

# Supplementary Consultation Document

London Biggin Hill Airport – Airspace  
Change Proposal



LONDON  
**BIGGIN HILL**  
AIRPORT

BUSINESS | TRAVEL | COMMUNITY



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## Executive Summary

This is a **Supplementary Consultation** conducted by London Biggin Hill Airport about the proposed introduction of an Instrument Approach Procedure to Runway 03 at London Biggin Hill Airport.

It follows on from the initial Sponsor Consultation carried out between 18 November 2015 and 26 February 2016 and details changes that have been made to the proposed Instrument Approach Procedure as a consequence of both operational and environmental concerns identified in the original consultation. A **Report of the Sponsor Consultation** was published on the London Biggin Hill Airport website in April 2016. A copy of the Consultation Report can be found at:

<http://www.bigginhillairport.com/downloads/Post%20Consultation%20Report%20Final%20-%2025%20April.pdf>

This **Supplementary Consultation** will run from **27 February 2017 to 10 April 2017**, a period of 6 weeks<sup>1</sup>, during which time you may submit a response to London Biggin Hill Airport with any comments you may have. Details of how you can submit your response are contained in the body of the document.

The UK Civil Aviation Authority has specified that the consultee list should cover those aviation and non-aviation stakeholders who may be affected by the changes that have been made to the proposed Instrument Approach Procedure. Nonetheless, London Biggin Hill Airport welcomes responses from the wider aviation and community organisations who feel that they may have an interest.

The introduction of the new procedure will provide a full instrument approach capability to Runway 03 which does not currently exist. The current Instrument Approach Procedures require that when Runway 03 is in use, aircraft must make an approach to Runway 21 followed by a visual circling manoeuvre to reposition onto the final approach to land on Runway 03.

This **Supplementary Consultation** document details only the changes that have been made to the original procedure design and how and why they have been made. It does not repeat the basic justification for the procedure or the background material relating to the development of an Instrument Approach Procedure and Airspace Change Proposal.

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<sup>1</sup> The CAA has agreed that a 6-week period is sufficient for this Supplementary Consultation.



## Abbreviations

### Airports referenced in this document

LBHA	London Biggin Hill Airport
LGW	London Gatwick Airport
LHR	London Heathrow Airport

Other airports are referenced by their unabbreviated names.

ACP	Airspace Change Proposal
ANSP	Air Navigation Service Provider
ATM	Air Traffic Management
ATS	Air Traffic Services
CAA	Civil Aviation Authority
CAP	Civil Aviation Publication
CO <sub>2</sub>	Carbon Dioxide (emissions)
CTA	Control Area
CTR	Control Zone
FAS	Future Airspace Strategy
GA	General Aviation
GNSS	Global Navigation Satellite Systems (space-based navigation aid, e.g. GPS)
IAP	Instrument Approach Procedure
IAS	Indicated Air Speed
IAWP	Initial Approach Way Point
INM	International Noise Model
LNAV	Lateral Navigation (as used in RNAV IAP operations)
LSRM	Lateral Separation Risk Modelling
LTMA	London Terminal Control Area
NATS	The en-route and terminal Air Navigation Service Provider (Previously National Air Traffic Services)
NM	Nautical Mile
PBN	Performance Based Navigation
RNAV	Area Navigation
SARG	Safety and Airspace Regulation Group (of the UK CAA)
SBAS	Satellite-based Augmentation System
SID	Standard Instrument Departure



SMS	Safety Management System
TAS	True Air Speed
TMA	Terminal Control Area
VFR	Visual Flight Rules
VNAV	Vertical Navigation (as used in RNAV Precision Approach operations)
VOR	VHF Omni-Directional Radio Range (ground-based navigation aid)



## References

- [1] CAP725 CAA Guidance on the Application of the Airspace Change Process
- [2] CAP785 Approval of Instrument Flight Procedures
- [3] ICAO Doc 8168 (PANS-OPS) Volume 2 Construction of Instrument and Visual Flight Procedures
- [4] DfT Guidance to the CAA on the Environmental Objectives Relating to the Exercise of its Air Navigation Functions (January 2014)
- [5] CAP1184 The Transition to Performance Based Regulation
- [6] CAP1378 Airspace Design Guidance: Noise mitigation considerations when designing PBN departure and arrival procedures
- [7] CAP 1385 Performance-Based Navigation: Enhanced route-spacing guidance
- [8] Implementation of Performance-Based Navigation in the UK
- [9] ICAO Doc 9613 Performance Based Navigation Manual
- [10] CAA Future Airspace Strategy
- [11] CAA Policy Statement - Policy for the Application of PBN in UK and Irish Airspace
- [12] CAA Policy Statement - Significant Point Name Codes (5LNC) (14 October 2013)
- [13] CAP670 Air Traffic Services Safety Requirements

## Acknowledgements

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Annex A Figure 2: Background mapping © 2016 Google



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## 1. Introduction

1.1. This is a Supplementary Consultation being carried out by London Biggin Hill Airport (LBHA) about a proposal to introduce an Instrument Approach Procedure (IAP) to Runway 03 at LBHA.

1.2. A Sponsor Consultation on the proposal was carried out by LBHA between 18 November 2015 and 26 February 2016. The original Sponsor Consultation document can be found on the LBHA website at:

<http://www.bigginhillairport.com/wp-content/uploads/2015/11/CL-5108-Doc-024-Sponsor-Consultation-Doc-Issue-1.0-16-Nov.pdf>

1.3. Seventy-two responses in total were received from airspace and environmental consultee organisations and from other organisations or members of the public. The Consultation identified a number of issues, both operational and environmental, that would require further consideration and resolution by LBHA before the proposal could progress to the submission of a formal Airspace Change Proposal (ACP) to the Civil Aviation Authority (CAA). A **Report of the Sponsor Consultation** was published on the LBHA website in April 2016. A copy of the **Report** can be found at:

<http://www.bigginhillairport.com/downloads/Post%20Consultation%20Report%20Final%20-%2025%20April.pdf>

1.4. **This Supplementary Consultation document** does not repeat the basic requirement or justification for the procedure nor the general airspace and environmental requirements that must be taken into account which were detailed in the original **Sponsor Consultation** document. It details the changes that have been made to the proposed IAP in order to mitigate operational and environmental concerns identified from the original Consultation. Cross reference to the **Sponsor Consultation document** and **Report of the Sponsor Consultation** are made where necessary.

1.5. The CAA has specified that this **Supplementary Consultation** may be limited to those of the original consultees who may be directly affected by the changes that have been made to the proposed IAP. A list of consultees to this **Supplementary Consultation** is given at **Appendix A** of this Document. However, responses from the wider aviation and environmental community or from members of the public will also be welcomed and will be taken into account by LBHA in developing its proposal. Details of how you can respond to the **Supplementary Consultation** are given in **Section 7**.



## 2. Sponsor Consultation – Principal Concerns Arising

- 2.1. The **Post-Sponsor Consultation Report**, cited in paragraph 1.2 above, collated responses from consultees and identified a number of themes. The **Report** identified several key issues that needed to be addressed, covering both technical aviation matters and environmental concerns. For the former, the key matters related to the interaction of the proposed LBHA IAP with the flight profiles of several departure routes from two of the major London airports. The environmental matters related to the desire by some communities to reposition the nominal route of the proposed IAP away from their location.
- 2.2. The **Sponsor Consultation** confirmed a number of operational interactions between the proposed IAP to Runway 03 at LBHA and existing Standard Instrument Departure (SID) procedures from London Gatwick Airport (LGW) and London Heathrow Airport (LHR) which would need to be resolved between LBHA and NATS<sup>2</sup> and the two Airport Operators.
- 2.3. In order to identify each individual procedural interaction between the proposed IAP and the LGW and LHR procedures, Cyrrus Ltd (for LBHA) developed an “Interactions Document” to facilitate discussions between the Air Traffic Management (ATM) and Airport stakeholders. It was clear from the initial analysis that resolving the identified operational impacts through design might not be possible and, in any event, would require further detailed work using the techniques developed by the UK CAA and NATS which were set out in the emerging guidance material in CAP1385<sup>3</sup>. Although, the desire to pursue the further investigative work has not lessened, it was evident that the investigative work would take time.
- 2.4. The interaction with the single route from LHR was more straight forward. Technical discussions took place during the second half of 2016 separately with Heathrow Airport Limited (HAL) and NATS to consider the procedural interactions in more detail and to establish appropriate mitigation measures. An accord was reached on how to resolve the safety issue identified through the changes to procedures detailed later in this document.
- 2.5. The **Sponsor Consultation** also identified a number of environmental concerns about the alignment of the proposed IAP over communities on the ground. Whilst the original procedure design had nominally routed aircraft over built up areas which were already subject to high levels of background traffic noise, this met with objection from some communities and Local Planning Authorities.
- 2.6. Therefore, LBHA has reviewed the alignment of the proposed IAP and, where possible, an alternative flight path route has been developed which reduces the number of communities overflowed. However, in some areas it has not been possible to develop a realignment of the procedure which would take it away from built-up areas. The revised alignment is discussed in **Section 6** below, together with an explanation of why some parts of the proposed procedure could not be changed.

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<sup>2</sup> NATS is the Air Navigation Service Provider (ANSP) which is the Controlling Authority for the London Terminal Control Area (LTMA) and provides Terminal Air Traffic Services (ATS) to both London Heathrow and London Gatwick Airports. LBHA also contracts NATS to provide a limited radar ATS to LBHA arrivals whilst they are on the Initial Approach Segment of existing IAPs to LBHA.

<sup>3</sup> CAP1385: *Performance-Based Navigation: Enhanced Route Spacing Guidance*



- 2.7. As a consequence of the changes to the proposed IAP, it has been necessary to alter the categorisation of the IAP to an Area Navigation (RNAV) Non-Precision (LNAV<sup>4</sup>) Approach only. The revised procedure configuration does not meet the full procedure design requirements for a Precision (LNAV/VNAV)<sup>5</sup> SBAS<sup>6</sup> Approach. This is discussed in **Section 4** below. However, in order that a viable IAP to Runway 03 can be introduced as soon as practicable, LBHA has elected to progress the adjusted Non-Precision procedure and will revisit the viability of introducing a Precision Approach at a later stage.
- 2.8. Diagrams showing the revised configuration of the proposed IAP in comparison with the original configuration detailed in the earlier **Sponsor Consultation** are given at **Annex B**. A Draft IAP Chart is given at **Annex C**. Details of the Environmental assessment of the revised procedure are given in **Section 7** below and are supported by diagrams at **Annexes D to G**.

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<sup>4</sup> LNAV: Lateral Navigation

<sup>5</sup> VNAV: Vertical Navigation

<sup>6</sup> SBAS: Space-Based Augmentation System



### 3. Interaction with Gatwick Departures

- 3.1. The Interactions analysis undertaken by Cyrrus Limited confirmed that adequate lateral and vertical separation would not exist, as a function of procedure design, between aircraft carrying out the Runway 03 Precision IAP and aircraft departing from Runway 08 at LGW and turning left after departure. This was because of the extant airspace configuration and rules applied to air operations in controlled airspace.
- 3.2. Procedural confliction would also exist against some Runway 26 departures at LGW turning right after departure; but resolution of these conflicts could be easily addressed if the more complex Runway 08 conflicts could be resolved.
- 3.3. Throughout the consideration of these conflicts it was of paramount importance to both NATS London Terminal Control (LTC) and Gatwick Airport Limited (GAL) and its ANSP that the flow of departing aircraft from LGW should not be interrupted by aircraft inbound to LBHA, and that any resolution of the conflict should not impose additional inter-controller co-ordination workload. Nor should there be any additional pilot workload in the critical stages of flight immediately after departure. Furthermore, any potential resolution should be environmentally neutral to LGW operations.
- 3.4. A number of potential resolutions for the various conflicts were considered and discussed between the interested parties. Some of the initiatives proposed included:
  - re-ordering of the departure sequence by Gatwick “Tower” controllers (if necessary) in the prevailing traffic situation;
  - Tactical intervention by NATS (LTMA) sectors; and
  - Changes to the climb profile and/or ground track of some LGW SID procedures. However, no acceptable solution could be developed which would satisfy the overriding conditions detailed above and be compatible with demonstrated aircraft climbing performance in the critical stages of flight shortly after take-off.
- 3.5. Therefore, notwithstanding that one objective in the original design of the Runway 03 IAP had been to keep the arriving aircraft as high as possible (i.e. within the LTMA at 3000ft) for as long as possible, it was concluded that the only resolution of the procedure interactions would be to descend the arriving aircraft on the LBHA IAP somewhat earlier than originally intended so that vertical separation (by procedure design) between the IAP and the LGW SIDs would be established before lateral separation between the appropriate procedure protection areas was eroded.
- 3.6. The other element within the interactions analysis that exacerbated the issue identified was that both the LGW and LBHA aircraft would be operating within controlled airspace where the rules for lateral spacing of aircraft were more demanding. Consequently, thought was given to adjusting the LBHA Runway 03 IAP flight path so that it would not penetrate the Gatwick Control Area (CTA) (base level 1500ft).
- 3.7. LBHA wishes to place on record its thanks to GAL for their assistance and co-operation in the investigation of this aspect of the LBHA proposal.



## 4. Area Navigation/Lateral Navigation Design

- 4.1. It should be noted that work on the analysis and procedure design adjustments needed to achieve the desired spacing between aircraft in the original proposal for the Precision Approach LNAV/VNAV SBAS IAP (set out in the **Sponsor Consultation document**) was suspended in October 2016. Focus was then applied to finding a solution which could be implemented in a shorter time frame.
- 4.2. Our procedure design specialists therefore considered the potential for an LNAV-only Non-Precision Approach procedure. Whilst not offering the benefits of the lower operating minima of a Precision Approach, the applicable procedure design criteria would enable a shorter Final Approach segment, intercepted from an offset Intermediate Segment. This, in turn, would enable the procedure design to remain outside controlled airspace from the Initial Approach Waypoint (IAWP) and resolve the interaction with LGW departure procedures.
- 4.3. Thus, for the revised IAP configuration, descent from 3000ft to 2000ft commences between waypoints ARRO3<sup>7</sup> and ARRO4 (as before), but a requirement to be not above 2400ft at waypoint ARRO4 is added. At the same time the IAWP and Intermediate Waypoint (KB03I) have been repositioned some 0.94NM north-west and 1.75NM north respectively of their previous positions in order to ensure that the 2000ft level segment of the IAP remains outside the Gatwick CTA. As a consequence, arriving aircraft carrying out an IAP will leave 3000ft approximately 2NM earlier than under the original procedure configuration and will be below controlled airspace (on descending through 2500ft) from approximately 1.3NM before ARRO4 onwards. The realignment of the Initial Approach Segment shortens the procedure as a whole by approximately 2NM.
- 4.4. The realignment of waypoints IAWP and KB03I results in the Initial Approach Segment lying along the M25 between Junctions 7 and 6. This in itself alleviates a number of the environmental objection areas identified in the initial consultation and is discussed further in **Section 6** of this document.
- 4.5. It is noted that part of the revised IAP will now lie in Class G airspace. As noted in the original **Sponsor Consultation** document and the **Report of the Sponsor Consultation**, the CAA accepts the concept of Instrument Flight Procedures (IFPs) in Class G airspace and there are numerous such procedures around the UK which transit through areas of high-density Visual Flight rules (VFR) operations.
- 4.6. LBHA revisited the HAZID (Hazard identification) previously carried out for the original IAP configuration, as part of the Safety Management System (SMS) requirements, and applied the same safety analysis processes with similarly-qualified stakeholders. The results derived at the HAZID indicated that the IAP design within the airspace it would operate was tolerably safe<sup>8</sup>. We propose to add a Warning to the IAP Charts (subject to CAA acceptance) that

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<sup>7</sup> Note: Waypoint names identified as “ARRxx” in this document are provisional working identifiers. In the final procedure design, waypoint designators will be allocated in accordance with the CAA Policy for waypoint naming and will be either in KBnnX format or 5-Letter Name Codes as appropriate.

<sup>8</sup> “Tolerably safe” is technical terminology used in SMS and HAZID. It provides an acceptable level of safety.



the IAP segments from ARRO4 onwards lie below controlled airspace in an area of regular VFR transit flights.

#### 4.7. Updated Arrivals Figures

4.8. As noted previously, currently IFR flights requiring to land on Runway 03 in poor weather must carry out an Instrument Approach to Runway 21 followed by Visual Manoeuvring below cloud, once they have the runway in sight, to land on Runway 03. In the original **Sponsor Consultation** document, we presented figures for the years 2009 to 2014 inclusive which demonstrated the utilisation of the runways at LBHA by arriving aircraft.

4.9. The movement figures to cover 2015 and 2016 traffic have been compiled and set out in **Table 1** and demonstrates the continuing need for a contemporary IAP design to sustain all-weather operations for the modern aircraft types currently utilising LBHA. In particular, the latest data reflects the trend that between 8-10% of IFR traffic need to operate on Runway 03 annually.

Year	Type	Runway 21	Runway 03	Runway 29/11	Total	%
2015	IFR Arrivals	5747	511	12	6270	23.2
	% IFR By Rwy	91.6	8.1	0.19		
	VFR Arrivals				20709	76.8
	Total Arrivals				26979	
2016	IFR Arrivals	6057	625	18	6700	24.6
	% IFR By Rwy	90.4	9.3	0.27		
	VFR Arrivals				20545	75.4
	Total Arrivals				27245	

Table 1: Aircraft Movements (Arrivals) 2015 and 2016



## 5. Interaction with Heathrow Detling Departures

- 5.1. It had been recognised in the original development of the Runway 03 IAP that there was no vertical separation as a function of procedure design between the initial segments of the IAP, which were required to be level at 3000ft, and LHR SID procedures from the easterly runways towards Detling (DET) VOR.
- 5.2. The published SID procedures only specify positions at which aircraft should be “above 3000ft” (at DET D29<sup>9</sup>) and “above 5000ft” (at DET D20). There is no specified position at which aircraft are required to be “above 4000ft”, which would be necessary to determine that vertical separation between the procedures before lateral separation was eroded was established by design. Nonetheless, it was recognised by the ATM experts that the climb performance of modern-day aircraft is invariably far better than the historic minimum requirements specified in the SID designs. Consequently, it was anticipated that vertical separation would routinely be achieved by aircraft flying the published procedure but it needed to be proven.
- 5.3. In order to determine whether an “above 4000ft” position could be specified at an appropriate position, Cyrrus Limited carried out an extensive traffic study of more than 33000 departures, covering a 21-month period, from LHR easterly runways on SIDs via DET. HAL kindly provided historic data from their Noise and Track Keeping Monitoring System to facilitate the traffic study.
- 5.4. The traffic study demonstrated that all but 46 aircraft departing from LHR Runways 09L/09R achieved the requisite “4000ft or above” before reaching a point 5NM<sup>10</sup> from the proposed IAP flight path (equivalent to a position DET R284/D29.7 on the LHR SID procedure). The residual 46 aircraft could all be identified as “unusual” performers<sup>11</sup> as all other aircraft of the same types operated by the same airlines had easily achieved/exceeded the requisite altitude.
- 5.5. Analysis of the minimum climb gradient necessary for departing aircraft to achieve “4000ft or above” by DET D29.7 indicates that the minimum climb gradient would be 5.1% (310ft per NM). This is comparable to minimum climb gradients specified for ATS purposes in other LHR SID procedures<sup>12</sup>.
- 5.6. Therefore, it is concluded that the addition of an ATS Significant Point at DET R284/D29.7 (rounded up to DET D30) to the LHR SID procedures via DET would facilitate separation by

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<sup>9</sup> DET D29 means 29NM (slant range) from the DME facility co-located with the DET VOR navigation facility.

<sup>10</sup> A minimum separation distance of 4.7NM (rounded up to 5NM) was developed using the CAAs Loss of Separation Risk Model (LSRM) methodology published in CAP1385 - *Performance Based Navigation - Enhanced route spacing guidance* (published April 2016).

<sup>11</sup> Due to the time lapse between the actual flights concerned and the performance analysis undertaken for this study it was not possible to investigate any flight-specific reasons for the actual climb performance of these flights.

<sup>12</sup> It should be noted that the DET SID procedures from Runways 27L/27R specify “4000ft or above” by Epsom (EPM) NDB, the achievement of which requires a minimum climb gradient of 5.3%. The distance from Departure End of the Runway (DER) to EPM from Runways 27L/27R is comparable to the distance from DER to DET D29.7 from Runways 09L/09R. There is no evidence that aircraft departing from Runways 27L/27R are failing to achieve the required minimum altitude at EPM.



procedure design between the LHR SID procedures and the proposed LBHA RNAV IAP to Runway 03.

- 5.7. Discussions with HAL have established that the conclusion reached in the analysis of the DET SID was commensurate with their findings. HAL is considering the matter further to determine how the text of the current promulgated SID might be adjusted and what additional action (if any) is needed to assure there is no adverse environmental impact. NATS has advised that the proposal is viable and would not adversely impact on the operational aspects of aircraft operations from LHR.
- 5.8. It should be noted that the traffic study analysed the climb performance of departing aircraft out to 7NM before the proposed IAP flight path to determine whether an earlier “4000ft or above” position could be reasonably specified. If this could be achieved, then it may have facilitated a westerly relocation of IAP waypoint ARRO3 to alleviate some environmental concerns identified in the **Sponsor Consultation**. As it transpired, an earlier specification of “4000ft or above” would not have provided such a high assurance of achievement by an acceptable percentage of flights and so was not progressed further. This is discussed further in **Section 6** of this document.
- 5.9. LBHA wishes to place on record its thanks to HAL for their assistance and co-operation in the investigation and resolution of this aspect of the LBHA proposal.



## 6. Flight Path Considerations

### 6.1. Overview

6.1.1. The responses to the **Sponsor Consultation** for the originally proposed Precision Approach LNAV/VNAV SBAS IAP to Runway 03 identified a number of areas of concern to communities who would be affected by the flight path of aircraft carrying out the proposed IAP, together with a number of suggestions for realignment.

6.1.2. The principal communities objecting to the proposal were:

- Purley and Coulsdon (A23 Corridor);
- South of the M25 (Bletchingley, Godstone, Tandridge);

6.1.3. Principal suggestions for alternative flight path alignments included:

- Replication of the Visual Manoeuvring flight path close to the Airport;
- Establish the procedure to the east of LBHA rather than to the west;
- Align the procedure away from the A23 between Purley and Coulsdon;
- Align the procedure along the M25 instead of to the south of it.

6.1.4. LBHA has carefully considered all of the objections and suggestions submitted in responses to the **Sponsor Consultation**. In some cases, it has not been possible to incorporate the changes sought within the safety, procedure design and operational constraints that must be taken into account in the design criteria for IAPs.

6.1.5. The CAA requires that all IAPs must be designed in accordance with the procedure design criteria detailed in ICAO Document 8168 Volume 2<sup>13</sup>. The procedure design criteria define the segment lengths and configurations which must be used in procedure design and allow little (if any) flexibility.

6.1.6. Similarly, it should be recognised that additional constraints are placed on designers by the interactions between adjacent flight procedures which must be considered to assure adequate spacing between flight paths to enable safe operation of aircraft inbound to and outbound from adjacent airports. **Sections 3, 4 and 5** of this document detail the considerations and adjustments that have been necessary to ensure the safe and integrated operation of aircraft inbound to LBHA and outbound from LGW and LHR Airports.

### 6.2. Replicate the Visual Manoeuvring Flight Path

6.2.1. This was detailed in the original **Sponsor Consultation** document. The visual circuit flown by aircraft carrying out Visual Manoeuvring to Runway 03 after making an instrument approach to Runway 21 has no fixed or defined flight path. It relies on the pilot of the aircraft maintaining visual contact with the runway after breaking out of cloud, whilst configuring the aircraft for landing on the opposite-direction runway.

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<sup>13</sup> ICAO Doc 8168: *Procedures for Air Navigation Services – Aircraft Operations, Volume 2: Construction of Visual and Instrument Flight Procedures*. (commonly known as “PANS-OPS”)



6.2.2. It is not possible to replicate such a pilot-determined visual flight path within the procedure design criteria for IAPs.

6.2.3. Whilst Visual Manoeuvring approaches are suitable for use by light aircraft they are no longer appropriate for the modern business jet aircraft types currently operating into LBHA under IFR and, having a high obstacle clearance minima, do not afford the continuity of all-weather operations necessary for modern day operations.

### 6.3. [Align the IAP to the east of LBHA](#)

6.3.1. Again, this was covered in the **Sponsor Consultation** document but we have reviewed the situation once again in the light of both the responses to the Consultation and the review of interactions with LGW procedures.

6.3.2. Our review has confirmed our original position. It is not possible to reconfigure the IAP to the east of LBHA because the downwind and base leg segments of the procedure would compromise the IAP final approach paths to LGW Runway 26 as well as conflicting with departure procedures from Runway 08 at LGW. An easterly oriented IAP would result in an interruption to the flow of approaches to LGW Runway 26 (or departures from Runway 08) whilst an aircraft was carrying out an IAP to Runway 03 at LBHA until the aircraft was turning onto final approach. Such disruption to the orderly flow of the LGW Runway 26 traffic is not acceptable.

6.3.3. Thus the IAP must remain aligned to the west of LBHA at a distance compatible with procedure design criteria.

### 6.4. [Align the Procedure away from the A23](#)

6.4.1. As noted in the **Sponsor Consultation**, alignment of the IAP segment ARR03 – ARR04 coincident with the A23 trunk road would place the aircraft above an area already subject to a higher level of background noise for most of the day than would be generated by the occasional overflight.

6.4.2. Nonetheless, in the light of responses to the consultation we have reviewed this part of the IAP to see if waypoints ARR03 and/or ARR04 could be moved further to the west to align the flight path approximately between Banstead and Chipstead.

6.4.3. In particular, as part of the traffic study of LHR Runway 09 departure procedure (as detailed in **Section 5** above) the climb performance analysis was extended to 7NM from waypoint ARR03 to determine whether a “4000ft or above” position could be specified in the LHR SID procedures earlier than the minimum separation distance (from ARR03) derived from the CAAs LSRM methodology detailed in CAP1385. If such an earlier position could be so specified with an adequate assurance that all aircraft could achieve the steeper climb profile, then ARR03 could be moved westwards such that the minimum separation distance (rounded up to 5NM) would be preserved.

6.4.4. However, the traffic study indicated that if the “4000ft or above” position was specified at 6NM or 7NM west of ARR03 then 0.8% and 6.4% respectively of departing aircraft had not achieved the requisite altitude. In both cases the number of aircraft not achieving the



requisite altitude was considered too great to allow specification of the “4000ft or above” position further away from the ARR03 position.

- 6.4.5. Thus, because of the close proximity of the LHR DET SIDs to the LBHA IAP, it has not proved feasible to move waypoint ARR03 further to the west whilst maintaining the safety requirements for minimum spacing between procedures.
- 6.4.6. Given that waypoint ARR03 cannot be moved, a westerly move of ARR04 would increase the track change angle between the segments ARR03-ARR04 and ARR04-IAWP, which, in turn, would require a greater segment length of ARR04-IAWP before a further turn could be accommodated.
- 6.4.7. Moreover, given that it would be necessary to shorten, not increase, the original segment lengths south of ARR04 in order to avoid penetration of the Gatwick CTA (as detailed in **Section 3** above) any change which might adversely affect the required truncation of the IAP to the south of ARR04 would not be acceptable.
- 6.4.8. Furthermore, again given that ARR03 could not be moved westwards, a move of ARR04 alone to the west would move the flight path closer to Chipstead without accruing a reduction of overflown population along the A23.
- 6.4.9. Thus, the original position of ARR04 has been retained and the alignment of ARR03 – ARR04 is unchanged from the original proposal.

## 6.5. South of the M25

- 6.5.1. As noted in **Section 3** above, in resolving the interactions between the proposed IAP and Runway 08 departure procedures from LGW, it proved necessary to realign the IAP away from the Gatwick CTA. This has been achieved by relocating waypoints IAWP and KB03I together with specifying a “not above 2400ft” altitude limitation at waypoint ARR04.
- 6.5.2. The relocation results in waypoint IAWP being moved approximately 0.94NM north-west of the original position (to approximately M25 Junction 7) and KB03I being moved approximately 1.75NM north of the original position (close to M25 Junction 6). As a result, the segment IAWP – KB03I is aligned closely adjacent to the M25 itself.
- 6.5.3. Thus the adverse impact of the proposed IAP on the communities of Bletchingley, Godstone and Tandridge to the south of the M25 is alleviated by the redesign of this part of the procedure.



## 7. Review of Environmental Assessment

### 7.1. Overview

7.1.1. For the initially proposed RNAV LNAV/VNAV SBAS IAP design LBHA commissioned Bickerdike Allen Partners (BAP) to carry out noise evaluations in accordance with the CAA's requirements specified in CAP725. These comprised:

- Current and forecast LAeq 16-hour noise footprints, comprising footprint areas and population counts, for 57, 63 and 69dB for both the existing (Visual Manoeuvring) approach and the proposed LNAV/VNAV SBAS approach and against the Airport Noise Action Plan (NAP);
- SEL<sup>14</sup> footprints at 80 and 90dB(A,) comprising footprint areas and population counts, for Cessna C560XL and Lear 35 aircraft types<sup>15</sup> for both the existing (Visual Manoeuvring) approach and the proposed LNAV/VNAV SBAS approach.

7.1.2. The resultant analyses and charts were depicted in the **Sponsor Consultation Document**<sup>16</sup>, and demonstrated that the then proposed Precision Approach IAP would have no impact on the LAeq 16-hour footprints and a substantial reduction in both the area encompassed and the population affected for the SEL analysis as a consequence of the introduction of the then proposed IAP.

7.1.3. As a consequence of the necessary redesign of the IAP as detailed in this **Supplementary Consultation Document**, LBHA has again commissioned BAP to undertake a comparable LAeq 16-hour and SEL evaluation for the revised IAP because a different flight path is now proposed in the vicinity of the M25 corridor.

7.1.4. In addition, LBHA also commissioned a report from CAA ERCD to develop data for the fuel burn and emissions. This is explained in paragraph 7.3.

### 7.2. BAP Results

7.2.1. The LAeq 16-hour noise contour assessment finds no change between the existing (Visual Manoeuvring) approach and both the originally proposed Precision Approach design and the revised Non-Precision IAP to Runway 03. The resulting Noise Contour Chart at 57 dB is shown at **Annex D**. The corresponding areas contained within the noise contours and populations affected are detailed in **Tables 2 and 3** below. Also included are the areas for higher value contours which correspond to higher levels of exposure, none of which contain any population.

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<sup>14</sup> SEL: Sound Exposure Level for single noise events

<sup>15</sup> These aircraft types are recognised as the noisiest and most common types likely to operate to LBHA in the early morning period.

<sup>16</sup> Sections 5.4 and 5.5 and Figures 11 to 13 of the Sponsor Consultation Document



Contour L <sub>Aeq, 16h</sub>	Contour Area (sq km)		
	Current (2014)	Future (2020)	NAP Limit
57 dB	2.1	2.9	4.3
63 dB	0.8	1.0	n/a
69 dB	0.3	0.4	n/a

Table 2: Leq Contour Areas (Revised IAP)

Contour L <sub>Aeq, 16h</sub>	Population figures (rounded to nearest hundred)		
	Current (2014)	Future (2020)	NAP Limit
57 dB	200	400	n/a
63 dB	0	0	n/a
69 dB	0	0	n/a

Table 3: Leq Contour Populations (Revised IAP)

7.2.2. The SEL contour assessment for the Non-Precision IAP (in comparison to the originally proposed Precision Approach IAP) shows a slight increase in the area and population affected at 80dB(A) SEL. This is due to the higher terrain elevation to the north of the M25 (to the south of Woldingham) when compared to the terrain to the south of the M25 (to the west of Limpsfield). The SEL Charts for the existing (Visual Manoeuvring), originally proposed Non-Precision IAP<sup>17</sup> and the revised Non-Precision IAP are depicted at **Annexes E, F and G** respectively. **Tables 4 and 5** below give the SEL Contour areas and Population figures for the 3 configurations detailed above. There are no changes with respect to the 90dB(A) SEL contours or populations resulting from the proposition to introduce the Non-Precision IAP; so they are not reproduced in this document.

7.2.3. For greater distances from the runway along the procedure flight path the predicted sound levels at 1km intervals were assessed using the International Noise Model (INM) for the Cessna 560XL and Learjet 35 aircraft types. The assessment confirmed that the predicted noise levels rapidly reduced with increasing distance from touchdown until the level flight segment (at 3000ft ALT) was reached. Along the level flight segment the only variable was the terrain elevation. Predicted LA<sub>max</sub> are in the range 57 to 60 dB, with fluctuations being solely due to terrain elevation variation.

<sup>17</sup> Reproduced from the Sponsor Consultation Document



	Footprint Area (sq km)	
	80 dB(A) SEL	90 dB(A) SEL
<b>Cessna C560XL</b>		
<b>Existing routes (Visual Manoeuvring)</b>	<b>13.3/10.5/7.6</b>	<b>0.6/0.6/0.5</b>
<b>Original RNAV IAP</b>	<b>3.5</b>	<b>0.4</b>
<b>Revised RNAV IAP</b>	<b>4.0</b>	<b>0.4</b>
<b>Learjet 35</b>		
<b>Existing routes</b>	<b>5.3/4.7/3.9</b>	<b>0.2</b>
<b>Original RNAV IAP</b>	<b>2.5</b>	<b>0.2</b>
<b>Revised RNAV IAP</b>	<b>3.1</b>	<b>0.2</b>

Table 4: SEL Footprint Areas

Route	Population in Thousands	
	80 dB(A) SEL	90 dB(A) SEL
<b>Cessna C560XL</b>		
<b>Existing routes (Visual manoeuvring)</b>	<b>10.5/6.6/1.1</b>	<b>0.1</b>
<b>Original RNAV IAP</b>	<b>0.5</b>	<b>0.1</b>
<b>Revised RNAV IAP</b>	<b>0.6</b>	<b>0.1</b>
<b>Learjet 35</b>		
<b>Existing routes</b>	<b>3.0/2.1/0.3,</b>	<b>0.0</b>
<b>Original RNAV IAP</b>	<b>0.3</b>	<b>0.0</b>
<b>Revised RNAV IAP</b>	<b>0.4</b>	<b>0.1</b>

Table 5: SEL Footprint Populations

### 7.3. Quantitative CO<sub>2</sub> assessment

7.3.1. In response to an objection raised by a Local Planning Authority to the proposed IAP, LBHA undertook to consult with the CAA to ascertain their requirements for a quantitative CO<sub>2</sub> assessment to support the proposal.

7.3.2. A calculation of the CO<sub>2</sub> emissions and the fuel burn of aircraft flying the proposed new Non-Precision RNAV IAP was undertaken for the ‘Top Ten’ most frequent aircraft types (by number of movements in 2016). To quantify the CO<sub>2</sub> emissions, ERCD used Eurocontrol’s BADA model (version 3.11) for the top 10 most frequent arrival aircraft types, for the following approach procedures:

- Runway 03 – current Visual Manoeuvring Approach procedure. This procedure was described in paragraph 3.2 and Figure 5 of the Sponsor Consultation Document and the



approximate eastern and western extremities of the flight path and a nominal middle flight path<sup>18</sup> are depicted in the diagram at Annex E;

- Runway 03 – proposed in this Supplementary Consultation;
- Runway 21 – where the current and future procedures are the same.

7.3.3. The estimated fuel consumption and CO<sub>2</sub> emissions (in kg) for a single movement of each aircraft type was calculated for each of the arrival procedure options. It has not been possible to provide calculations for all aircraft types currently operating at LBHA because the BADA modelling tool has a restricted ‘menu’ of aircraft types.

7.3.4. Each of the nominal flight paths bulleted at paragraph 7.3.2 were measured for the ‘total distance’ that would be flown by an aircraft following the nominal track. An estimate of the time taken to fly the procedure was derived by assuming an average true air speed (TAS). The resulting figures are depicted in Table 6.

Index	Procedure	Distance (NM)	Total Time (sec)	Average TAS (kts)
1	03 Circling (western track)	28.5	540	190.0
2	03 Circling (middle track)	25.0	486	185.2
3	03 Circling (eastern track)	21.7	541	144.4
4	03 IAP (proposed RNAV procedure)	35.6	662	193.6
5	21 IAP (current published)	14.0	263	191.6

Table 6: Data Used in Calculations

7.3.5. The ‘Top Ten’ aircraft types are listed alphabetically below in Tables 7 and 8. The fuel consumption (in Kg) and the Greenhouse gas emissions (expressed in Kg CO<sub>2</sub>eq) are set out in **Tables 7 and 8** respectively. The numbering (second line) of the Procedures in Tables 7 and 8 relates to the index and procedure shown in columns 1 and 2 respectively in Table 6.

<sup>18</sup> It is emphasised that there is no fixed or predetermined flight path for a Visual Manoeuvre after an IAP to Runway 21 to land on the opposite-direction Runway 03. The actual flight path flown by an aircraft will result from the pilot maintaining visual contact with the runway, having broken out of cloud on the Runway 21 approach, and configuring the aircraft for landing and taking the aircraft performance and prevailing weather conditions into account. The typical spread of tracks likely to be flown is depicted by the inner and outer tracks in Annex E, with the “inner” track more likely to be flown by lighter, propeller-driven, aircraft and the outer spread of tracks more likely to be flown by larger, faster corporate jet aircraft types currently using LBHA. The middle track depicted is a “nominal” middle of the spread of tracks likely to be flown.



Aircraft Model	Procedure				
	1	2	3	4	5
Beech 200/350		25.3	25.4	36.0	17.7
PC12		29.9	25.9	44.6	11.9
Citation CJ2	35.1	29.3		46.5	12.7
Citation CJ3	37.0	30.9		49.0	13.4
Citation CJ4	35.9	29.8		48.4	12.1
Citation C525	20.0	16.6		37.6	6.7
Citation 56X	39.1	33.0		51.5	14.4
Global Express	32.2			42.7	10.8
Falcon 2000/ Challenger 300	46.7			60.5	18.2
Gulfstream 4/5	55.2			87.3	19.1
HS25B	109.7			139.0	42.1
Learjet 40	39.4	33.4		51.2	14.7

Table 7: Fuel Consumption in Kg

Aircraft Model	Procedure				
	1	2	3	4	5
Beech 200/350		80	81	115	56
PC12		95	82	142	38
Citation CJ2	112	93		148	40
Citation CJ3	118	98		156	43
Citation CJ4	114	95		154	39
Citation C525	63	53		120	21
Citation 56X	124	105		164	46
Global Express	103			136	34
Falcon 2000/ Challenger 300	149			192	58
Gulfstream 4/5	176			278	61
HS25B	349			442	134
Learjet 40	125	106		163	47

Table 8: Greenhouse Gas Emissions in Kg CO<sub>2</sub>eq



## 8. Conclusions

- 8.1. LBHA has carefully considered all of the operational and environmental concerns raised in responses to the **Sponsor Consultation**. Whilst the ‘new design’ achieves a better outcome for some of the issues raised, it has not been possible to find alternative solutions for all.
- 8.2. An “Interactions analysis” was carried out as detailed in the **Report of the Sponsor Consultation**. In particular, a detailed traffic study of the demonstrated climb performance of LHR easterly departures via DET was carried out. Discussions have been held with NATS and HAL on the operational issues of concern.
- 8.3. Resolution of the interaction between the proposed IAP to LBHA Runway 03 and LGW SID procedures, particularly from Runway 08 turning left, was not possible with the SBAS design due to need to satisfy technical ATM issues. However, the identified ATM issues were mitigated by redesign of the Initial and Intermediate segments of the new IAP proposal (such that the nominal track no longer penetrates the Gatwick CTA) and the procedure remains outside controlled airspace after leaving the LTMA no later than ARR 04.
- 8.4. Resolution of the interaction with Heathrow departures can be achieved by the introduction of a “4000ft or above” position in the current promulgated Heathrow SID procedures without detriment to aircraft operations or environmental impact.
- 8.5. As a consequence of the interaction between the proposed IAP to Runway 03 and other extant airspace procedures, it has not proved possible to redesign the nominal track of the IAP away from the Purley and Coulsdon conurbations or the A23 corridor within the required procedure design criteria for IAP design.
- 8.6. As a consequence of developing the revised Non-Precision IAP, the interaction with LGW Runway 08 departures has been removed. Furthermore, the southerly ‘base leg’ elements of the procedure no longer overfly the conurbations of Bletchingley, Godstone and Tandridge. However, the necessary revision of the proposed IAP results in a marginal increase in the size of the 80dB(A) SEL contour and the population encompassed. This is due to the higher terrain elevation beneath the adjusted flight path where it turns to intercept the final approach track. This is unavoidable.
- 8.7. The resulting configuration of the proposed IAP meets the safety and procedure design requirements necessary for introduction of a viable Non-Precision RNAV approach to Runway 03 at LBHA.
- 8.8. Introduction of an RNAV IAP to Runway 03 reflects the CAA’s Future Airspace Strategy (FAS) and Policy for the application of Performance-Based Navigation (PBN) in UK airspace and will enhance the all-weather operations capability for aircraft operations at LBHA.
- 8.9. Thus, subject to successful completion of and careful consideration of responses to **this Supplementary Consultation**, LBHA proposes that an ACP for the introduction of an RNAV IAP to Runway 03 should be submitted to the CAA.



## 9. Supplementary Consultation – How to Respond

9.1. This **Supplementary Consultation** will run from **27 February to 10 April 2017**, a period of **6 weeks**, during which time you may submit a response to LBHA on the aspects of the revised procedure detailed in this document.

9.2. LBHA has established a dedicated e-mail address:

[acp@bigginhillairport.com](mailto:acp@bigginhillairport.com)

on which you can submit your response. The address is also accessible through a link on the LBHA website:

[www.bigginhillairport.com/](http://www.bigginhillairport.com/)

9.3. Please annotate your response “**Response to the Supplementary Consultation**” and identify yourself and the organisation (if any) that you represent<sup>19</sup>. An automatic receipt notification will be sent. We will not reply individually to your comments unless it is clear that there has been some misunderstanding of the proposal.

9.4. If you have any queries relating to the content of the Supplementary Consultation please submit them via the same e-mail address, annotating them as “**Query to the Supplementary Consultation**”. We will be checking the e-mail site regularly during the consultation period and will reply to your query as soon as practicable.

9.5. Whilst the **Supplementary Consultation** is targeted at the list of Consultees detailed at **Annex A** and agreed by the CAA, LBHA welcomes responses from any other aviation or community organisations that consider they may be affected by the proposal. All such responses will be considered.

9.6. However, it should be noted that this **Supplementary Consultation** is only about the revised IAP as set out in this document. It is not about the basic principle of establishing an IAP, the future development of LBHA or any other aspects of aircraft operations at LBHA. Any concerns you may have about these issues should be raised through the appropriate established communications channels as outlined on the LBHA website.

9.7. At the end of the Consultation period we will carefully consider all the responses received and produce a **Report of the Supplementary Consultation** which will be posted on the LBHA website.

9.8. Subject to satisfactory conclusion of the **Supplementary Consultation** LBHA will prepare an ACP for submission to the CAA for the introduction of an RNAV IAP to Runway 03 at LBHA.

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<sup>19</sup> If you are unable to respond via the e-mail address or website link detailed above you may send a written response to the following address: Manager ATS, Executive Terminal, London Biggin Hill Airport, Bromley TN16 3BH. Please annotate the envelope “Response to the Supplementary Consultation”. We will not acknowledge written responses so if you require assurance of delivery please use a recognised postal method for this.



## A. Consultee list

### A.1. Airport User Consultees

- 1 Aviation
- Acropolis Aviation
- Alouette Flying Club
- Arena Aviation
- Avalon Aero
- Castle Air
- Catreus Ltd
- Centreline Air Charter
- Cirrus Aircraft
- EFG Flying School
- Heritage Hangar
- Interflight Air Charter
- Jets (Biggin Hill) Ltd
- JT Air Ltd
- Linkinjet
- London Executive Aviation
- Net Jets
- RAS Completions
- Rizon Jet UK Ltd
- Signature Flight Support
- Shipping & Airlines
- Sovereign Business Jets
- Surrey & Kent Flying Club
- Wessex Aviation
- Zenith Aviation

### A.2. Other Affected Aviation Stakeholders

- East Haxted microlight site
- Green Dragons parascending and Hang Gliding near Warlingham
- Hurley Lodge helicopter site
- Kenley Aerodrome
- London Gatwick Airport (including ANSP)
- London Heathrow Airport (including ANSP)
- London City Airport (including ANSP)
- NATS (Farnborough – LARS)
- NATS (TC)
- Redhill Aerodrome
- Rochester Airport
- Staffhurst Woods



### A.3. NATMAC - Civil Consultees

- Airport Operators Association (AOA)
- Aircraft Owners & Pilots Association UK (AOPA UK)
- Association for Remotely Piloted Aircraft and Systems (ARPAS-UK)
- Aviation Environment Federation (AEF)
- BAe Systems
- British Airways (BA)
- British Airline Pilots Association (BALPA)
- British Air Transport Association (BATA)
- British Balloon & Airship Club (BBAC)
- British Business & General Aviation Association (BBGA)
- British Gliding Association (BGA)
- British Hang Gliding & Paragliding Association (BHPA)
- British Helicopter Association (BHA)
- British Microlight Aircraft Association (BMAA)
- Future Airspace System VFR Integration Group (FASVIG)
- General Aviation Safety Council (GASCo)
- Guild of Air Traffic Control Officers (GATCO)
- “Heavy Airlines”
- Helicopter Club of Great Britain (HCGB)
- Honourable Company of Air Pilots (HCAP)
- Light Aircraft Association (LAA)
- “Light Airlines”
- “Low Cost Airlines”
- NATS
- PPL/IR Europe
- Unmanned Aerial Vehicle Systems Association (UAVS Association)
- UK AIRPROX Board (UKAB)
- UK Flight Safety Committee (UKFSC)

### A.4. NATMAC - Military Consultees

- DAATM
- HQ 3rd Air Force USAFE (3AF UK/A3)
- Military Aviation Authority (MAA)
- Ministry of Defence (MoD) (JtCap-ISTAR-1)
- NC HQ Aviation Division

### A.5. Non-aviation Consultees – Airport Consultative Committee

- Cllr D Hodge
- Cllr R Hogarth
- Cllr T Letts
- Cllr I Mitchell
- Cllr P Morgan
- Cllr R Parry



- Cllr R Scoates
- Cllr M Stevens
- Cllr D Weightman
- Mr J Bowden
- Mr V Endacott
- Mrs M Manuel
- Deva Pannoosami
- Mr J Willis
- Mr B Wingate

#### A.6. Non-aviation Consultees - County, City, District Councils

- Dartford
- Greater London Authority
- Kent County Council
- London Borough of Bromley
- London Borough of Bexley
- London Borough of Croydon
- Reigate & Banstead
- Sevenoaks
- Surrey County Council
- Tandridge DC

#### A.7. Non-aviation Consultees - Parish Councils (or equivalent)

- Badgers Mount
- Bletchingley
- Caterham on the Hill
- Caterham Valley
- Chaldon Village Council
- Chelsham & Farleigh
- Crockenhill
- Eynsford
- Farningham
- Godstone
- Halstead
- Hextable
- Horton Kirby
- Knockholt
- Nutfield
- Oxted
- Swanley
- Tatsfield
- Warlingham
- Westerham
- Whyteleaf Village Council
- Woldingham



### A.7.1. Non-aviation Consultees - Other Organisations/Individuals

- “40 Shillings”
- Mr R Trott
- CPRE - Kent
- Flightpath Watch
- Natural England
- Surrey Hills AONB

### A.7.2. Members of Parliament

- Beckenham
- Bexleyheath & Crayford
- Bromley & Chislehurst
- Croydon Central
- Croydon North
- Croydon South
- Dartford
- East Surrey
- Old Bexley & Sidcup
- Orpington
- Reigate
- Sevenoaks
- Sutton & Cheam

### A.7.3. Copy addressees

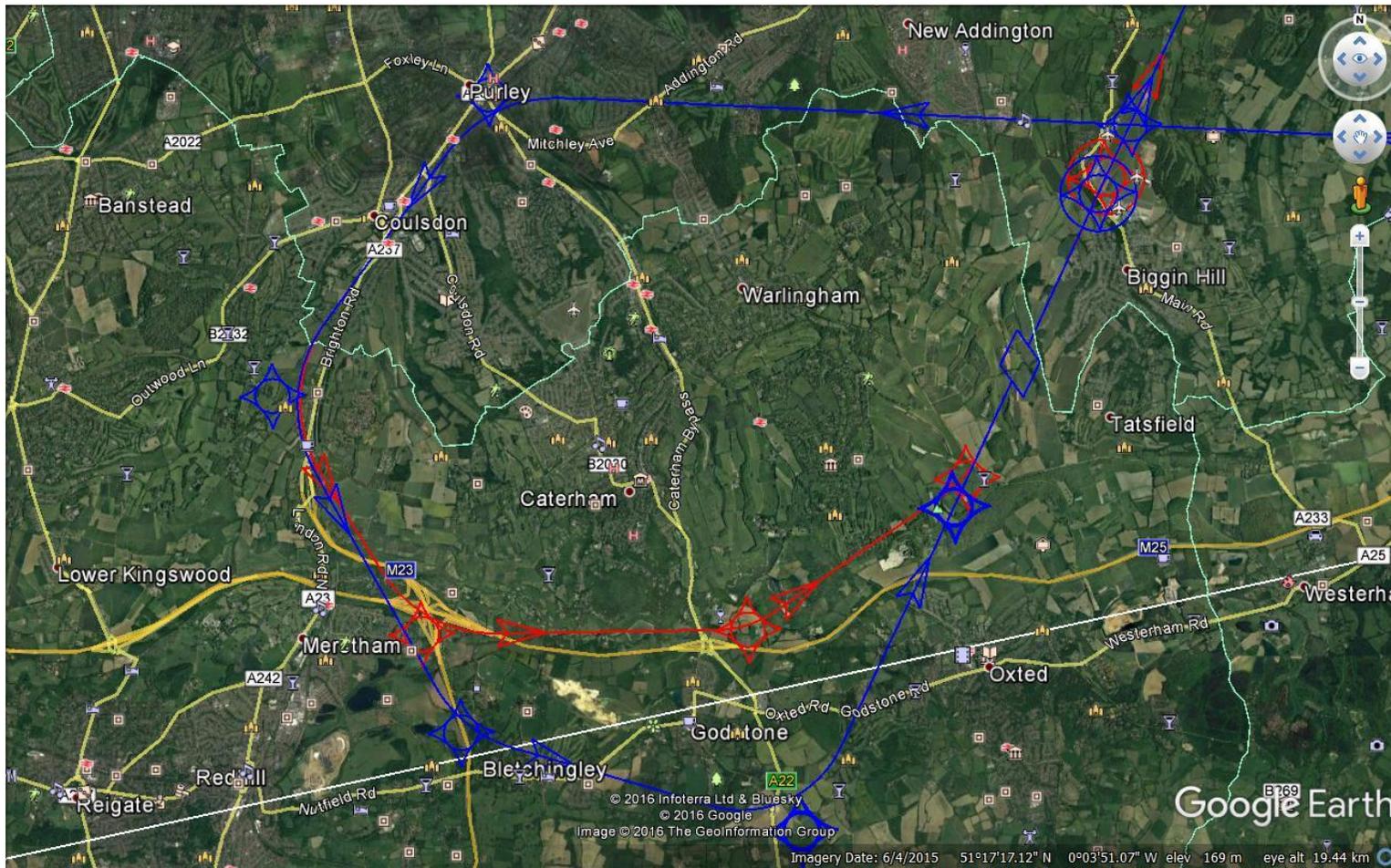
- |            |                    |
|------------|--------------------|
| • NATS Hd  | LTC operations     |
| • NATS Mgr | LAMP               |
| • CAA SARG | R Bishton (NATMAC) |
| • CAA SARG | J Mills (NATMAC)   |
| • CAA CAI  | C Peart (NATMAC)   |



## B. Differences Between Original and Revised IAP proposal



Figure 1: Original proposal in blue; revised proposal in red (overlaid on OS mapping)



**Figure 2: Enlarged portion of the changed segments of the IAP (overlaid on Google Earth)**

*Note: the solid white line depicted on Figure 2 represents the northern boundary of the Gatwick CTA*



## C. Draft Instrument Approach Procedure Chart

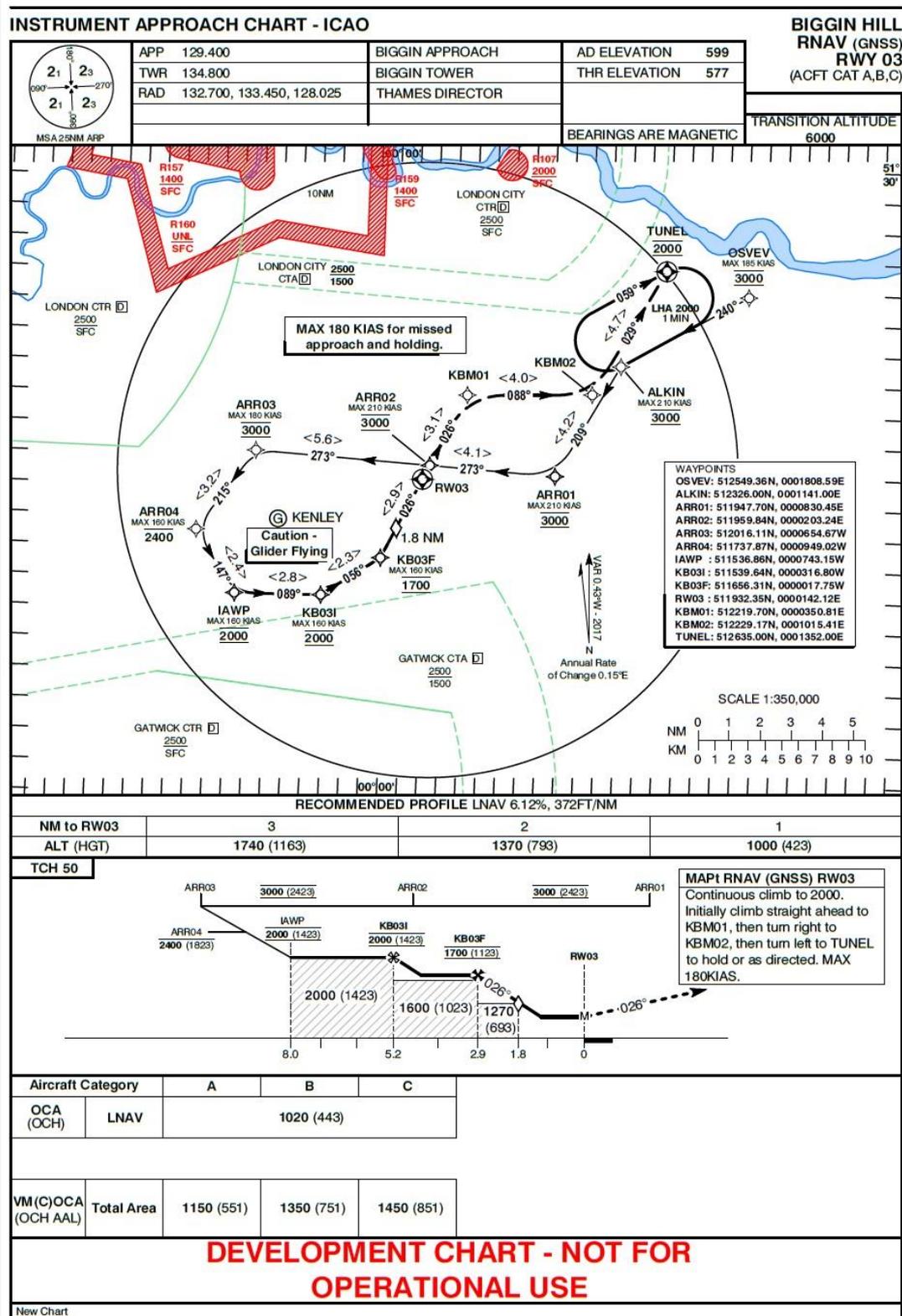


Chart created by Cyrrus Ltd.

Chart DRAFT B

Figure 3: Draft IAP Chart for the revised IAP (NOT FOR OPERATIONAL USE)



## D. LAeq 16hour Noise Contour Chart

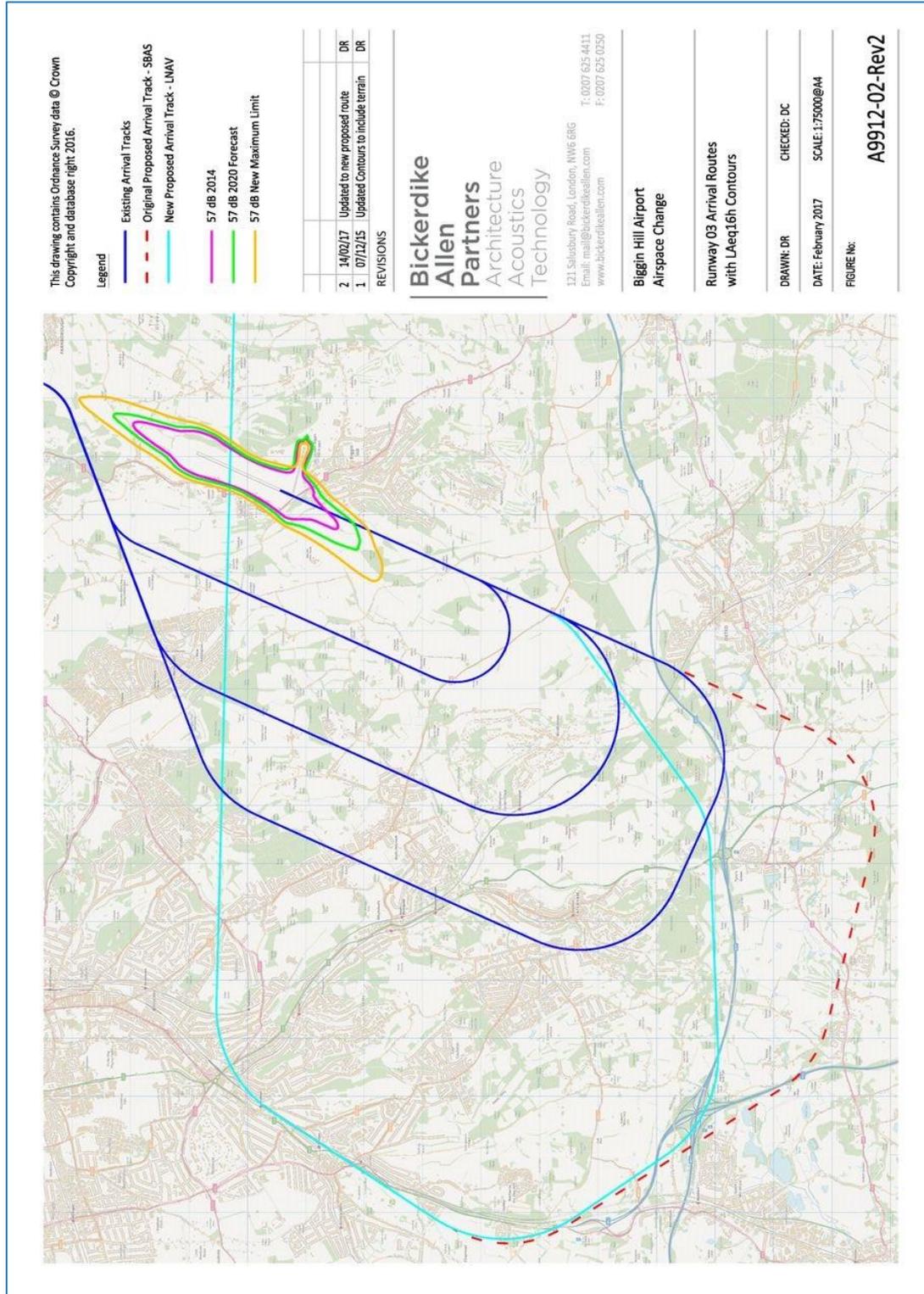


Figure 4: LAeq 16-hour Noise Contour



## E. SEL 80dB(A) and 90dB(A) contours: Existing (Visual Manoeuvring) Approach

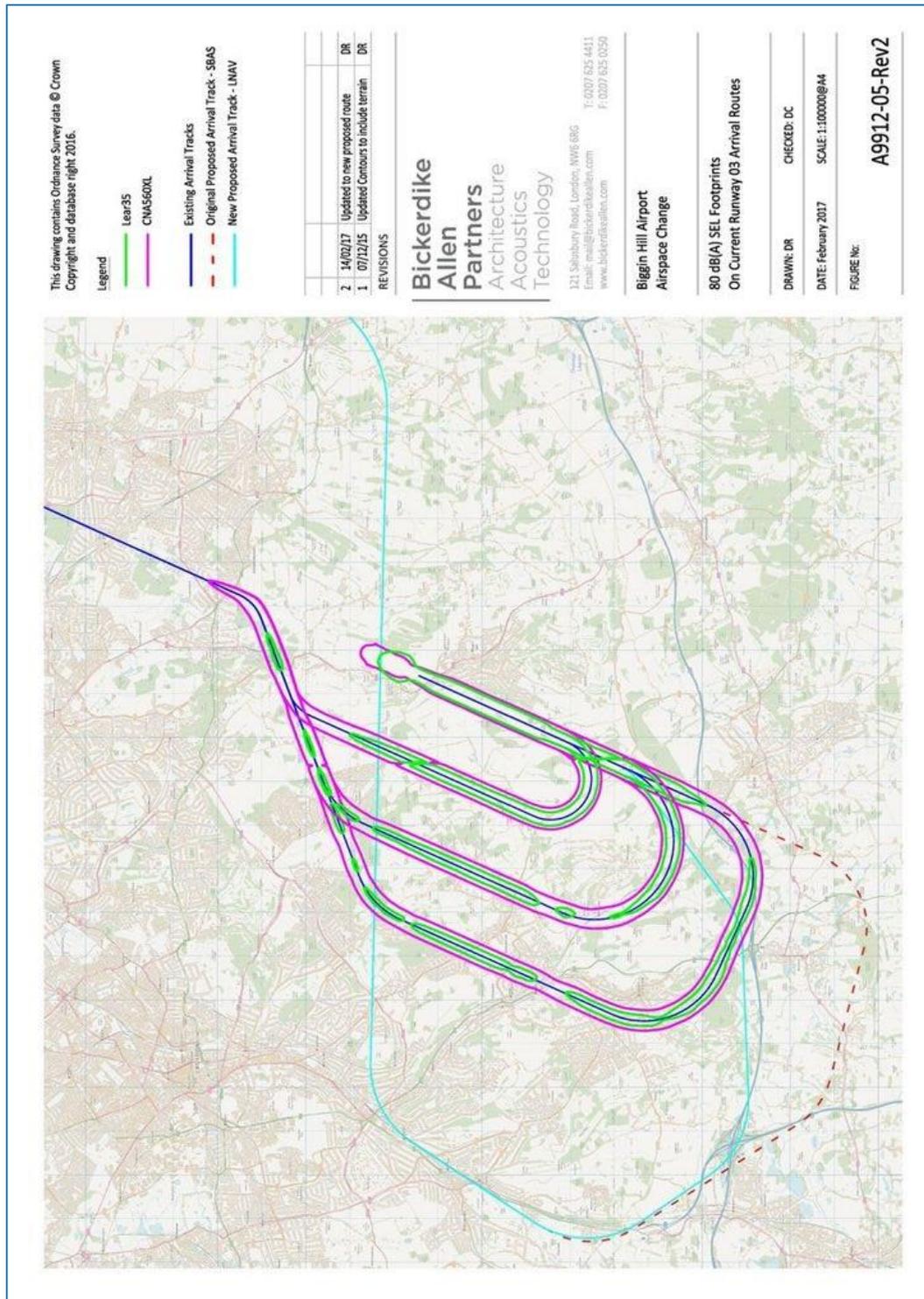


Figure 5: SEL 80dB(A) and 90dB(A) contours Visual Manoeuvring Approach



## F. SEL 80dB(A) and 90dB(A) contours: Original Proposition for Precision RNAV IAP

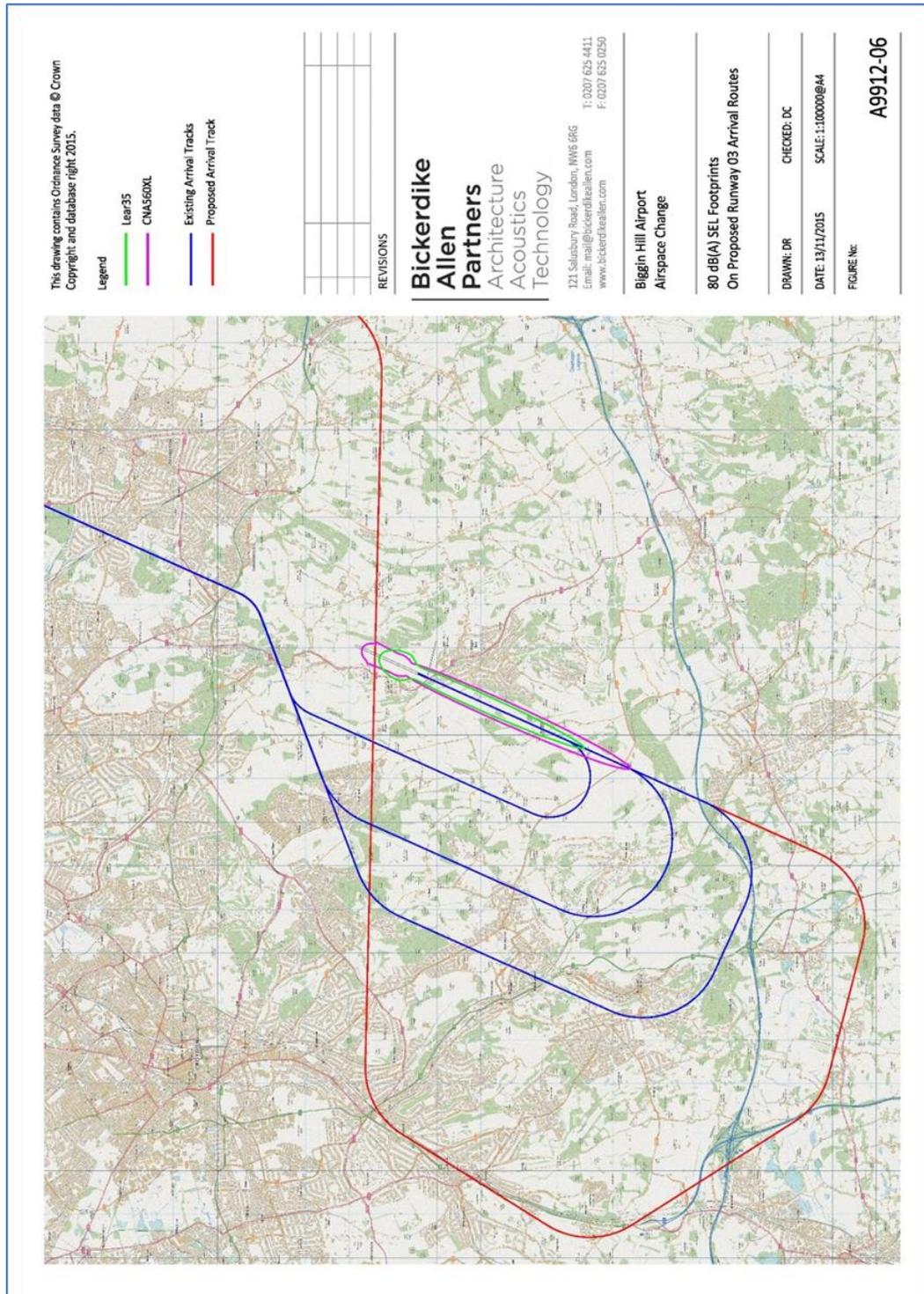


Figure 6: SEL 80dB(A) and 90dB(A) contours – Precision RNAV IAP



## G. SEL 80dB(A) and 90dB(A) contours: Revised Proposed Non-Precision RNAV IAP

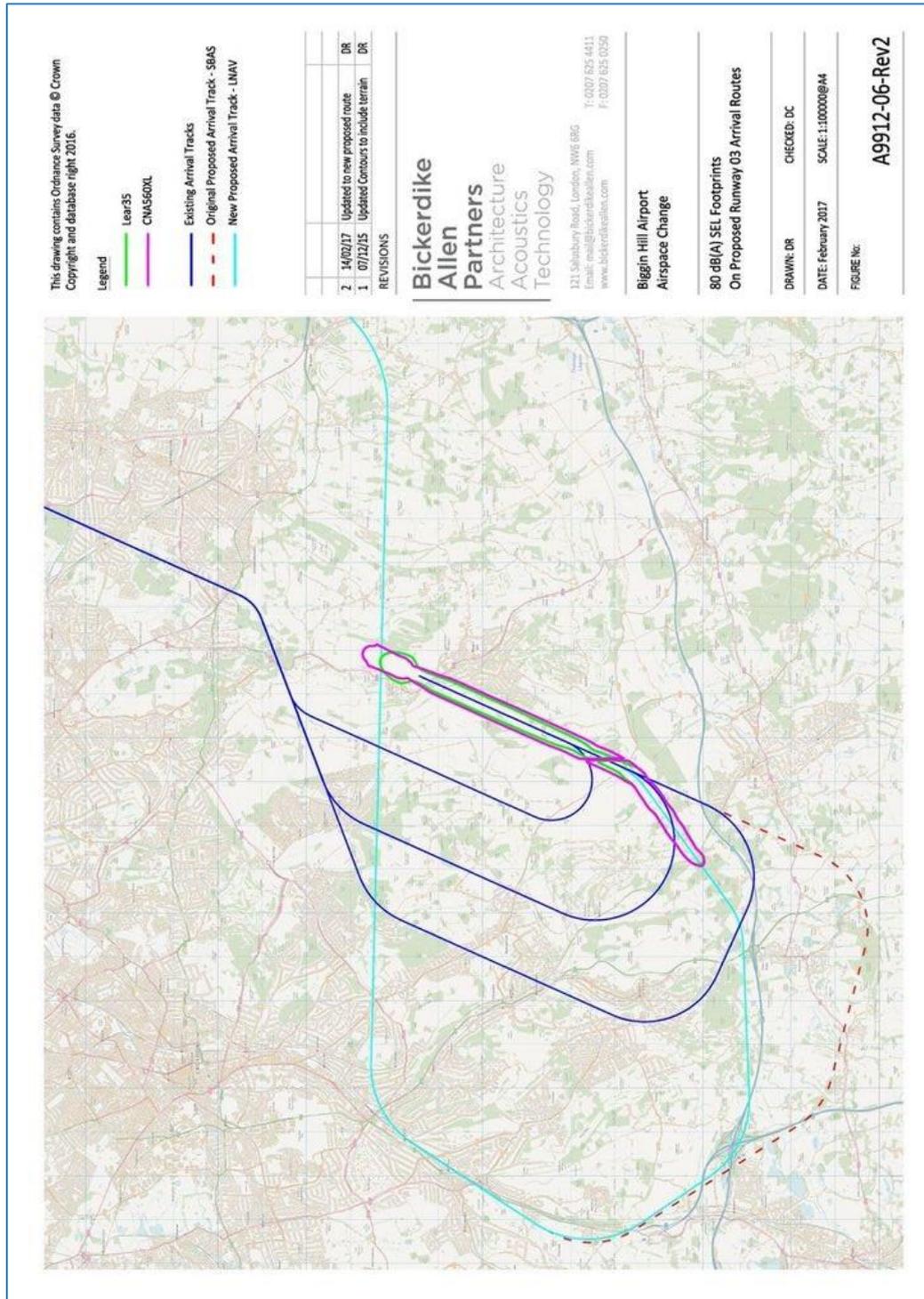


Figure 7: SEL 80dB(A) and 90dB(A) contours - Proposed Non-Precision RNAV IAP