

March 2023

An aerial photograph of Heathrow Airport at dusk. The terminal buildings are illuminated from within, and the sky is a mix of orange, pink, and blue. In the foreground, there are various airport buildings, a tall navigation aid tower, and a large aircraft on the tarmac. The overall scene is a busy airport at the end of the day.

# Airspace Modernisation: Airspace Change Proposal Step 2A Engagement on Design Principle Evaluation

Heathrow



## **DISCLAIMER:**

**The information contained within this document does not constitute a formal company position and does not necessarily reflect a final view.**

**It is provided to you to facilitate discussions with Heathrow Airport and feedback on our developing proposals. The incomplete and preliminary nature of the information should be recognised when reviewing this material.**

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**Heathrow will submit a formal submission that will be publicly available on the CAA Airspace Change Portal in 2023.**

All options in this document are subject to change throughout the airspace change process as options are matured in detail and refined in accordance with safety requirements, our Design Principles, our appraisals and stakeholder engagement and consultation.





# Agenda:

1. Purpose of the workshop
2. Recap
3. Summary of Stakeholder Feedback on the CLOO
4. Design Principle Evaluation:
  - a) CAP1616 Requirements
  - b) Heathrow's Approach
  - c) High-Level Summary & Observations

**Break**

  - d) Evaluation Methodology
5. Next Steps

## Appendix:

1. Glossary
2. List of Stakeholders Engaged
3. DPE Methodology

# Purpose of this workshop

## Today's workshop is for:

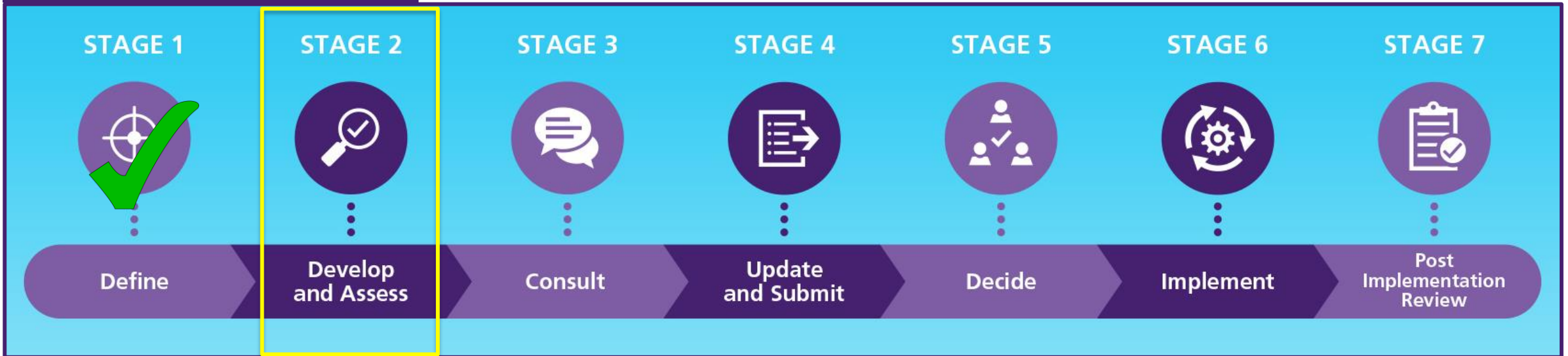
- Heathrow to share the feedback received from the Step 2A engagement on the Comprehensive List of Options
- Heathrow to explain the approach taken to the Design Principle Evaluation (DPE) and to share a summary of the results
- Stakeholders to ask questions and share their views on Heathrow's approach to the DPE

## Today's workshop is not to:

- Discuss Stage 1 elements (e.g. Design Principles)
- Discuss Stage 3 elements or the appraisal of impacts (there will be future opportunities for this)
- Discuss the wider political/regulatory landscape

# We are currently at Stage 2 of the CAA's CAP1616 Airspace Change Process

## CAP1616 PROCESS OVERVIEW



## INDICATIVE TIMELINE\*



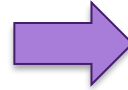
\*Timeline dependent upon ACOG Masterplan, and coordination with NATS and other airports' airspace change proposals



# Heathrow passed the CAA's Stage 1 Gateway, developing a Statement of Need and a list of Design Principles

## Step 1A: Statement of Need

"The change sponsor prepares a Statement of Need setting out what airspace or opportunity it is seeking to address"



## Step 1B: Design Principles

"The design principles encompass the safety, environmental and operational criteria and strategy policy objectives that the change sponsor aims for in developing the airspace change proposal"



Heathrow passed the Stage 1 Gateway in March 2022

### Our Design Principles for Airspace Modernisation:

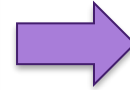
1	Our new airspace design <b>must</b>	Be safe	
2		Remain in accordance with the CAA's published Airspace Modernisation Strategy and any current or future plans associated with it and all other relevant UK policy, legislation and regulatory standards (for example, Air Navigation Guidance). This includes preventing any worsening of local air quality due to emissions from Heathrow's aircraft movements, to remain within local authorities' limits	
3		Use noise efficient operational practices to limit and, where possible, reduce adverse impacts from aircraft noise	
4		Reduce the contribution to climate change from CO2 emissions and other greenhouse gas emissions arising from Heathrow's aircraft activities	
5	And <b>should</b> also	Enable Heathrow to make the most operationally efficient and resilient use of its existing two runways, to maximise benefits to the airport, airlines and cargo handlers, passengers, and local communities	
6		Provide predictable and meaningful respite to those affected by noise from Heathrow's movements	
7	And <b>should</b> also	Seek to avoid overflying the same communities with multiple routes including those to/from other airports	
8		Contribute to minimising the negative impacts of night flights	
9	And <b>should</b> also	Keep the number of people who experience an increase in noise from the future airspace design to a minimum	
10		Keep the total number of people who experience noise from the future airspace design to a minimum	
11	And <b>should</b> also	Enable the efficiency of other airspace users' operations	
12		Minimise the impact to all stakeholders from future changes to Heathrow's airspace	

There is no prioritisation of the principles beyond this grouping into "must" and "should"

# At Stage 2 we are required to develop options and evaluate them against our Design Principles

## Step 2A: Comprehensive List of Options

*"The change sponsor develops one or more options that address the Statement of Need and align with the defined Design Principles"*



## Step 2A: Design Principle Evaluation (DPE)

*"The change sponsor produces a DPE that sets out how the design options have responded to the design principles"*

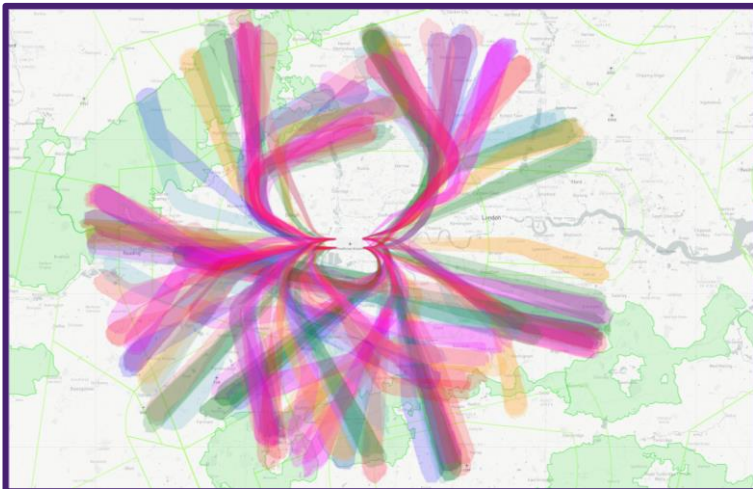
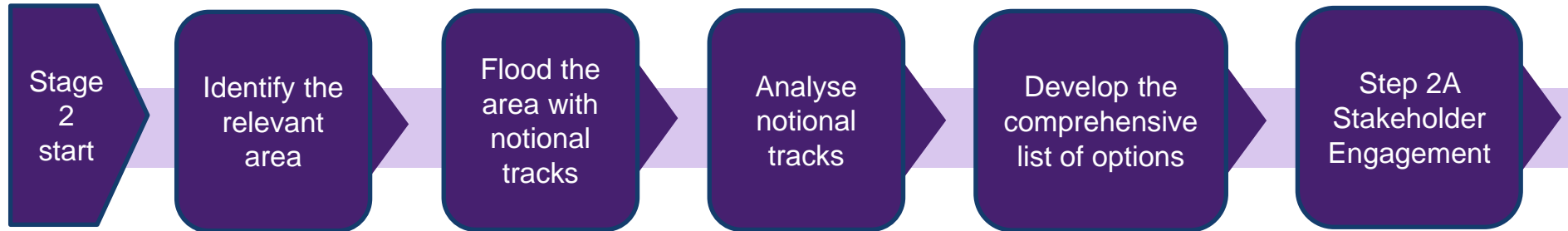
### CAP1616 Stage 2 Gateway Requirements

DEVELOP AND ASSESS GATEWAY	Status
In order for the CAA to sign-off the 'Develop and Assess' gateway:	<b>Complete</b>
<ul style="list-style-type: none"> <li>the change sponsor must have produced a comprehensive list of airspace change design options</li> </ul>	
<ul style="list-style-type: none"> <li>the change sponsor must have engaged with relevant stakeholders to explore those options to the CAA's satisfaction against the requirements in <b>Appendix C</b></li> </ul>	<b>Complete</b>
<ul style="list-style-type: none"> <li>the change sponsor must have produced a design principle evaluation that the CAA has accepted, showing how its design options have responded to the design principles</li> </ul>	<b>In progress</b>
<ul style="list-style-type: none"> <li>the change sponsor must have produced an Initial options appraisal (phase I)</li> </ul>	<b>Next Step</b>
<ul style="list-style-type: none"> <li>the CAA must have produced and then published an assessment that the options appraisal is satisfactory against the requirements in <b>Appendix E</b></li> </ul>	<b>Stage 2 Gateway August 2023</b>

Design Principle	Option A	Option B	Option C
1	Green	Green	Yellow
2	Yellow	Red	Green
3	Green	Yellow	Yellow
4	Green	Red	Green
5	Yellow	Green	Red
6	Yellow	Red	Yellow
7	Green	Green	Green
8	Green	Yellow	Yellow
9	Red	Green	Red
10	Yellow	Yellow	Yellow

**ILLUSTRATIVE EXAMPLE**

# We developed a Comprehensive List of Options to align with the Statement of Need and Design Principles



*The comprehensive list of PBN departure options*



*The comprehensive list of PBN arrival options*



*Example of Vectored arrival options*

All options are subject to change throughout the airspace change process as options are matured in detail and refined in accordance with safety requirements, our Design Principles, our appraisals and stakeholder engagement and consultation.



# We engaged on the comprehensive list of options in late 2022, as required under the CAP1616 process

CAP1616 requires that the “*change sponsor preliminary tests these [the options] with the same stakeholders it engaged with in Step 1B to ensure that they are satisfied that the design options are aligned with the design principles and that the change sponsor has properly understood and accounted for stakeholder concerns specifically related to the design options.*”

In November 2022, we held 6 workshops for community stakeholder representatives and 7 workshops for industry stakeholders. We presented our comprehensive list of options and associated concepts to all stakeholders engaged at Stage 1.

We circulated the workshop material to over 400 stakeholders, regardless of whether they attended a workshop, and provided a four-week feedback response period.

We asked stakeholders:

- For feedback on our approach to developing the comprehensive list of options;
- Whether they were satisfied that the options were aligned with the design principles; and
- For feedback on our potential concepts for respite, night flights and noise efficient operations.

In January 2023 we also conducted 2 public focus groups and 3 schools focus groups in areas local to the airport.

**Today, we will summarise the key feedback themes, our response, and any amendments we have made to the Comprehensive List of Options**

# We received feedback on the list of options from a range of community and industry stakeholder groups

Industry	FASI Airports	Local Authorities	Community Groups (e.g. LCF & NACF representatives)		Environmental Groups
American Airlines	Biggin Hill Airport	Bracknell Forest Council	Buckinghamshire Council	Local Resident Walton-on-Thames, Surrey	Clean Air Bayswater
BALPA	Farnborough Airport Ltd	Elmbridge Borough Council	Communities Against Gatwick Noise Emissions	Luton and District Association for the Control of Aircraft Noise	Chiltern Society
British Airways	London City Airport	London Borough of Hounslow	London Borough of Ealing	Molesey Residents' Association	The Chilterns Conservation Board
British Helicopter Association	London Luton Airport	Royal Borough of Kingston, London Borough of Sutton	Ealing Aircraft Noise Action Group	Pavilion Association	CPRE Oxfordshire
Delta Airlines	London Southend Airport	Mole Valley District Council	Englefield Green Action Group	Plane Hell Action South East London	Friends of Richmond Park
Lufthansa Group	MAG Stansted Airport	Newham Council	Forest Hill Society	Richmond Heathrow Campaign	Kent Downs AONB Unit
Ministry of Defence	RAF Northolt	Runnymede Borough Council	HACAN	London Borough of Richmond Upon Thames	The National Trust
NATS	London Gatwick Airport	Sevenoaks District Council	Heathrow Strategic Planning Group	Teddington Action Group	The Royal Parks
United Airlines		London Borough of Southwark	Iver Village Residents' Association	Westbourne Park Road East Resident's Association	The complete list of engaged stakeholders is provided in the Appendix
WestJet Airlines		St Albans City and District Council	London Borough of Lewisham	The Windlesham Society	
		London Borough of Waltham Forest	Local Authorities' Aircraft Noise Council	Windsor & Maidenhead Borough Council	
		Waverley Borough Council			





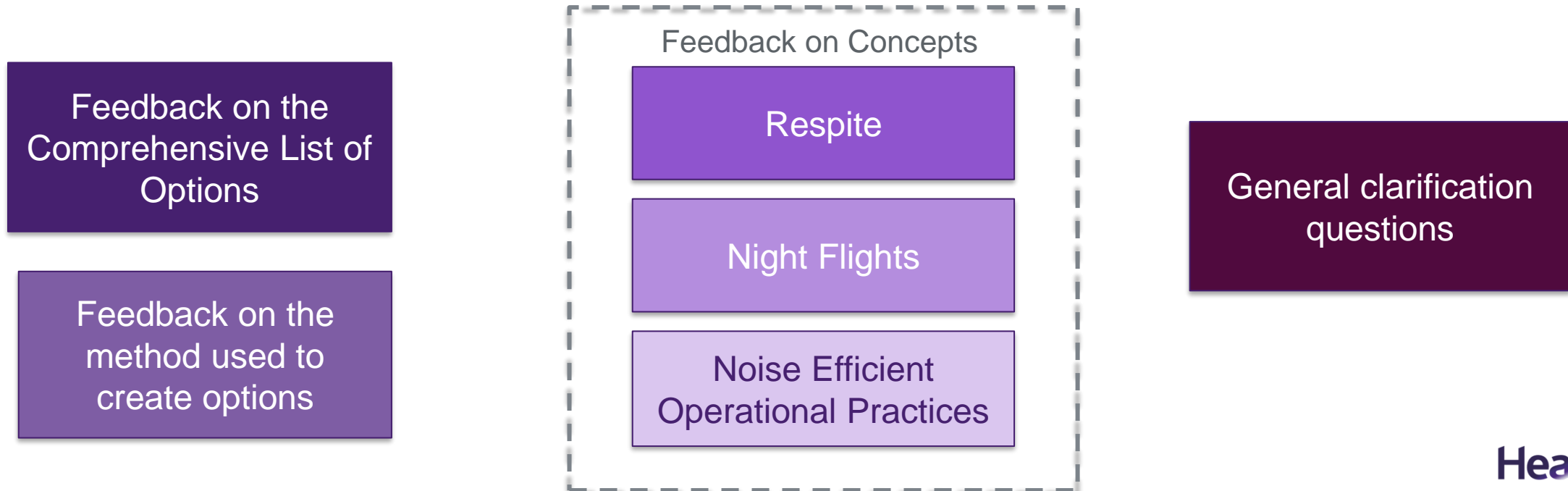
# Summary of Stakeholder Feedback on the Comprehensive List of Options



# Stakeholder feedback on the options has been categorised into 6 key themes

Much of the feedback that was received related to previous or future stages of the ACP, and therefore did not directly relate to the options we shared in the engagement material. This presentation provides a summary of only that feedback which relates to our Comprehensive List of Options, with the wider feedback to be considered by Heathrow at future stages of the ACP.

All feedback forms and associated email correspondence, including Heathrow's responses to key issues, will be in our CAA Stage 2 submission and uploaded to the CAA's Airspace Change Portal.





# Feedback related to our comprehensive list of options

The comprehensive nature of our options meant that we received only two suggestions for potential changes to the list.

	Stakeholder Feedback	Heathrow Response
1	Suggestion that the options should include a “do nothing” option	The Comprehensive List of Options does contain a 'Do Nothing' option for each runway end. It is evaluated in its own right in the DPE and retained throughout the Airspace Change Proposal for comparison purposes.
2	Suggestion that there should be an easterly departure option that does not overfly Richmond Park owing to its specific tranquil characteristics.	Added. We also considered options that do not overfly Bushy Park or Windsor Great Park: we already have an option that does not overfly Bushy Park and we would not be able to avoid Windsor Great Park without significant impact on airport throughput.



This new option was designed based on the previous departure route created for a blend of Design Principle's 2, 4, 9 & 10 and adjusted to avoid overflying Richmond Park.

# Feedback on the method used to develop options (1)

Feedback on the method used to create options

Some of the feedback included requests for more detail on how the options in the comprehensive list were developed.

	Sample of Stakeholder Feedback	Heathrow Response
1	Request for more detail on how DPs will be weighted/prioritised, and how the DPs were “blended” in the Comprehensive List of Options.	DPs have not been prioritised beyond the grouping into “must” and “should” principles. The “blended” options were created using software that compared all possible DP weighting combinations to identify the overall highest performing tracks.
2	Query whether options to meet DP9 and DP10 could be based on visitor numbers rather than population data.	We used available population data to create these options. Data on peoples’ movements to work/school/leisure facilities would be needed to develop options that take account of visitors. CAA confirmed they expect appraisals to be based on resident population data.
3	Query whether options for DP9 consider those currently overflowed who could experience additional noise/disturbance.	The options created for DP9 consider those who are currently overflowed <b>and</b> those who could be newly overflowed <u>in terms of population numbers</u> . Further assessment of the options will consider the <i>impacts</i> of noise <u>in terms of noise metrics</u> .



# Feedback on the method used to develop options (2)

Feedback on the method used to create options

	Sample of Stakeholder Feedback	Heathrow Response
4	Query why there are more departure options to the south of the airport than to the north.	There is more demand for travel to international destinations to the south and southeast of Heathrow.
5	Query why there aren't more arrival routes to the north-east.	The location of Northolt and London City airports reduces our flexibility in route positioning to the northeast, where there is very dense population. This meant that our design principle-led development of options directed us to identify options elsewhere.
6	Query whether the needs of other airports are being considered in the development of route options ("how" routes will be used as well as "where").	We continue to work closely with surrounding airports, and ACOG, to ensure our airspace designs work together as effectively as possible.
7	Query whether potentially newly overflowed communities are being actively engaged in workshops.	We engaged new stakeholders at Stage 2, including local young people and communities who might be overflowed in future. We also engaged all 77 local authorities surrounding Heathrow. We are developing our plans for wider community engagement at Stage 3, when we will undertake public consultation.

# Feedback on potential concepts

We shared a range of potential concepts for delivering:

- Respite
- Night flights
- Noise efficient operational practices

Respite		
	Sample of Stakeholder Feedback	Heathrow Response
1	Request for clearer definition of “respite”, and Heathrow’s objectives. Query the frequency and duration of breaks, and the reduced noise level, required to provide health and wellbeing benefit.	We are using industry information and research to understand how respite should be defined and the noise differentials required to benefit overflowed communities. Research will help inform the inclusion of respite concepts in this ACP. Detailed information on the planned provision of respite will be provided at the Stage 3 public consultation.
2	Support for route alternation versus the concern that route alternation will lead to more people being overflowed.	The provision of respite will lead to a degree of “sharing” of noise impacts across different communities with more people overflowed in total, compared to fewer routes overflying fewer people.
3	Concerns from industry on respite routes leading to greater complexity and a need for Heathrow to use more airspace.	We know some airline operators have concerns about the potential introduction of multiple respite routes. As our options and concepts evolve, we will work with airlines and neighbouring airports to assess feasibility, impacts and risks of route alternation.



# Feedback on potential concepts

Night Flights		
	Sample of Stakeholder Feedback	Heathrow Response
1	Request that night flights are banned (generally from 11pm to 7am).	Night flight regulations are the responsibility of Government policy and are therefore outside the scope of our ACP.
2	Support for/opposition to bespoke late running departure routes: some concern that this approach could impact surrounding airports by using more airspace.	Most stakeholders were supportive of the use of bespoke late departure routes during/after disruption, so long as these were only used when justifiable, and that Heathrow does all it can to reduce late-runners under normal operating conditions. Heathrow continues to consider the feasibility of this concept.
3	Suggestion that respite routes for night flights could potentially increase fuel burn and emissions.	The full benefits and impacts of respite routes will be assessed at Stage 3, once we have system options. Respite routes could increase emissions so this will need to be considered against the noise benefits of respite routes. Government policy is to limit and where possible reduce the adverse effects of noise.

# Feedback on potential concepts

Noise Efficient Operational Practices		
	Sample of Stakeholder Feedback	Heathrow Response
1	Request that arrivals operate CDO <sup>1</sup> , and query whether CDO is possible on curved approaches.	Arriving aircraft will continue to operate CDO and we aspire to improve CDO performance. CDO is possible on curved approaches.
2	Request that NADP <sup>2</sup> is mandated for all departures.	Research into the pros and cons of different NADPs is being led by the CAA. We will apply the findings of this work to our designs where appropriate.
3	Suggestion that imposing NADPs and steeper climb gradients needs careful consideration: some modern aircraft are designed to be quieter at shallower gradients and NADPs can lead to increased noise and carbon footprint.	
4	Request for CCO <sup>3</sup> and CDO versus a query whether benefits of these outweigh impacts on neighbouring airports.	We are aiming to achieve both CCO and CDO for all routes. Heathrow's CCO/CDO improvements should enable neighbouring airports to better achieve their noise efficient practices.

<sup>1</sup> Continuous Descent Operations

<sup>2</sup> Noise Abatement Departure Procedure

<sup>3</sup> Continuous Climb Operations

# General clarification questions

We received some general clarification requests relating to our ACP

	Sample of Stakeholder Feedback	Heathrow Response
1	Query whether ATC will continue to vector aircraft on departures above 4,000 feet.	We expect there to be less vectoring above 4,000ft than today. In our analysis of the options in Stage 2, we assume aircraft stay on the route centrelines to 7,000 feet.
2	Query why climb gradient for departures is lower than at surrounding airports.	Climb gradients have not yet been determined and may vary by departure route. We assumed a climb gradient of 5.5% as a standard comparator for developing and evaluating the options at Step 2A.
3	Request for clarity around how trade-offs between noise and carbon will be assessed (and how “disproportionate” will be defined).	Noise and carbon effects of each option will be assessed in the IOA and FOA. We will determine whether a route “would disproportionately increase CO2 emissions” based on this data and we will be open and transparent with CAA and stakeholders on our decisions.
4	Requests that Heathrow works with surrounding airports to ensure: <ul style="list-style-type: none"> <li>• Each airport can operate CDA and CCO</li> <li>• Communities are not overflowed by multiple routes</li> <li>• Best practice in PBN implementation</li> </ul>	We are working with other UK airports, via ACOG, to try to separate future flight paths, allowing aircraft to climb and descend continuously and avoiding overflying communities with multiple routes. We also engage frequently with CAA, DfT and ACOG to keep abreast of emerging best practice.





# Design Principle Evaluation



# CAP1616 requires us to undertake a Design Principle Evaluation (DPE) at Stage 2A

CAP1616 guidance for completion of the DPE states:

- The DPE is described as a “high level” assessment of how the options have performed against the Design Principles
- The design options are to be evaluated against the design principles in a fair and consistent manner

The Change Sponsor produces a DPE at Step 2A. There is no specific requirement in CAP1616 for change sponsors to carry out stakeholder engagement on the DPE, however we know that the DPE outcomes will be of interest to some of our stakeholders.

CAP1616 requires us to assess whether each Design Principle is **not met**, **partially met** or **met**. We have applied a Red, Amber, Green (RAG) assessment to illustrate the DPE results. Where assessment is not possible at this stage, the option is coloured Grey.

**There is no specific requirement in CAP1616 for change sponsors to discount ("drop") any options based on the results of the DPE.**

The DPE is a high-level assessment of the options.

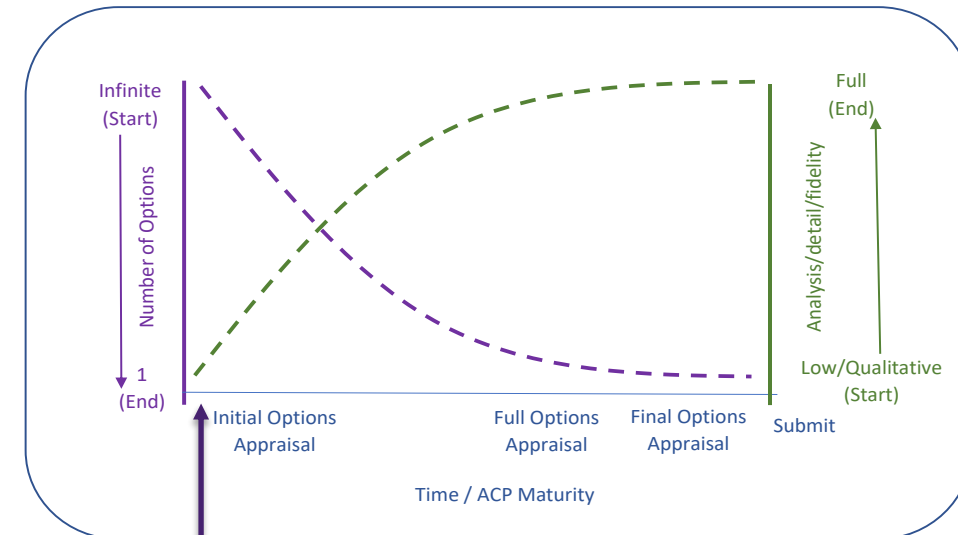
Following the DPE, Step 2B requires us to carry out an initial appraisal of the impacts of each of the options taken through the DPE, known as the Initial Options Appraisal (IOA)

# The DPE is evaluating options that will mature and evolve as we receive further information

## Challenges and Limitations of the DPE:

1. CAP1616 is not prescriptive: airport sponsors need to develop their own methodology
2. Our comprehensive list of options was created based on generic assumptions; these assumptions will change as we get more information:
  - Climb gradients
  - Other airports' airspace change proposals
  - Heathrow's future arrivals mechanism ("holding stacks")
  - Aircraft types
3. The outputs of the IOA may provide greater detail to complement the DPE results
4. **Our options will evolve** as we consider system options (arrivals and departures together, easterly operations with westerly operations) and carry out more detailed analysis during the three stages of options appraisal as indicated in the diagram

Options (and our analysis of the options) mature as we work through the ACP process



WE ARE HERE



# Our DPE provides a high-level assessment of how well our design options align with our design principles

## Our Approach

- We identified criteria for assessing each option against each Design Principle
- A “do nothing” option was assessed as an option in its own right
- Where relevant data was available, a quantitative assessment was undertaken. Otherwise, a qualitative assessment was applied

## DPE Results

- Many of the options emerged as **amber**. This **validates the need to carry out greater analysis of options** in the IOA
- Options assessed as **red** perform worse than other options for that particular criterion: it is not always an indicator that the option should be discounted

## Further Analysis

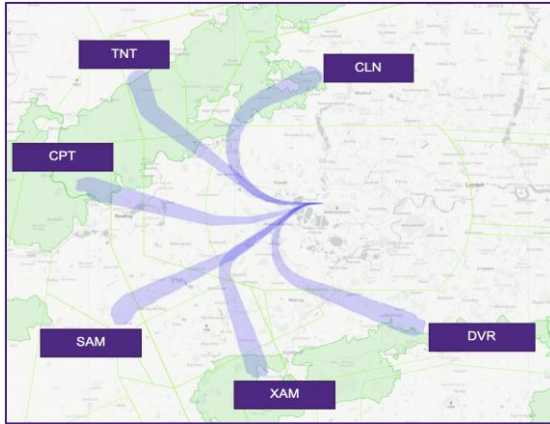
- Due to the high-level nature of the DPE, **we are not discounting any new options based on the DPE alone**
- We will consider the DPE and IOA results together to understand the likely **impact** of the options

**Quantitative analysis:** based on numerical data and metrics

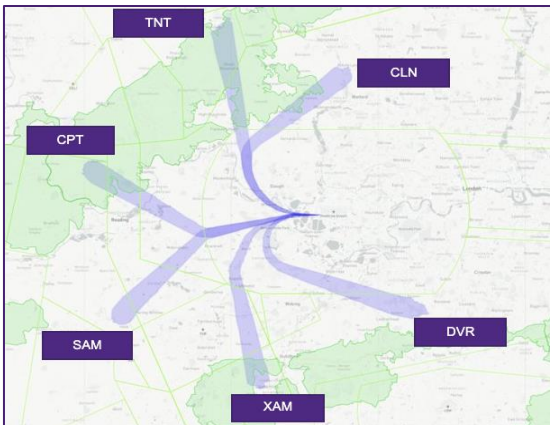
**Qualitative analysis:** based on observations and expertise of the technical team, including non-numerical information such as air traffic control procedures or other airports' design options

# The comprehensive list of flight path options were re-named for analysis in the DPE

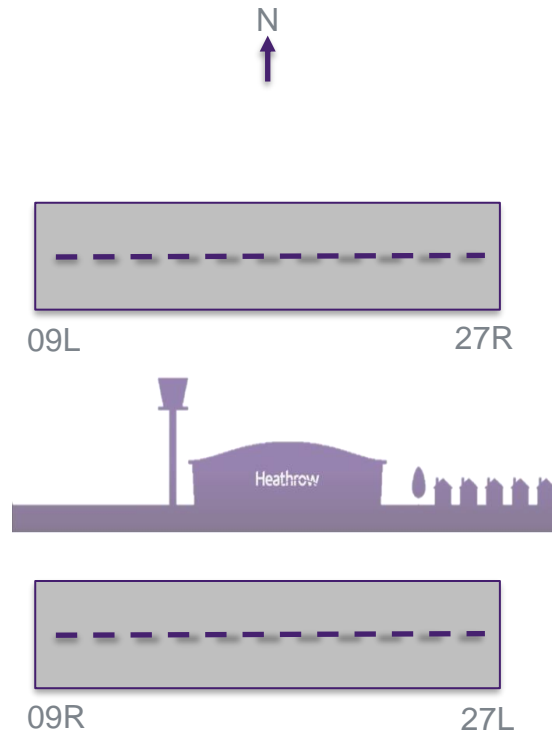
Example: Options created for Design Principle 2 were re-named as Option A in the DPE.  
For PBN Departures, options were assessed as groups of six departure routes.



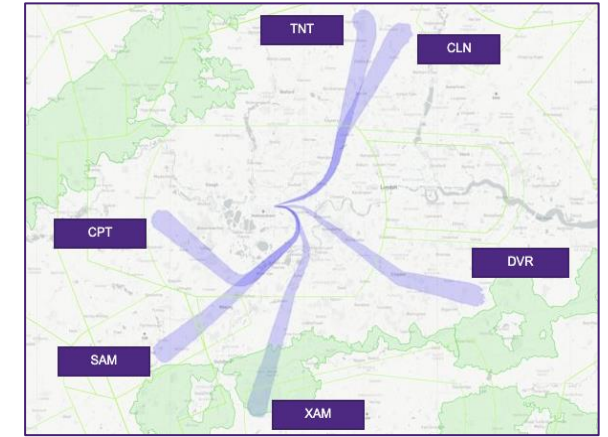
27R Option A for Design Principle 2



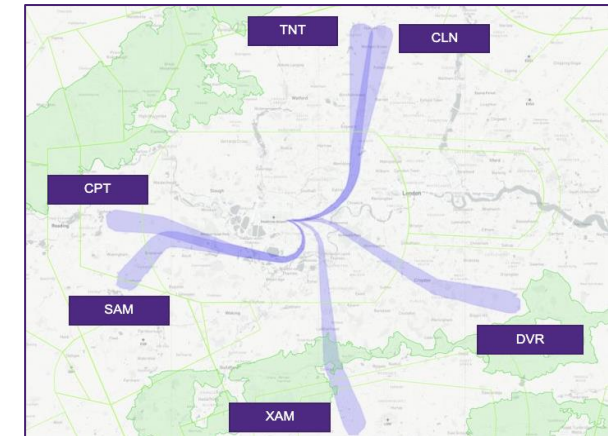
27L Option A for Design Principle 2



These options were designed to minimise the number of people exposed to noise up to 7,000ft, whilst also considering CO<sub>2</sub> and AONBs



09L Option A for Design Principle 2



09R Option A for Design Principle 2





# The high-level summary provides an initial view of how the options perform against the Design Principles

The table summarises DPE results for groups of departure options from the southern runway when on westerly operations (runway 27L).

The “do-nothing” option performs poorly for DP2 and DP3 and is generally the worst performing option.

DP6 relates to respite. DP8 relates to night flights. These are grey because assessment is not possible at this stage.

Design Principle	'Do Nothing'	Option A	Option B	Option C	Option D	Option E	Option F	Option G	Option H
1	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
2	Red	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
3	Red	Green	Green	Green	Green	Green	Green	Green	Green
4	Red	Red	Yellow	Green	Green	Red	Yellow	Red	Red
5	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
6	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey
7	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
8	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey
9	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
10	Grey	Green	Green	Yellow	Yellow	Yellow	Yellow	Green	Green
11	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
12	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow

Most options perform well for DP3 (noise efficient operational practices).

Options that are red for carbon (DP4) were created with noise principles in mind. This illustrates the trade-off between noise and carbon.

The options appear to perform well against DP 10 which is keeping the total number of people who experience noise to a minimum.

Options shown in this document are subject to change throughout the airspace change process as the level of analysis becomes more detailed and additional information is received





**BREAK**

Heathrow



# The approach to the DPE varied by option type

All options have been evaluated per single runway operation, not as a complete system of westerly and easterly departures and arrivals to/from both runways. This allows us to consider many more options for a final solution. **There are 181 options in total.**

## PBN Departures

For the development of the Comprehensive List of Options, flight paths for departures from all 4 runway ends to each of the **six** common network points (SIDs) were assembled using **inputs for each design principle.**

All six SIDs need to be sufficiently separated from each other. Therefore, the assessment of PBN departure flight paths is shown **as a collective group of six SIDs per Option.**



PBN Departure Option A for Runway 27L

## PBN Arrivals

For the development of the Comprehensive List of Options, flight path options for **PBN arrivals** were assembled using **inputs for each design principle.**

PBN arrival options have been evaluated as individual route options. This enables us to consider whether it would be technically feasible and beneficial to use any one or more routes **for arrivals during less busy times.**



PBN Arrival Option A for Runway 27L

## Vectored Arrivals

For the development of the Comprehensive List of Options, **vectored** arrival options were assembled based on **the direction we expect arriving aircraft to come from.**

Vectored arrival options have been **assessed in distance bands** (nautical miles) from the runway, to help us determine whether it would be beneficial and/or feasible to use different vectoring areas during different periods to provide respite or relief from noise.



Vectored Arrival Option A for Runway 27L



# A RAG status was assigned for each design principle, based on quantitative and qualitative analysis

## Quantitative Analysis:

- Where the Design Principle can be measured using numerical metrics, we ranked each option by percentile ranges.
- For example, when assessing the 'overall mileage' metric, the option with the highest track miles equals 100% and the option with the lowest track miles equals 0%. All other options are given a percentile within this range.

Design Principle	Detailed Criteria	Option A	Option B	Option C	Option D	Option E	Option F
Design Principle Number	Quantitative Assessment:	454.8	441.0	432.8	437.7	450.3	445.7
		<b>100%*</b>	<b>37%*</b>	<b>0%*</b>	<b>22%*</b>	<b>80%*</b>	<b>59%*</b>
		Within highest 25 <sup>th</sup> percentile	Within middle 50 <sup>th</sup> percentile	Within lowest 25 <sup>th</sup> percentile	Within lowest 25 <sup>th</sup> percentile	Within highest 25 <sup>th</sup> percentile	Within middle 50 <sup>th</sup> percentile
		<b>Not Met</b>	<b>Partially Met</b>	<b>Met</b>	<b>Met</b>	<b>Not Met</b>	<b>Partially Met</b>

\*Indicative percentile range 0%-100% across all options

**ILLUSTRATIVE**

## Qualitative Statements:

- Where the Design Principle cannot be assessed using numerical metrics, the technical team undertook a high-level qualitative assessment.
- Qualitative statements are set out in the DPE methodology slides in the Appendix of this slide pack.


If **neither** a Qualitative or Quantitative assessment was possible at this stage, this was shown as **N/A** and the cell is **Grey**

# The DPE Methodology assesses all options against criteria set for each of the Design Principles

- The DPE assesses all options against the 12 Design Principles for PBN departures, PBN arrivals, and vectored arrivals using this process:




- The tables on the following slides present an example of the DPE methodology applicable to PBN departures, PBN arrivals and vectored arrivals for Design Principle 4 and Design Principle 2.

DP	Detailed Criteria	Approach to Evaluation	Quantitative / Qualitative	Met	Partially Met	Not Met
4. 	Reduce the contribution to climate change from CO2 emissions and other greenhouse gas emissions arising from Heathrow's aircraft activities	Consider track length (nautical miles) from runway end to the relevant point in the upper airspace network.*	Quantitative	Within lowest 25 <sup>th</sup> percentile	Within middle 50 <sup>th</sup> percentile	Within highest 25 <sup>th</sup> percentile.

\*For PBN Vectored Arrivals it is not possible to assess the option against this criteria until we receive additional information from NATS about Heathrow's future arrivals mechanism ("holding stacks")

# The Airspace Modernisation Strategy is separated in Design Principle 2 as the key driver of airspace change

DP	Detailed Criteria	Approach to Evaluation	Quantitative / Qualitative	Met	Partially Met	Not Met
2.	Safety	DP1 outcome used to evaluate this	Qualitative	DP1 evaluation	DP1 evaluation	DP1 evaluation
	Integration of diverse airspace users	DP11 outcome used to evaluate this	Qualitative	DP11 evaluation	DP11 evaluation	DP11 evaluation
	Simplification of airspace, improving efficiency	DP5 outcome used to evaluate this	Qualitative	DP5 evaluation	DP5 evaluation	DP5 evaluation
	Environmental sustainability	DP2, DP3, and DP4 outcomes used to evaluate this	Qualitative & Quantitative	Evaluated in DP2, DP3, and DP4 and outcome met all three DPs.	Evaluated in DP2, DP3, and DP4 with mixture of Met, Partially Met and Not Met outcome.	Evaluated in DP2, DP3, and DP4 and outcome did not meet the criteria.
	<b>Overall AMS Evaluation (as required by the CAA)</b>			<b>All 4 AMS outcomes Met</b>	<b>All 4 evaluations Partially Met or mix of Met/Not Met</b>	<b>All 4 AMS outcomes Not Met</b>
	Minimise and where possible reduce, the total negative impacts on health and wellbeing from aircraft noise, and, assess against DfT's altitude-based priorities	Evaluate the population exposed to 70dB SEL	Quantitative	Within lowest 25 <sup>th</sup> percentile	Within middle 50 <sup>th</sup> percentile	Within highest 25 <sup>th</sup> percentile
		Number of people overflown (between 0-4000ft, at least once per day on average)	Quantitative	Within lowest 25 <sup>th</sup> percentile	Within middle 50 <sup>th</sup> percentile	Within highest 25 <sup>th</sup> percentile
		Number of people overflown (between 4-7,000ft, at least once per day on average)	Quantitative	Within lowest 25 <sup>th</sup> percentile	Within middle 50 <sup>th</sup> percentile	Within highest 25 <sup>th</sup> percentile
		Track mileage between runways and points within the network*	Quantitative	Within lowest 25 <sup>th</sup> percentile	Within middle 50 <sup>th</sup> percentile	Within highest 25 <sup>th</sup> percentile

\*For PBN Vectored Arrivals it is not possible to assess the option against this criteria until we receive additional information from NATS about Heathrow's future arrivals mechanism ("holding stacks")

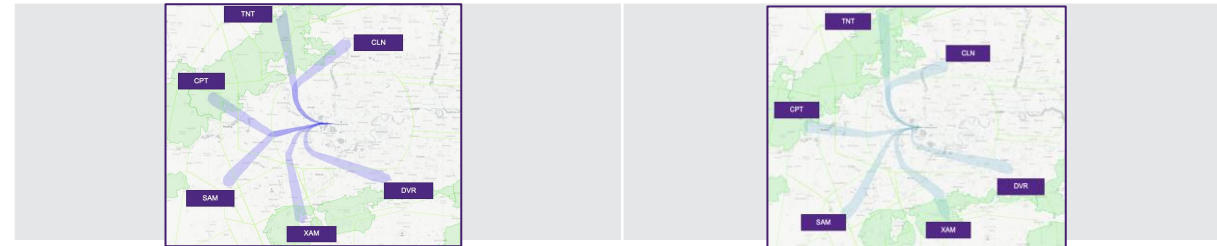


# Design Principle 2 is broken down further into more detailed criteria relating to environmental factors

DP	Detailed Criteria	Approach to Evaluation	Quantitative / Qualitative	Met	Partially Met	Not Met
2.	Tranquillity	The area (km <sup>2</sup> ) of AONBs and National Parks overflown	Quantitative	Within lowest 25 <sup>th</sup> percentile	Within middle 50 <sup>th</sup> percentile	Within highest 25 <sup>th</sup> percentile
		The area (km <sup>2</sup> ) of Historic Parks and Gardens overflown	Quantitative	Within lowest 25 <sup>th</sup> percentile	Within middle 50 <sup>th</sup> percentile	Within highest 25 <sup>th</sup> percentile
		Overfly Richmond Park at least 20 times per day, on average below 7,000ft ( <b>PBN departures options and vectored arrivals options</b> ). Overfly Richmond Park at least once a day between 0430-0600, below 7,000ft ( <b>PBN Arrivals options</b> )	Qualitative	Option not expected to overfly Richmond Park 20 times per day for <b>PBN Departures/ Vectored Arrivals options</b> , or at least once a day for <b>PBN Arrivals options</b>	N/A	Option expected to overfly Richmond Park 20 times per day for <b>PBN Departures/ vectored options</b> , or at least once a day for <b>PBN Arrivals options</b>
	Ecology and/or biodiversity	The area (km <sup>2</sup> ) of SPA, SACs and/or SSSIs overflown	Quantitative	Within lowest 25 <sup>th</sup> percentile	Within middle 50 <sup>th</sup> percentile	Within highest 25 <sup>th</sup> percentile.
	Prevent any worsening of air quality, to remain within local authorities' limits	If an option has a change to flightpaths below 1,000ft it will be evaluated as 'Partially Met' but requires further analysis to determine the scale of the impact on local air quality. If an option has no change to flightpaths below 1,000ft it will be evaluated as 'Met'	Qualitative	Option unlikely to affect local air quality	Option has potential to affect local air quality below 1,000ft.	N/A
<b>Overall DP 2 Evaluation</b>				<b>All evaluations Met</b>	<b>All evaluations Partially Met or a mix of Met/Not Met</b>	<b>All evaluations Not Met</b>



# Criteria were created for the assessment of each Design Principle



DP	Design Principle	Detailed Criteria	Option A	Option B
4.	Reduce the contribution to climate change from CO2 emissions and other greenhouse gas emissions arising from Heathrow's aircraft activities	Track length from runway end to relevant point in the upper airspace network (nautical miles)	Option within highest 25 <sup>th</sup> percentile	Option within middle 50 <sup>th</sup> percentile
Overall Assessment for DP4			Not Met	Partially Met



Options shown in this document are subject to change throughout the ACP as the level of analysis becomes more detailed and additional information is received

**ILLUSTRATIVE**

# Some Design Principles were broken down into multiple criteria for assessment

DP	Detailed Criteria		Option A	Option B
2.	AMS Objectives	Safety	Expected to maintain/improve existing levels of safety: further assurance required	Expected to maintain/improve existing levels of safety: further assurance required
		Integration of diverse airspace users	Mixed impacts on other airspace users	Mixed impacts on other airspace users
		Simplification of airspace, improving efficiency	Likely to maintain operational efficiency	Likely to maintain operational efficiency
		Environmental sustainability	Mixed environmental impacts	Mixed environmental impacts
	<b>Overall AMS Evaluation (required by the CAA)</b>		<b>All 4 evaluations Partially Met</b>	<b>All 4 evaluations Partially Met</b>
	Minimise/reduce negative impacts on health & wellbeing from aircraft noise & altitude-based priorities	Population exposed to 70dB SEL	Option within lowest 25 <sup>th</sup> percentile	Option within lowest 25 <sup>th</sup> percentile
		No. of people overflown (0-4000ft, >once/day)	Option within lowest 25 <sup>th</sup> percentile	Option within lowest 25 <sup>th</sup> percentile
		No. of people overflown (4000-7000ft, >once/day)	Option within lowest 25 <sup>th</sup> percentile	Option within middle 50 <sup>th</sup> percentile
		Track mileage between runways and network points	Option within highest 25 <sup>th</sup> percentile	Option within middle 50 <sup>th</sup> percentile
	Tranquillity	AONBs/ National Parks (Total km <sup>2</sup> )	Option within lowest 25 <sup>th</sup> percentile	Option within lowest 25 <sup>th</sup> percentile
		Historic Parks & Gardens, public parks (Total km <sup>2</sup> )	Option within lowest 25 <sup>th</sup> percentile	Option within lowest 25 <sup>th</sup> percentile
		Richmond Park (overflight 20x per day* on average)	Does not overfly Richmond Park	Does not overfly Richmond Park
	Ecology/ Biodiversity	Total km <sup>2</sup> of SPA, SAC, SSSI (0-3000ft)	Option within middle 50 <sup>th</sup> percentile	Option within middle 50 <sup>th</sup> percentile
	Prevent any worsening of air quality, to remain within local authorities' limits		Potential impact to AQ <1000ft	Potential impact to AQ <1000ft
	<b>Overall Assessment for DP2</b>		<b>Mix of Met/Not Met</b>	<b>Mix of Met/Not Met</b>



Options shown in this document are subject to change throughout the ACP as the level of analysis becomes more detailed and additional information is received

\* At least once a day between 0430-0600 period for PBN arrivals





# Next Steps

# Next Steps

Following this session, we will produce an Initial Options Appraisal (IOA).

The results of our IOA will be shared with you prior to our Stage 2 submission, and the DPE and IOA outputs will be published on the CAA's Airspace Change Portal.

CAP1616	2021	2022	2023	2024	2025	2026	2027	2028	2029
Stage 1 Define									
Stage 2 Develop & Assess			WE ARE HERE						
Stage 3 Consult									
Stage 4 Update & Submit									
Stage 5 CAA Decide									
Stage 6 Implement									

**INDICATIVE**

Note: The progress of our ACP is dependent on the progress of other airports, NATS, and the Masterplan which is being developed by the Airspace Change Organising Group (ACOG)



# Thank you for your engagement

We will provide you with:

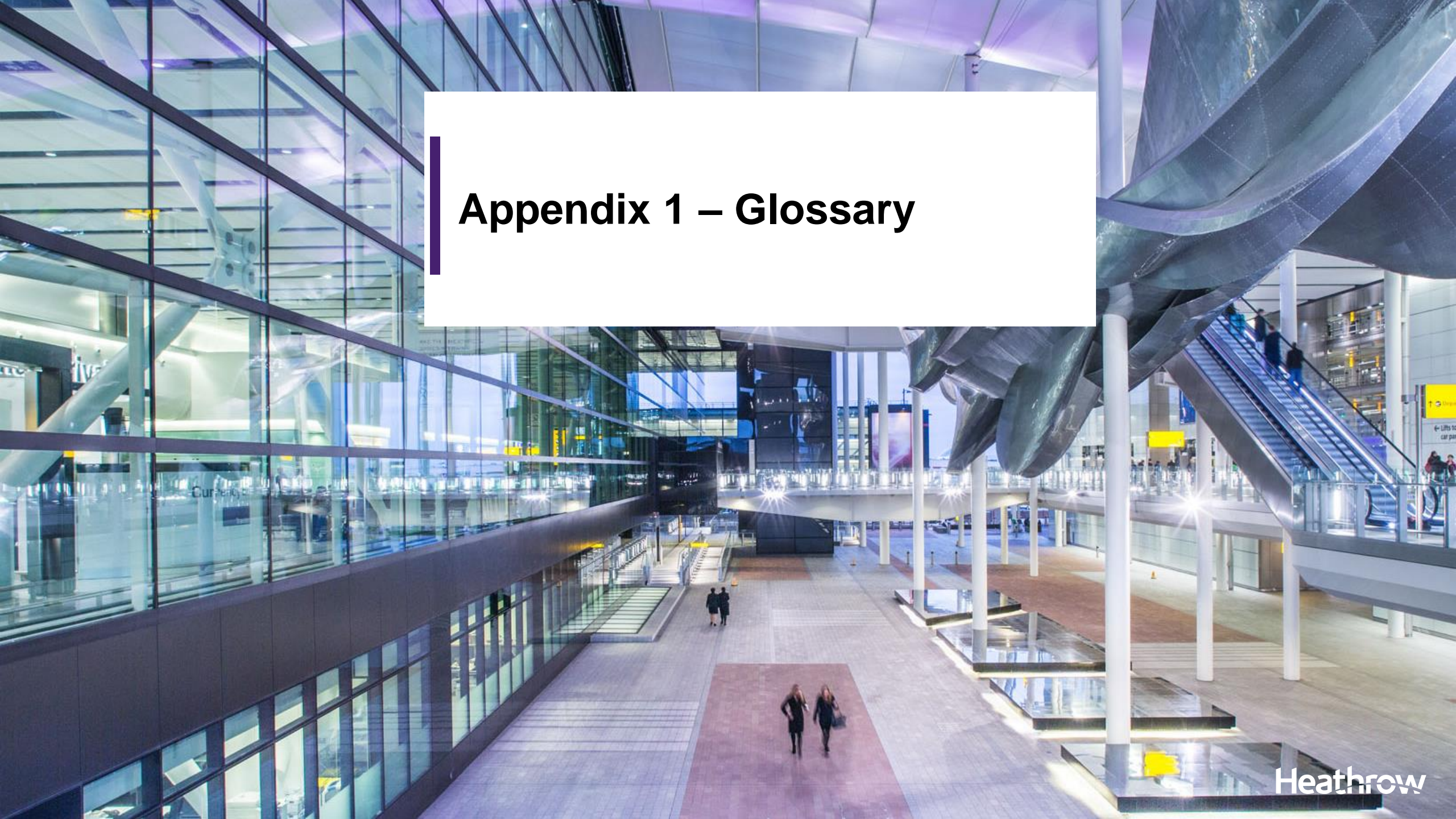
1. A copy of this presentation
2. A Technical Appendix with maps of the options and summary tables showing the results of the Design Principle Evaluation

As always, we are open to receiving comments and questions on the material shared today. Please email any feedback to: [airspace@heathrow.com](mailto:airspace@heathrow.com)

All Stage 2 work, including evidence of engagement with stakeholders, will be submitted to the CAA in Summer 2023 and published on the Airspace Change Portal.

**We welcome comments and questions on our approach to the DPE and DPE outputs at this stage, not on the specific geographical areas or potential impacts of the flight path options. This discussion will take place at Stage 3 once we have more information to share about the options.**





# Appendix 1 – Glossary



# Glossary

Term	Description
ACP Sponsor	An organisation that proposes, or sponsors, a change to the airspace design in accordance with the CAA's airspace change process. Heathrow is the sponsor of this airspace change.
Advanced Air Mobility (AAM)	Advanced Air Mobility is an air transport system concept that integrates new, transformational aircraft designs and flight technologies into existing and modified airspace operations. This includes electric aircraft (e.g. air taxis), and small unmanned aircraft systems (drones).
Airspace Change Organising Group (ACOG)	<a href="#">ACOG</a> was established in 2019 at the request of the DfT and CAA to coordinate the delivery of key elements of the UK's Airspace Modernisation Strategy. ACOG is a fully independent organisation and is responsible for coordinating airports' individual airspace changes via an Airspace Modernisation Masterplan.
Airspace Change Portal	The CAA's <a href="#">Airspace Change Portal</a> is a publicly-accessible website where all ACP Sponsors are required to upload information on their ACPs.
Airspace Change Process	The CAA's airspace change process is known as ' <a href="#">CAP1616</a> '. The process is designed to ensure that the CAA meets modern standards for regulatory decision-making, and is fair, transparent, consistent and proportionate. The process ensures that when the CAA decides whether or not to approve a proposal to change UK airspace, it does so in an impartial and evidence-based way that takes proper account of the needs and interests of all affected stakeholders.
Airspace Change Proposal (ACP)	Airspace change proposals (ACPs) are requests from a 'change sponsor', usually an airport or a provider of air navigation services (including air traffic control), to change the notified airspace design. ACPs must follow the CAA's CAP1616 airspace change process.
Airspace Modernisation Strategy (AMS)	The <a href="#">Airspace Modernisation Strategy</a> , or AMS, is co-sponsored by the CAA and DfT. It sets out the 'ends', 'ways' and 'means' of modernising the design, technology and operations of airspace. A nationwide airspace modernisation programme is underway across UK airports in support of the AMS.
Air Traffic Control (ATC)	Air Traffic Control, or ATC, is a service provided by ground-based air traffic controllers who direct aircraft on the ground and through a given section of controlled airspace, and can provide advisory services to aircraft in non-controlled airspace.
Altitude Based Priorities	To assist the CAA and sponsors, the Government has laid out (in Air Navigation Guidance, or ANG) the altitude-based priorities which should be taken into account when considering the potential environmental impact of airspace changes. These refer to consideration of noise, CO2 emissions, AONBs and local circumstances.

# Glossary

Term	Description
Area of Outstanding Natural Beauty (AONB)	An area of outstanding natural beauty is an area of countryside in England, Wales or Northern Ireland that has been designated for protection by the Countryside and Rights of Way Act 2000 (CROW Act) due to its significant landscape value. The Act protects the land to conserve and enhance its natural beauty.
Biodiversity	Biodiversity is the variety of all life on Earth including all species of animals and plants. Biodiversity supports the vital benefits humans get from the natural environment.
CAP1616	<a href="#">CAP1616</a> is the CAA's airspace change process guidance, introduced in December 2017. CAP1616 established additional CAA scrutiny and validation of sponsors' work and evidence as they develop proposals; increased requirements relating to transparency and engagement; and introduced new opportunities for those impacted by proposals to have their voices heard.
Civil Aviation Authority (CAA)	The CAA is the UK's aviation regulator, overseeing and regulating all aspects of civil aviation in the UK. The Secretary of State for Transport placed a statutory duty upon the CAA to have a strategy and plan for modernising airspace.
Climb Gradient	The climb gradient is how steeply the aircraft climbs on departure. It is the ratio between distance travelled over the ground and altitude gained and is usually expressed as a percentage.
Controlled Airspace (CAS)	A defined area of airspace in which Air Traffic Control (ATC) services are provided. Controlled airspace usually exists in the immediate vicinity of busier airports and at higher <a href="#">levels</a> where air transport flights would tend to cruise.
Comprehensive List of Options (CLOO)	Airspace change sponsors are required to develop a Comprehensive List of Options at Stage 2 of the CAP1616 process. The CLOO should include a comprehensive set of airspace design options that address the Statement of Need and align with the Design Principles set at Stage 1.
Continuous Climb Operations (CCO)	CCO is a noise efficient departure procedure whereby the aircraft climbs continuously to its cruising level without levelling off. Heathrow's Comprehensive List of Options assumes that aircraft will perform a CCO to at least 7,000ft.
Continuous Descent Operations (CDO)	CDO is a noise efficient arrival procedure whereby the aircraft descends continuously from its cruising level without levelling off. Heathrow's Comprehensive List of Options assumes that aircraft will perform a CDO from at least 7,000ft.
Department for Transport (DfT)	The Department for Transport (DfT) is the UK Government department responsible for the English transport network (and a limited number of transport matters in Scotland, Wales and Northern Ireland that have not been devolved).



# Glossary

Term	Description
Design Principle (DP)	Design Principles encompass the objectives that the airport seeks to achieve through the airspace change, including safety, policy, environmental and operational factors. Design Principles are set through engagement with stakeholders at Stage 1, and they guide the airspace designers to create suitable flight path options at Stage 2.
Design Principle Evaluation (DPE)	The Design Principle Evaluation is a requirement of the CAP1616 airspace change process at Stage 2. It involves assessing the Comprehensive List of Options against each Design Principle.
Easterly Alternation	A Heathrow project to enable respite from noise through runway alternation when on easterly operations. The timescales to deliver full easterly alternation will be subject to both this ACP and the separate process for seeking permission for associated groundworks.
FASI	Heathrow is part of the 'Future Airspace Strategy Implementation-South' programme to re-design airspace in the south of the UK. There is also a 'FASI-N' programme for the north of the UK.
Flight Path Options	Flight path options are operationally viable (flyable) flight paths developed by Heathrow's technical airspace team.
Full Options Appraisal (FOA)	The FOA is required at Stage 3A of the CAP1616 process. It involves a quantitative assessment of the shortlist of flight path options.
Heathrow Expansion	A Heathrow project to build a new third runway to the north-west of the existing two runways and re-design the airspace to accommodate it. Heathrow was previously progressing airspace modernisation via its Airspace Change Proposal (ACP) for airport expansion and we consulted widely on these plans in 2018 and 2019. This project has remained on pause since 2020.
Holding Stack	Holding stacks are areas of airspace used as a waiting room which allow air traffic controllers to organise the planes before they land. Heathrow has four holding stacks located over navigation beacons that lend them their names. The locations of Heathrow's stacks have been the same since the 1960s.
Initial Options Appraisal (IOA)	The IOA is required at Step 2B of the CAP1616 process. It involves an assessment of the impacts (costs and benefits) of each of the viable options. The appraisal must use TAG, the DfT's appraisal guidance, which includes consideration of environmental impacts, economic impacts and health impacts associated with noise.
NATS En-Route Limited (NERL)	NATS is the air navigation service provider responsible for the UK's airspace above 7,000ft, and at many airports (including at Heathrow). NATS is the parent company of NERL who provide ATC services to aircraft flying in airspace over the UK and the eastern part of the North Atlantic.

# Glossary

Term	Description
Nautical Miles (nm)	A nautical mile is a unit of length used in air, marine and space navigation.
Night Flights	<p>There is no formal ban on night flights at Heathrow, but the Government has placed restrictions on them since the 1960s. Night-time (23:30 - 06:00) operations at Heathrow are heavily restricted by the Government, which sets a limit of 5,800 night-time take-offs and landings a year. A night quota limit is also in place, which caps the amount of noise the airport can make at night.</p> <p>Around 80% of the night flights at Heathrow are between 04:30 - 06:00 with an average of 16 aircraft arriving each day between these hours. Heathrow has a voluntary ban in place that prevents flights from landing before 04:30. We also do not schedule any departures between 23:00 and 06:00.</p>
Noise Abatement Departure Procedures (NADP1 / NADP2)	A noise abatement departure procedure defines the height at which the flight crew will reduce engine power after take-off and the height at which acceleration from the take-off speed commences. The balance between how much energy is put into gaining altitude and speed, and at what altitudes power reduction and acceleration are initiated, and in what order, impacts the noise footprint of the aircraft. ICAO guidance provides two examples: NADP1 and NADP2.
Noise Efficient Operational Practices	Noise efficient operational practices are considered to be: Continuous Climb Operations (CCO), Continuous Descent Operations (CDO), Noise Abatement Departure Procedures (NADPs), Steeper Approaches, Steeper Climbs, Landing Gear Deployment and Low Power Low Drag.
Notional Tracks	Notional tracks are lines drawn to/from a runway end to/from a point in the airspace network. They are based on basic principles of airspace design, but they cannot be considered 'flyable' flight paths. They are used to collect data on the areas that would be "overflown" by them.
Overflight	CAA's <a href="#">CAP1498</a> document sets out a definition of overflight for use in ACPs. "Overflown" is defined as "an aircraft in flight passing an observer at an elevation angle of 48.5° from the ground at an altitude below 7000ft" (CAA). The overflight metric enables the number of overflights experienced at locations on the ground to be calculated according to the agreed definition.
Overflight Cones	The CAA's <a href="#">CAP1498</a> document states that overflight above a given location should be measured using a cone. The cone identifies the airspace above a given location within which an aircraft might be perceived as "overflying" that location. This is because an aircraft does not need to be directly overhead to have an impact (noise and/or visual) on the local population.
Parks and Gardens	Areas of land designed, constructed, managed and maintained as a public park or garden. These normally have a defined perimeter and free public access, and generally sit within or close to urban areas.

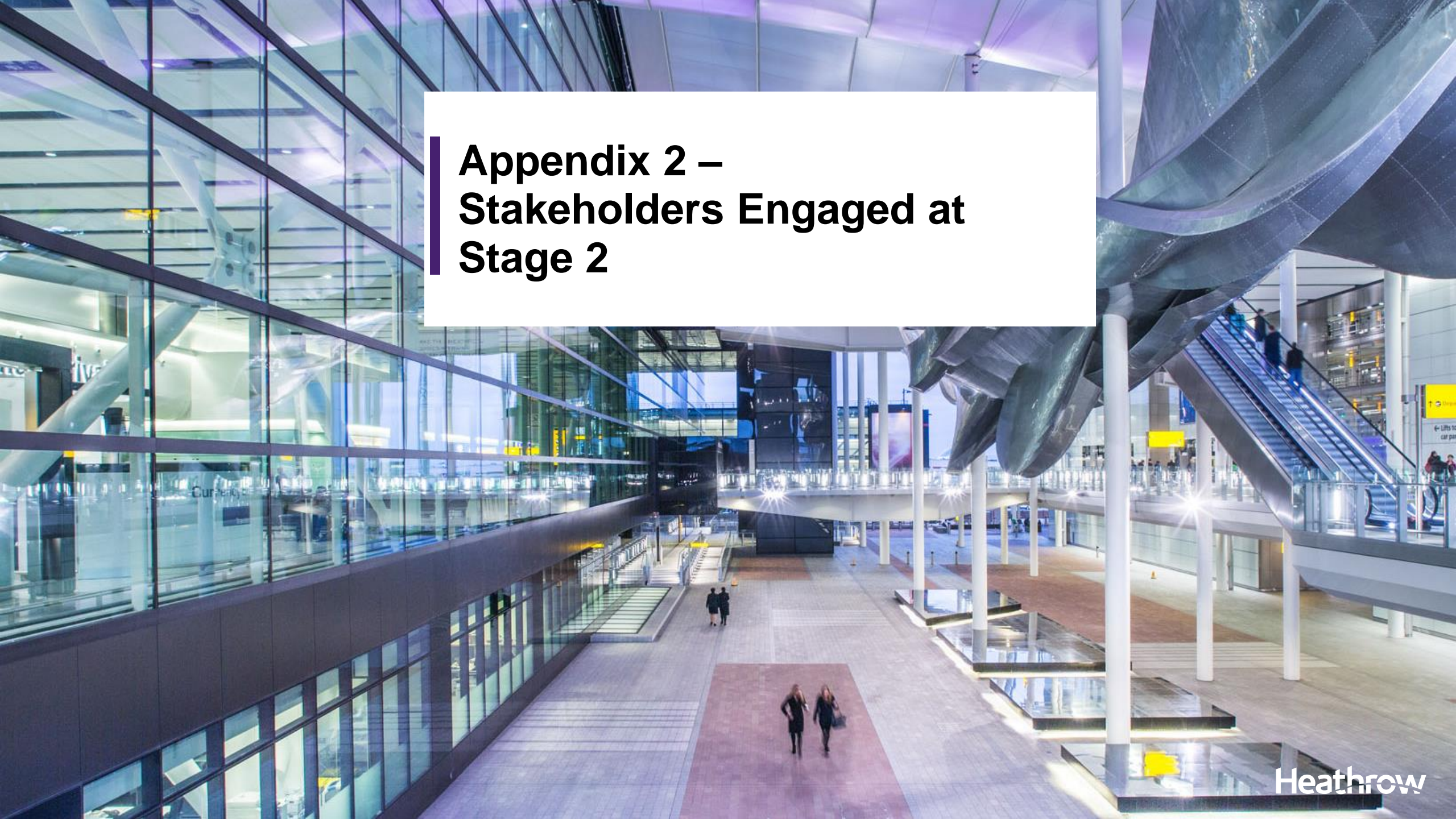
# Glossary

Term	Description
Percentile Range	A percentile range is between 0% and 100%. We have applied percentile ranges to options when using numerical (quantitative) metrics. The highest number for a given metric will score 100% and the lowest will score 0%. All other options are then assigned a percentile within this range.
Performance Based Navigation (PBN)	PBN improves the accuracy of where aircraft fly by using modern satellite navigation and moving away from outdated and conventional navigation techniques using ground-based beacons (it is similar to GPS "sat nav" devices that most people use in their cars today). PBN is being adopted worldwide through International, Regional and State level initiatives and regulations.
Qualitative Analysis	A method of assessment based on observations and expertise, including non-numerical information such as air traffic control procedures or other airports' design options.
Quantitative Analysis	A method of assessment based on numerical data and metrics.
Relief	A break from, or a reduction in, aircraft noise.
Respite	Scheduled relief from aircraft noise for a set period of time.
Sites of Special Scientific Interest (SSSI)	An SSSI is an area that is of particular interest to science due to the rare species of fauna or flora it contains - or important geological or physiological features that may lie in its boundaries. These areas have high conservation value and need to be protected. Natural England is the official authority in England determining which sites have SSSI status.
Special Areas of Conservation (SAC)	Protected areas in the UK designated under UK Government environmental regulations. These sites are classified as making a significant contribution to conserving habitats and species identified in the <a href="#">Habitats Directive</a> .
Sound Exposure Level (SEL)	Occasional loud noise is measured in the UK by Sound Exposure Level (SEL). An SEL footprint can be created to show the geographical area over which a particular SEL is reached from a single noise event (e.g. the area in which the sound of a plane taking off reaches 70 decibels).
Special Protection Areas (SPA)	Special protection areas are areas in the UK protected due to known use by migratory birds and certain threatened species of bird.
Standard Instrument Departures (SIDs)	SIDs are published flight procedures that provide a departure route from the runway end to a common network point in the airspace. Heathrow has 6 published SIDs from each runway end.



# Glossary

Term	Description
Statement of Need (SoN)	At the first stage of the airspace change process, airport sponsors are required to outline the objectives of the ACP, by setting out the airspace issue or opportunity it is seeking to address and what outcome it wishes to achieve.
Vectoring	Vectoring is the provision of navigational guidance to aircraft in flight by air traffic controllers (ATC). Vectoring helps to maximise use of available airspace.



**Appendix 2 –  
Stakeholders Engaged at  
Stage 2**



# Stage 2 Engagement: Industry Stakeholders

Airlines	Airports & Local Airfields	Other Industry stakeholders		
Aer Lingus	Biggin Hill Airport	Airlines UK	British Hang Gliding and Paragliding Association	Iprosurv
American Airlines	Blackbushe Airport	Airspace4All	British Microlight Aircraft Association	Isle of Man CAA
British Airways	Denham Aerodrome	Airport Coordination Ltd	British Model Flying Association	Light Aircraft Association
Cathay Pacific	Elstree Aerodrome	Airport Operators Association	British Skydiving	Low Fare Airlines
Delta Airlines	Fairoaks Airport	Airfield Operators Group	Civil Aviation Authority (CAA)	Met Office
Etihad	Farnborough Airport	Aircraft Owners and Pilots Association	Department for Transport (DfT)	Military Aviation Authority
Flybe	Gatwick Airport	Airspace Change Organising Group (ACOG)	Drone Major	Ministry of Defence
KLM	London City Airport	Association of Remotely Piloted Aircraft Systems UK	Future Aviation Industry Working Group on Airspace Integration	National Air Traffic Services (NATS) – NERL, Heathrow, Swanwick
Lufthansa (Swiss)	Luton Airport	Aviation Environment Federation	General Aviation Alliance	Navy Command HQ
United	RAF Northolt	BAE Systems	Guild of Air Traffic Control Officers	PPL/IR (Europe)
Virgin	Southampton Airport	British Airline Pilots Association	Heathrow Airlines Operators Committee / AOE	UK Airprox Board
WestJet	Southend Airport	British Balloon and Airship Club	Heavy Airlines	UK Flight Safety Committee
	Stansted Airport	British Business and General Aviation Association	Helicopter Club of Great Britain	United States Visiting Forces
	White Waltham Airfield	British Gliding Association	Honourable Company of Air Pilots	
	Wycombe Air Park	British Helicopter Association	IATA	



# Stage 2 Engagement: Local Authorities (1 of 2)

Barking and Dagenham London Borough Council	Croydon London Borough Council	Hammersmith & Fulham Council
Barnet London Borough Council	Dacorum Borough Council	Hampshire County Council
Basingstoke and Dean Borough Council	Dartford Borough Council	Haringey London Borough Council
Bexley London Borough Council	Ealing London Borough Council	Harlow Council
Bracknell Forest Council	East Hampshire District Council	Harrow London Borough Council
Brent London Borough Council	East Herts District council	Hart District Council
Brentwood Borough Council	East Sussex County Council	Havering London Borough Council
Bromley Council	Elmbridge Borough Council	Hertfordshire County Council
Borough of Broxbourne Council	Enfield London Borough Council	Hertsmere Borough Council
Buckinghamshire County Council	Epping Forest District Council	Hillingdon London Borough Council
Camden London Borough Council	Epsom and Ewell Borough Council	Horsham District Council
Central Bedfordshire Council	Essex County Council	Hounslow London Borough Council
Chichester District Council	Greenwich London Borough Council	Islington London Borough Council
City of London Corporation	Guildford Borough Council	Kensington & Chelsea London Borough Council
Crawley Borough Council	Hackney London Borough Council	Kent County Council

# Stage 2 Engagement: Local Authorities (2 of 2)

Kingston upon Thames Council	Reigate and Banstead Borough Council	Thurrock Borough Council
Lambeth London Borough Council	London Borough of Richmond-Upon-Thames, Wandsworth London Borough Council	Tower Hamlets London Borough Council
Lewisham London Borough Council	Runnymede Borough Council	Waltham Forest Council
Luton Borough Council	Rushmoor Borough Council	Watford Borough Council
Merton London Borough Council	Sevenoaks District Council	Waverley Borough Council
Mid Sussex District Council	Slough Borough Council	Welwyn Hatfield Borough Council
Milton Keynes Council	South Oxfordshire and Vale of White Horse District Councils	West Berkshire Council
Mole Valley District Council	Southwark Council	Westminster City Council
Newham London Borough Council	Spelthorne Borough Council	Windsor & Maidenhead Borough Council
North Hertfordshire District Council	St Albans City and District Council	Woking Borough Council
Northamptonshire County Council	Surrey County Council	Wokingham Borough Council
Old Oak and Park Royal Development Corporation	Surrey Heath Borough Council	
Oxfordshire County Council	Sutton London Borough Council	
Reading Borough Council	Tandridge District Council	
Redbridge London Borough Council	Three Rivers District Council	

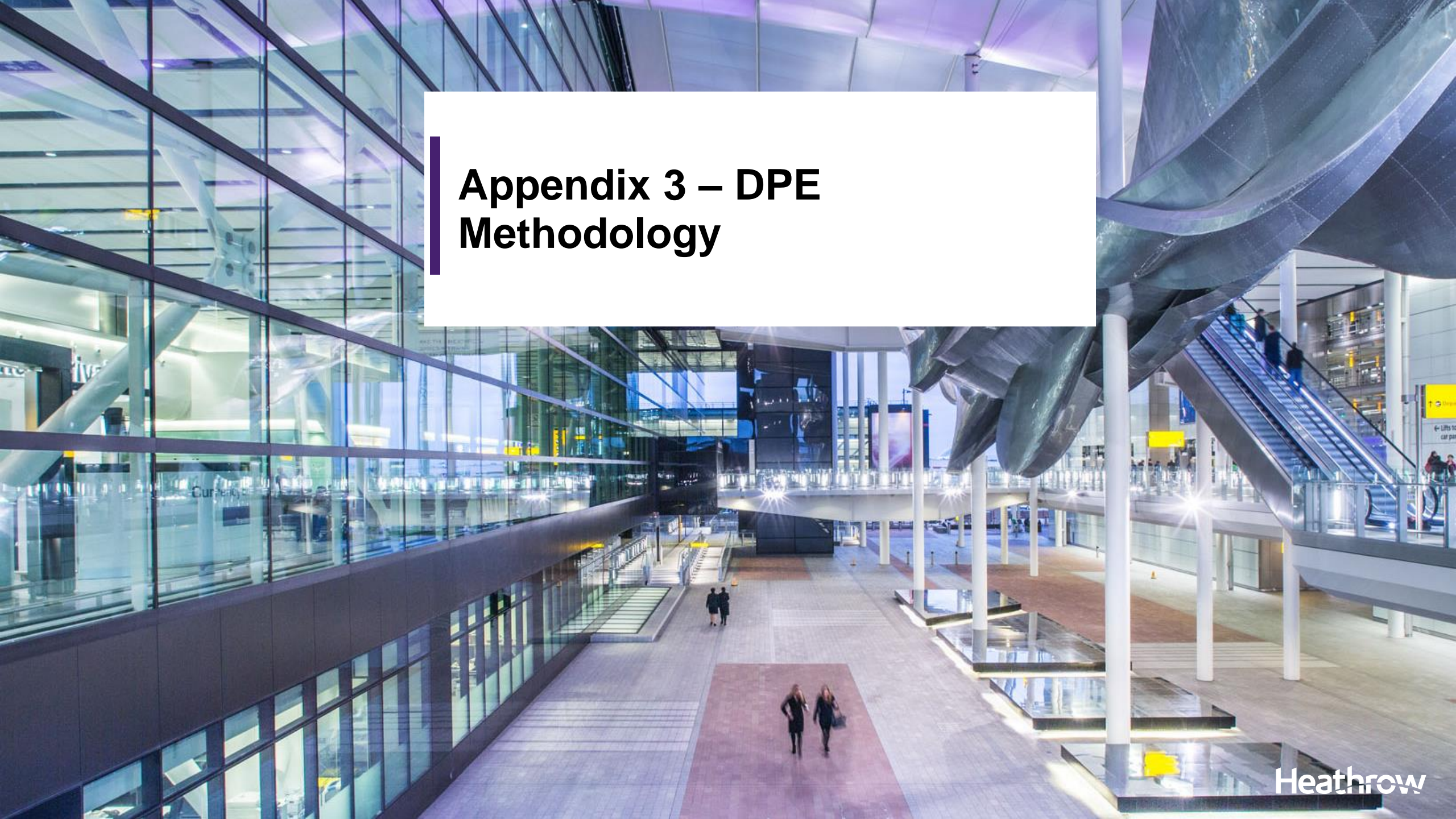
# Stage 2 Engagement: Community Groups

Committee for the Independent Scrutiny of Heathrow Airport (CISHA)	Friends of the Great Barn Harmondsworth	Local Community Forum (LCF)	Richings Park Residents Association
Cleveland Square Residents Association	Heathrow Association for the Control of Aircraft Noise (HACAN)	Local Resident Walton-on-Thames, Surrey	Richmond Heathrow Campaign (RHC)
Colnbrook Residents Association	Harmondsworth and Sipson Residents Association (HASRA)	Longford Residents Association	Stanwell Moor Resident Association
Colnbrook with Poyle Parish Council	Heathrow Strategic Planning Group (HSPG)	Lower Sunbury Residents Association (LOSRA)	Stanwell Preservation Action Group
Communities Against Gatwick Noise Emissions (CAGNE)	Heston Residents Association	Molesey Residents Association	Stanwell Village Hall
Cranford Residents Association	Iver Parish Council	Noise and Airspace Community Forum (NACF)	Teddington Action Group (TAG)
Ealing Aircraft Noise Action Group	Iver Village Residents Association	Paddington Residents Active Concern on Transport (PRACT)	The Windlesham Society
Englefield Green Action Group (EGAG)	Luton And District Association for the Control of Aircraft Noise (LADACAN)	Pavilion Association	Westbourne Park Road East Resident's Association (WPRERA)
Forest Hill Society	Local Authorities Aircraft Noise Council (LAANC)	Plane Hell Action South East (PHASE)	Wimbledon and Putney Commons Conservators and Friends



# Stage 2 Engagement: Environmental Stakeholders

Environmental Groups		Areas of Outstanding National Beauty (AONB)
CPRE	Environment Agency	Chilterns
CPRE Bedfordshire	Friends of Richmond Park	High Weald
CPRE Berkshire	Friends of the Earth	Kent Downs
CPRE Buckinghamshire	Kew Gardens	North Wessex Downs
CPRE Kent	National Trust	South Downs
CPRE London	Natural England	North Wessex Downs
CPRE Oxfordshire	The Chiltern Society	
CPRE Surrey	The Holly Lodge Centre	
Clean Air Bayswater	The Royal Parks	
English Heritage		



# Appendix 3 – DPE Methodology




# DPE Methodology for Design Principle 1

The following slides present the DPE Methodology used to assess each option for PBN Departures, PBN Arrivals and Vectored Arrivals against each Design Principle.

## Note:

- PBN Arrivals options are evaluated for the early morning period only
- Evaluation of Vectored Arrivals is not possible for every metric, since more information is required from NATS on the design of Heathrow's future arrivals mechanism ("holding stacks")

DP	Detailed Criteria	Approach to Evaluation	Quantitative / Qualitative	Met	Partially Met	Not Met
1. 	N/A	The technical team considers whether the option is likely to: <ul style="list-style-type: none"> <li>• Maintain or improve safety</li> <li>• Require further safety assurances</li> <li>• Result in issues which could be harmful to safety</li> </ul>	Qualitative	<b>Maintains existing level of safety or improves on it.</b>	<b>Expected to maintain the existing level of safety or improve on it. Further safety assurances are required.</b>	<b>Issues identified which could be harmful to safety</b>




# DPE Methodology for Design Principle 2 (1 of 2)


DP	Detailed Criteria	Approach to Evaluation	Quantitative / Qualitative	Met	Partially Met	Not Met	
2.	Safety	DP1 outcome used to evaluate this	Qualitative	DP1 evaluation	DP1 evaluation	DP1 evaluation	
	Integration of diverse airspace users	DP11 outcome used to evaluate this	Qualitative	DP11 evaluation	DP11 evaluation	DP11 evaluation	
	Simplification of airspace, improving efficiency	DP5 outcome used to evaluate this	Qualitative	DP5 evaluation	DP5 evaluation	DP5 evaluation	
	Environmental sustainability	DP2, DP3, and DP4 outcomes used to evaluate this	Qualitative & Quantitative	Evaluated in DP2, DP3 and DP4 and outcome met all three DPs.	Evaluated in DP2, DP3 and DP4 with mixture of Met, Partially Met and Not Met outcome.	Evaluated in DP2, DP3 and DP4 and outcome did not meet the criteria.	
	<b>Overall AMS Evaluation (as required by the CAA)</b>				<b>All 4 AMS outcomes Met</b>	<b>All 4 evaluations Partially Met or mix of Met/Not Met</b>	<b>All 4 AMS outcomes Not Met</b>
	Minimise, and where possible reduce, the total negative impacts on health and wellbeing from aircraft noise and Altitude-based priorities	Evaluate the population exposed to 70dB SEL (for PBN Deps c. 4000ft, PBN & Vectored Arrs c. 5000ft).	Quantitative	Within lowest 25 <sup>th</sup> percentile	Within middle 50 <sup>th</sup> percentile	Within highest 25 <sup>th</sup> percentile	
		Number of people overflown (between 0-4000ft, at least once per day on average)	Quantitative	Within lowest 25 <sup>th</sup> percentile	Within middle 50 <sup>th</sup> percentile	Within highest 25 <sup>th</sup> percentile	
		Number of people overflown (between 4-7000ft, at least once per day on average)	Quantitative	Within lowest 25 <sup>th</sup> percentile	Within middle 50 <sup>th</sup> percentile	Within highest 25 <sup>th</sup> percentile	
Track mileage between runways and points within the network*		Quantitative	Within lowest 25 <sup>th</sup> percentile	Within middle 50 <sup>th</sup> percentile	Within highest 25 <sup>th</sup> percentile		

\* Assessment for Vectored Arrivals not possible until we receive additional information from NATS about the design of Heathrow's future holding stacks

# DPE Methodology for Design Principle 2 (2 of 2)




DP	Detailed Criteria	Approach to Evaluation	Quantitative / Qualitative	Met	Partially Met	Not Met
	Tranquillity	The area (km <sup>2</sup> ) of AONBs and National Parks overflown	Quantitative	Within lowest 25 <sup>th</sup> percentile	Within middle 50 <sup>th</sup> percentile	Within highest 25 <sup>th</sup> percentile
		The area (km <sup>2</sup> ) of Historic Parks and Gardens overflown	Quantitative	Within lowest 25 <sup>th</sup> percentile	Within middle 50 <sup>th</sup> percentile	Within highest 25 <sup>th</sup> percentile
		Overfly Richmond Park at least 20 times per day on average, below 7000ft ( <b>PBN Departures options and Vectored Arrivals options</b> ). Overfly Richmond Park at least once a day between 0430-0600, below 7000ft ( <b>PBN Arrivals options</b> )	Qualitative	Option not expected to overfly Richmond Park 20 times per day for <b>PBN Departures/ Vectored Arrivals options</b> , or at least once a day for <b>PBN Arrivals options</b>	N/A	Option expected to overfly Richmond Park 20 times per day for <b>PBN Departures/ Vectored Arrivals options</b> , or at least once a day for <b>PBN Arrivals options</b>
	Ecology and/or biodiversity	The area (km <sup>2</sup> ) of SPA, SACs and/or SSSIs overflown below 3000ft	Quantitative	Within lowest 25 <sup>th</sup> percentile	Within middle 50 <sup>th</sup> percentile	Within highest 25 <sup>th</sup> percentile.
	Prevent any worsening of air quality, to remain within local authorities' limits	If an option has a change to flightpaths below 1000ft it will be evaluated as 'Partially Met' but requires further analysis to determine the scale of the impact on local air quality. If an option has no change to flightpaths below 1000ft it will be evaluated as 'Met'	Qualitative	Option unlikely to affect local air quality	Option has potential to affect local air quality below 1,000ft.	N/A
<b>Overall DP 2 Evaluation</b>				<b>All evaluations Met</b>	<b>All evaluations Partially Met or a mix of Met/Not Met</b>	<b>All evaluations Not Met</b>

# DPE Methodology for Design Principle 3

DP	Detailed Criteria	Approach to Evaluation	Quantitative / Qualitative	Met	Partially Met	Not Met
3. 	Continuous Climb Operations (CCO)	CCO to 7000ft assumed for all options	Qualitative	Option has the potential to achieve CCO	Option has the potential to largely achieve CCO but there may be small-trade-offs required	Option is not expected to achieve CCO or significant trade-offs would be required
	Noise Abatement Departure Procedures (NADP) (PBN Departures options)	Application of noise efficient operational practices are to be considered in more detail at Stage 3. If there is anything about the design options that the technical team feel could limit any of these practices, this will be described.	Qualitative	Nothing identified by the technical team to suggest that noise efficient operational practices cannot be applied to the option.	N/A	Aspect identified by the technical team to suggest it might not be possible to apply some noise efficient operational practices to the option.
	Steeper climbs (PBN Departures options)					
	Low Power Low Drag, Landing Gear Deployment, Steeper Approaches (PBN & Vectored Arrivals options)					
	Overall DP 3 Evaluation				Both evaluations Met	Mixture of Met, Partially Met and Not Met



# DPE Methodology for Design Principles 4, 5 and 6

DP	Detailed Criteria	Approach to Evaluation	Quantitative / Qualitative	Met	Partially Met	Not Met
4. 	Reduce the contribution to climate change from CO2 emissions and other greenhouse gas emissions arising from Heathrow's aircraft activities	Consider track length (nautical miles) from runway end to the relevant point in the upper airspace network*	Quantitative	Within lowest 25 <sup>th</sup> percentile	Within middle 50 <sup>th</sup> percentile	Within highest 25 <sup>th</sup> percentile
5. 	Enable Heathrow to make the most operationally efficient and resilient use of its existing two runways, to maximise benefits to the airport, airlines and cargo handlers, passengers and local communities	Technical team input on air traffic control procedures and Heathrow's operation in terms of providing sufficient capacity and resilience to handle demand	Qualitative	Option considered to enhance operational performance and/or resilience, subject to further work	Option considered to maintain operational performance and/or resilience, subject to further work	Option considered to degrade operational performance and/or resilience
6. 	Provide predictable and meaningful respite to those affected by noise from Heathrow's movements	We have identified 3 potential concepts for providing respite or relief from noise. This design principle will be assessed at Stage 3 when system options are developed that include respite concepts.	N/A	N/A at this Stage	N/A at this Stage	N/A at this Stage


\* Assessment for Vectored Arrivals not possible until we receive additional information from NATS about the design of Heathrow's future holding stacks

# DPE Methodology for Design Principle 7




DP	Detailed Criteria	Approach to Evaluation	Other FASI Airports	Quantitative / Qualitative	Met	Partially Met	Not Met
7.	Seek to avoid overflying the same communities with multiple routes including those to/from other airports	Technical team consider whether the option would overfly the same communities below 7000ft as nearby airports. The overflight cones of Heathrow's individual options were compared with the airspace design options of other airports <b>accounting for:</b> <ul style="list-style-type: none"> <li>If the sponsor is at Stage 1 (and does not have a Comprehensive List of Options yet) the assessment considers potential interactions with arrival and departure areas, as contained within ACOG's Masterplan Iteration 2;</li> <li>If the sponsor is at Stage 2, the assessment considers their Comprehensive List of Options;</li> <li>If the sponsor is at Stage 3, the assessment considers their shortlisted options.</li> </ul> This assessment <b>does not account for</b> interactions within Heathrow's own route options since this assessment will only be possible when we have system options at Stage 3.	RAF Northolt	Qualitative	No overflight of same communities below 7,000ft	N/A	Overflight of same communities below 7,000ft
			Luton		No overflight of same communities below 7,000ft	N/A	Overflight of same communities below 7,000ft
			Stansted		No overflight of same communities below 7,000ft	N/A	Overflight of same communities below 7,000ft
			London City		No overflight of same communities below 7,000ft	N/A	Overflight of same communities below 7,000ft
			Biggin Hill		No overflight of same communities below 7,000ft	N/A	Overflight of same communities below 7,000ft
			Gatwick		No overflight of same communities below 7,000ft	N/A	Overflight of same communities below 7,000ft
			Farnborough		No overflight of same communities below 7,000ft	N/A	Overflight of same communities below 7,000ft
			Southampton		No overflight of same communities below 7,000ft	N/A	Overflight of same communities below 7,000ft
			<b>Overall DP 7 Evaluation</b>				

# DPE Methodology for Design Principle 8

DP	Detailed Criteria	Approach to Evaluation	Quantitative / Qualitative	Met	Partially Met	Not Met
8. 	Contribute to minimising the negative impacts of night flights	We have identified 3 potential concepts for minimising the negative impacts of night flights. This design principle will be assessed at Stage 3 when system options are developed.	N/A	N/A at this Stage	N/A at this Stage	N/A at this Stage




# DPE Methodology for Design Principle 9

DP	Detailed Criteria	Approach to Evaluation	Quantitative / Qualitative	Met	Partially Met	Not Met
9.	 Keep the number of people who experience an increase in noise from the future airspace design to a minimum	Population number within the 70dB SEL	Quantitative	Within lowest 25 <sup>th</sup> percentile	Within middle 50 <sup>th</sup> percentile	Within highest 25 <sup>th</sup> percentile
		Population overflown below 7000ft at least once a day/night on average*		Within lowest 25 <sup>th</sup> percentile	Within middle 50 <sup>th</sup> percentile	Within highest 25 <sup>th</sup> percentile
		Population overflown below 7000ft at least 20 times a day/night on average*		Within lowest 25 <sup>th</sup> percentile	Within middle 50 <sup>th</sup> percentile	Within highest 25 <sup>th</sup> percentile
		Number of people who are potentially newly overflown at least 20 times a day on average compared to 2019 ( <b>PBN Departures options</b> )		Within lowest 25 <sup>th</sup> percentile	Within middle 50 <sup>th</sup> percentile	Within highest 25 <sup>th</sup> percentile
		Number of people who are potentially newly overflown at least once during 0430-0600 period on average ( <b>PBN Arrivals options</b> )		Within lowest 25 <sup>th</sup> percentile	Within middle 50 <sup>th</sup> percentile	Within highest 25 <sup>th</sup> percentile
		<b>Overall DP 9 Evaluation</b>		<b>All 4 evaluations Met</b>	<b>All 4 evaluations Partially Met, or a Mixture of Met and Not Met</b>	<b>All 4 evaluations Not Met</b>

\*For Vectored Arrivals we have assumed that the population within the reduced vectoring size of swathe would be overflown at least 20 times per day since the reduced swathe will lead to increased concentration of overflight

# DPE Methodology for Design Principle 10

DP	Detailed Criteria	Approach to Evaluation	Quantitative / Qualitative	Met	Partially Met	Not Met
10. 	Keep the total number of people who experience noise from the future airspace design to a minimum	Population number within the 70dB SEL	Quantitative	Within lowest 25 <sup>th</sup> percentile	Within middle 50 <sup>th</sup> percentile	Within highest 25 <sup>th</sup> percentile.
		Population overflown below 7000ft at least once a day		Within lowest 25 <sup>th</sup> percentile	Within middle 50 <sup>th</sup> percentile	Within highest 25 <sup>th</sup> percentile.
	<b>Overall DP 10 Evaluation</b>				<b>Both evaluations Met</b>	<b>Both evaluations Partially Met, or a Mixture of Met and Not Met</b>


# DPE Methodology for Design Principle 11 (1 of 2)

DP	Detailed Criteria	Approach to Evaluation	Other FASI Airports	Quantitative / Qualitative	Met	Partially Met	Not Met
 11.	Enable the efficiency of other airspace users' operations:  Other FASI Airports	Technical team considers whether the option could restrict CCO/CDO to/from 7000ft for nearby airports  For <b>PBN arrivals options</b> , this assessment considers the operating hours of the adjacent airports  For <b>Vectored arrivals options</b> , we assume continuous descent from the future stacks*	RAF Northolt	Qualitative	Option does not restrict CCO/CDO to/from other airports options	N/A	Option may restrict CCO/CDO to/from other airports options
			Luton		Option does not restrict CCO/CDO to/from other airports options	N/A	Option may restrict CCO/CDO to/from other airports options
			Stansted		Option does not restrict CCO/CDO to/from other airports options	N/A	Option may restrict CCO/CDO to/from other airports options
			London City		Option does not restrict CCO/CDO to/from other airports options	N/A	Option may restrict CCO/CDO to/from other airports options
			Biggin Hill		Option does not restrict CCO/CDO to/from other airports options	N/A	Option may restrict CCO/CDO to/from other airports options
			Gatwick		Option does not restrict CCO/CDO to/from other airports options	N/A	Option may restrict CCO/CDO to/from other airports options
			Farnborough		Option does not restrict CCO/CDO to/from other airports options	N/A	Option may restrict CCO/CDO to/from other airports options
			Southampton		Option does not restrict CCO/CDO to/from other airports options	N/A	Option may restrict CCO/CDO to/from other airports options

\*We do not yet know locations or heights of future holding stacks, or the aircraft profiles from these stacks to Heathrow's runways, but the aspiration of both Heathrow and NATS is for higher holding facilities. Higher holding stacks at Heathrow should enable improved CCO/CDO for some other airports.



# DPE Methodology for Design Principle 11 (2 of 2)

DP	Detailed Criteria	Approach to Evaluation	Quantitative / Qualitative	Met	Partially Met	Not Met
11. 	General Aviation	Technical team considers whether any changes to existing controlled airspace (CAS) may be required	Qualitative	Option not expected to require any additional CAS	Option may require additional CAS, further work required	Option requires additional CAS
	Military	Technical team considers whether the option is expected to impact defence and security objectives set by the Ministry of Defence	Qualitative	Option not expected to affect defence and security objectives	N/A	Option expected to impact defence and security objectives
	Helicopters	Technical team considers whether existing helicopter routes could be impacted	Qualitative	Option not expected to impact existing helicopter routes	Option may impact existing helicopter routes, further work required	Option will impact existing helicopter routes: further work required
	Overall DP11 Evaluation			All 11 evaluations Met	A mixture of Fully and Not Met	All 11 evaluations Not Met

# DPE Methodology for Design Principle 12

DP	Detailed Criteria	Approach to Evaluation	Future Change	Quantitative / Qualitative	Met	Partially Met	Not Met
12.	Minimise the impact to all stakeholders from future changes to Heathrow's airspace	Technical team considers whether the option is compatible with known, conceptual or paused future changes to Heathrow's airspace	Easterly Alternation (known)	Qualitative	Option may be compatible with the future change	Unclear if option is compatible with the future change	Option is not compatible with the future change
			Advanced Air Mobility (AAM) (concept)		Option may be compatible with future changes	Unclear if option is compatible with future changes	Option is not compatible with future changes
			Heathrow's Third Runway (paused)		Option may be compatible with potential future change	Unclear if option is compatible with potential future change	Option is not compatible with potential future change
		<b>Overall DP12 Evaluation</b>				<b>All 3 evaluations Met</b>	<b>All 3 evaluations Partially Met or a mixture of Fully, Partially and Not Met</b>