operators with no significant economic impact upon the GA community.
	Fuel-burn	Reduced fuel-burn as compared to the baseline.
Commercial airlines	Training costs	Very minimal training adapting to an amended departure profile.
	Other costs	No other costs have been identified.
Airport/ Air navigation service provider	Infrastructure costs	Removal of reliance on ground-based navigational aids reduces cost as compared to the baseline.
	Operational costs	No operational costs have been identified.
	Deployment costs	Other than the cost of conducting the ACP there are minimal deployment costs.
All	Safety	The DPE assessed this DP as Amber due to lack of CAS containment. This can be mitigated by lowering the base of the CAS to the North.

4.8.2. Carried forward as the preferred option as it might represent an improvement from a noise perspective.

4.9. RW32 SE Departures

4.9.1. The following figure shows the DOs as compared to the Baseline against population density mapping.

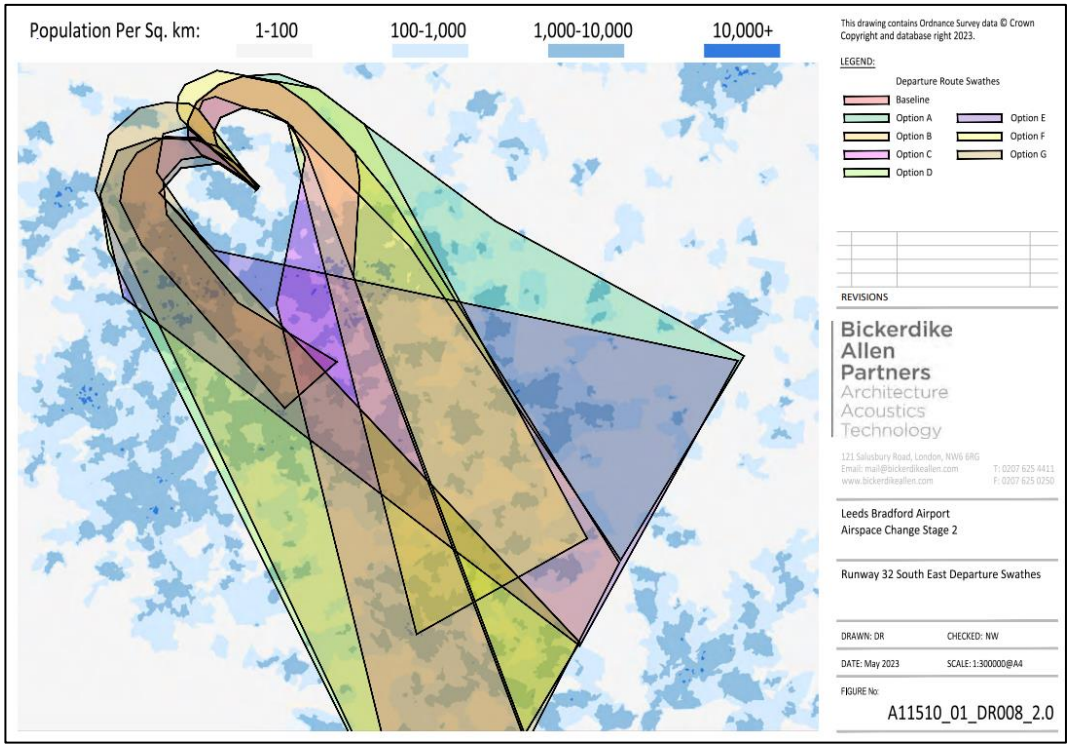


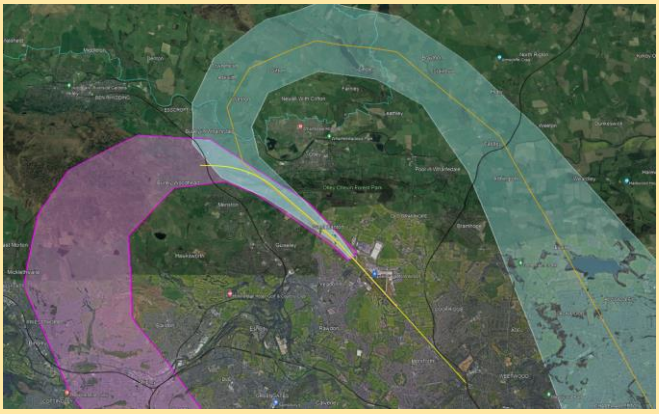
Figure 23: Runway 32 South East Departure Swathes

4.10. RW32 SE Baseline

4.10.1. The existing departure procedure turns initially left following the NPR. It then overflies central Bradford and then heads towards Wakefield.

4.12. 32SEB

4.12.1. This DO is similar to Options A (discounted during DPE) and C and flies between the two. It overflies more of central Leeds than Option A, but less than Option C. The latter stages of this DO overfly various populated areas south-east of Leeds.

Group	Impact	Qualitative Assessment
Communities	Noise impact on health and quality of life	The newly overflown areas would generally be of a slightly lower population density compared to those overflown in the baseline at lower altitudes. At higher altitudes areas of similar population density would be overflown.  The baseline is the pink swathe. The existing NPR is contained within the DO swathe until it reaches Burley-in-Wharfedale. The 32SEB swathe (blue) then turns right to the North of Otley, overflying less densely populated areas. Communities of North-East Leeds may experience some aviation noise from aircraft between 5,000 and 7,000ft.
	Air Quality	Insignificant change below 1,000ft and therefore it is assessed that there would be insignificant impact on air quality.
Wider society	Greenhouse gas impact	Similar track mileage with either a left or a right turn and therefore negligeable difference.
	Capacity/ resilience	An improvement on the baseline as departures are turned away from busy airspace to the west of LBA.
	Tranquillity	The Nidderdale AONB is impacted instead of Ilkley Moor. Eccup Reservoir is also overflown by the swathe.

Group	Impact	Qualitative Assessment
General aviation	Access	It is possible that additional CAS would be required to the East of LBA at the detriment of Class G and other airspace users.
General aviation/ commercial airlines	Economic impact from increased effective capacity	Insignificant difference assessed.
	Fuel-burn	Insignificant difference assessed.
Commercial airlines	Training costs	Very minimal training adapting to an amended departure profile.
	Other costs	No other costs have been identified.
Airport/ Air navigation service provider	Infrastructure costs	Removal of reliance on ground-based navigational aids reduces cost as compared to the baseline.
	Operational costs	No operational costs have been identified.
	Deployment costs	Other than the cost of conducting the ACP there are minimal deployment costs.
All	Safety	The DPE assessed this DP as Amber due to lack of CAS containment. This can be mitigated by a marginal extension of CAS to the East.

4.12.2. Carried forward but less attractive than 32SEF.

4.14. 32SEC

4.14.1. This DO is initially similar to Option A (discounted during DPE as it would result in climbing head on into arrivals from the East) but flies further to the south. It therefore overflies more of the densely populated areas in central Leeds. The latter stages of this DO overfly various populated areas south of Leeds.

Group	Impact	Qualitative Assessment
Communities	Noise impact on health and quality of life	The newly overflown areas would generally be of a slightly lower population density compared to those overflown in the baseline at lower altitudes. At higher altitudes areas of similar population density would be overflown.  The screengrab above shows the baseline in pink, and that the existing NPR is contained within the 32SEC swathe (orange) until it reaches Burley-in-Wharfedale. The 32SEC swathe then turns right to the North of Otley, overflying less densely populated areas. Communities of North-West Leeds may experience some aviation noise from aircraft between 5,000 and 7,000ft.
	Air Quality	Insignificant change below 1,000ft and therefore it is assessed that there would be insignificant impact on air quality.
Wider society	Greenhouse gas impact	Similar track mileage with either a left or a right turn and therefore negligeable difference.
	Capacity/ resilience	An improvement on the baseline as departures are turned away from busy airspace to the west of LBA.

Group	Impact	Qualitative Assessment
	Tranquillity	The Nidderdale AONB is impacted instead of Ilkley Moor. Eccup Reservoir is also overflown by the swathe.
General aviation	Access	It is possible that additional CAS would be required to the East of LBA at the detriment of Class G and other airspace users.
General aviation/ commercial airlines	Economic impact from increased effective capacity	Insignificant difference assessed.
	Fuel-burn	Insignificant difference assessed.
Commercial airlines	Training costs	Very minimal training adapting to an amended departure profile.
	Other costs	No other costs have been identified.
Airport/ Air navigation service provider	Infrastructure costs	Removal of reliance on ground-based navigational aids reduces cost as compared to the baseline.
	Operational costs	No operational costs have been identified.
	Deployment costs	Other than the cost of conducting the ACP there are minimal deployment costs.
All	Safety	The DPE assessed this DP as Amber due to lack of CAS containment. This can be mitigated by a marginal extension of CAS to the East.

4.14.2. This DO is rejected on the grounds that it overflies densely populated areas of Leeds at lower altitudes than other DOs and could result in greater noise nuisance.

4.15. 32SED

4.15.1. This DO is similar to the baseline and overflies largely the same areas as the baseline.

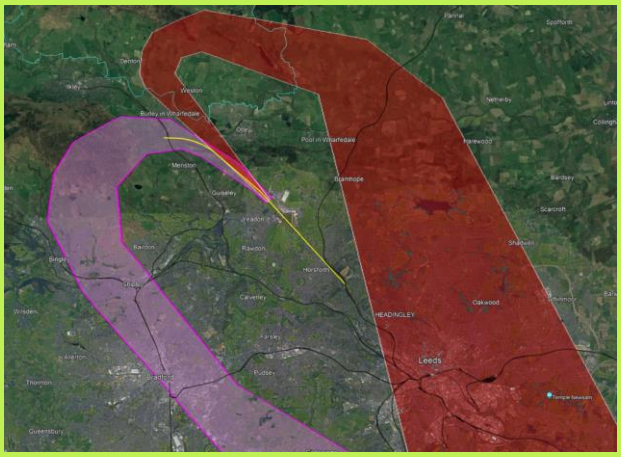
Group	Impact	Qualitative Assessment
Communities	Noise impact on health and quality of life	The newly overflown areas would generally be of a similar population density compared to those overflown in the baseline.  The 32SED swathe is the 'Do Minimum' option as it bears closest resemblance to the baseline.
	Air Quality	Insignificant change below 1,000ft and therefore it is assessed that there would be insignificant impact on air quality.
Wider society	Greenhouse gas impact	Similar track mileage to the baseline so negligeable difference.
	Capacity/ resilience	Similar to the baseline.
	Tranquillity	Similar to the baseline – Ilkley Moor overflown.
General aviation	Access	No impact.
General aviation/ commercial airlines	Economic impact from increased effective capacity	Insignificant difference assessed.

Group	Impact	Qualitative Assessment
	Fuel burn	Insignificant difference assessed.
Commercial airlines	Training costs	Very minimal training adapting to an amended departure profile.
	Other costs	No other costs have been identified.
Airport/ Air navigation service provider	Infrastructure costs	Removal of reliance on ground-based navigational aids reduces cost as compared to the baseline.
	Operational costs	No operational costs have been identified.
	Deployment costs	Other than the cost of conducting the ACP there are minimal deployment costs.
All	Safety	No less safe than the baseline.

4.15.2. Carried forward but not as favourable as 32SEF.

4.16. 32SEF

4.16.1. This DO is similar to Option B, but the initial turn happens slightly later. This would result in aircraft being slightly higher when they overfly Leeds. The latter stages of this DO overfly various populated areas south-east of Leeds.

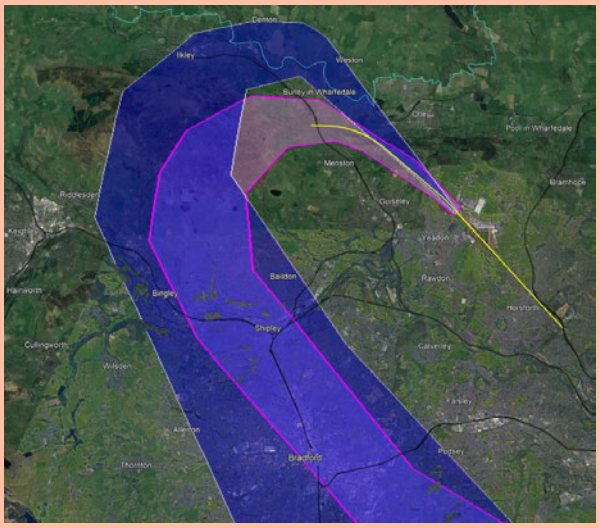
Group	Impact	Qualitative Assessment
Communities	Noise impact on health and quality of life	The newly overflown areas would generally be of a slightly lower population density compared to those overflown in the baseline at lower altitudes. At higher altitudes areas of similar population density would be overflown.  The screengrab above shows the baseline in pink, and that the existing NPR is only contained within the 32SEF swathe (red) briefly as the NPR veers to the North-West whilst this swathe maintains runway track overflying the western side of Otley. Communities of Northern Leeds may experience some aviation noise from aircraft between 5,000 and 7,000ft.
	Air Quality	Minor change below 1,000ft and therefore it is assessed that there would still be insignificant impact on air quality.
Wider society	Greenhouse gas impact	Marginally greater track mileage to the baseline but still likely to be a negligeable difference.
	Capacity/ resilience	Similar to the baseline.

Group	Impact	Qualitative Assessment
	Tranquillity	The Nidderdale AONB is impacted instead of Ilkley Moor. Eccup Reservoir is also overflown by the swathe as is Harewood House.
General aviation	Access	It is possible that additional CAS would be required to the East of LBA at the detriment of Class G and other airspace users.
General aviation/ commercial airlines	Economic impact from increased effective capacity	Insignificant difference assessed.
	Fuel-burn	Insignificant difference assessed.
Commercial airlines	Training costs	Very minimal training adapting to an amended departure profile.
	Other costs	No other costs have been identified.
Airport/ Air navigation service provider	Infrastructure costs	Removal of reliance on ground-based navigational aids reduces cost as compared to the baseline.
	Operational costs	No operational costs have been identified.
	Deployment costs	Other than the cost of conducting the ACP there are minimal deployment costs.
All	Safety	No less safe than the baseline. It is assessed that the departures could climb well above the arrivals to RW32.

4.16.2. Carried forward as the preferred option as it is considered there is a potential for a reduction in noise impact on local communities as compared to the baseline and the other DOs.

4.17. 32SEG

4.17.1. This DO is similar to Option D, but the initial turn happens slightly later, this results in overflying parts of the area around Ilkley. The latter stages of this DO overfly largely the same areas as the baseline.

Group	Impact	Qualitative Assessment
Communities	Noise impact on health and quality of life	The newly overflown areas would generally be of a slightly higher population density compared to those overflown in the baseline at lower altitudes. At higher altitudes areas of similar population density would be overflown.  The 32SEG swathe (blue) routes out on runway track for longer than the baseline (pink) resulting in a routing to the East of the NPR and overflight of Otley, Burley-in-Wharfedale, Esscroft, Ben Rhydding and Ilkley.
	Air Quality	Minor change below 1,000ft and therefore it is assessed that there would still be insignificant impact on air quality.
Wider society	Greenhouse gas impact	Marginally greater track mileage to the baseline but still likely to be a negligeable difference.
	Capacity/ resilience	Similar to the baseline.
	Tranquillity	Ilkley Moor and Nidderdale AONB overflown.

Group	Impact	Qualitative Assessment
General aviation	Access	No impact.
General aviation/ commercial airlines	Economic impact from increased effective capacity	Insignificant difference assessed.
	Fuel burn	Insignificant difference assessed.
Commercial airlines	Training costs	Very minimal training adapting to an amended departure profile.
	Other costs	No other costs have been identified.
Airport/ Air navigation service provider	Infrastructure costs	Removal of reliance on ground-based navigational aids reduces cost as compared to the baseline.
	Operational costs	No operational costs have been identified.
	Deployment costs	Other than the cost of conducting the ACP there are minimal deployment costs.
All	Safety	No less safe than the baseline.

4.17.2. This DO is rejected on the grounds that it is anticipated that there will be a net increase in noise impact particularly at lower altitudes.

4.19. RW32 S&W Departures

4.19.1. The following figure shows the DOs as compared to the Baseline against population density mapping.

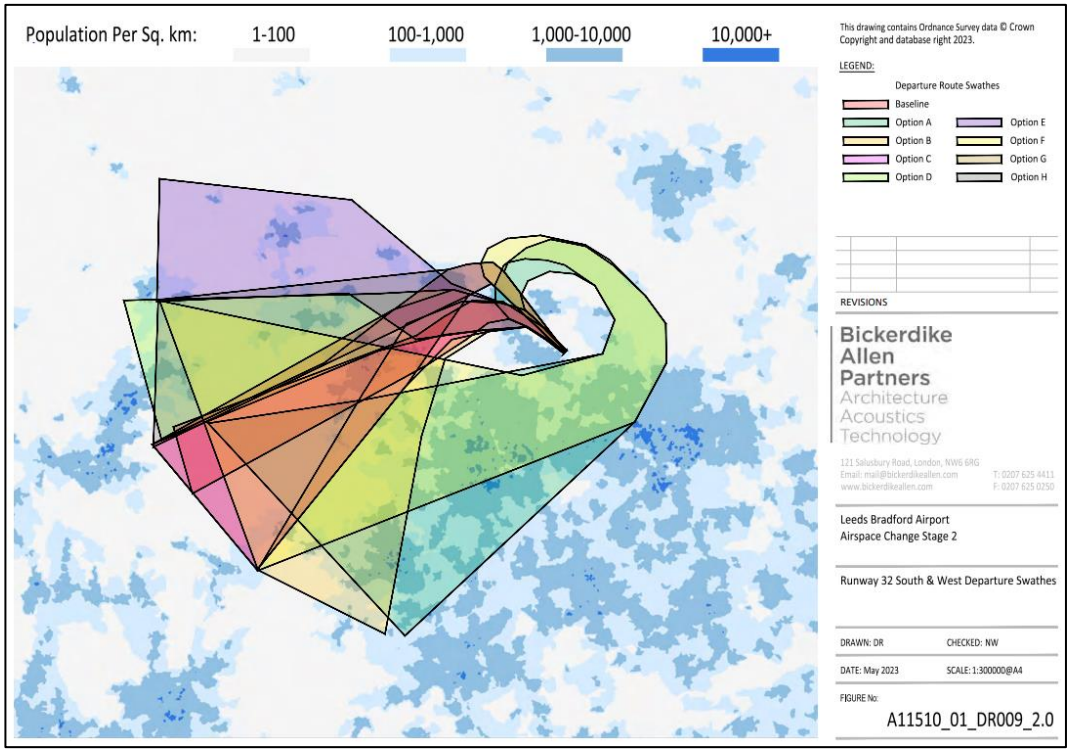


Figure 24: Runway 32 South & West Departure Swathes

4.20. RW32 S&W Baseline

4.20.1. The existing departure procedure turns left following the NPR and avoids overflying Ilkley. Aircraft then continue south-west and overfly Keighley. In the later stages the areas overflown are generally sparsely populated

4.22. 32S&WA

4.22.1. This DO would initially turn right and loop around to head south-west. Initially the areas overflown are relatively sparsely populated. However, In the later stages this DO overflies densely populated areas in northern Leeds, Bradford, Keighley and Halifax.

Group	Impact	Qualitative Assessment
Communities	Noise impact on health and quality of life	The newly overflown areas would generally be of a much lower population density compared to those overflown in the baseline at lower altitudes. At higher altitudes areas of higher population density would be overflown.  The screengrab above shows the baseline (peach) and that the existing NPR is contained within the 32S&WA swathe (grey) until it reaches Burley-in-Wharfedale. It then turns right to the North of Otley, overflying less densely populated areas. Communities of North-West Leeds may experience some aviation noise from aircraft between 5,000 and 7,000ft.
	Air Quality	Insignificant change below 1,000ft and therefore it is assessed that there would be insignificant impact on air quality.
Wider society	Greenhouse gas impact	Additional track mileage as compared to the baseline resulting in greater fuel-burn however may result in unrestricted climb as it turns away from the congested POL area initially. An unrestricted climb could offset the additional track mileage.
	Capacity/ resilience	An improvement on the baseline as departures are turned away from busy airspace to the west of LBA.

Group	Impact	Qualitative Assessment
	Tranquillity	The Nidderdale AONB is impacted instead of Ilkley Moor. Eccup Reservoir is also overflown by the swathe.
General aviation	Access	It is possible that additional CAS would be required to the East of LBA at the detriment of Class G and other airspace users.
General aviation/ commercial airlines	Economic impact from increased effective capacity	Insignificant difference assessed.
	Fuel-burn	Additional track mileage as compared to the baseline resulting in greater fuel-burn however may result in unrestricted climb as it turns away from the congested POL area initially. An unrestricted climb could offset the additional track mileage.
Commercial airlines	Training costs	Very minimal training adapting to an amended departure profile.
	Other costs	No other costs have been identified.
Airport/ Air navigation service provider	Infrastructure costs	Removal of reliance on ground-based navigational aids reduces cost as compared to the baseline.
	Operational costs	No operational costs have been identified.
	Deployment costs	Other than the cost of conducting the ACP there are minimal deployment costs.
All	Safety	The DPE assessed this DP as Red due to lack of CAS containment on this wraparound SID. This could be mitigated by a marginal extension of CAS to the East. It is assessed that departures could climb well above inbounds to RW32.

4.22.2. Carried forward as the preferred option as it is there is potential that this may offer a net improvement on the noise impact, particularly at lower altitudes.

4.23. 32S&WB

4.23.1. This DO is initially similar to the baseline, but heads further south. This overflies less of Keighley initially but in the later stages overflies parts of Halifax.

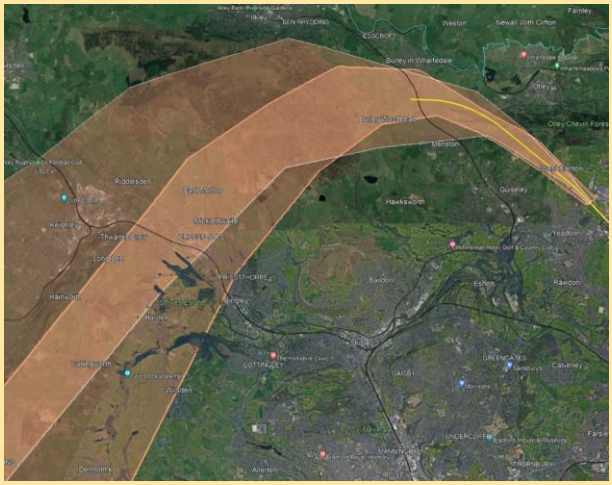
Group	Impact	Qualitative Assessment
Communities	Noise impact on health and quality of life	The newly overflown areas would generally be of a slightly lower population density compared to those overflown in the baseline at lower altitudes. At higher altitudes areas of slightly higher population density would be overflown.  The 32S&WB swathe is the 'Do Minimum' option as it bears closest resemblance to the baseline. The NPR is contained within the swathe.
	Air Quality	Insignificant change below 1,000ft and therefore it is assessed that there would be insignificant impact on air quality.
Wider society	Greenhouse gas impact	Similar track mileage to the baseline so negligeable difference.
	Capacity/ resilience	Similar to the baseline.
	Tranquillity	Similar to the baseline – Ilkley Moor overflown.
General aviation	Access	No impact.

Group	Impact	Qualitative Assessment
General aviation/ commercial airlines	Economic impact from increased effective capacity	Insignificant difference assessed.
	Fuel-burn	Insignificant difference assessed.
Commercial airlines	Training costs	Very minimal training adapting to an amended departure profile.
	Other costs	No other costs have been identified.
Airport/ Air navigation service provider	Infrastructure costs	Removal of reliance on ground-based navigational aids reduces cost as compared to the baseline.
	Operational costs	No operational costs have been identified.
	Deployment costs	Other than the cost of conducting the ACP there are minimal deployment costs.
All	Safety	No less safe than the baseline.

4.23.2. This DO is rejected on the grounds that whilst it is very similar to the baseline and 32S&WC, it has the potential to affect a greater population density and it doesn't point towards POL where these departures need to link into the route network.

4.25. 32S&WC

4.25.1. This DO is initially similar to the baseline overflies largely the same areas.

Group	Impact	Qualitative Assessment
Communities	Noise impact on health and quality of life	The newly overflown areas would generally be of a similar population density compared to those overflown in the baseline.  The 32S&WC swathe (most North-Westerly of the two, the other being the baseline) contains the NPR but then routes slightly further west over Keighley.
	Air Quality	Insignificant change below 1,000ft and therefore it is assessed that there would be insignificant impact on air quality.
Wider society	Greenhouse gas impact	Similar track mileage to the baseline so negligeable difference.
	Capacity/ resilience	Similar to the baseline.
	Tranquillity	Similar to the baseline – Ilkley Moor overflown.
General aviation	Access	No impact.

Group	Impact	Qualitative Assessment
General aviation/ commercial airlines	Economic impact from increased effective capacity	Insignificant difference assessed.
	Fuel-burn	Insignificant difference assessed.
Commercial airlines	Training costs	Very minimal training adapting to an amended departure profile.
	Other costs	No other costs have been identified.
Airport/ Air navigation service provider	Infrastructure costs	Removal of reliance on ground-based navigational aids reduces cost as compared to the baseline.
	Operational costs	No operational costs have been identified.
	Deployment costs	Other than the cost of conducting the ACP there are minimal deployment costs.
All	Safety	No less safe than the baseline.

4.25.2. Carried forward but not as favourable as 32S&WA.

4.27. 32S&WD

4.27.1. This DO is initially similar to the baseline, but heads further north. This overflies less of Keighley but more of Bradford.

Group	Impact	Qualitative Assessment
Communities	Noise impact on health and quality of life	The newly overflown areas would generally be of a similar population density compared to those overflown in the baseline at lower altitudes. At higher altitudes areas of similar or slightly lower population density would be overflown.  The NPR is contained within this swathe but then the swathe diverges from the baseline to the West and then to the Northern side of Keighley.
	Air Quality	Insignificant change below 1,000ft and therefore it is assessed that there would be insignificant impact on air quality.
Wider society	Greenhouse gas impact	Similar track mileage to the baseline so negligeable difference.
	Capacity/ resilience	Similar to the baseline.
	Tranquillity	Similar to the baseline – Ilkley Moor overflown.
General aviation	Access	No impact.
General aviation/ commercial airlines	Economic impact from increased effective capacity	Insignificant difference assessed.

Group	Impact	Qualitative Assessment
	Fuel-burn	Insignificant difference assessed.
Commercial airlines	Training costs	Very minimal training adapting to an amended departure profile.
	Other costs	No other costs have been identified.
Airport/ Air navigation service provider	Infrastructure costs	Removal of reliance on ground-based navigational aids reduces cost as compared to the baseline.
	Operational costs	No operational costs have been identified.
	Deployment costs	Other than the cost of conducting the ACP there are minimal deployment costs.
All	Safety	This points a departure towards a potential arrival route (via NELSA) and could result in complexities.

4.27.2. This DO is rejected on safety grounds.

4.29. 32S&WF

4.29.1. This DO is similar to Option A, but the initial right turn occurs slightly later. This would result in aircraft being slightly higher when they overfly Leeds. In the latter stages this DO also flies slightly further north than Option A.

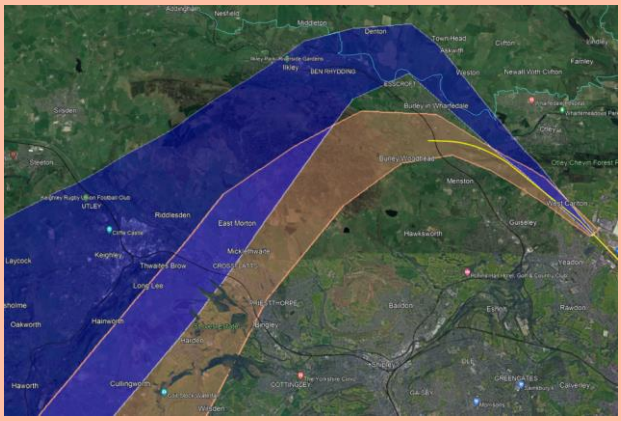
Group	Impact	Qualitative Assessment
Communities	Noise impact on health and quality of life	The newly overflown areas would generally be of a much lower population density compared to those overflown in the baseline at lower altitudes. At higher altitudes areas of higher population density would be overflown.  The screengrab above shows that the existing NPR is only contained within the 32S&WF swathe (yellow) briefly as the NPR veers to the North-West with the baseline (peach) whilst 32S&WF maintains runway track overflying the western side of Otley. Communities of North-Western Leeds may experience some aviation noise from aircraft between 5,000 and 7,000ft.
	Air Quality	Minor change below 1,000ft and therefore it is assessed that there would still be insignificant impact on air quality.
Wider society	Greenhouse gas impact	Additional track mileage as compared to the baseline resulting in greater fuel-burn however may result in unrestricted climb as it turns away from the congested POL area initially. An unrestricted climb could offset the additional track mileage.
	Capacity/ resilience	An improvement on the baseline as departures are turned away from busy airspace to the west of LBA.

Group	Impact	Qualitative Assessment
	Tranquillity	The Nidderdale AONB is impacted instead of Ilkley Moor. Eccup Reservoir is also overflown by the swathe.
General aviation	Access	It is possible that additional CAS would be required to the East of LBA at the detriment of Class G and other airspace users.
General aviation/ commercial airlines	Economic impact from increased effective capacity	Insignificant difference assessed.
	Fuel-burn	Additional track mileage as compared to the baseline resulting in greater fuel-burn however may result in unrestricted climb as it turns away from the congested POL area initially. An unrestricted climb could offset the additional track mileage.
Commercial airlines	Training costs	Very minimal training adapting to an amended departure profile.
	Other costs	No other costs have been identified.
Airport/ Air navigation service provider	Infrastructure costs	Removal of reliance on ground-based navigational aids reduces cost as compared to the baseline.
	Operational costs	No operational costs have been identified.
	Deployment costs	Other than the cost of conducting the ACP there are minimal deployment costs.
All	Safety	The DPE assessed this DP as Red due to lack of CAS containment on this wraparound SID. This could be mitigated by a marginal extension of CAS to the East. It is assessed that departures could climb well above inbounds to RW32.

4.29.2. Carried forward but not considered a favourable as 32S&WA.

4.30. 32S&WG

4.30.1. This DO is similar to Option C, but the initial left turn occurs slightly later. This results in overflying the area around Ilkley. The latter stages of this design option overfly largely the same areas as the baseline and Option C.

Group	Impact	Qualitative Assessment
Communities	Noise impact on health and quality of life	The newly overflown areas would generally be of a slightly higher population density compared to those overflown in the baseline at lower altitudes. At higher altitudes areas of similar population density would be overflown.  The 32S&WG swathe routes out on runway track for longer resulting in a routing to the East of the NPR and overflight of Otley, Burley-in-Wharfedale, Esscroft, Ben Rhydding and Ilkley. It then remains slightly North of the baseline resulting in overflight of Keighley.
	Air Quality	Minor change below 1,000ft and therefore it is assessed that there would still be insignificant impact on air quality.
Wider society	Greenhouse gas impact	Marginally greater track mileage to the baseline but still likely to be a negligeable difference.
	Capacity/ resilience	Similar to the baseline.
	Tranquillity	Ilkley Moor and Nidderdale AONB overflown.
General aviation	Access	No impact.

Group	Impact	Qualitative Assessment
General aviation/ commercial airlines	Economic impact from increased effective capacity	Insignificant difference assessed.
	Fuel-burn	Insignificant difference assessed.
Commercial airlines	Training costs	Very minimal training adapting to an amended departure profile.
	Other costs	No other costs have been identified.
Airport/ Air navigation service provider	Infrastructure costs	Removal of reliance on ground-based navigational aids reduces cost as compared to the baseline.
	Operational costs	No operational costs have been identified.
	Deployment costs	Other than the cost of conducting the ACP there are minimal deployment costs.
All	Safety	No less safe than the baseline.

4.30.2. This DO is rejected as it is anticipated there will be greater noise impact on communities at lower altitudes.

4.31. 32S&WH

4.31.1. This DO is similar to Option D, but the initial left turn occurs slightly later. This results in overflying the area around Ilkley. The latter stages of this design option overfly largely the same areas as Option D.

Group	Impact	Qualitative Assessment
Communities	Noise impact on health and quality of life	The newly overflown areas would generally be of a slightly higher population density compared to those overflown in the baseline at lower altitudes. At higher altitudes areas of similar or slightly lower population density would be overflown.  The NPR is not contained within this swathe as it maintains runway track over Western Otley and Burley-in-Wharfedale before turning overhead Ilkley and then to the North of Keighley.
	Air Quality	Minor change below 1,000ft and therefore it is assessed that there would still be insignificant impact on air quality.
Wider society	Greenhouse gas impact	Greater track mileage to the baseline but still likely to be a negligeable difference.
	Capacity/ resilience	Similar to the baseline.
	Tranquillity	Ilkley Moor and Nidderdale AONB overflown.
General aviation	Access	No impact.

Group	Impact	Qualitative Assessment
General aviation/ commercial airlines	Economic impact from increased effective capacity	Insignificant difference assessed.
	Fuel-burn	Additional track miles will result in greater fuel-burn.
Commercial airlines	Training costs	Very minimal training adapting to an amended departure profile.
	Other costs	No other costs have been identified.
Airport/ Air navigation service provider	Infrastructure costs	Removal of reliance on ground-based navigational aids reduces cost as compared to the baseline.
	Operational costs	No operational costs have been identified.
	Deployment costs	Other than the cost of conducting the ACP there are minimal deployment costs.
All	Safety	This points a departure towards a potential arrival route (via NELSA) and could result in complexities.

4.31.2. This DO is rejected as it is anticipated there will be greater noise impact on communities at lower altitudes and on the grounds of safety.

4.32. RW14 NW Departures

4.32.1. The following figure shows the DOs as compared to the Baseline against population density mapping.

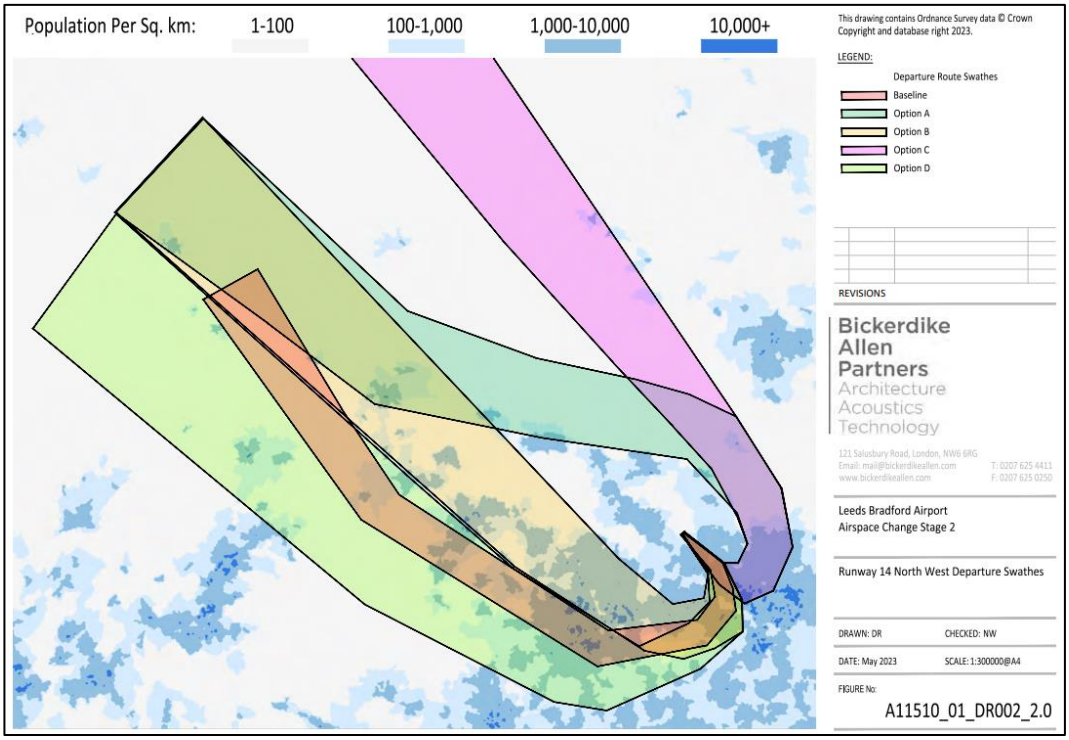


Figure 25: Runway 14 North West Departure Swathes

4.33. RW14 NW Baseline

4.33.1. There isn't a North-Westerly SID currently and aircraft wishing to depart in this direction do so tactically. However, NTMS data shows that after following the NPR, aircraft routing to the North-West typically turn right overflying western Leeds and Bradford before continuing to the North-West.

4.35. 14NWA

4.35.1. This DO would turn initially left, overflying relatively densely populated areas in North-Eastern Leeds. The latter stages of this DO largely avoid other substantial areas of dense population. As this DO turns left if avoids overflying Bradford

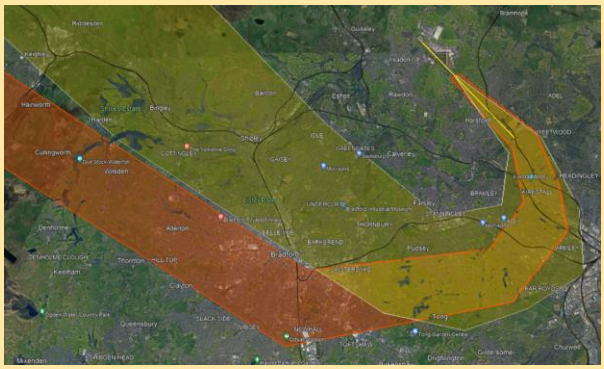
Group	Impact	Qualitative Assessment
Communities	Noise impact on health and quality of life	The newly overflown areas would generally be of a similar or slightly higher population density compared to those overflown in the baseline at lower altitudes. At higher altitudes areas of lower population density would be overflown.  The 14NWA swathe (turquoise) contains the NPR but the swathe then turns to the left over North-West Leeds as compared to the baseline which turns right (orange).
	Air Quality	Insignificant change below 1,000ft and therefore it is assessed that there would be insignificant impact on air quality.
Wider society	Greenhouse gas impact	Similar track mileage to the baseline so negligeable difference.
	Capacity/ resilience	An improvement on the baseline as departures are turned away from busy airspace to the west of LBA.
	Tranquillity	Impacts Meanwood Park, Eccup Reservoir and the Nidderdale AONB below 7,000ft.

Group	Impact	Qualitative Assessment
General aviation	Access	It is possible that additional CAS would be required to the East of LBA at the detriment of Class G and other airspace users.
General aviation/ commercial airlines	Economic impact from increased effective capacity	Insignificant difference assessed.
	Fuel-burn	Insignificant difference assessed.
Commercial airlines	Training costs	Very minimal training adapting to an amended departure profile.
	Other costs	No other costs have been identified.
Airport/ Air navigation service provider	Infrastructure costs	Removal of reliance on ground-based navigational aids reduces cost as compared to the baseline.
	Operational costs	No operational costs have been identified.
	Deployment costs	Other than the cost of conducting the ACP there are minimal deployment costs.
All	Safety	This points a departure towards arrivals from the North and could result in complexities.

4.35.2. This DO is rejected as it is anticipated there will be greater noise impact on communities at lower altitudes and on the grounds of safety.

4.37. 14NWB

4.37.1. This DO is very similar to the baseline; however, it turns slightly sharper. This results in overflying more northerly areas of Bradford and areas to the northwest such as Keighley. Parts of these areas are also overflown by the baseline.

Group	Impact	Qualitative Assessment
Communities	Noise impact on health and quality of life	The newly overflown areas would generally be of a similar population density compared to those overflown in the baseline at lower altitudes. At higher altitudes areas of slightly higher population density would be overflown.  The NPR is contained within the 14NWB swathe (yellow) but the swathe then broadens and turns sharper to the North-West than the baseline (orange), taking in different areas of Leeds such as Pudsey and Northern Bradford, Shipley and Bingley.
	Air Quality	Insignificant change below 1,000ft and therefore it is assessed that there would be insignificant impact on air quality.
Wider society	Greenhouse gas impact	Similar track mileage to the baseline so negligeable difference.
	Capacity/ resilience	Similar to the baseline.
	Tranquillity	Ilkley Moor overflown.
General aviation	Access	No impact.

Group	Impact	Qualitative Assessment
General aviation/ commercial airlines	Economic impact from increased effective capacity	Insignificant difference assessed.
	Fuel-burn	Insignificant difference assessed.
Commercial airlines	Training costs	Very minimal training adapting to an amended departure profile.
	Other costs	No other costs have been identified.
Airport/ Air navigation service provider	Infrastructure costs	Removal of reliance on ground-based navigational aids reduces cost as compared to the baseline.
	Operational costs	No operational costs have been identified.
	Deployment costs	Other than the cost of conducting the ACP there are minimal deployment costs.
All	Safety	No less safe than the baseline.

4.37.2. Carried forward but not considered a favourable as 14NWD.

4.38. 14NWD

4.38.1. This DO is very similar to the baseline; however, it turns slightly less sharply. This results in overflying more southerly areas of Bradford and areas to the northwest such as Keighley. Parts of these areas are also overflown by the baseline.

Group	Impact	Qualitative Assessment
Communities	Noise impact on health and quality of life	The newly overflown areas would generally be of a similar or slightly lower population density compared to those overflown in the baseline at lower altitudes. At higher altitudes areas of similar population density would be overflown.  The NPR is contained within the14NWD swathe (green), and this DO is the most similar option to the baseline (orange), i.e. the 'Do Minimum' option.
	Air Quality	Insignificant change below 1,000ft and therefore it is assessed that there would be insignificant impact on air quality.
Wider society	Greenhouse gas impact	Similar track mileage to the baseline so negligeable difference.
	Capacity/ resilience	Similar to the baseline.
	Tranquillity	Similar to the baseline, no significant issues identified.
General aviation	Access	No impact.

Group	Impact	Qualitative Assessment
General aviation/ commercial airlines	Economic impact from increased effective capacity	Insignificant difference assessed.
	Fuel-burn	Insignificant difference assessed.
Commercial airlines	Training costs	Very minimal training adapting to an amended departure profile.
	Other costs	No other costs have been identified.
Airport/ Air navigation service provider	Infrastructure costs	Removal of reliance on ground-based navigational aids reduces cost as compared to the baseline.
	Operational costs	No operational costs have been identified.
	Deployment costs	Other than the cost of conducting the ACP there are minimal deployment costs.
All	Safety	No less safe than the baseline.

4.38.2. Carried forward as the preferred option as there is potential for a reduction in the noise impact on communities at a lower level as compared to the baseline and the other DOs.

4.39. RW14 SE Departures

4.39.1. The following figure shows the DOs as compared to the Baseline against population density mapping.

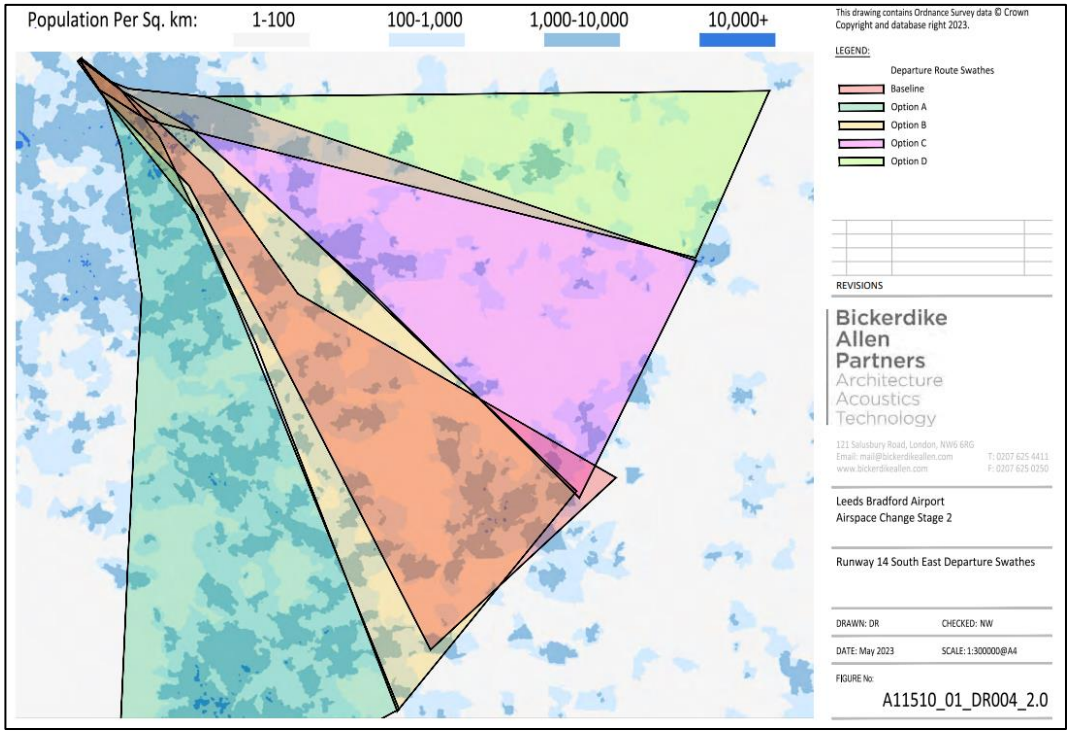


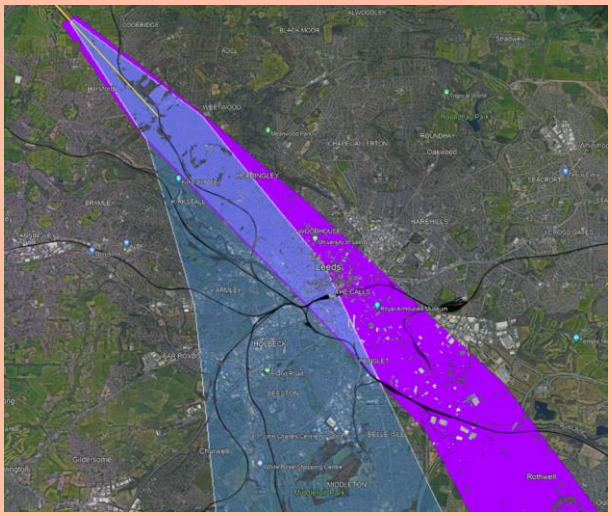
Figure 26: Runway 14 South East Departure Swathes

4.40. RW14 SE Baseline

4.40.1. The existing departure procedure flies largely straight following the NPR initially. This overflies central Leeds and continues to the South-East towards Doncaster.

4.42. 14SEA

4.42.1. This DO would initially turn right, overflying central and southern Leeds. The latter stages of this DO overfly several densely populated areas such as Wakefield and Barnsley.

Group	Impact	Qualitative Assessment
Communities	Noise impact on health and quality of life	The newly overflown areas would generally be of a similar population density compared to those overflown in the baseline at lower altitudes. At higher altitudes areas of higher population density would be overflown.  The NPR is contained within this swathe but after this, the 14SEA swathe (blue) diverts more directly south than the baseline (pink) potentially impacting a great number of people as it routes towards Wakefield.
	Air Quality	Insignificant change below 1,000ft and therefore it is assessed that there would be insignificant impact on air quality.
Wider society	Greenhouse gas impact	Similar track mileage to the baseline so negligeable difference.
	Capacity/ resilience	Similar to the baseline.
	Tranquillity	Overflight of Middleton Park and Ardsley Reservoir.
General aviation	Access	No impact.

Group	Impact	Qualitative Assessment
General aviation/ commercial airlines	Economic impact from increased effective capacity	Insignificant difference assessed.
	Fuel-burn	Insignificant difference assessed.
Commercial airlines	Training costs	Very minimal training adapting to an amended departure profile.
	Other costs	No other costs have been identified.
Airport/ Air navigation service provider	Infrastructure costs	Removal of reliance on ground-based navigational aids reduces cost as compared to the baseline.
	Operational costs	No operational costs have been identified.
	Deployment costs	Other than the cost of conducting the ACP there are minimal deployment costs.
All	Safety	No less safe than the baseline.

4.42.2. This DO is rejected on the grounds that whilst it is similar to 14SEB, it has the potential to affect a greater population density.

4.43. 14SEB

4.43.1. This DO is very similar to the baseline and therefore overflies largely the same areas.

Group	Impact	Qualitative Assessment
Communities	Noise impact on health and quality of life	The newly overflown areas would generally be of a similar population density compared to those overflown in the baseline.  Overflies Central Leeds just as the baseline track (pink) but once beyond Leeds it has the potential to affect less people than the alternate options. Identified as the 'Do Minimum' option.
	Air Quality	Insignificant change below 1,000ft and therefore it is assessed that there would be insignificant impact on air quality.
Wider society	Greenhouse gas impact	Similar track mileage to the baseline so negligeable difference.
	Capacity/ resilience	Similar to the baseline.
	Tranquillity	Similar to the baseline, no significant issues identified.
General aviation	Access	No impact.

Group	Impact	Qualitative Assessment
General aviation/ commercial airlines	Economic impact from increased effective capacity	Insignificant difference assessed.
	Fuel-burn	Insignificant difference assessed.
Commercial airlines	Training costs	Very minimal training adapting to an amended departure profile.
	Other costs	No other costs have been identified.
Airport/ Air navigation service provider	Infrastructure costs	Removal of reliance on ground-based navigational aids reduces cost as compared to the baseline.
	Operational costs	No operational costs have been identified.
	Deployment costs	Other than the cost of conducting the ACP there are minimal deployment costs.
All	Safety	No less safe than the baseline.

4.43.2. Carried forward as the preferred option as there is potential for a reduction in the noise impact on communities as compared to the other DOs.

4.45. RW14 S&W Departures

4.45.1. The following figure shows the DOs as compared to the Baseline against population density mapping.

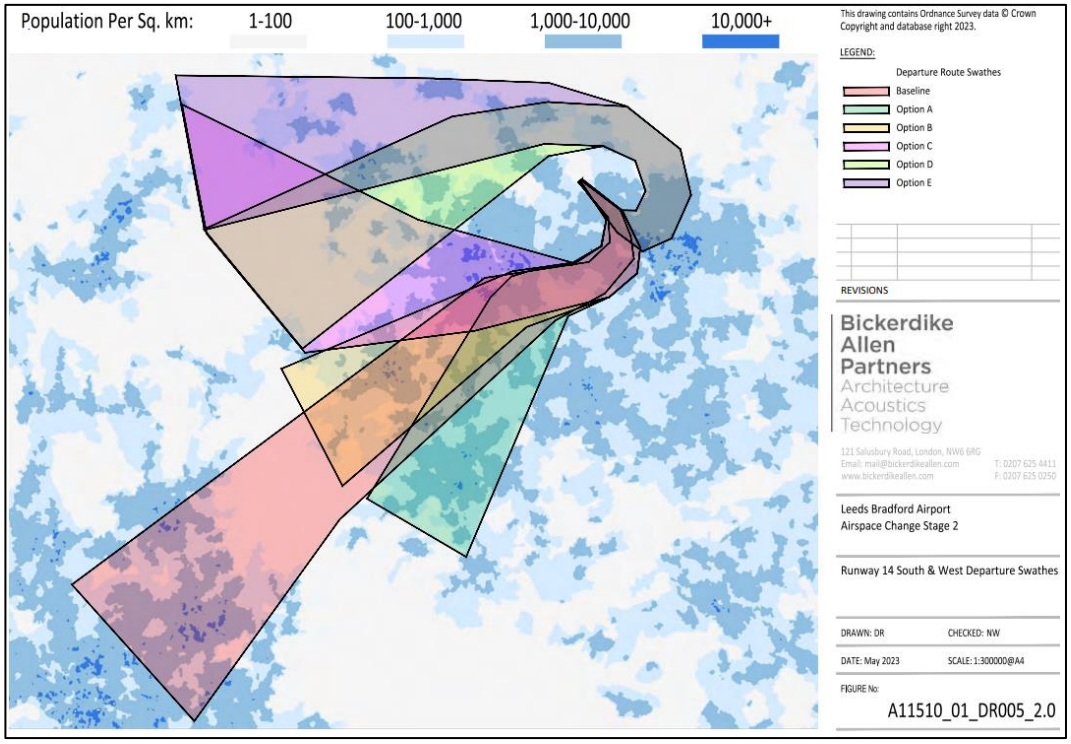


Figure 27: Runway 14 South & West Departure Swathes

4.46. RW14 S&W Baseline

4.46.1. After following the NPR, the existing departure procedure turns initially right overflying western Leeds and southern Bradford before veering left to the South-West over Halifax towards Manchester.

4.48. 14S&WA

4.48.1. This DO is initially very similar to the baseline. In the latter stages of this DO it goes slightly further south than the baseline, overflying Huddersfield rather than Halifax.

Group	Impact	Qualitative Assessment
Communities	Noise impact on health and quality of life	The newly overflown areas would generally be of a similar population density compared to those overflown in the baseline.  The NPR is contained within the swathe and the track is very similar to the baseline (baseline is the narrower of the two swathes in the screenshot) for the first 3-4,000ft of the climb at which point it veers further South over Brighouse and Huddersfield as opposed to Halifax and Sowerby Bridge.
	Air Quality	Insignificant change below 1,000ft and therefore it is assessed that there would be insignificant impact on air quality.
Wider society	Greenhouse gas impact	Similar track mileage to the baseline so negligeable difference however, for aircraft wishing to route to the West, it is not as direct.
	Capacity/ resilience	Similar to the baseline.

Group	Impact	Qualitative Assessment
	Tranquillity	Similar to the baseline, no significant issues identified.
General aviation	Access	No impact.
General aviation/ commercial airlines	Economic impact from increased effective capacity	Insignificant difference assessed.
	Fuel-burn	Greater fuel-burn for aircraft wishing to route to the West. May result in step climbs due to Manchester inbounds. This will incur a fuel penalty.
Commercial airlines	Training costs	Very minimal training adapting to an amended departure profile.
	Other costs	No other costs have been identified.
Airport/ Air navigation service provider	Infrastructure costs	Removal of reliance on ground-based navigational aids reduces cost as compared to the baseline.
	Operational costs	No operational costs have been identified.
	Deployment costs	Other than the cost of conducting the ACP there are minimal deployment costs.
All	Safety	Potentially points towards inbounds from the south through DENBY and needs to cross the Manchester inbound lane from the East.

4.48.2. This DO is rejected on the grounds of fuel-burn and safety due to potential confliction with Manchester inbounds and the ROSUN hold.

4.50. 14S&WB

4.50.1. This DO is initially very similar to the baseline. In the latter stages of this DO it goes slightly further North than the baseline, overflying more of Halifax.

Group	Impact	Qualitative Assessment
Communities	Noise impact on health and quality of life	The newly overflown areas would generally be of a similar population density compared to those overflown in the baseline.  Identified as the 'Do Minimum' option. The NPR is contained within the swathe. The baseline is the orange swathe.
	Air Quality	Insignificant change below 1,000ft and therefore it is assessed that there would be insignificant impact on air quality.
Wider society	Greenhouse gas impact	Similar track mileage to the baseline so negligeable difference.
	Capacity/ resilience	Similar to the baseline.
	Tranquillity	Similar to the baseline, no significant issues identified.
General aviation	Access	No impact.

Group	Impact	Qualitative Assessment
General aviation/ commercial airlines	Economic impact from increased effective capacity	Insignificant difference assessed.
	Fuel-burn	Similar to the baseline although may result in step climbs due to Manchester inbounds. This will incur a fuel penalty.
Commercial airlines	Training costs	Very minimal training adapting to an amended departure profile.
	Other costs	No other costs have been identified.
Airport/ Air navigation service provider	Infrastructure costs	Removal of reliance on ground-based navigational aids reduces cost as compared to the baseline.
	Operational costs	No operational costs have been identified.
	Deployment costs	Other than the cost of conducting the ACP there are minimal deployment costs.
All	Safety	Potential conflict as needs to cross the Manchester inbound lane from the East.

4.50.2. This DO is rejected on the grounds of fuel-burn and safety due to potential confliction with Manchester inbounds and the ROSUN hold.

4.51. 14S&WC

4.51.1. This DO is initially similar to the baseline, but flies further North overflying more of Bradford. In the latter stages of this DO it overflies generally less densely populated areas.

Group	Impact	Qualitative Assessment
Communities	Noise impact on health and quality of life	The newly overflown areas would generally be of a slightly higher population density compared to those overflown in the baseline at lower altitudes. At higher altitudes areas of lower population density would be overflown.  The NPR is contained within the swathe but thereafter, 14S&WC turns harder to the West and overflies large areas of Bradford than the baseline which continues South-West.
	Air Quality	Insignificant change below 1,000ft and therefore it is assessed that there would be insignificant impact on air quality.
Wider society	Greenhouse gas impact	Additional track mileage to the baseline if routing to the South-West but less if routing West and this probably balances this out.
	Capacity/ resilience	Similar to the baseline.
	Tranquillity	Similar to the baseline, no significant issues identified.

Group	Impact	Qualitative Assessment
General aviation	Access	No impact.
General aviation/ commercial airlines	Economic impact from increased effective capacity	Insignificant difference assessed.
	Fuel-burn	Additional track mileage to the baseline if routing to the South-West but less if routing West and this probably balances this out.
Commercial airlines	Training costs	Very minimal training adapting to an amended departure profile.
	Other costs	No other costs have been identified.
Airport/ Air navigation service provider	Infrastructure costs	Removal of reliance on ground-based navigational aids reduces cost as compared to the baseline.
	Operational costs	No operational costs have been identified.
	Deployment costs	Other than the cost of conducting the ACP there are minimal deployment costs.
All	Safety	No less safe than the baseline.

4.51.2. Carried forward as the preferred option on the grounds that it points in the direction most likely to suit the route network and the baseline is contained within it at lower altitudes such that overflight of the more densely populated areas might be avoided. The width of the swathe presents flexibility to try various options.

4.52. 14S&WD

4.52.1. This DO would initially turn left, overflying north-eastern Leeds. The latter stages of this DO overfly generally more sparsely populated areas than the baseline.

Group	Impact	Qualitative Assessment
Communities	Noise impact on health and quality of life	The newly overflown areas would generally be of a similar population density compared to those overflown in the baseline at lower altitudes. At higher altitudes areas of lower population density would be overflown.  The NPR is contained within the 14S&WD swathe (yellow) before it then turns left and loops around to the North of the Airport impacting the communities of North-West Leeds but of similar population density to the baseline (purple).
	Air Quality	Insignificant change below 1,000ft and therefore it is assessed that there would be insignificant impact on air quality.
Wider society	Greenhouse gas impact	Additional track mileage to the baseline however, the ability to climb in an unrestricted fashion may offset this.
	Capacity/ resilience	Potential improvement as the climb is achieved earlier before turning towards the busy POL area.
	Tranquillity	Overflight of Meanwood Park, Eccup Reservoir and Otley Chevin Forest Park.

Group	Impact	Qualitative Assessment
General aviation	Access	It is possible that additional CAS would be required to the East of LBA at the detriment of Class G and other airspace users.
General aviation/ commercial airlines	Economic impact from increased effective capacity	Insignificant difference assessed.
	Fuel-burn	Additional track mileage to the baseline however, the ability to climb in an unrestricted fashion may offset this.
Commercial airlines	Training costs	Very minimal training adapting to an amended departure profile.
	Other costs	No other costs have been identified.
Airport/ Air navigation service provider	Infrastructure costs	Removal of reliance on ground-based navigational aids reduces cost as compared to the baseline.
	Operational costs	No operational costs have been identified.
	Deployment costs	Other than the cost of conducting the ACP there are minimal deployment costs.
All	Safety	No less safe than the baseline. Outbounds will climb well above the inbounds to RW14.

4.52.2. Carried forward as a contrast due to the direction of the turn-out but not considered as favourable as 14S&WC.

4.53. 14S&WE

4.53.1. This DO is initially the same as Option D but flies further North. The latter stages of this DO overfly generally more sparsely populated areas than the baseline or Option D.

Group	Impact	Qualitative Assessment
Communities	Noise impact on health and quality of life	The newly overflown areas would generally be of a similar population density compared to those overflown in the baseline at lower altitudes. At higher altitudes areas of lower population density would be overflown.  The NPR is contained within the14S&WE swathe (red) before this DO turns left and wraps around to the North of the Airport affecting the communities of North-West Leeds. The baseline is the purple swathe.
	Air Quality	Insignificant change below 1,000ft and therefore it is assessed that there would be insignificant impact on air quality.
Wider society	Greenhouse gas impact	Additional track mileage to the baseline and the ability to climb in an unrestricted fashion may offset this however, it also doesn't point towards POL such that additional track miles are flown to go South-West.
	Capacity/ resilience	Potential improvement as the climb is achieved earlier before turning towards the busy POL area.
	Tranquillity	Overflight of Meanwood Park, Eccup Reservoir and Otley Chevin Forest Park.

Group	Impact	Qualitative Assessment
General aviation	Access	It is possible that additional CAS would be required to the East of LBA at the detriment of Class G and other airspace users.
General aviation/ commercial airlines	Economic impact from increased effective capacity	Insignificant difference assessed.
	Fuel-burn	Additional track mileage to the baseline and the ability to climb in an unrestricted fashion may offset this however, it also doesn't point towards POL such that additional track miles are flown to go South-West.
Commercial airlines	Training costs	Very minimal training adapting to an amended departure profile.
	Other costs	No other costs have been identified.
Airport/ Air navigation service provider	Infrastructure costs	Removal of reliance on ground-based navigational aids reduces cost as compared to the baseline.
	Operational costs	No operational costs have been identified.
	Deployment costs	Other than the cost of conducting the ACP there are minimal deployment costs.
All	Safety	Whilst the outbounds will climb well above the RW14 approach, this swathe potentially climbs departures towards arrivals via NELSA adding a layer of complexity.

4.53.2. This DO is rejected as it is anticipated there will be greater fuel-burn and on the grounds of safety.

4.54. Arrivals

4.54.1. Although there are general trends in the flight paths arriving aircraft use, many aircraft approaching LBA are routed direct by ATC. This results in large swathes of the region being overflown by at least some aircraft. This general approach where many aircraft are directed (vectored) by ATC rather than following strict established and repeatable routes is expected to reduce in future due to the proposed introduction of Arrival Transitions but it will not be entirely eradicated as there will always be a requirement for tactical vectoring.

4.54.2. This assessment concentrates on those aircraft not directed by ATC and is based on aircraft flying from the Initial Approach Fix or Holding Fix to the final approach (i.e. those that follow the Arrival Transitions). This assessment does not consider the final approach track (the straight-line approach to the runway from approximately 10 nautical miles out) as this will be the same for the baseline and all DOs.

4.55. Arrival System Baseline

4.55.1. The are two general swathes of aircraft approaching RW32 that have been identified based on existing operations. One of these approaches from the south-west and overflies Huddersfield and then Wakefield before turning to join the final approach, which is labelled A on the figure. The second route flies straight in over Featherston and Normanton. Both the baseline swathes converge on Rothwell where they join the final approach, which overflies central Leeds.

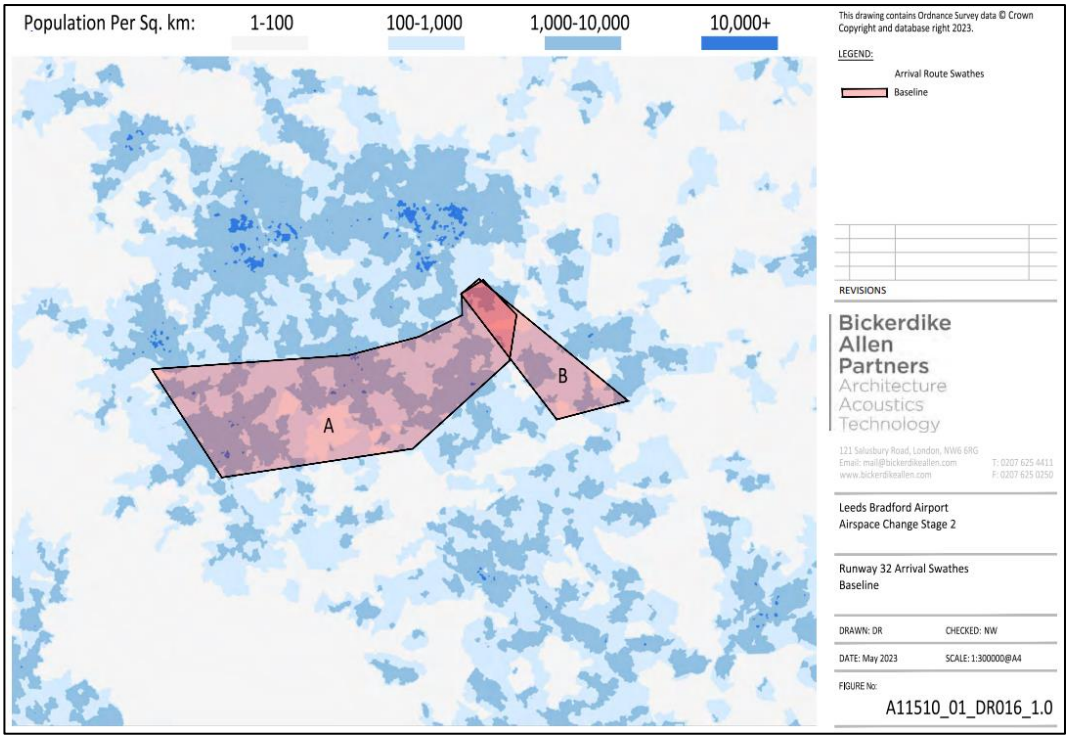


Figure 28: RW32 Arrival Swathes Baseline

4.55.2. The are four general swathes of aircraft approaching RW14 that have been identified based on existing operations. One of these approaches from the south-west, which is labelled A on the figure. The remaining three swathes approach from the south or south-east. The first of

these overflies Huddersfield and Halifax and then passes to the west of Bradford and is labelled B. The second overflies Normanton and parts of Wakefield before flying between Leeds and Bradford and is labelled C. The third overflies Pontefract and Castleford before flying to the west of Leeds and is labelled D. All four of the baseline swathes converge on Bolton Abbey where they join the final approach.

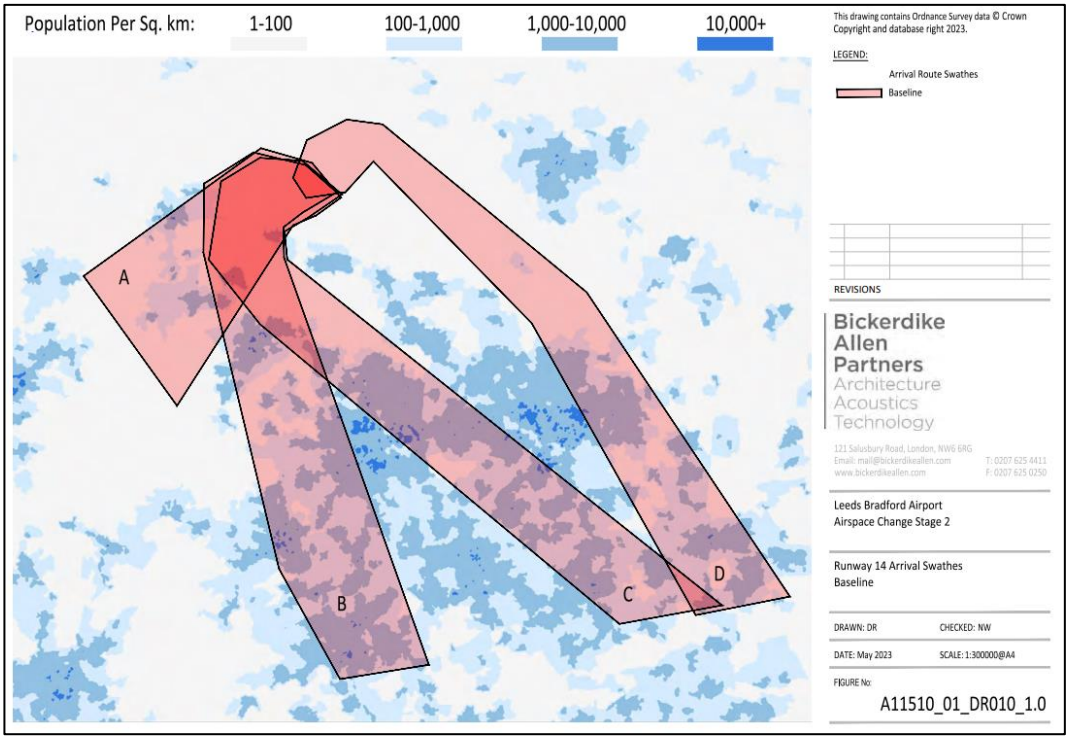


Figure 29: RW14 Arrival Swathes Baseline

4.56. Arrival Option 1 – LBA (Do Minimum)

4.56.1. RW32 Option 1 approaches from the north (having left the LBA hold/IAF flying between the centres of Leeds and Bradford before turning to broadly follow the later stages of RW32 baseline approach swathe A.

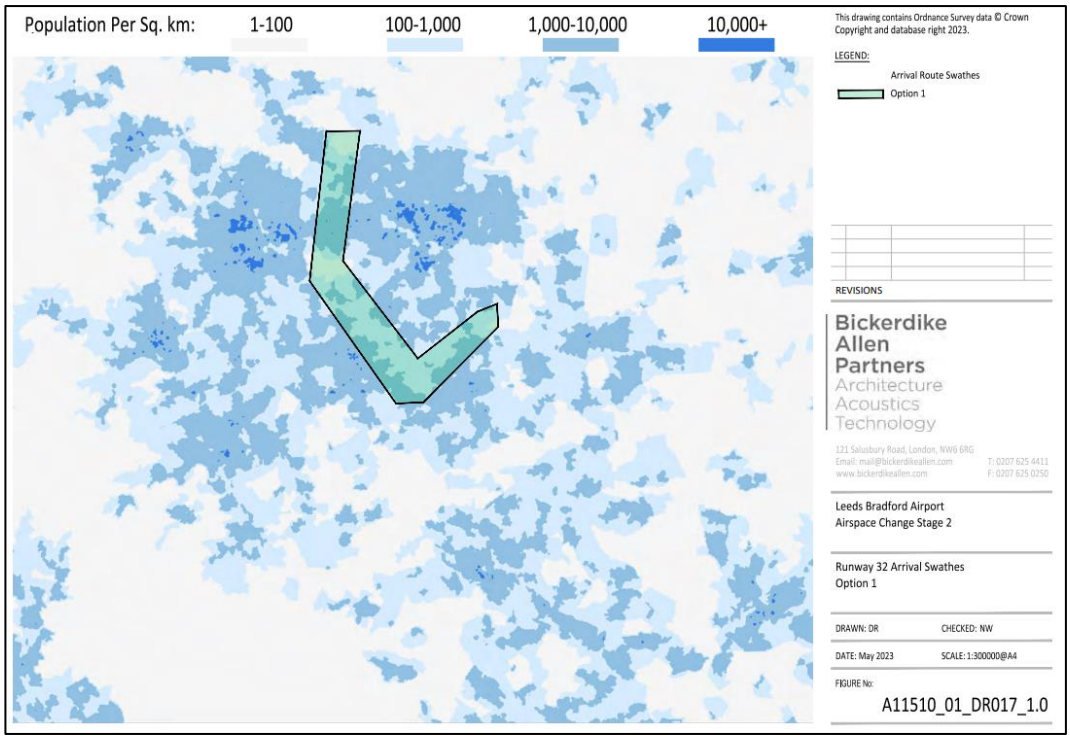


Figure 30: RW32 Arrival Swathes Option 1

4.56.2. RW14 Option 1 includes two approach routes which begin at the LBA hold over the Airport before circling either left or right respectively. The left turn route overflies generally sparsely populated areas. The right turn route overflies northern Bradford and Keighley. Both routes then converge on Bolton Abbey and are similar to RW14 baseline swathes C and D.

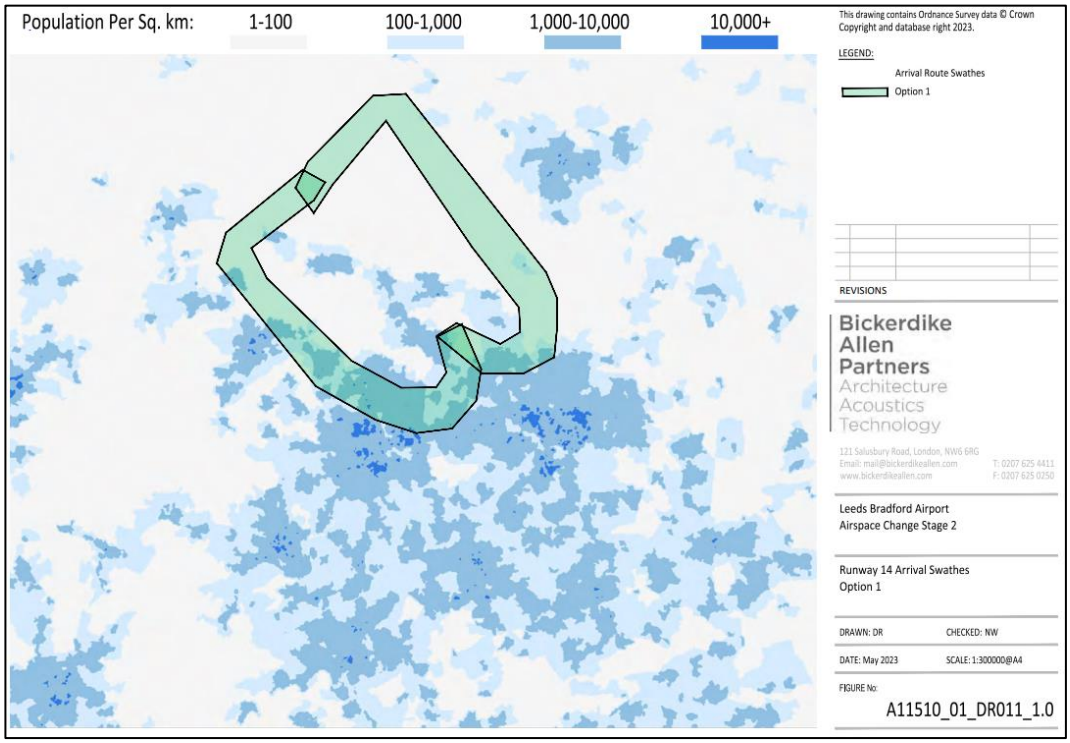


Figure 31: RW14 Arrival Swathes Option 1

Group	Impact	Qualitative Assessment
Communities	Noise impact on health and quality of life	RW32 - The newly overflown areas would generally be of a slightly lower population density compared to those overflown in the baseline at higher altitudes. At lower altitudes areas of similar population density would be overflown. RW14 - The newly overflown areas would generally be of a slightly lower population density compared to those overflown in the baseline at higher altitudes. At lower altitudes areas of similar population density would be overflown.
	Air Quality	The final approach will remain unaffected and therefore no change to air quality as no change to procedures below 1,000ft.
Wider society	Greenhouse gas impact	Insignificant difference from the baseline as very similar.
	Capacity/ resilience	Insignificant difference from the baseline as very similar but not as efficient as other available options due to the hold being in the overhead of the Airport.
	Tranquillity	Insignificant difference from the baseline as very similar.
General aviation	Access	It is likely that additional CAS would be required to contain the Eastern T-Bar for RW14 at the detriment of Class G and other airspace users.
General aviation/ commercial airlines	Economic impact from increased effective capacity	This DO does not increase effective capacity.
	Fuel-burn	Not as efficient as other available options but no less efficient than the baseline.
Commercial airlines	Training costs	Minimal.
	Other costs	No other costs identified.

Group	Impact	Qualitative Assessment
Airport/ Air navigation service provider	Infrastructure costs	Removal of reliance on ground-based navigational aids reduces cost as compared to the baseline.
	Operational costs	No operational costs have been identified.
	Deployment costs	Other than the cost of conducting the ACP there are minimal deployment costs.
All	Safety	No less safe than the baseline.

4.57. Arrival Option 2 – NELSA/GOLES

4.57.1. RW32 Option 2 includes two routes. The first approaches from the west (from NELSA) flying over southern Bradford before turning to broadly follow the later stages of RW32 baseline approach swathe A. The second is similar to RW32 approach baseline swathe B, but with the initial fix points located further from the Airport.at GOLES.

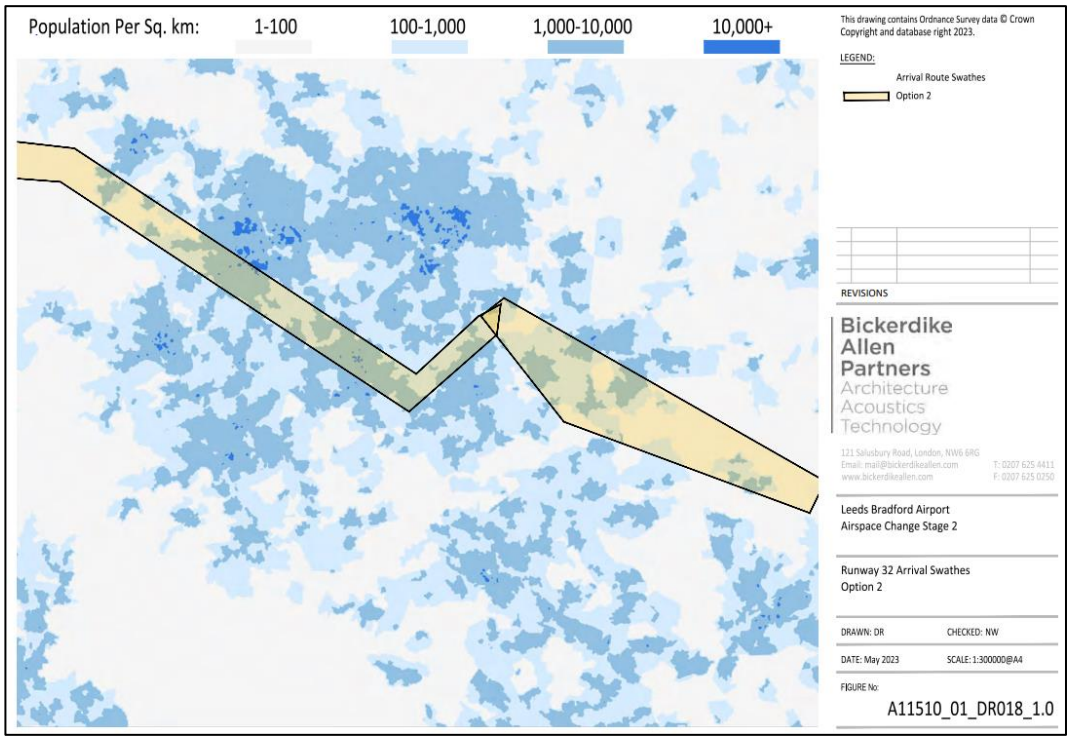


Figure 32: RW32 Arrival Swathes Option 2

4.57.2. RW14 Option 2 includes two approach routes which are similar to RW14 baseline swathes A and D, but with the initial fix points located further from the airport at NELSA and GOLES.

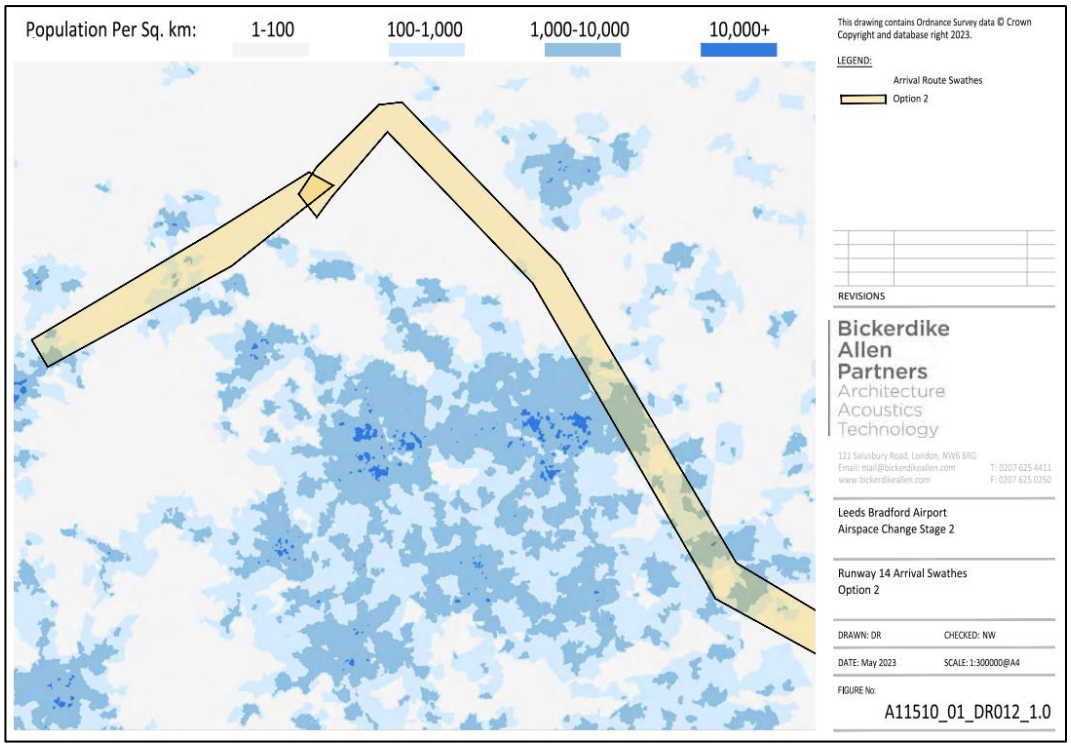


Figure 33: RW14 Arrival Swathes Option 2

Group	Impact	Qualitative Assessment
Communities	Noise impact on health and quality of life	RW32 - The newly overflown areas would generally be of a similar or slightly higher population density compared to those overflown in the baseline at higher altitudes. At lower altitudes areas of similar population density would be overflown. RW14 - The newly overflown areas would generally be of a similar population density compared to those overflown in the baseline.
	Air Quality	The final approach will remain unaffected and therefore no change to air quality as no change to procedures below 1,000ft.
Wider society	Greenhouse gas impact	If it can be assumed that much of the inbound traffic from the South will be re-routed via the GOLES area by NERL with traffic from the North-West and West being routed via NELSA, then this DO is efficient as the track miles are no more than necessary and the systemised approach should result in continuous descent.

Group	Impact	Qualitative Assessment
	Capacity/ resilience	This DO may increase effective capacity and reduce the need for stepped climbs and descents.
	Tranquillity	May have some impact on the Nidderdale AONB.
General aviation	Access	It is likely that additional CAS would be required, to contain the Eastern T-Bar for RW14, the Holds and for the Arrival Transition routing to the East of the Airport, at the detriment of Class G and other airspace users.
General aviation/ commercial airlines	Economic impact from increased effective capacity	This DO may increase effective capacity but the economic value of this is impossible to state in qualitative terms.
	Fuel-burn	If it can be assumed that much of the inbound traffic from the South will be re-routed via the GOLES area by NERL with traffic from the North-West and West being routed via NELSA, then this DO is efficient as the track miles are no more than necessary and the systemised approach should result in continuous descent.
Commercial airlines	Training costs	Minimal.
	Other costs	No other costs identified.
Airport/ Air navigation service provider	Infrastructure costs	Removal of reliance on ground-based navigational aids reduces cost as compared to the baseline.
	Operational costs	No operational costs have been identified.
	Deployment costs	Other than the cost of conducting the ACP there are minimal deployment costs.
All	Safety	No less safe than the baseline.

4.58. Arrival Option 3 – AIREY/WORTH

4.58.1. RW32 Option 3 includes two routes. The first approaches from the north-west from the hold/IAF at WORTH flying over eastern Bradford before turning to broadly follow the later stages of RW32 baseline approach swathe A. The second is similar to RW32 approach baseline swathe B, but with the initial fix points located further from the airport and slightly further east at AIREY. This route would overfly Pontefract instead of Normanton.

Figure 34: RW32 Arrival Swathes Option 3

4.58.2. RW14 Option 3 is similar to RW14 Option 2, but with the initial fix points located closer to the airport at WORTH and AIREY.

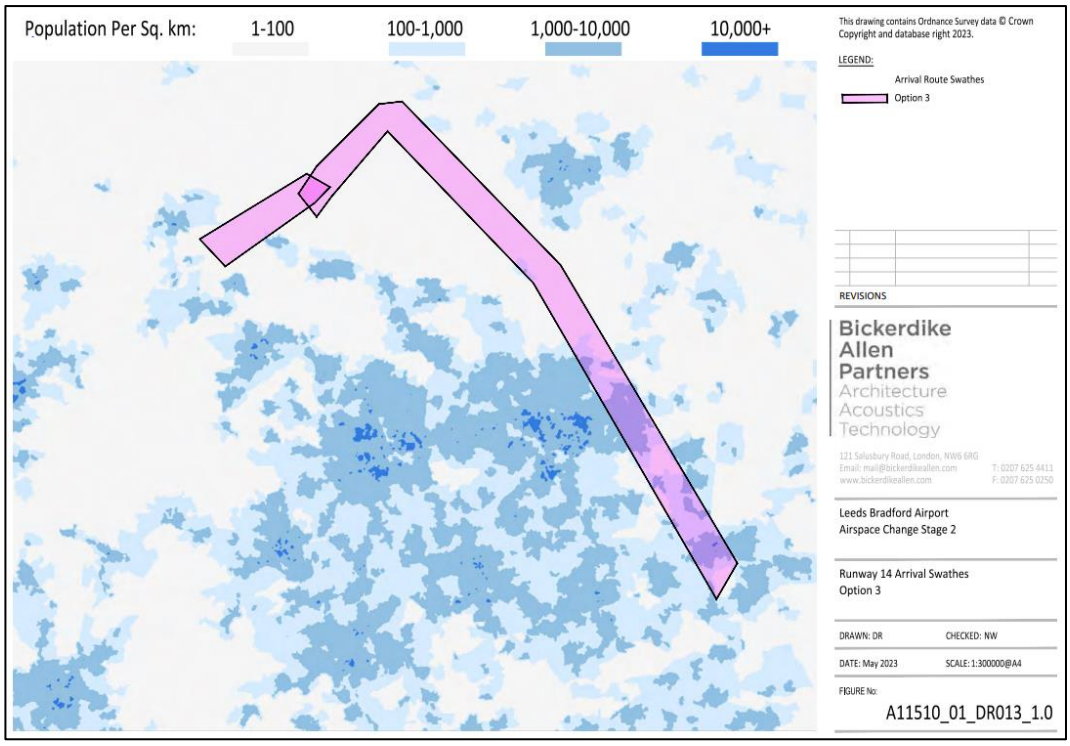


Figure 35: RW14 Arrival Swathes Option 3

Group	Impact	Qualitative Assessment
Communities	Noise impact on health and quality of life	RW32 - The newly overflown areas would generally be of a similar or slightly higher population density compared to those overflown in the baseline at higher altitudes. At lower altitudes areas of similar population density would be overflown. RW14 - The newly overflown areas would generally be of a similar population density compared to those overflown in the baseline.
	Air Quality	The final approach will remain unaffected and therefore no change to air quality as no change to procedures below 1,000ft.
Wider society	Greenhouse gas impact	If it can be assumed that much of the inbound traffic from the South will be re-routed via the AIREY area by NERL with traffic from the North-West and West being routed via NELSA to WORTH, then this DO is efficient as the track miles are no more than necessary. However, the position of the Hold at WORTH may impact upon continuous climbs.

Group	Impact	Qualitative Assessment
	Capacity/ resilience	The IAF/Hold at WORTH is most likely to reduce the likelihood of CCOs off RW32 and add unnecessary congestion close to the Airport.
	Tranquillity	May have some impact on the Nidderdale AONB.
General aviation	Access	It is likely that additional CAS would be required, to contain the Eastern T-Bar for RW14, the Holds and for the Arrival Transition routing to the East of the Airport, at the detriment of Class G and other airspace users. The airspace required for the AIREY Hold is disproportionate.
General aviation/ commercial airlines	Economic impact from increased effective capacity	This DO is unlikely to increase capacity.
	Fuel-burn	If it can be assumed that much of the inbound traffic from the South will be re-routed via the AIREY area by NERL with traffic from the North-West and West being routed via NELSA to WORTH, then this DO is efficient in terms of expeditious routing however, CCOs/CDOs may be impacted.
Commercial airlines	Training costs	Minimal.
	Other costs	No other costs identified.
Airport/ Air navigation service provider	Infrastructure costs	Removal of reliance on ground-based navigational aids reduces cost as compared to the baseline.
	Operational costs	No operational costs have been identified.
	Deployment costs	Other than the cost of conducting the ACP there are minimal deployment costs.
All	Safety	No less safe than the baseline.

4.59. Arrival Option 4 – AIREY/WORTH/LBA

4.59.1. RW32 Option 4 is a combination of Options 1 and 3.

Figure 36: RW32 Arrival Swathes Option 4

4.59.2. RW14 Option 4 is a combination of Option 1 and Option 3.

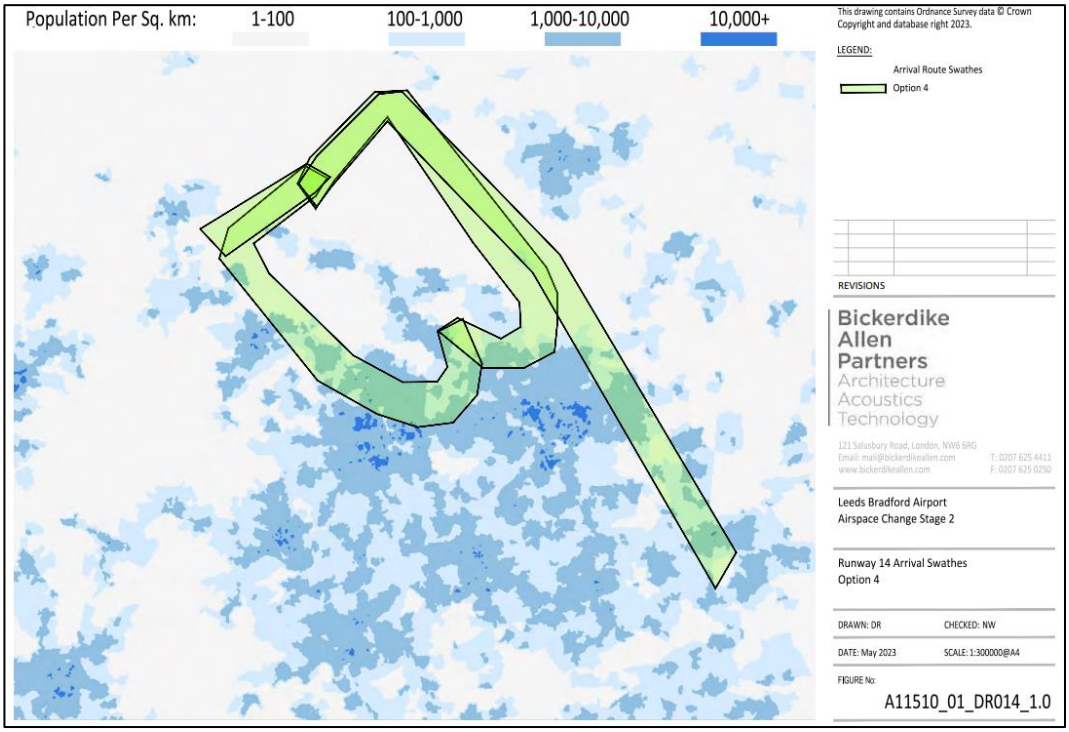


Figure 37: RW14 Arrival Swathes Option 4

Group	Impact	Qualitative Assessment
Communities	Noise impact on health and quality of life	Similar to Options 1 and 3.
	Air Quality	The final approach will remain unaffected and therefore no change to air quality as no change to procedures below 1,000ft.
Wider society	Greenhouse gas impact	Routing via the LBA results in an insignificant difference from the baseline as very similar. If it can be assumed that much of the inbound traffic from the South will be re-routed via the AIREY area by NERL with traffic from the North-West and West being routed via NELSA to WORTH, then this DO is efficient as the track miles are no more than necessary. However, the position of the Hold at WORTH may impact upon continuous climbs.
	Capacity/ resilience	The IAF/Hold at WORTH is most likely to reduce the likelihood of CCOs off RW32 and add unnecessary congestion close to the Airport.
	Tranquillity	May have some impact on the Nidderdale AONB.
General aviation	Access	It is likely that additional CAS would be required, to contain the Eastern T-Bar for RW14, the Holds and for the Arrival Transition routing to the East of the Airport, at the detriment of Class G and other airspace users. The airspace required for the AIREY Hold is disproportionate.
General aviation/ commercial airlines	Economic impact from increased effective capacity	This DO is unlikely to increase capacity.
	Fuel-burn	If it can be assumed that much of the inbound traffic from the South will be re-routed via the AIREY area by NERL with traffic from the North-West and West being routed via NELSA to WORTH, then this DO is efficient in terms of expeditious routing however, CCOs/CDOs may be impacted.

Group	Impact	Qualitative Assessment
Commercial airlines	Training costs	Minimal.
	Other costs	No other costs identified.
Airport/ Air navigation service provider	Infrastructure costs	Removal of reliance on ground-based navigational aids reduces cost as compared to the baseline.
	Operational costs	No operational costs have been identified.
	Deployment costs	Other than the cost of conducting the ACP there are minimal deployment costs.
All	Safety	No less safe than the baseline.

4.60. Arrival Option 5 – NELSA/GOLES/UDDER

4.60.1. RW32 Option 5 includes both routes from Option 2 as well as an additional approach route from the hold/IAF at UDDER. The additional approach route also approaches from the west, but flies further south than that from Option 2.

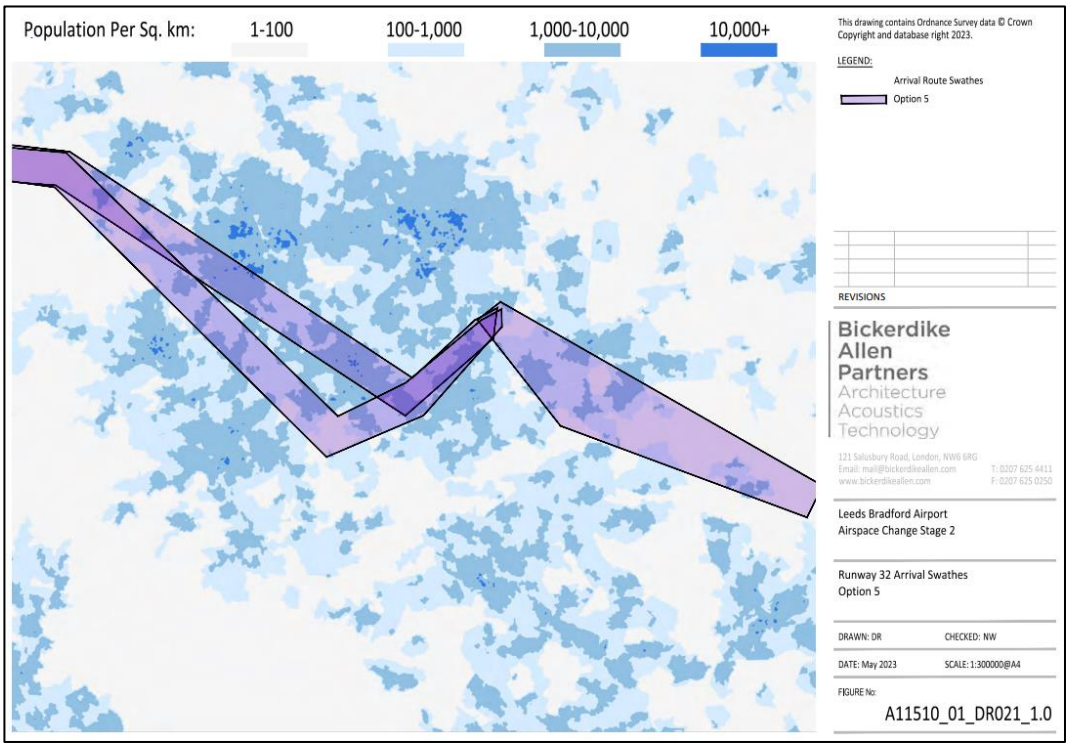


Figure 38: RW32 Arrival Swathes Option 5

4.60.2. RW14 Option 5 includes both routes from Option 2 as well as an additional approach route from the hold/IAF at UDDER. The additional approach route overflies central Bradford.

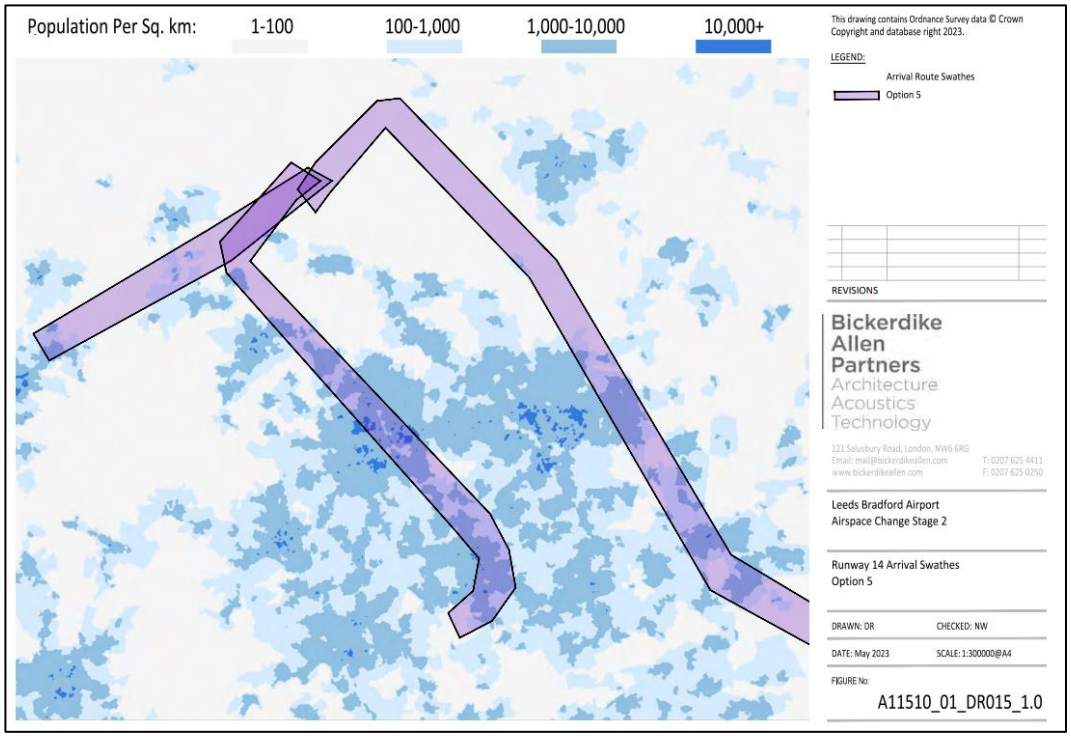


Figure 39: RW14 Arrival Swathes Option 5

Group	Impact	Qualitative Assessment
Communities	Noise impact on health and quality of life	RW32 - This route would overfly areas with a slightly lower population density compared to those overflown in the baseline at higher altitudes. However, the Option 2 routes overfly areas with a similar or slightly higher population density compared to those overflown in the baseline at higher altitudes. At lower altitudes Option 5 is similar to the baseline so areas of similar population density would be overflown. RW14 – The additional route from UDDER would overfly areas with a slightly higher population density compared to those overflown in the baseline.
	Air Quality	The final approach will remain unaffected and therefore no change to air quality as no change to procedures below 1,000ft.

Group	Impact	Qualitative Assessment
Wider society	Greenhouse gas impact	If it can be assumed that much of the inbound traffic from the South will be re-routed via the GOLES area by NERL with traffic from the North-West and West being routed via NELSA, then this DO is efficient as the track miles are no more than necessary and the systemised approach should result in continuous descent.
	Capacity/ resilience	This DO may increase effective capacity and reduce the need for stepped climbs and descents.
	Tranquillity	May have some impact on the Nidderdale AONB.
General aviation	Access	It is likely that additional CAS would be required, to contain the Eastern T-Bar for RW14, the Holds and for the Arrival Transition routing to the East of the Airport, at the detriment of Class G and other airspace users.
General aviation/ commercial airlines	Economic impact from increased effective capacity	This DO may increase effective capacity but the economic value of this is impossible to state in qualitative terms.
	Fuel-burn	If it can be assumed that much of the inbound traffic from the South will be re-routed via the GOLES area by NERL with traffic from the North-West and West being routed via NELSA, then this DO is efficient as the track miles are no more than necessary and the systemised approach should result in continuous descent.
Commercial airlines	Training costs	Minimal.
	Other costs	No other costs identified.
Airport/ Air navigation service provider	Infrastructure costs	Removal of reliance on ground-based navigational aids reduces cost as compared to the baseline.
	Operational costs	No operational costs have been identified.

Group	Impact	Qualitative Assessment
	Deployment costs	Other than the cost of conducting the ACP there are minimal deployment costs.
All	Safety	No less safe than the baseline.

4.61. Results Summary

4.61.1. The following table summarises the outcome of the IOA for the departure swathes and details the Preferred Options. In the case of the red 'Rejected' options, the main reason for the discounting of the respective DO is indicated.

- DM indicates the 'Do Minimum' option.
- P indicates the 'Preferred' option.

Departure Option	A	B	C	D	E	F	G	H
32 - NW	DM	P						
32 - SE			Noise	DM		P	Noise	
32 - S&W	P	DM Noise		Safety			Noise	Noise & Safety
14 - NW	Noise & Safety			P & DM				
14 - SE	Noise	P & DM						
14 - S&W	Fuel & Safety	Fuel & Safety	P & DM		Fuel & Safety			

Table 13: IOA - Departure Options Summary

4.61.2. The following table summarises the outcome of the IOA for the arrival systems and details the Preferred Options.

Arrival Option	Outcome
Option 1 - LBA	DM
Option 2 – NELSA/GOLES	P – Considered the most efficient in terms of CCO/CDO and most likely to facilitate systemisation
Option 3 – AIREY/WORTH	Fuel / Greenhouse Gas / Access / Capacity
Option 3 – AIREY/WORTH/LBA	Fuel / Greenhouse Gas / Access / Capacity
Option 5 – NELSA/GOLES/UDDER	

Table 14: IOA - Arrival Options Summary

5. Safety Assurance Plan

5.1. CAP1616 Safety Assessments

5.1.1. CAP1616 requires Change Sponsors to conduct a qualitative Safety Assessment at Step 2b of the process. This Assessment has been included in the appraisal tables for each DO in the previous section of this document.

5.1.2. A seven-step CAP760 compliant Safety Assessment will be conducted prior to Step 4b. This activity will include Hazard Identifications, Risk Assessment, and the production of the required Safety Case(s) for the proposed change(s).

5.2. Safety Assurance Team

5.2.1. The Safety Assurance Team involved in this process will consist of the following suitably qualified and empowered individuals:

- Representative of the ANSP conversant with the Safety Management System (SMS);
- Airspace Change Consultant and Safety Manager;
- Representatives from neighbouring MTMA ACP Sponsors (including NERL); and
- At least one representative pilot from an airline routinely operating at LBA.

6. Design Options Shortlist

6.1. Shortlist of Options Taken Forward

6.1.1. It is proposed that the following DOs are taken forward to Stage 3 of the ACP process for further investigation and development (the preferred highlighted bold):

- RW32 Departures (8 DOs)
  - 32NWA and **32NWB (P)**
  - 32SEB, 32SED and **32SEF (P)**
  - **32S&WA (P)**, 32S&WC and 32S&WF
- RW14 Departures (5 DOs)
  - 14NWB and **14NWD (P)**
  - **14SEB (P)**
  - **14S&WC (P)** and 14S&WD
- Arrival System Options (3 DOs)
  - Option 1
  - **Option 2 (P)**
  - Option 5

6.3. Impacted Audiences

6.3.1. The swathes devised for the options progressed to Stage 3 (pictured below) will be the starting point to determine the 'Impacted Audiences' for the Consultation Strategy. These will include populations on the ground (communities and environmental groups) and communities in the air or with a vested interest in airspace (airspace users). Clearly not everyone under these swathes will be 'impacted' as ultimately the options will be fine-tuned with the aim of being the optimal operational procedures with the least impact possible.

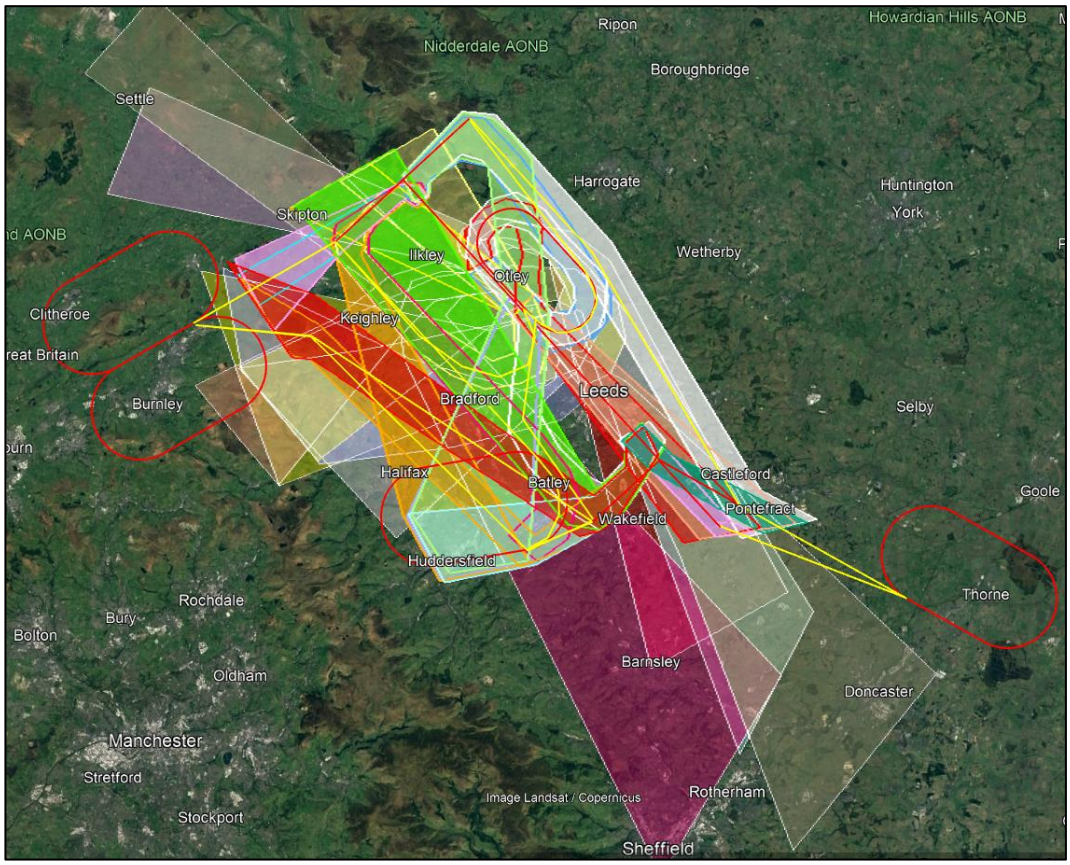


Figure 40: Impacted Audiences

6.4. Next Step – Full Options Appraisal

6.4.1. Step 3a of the process requires that the options are developed to the point that a rigorous quantitative options appraisal can be conducted. Whilst this is being done, LBA will be preparing documentation for a public consultation to give the impacted audiences the opportunity to influence the outcome of this ACP.

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