Leeds Bradford Airport (LBA) Future Airspace

Step 2a – Design Option Update Brief – Nov 23

Part 2: Arrivals

IMPORTANT: This presentation is part of the LBA ACP Stage 2 Stakeholder Engagement on Design Options and Design Principle Evaluation, further information, background and context can be found in a document titled ‘CPJ-5692-DOC-034-LBA FASI(N) ACP Stakeholder Engagement Overview’ which has been sent out with this presentation (and another focused on ‘Departures’) and all of these will ultimately be available on the ACP portal.

Agreed Design Principles (DPs)

DP #	Design Principle
1	**Importance of Safety** – The airspace design and its operation must maintain or where possible, enhance current levels of safety.
2	**Noise** - The design should limit, and where practicable reduce, the number of people overflown, the impact of noise to stakeholders on the ground and where possible periods of built-in respite should be considered.
3	**Tranquillity** - Where practical, route designs should limit effects upon noise sensitive areas. These may include cultural or historic assets, tranquil or rural areas, sites of care or education and AONBs.
4	**Emissions and Air Quality** – The proposed design should minimise CO2 emissions per flight.
5	**Airspace Dimensions** – The volume and classification of controlled airspace required for LBA should be the minimum necessary to deliver an efficient airspace design, considering the needs of all airspace users.
6	**Airspace Complexity** – The airspace design should seek to reduce complexity and bottlenecks in controlled and uncontrolled airspace and contribute to a reduction in airspace infringements.
7	**Technical Requirements** – The design shall be fully compliant with PANS-OPS and UK CAA criteria to meet the technical capability requirements of aircraft using the airport.
8	**Systemisation** – The new procedures will integrate with the en-route network, as per the FASI(N) programme. If required, the arrival transitions shall integrate with the Instrument Approach Procedures (IAPs), deconflict with the departure procedures, reducing the requirement for tactical coordination.
9	**Operational Cost** – Provided it does not have an adverse impact of community disturbance, procedures should be designed to optimise fuel efficiency.
10	**AMS Realisation** – This ACP must serve to further, and not conflict with, the realisation of the AMS.
11	**PBN** – The new procedures should capitalise on as many of the potential benefits of PBN implementation as are practicable.

Design Principles Evaluation (DPE) Criteria

DP #	Design Principle		
DP1	**Importance of Safety** – The airspace design and its operation must maintain or where possible, enhance current levels of safety.		
Criteria	**Meets:** No safety issues identified that could not be overcome with similar levels of safety assurance to today's operation.	**Partially Meets:** Issues identified that would require a significantly more robust safety argument than today's operation to overcome.	**Does Not Meet:** Issues identified that could not be overcome without prohibitively restrictive safety mitigation.
DP2	**Noise** - The design should limit, and where practicable reduce, the number of people overflown, the impact of noise to stakeholders on the ground and where possible periods of built-in respite should be considered.		
Criteria	**Meets:** Limits or has the potential to reduce overall impacts of aircraft noise.	**Partially Meets:** Impacts of aircraft noise likely to be broadly similar in terms of the number of people affected. Some communities (possibly previously unaffected ones) may be affected more than others.	**Does Not Meet:** Has the potential to increase the overall impacts of aircraft noise on local communities.
DP3	**Tranquillity** - Where practical, route designs should limit effects upon noise sensitive areas. These may include cultural or historic assets, tranquil or rural areas, sites of care or education and AONBs.		
Criteria	**Meets:** Limits effects on Noise Sensitive Areas and does not result in any overflight of an AONB or a NP below 7000ft.	**Partially Meets:** Does not result in overflight of a significant portion of an AONB or a NP but may result in overflight of other sensitive areas.	**Does Not Meet:** Results in direct and significant overflight of AONBs, NPs and/or various tranquil areas important to local communities.
4	**Emissions and Air Quality** – The proposed design should minimise CO_2 emissions per flight.		
Criteria	**Meets:** Has potential to burn less fuel and emit less CO_2 than other DOs.	**Partially Meets:** Is not the most fuel-efficient DO but is not significantly worse than other DOs.	**Does Not Meet:** Clearly an inefficient DO resulting in unnecessary and excessive fuel burn and therefore CO_2 emissions.

Design Principles Evaluation (DPE) Criteria

DP #	Design Principle		
5	**Airspace Dimensions** – The volume and classification of controlled airspace required for LBA should be the minimum necessary to deliver an efficient airspace design, considering the needs of all airspace users.		
Criteria	**Meets:** Allows for either a reduction in the volume of CAS required or does not require any additional CAS.	**Partially Meets:** May result in a need for small amounts of additional CAS but there may be potential to revert some CAS to Class G.	**Does Not Meet:** Large additional volumes of CAS are required to contain the proposed DO without the potential to revert some to Class G.
6	**Airspace Complexity** – The airspace design should seek to reduce complexity and bottlenecks in controlled and uncontrolled airspace and contribute to a reduction in airspace infringements.		
Criteria	**Meets:** Does not result in a complex CTA/CTR configuration.	**Partially Meets:** Results in changes to the CAS configuration that may cause other aviators some minor challenges.	**Does Not Meet:** Results in a highly complex CAS configuration.
7	**Technical Requirements** – The design shall be fully compliant with PANS-OPS and UK CAA criteria to meet the technical capability requirements of aircraft using the airport.		
Criteria	**Meets:** Is fully compliant and meets the technical capabilities of almost all airport operators.	**Partially Meets:** Is largely compliant but with reasonable justification for any non-compliance and meets the technical capabilities of most airport operators.	**Does Not Meet:** Has several non-compliances without reasonable justification and does not meet the technical capabilities of several airport operators.
8	**Systemisation** – The new procedures will integrate with the en-route network, as per the FASI(N) programme. If required, the arrival transitions shall integrate with the Instrument Approach Procedures (IAPs), deconflict with the departure procedures, reducing the requirement for tactical coordination.		

Design Principles Evaluation (DPE) Criteria

DP #	Design Principle		
Criteria	**Meets:** Integrates seamlessly with the en-route network and is likely to reduce the need for tactical coordination and vectoring within the CTA/CTR.	**Partially Meets:** Integrates seamlessly with the en-route network but may not reduce the need for tactical coordination and vectoring within the CTA/CTR.	**Does Not Meet:** Does not integrate seamlessly with the en-route network and will increase the need for tactical coordination and vectoring within the CTA/CTR.
9	**Operational Cost** – Provided it does not have an adverse impact of community disturbance, procedures should be designed to optimise fuel efficiency.		
Criteria	**Meets:** Fuel efficiency is optimal without an adverse impact on local communities.	**Partially Meets:** Fuel efficiency is marginally sub-optimal due to consideration to the impact on local communities.	**Does Not Meet:** Fuel efficiency is clearly not optimised, or it has been optimised at the expense of local communities.
10	**AMS Realisation** – This ACP must serve to further, and not conflict with, the realisation of the AMS.		
Criteria	**Meets:** Generally aligned with the AMS.	**Partially Meets:** Partially aligned with the AMS.	**Does Not Meet:** Not aligned with the AMS.
11	**PBN** – The new procedures should capitalise on as many of the potential benefits of PBN implementation as are practicable.		
Criteria	**Meets:** Designed to the latest navigation standards that do not require aircraft fleet upgrades.	**Partially Meets:** Designed to the latest navigation standards that may require aircraft fleet upgrades.	**Does Not Meet:** Fails to utilise the latest navigation standards.

What's New?

Why? As with the departures, the DPE needed to be revised following CAA review and following bilateral meetings between NATS En-Route Ltd (NERL) and LBA, an additional arrival option was deemed necessary.

What has changed? The Arrival DOs that utilised a hold location to the NW of the Airport (named NELSA) may ultimately prove to be not viable. Discussion with NERL has resulted in a conclusion that Arrival DOs 2- 3- 4 and 5 are not viable. Accordingly, an arrival system has been conceived that utilises the LBA (for aircraft from the North, NW and West) and GOLES (for aircraft from the South, SW and East). Additionally, we have developed systems that utilise a hold out to the NW combined with the LBA and GOLES holds.

The DPE for all the Arrival DOs has been revised following CAA review. A revised DPE is presented for comment.

Arrivals

Now ten DOs with pattern shown for each Runway Mode (Runways 32 and 14):

- Option 1 - 1 Hold – LBA
- Option 2 - 2 Holds – NELSA & GOLES
- Option 3 - 2 Holds – ‘AIREY’ & ‘WORTH’
- Option 4 - 3 Holds – LBA, ‘AIREY’ & ‘WORTH’
- Option 5 - 3 Holds – NELSA, GOLES & ’UDDER’
- Option 6 – 2 Holds – LBA & GOLES
- Option 7 – 3 Holds – SETEL, LBA & GOLES
- Option 8 – 3 Holds – NW, LBA & GOLES
- Option 9 – 2 Holds – NW & GOLES
- Option 10 – 1 Arrival Hold (GOLES) & Direct Arrivals

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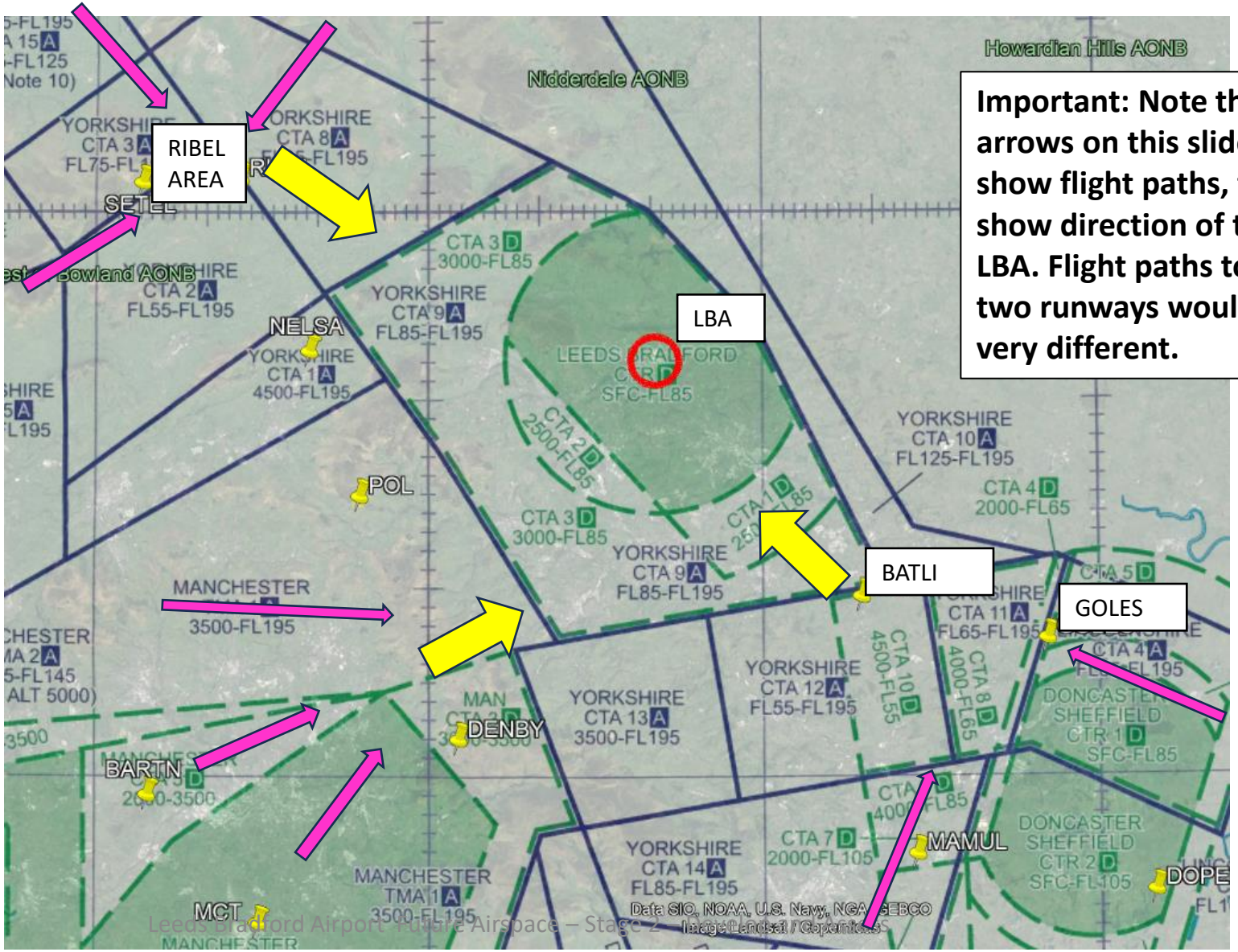
Arrival Directions and the Route Network Flow

NERL have expressed a preference to see Standard Terminal Arrival Routes (STARs) to LBA route via three particular exits from the Route Network:

- Traffic from W, NW and NE via RIBEL area
- Traffic from S and ESE via MAMUL/GOLES
- Traffic from SW and W towards the LBA via existing arrival gates

These points are chosen as they best fit the overall flow of the Manchester Terminal Manoeuvring Area (MTMA) within which aircraft are climbing in and out of various airports.

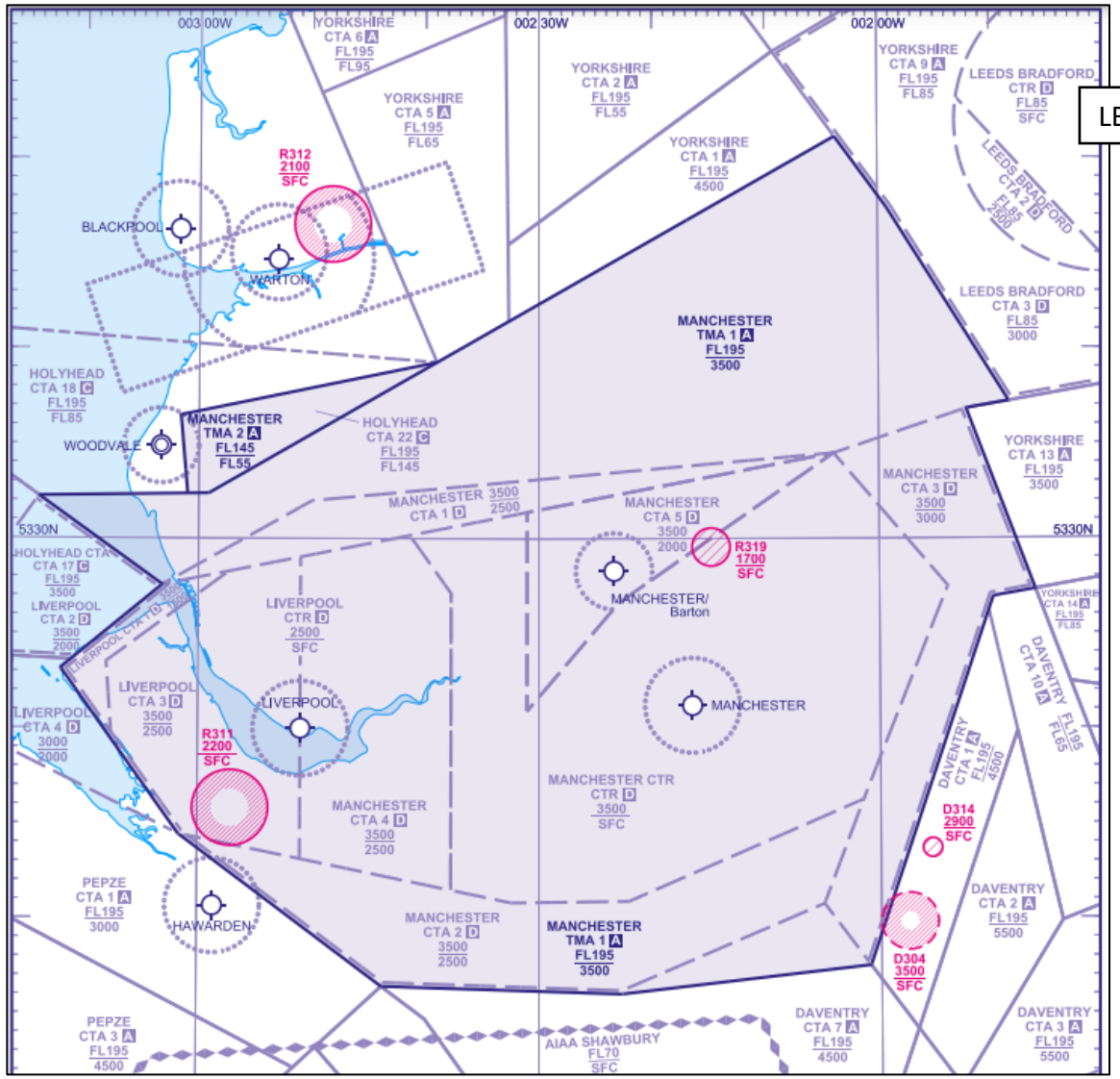


Important: Note that the arrows on this slide do not show flight paths, they show direction of travel to LBA. Flight paths to the two runways would look very different.

MTMA

The points on the previous slides are chosen as they best fit the overall flow of the Manchester Terminal Manoeuvring Area (MTMA) within which aircraft are climbing in and out of various airports, principally:

- Manchester;
- Liverpool;
- East Midlands; and
- Leeds Bradford.



Hold, Missed Approach and Arrival Transition Depictions

Holds

Technically speaking, as the holding patterns form the end of the STARs and are above 7000ft, they are the domain of the en-route Air Traffic Service Provider (ANSP) NATS En-Route Limited (NERL).

The only difference to this is a Hold that is used for the Missed Approach Procedure (MAP). Such a hold may require a lowest holding altitude of 4-5000ft.

The hold depictions are intended to give stakeholders an idea of how the system might work. These are drawn within blue circles/lozenges surrounding them as the final location is not determined.

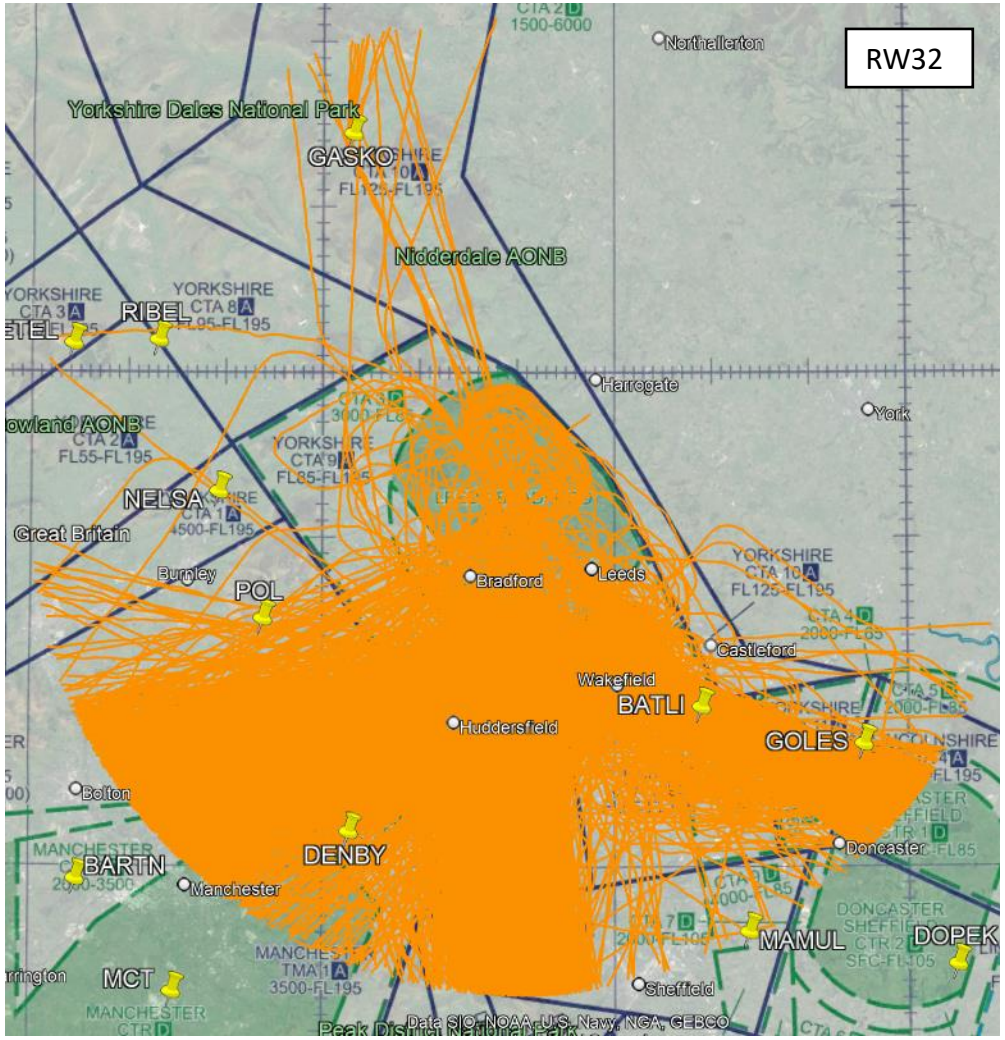
The LBA Hold already exists and this is depicted as it is today.

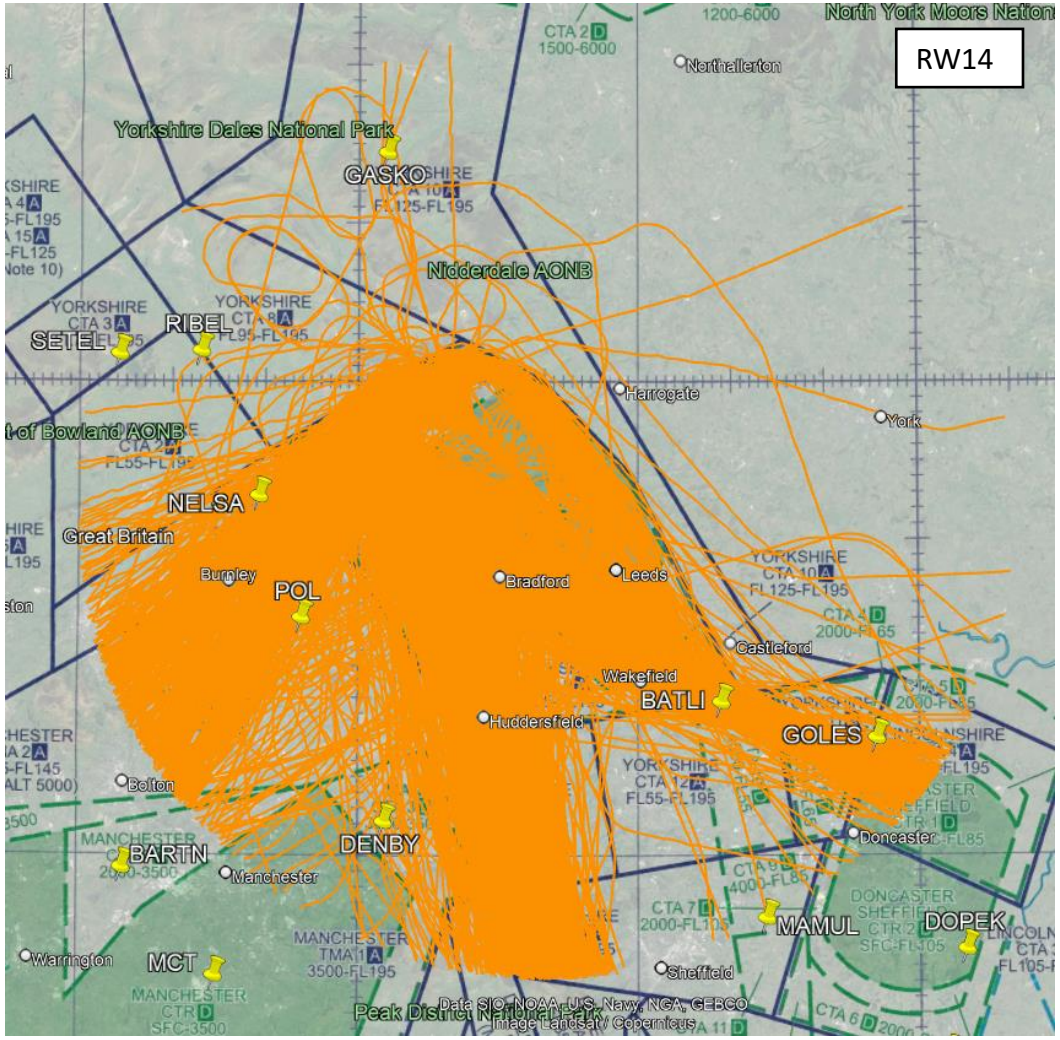
Arrivals Transitions and Missed Approaches

The lines depicting the Arrival Transitions and the Missed Approach Procedures **are not intended to show definitive tracks over the ground**. These are purely intended to provide an indication of how such a system would work. The final procedures would be refined through the consultation process should a given option progress beyond Stage 2 of the process.

Baseline Swathe Development

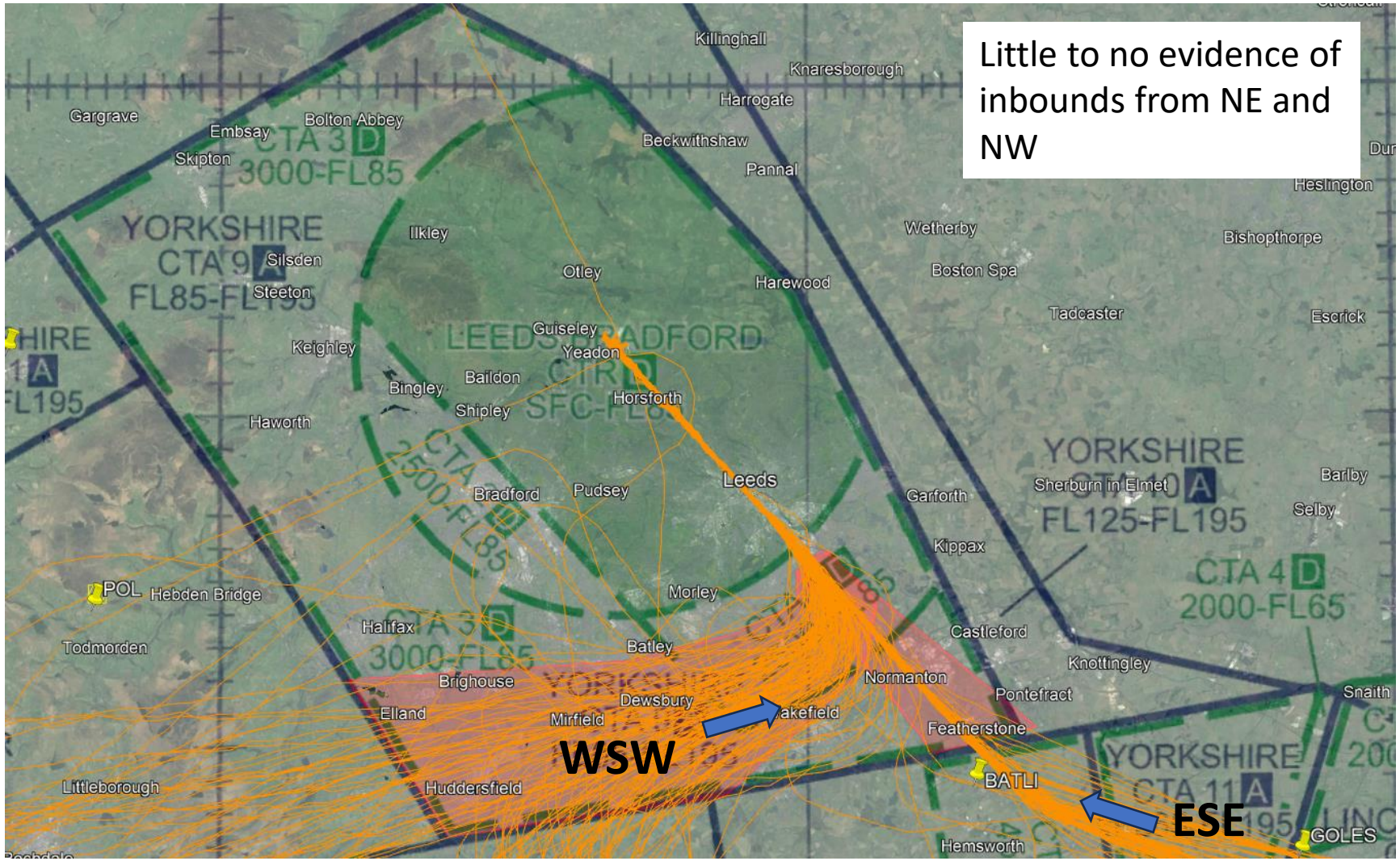
LBA Baseline Arrival Swathe Creation:
Too cluttered to make any sense over 92 days





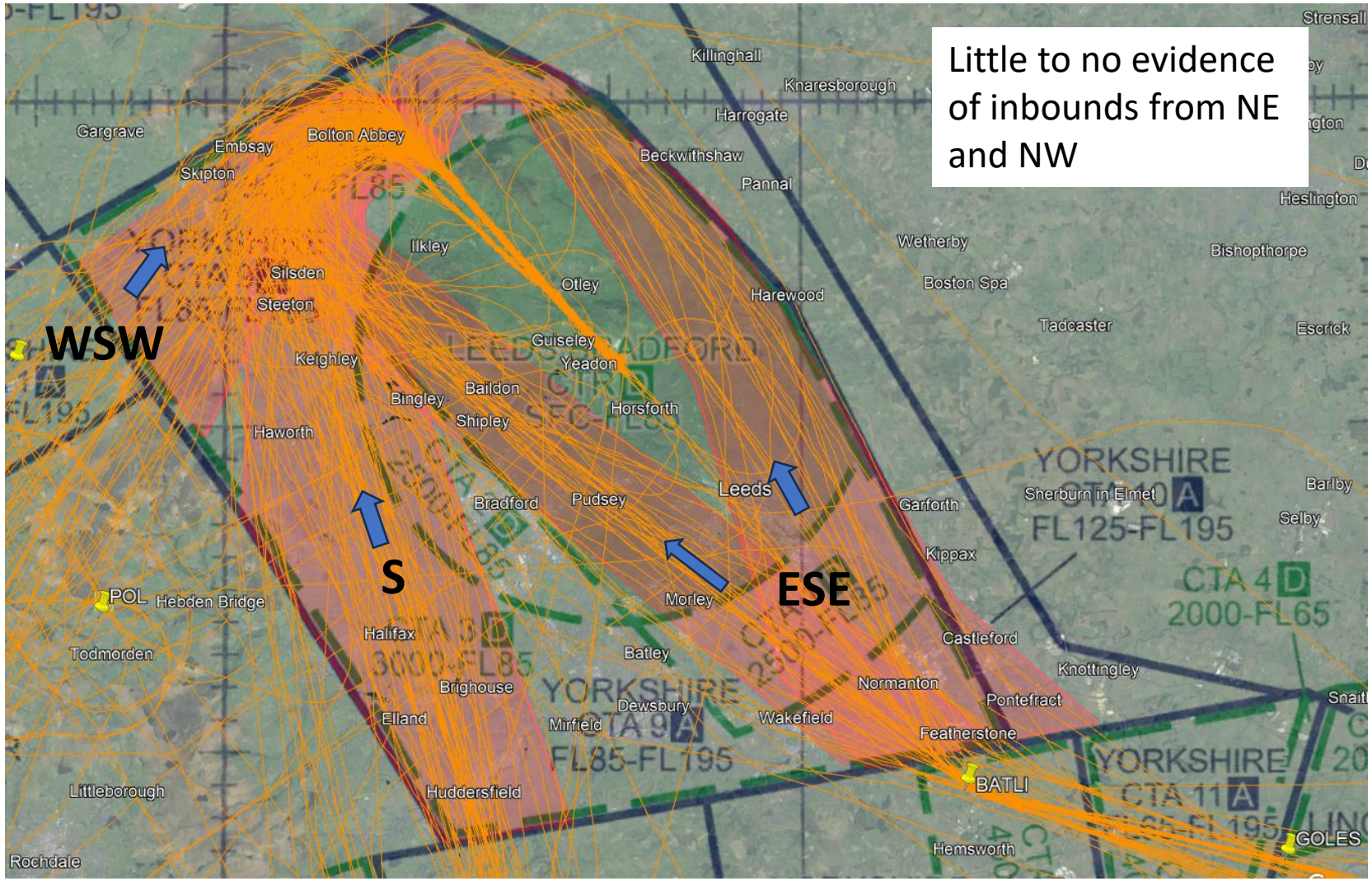
NTMS RW32 & RW14 Arrivals 92-day Summer 2022

LBA RW32 Baseline Arrival Swathe Creation



NTMS RW32 Arrival Data 3rd to 10th July 2022

LBA RW14 Baseline Arrival Swathe Creation



NTMS RW14 Arrival Data 3rd to 10th July 2022

Existing Arrival Options

Arrivals – Option 1 - 1 Hold – LBA – RW32 (Status Quo with PBN)

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LBA hold retained as MAP and weather hold

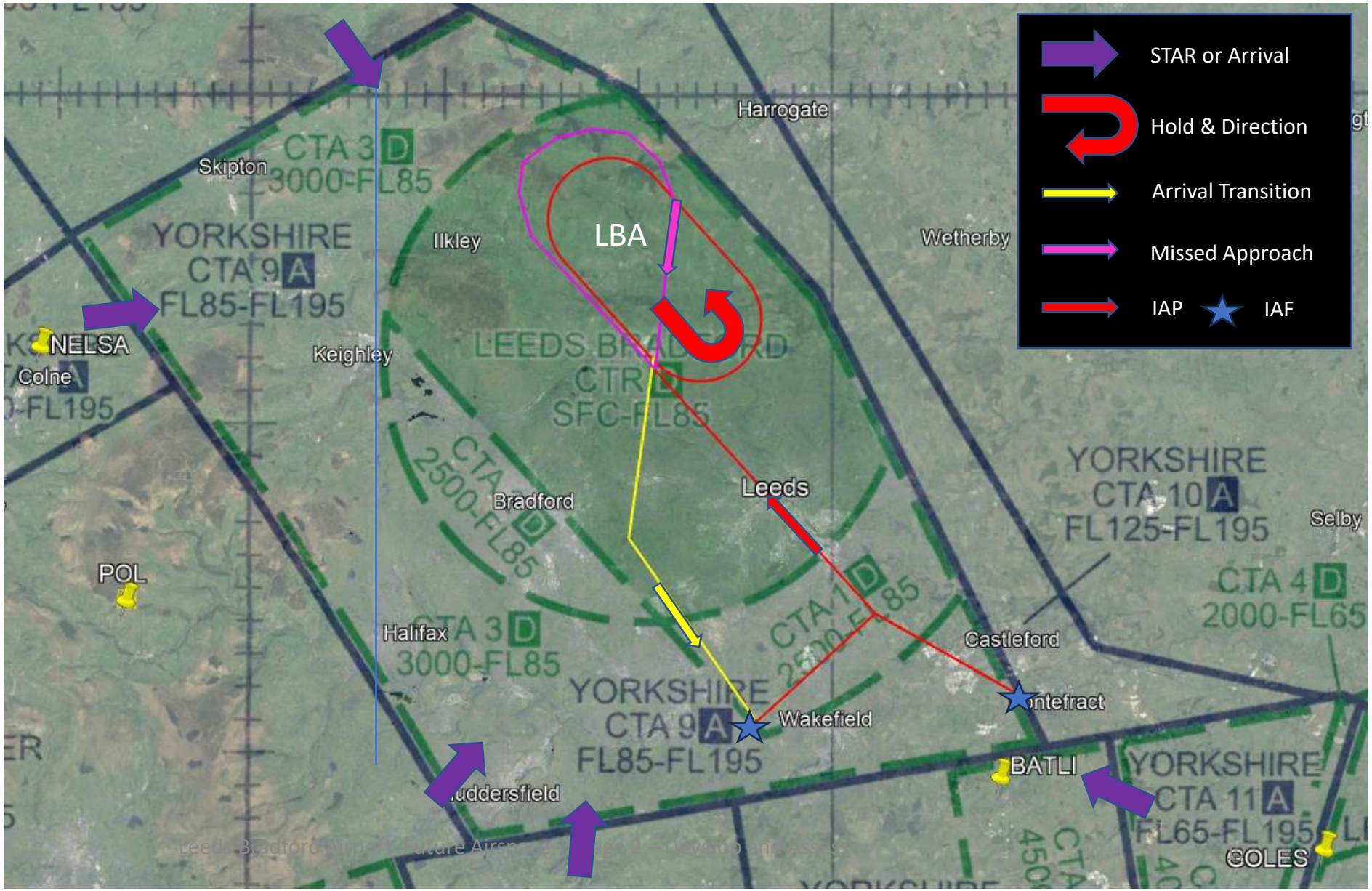
Most traffic would be tactically controlled and would rarely route to the LBA holding fix or follow the arrival transition

One-sided T-Bar or Y-Bar (might be straightened out towards BATLI)

MAP same as existing

Limited flexibility with hold still in overhead

Traffic from the SE likely to be being routed towards MAMUL/GOLES by NERL



Arrivals – Option 1 - 1 Hold – LBA – RW14 (Status Quo with PBN)

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LBA hold retained as MAP and weather hold

Most traffic would be tactically controlled and would rarely route to the LBA holding fix or follow the arrival transitions

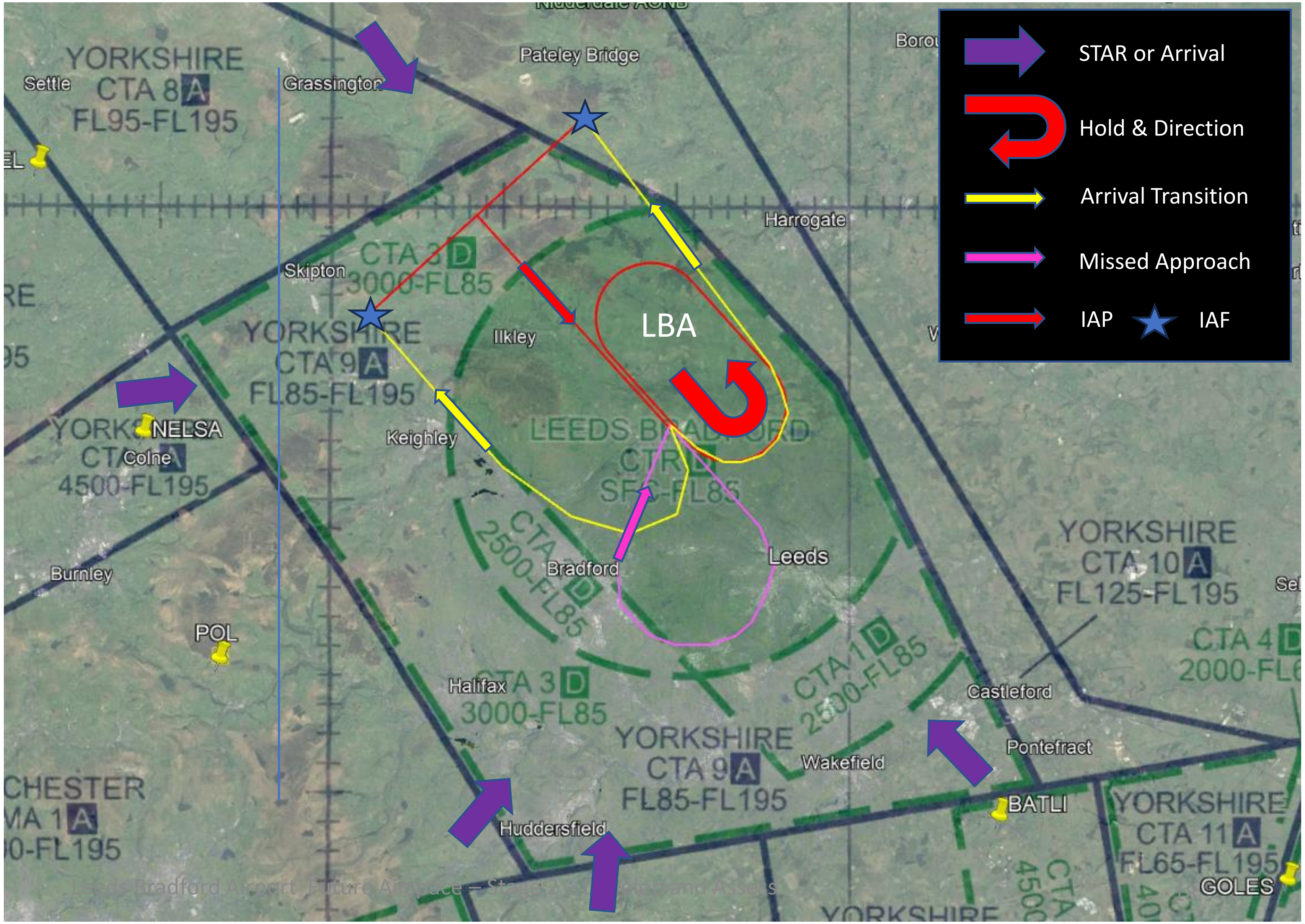
Choice of 2 Arrival Transitions from the LBA (yellow lines)

Eastern 'T' extension & Arrival Transition needs additional CAS

MAP same as existing

Limited flexibility with hold still in overhead

Traffic from the SE likely to be being routed towards MAMUL/GOLES by NERL



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Arrivals – Option 1 - 1 Hold – LBA (Status Quo with PBN)

Option	DP1 Safety	DP2 Noise	DP3 Tranquillity	DP4 Emissions & Air Quality	DP5 Airspace Dimensions	DP6 Airspace Complexity	DP7 Technical	DP8 Systemisation	DP9 Operational Cost	DP10 AMS Realisation	DP11 PBN
Option 1	Despite MAP requiring controller intervention today	Eastern pattern for RW14 potentially affects new people	Eastern T-Bar for RW14 significant overflight of Nidderdale AONB	Potentially less expeditious than other options	Eastern T-Bar RW14 requires more CAS			Hold in the overhead can limit Continuous Climb Operations	Every arrival must file and plan to route via the LBA	Not really a modernisation of the LBA operation	

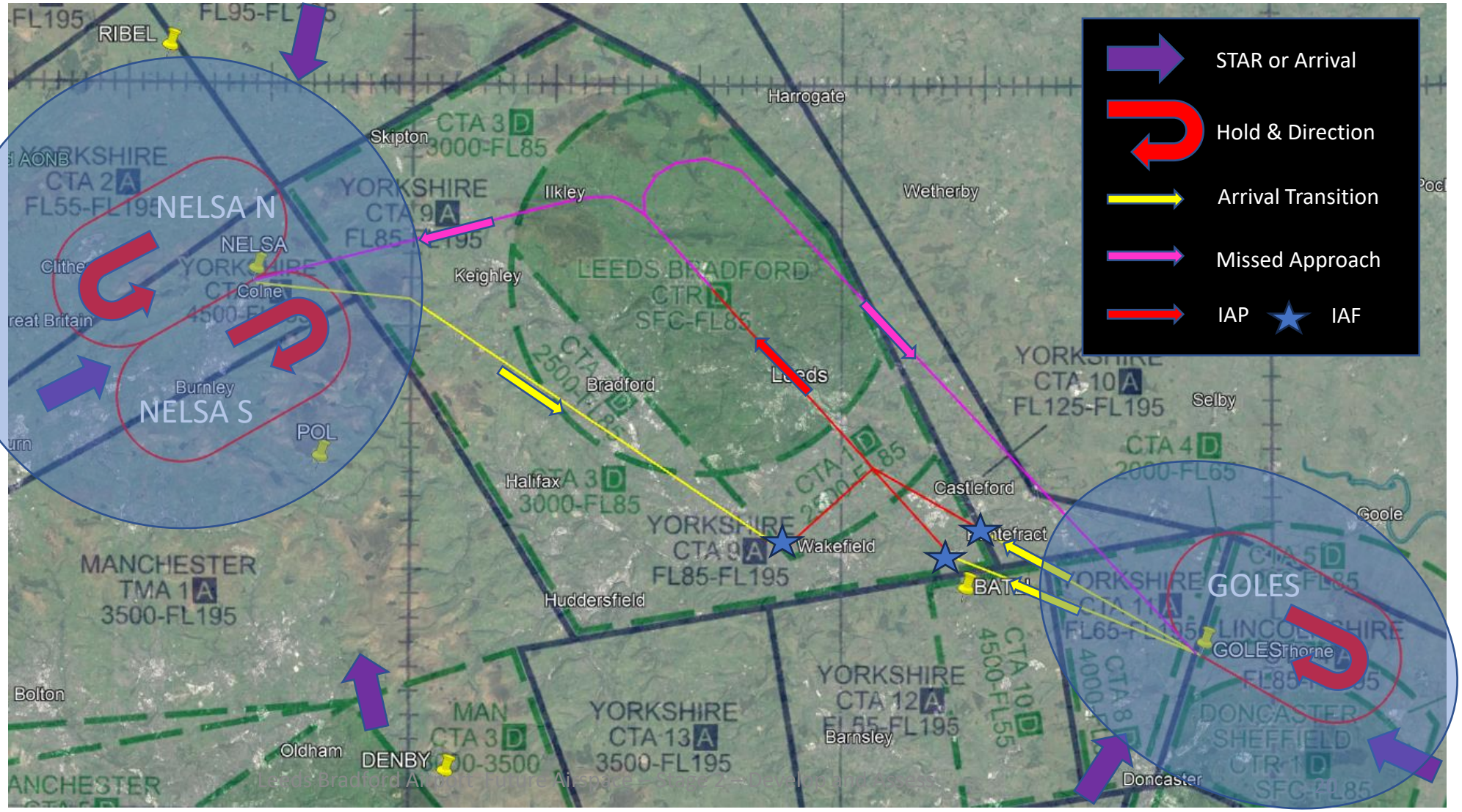
Arrivals – Option 2 - 2 Holds - NELSA/GOLES – RW32

Either NELSA North (left hand) or NELSA South (right hand) - potential Arrival/MAP Hold from 5000ft vice the LBA

Traffic from the SE likely to be routed towards MAMUL/GOLES by NERL

T-Bar or Y-Bar to suit based on airspace and noise considerations

GOLES more likely just an Arrival Hold with a lowest base of FL80 and likely to require additional CAS



Arrivals – Option 2 - 2 Holds - NELSA/GOLES – RW14

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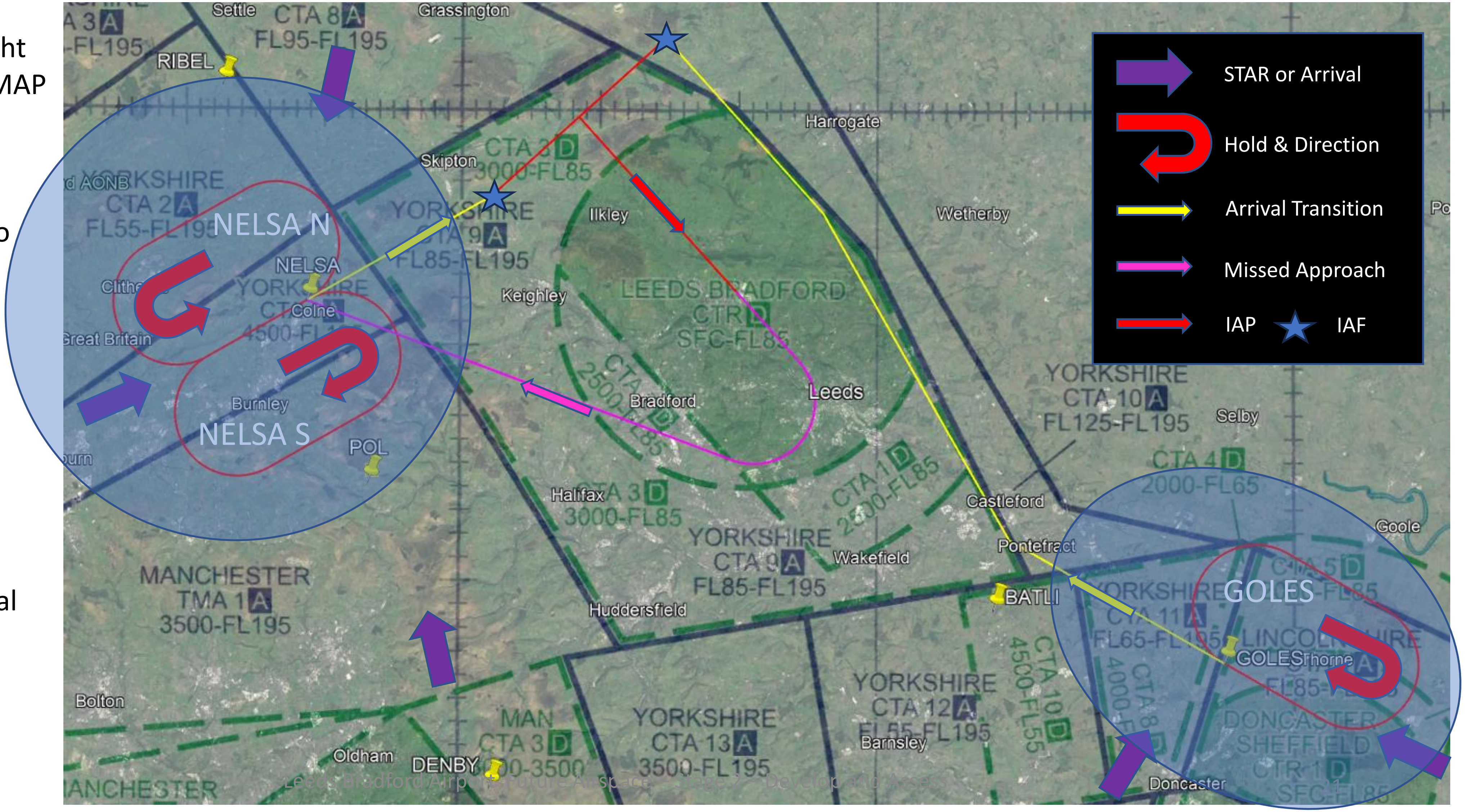
Either NELSA North (left hand) or NELSA South (right hand) - potential Arrival/MAP Hold from 5000ft vice the LBA

Traffic from the SE likely to be routed towards MAMUL/GOLES by NERL

GOLES more likely just an Arrival Hold with a lowest base of FL80 and likely to require additional CAS

Additional CAS will be required for eastern Arrival Transition and T-Bar



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Arrivals – Option 2 - 2 Holds - NELSA/GOLES

Option	DP1 Safety	DP2 Noise	DP3 Tranquillity	DP4 Emissions & Air Quality	DP5 Airspace Dimensions	DP6 Airspace Complexity	DP7 Technical	DP8 Systemisation	DP9 Operational Cost	DP10 AMS Realisation	DP11 PBN
Option 2		Eastern pattern for RW14 potentially reduces noise impact	Eastern T-Bar for RW14 affects Nidderdale AONB		Potential requirement for additional CAS for GOLES/NELSA holds	Likely changes to CAS		Arrival route BARTN-POL-NELSA may not work well for NERL			

Arrivals – Option 3 - 2 Holds – 'AIREY' & 'WORTH' – RW32

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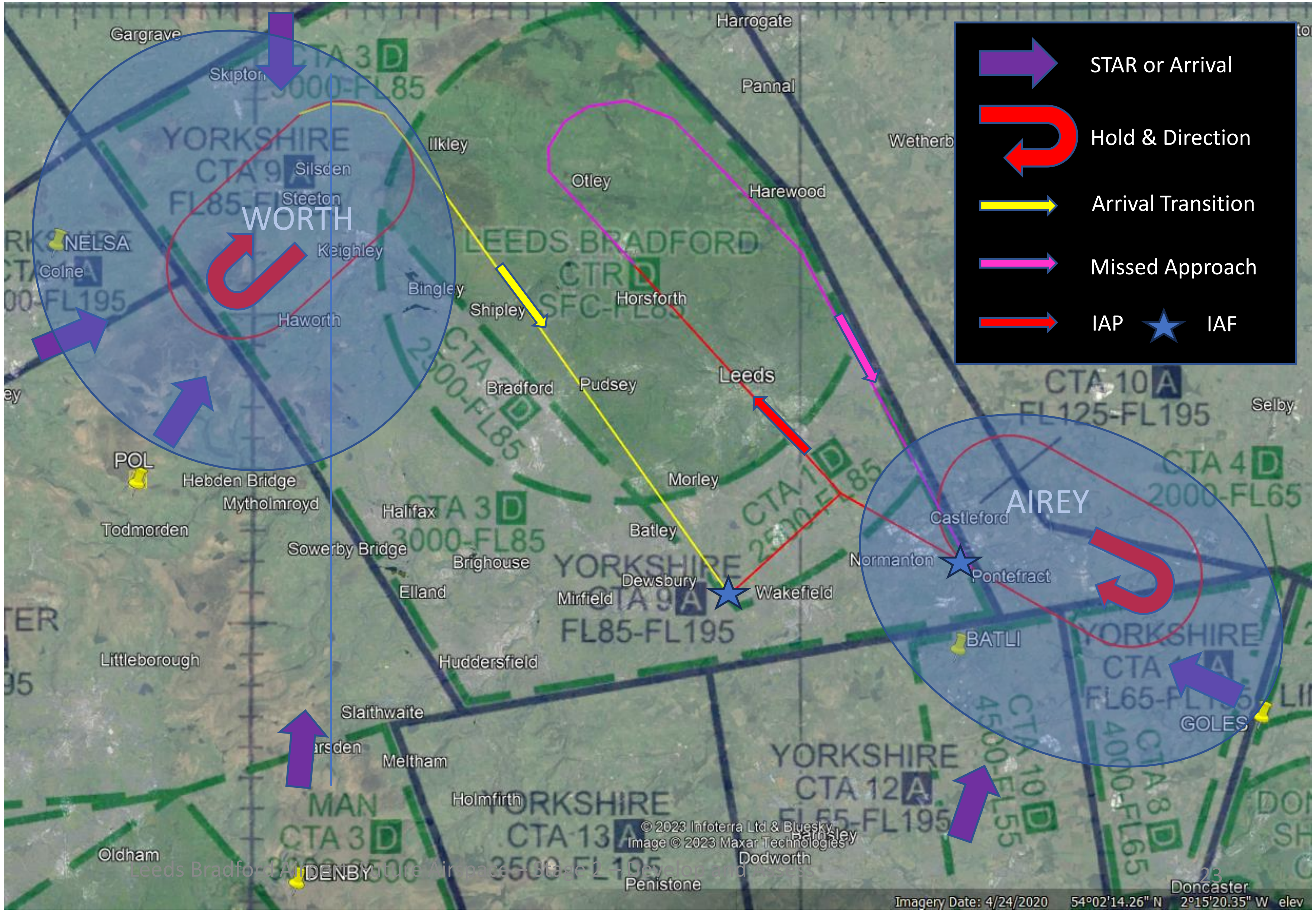
WORTH too close and limiting deps?

AIREY needing additional CAS

T/Y-Bar angle – closer to BATLI? SIE/Leeds East/Burn GC to consider

MAP to AIREY as WORTH in conflict with deps? (Hold base circa 5000ft)

Traffic from the SE likely to be routed towards MAMUL/GOLES by NERL



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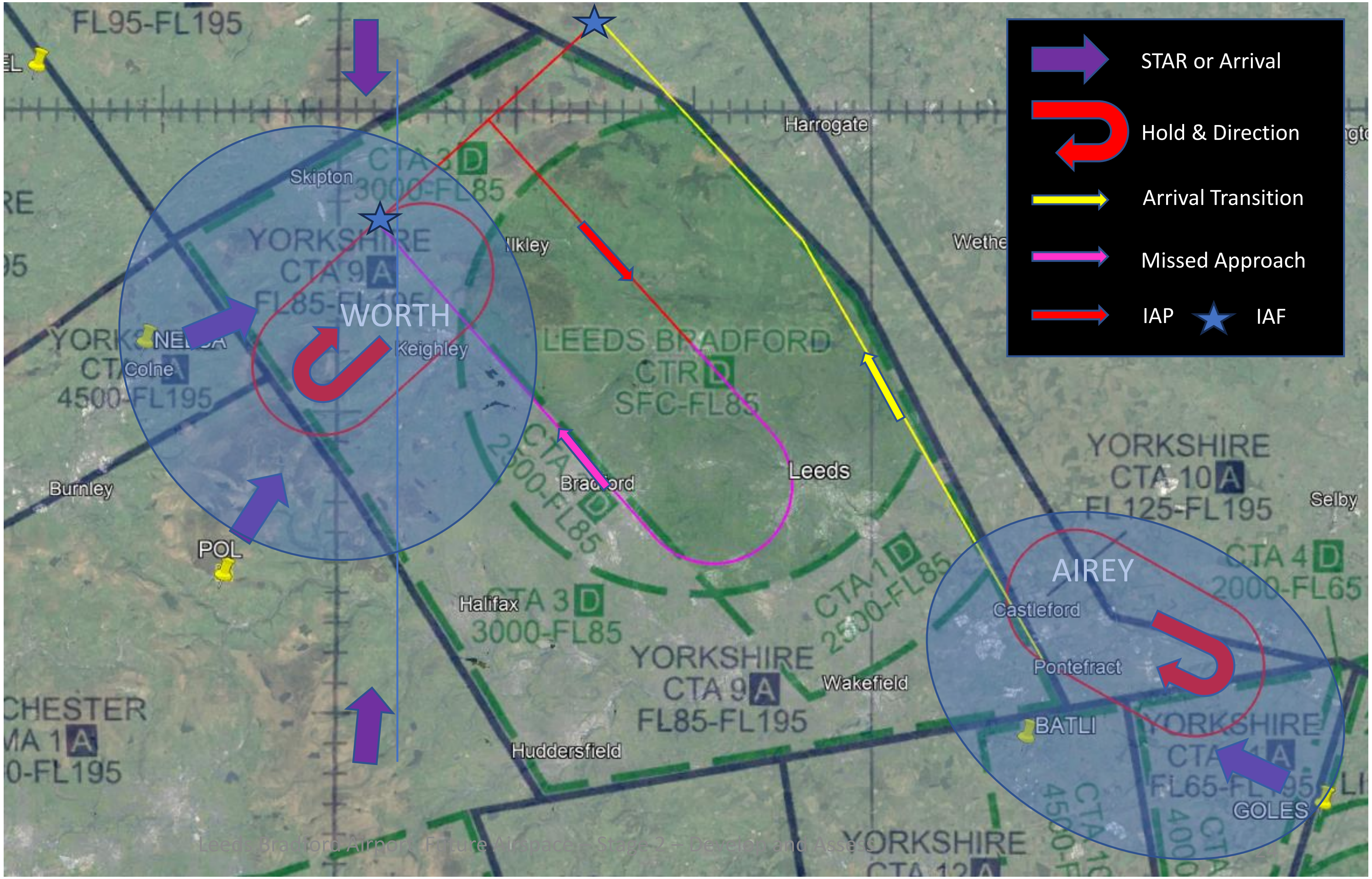
Arrivals – Option 3 - 2 Holds – 'AIREY' & 'WORTH' – RW14



WORTH too close and limiting deps?

AIREY needing additional CAS and unlikely due to SIE/Leeds East/Burn GC

MAP to WORTH (Hold base circa 5000ft)

Traffic from the SE likely to be routed towards MAMUL/GOLES by NERL

Arrivals – Option 3 - 2 Holds – 'AIREY' & 'WORTH'

Option	DP1 Safety	DP2 Noise	DP3 Tranquillity	DP4 Emissions & Air Quality	DP5 Airspace Dimensions	DP6 Airspace Complexity	DP7 Technical	DP8 Systemisation	DP9 Operational Cost	DP10 AMS Realisation	DP11 PBN
Option 3	Tactical coordination required to deconflict WORTH and RW32 departures. Proximity of AIREY hold to Sherburn and Leeds East and Burn Gliders is problematic.	Eastern transition to RW14 likely to reduce noise impact	Eastern T-Bar for RW14 affects Nidderdale AONB	Stepped climbs off RW reduces efficiency	Requirement for significantly more CAS to contain AIREY hold	Likely changes to CAS		WORTH may result in stepped climbs off RW32			

Arrivals – Option 4 - 3 Holds – LBA with 'AIREY' & 'WORTH' – RW32

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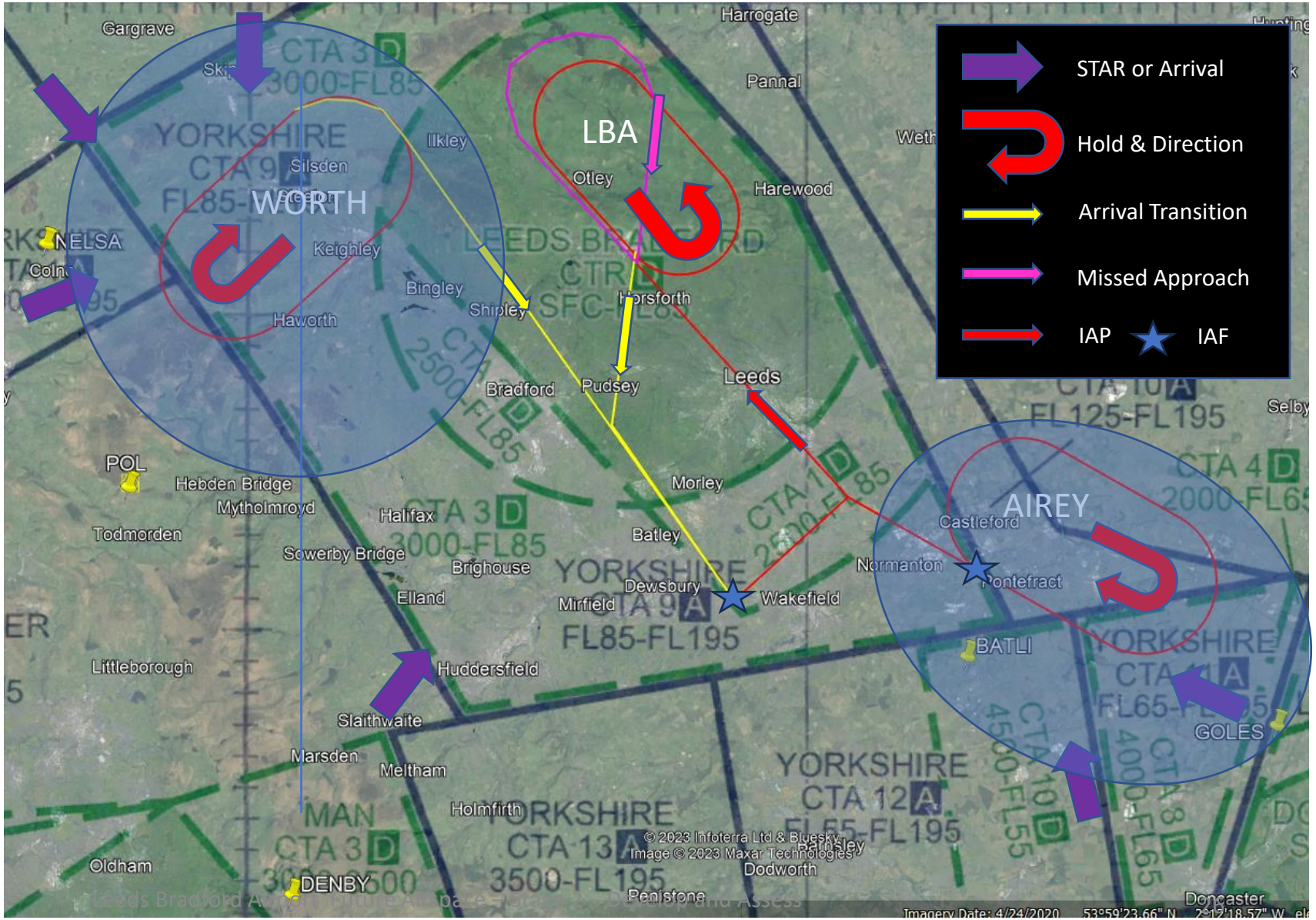
Traffic from SW still inbound via arrival gates towards the LBA and likely to be tactically controlled direct to the IAF

WORTH too close and limiting deps?

AIREY needing additional CAS and unlikely due to Sherburn-in-Elmet, Leeds East and Burn GC.

T/Y-Bar angle – should the IAF be closer to BATLI?

MAP for LBA or AIREY?



Arrivals – Option 4 - 3 Holds – LBA with 'AIREY' & 'WORTH' – RW14

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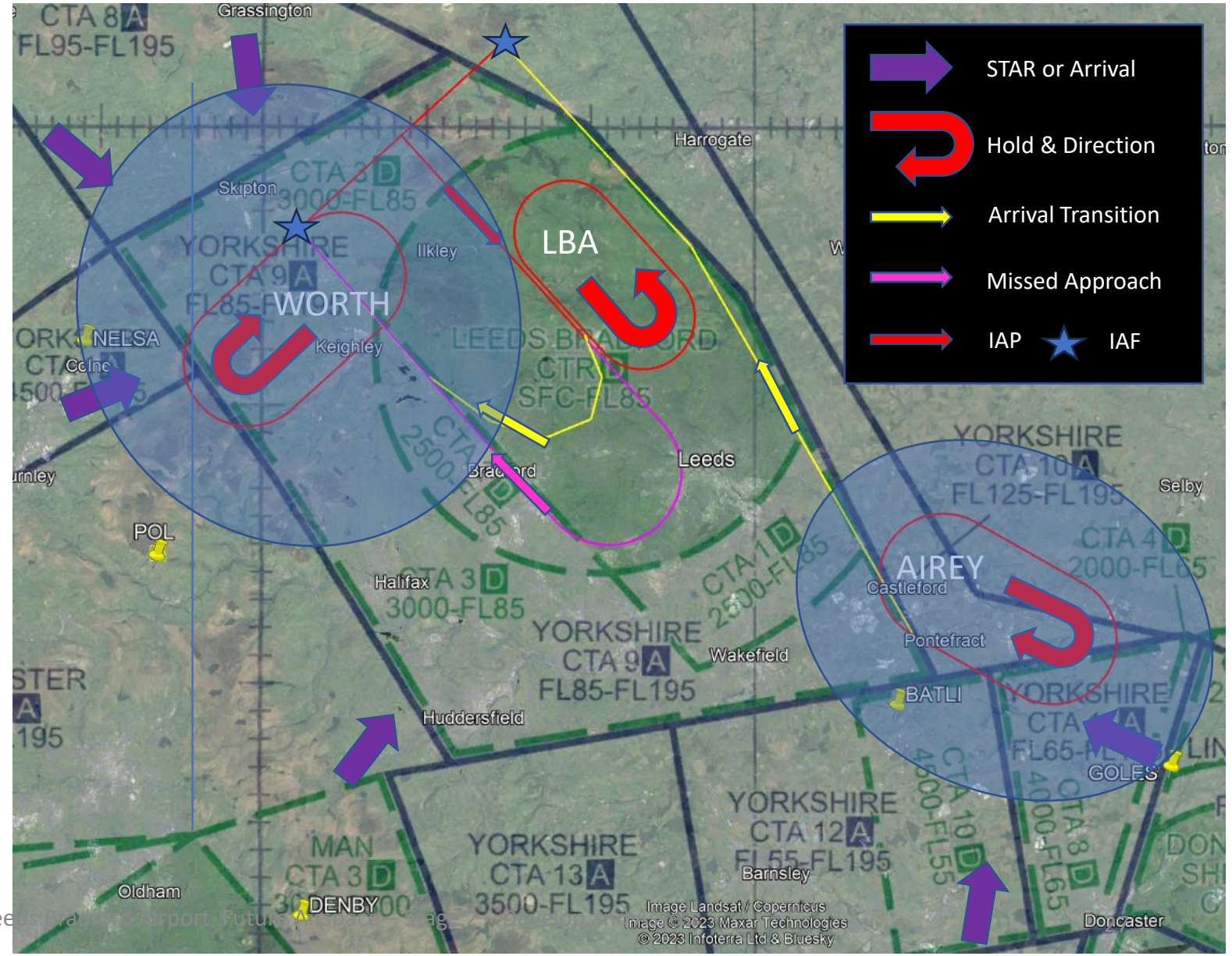
Traffic from SW still inbound via arrival gates towards the LBA and likely to be given own navigation or vectored towards the IAF

AIREY needing additional airspace and unlikely due to Leeds East, Burn Gliders etc.

MAP for LBA or AIREY?



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Arrivals – Option 4 - 3 Holds – LBA with 'AIREY' & 'WORTH'

Option	DP1 Safety	DP2 Noise	DP3 Tranquillity	DP4 Emissions & Air Quality	DP5 Airspace Dimensions	DP6 Airspace Complexity	DP7 Technical	DP8 Systemisation	DP9 Operational Cost	DP10 AMS Realisation	DP11 PBN
Option 4	Tactical coordination required to deconflict WORTH and RW32 departures. Proximity of AIREY hold to Sherburn and Leeds East and Burn Gliders is problematic.	Eastern transition to RW14 likely to reduce noise impact	Eastern T-Bar for RW14 affects Nidderdale AONB	WORTH and LBA hold likely to result In impact to Continuous Climbs off RW32	Requirement for significantly more CAS to contain AIREY hold	Likely changes to CAS		WORTH and LBA hold likely to result In impact to Continuous Climbs			

Arrivals – Option 5 - 3 Holds – NELSA/'UDDER'/GOLES – RW32

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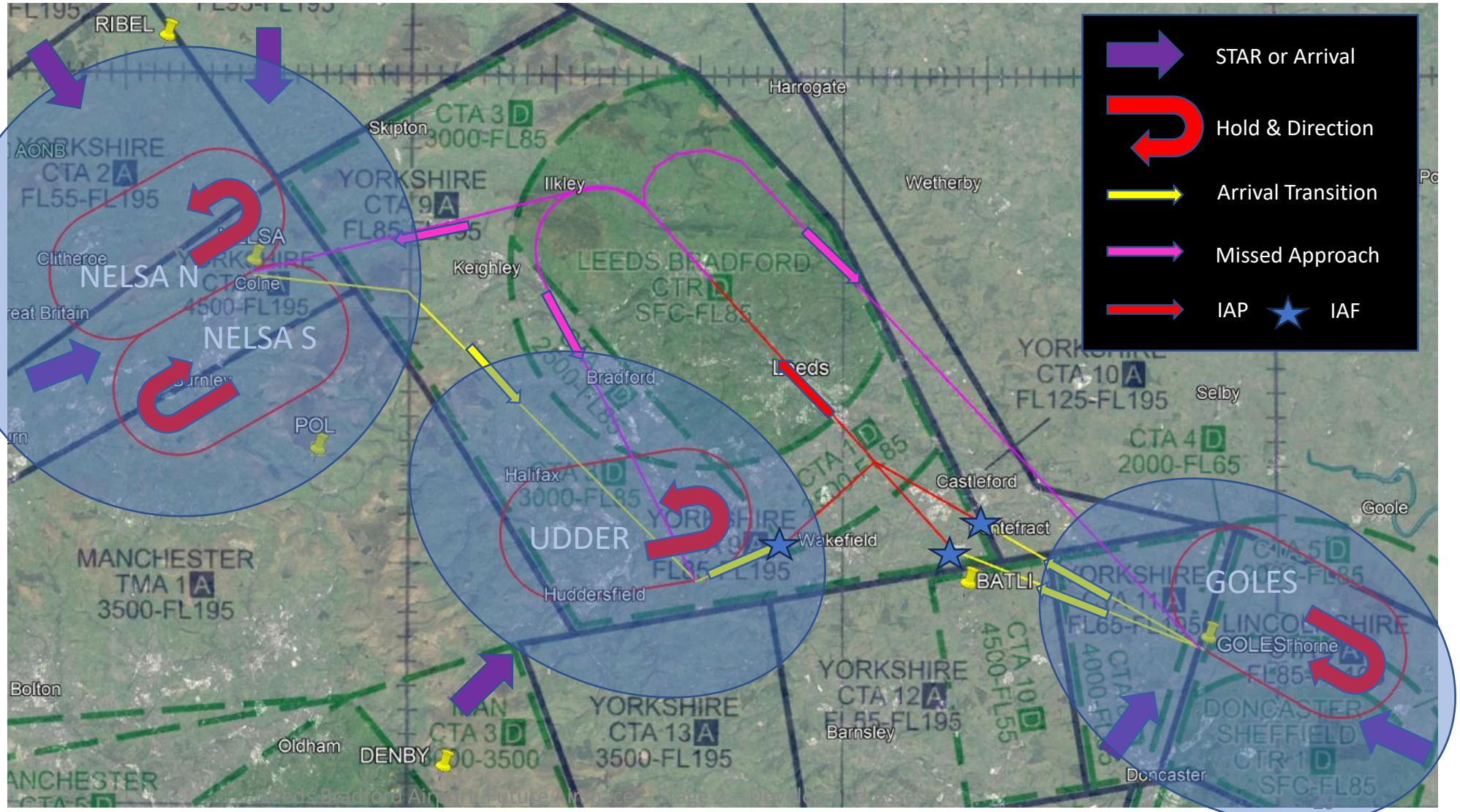
Either NELSA North (LH) or NELSA South (RH) – potential Arrival/MAP Hold from 5000ft

Arrivals from the SW now have 'UDDER' option (Note: Traffic from SE likely to be being routed towards MAMUL/GOLES by NERL)

GOLES additional CAS required

GOLES & UDDER Arrival Holds FL80 upwards



Arrivals – Option 5 - 3 Holds – NELSA/'UDDER'/GOLES – RW14

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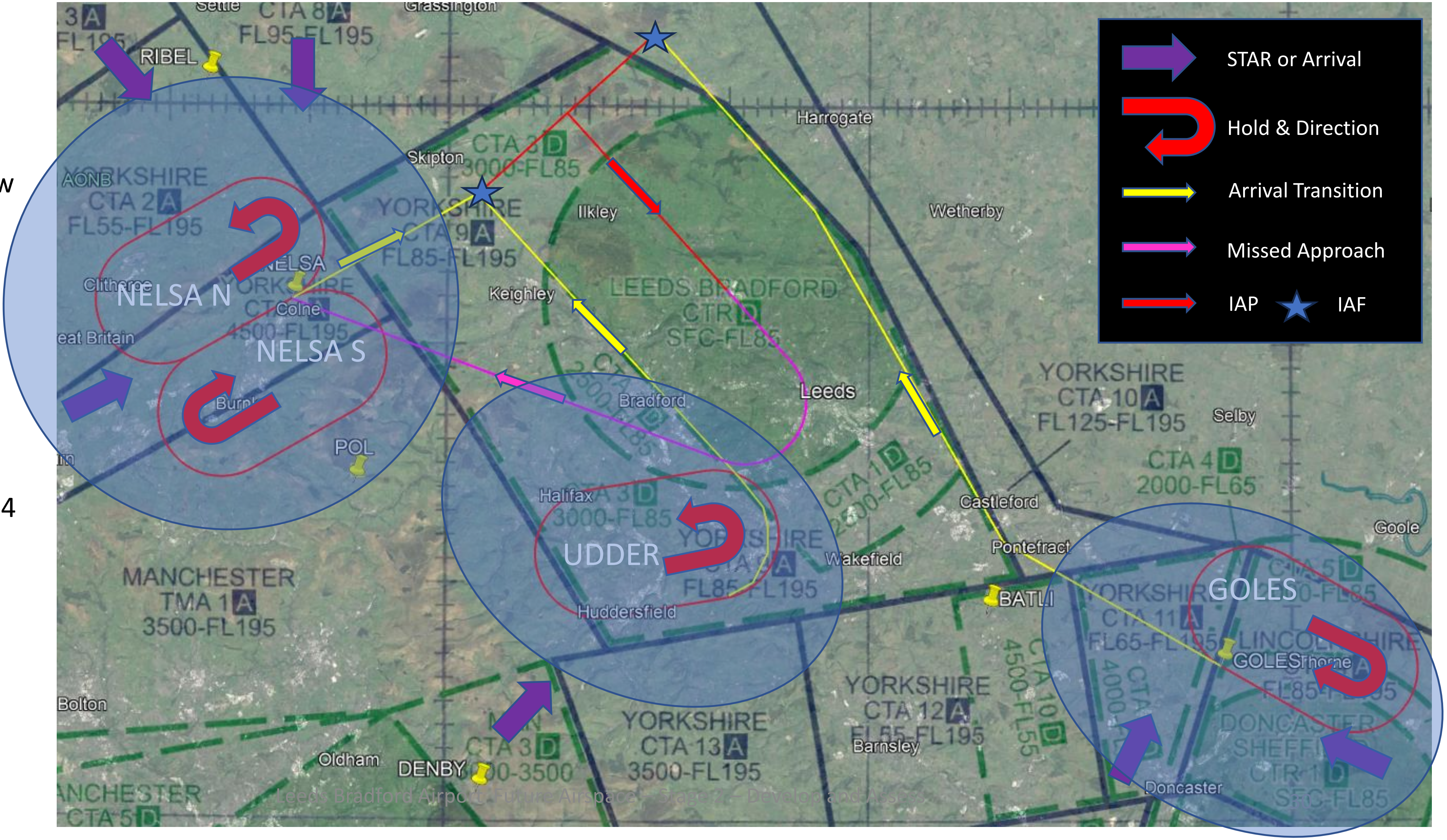
Either NELSA North (LH) or NELSA South (RH) - potential Arrival/MAP Hold from 5000ft

Arrivals from the SW now have 'UDDER' option (Note: Traffic from SE likely to be being routed towards MAMUL/GOLES by NERL)

'UDDER' – Potential conflict with deps to South and West off RW14

GOLES additional CAS required

GOLES & UDDER Arrival Holds FL80 upwards



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Arrivals – Option 5 - 3 Holds – NELSA/'UDDER'/GOLES

Option	DP1 Safety	DP2 Noise	DP3 Tranquillity	DP4 Emissions & Air Quality	DP5 Airspace Dimensions	DP6 Airspace Complexity	DP7 Technical	DP8 Systemisation	DP9 Operational Cost	DP10 AMS Realisation	DP11 PBN
Option 5			Eastern T-Bar for RW14 affects Nidderdale AONB	UDDER hold may impact RW14 departures	Potential requirement for additional CAS for GOLES/NELSA holds	Likely changes to CAS		UDDER hold may impact RW14 departures			

New Arrival Options

Arrivals – Option 6 - 2 Holds - LBA/GOLES – RW32

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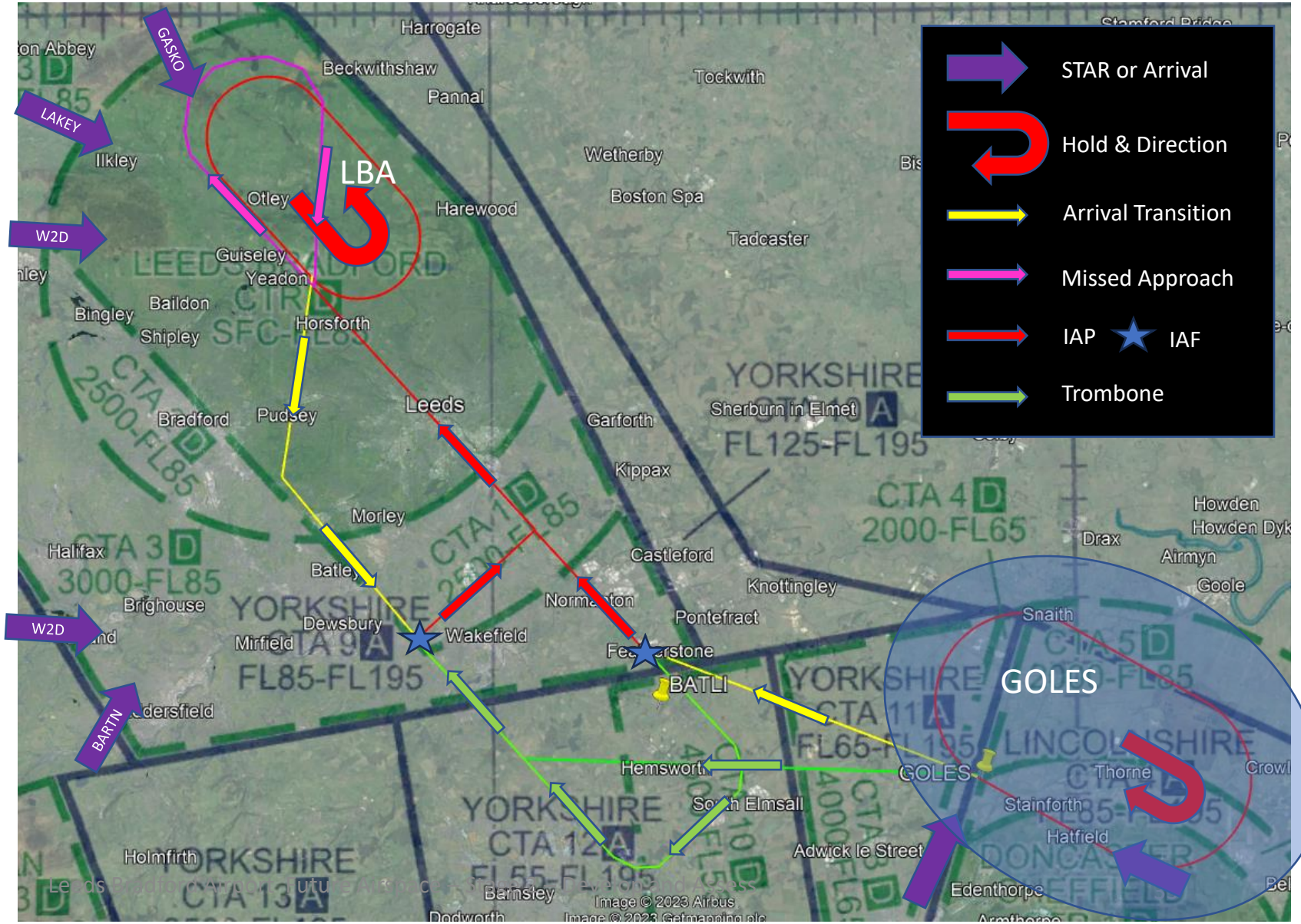
MAP to 5000ft turning right back towards the LBA at circa 4.5nm

Traffic from the South likely to be being routed towards MAMUL/GOLES by NERL

GOLES just an Arrival Hold with a base of FL90 and likely to require additional CAS

Two overflow extensions (Trombones) for sequencing; one from the LBA and one from GOLES



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Arrivals – Option 6 - 2 Holds - LBA/GOLES – RW14

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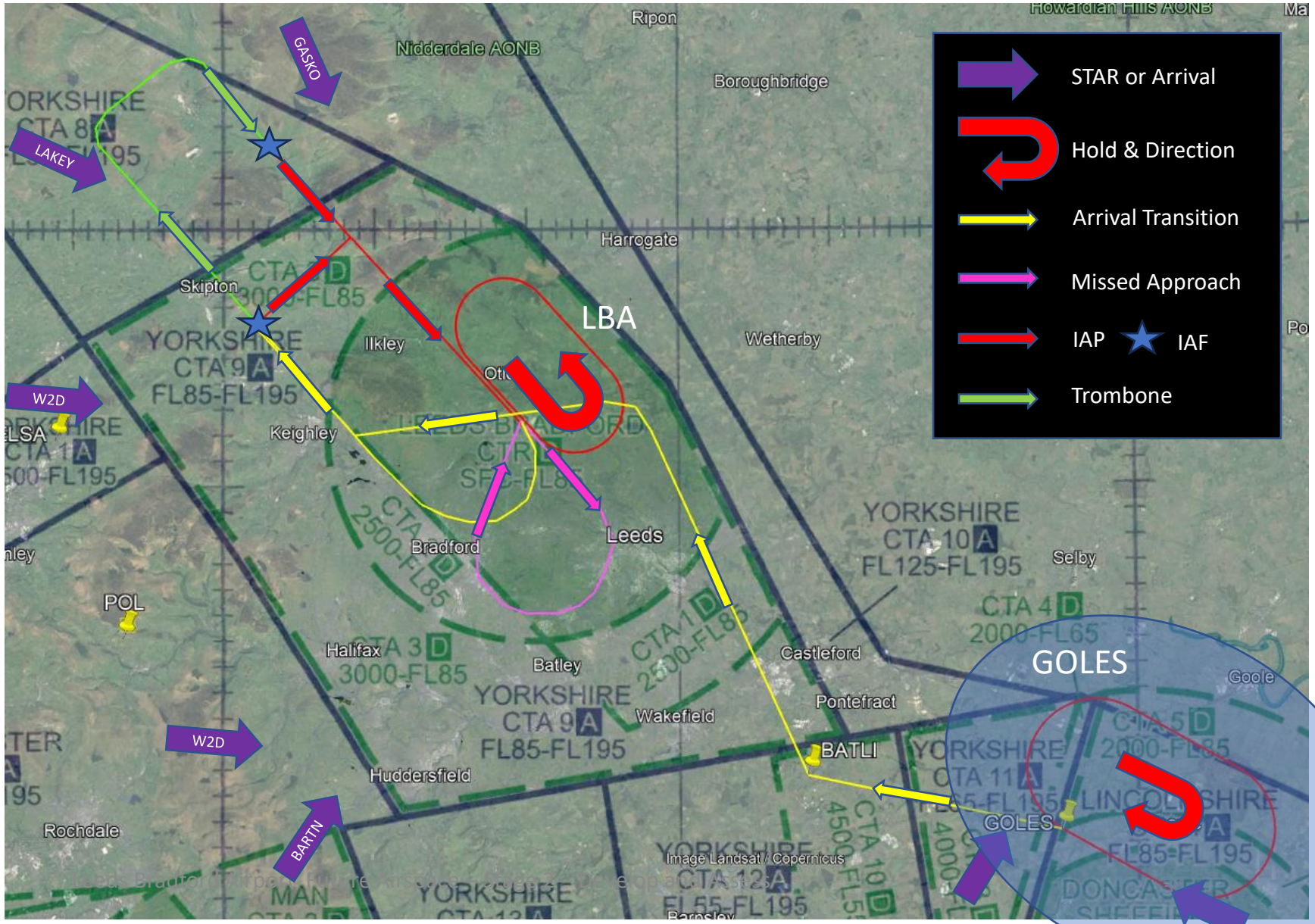
MAP mirror image of RW32

RH Arrival Transitions from both Arrival Holds

Traffic from the South likely to be being routed towards GOLES by NERL

GOLES Hold just an Arrival Hold from FL90 up and likely to require additional CAS

Additional CAS will be required for overflow extension (Trombone) to a 15nm final required for sequencing



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Arrivals – Option 6 - 2 Holds – LBA/GOLES

Option	DP1 Safety	DP2 Noise	DP3 Tranquillity	DP4 Emissions & Air Quality	DP5 Airspace Dimensions	DP6 Airspace Complexity	DP7 Technical	DP8 Systemisation	DP9 Operational Cost	DP10 AMS Realisation	DP11 PBN
Option 6		Similar to what is done today.	AONB and NP overflown	Unnecessary fuel carriage for always planning via LBA	Needed for 15nm final and trombone	GOLES element simplifies but the LBA and trombone airspace has the opposite affect		Heavy requirement for tactical vectoring and level restrictions particularly on RW32	Unnecessary fuel carriage for always planning via LBA	Not entirely systemised but modernising airspace with PBN	

Arrivals – Option 7 - 3 Holds – NW Hold/LBA/GOLES – RW32

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MAP to 5000ft turning right back towards the LBA at circa 4.5nm

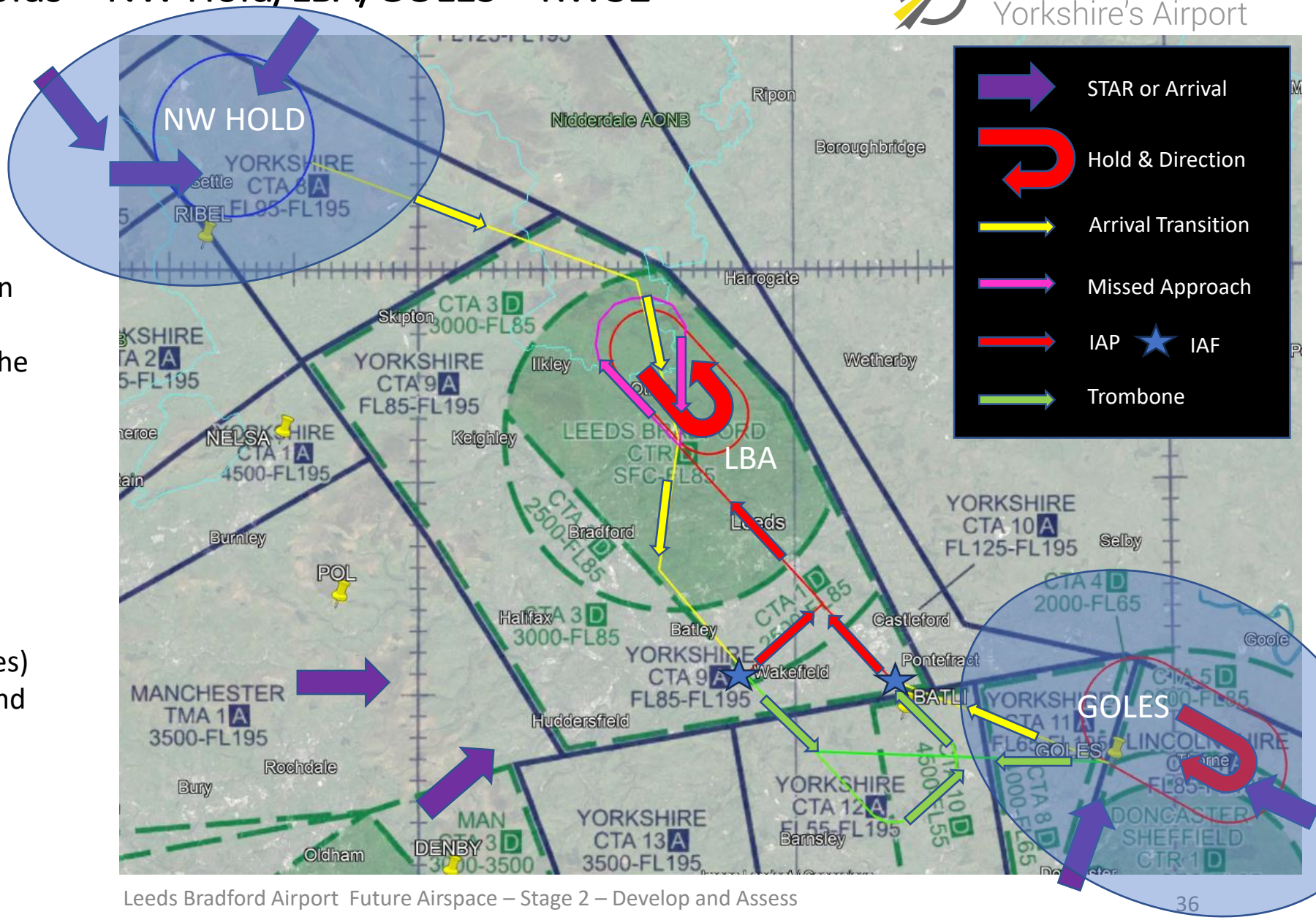
From the SE: MAMUL/GOLES

Arrival Gates for SW/W, direct to western IAF or via LBA and transition

From the NW and NE: NW Hold to the LBA then transition or direct to western IAF

Arrival Holds with a base of at least FL90 and likely to require additional CAS

Two overflow extensions (Trombones) for sequencing; one from the LBA and one from GOLES



Arrivals – Option 7 - 3 Holds – NW HOLD/LBA/GOLES – RW14

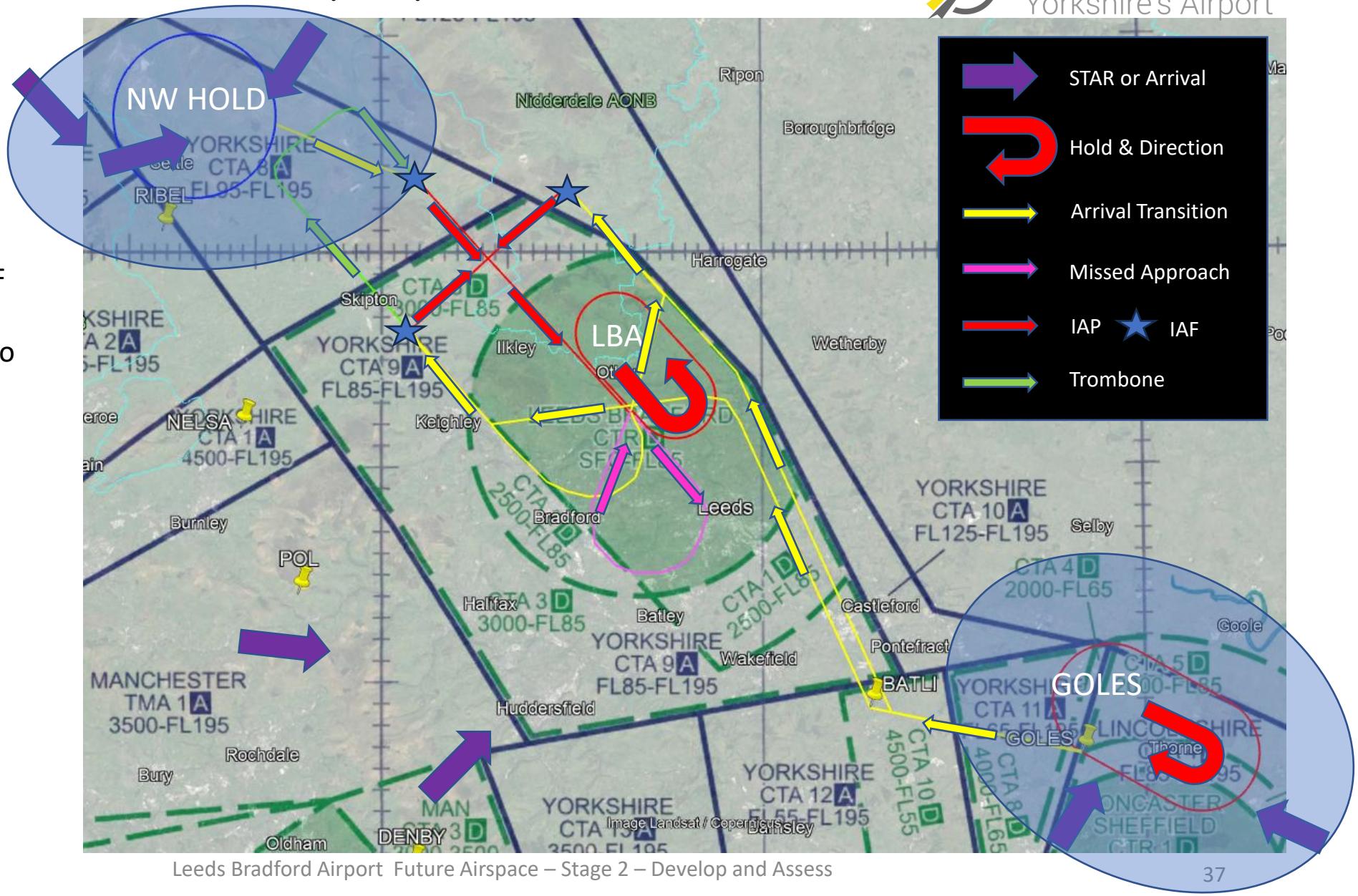
From the SE: MAMUL/GOLES - arrival transition through the overhead or downwind left

Arrival Gates for SW/W and Arrival Transition downwind left from LBA or direct to western IAF

From the NW and NE: NW Hold to 15nm straight-in final

Arrival Holds with a base of at least FL90 and likely to require additional CAS

One overflow extension (Trombone) from the LBA for sequencing



Arrivals – Option 7 - 3 Holds – NW Hold/LBA/GOLES

Option	DP1 Safety	DP2 Noise	DP3 Tranquillity	DP4 Emissions & Air Quality	DP5 Airspace Dimensions	DP6 Airspace Complexity	DP7 Technical	DP8 Systemisation	DP9 Operational Cost	DP10 AMS Realisation	DP11 PBN
Option 7	LBA STAR via SW Arrival Gate system is the problem as conflicts with outbounds off RW14	No improvement	AONB and NP overflown	Regardless of Hold, if coming from the SW, aircraft planning for unexpeditious recovery	Needed for 15nm final, eastern T on RW14 and trombone to the north	GOLES element simplifies but the LBA and trombone airspace has the opposite affect		Heavy requirement for tactical vectoring and level restrictions particularly on RW32	Regardless of Hold, if coming from the SW, aircraft planning for unexpeditious recovery	Not entirely systemised but modernising airspace with PBN	

Arrivals – Option 8 - 2 Arrival Holds – NW Hold/GOLES – RW32

MAP to 5000ft turning right back towards the LBA (purely MAP Hold) at circa 4.5nm

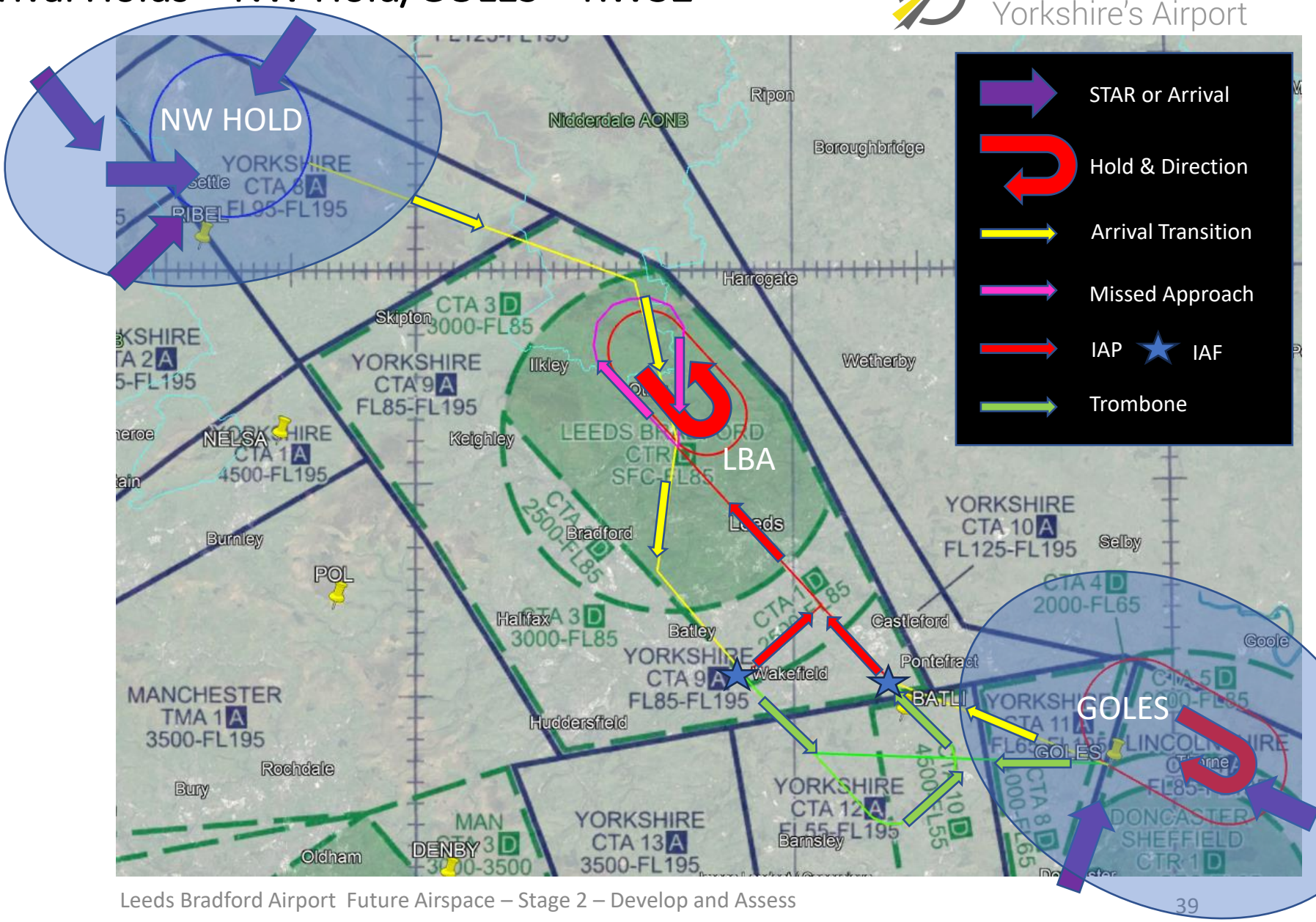
No Arrival Gates

From the SW and SE: MAMUL/GOLES

From the W, NW and NE: NW Hold to the LBA then transition or direct to western IAF

Arrival Holds with a base of at least FL90 and likely to require additional CAS

Two overflow extensions (Trombones) for sequencing; one from the LBA and one from GOLES



Arrivals – Option 8 – 2 Arrival Holds – NW HOLD/GOLES – RW14

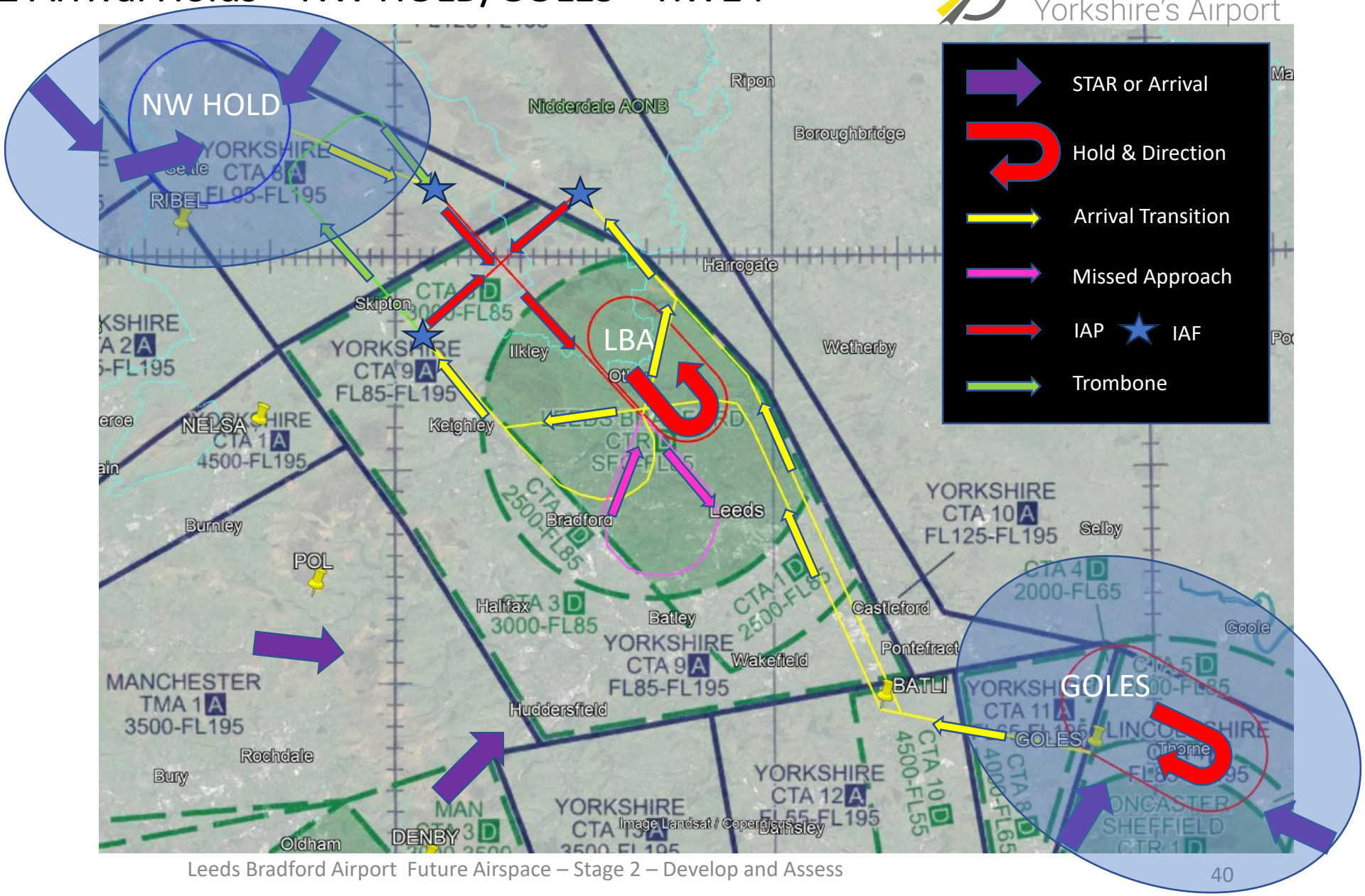
From the SW and SE: MAMUL/GOLES - arrival transition through the overhead or downwind left

No Arrival Gates

From the W, NW and NE: NW Hold to 15nm straight-in final

Arrival Holds with a base of at least FL90 and likely to require additional CAS

One overflow extension (Trombone) from the LBA for sequencing



Arrivals – Option 8 - 2 Holds – SETEL/LBA/GOLES

Option	DP1 Safety	DP2 Noise	DP3 Tranquillity	DP4 Emissions & Air Quality	DP5 Airspace Dimensions	DP6 Airspace Complexity	DP7 Technical	DP8 Systemisation	DP9 Operational Cost	DP10 AMS Realisation	DP11 PBN
Option 8		No improvement	AONB and NP overflown		Needed for 15nm final, eastern T on RW14 and trombone to the north						

Arrivals – Option 9 - 2 Holds – ’UDDER’/GOLES – RW32

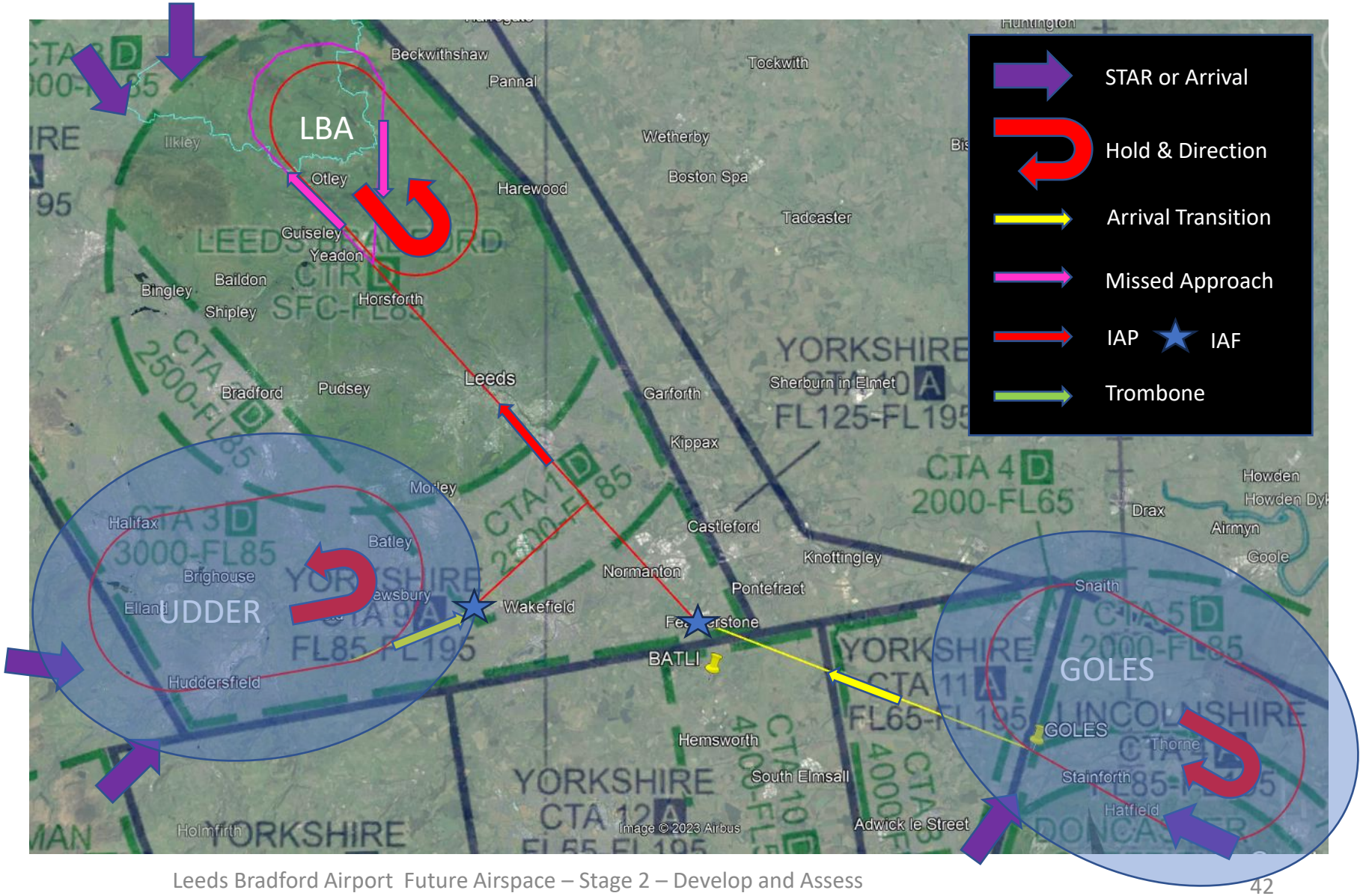
LBA purely MAP Hold

Arrivals from the W and SW now have ‘UDDER’ option (Note: Traffic from SE likely to be being routed towards MAMUL/GOLES by NERL)

GOLES additional CAS required

GOLES & UDDER Arrival Holds FL80 upwards

Arrivals from NW and NE tactically managed



Arrivals – Option 9 - 2 Holds – 'UDDER'/GOLES – RW14

LBA purely MAP Hold

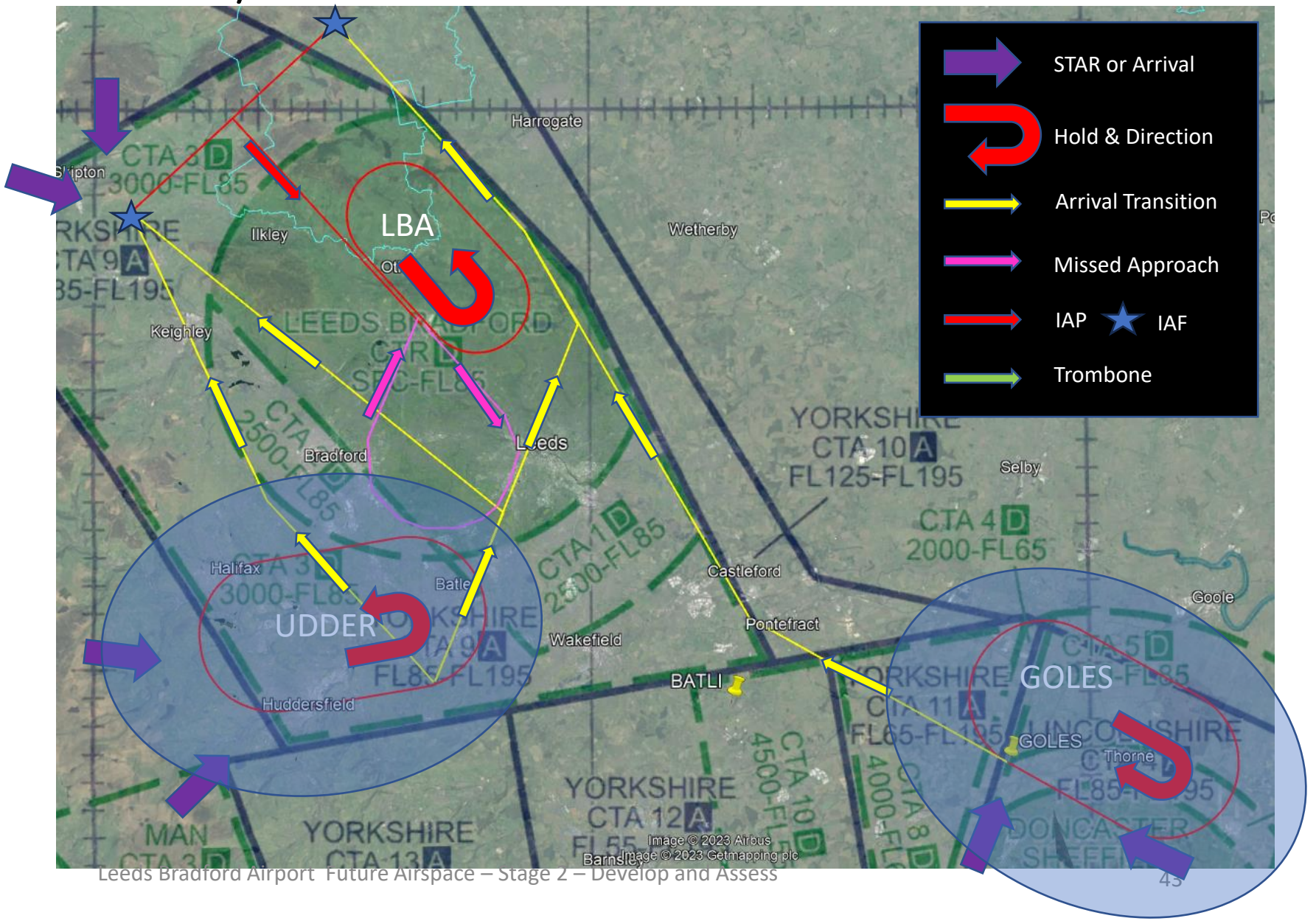
Arrivals from the W and SW now have 'UDDER' option (Note: Traffic from SE likely to be being routed towards MAMUL/GOLES by NERL)

GOLES additional CAS required

GOLES & UDDER Arrival Holds FL80 upwards

Arrivals from NW and NE tactically managed

Arrival transition options: wide downwind right for when no POL/NELSA departures, closer downwind right and downwind left for when there are departures to LAMIX or POL/NELSA



Arrivals – Option 9 - 2 Holds - ’UDDER’/GOLES

Option	DP1 Safety	DP2 Noise	DP3 Tranquillity	DP4 Emissions & Air Quality	DP5 Airspace Dimensions	DP6 Airspace Complexity	DP7 Technical	DP8 Systemisation	DP9 Operational Cost	DP10 AMS Realisation	DP11 PBN
Option 9		No improvement	AONB overflown by eastern T-Bar to RW14	UDDER hold may impact RW14 departures	Potential requirement for additional CAS for GOLES/UDDER holds	Likely changes to CAS		UDDER hold may impact RW14 departures			

Rationale behind Option 10

UK Policy on STARs versus the AMS

UK policy requires that STARs conclude at a holding fix with an associated arrival hold. From this holding fix, arrival transitions can be designed to take aircraft directly to the various IAFs from which to commence their final approach.

Holds take up significant volumes of airspace and the protection required around them exacerbates this still further. Therefore, finding suitable volumes of airspace within which to contain the holds required for the required STARs into LBA has become a challenge.

One of the objectives of the AMS is to systemise airspace to an optimal extent, providing repeatable, predictable and efficient procedures that are all linked. Adherence to UK policy on STARs whilst seeking to meet the demands of the AMS is proving challenging at LBA due to the limitations on where holds can go.

CAP785B

The above-named Civil Aviation Publication written by the CAA gives sponsors the option to develop STARs that do not have holding fixes or holds but instead route directly to the IAFs. These 'Direct Arrivals' require the Sponsor to provide the CAA's IFP Regulator sufficient justification for why they do not wish to adhere to normal policy.

Option 10 is an attempt to systemise the LBA operation without having STARs (that have holding fixes and holds) for every arrival direction. Instead, only traffic from the South and East would have a STAR ending at a holding fix (GOLES). Traffic from all other arrival directions would have direct arrivals to the respective IAFs contained within the swathes depicted on the following slides.

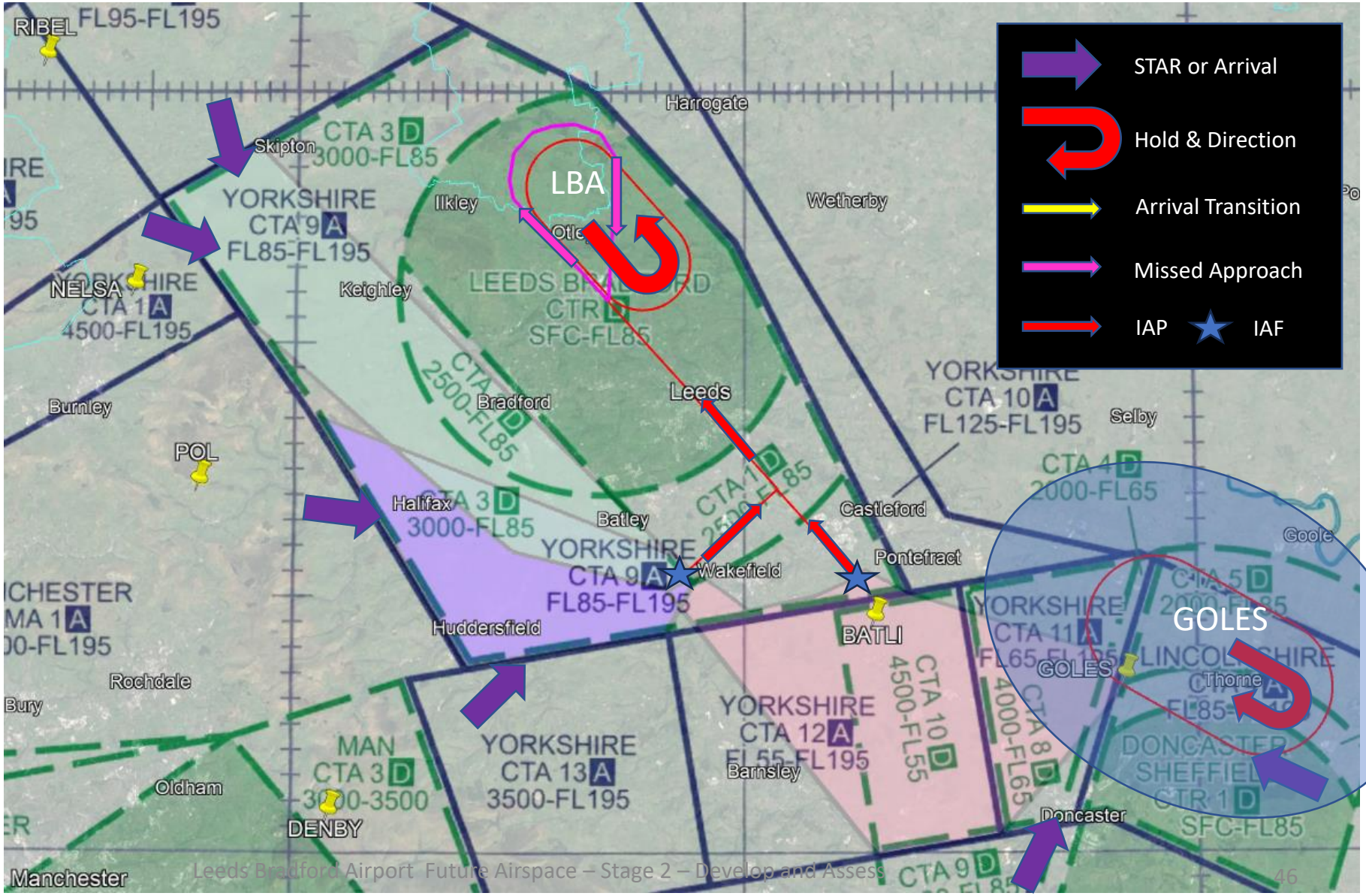
Arrivals – Option 10 – 1 Arrival Hold – GOLES & Direct Arrivals – RW32

LBA MAP and weather hold. GOLES arrival and weather hold with transitions to the approach

Coloured swathes depict containment for other arrival transitions with purple arrows depicting the likely origin of that traffic into the LBA CTA

Airspace to the west of GOLES intended to contain potential 'trombone' procedure to facilitate the sequencing of arrivals

GOLES additional CAS required and likely base FL80



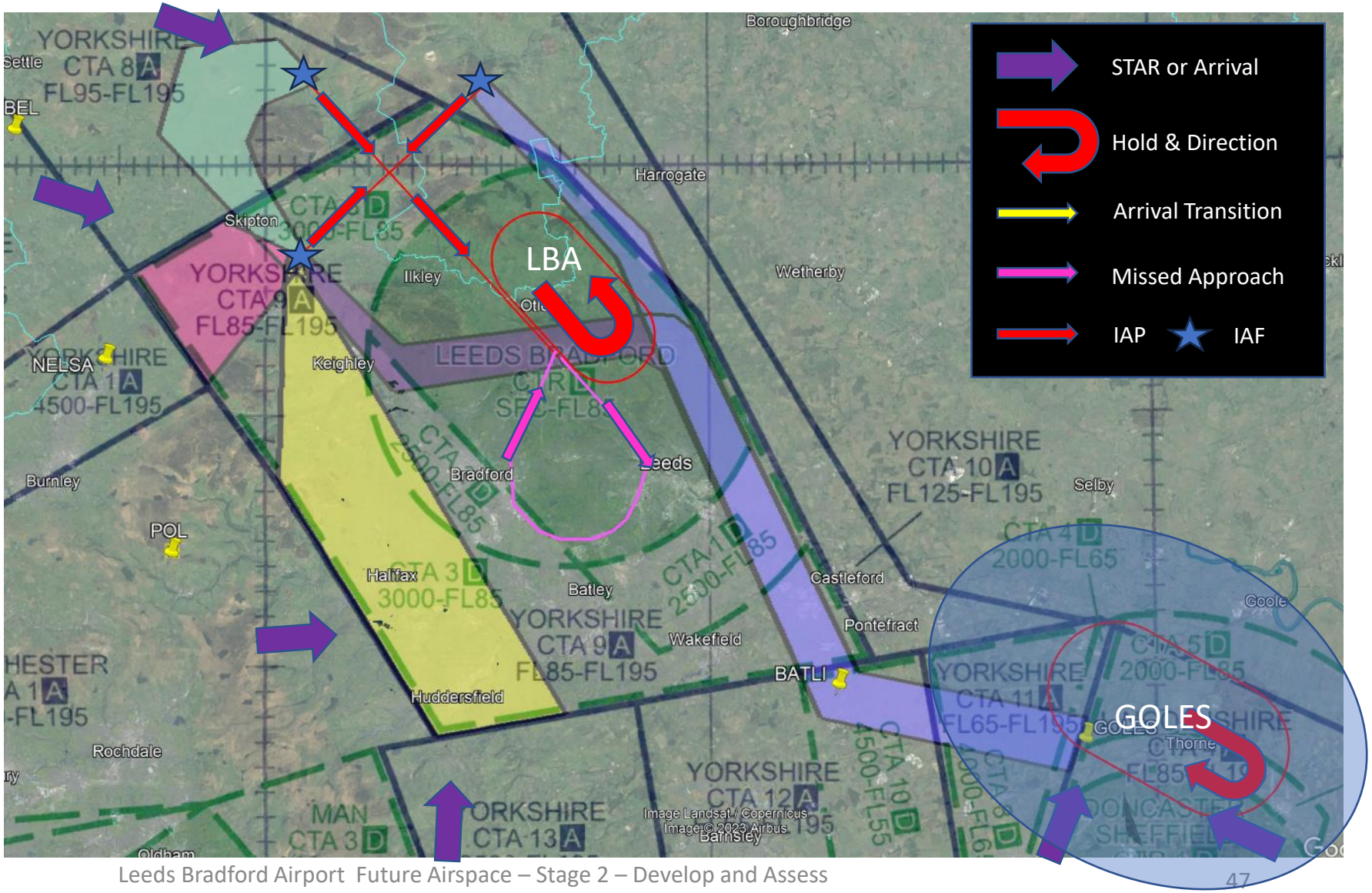
Arrivals – Option 10 – 1 Arrival Hold – GOLES & Direct Arrivals – RW14

LBA MAP and weather hold. GOLES arrival and weather hold with transitions to the approach

Coloured swathes depict containment for other arrival transitions with purple arrows depicting the likely origin of that traffic into the LBA CTA

Airspace to the NW intended to contain potential 'trombone' procedure to facilitate the sequencing of arrivals

GOLES additional CAS required and likely base FL80



Arrivals – Option 10 – 1 Arrival Hold – GOLES & Direct Arrivals

Option	DP1 Safety	DP2 Noise	DP3 Tranquillity	DP4 Emissions & Air Quality	DP5 Airspace Dimensions	DP6 Airspace Complexity	DP7 Technical	DP8 Systemisation	DP9 Operational Cost	DP10 AMS Realisation	DP11 PBN
Option 10		Potential for improvements to be made within the swathes	Yorkshire Dales NP and AONB impacted	Cannot justify 'green' at this stage. Too early to tell.	Potential requirement for additional CAS for GOLES hold	Likely changes to CAS	Lack of holding fixes and holds for some arrivals needs justification	Potential for inbounds from W and SW to still conflict with departures			

Arrival Options Overview

Leeds Bradford®
Yorkshire's Airport

Option	DP1 Safety	DP2 Noise	DP3 Tranquillity	DP4 Emissions & Air Quality	DP5 Airspace Dimensions	DP6 Airspace Complexity	DP7 Technical	DP8 Systemisation	DP9 Operational Cost	DP10 AMS Realisation	DP11 PBN
Option 1											
Option 2											
Option 3											
Option 4											
Option 5											
Option 6											
Option 7											
Option 8											
Option 9											
Option 10											

Required Navigation Performance Authorisation Required (RNP AR)

Cutting-edge satellite-based technology utilised by the most up to date aircraft fleets.

Highly accurate track monitoring enables shorter final approaches and manoeuvres around built-up areas.

LBA would be the first UK airport to propose such ambitious eco-friendly approaches, but these have been safely proven around the world for over a decade.

Limited aircraft certified to fly such approaches in Instrument Meteorological Conditions in the UK at this time, however forecast to increase rapidly in the next 2-5 years.

Could potentially be flown under Visual Meteorological Conditions by non-certified operators.

Leeds Bradford®
Yorkshire's Airport

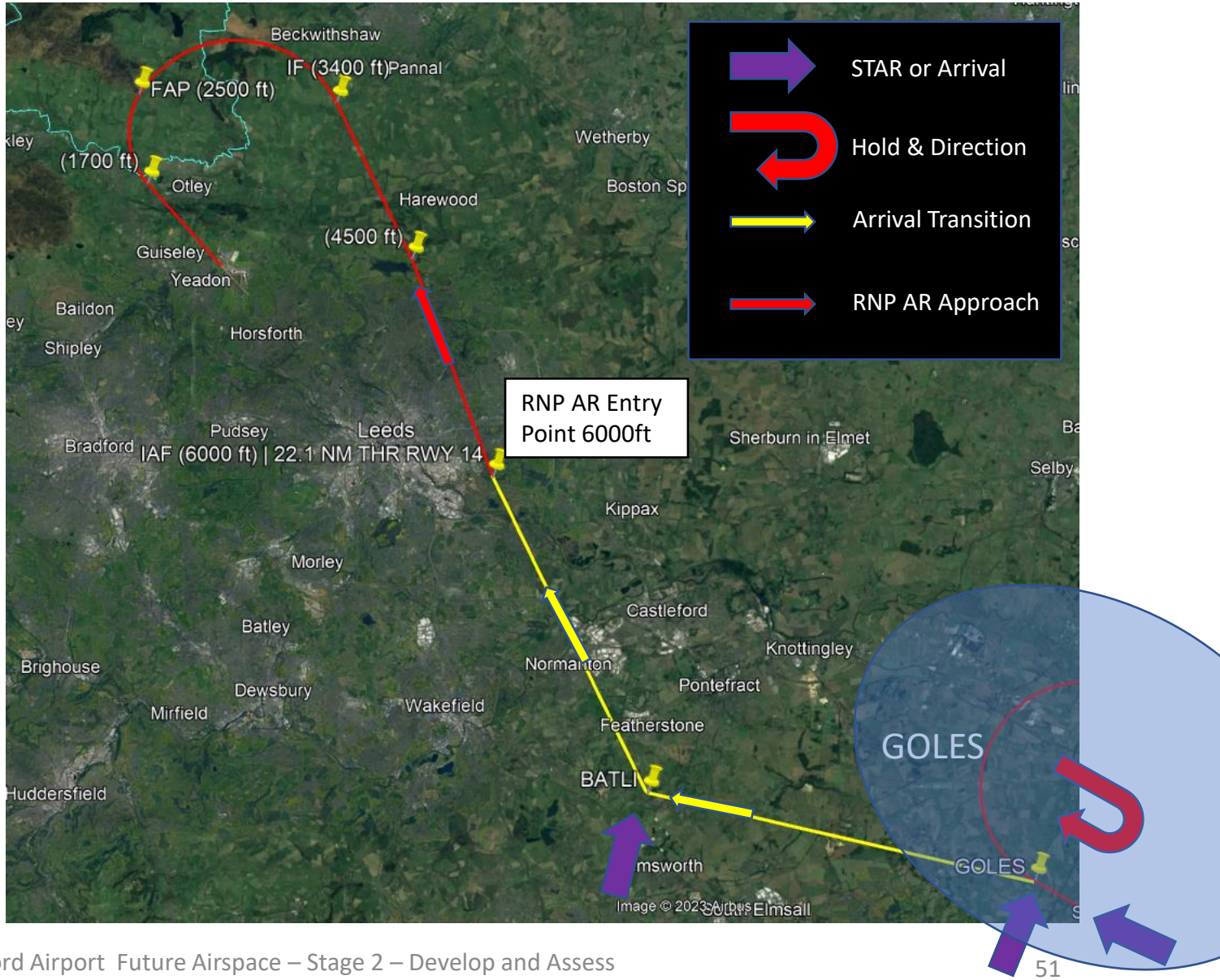
CYRRUS

Additional Option – RNP AR - RW14

More environmentally friendly approach providing a shorter route to RW14 from the SE

Significantly shorter than the standard arrival and, as a result, significant fuel and CO_2 saved on each arrival

Eastern suburbs of Leeds overflown not below 5000 feet at continuous descent on idle power, further descent over open countryside until final approach



Additional Option – RNP AR - RW14

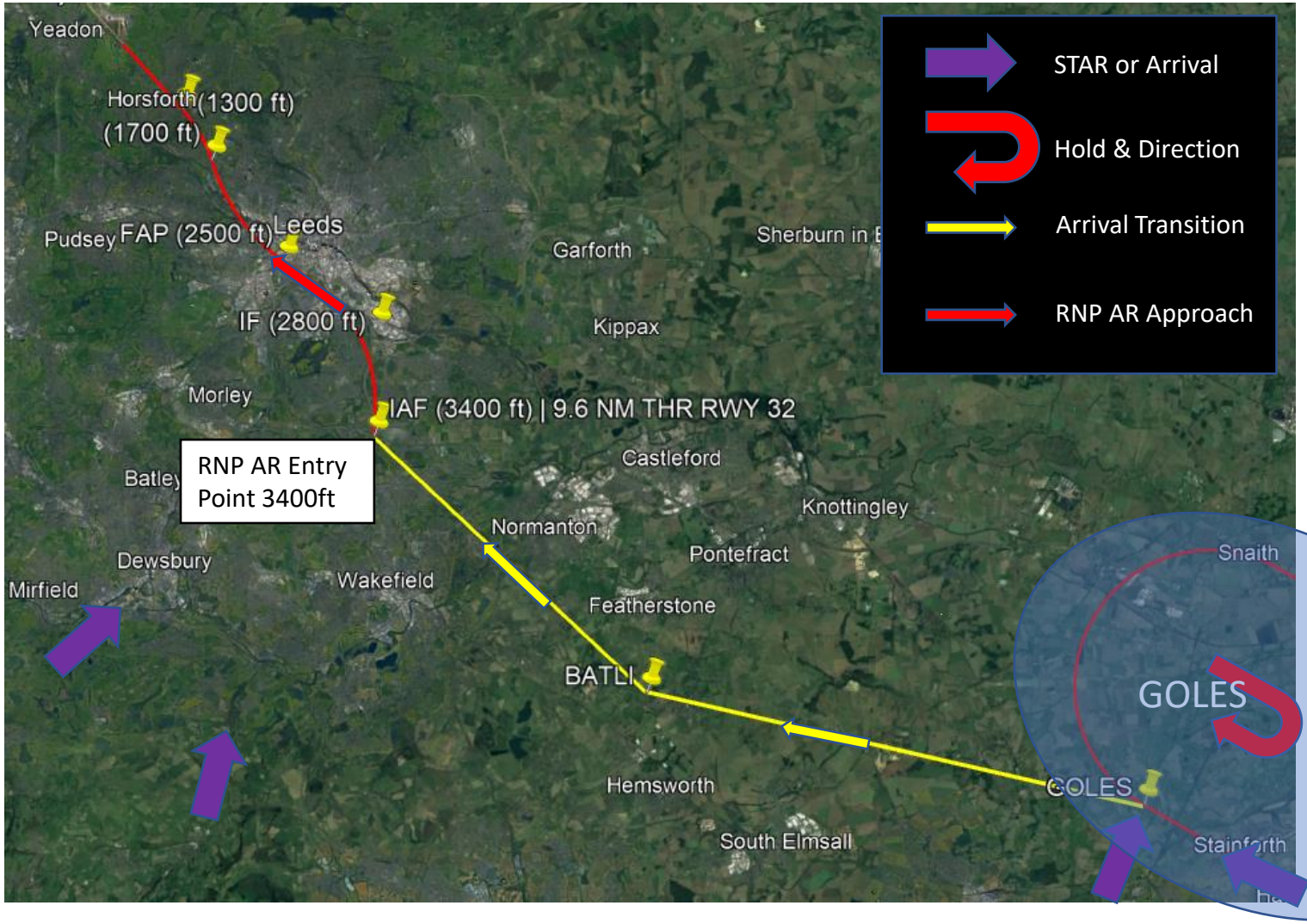
Important Note: Concept Only - Track only an indication of what might be possible. It would be optimised for noise, fuel and emissions reduction before final proposals are developed for consultation

Additional Option – RNP AR – RW32

Approach offset intended to avoid overflying central Leeds Residential district, Headingley, Hyde Park Districts

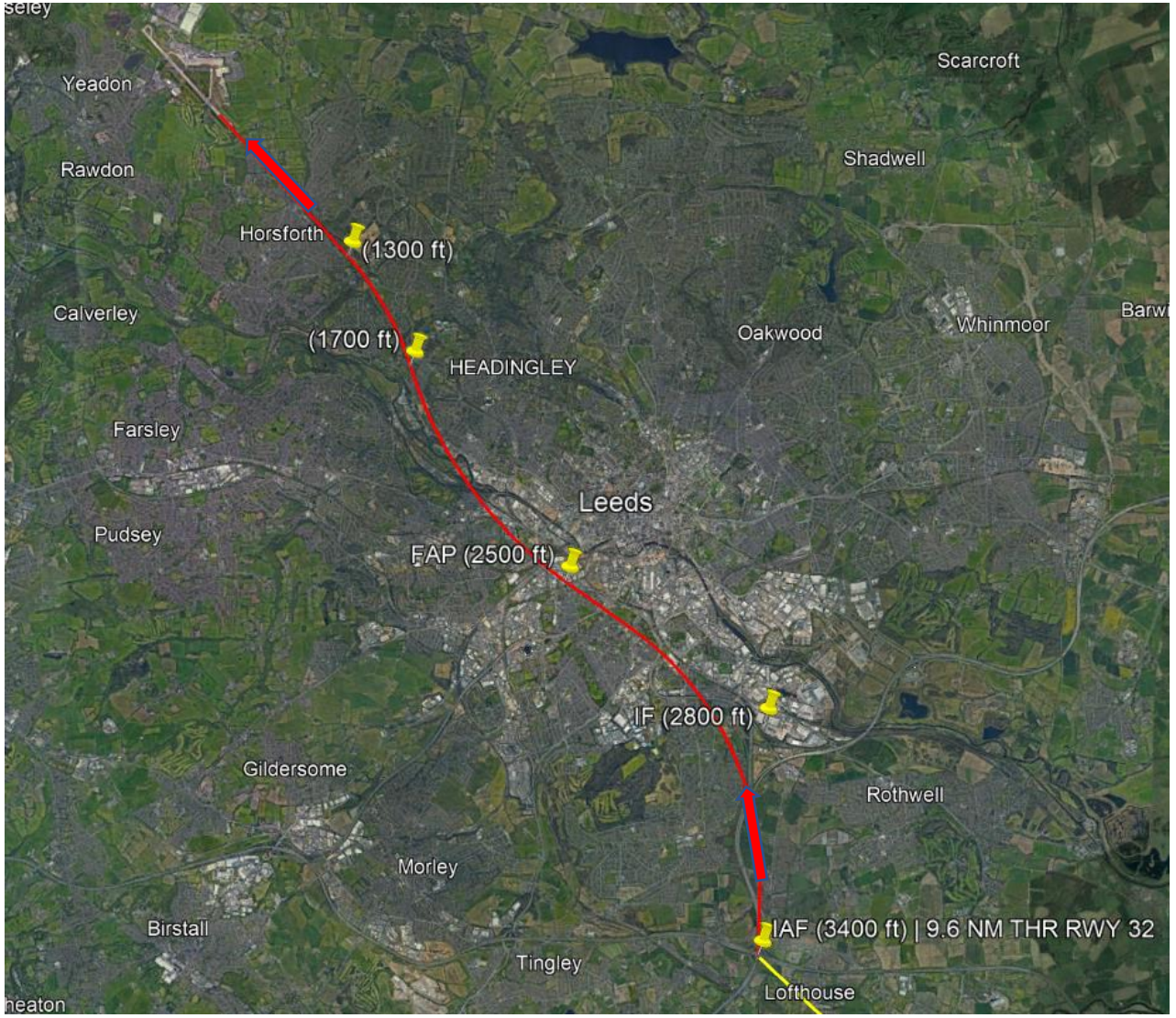
Potential respite option that could be alternated with standard approach on rotation

Potential for arrival transitions to the IAF from other arrival directions, not just GOLES



Additional Option – RNP AR – RW32

Important Note: Concept Only - Track only an indication of what might be possible. It would be optimised for noise, fuel and emissions reduction before final proposals are developed for consultation



Additional Option – RNP AR – RW14 and RW32

Option	DP1 Safety	DP2 Noise	DP3 Tranquillity	DP4 Emissions & Air Quality	DP5 Airspace Dimensions	DP6 Airspace Complexity	DP7 Technical	DP8 Systemisation	DP9 Operational Cost	DP10 AMS Realisation	DP11 PBN
RW14		NE Leeds suburbs overflown in the descent to 5000ft					Crews not currently certified to fly such approaches				Some operators would require a fleet upgrade
RW32							Crews not currently certified to fly such approaches				Some operators would require a fleet upgrade

Leeds Bradford Airport Future Airspace

Thank you for your time. We hope that you find this information on Leeds Bradford Future Airspace useful.

If you have any further queries, please address them to Airspace Change

We are very grateful for your assistance.

The Leeds Bradford ACP Team