London Biggin Hill Airport RNAV (GNSS) Runway 21 Airspace Change Proposal ACP-2019-86

ACP-2019-86

Comprehensive List

Document Details

Reference	Description
Document Title	London Biggin Hill Airport RNAV (GNSS) Runway 21 Airspace Change Proposal ACP-2019-86
	Comprehensive List
Issue	Final
Date	8th April 2021

Table of Contents

Table of Figures

1 Comprehensive List

1.1 Requirement

Civil Aviation Publication (CAP) 1616 requires London Biggin Hill Airport (LBHA) to develop a comprehensive list of options, but also accepts that there may be limited scope for multiple design options due to, for example, the physical constraints of adjacent airspace and/or procedures. Consequently it is first necessary to set out the constraints that apply in this case.

1.2 Constraints

It is important to state what this change is not about. It is not about increasing the numbers of aircraft that utilise LBHA and it is not about introducing new ground infrastructure at the airport.

In addition, this Airspace Change Proposal (ACP) is bound by the following constraints established in Stage 1:

- Designs should be PANS-OPS compliant, which means that the parameters of the Instrument Flight Procedures (IFP) for all the options, e.g. shape, accuracy, turn areas and obstacle clearances are predetermined (to a degree) in ICAO document PANS-OPS 8168 Aircraft Operations – Volume 2 Construction of Visual and Instrument Flight Procedures. This is the international standard for all IFPs.
- This change should not necessitate any change to any other air traffic procedure.
- This change should not change any airspace configuration or classification.
- This change is limited to changes at 3000 feet and below, as procedures above are "owned" by NATS and are not part of this change.

1.3 Comprehensive List

While accepting that designs can be adjusted with minor changes ad infinitum, the options below, we believe, constitute a Comprehensive List as defined in CAP 1616. The following paragraphs show how these options were developed.

1.3.1 Options outside of CAP 1616

At first it was considered if this proposal could be achieved by change outside of the airspace change process. However, it would not be possible to meet the objectives of resilience and regulatory adherence any other way than through an ACP.

1.3.2 Radical ACP options

Next it was necessary to explore whether any possible radical airspace change options were appropriate. One of these possibilities was to look at multiple routes (feedback from Stage 1), offering managed dispersion. Another was the possibility of utilising the initial RNAV(GNSS) routing to enable interception of the ILS. Unfortunately, neither of these possibilities have been successfully introduced into UK airspace[1] and as such would require an enhanced level of safety work, would likely need airspace trials, and may need new ATC tools to even be feasible.

Further possibilities lay outside the constraints of this project as they would entail partial or wholesale change to the airspace in the area. These aspects are under consideration within a different airspace change; the Future Airspace Strategy Implementation South (FASI-S) airspace redesign work.[2]

Consideration was also given to the specification of the PANS-OPS design. A high-end specification (known as RNP-AR) would limit, considerably, the ability of certain aircraft types and crews to undertake such a procedure due to the requirement for specific CAA approval following specific training. Therefore, this would not meet the resilience criteria and has not been further investigated.

An assessment was made as to whether there were any radical options for the Missed Approach Procedure (MAP) even though as an emergency procedure these would be limited. Due to the constraints of the project regarding airspace construct and not interfering with other procedures, it was apparent that no MAP option could change the current maximum altitude.

1.3.3 The Design Principles and additional Stage 1 feedback

The final Design Principles, the output from Stage 1 were then utilised as options were developed. For instance, Design Principles 1, 3, 4 and 5 led us to utilise the primary type of design for RNAV(GNSS) procedures which provide the most efficient routing in terms of track miles.

Additionally, due to the feedback to minimise the environmental impact of this change we developed options that minimised overflying new areas together with options to keep aircraft higher for longer. Further detail is contained in the following paragraphs.

1.3.4 Lateral only options

The Design Principles and additional feedback from Stage 1 suggested the desire to keep arrival aircraft within the current vectoring swathe, this aligns with the constraints of the extant air traffic arrangements and is progressed within the options development.

An option set was considered that would allow aircraft to arrive at LBHA from any direction, therefore, not utilising either OSVEV or ALKIN. Due to the constraints mentioned above and the desire for options to be within the current swathe, the only possible option was to focus on the area shown below circled in orange, as the diagram clearly shows some aircraft utilising this space today.

[1] 2014 Heathrow Trials identified issues
[2] Details can be found on the CAA Airspace Change Portal for each airport involved

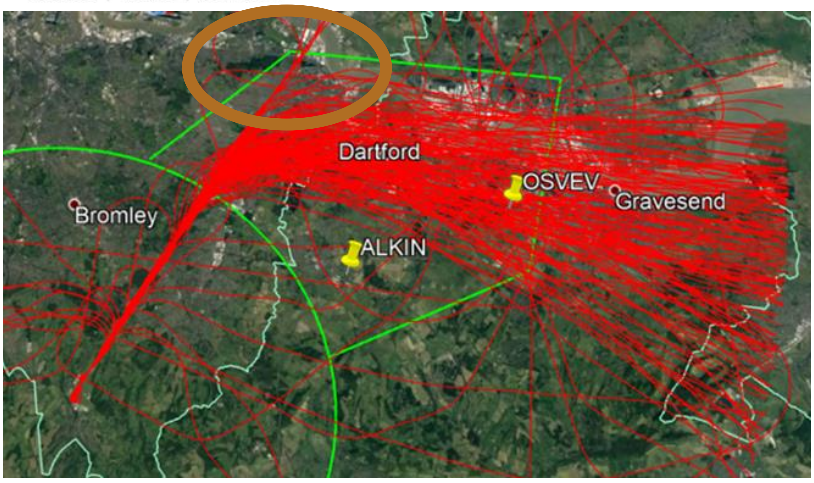

Figure 1 Current LBHA Radar Vectors with emphasis on northerly tracks

While it is possible that this option set may not "fit" into the extant air traffic arrangements, at this stage of high-level assessment we have included this in our options list. Options that utilise this element are shown by the addition of a "T". These options cannot be associated with designs that utilise ALKIN due to design constraints.

During this develop stage it became apparent that some options could utilise an OSVEV to ALKIN direct link, instead of the current radar vector arrangement. Any of our options that utilise this link are shown by the addition of "D". It was not possible to establish any other options for this link as by default it is a straight line between 2 points.

Another set of options looked at ignoring ALKIN and just using OSVEV. While it is possible that this option set may not "fit" into the extant air traffic arrangements as aircraft will leave OSVEV differently to today, at this stage of high-level assessment we have included these in our options list.

As the design phase progressed options 3 and 4 were discontinued but are included in this document for completeness. The lateral options are numbered 1 to 7 for the inbound/arrival phase, with the addition of a D or a T where applicable.

When considering options for the MAP, the airspace construct and the IFP requirements have meant fewer options are possible. All options utilise ALKIN as the MAP hold (although the construct of the hold will change with the RNAV(GNSS) design requirements). The constraints of this project negate the construction of a hold anywhere else due to the knock-on effect to other procedures and airspace users. The MAP options are numbered 8 to 11.

1.3.5 Vertical only options

The Design Principles and additional feedback from Stage 1 suggest that due to environmental concerns aircraft should be kept higher for longer. This project is only concerned with aircraft from 3000 feet[3] due to the extant airspace structure, so this element was investigated as higher final approach gradients

[3] Above mean sea level

(approximately the last 10 nautical miles before touchdown). It was decided to progress these options as there is an evidence base to draw upon; procedures are operational at Heathrow Airport providing higher than the industry standard glideslopes for environmental benefit.

An important element to consider here is the impact that temperature has on the glideslope angle of an RNAV(GNSS) approach. It has a small effect on the altitude that an aircraft's altimeter says the aircraft is at compared to the height it actually is at, because the descent angle is based on the angle at the International Standard Atmosphere (ISA) temperature at mean sea level which is 15°C. Consequently, when the temperature is not exactly 15°C the RNAV (GNSS) approach angle will change ever so slightly; colder than 15°C produces a shallower approach angle and warmer than 15°C produces a steeper approach angle.

Consequently, if utilising a 3.5° RNAV(GNSS) it will be necessary to establish and publish the maximum temperature permissible to allow the approach to be flown, which is likely to make it unavailable during some of the summer as the actual Vertical Path Angle would then be non-compliant with the design criteria.

The vertical options considered are as follows:

Option A 3° Glideslope – the industry standard and the current approach angle for the VOR/DME and the ILS on Runway 21.

Option B 3.2° Glideslope – The Slightly Steeper RNAV trials at Heathrow and the associated ACP have shown that this approach can be flown successfully alongside a 3° ILS and that a small noise reduction is achievable.

Option C 3.5° Glideslope – the work undertaken by LBHA on the ACP for an RNAV approach to Runway 03 proves that the operators at LBHA can successfully operate with a glideslope at 3.5°. This glideslope for the RNAV approach on Runway 21 would necessitate an associated change to the ILS gradient to achieve a safe final approach environment. We acknowledge that this is contrary to the constraint of not changing any other procedure but feel that in this case it is acceptable to include this as the only change is a positive vertical one, it is a LBHA procedure and will have no impact on the positioning to the final approach. The prospect here is that all arrivals, when not flying visually, but flying the RNAV or the ILS would be slightly higher than today and therefore provide an increased noise benefit.

Radical option > 3.5° Glideslope – landing on the runway from angles greater than 3.5° is not operationally viable for many aircraft and some require modifications (an example is London City Airport). This option is contrary to the design regulations, PANS-OPS 8168 Vol 2; Part 3; Section 3; Chapter 4, Subsection 4.2.1.3 A procedure shall not have a promulgated Vertical Path Angle that is less than 2.5°. A procedure with a promulgated Vertical Path Angle that exceeds 3.5° is a non-standard procedure. Therefore this option is discounted as non-compliant.

To help visualise these differences Figure 2 below shows the approximate heights above ground level for each glideslope angle at various ranges from the airport.

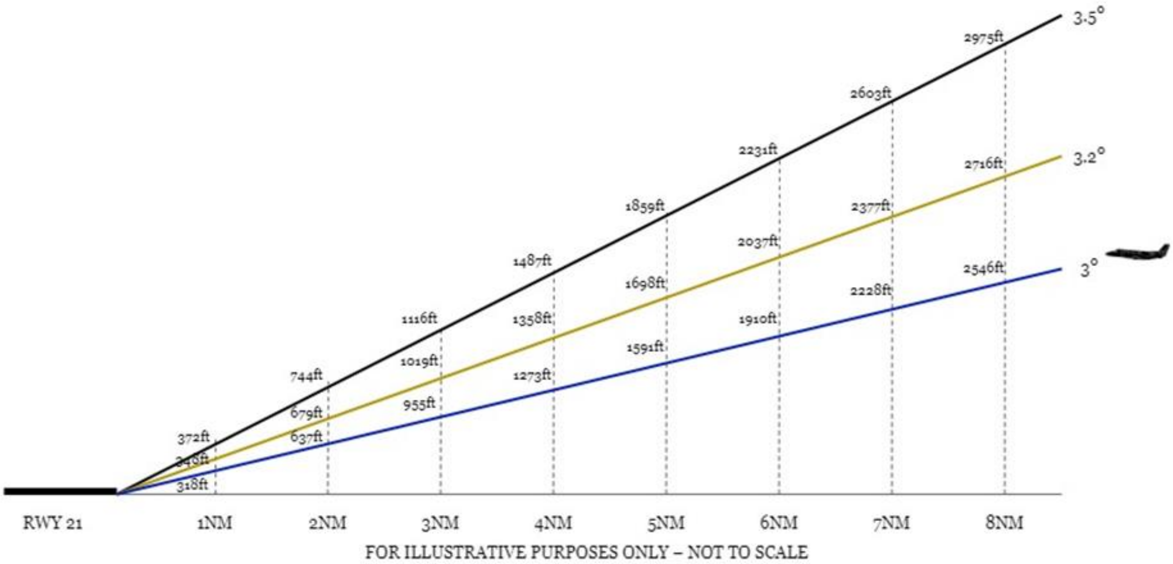

Figure 2 RWY 21 Options A/B/C Glideslope

Consequently the lateral options can now have an associated vertical option of A, B or C added.

1.3.6 Number of Options

This work has resulted in 25 inbound options and 4 MAP options, details are shown in the following sections.

2 The Inbound Options

2.1 Option 1

Do Nothing. This will mean that when the VOR is removed from service there will be no IFR approach other than the ILS into LBHA on Runway 21, which would rely on radar vectors from NATS for positioning and have no functioning MAP. In addition, by not implementing a PBN approach LBHA will not be compliant with EASA Regulatory requirements detailed within IR (EU) 20 18/10 48.

2.2 Option 2A

Do Minimum. This option would be to replicate/mimic the current VOR/DME approach which starts from ALKIN. This assumes radar vectors from OSVEV to enable inbounds to exit the network using extant procedures, or radar vectors by NATS for inbounds from the MAP or the south as is the current practice for the VOR/DME approach. The glideslope is at 3.0°.

The shaded area shows the position of the vast majority of the current arrivals of all types receiving radar vectors. The depiction shows aircraft arrival via the hold at ALKIN.

Figure 3 Option 2A

2.3 Option 2AD

This option would be to replicate/mimic the current VOR/DME approach which starts from ALKIN and utilise a new direct link from OSVEV to enable inbounds to exit the network. This assumes radar vectors or radar vectors by NATS for inbounds from the MAP or the south as is the current practice for the VOR/DME approach. The glideslope is at 3.0°.

The shaded area shows the position of the vast majority of the current arrivals of all types receiving radar vectors.

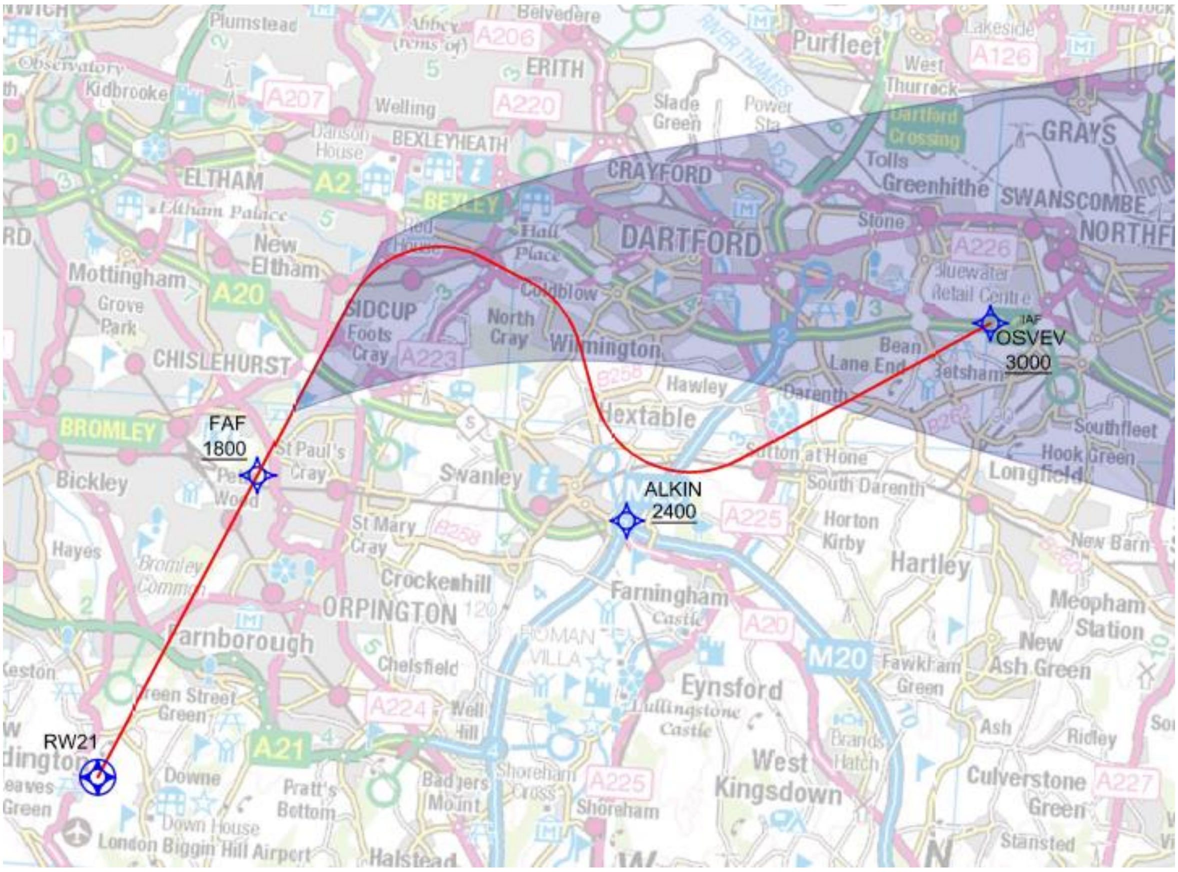

Figure 4 Option 2AD

2.4 Option 2B

This option would be to replicate/mimic the current VOR/DME approach which starts from ALKIN. This assumes radar vectors from OSVEV to enable inbounds to exit the network using extant procedures, or radar vectors by NATS for inbounds from the MAP or the south as is the current practice for the VOR/DME approach. The glideslope is at 3.2°.

The shaded area shows the position of the vast majority of the current arrivals of all types receiving radar vectors. The depiction shows aircraft arrival via the hold at ALKIN.

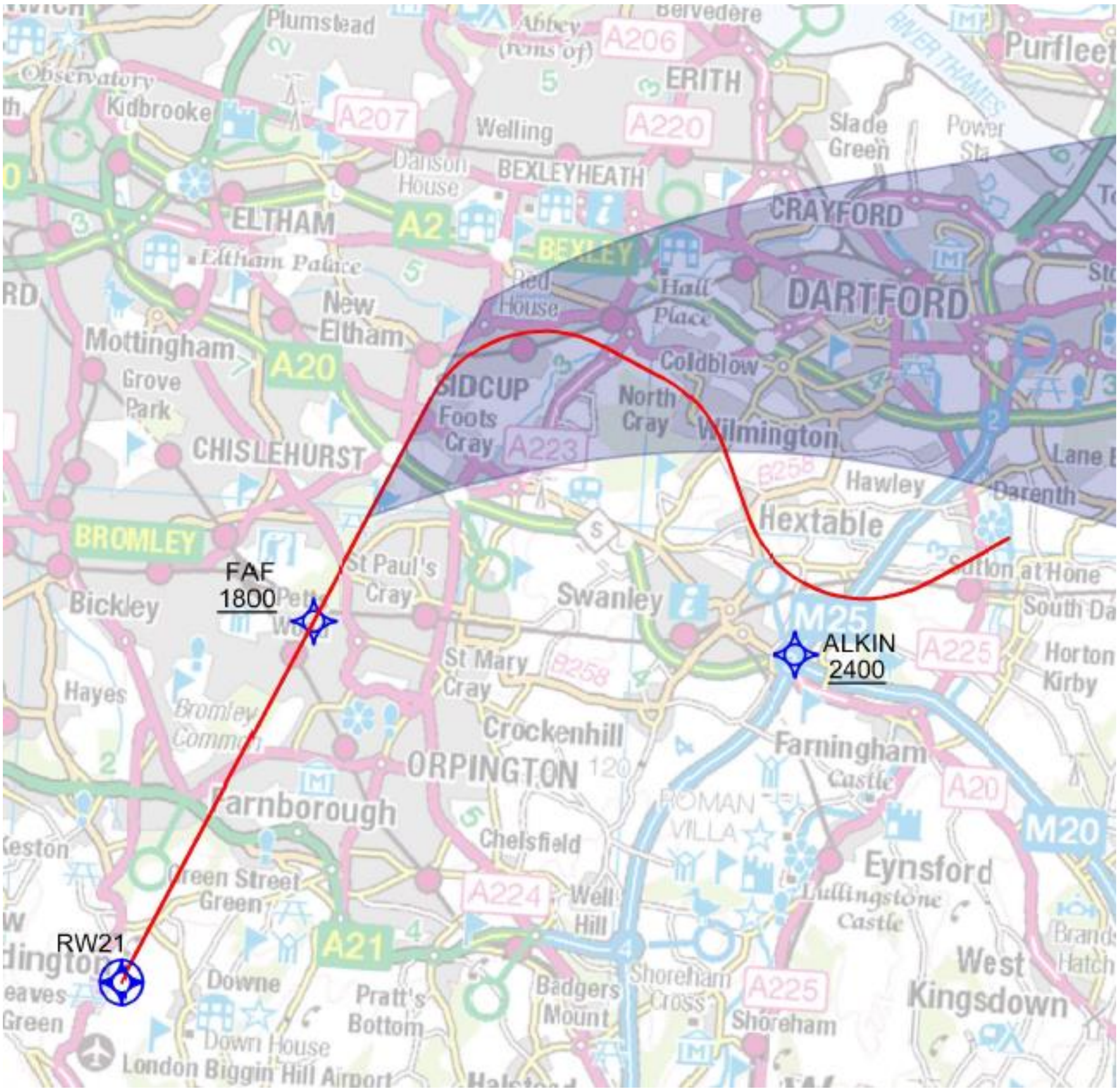

Figure 5 Option 2B

2.5 Option 2BD

This option would be to replicate/mimic the current VOR/DME approach which starts from ALKIN and utilise a new direct link from OSVEV to enable inbounds to exit the network. This assumes radar vectors or radar vectors by NATS for inbounds from the MAP or the south as is the current practice for the VOR/DME approach. The glideslope is at 3.2°.

The shaded area shows the position of the vast majority of the current arrivals of all types receiving radar vectors.

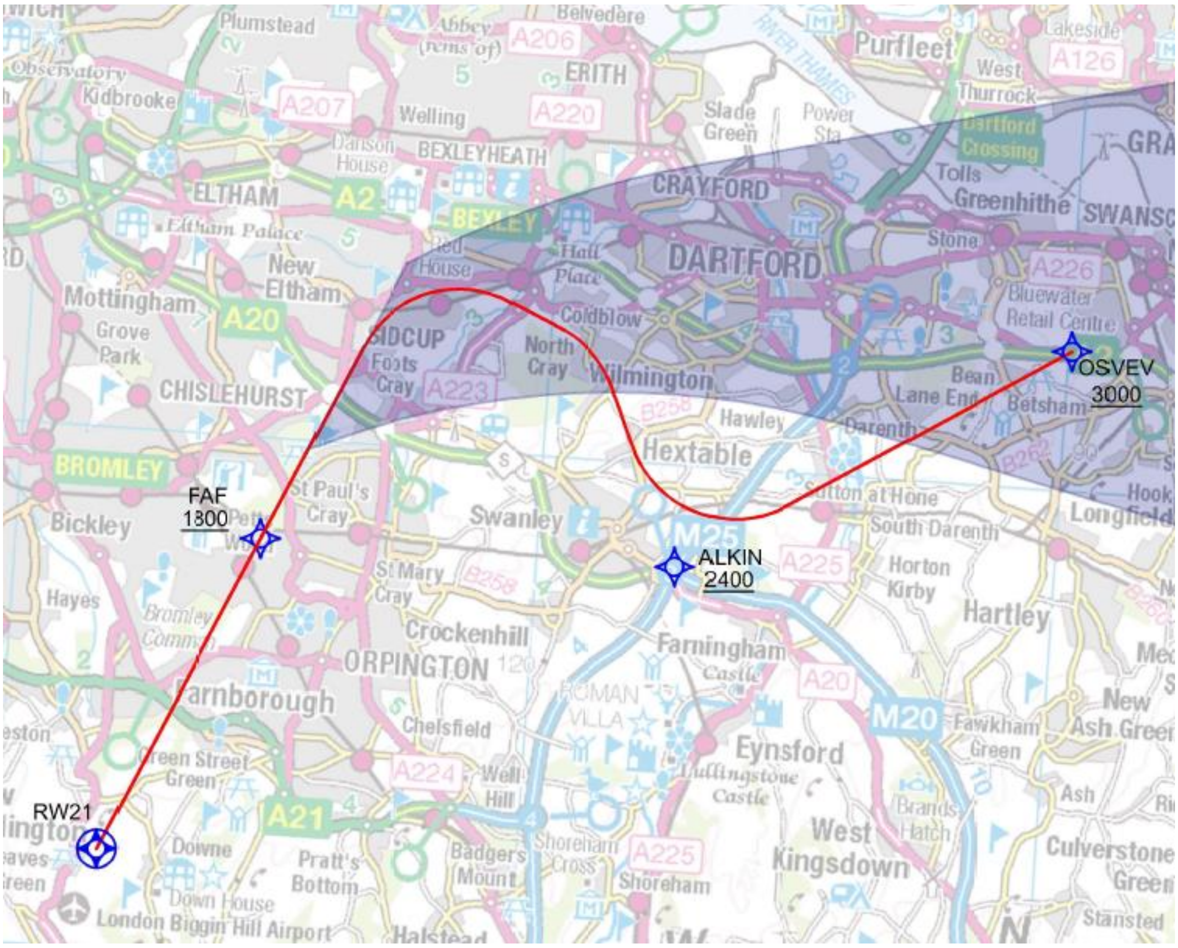

Figure 6 Option 2BD

2.6 Option 2C

This option would be to replicate/mimic the current VOR/DME approach which starts from ALKIN. This assumes radar vectors from OSVEV to enable inbounds to exit the network using extant procedures, or radar vectors by NATS for inbounds from the MAP or the south as is the current practice for the VOR/DME approach. The glideslope is at 3.5°.

The use of this option would require the ILS glideslope to also be increased, this would not change the lateral positioning.

The shaded area shows the position of the vast majority of the current arrivals of all types receiving radar vectors. The depiction shows aircraft arrival via the hold at ALKIN.

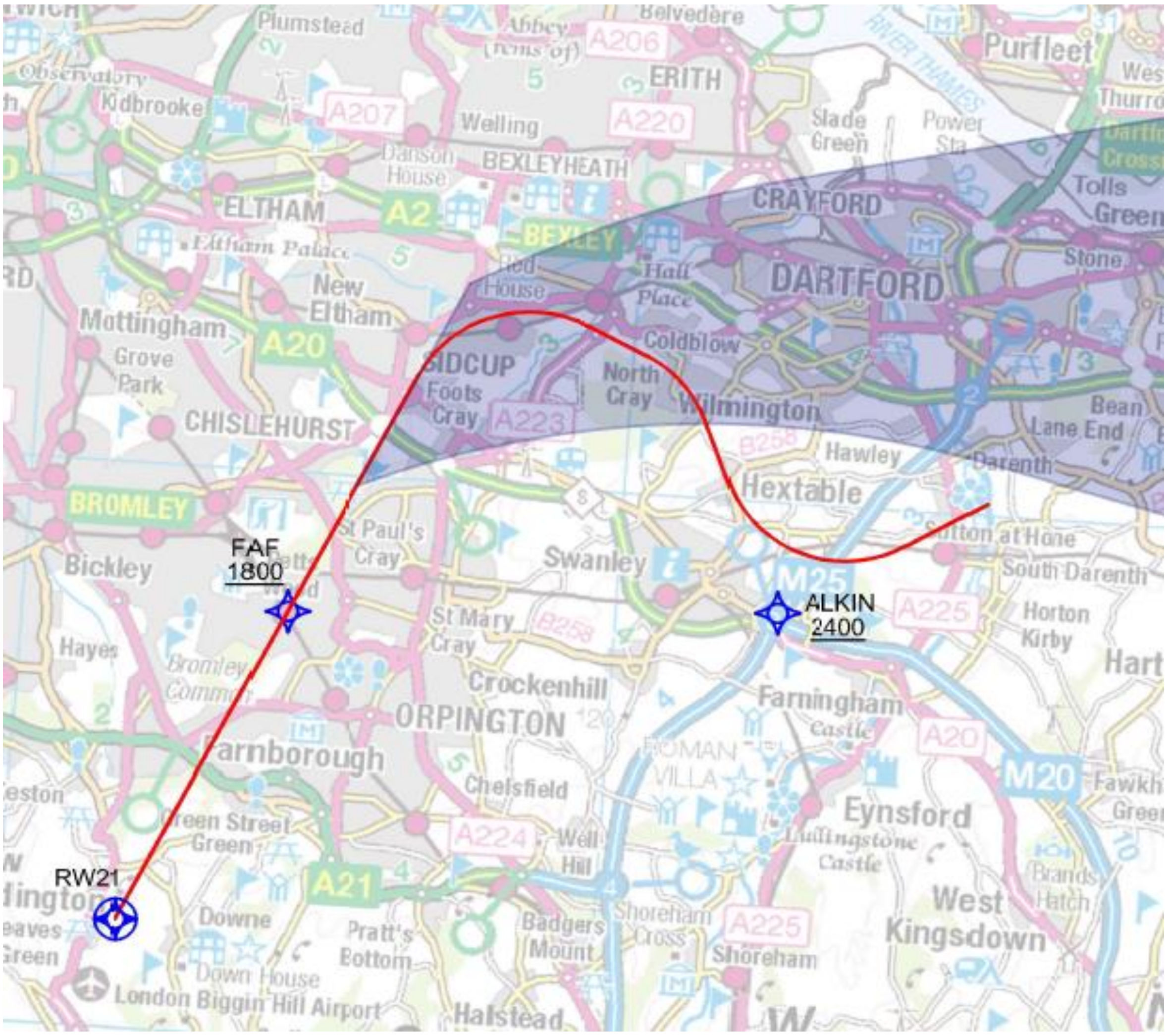

Figure 7 Option 2C

2.7 Option 2CD

This option would be to replicate/mimic the current VOR/DME approach which starts from ALKIN and utilise a new direct link from OSVEV to enable inbounds to exit the network. This assumes radar vectors by NATS for inbounds from the MAP or the south as is the current practice for the VOR/DME approach. The glideslope is at 3.5°.

The use of this option would require the ILS glideslope to also be increased, this would not change the lateral positioning.

The shaded area shows the position of the vast majority of the current arrivals of all types receiving radar vectors.

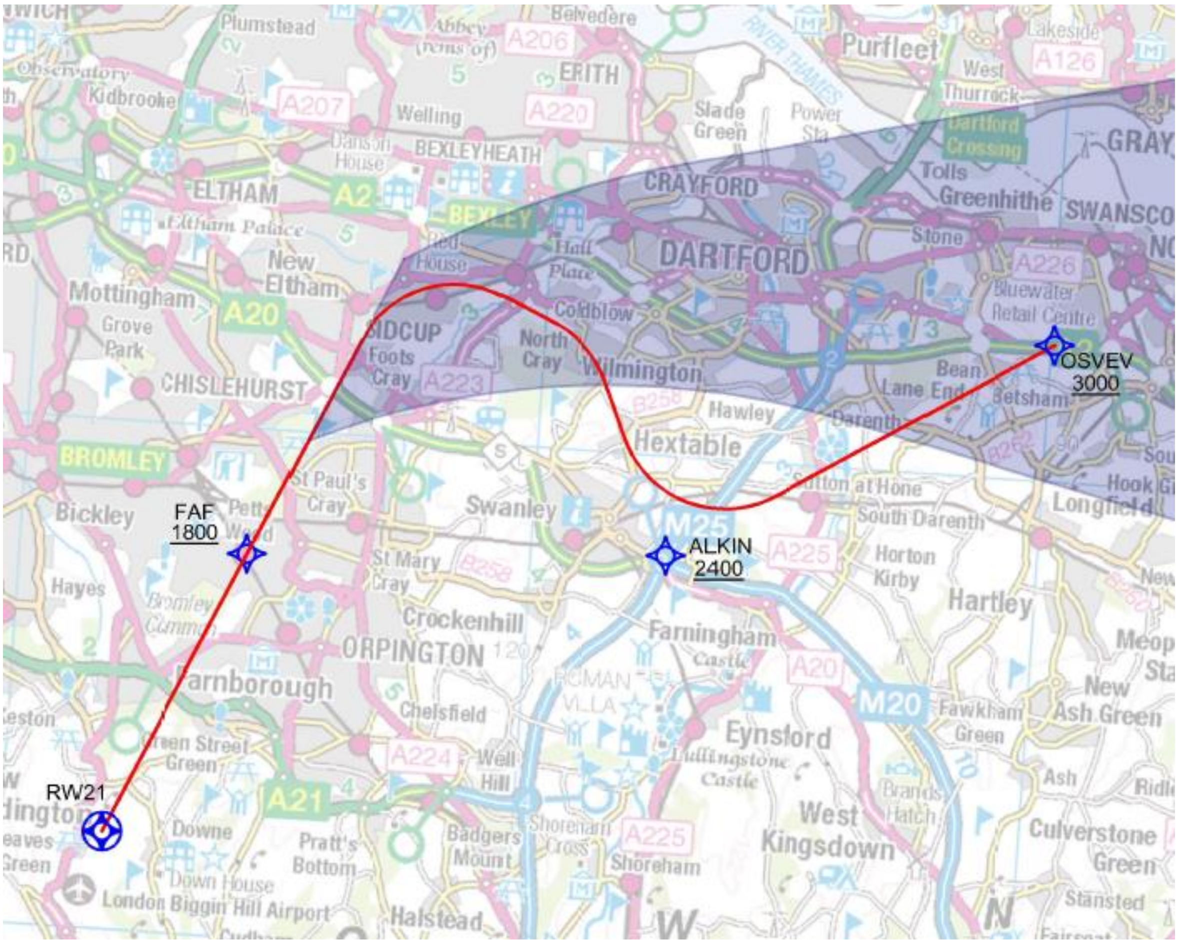

Figure 8 Option 2CD

2.8 Option 3A/B/C

Laterally left of current VOR plate, starting from ALKIN but remaining within current ILS vectoring swathe, final approach at 3°/3.2°/3.5°. This assumes radar vectors from OSVEV to enable inbounds to exit the network using extant procedures, or radar vectors by NATS for inbounds from the MAP as is the current practice for the VOR/DME approach.

Discontinued as it proved impossible to design within the constraints as it would result in a change to the positioning of aircraft as they prepared to land resulting in overflying new people.

2.9 Option 4A/B/C

Laterally right of current VOR plate, starting from ALKIN remaining within current ILS vectoring swathe final approach at 3°/3.2°/3.5°. This assumes radar vectors from OSVEV to enable inbounds to exit the network using extant procedures, or radar vectors by NATS for inbounds from the MAP as is the current practice for the VOR/DME approach.

Discontinued as it proved impossible to design within the constraints as it would result in a change to the positioning of aircraft as they prepared to land resulting in overflying new people.

2.10 Option 5A

From OSVEV and ignoring ALKIN, to enable inbounds to exit the network routing through the centre of the current ILS vectoring swathe, final approach at 3°.

The shaded area shows the position of the vast majority of the current arrivals of all types receiving radar vectors.

This option will require work to assess whether extant or new procedures will be utilised to exit the network at OSVEV.

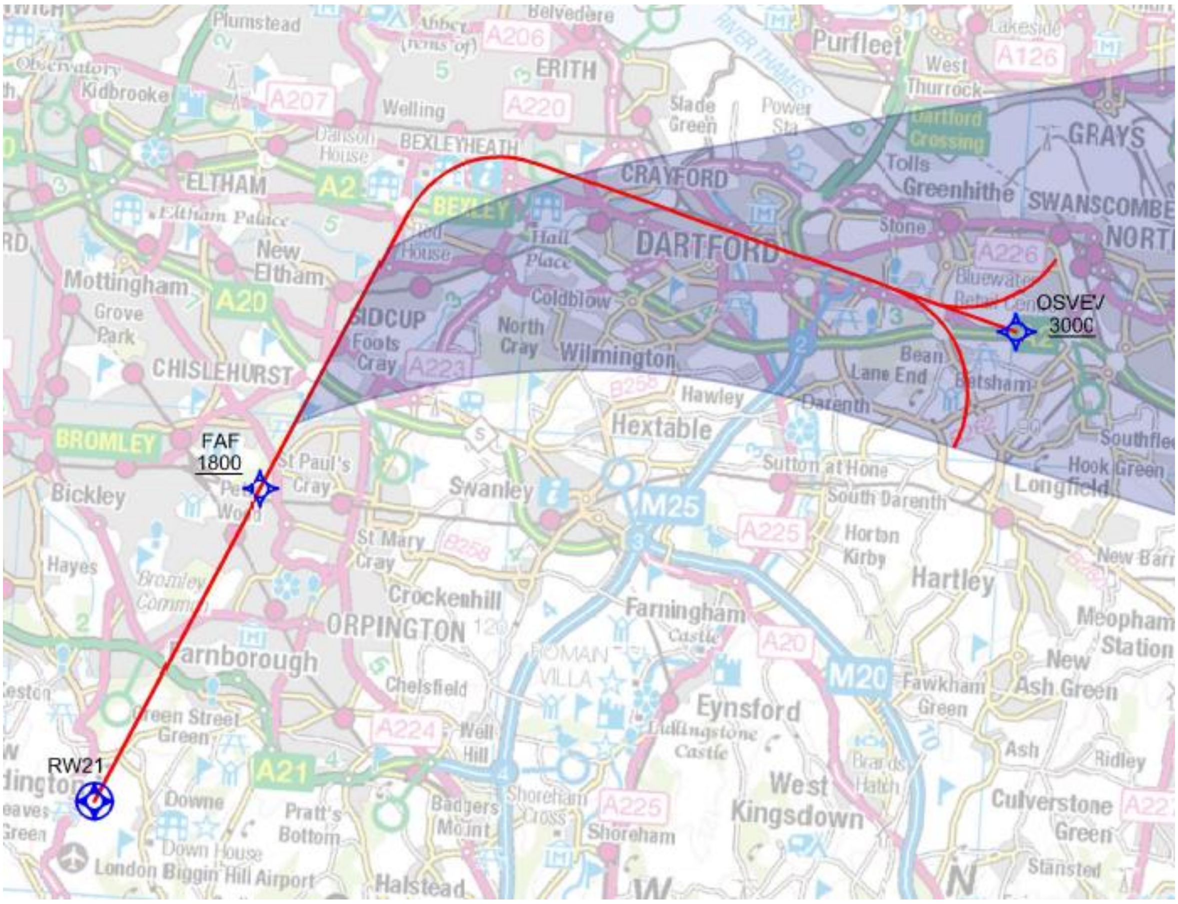

Figure 9 Option 5A

2.11 Option 5AT

From OSVEV and ignoring ALKIN, to enable inbounds to exit the network routing through the centre of the current ILS vectoring swathe, with the addition of a new route positioned from the north/northeast. Final approach at 3°.

The shaded area shows the position of the vast majority of the current arrivals of all types receiving radar vectors.

This option will require work to understand the viability of the IAF North.

This option will require work to assess whether extant or new procedures will be utilised to exit the network at OSVEV.

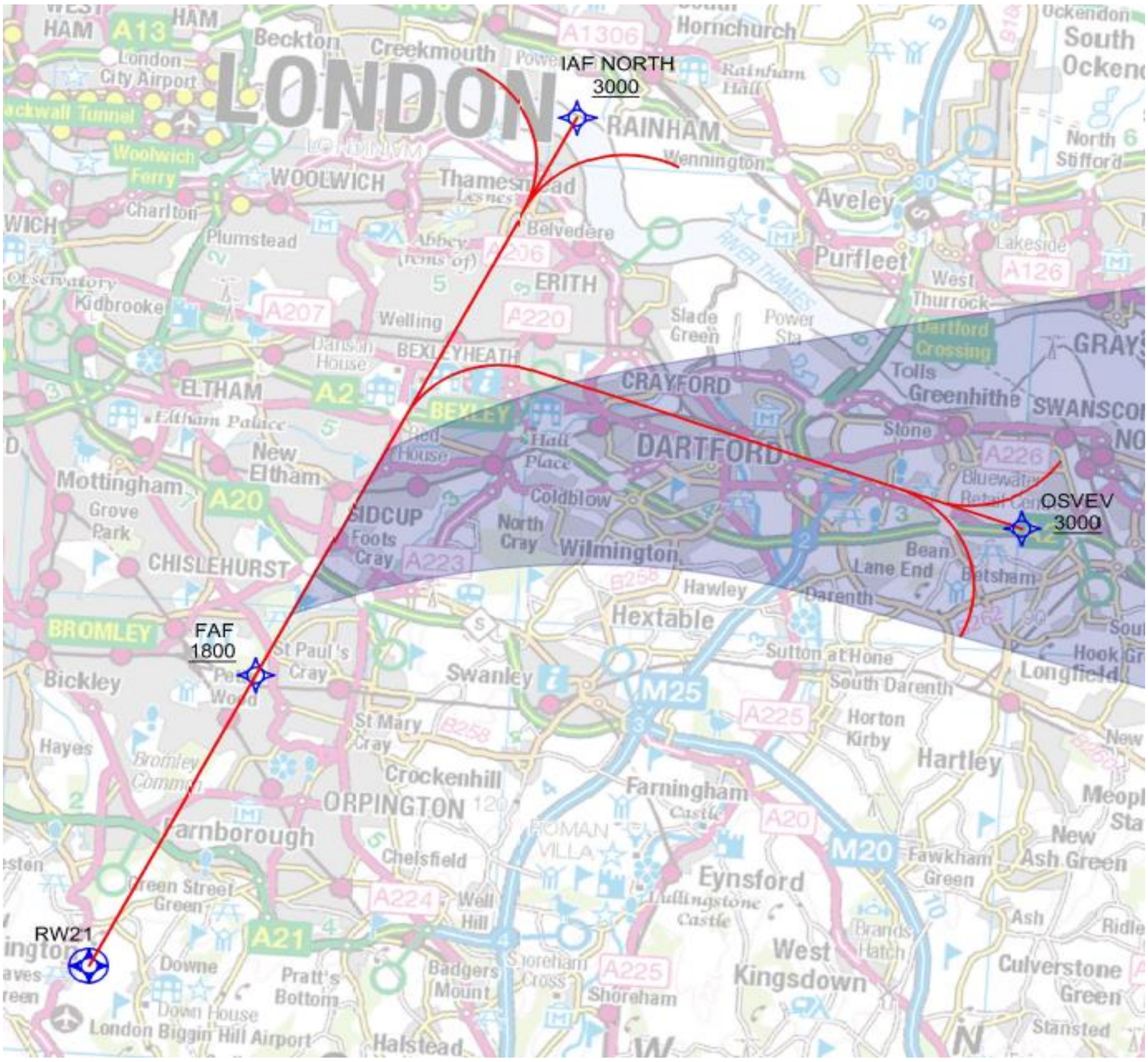

Figure 10 Option 5AT

2.12 Option 5B

From OSVEV and ignoring ALKIN, to enable inbounds to exit the network routing through the centre of the current ILS vectoring swathe, final approach at 3.2°.

The shaded area shows the position of the vast majority of the current arrivals of all types receiving radar vectors.

This option will require work to assess whether extant or new procedures will be utilised to exit the network at OSVEV.

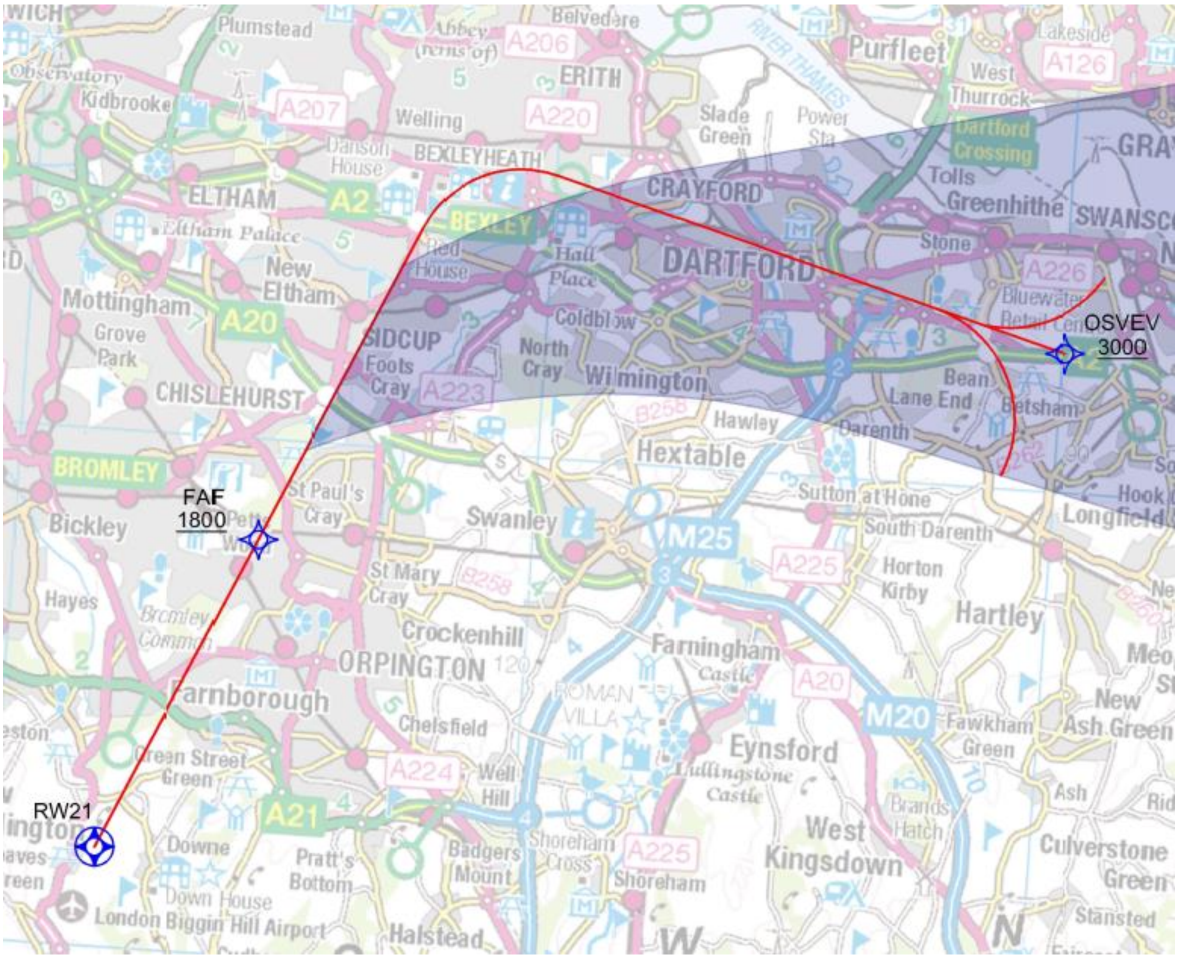

Figure 11 Option 5B

2.13 Option 5BT

From OSVEV and ignoring ALKIN, to enable inbounds to exit the network routing through the centre of the current ILS vectoring swathe, with the addition of a new route positioned from the north/northeast. Final approach at 3.2°.

The shaded area shows the position of the vast majority of the current arrivals of all types receiving radar vectors.

This option will require work to understand the viability of the IAF North.

This option will require work to assess whether extant or new procedures will be utilised to exit the network at OSVEV.

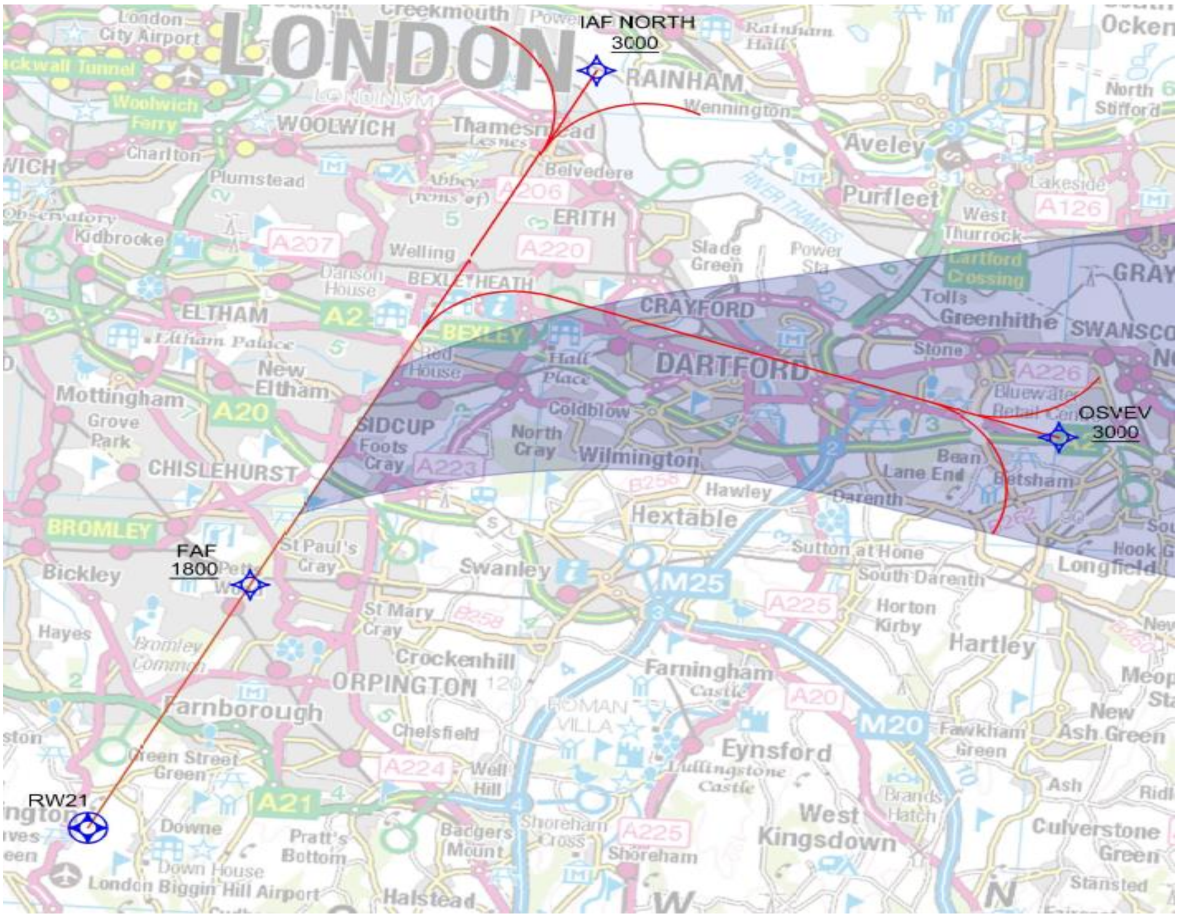

Figure 12 Option 5BT

2.14 Option 5C

From OSVEV and ignoring ALKIN, to enable inbounds to exit the network routing through the centre of the current ILS vectoring swathe, final approach at 3.5°.

The shaded area shows the position of the vast majority of the current arrivals of all types receiving radar vectors.

The use of this option would require the ILS glideslope to also be increased, this would not change the lateral positioning.

This option will require work to assess whether extant or new procedures will be utilised to exit the network at OSVEV.

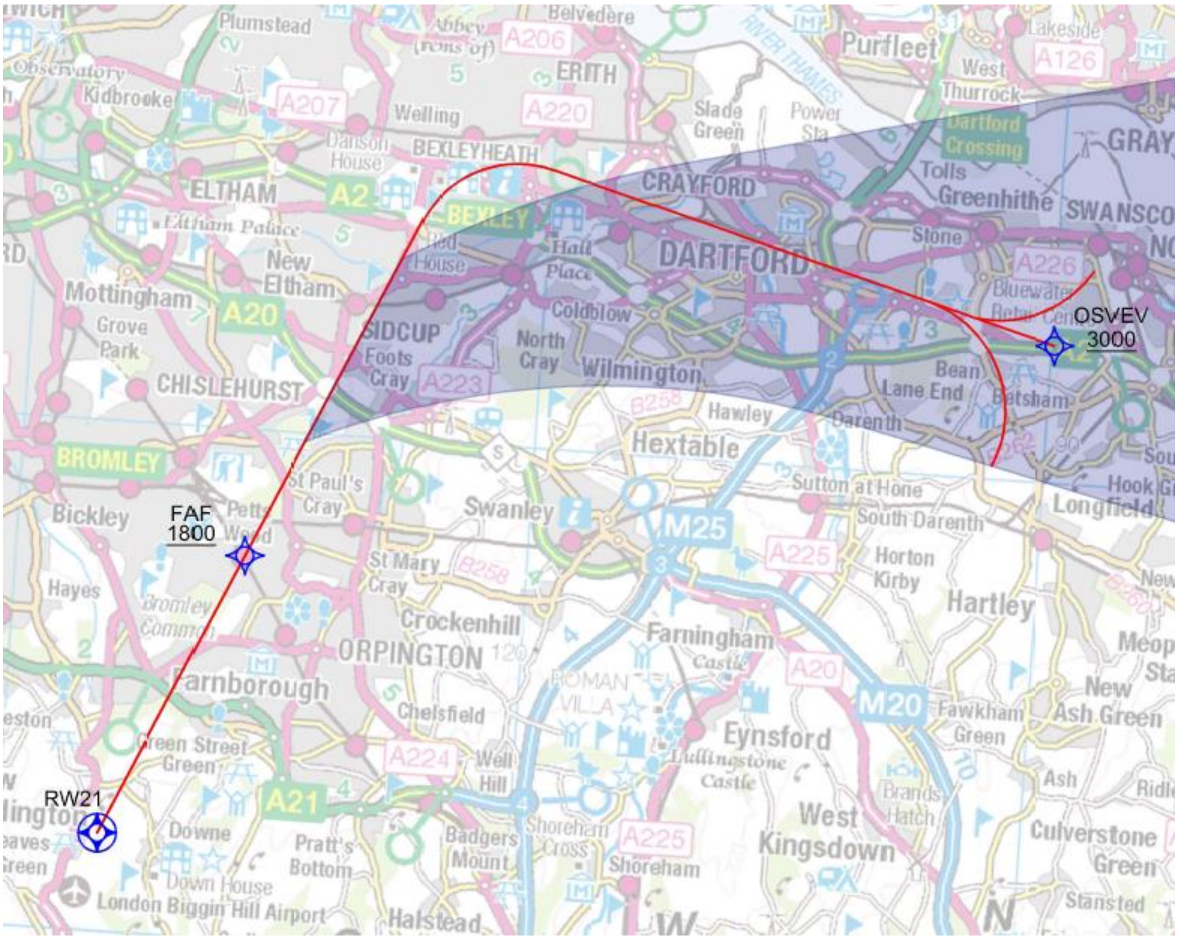

Figure 13 Option 5C

2.15 Option 5CT

From OSVEV and ignoring ALKIN, to enable inbounds to exit the network routing through the centre of the current ILS vectoring swathe, with the addition of a new route positioned from the north/northeast. Final approach at 3.5°.

The shaded area shows the position of the vast majority of the current arrivals of all types receiving radar vectors.

The use of this option would require the ILS glideslope to also be increased, this would not change the lateral positioning.

This option will require work to understand the viability of the IAF North.

This option will require work to assess whether extant or new procedures will be utilised to exit the network at OSVEV.

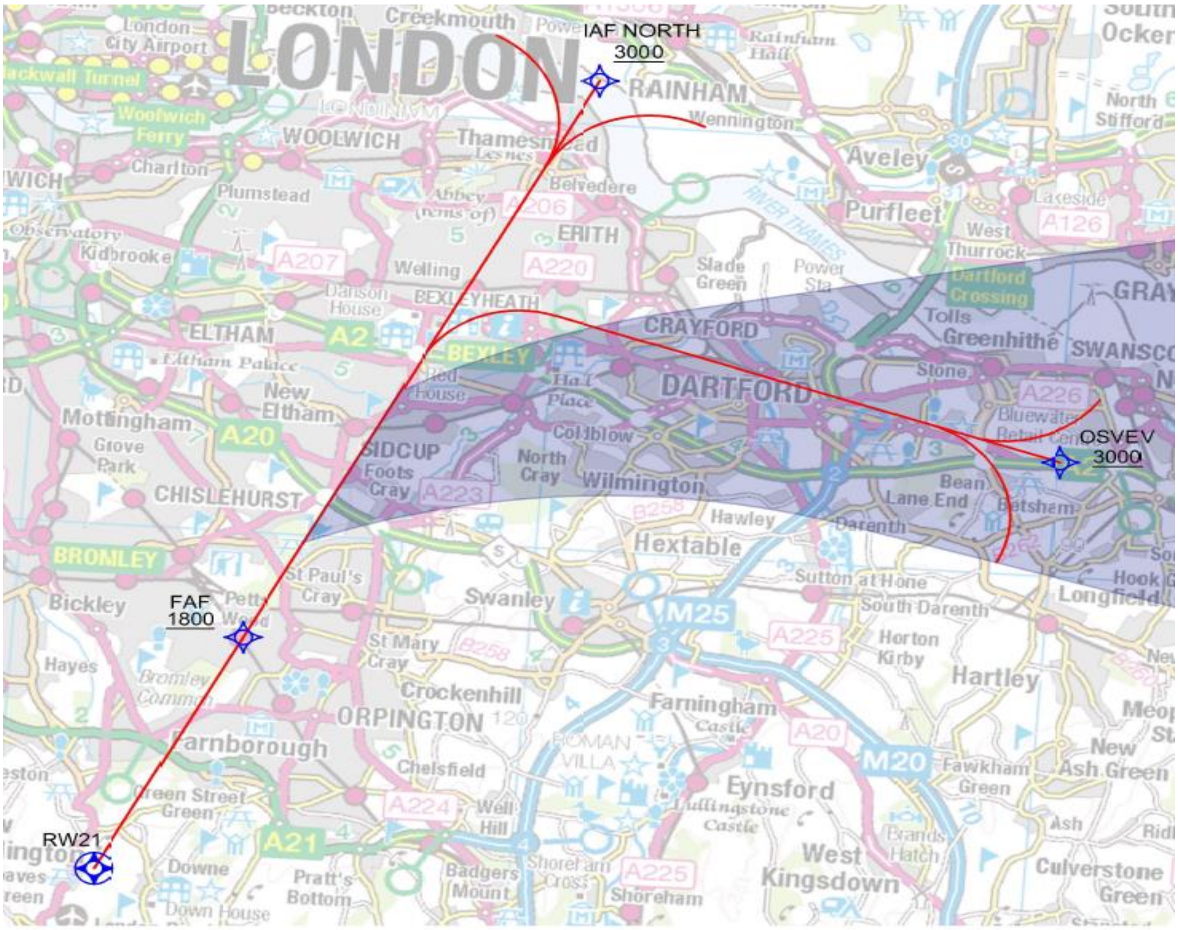

Figure 14 Option 5CT

2.16 Option 6A

From OSVEV and ignoring ALKIN, to enable inbounds to exit the network routing down the left of the current ILS vectoring swathe, final approach at 3°.

The shaded area shows the position of the vast majority of the current arrivals of all types receiving radar vectors.

Unable to route further left (which means this is the furthest south possible) due to the design criteria.

This option will require work to assess whether extant or new procedures will be utilised to exit the network at OSVEV.

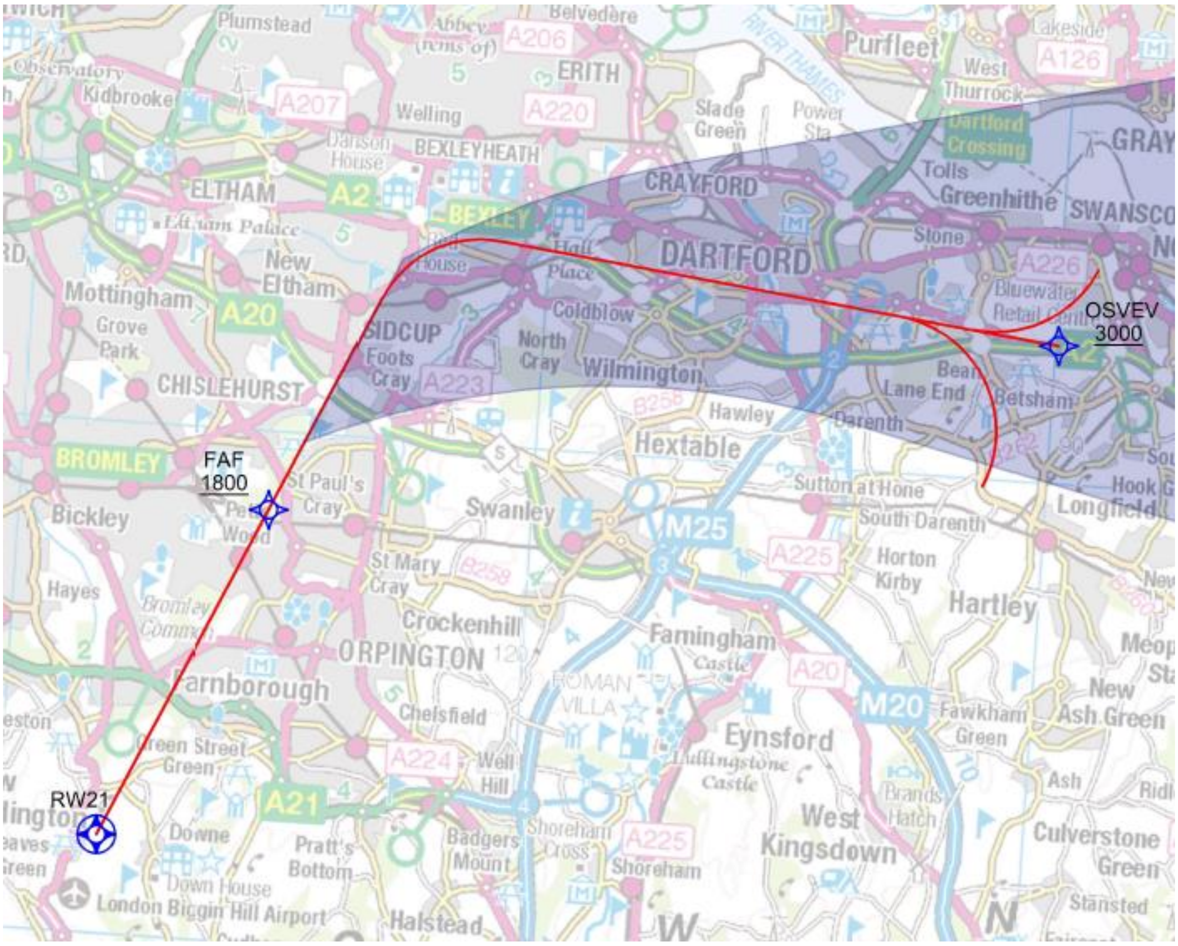

Figure 15 Option 6A

2.17 Option 6AT

From OSVEV and ignoring ALKIN, to enable inbounds to exit the network routing down the left of the current ILS vectoring swathe, with the addition of a new route positioned from the north/northeast. Final approach at 3°.

The shaded area shows the position of the vast majority of the current arrivals of all types receiving radar vectors.

This option will require work to understand the viability of the IAF North.

Unable to route further left (which means this is the furthest south possible) due to the design criteria.

This option will require work to assess whether extant or new procedures will be utilised to exit the network at OSVEV.

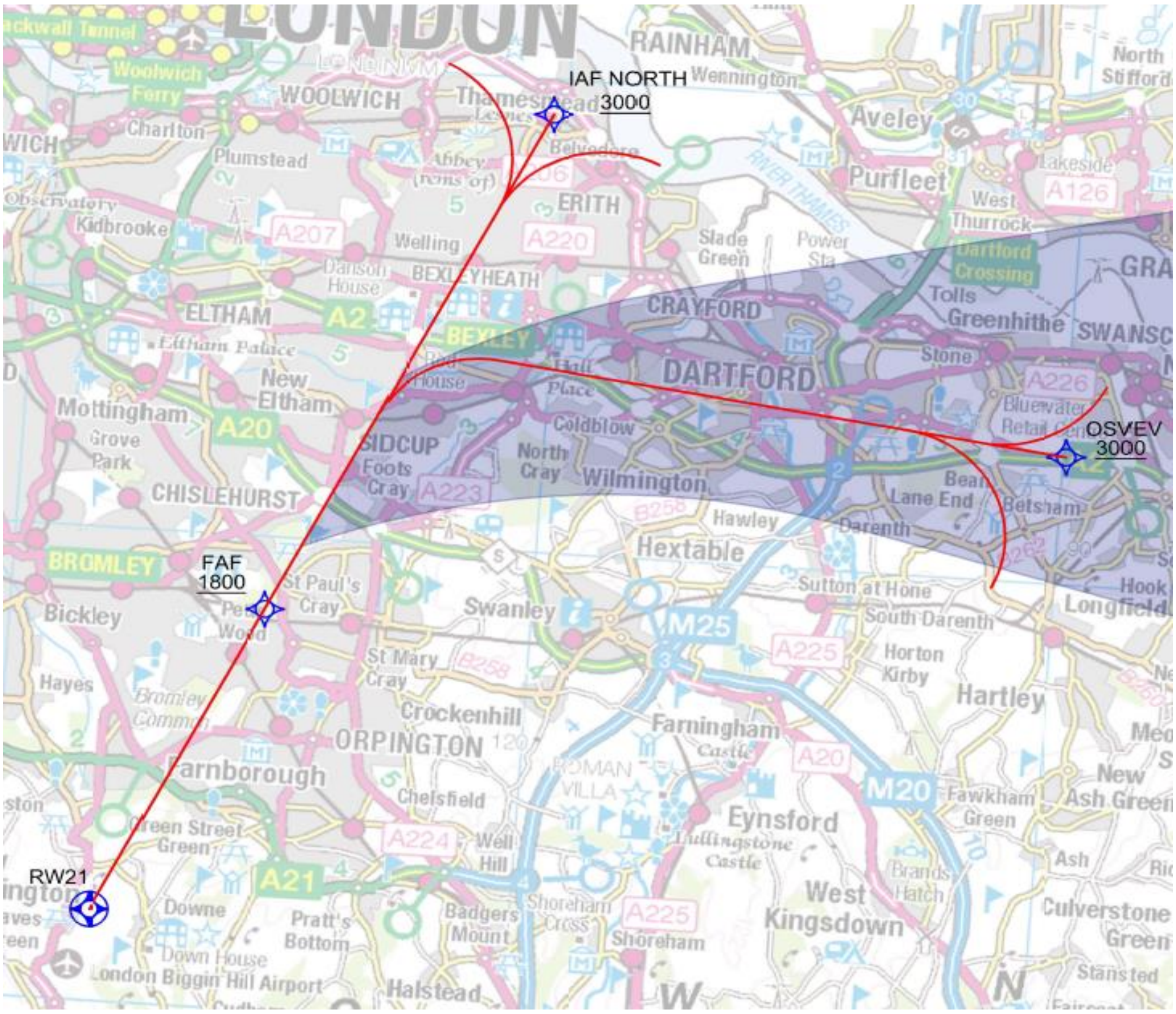

Figure 16 Option 6AT

2.18 Option 6B

From OSVEV and ignoring ALKIN, to enable inbounds to exit the network routing down the left of the current ILS vectoring swathe, final approach at 3.2°.

The shaded area shows the position of the vast majority of the current arrivals of all types receiving radar vectors.

Unable to route further left (which means this is the furthest south possible) due to the design criteria. This option will require work to assess whether extant or new procedures will be utilised to exit the network at OSVEV.

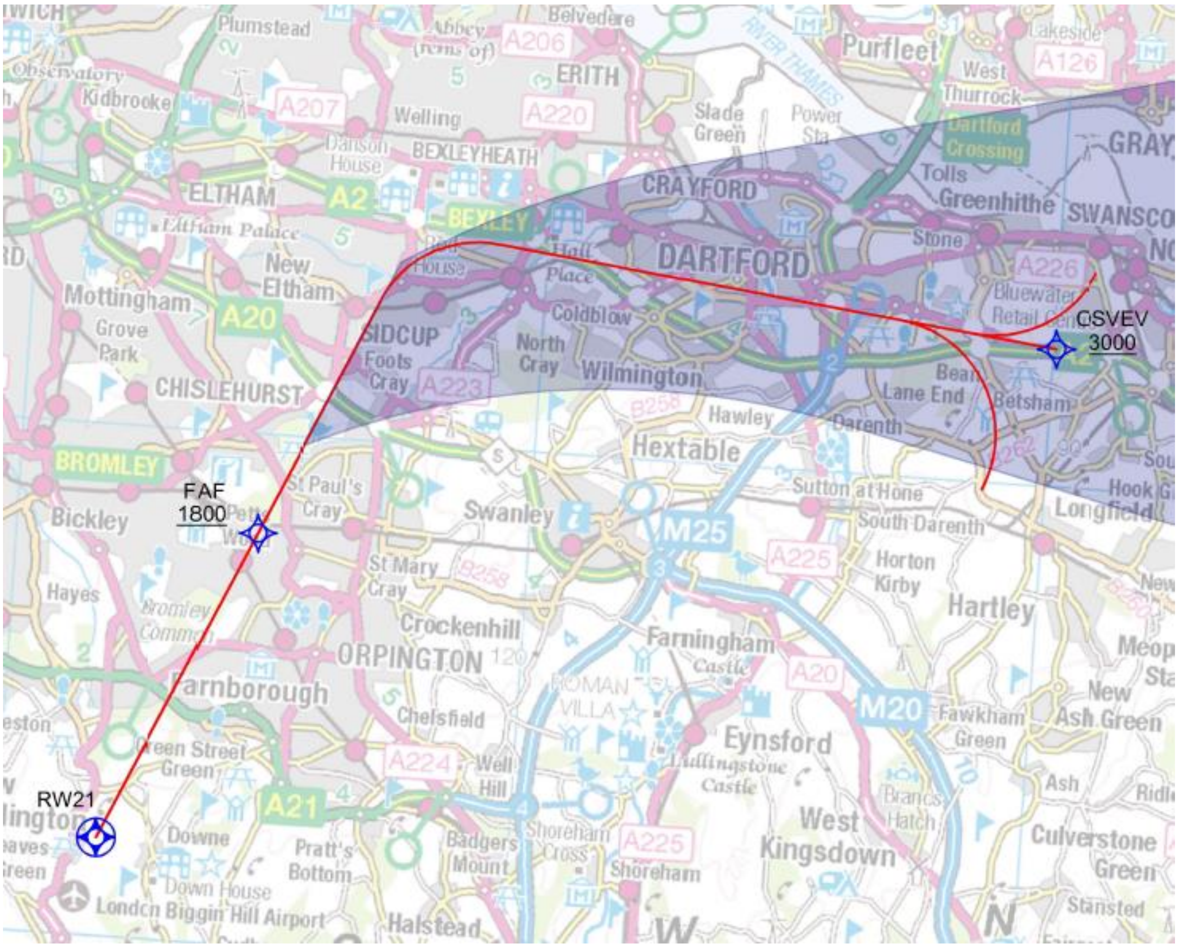

Figure 17 Option 6B

2.19 Option 6BT

From OSVEV and ignoring ALKIN, to enable inbounds to exit the network, routing down the left of the current ILS vectoring swathe, with the addition of a new route positioned from the north/northeast. Final approach at 3.2°.

The shaded area shows the position of the vast majority of the current arrivals of all types receiving radar vectors.

This option will require work to understand the viability of the IAF North.

Unable to route further left (which means this is the furthest south possible) due to the design criteria.

This option will require work to assess whether extant or new procedures will be utilised to exit the network at OSVEV.

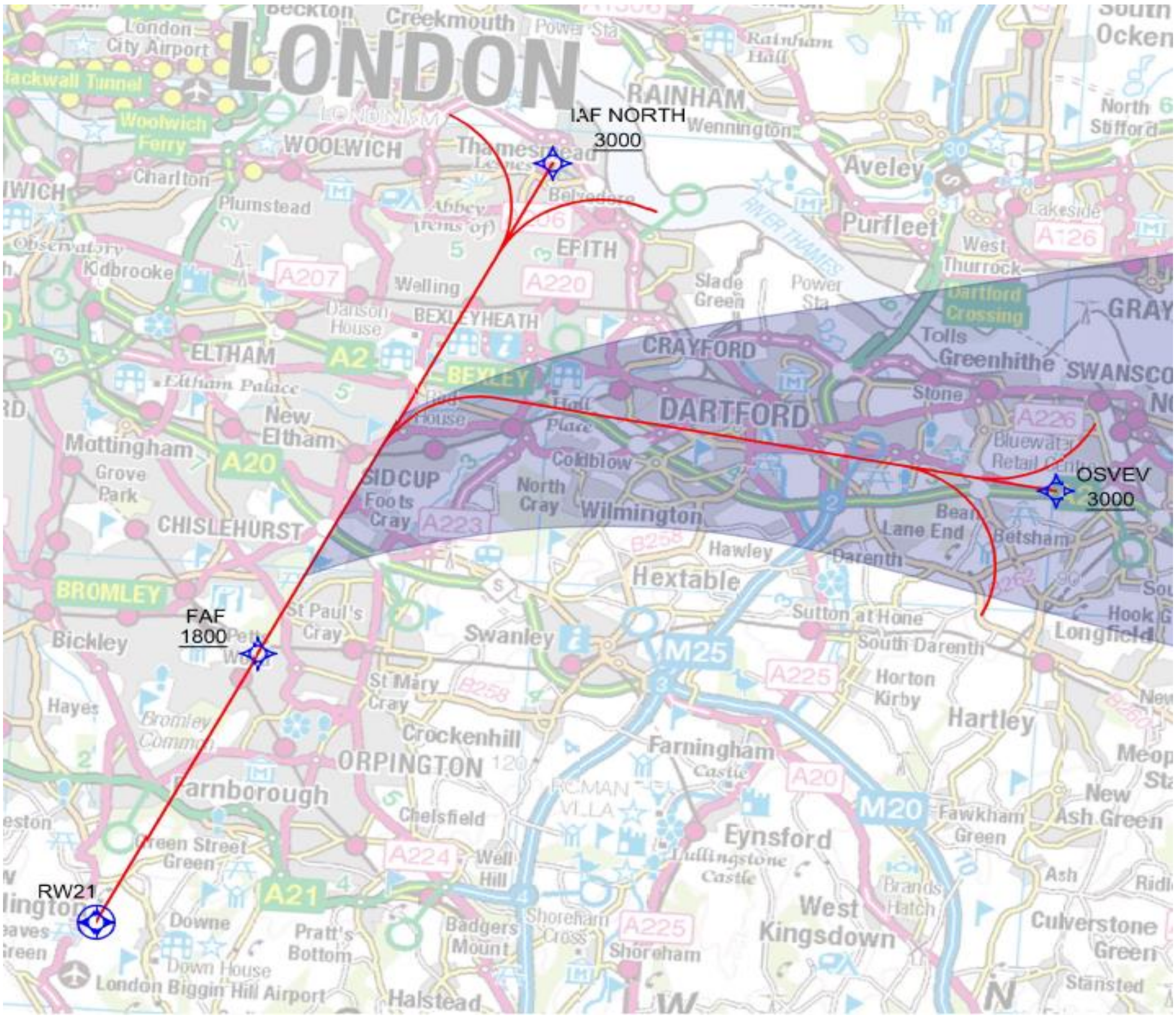

Figure 18 Option 6BT

2.20 Option 6C

From OSVEV and ignoring ALKIN, to enable inbounds to exit the network routing down the left of the current ILS vectoring swathe, final approach at 3.5°.

The shaded area shows the position of the vast majority of the current arrivals of all types receiving radar vectors.

The use of this option would require the ILS glideslope to also be increased, this would not change the lateral positioning.

Unable to route further left (which means this is the furthest south possible) due to the design criteria.

This option will require work to assess whether extant or new procedures will be utilised to exit the network at OSVEV.

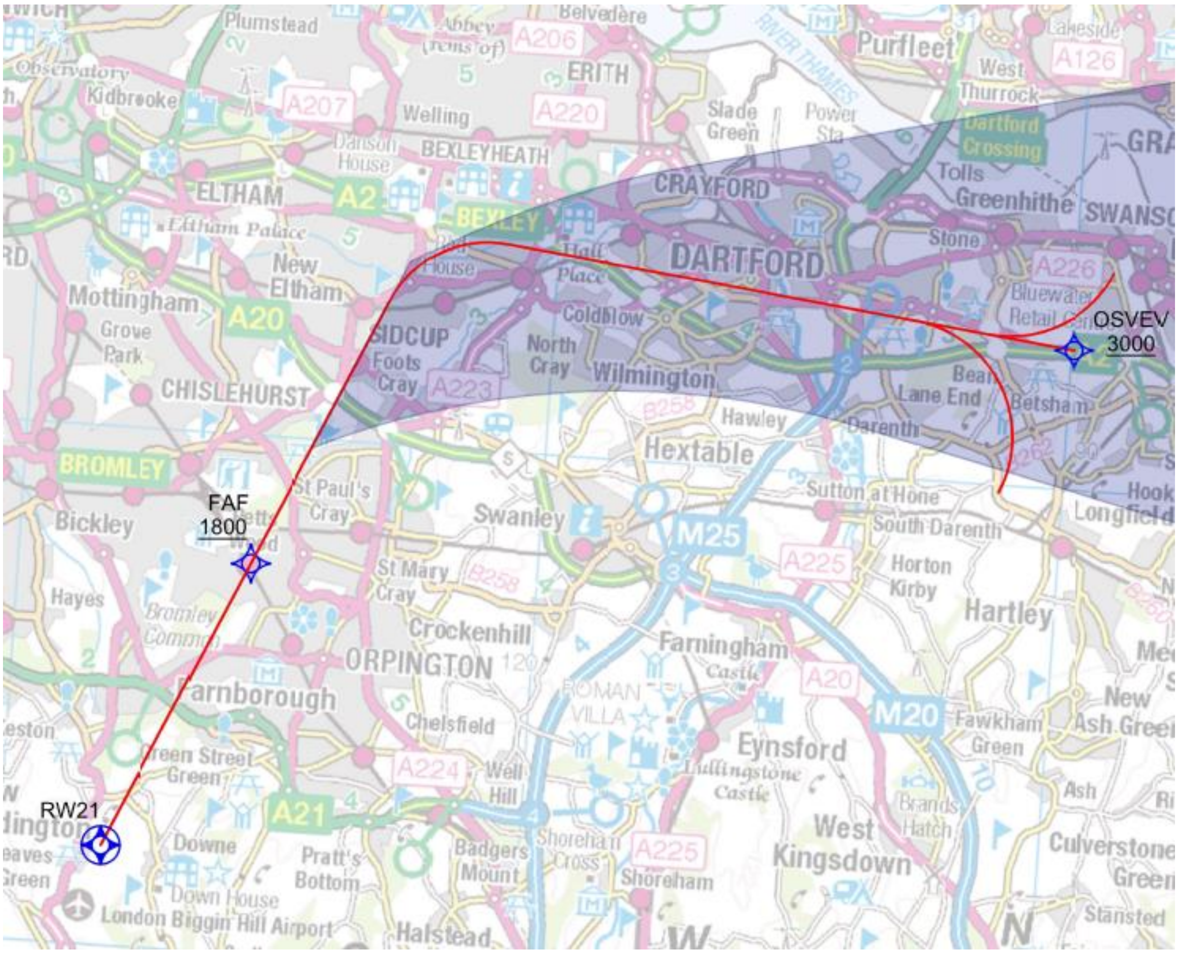

Figure 19 Option 6C

2.21 Option 6CT

From OSVEV and ignoring ALKIN, to enable inbounds to exit the network routing down the left of the current ILS vectoring swathe, with the addition of a new route positioned from the north/northeast. Final approach at 3.5°.

The shaded area shows the position of the vast majority of the current arrivals of all types receiving radar vectors.

The use of this option would require the ILS glideslope to also be increased, this would not change the lateral positioning. This option will require work to understand the viability of the IAF North. Unable to route further left (which means this is the furthest south possible) due to the design criteria. This option will require work to assess whether extant or new procedures will be utilised to exit the network at OSVEV.

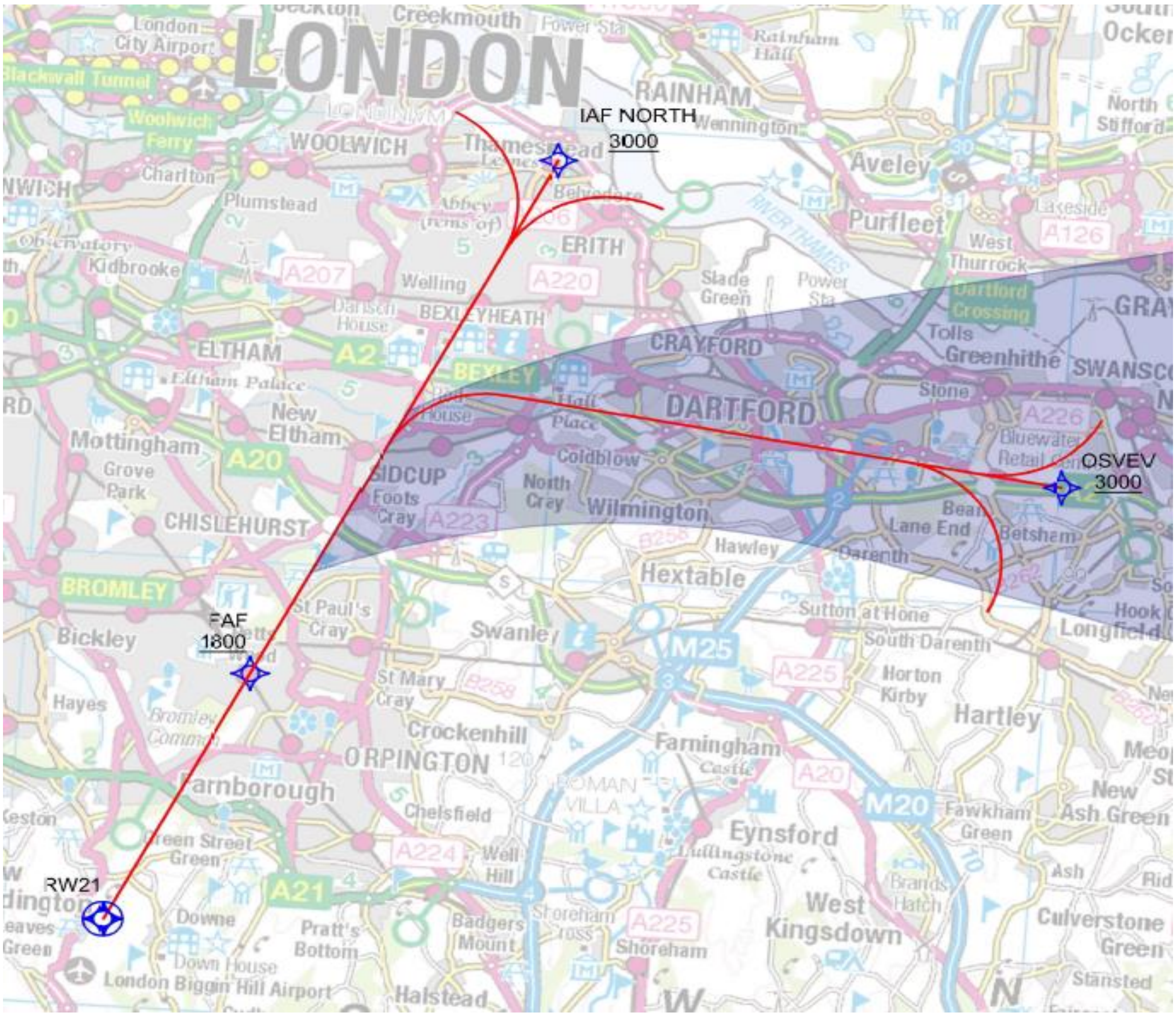

Figure 20 Option 6CT

2.22 Option 7A

From OSVEV and ignoring ALKIN, to enable inbounds to exit the network, routing down the right of the current ILS vectoring swathe, final approach at 3°.

The shaded area shows the position of the vast majority of the current arrivals of all types receiving radar vectors.

Unable to route further right (which means this is the furthest north possible) due to the design criteria.

This option will require work to assess whether extant or new procedures will be utilised to exit the network at OSVEV.

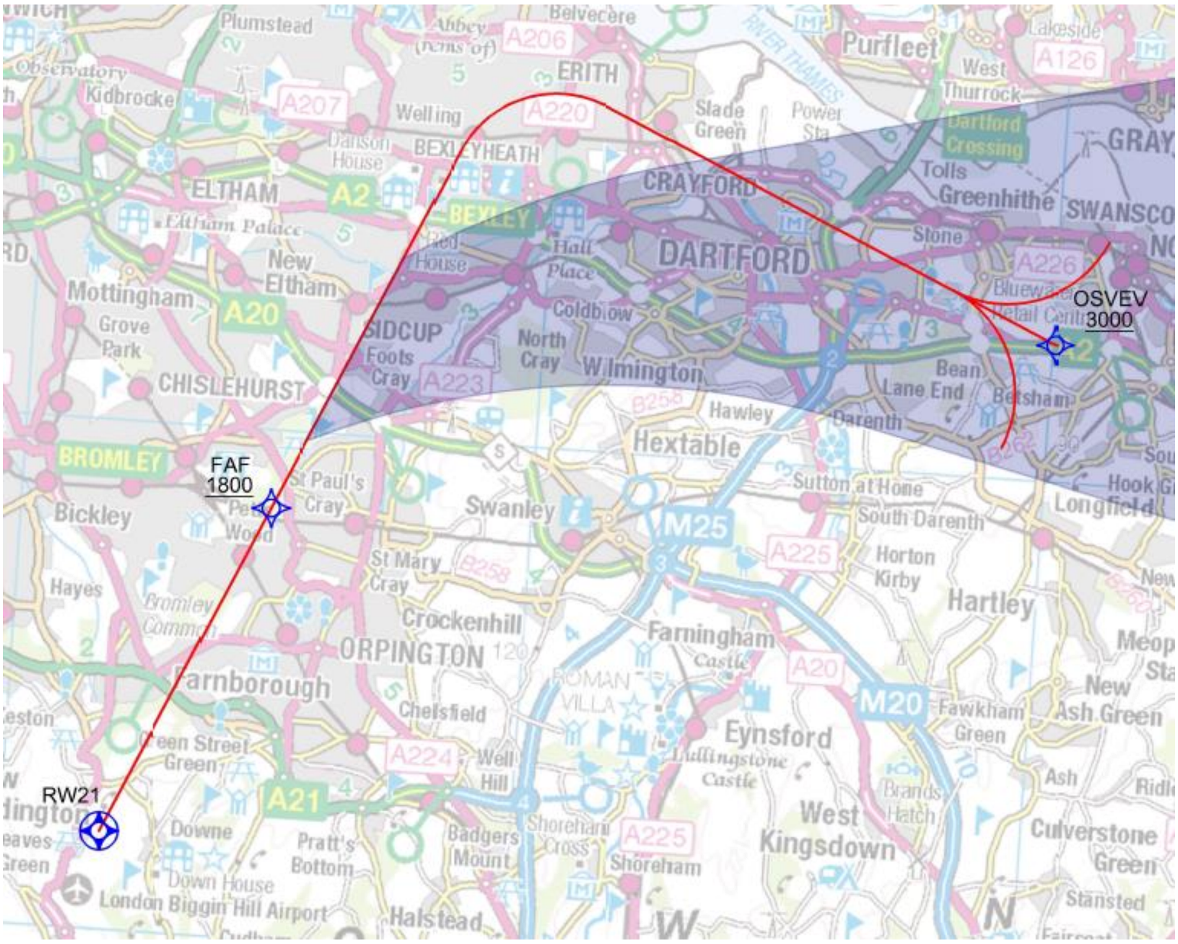

Figure 21 Option 7A

2.23 Option 7AT

From OSVEV and ignoring ALKIN, to enable inbounds to exit the network routing down the right of the current ILS vectoring swathe, with the addition of a new route positioned from the north/northeast. Final approach at 3°. The shaded area shows the position of the vast majority of the current arrivals of all types receiving radar vectors. The use of this option would require the ILS glideslope to also be increased, this would not change the lateral positioning. This option will require work to understand the viability of the IAF North. Unable to route further right (which means this is the furthest north possible) due to the design criteria. This option will require work to assess whether extant or new procedures will be utilised to exit the network at OSVEV.

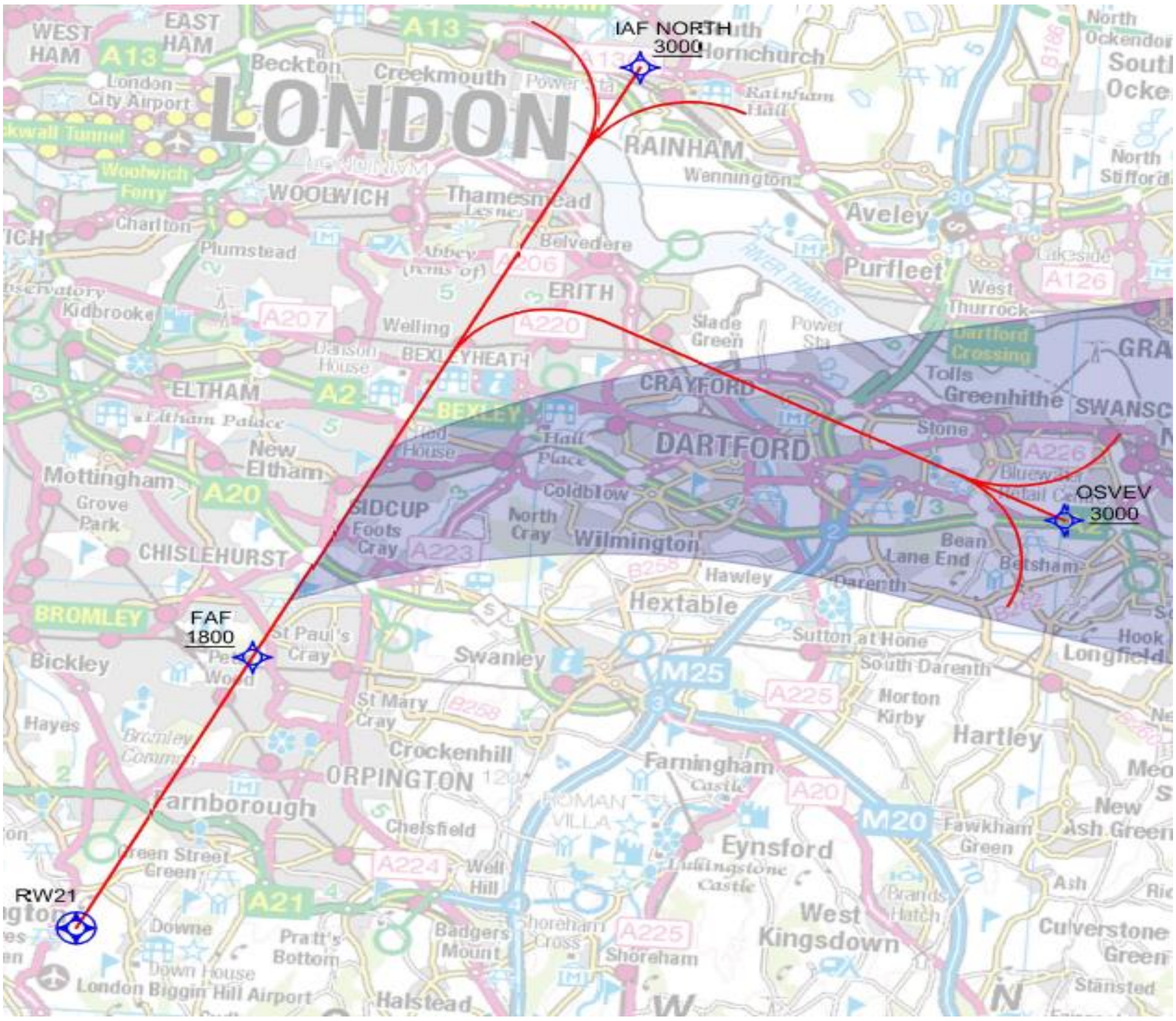

Figure 22 Option 7AT

2.24 Option 7B

From OSVEV and ignoring ALKIN, to enable inbounds to exit the network routing down the right of the current ILS vectoring swathe, final approach at 3.2°.

The shaded area shows the position of the vast majority of the current arrivals of all types receiving radar vectors.

Unable to route further right (which means this is the furthest north possible) due to the design criteria.

This option will require work to assess whether extant or new procedures will be utilised to exit the network at OSVEV.

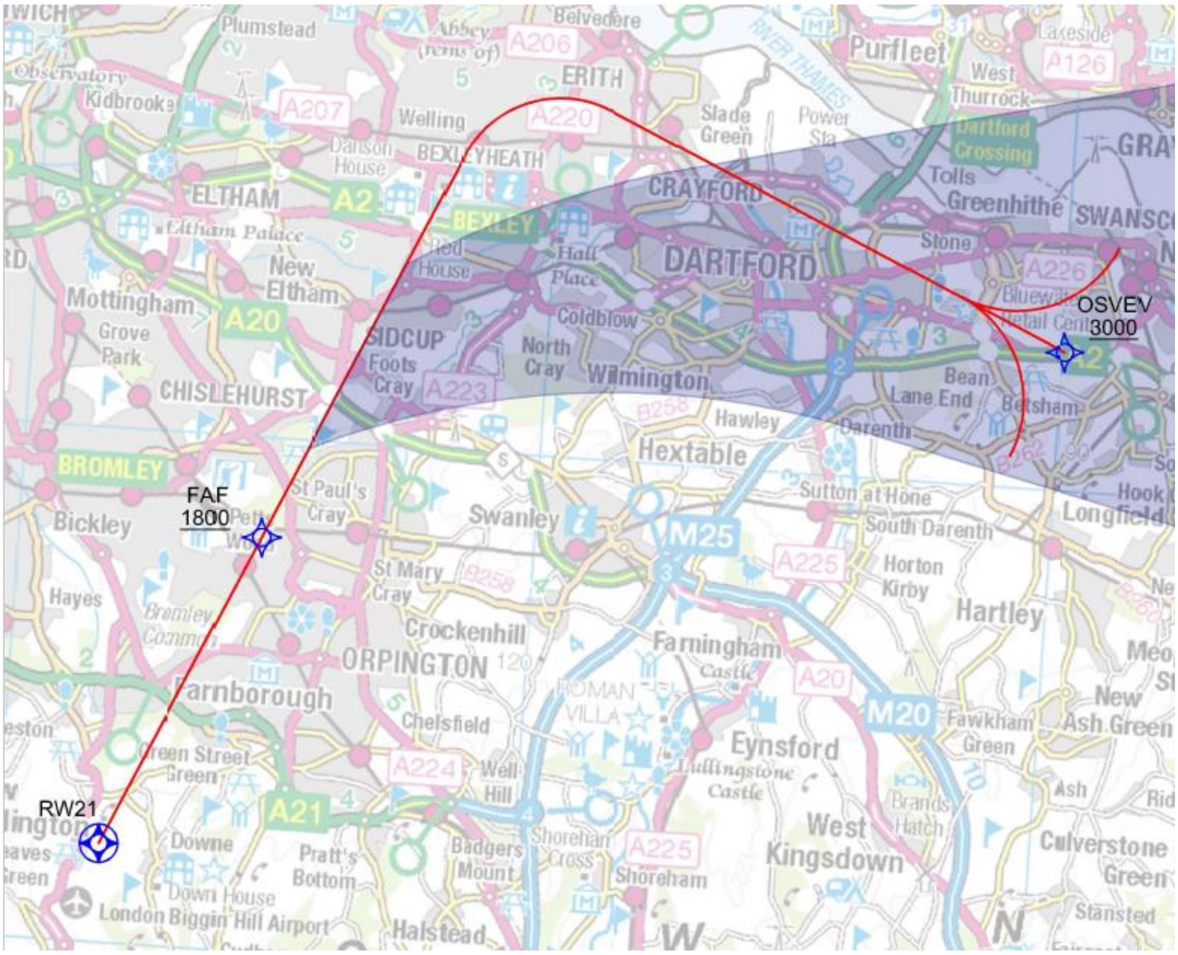

Figure 23 Option 7B

2.25 Option 7BT

From OSVEV and ignoring ALKIN, to enable inbounds to exit the network routing down the right of the current ILS vectoring swathe, with the addition of a new route positioned from the north/northeast. Final approach at 3.2°. The shaded area shows the position of the vast majority of the current arrivals of all types receiving radar vectors.

This option will require work to understand the viability of the IAF North. Unable to route further right (which means this is the furthest north possible) due to the design criteria. This option will require work to assess whether extant or new procedures will be utilised to exit the network at OSVEV.

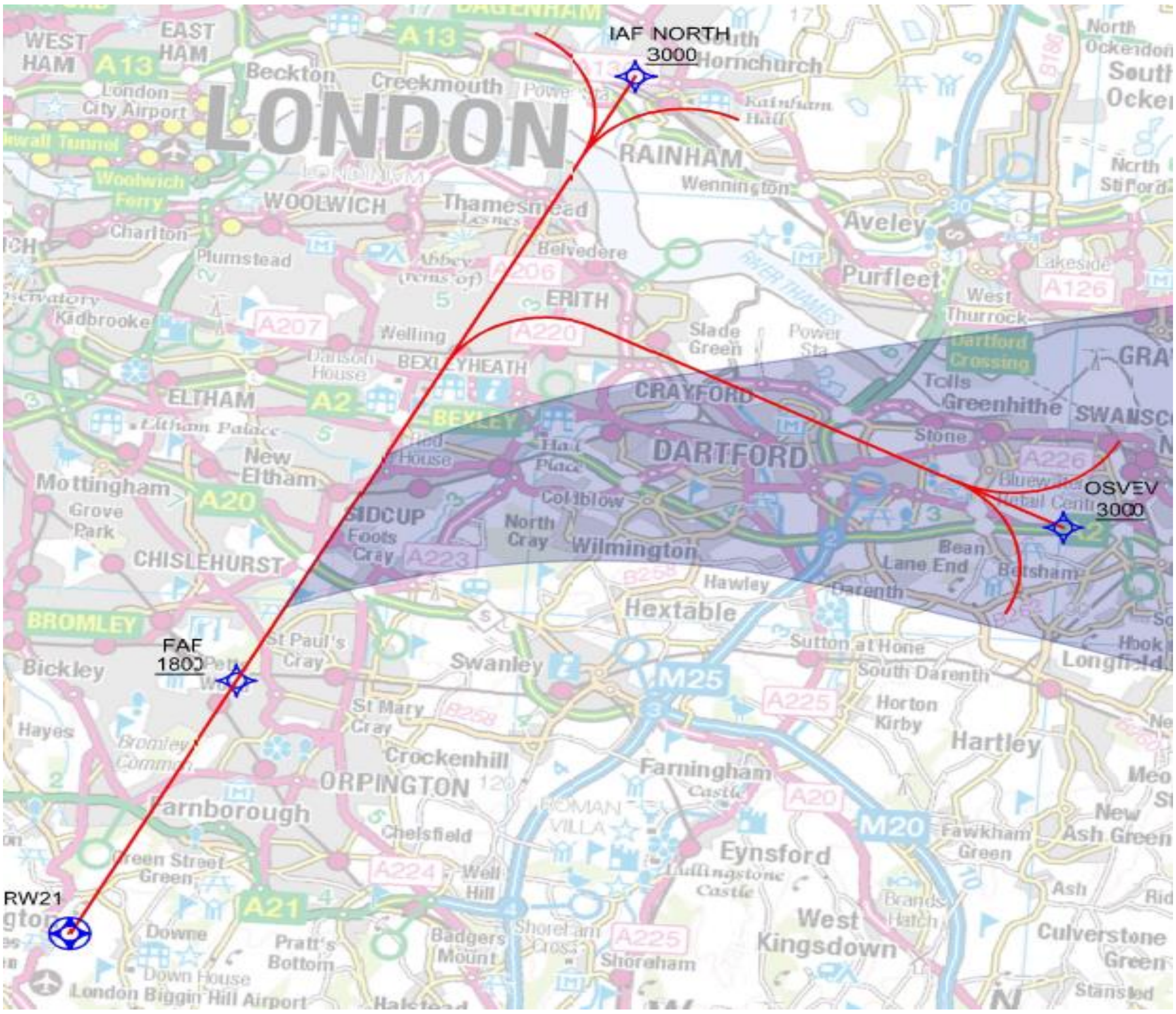

Figure 24 Option 7BT

2.26 Option 7C

From OSVEV and ignoring ALKIN, to enable inbounds to exit the network routing down the right of the current ILS vectoring swathe, final approach at 3.5°.

The shaded area shows the position of the vast majority of the current arrivals of all types receiving radar vectors.

The use of this option would require the ILS glideslope to also be increased, this would not change the lateral positioning.

Unable to route further right (which means this is the furthest north possible) due to the design criteria.

This option will require work to assess whether extant or new procedures will be utilised to exit the network at OSVEV.

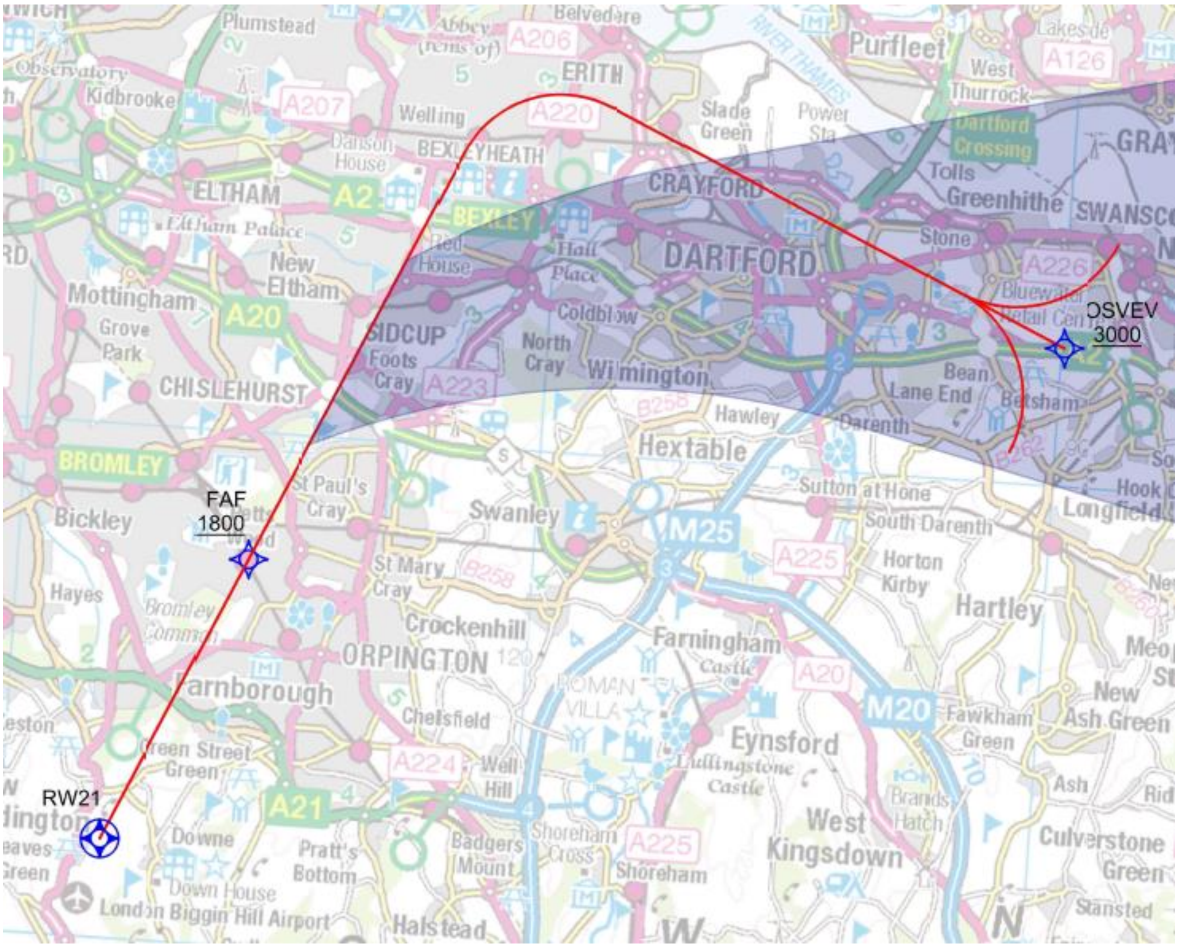

Figure 25 Option 7C

2.27 Option 7CT

From OSVEV and ignoring ALKIN, to enable inbounds to exit the network routing down the right of the current ILS vectoring swathe, with the addition of a new route positioned from the north/northeast. Final approach at 3.5°. The shaded area shows the position of the vast majority of the current arrivals of all types receiving radar vectors. The use of this option would require the ILS glideslope to also be increased, this would not change the lateral positioning.

This option will require work to understand the viability of the IAF North. Unable to route further right (which means this is the furthest north possible) due to the design criteria. This option will require work to assess whether extant or new procedures will be utilised to exit the network at OSVEV.

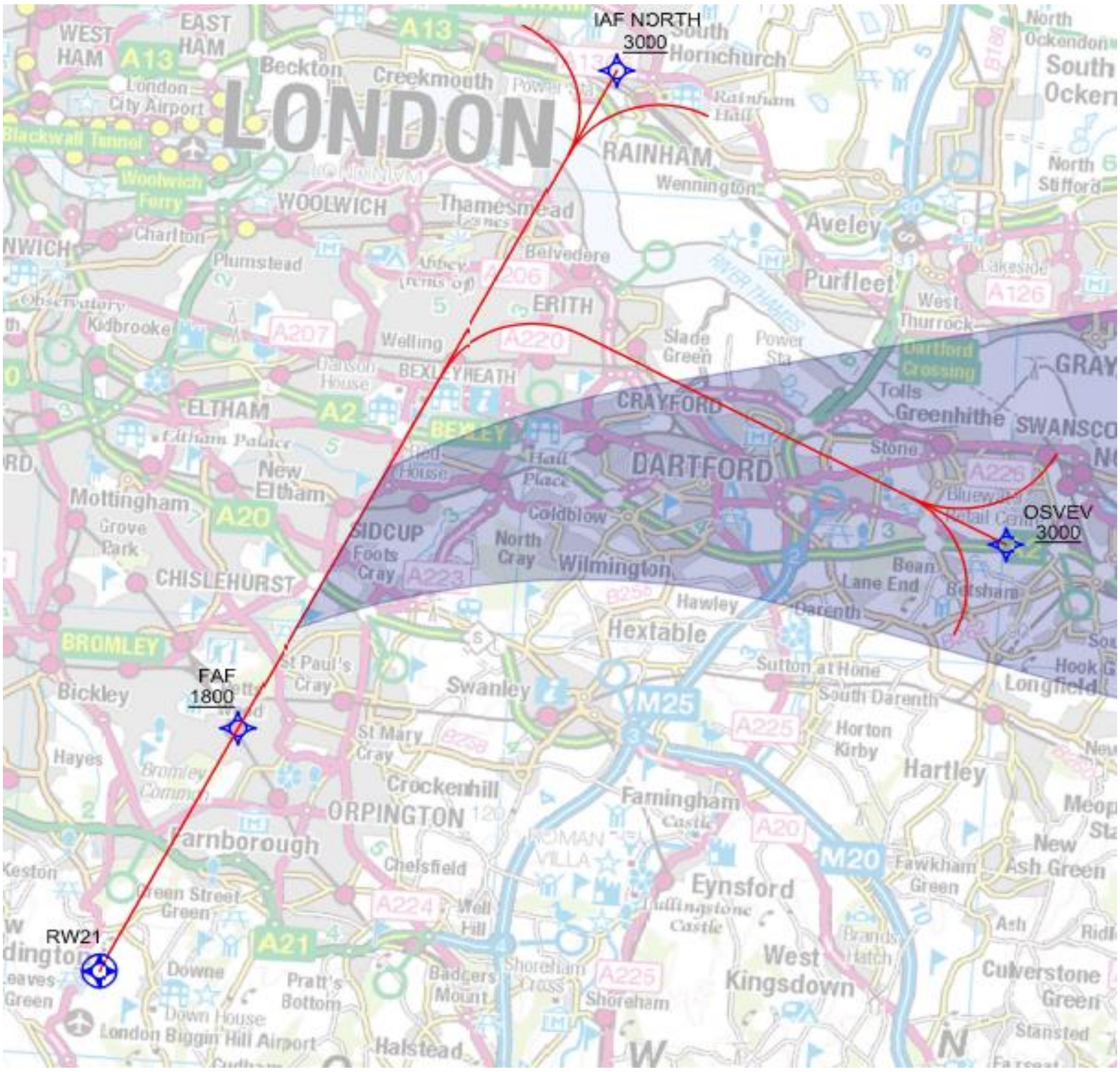

Figure 26 Option 7CT

3 The Missed Approach Options

3.1 Option 8 MAP Do Nothing

This is only possible with Option 1. Any change from the VOR/DME procedure will necessitate a different MAP.

3.2 Option 9 MAP Do Minimum

Mimic the current right turn MAP to ALKIN and then radar vectors from NATS. This will, however, result in different protection areas due to the design regulations, additionally the ALKIN hold will be laterally different from the conventional one, radar vectors from NATS after ALKIN will be required as is the case with the VOR/DME procedure.

This MAP would also become the ILS MAP.

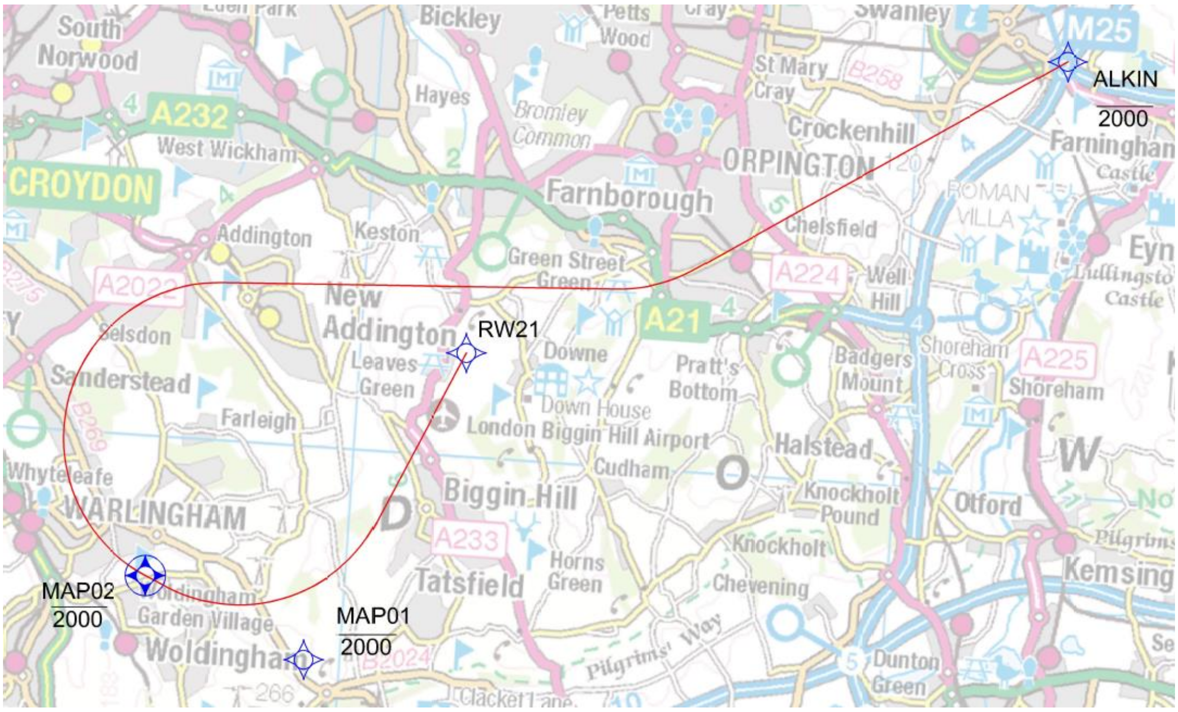

Figure 27 Option 9

3.3 Option 10

Most efficient left turn out back to ALKIN. This option will require work to assess interaction with the Gatwick zone.

This MAP would also become the ILS MAP.

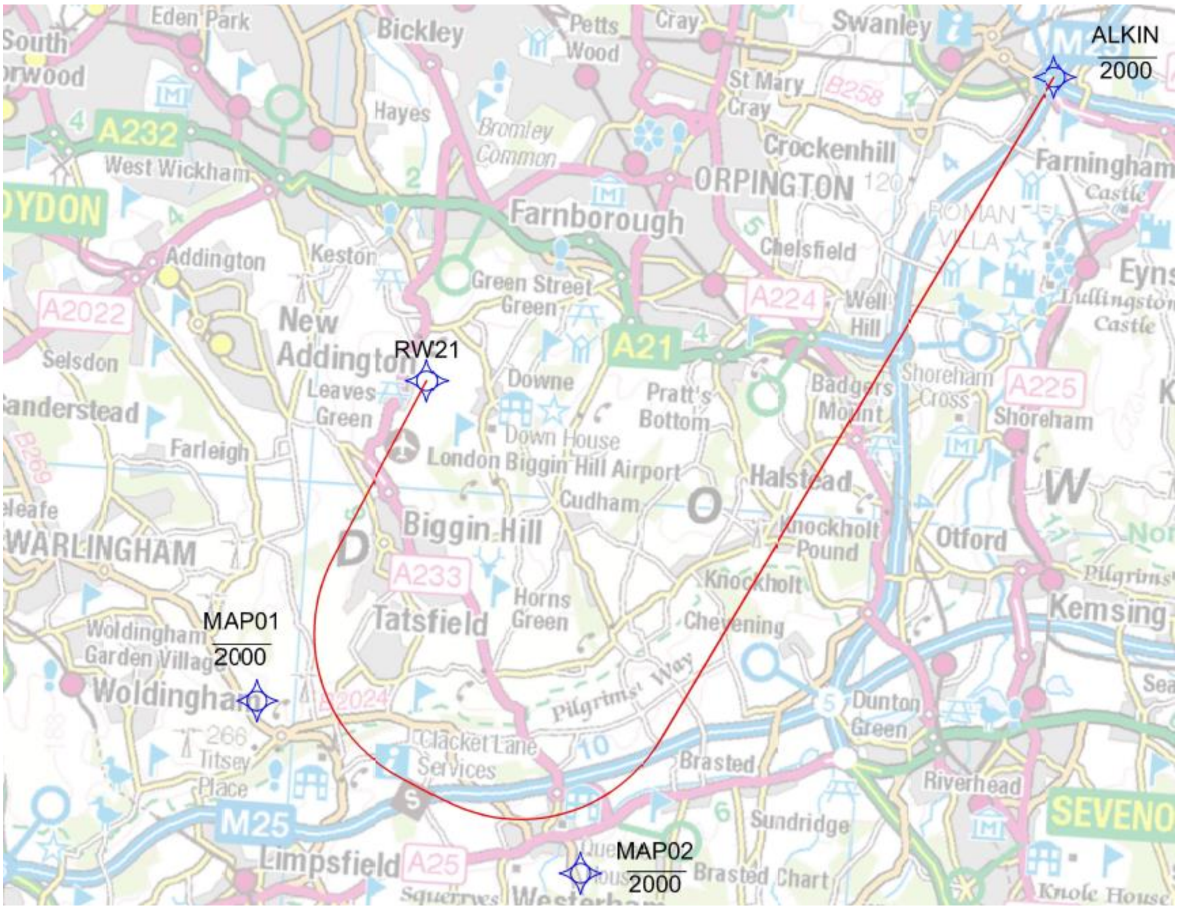

Figure 28 Option 10

3.4 Option 11

Most efficient right turn out back to ALKIN.

This option will require work to assess the first turns interaction with the Gatwick zone, and for the remainder of the right turn, the interaction with RAF Kenley.

This MAP would also become the ILS MAP.

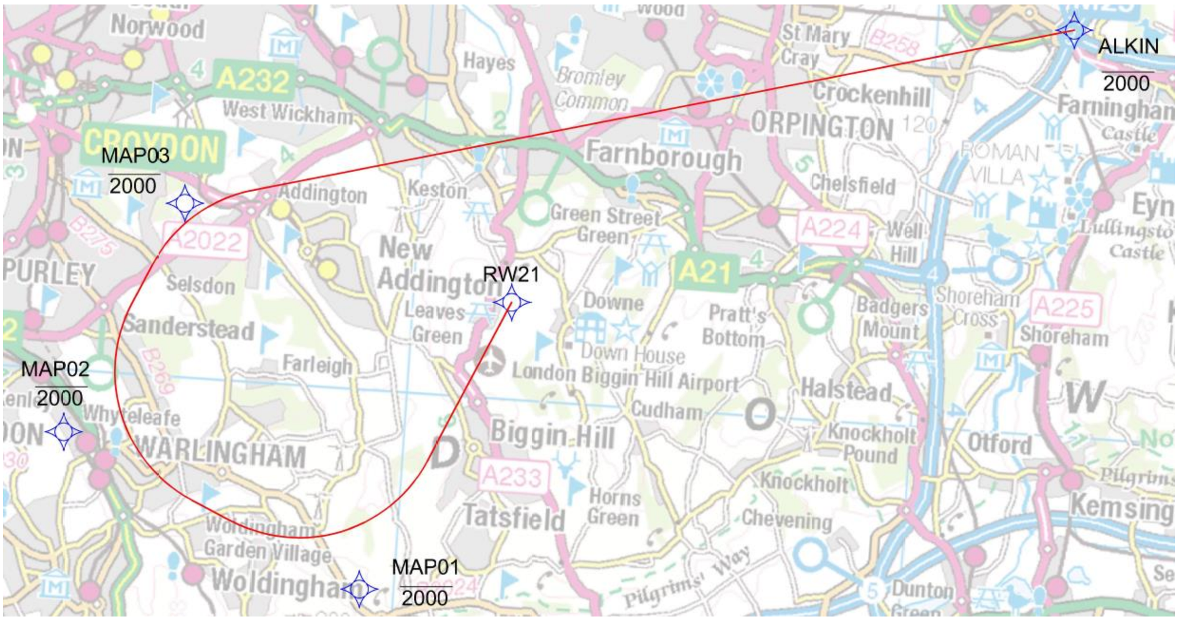

Figure 29 Option 11