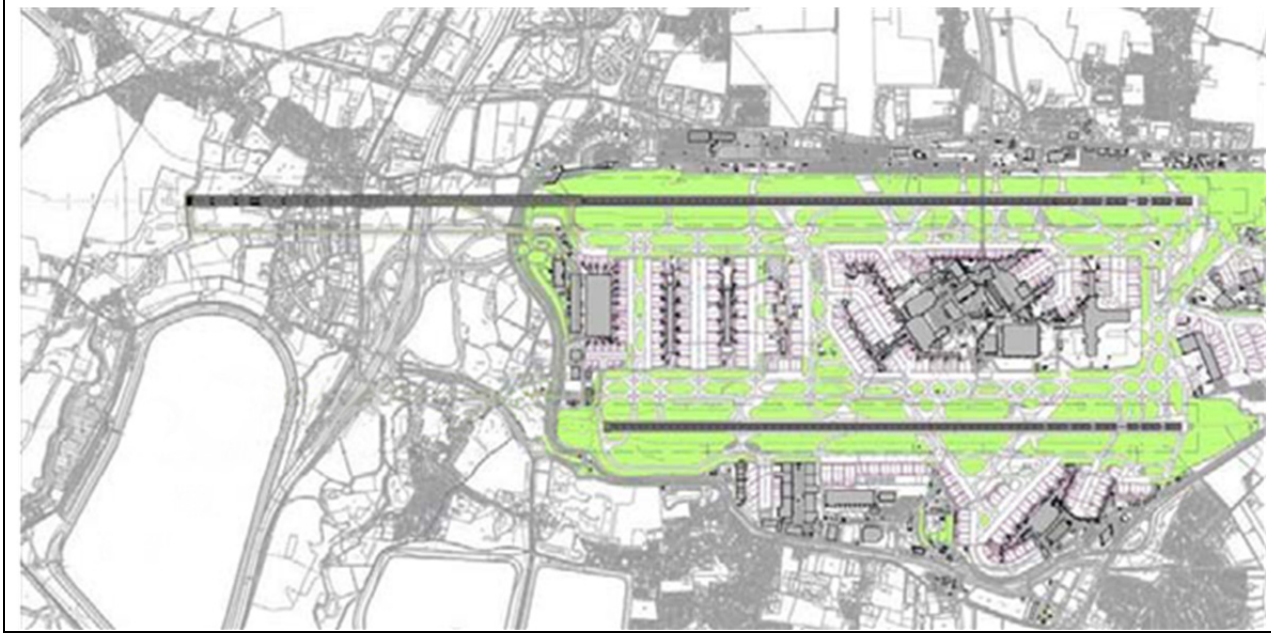
PROPOSAL TITLE:	Heathrow Hub – North Runway Extension	Group:	LHR
SUBMITTED BY:	Heathrow Hub Limited	Reference No.:	64

PROPOSAL

The proposal contains two elements. Firstly, an extension of both existing runways to a length of 6,400m enabling each runway to operate as two runways: the down-wind ends used for arrivals and the up-wind ends for departures. Secondly, a multi-modal interchange and passenger terminal, "Heathrow Hub", located ~3 km north of the existing airport.

This assessment considers the proposed Phase 1 extension of the existing northern runway only to form a three runway configuration, with necessary supporting infrastructure.



ASSESSMENT SUMMARY

STRATEGIC FIT / ECONOMY / OPERATIONS

Runways (net increase)	Passengers (net mppa)	ATMs (net)	London Airports Impact
	62	370,000	LHR
	60	317,000	LGW
2	53	268,000	
▶ 1 ◀	46	260,000	STN
	40	250,000	
	34	222,500	LTN
	▶ 30 ◀	▶ 190,000 ◀	LCY

ENVIRONMENT

57 dBA Leq 2030 pop'n with scheme	Listed Bldgs Grades I&II*, SM, CA, RP&G	Heritage & Designations Affected
1,400	▶ 0 ◀	SPA
2,500	3	Ramsar
6,300		SSSI
13,500	4	
142,600	5	Grade I
144,000		
144,600	8	Grade II*
▶ 180,900 ◀	14	Sched. Mon.

SURFACE ACCESS

45 min Population (millions)	1hr Population (millions)	2hr Population (millions)
▶ 17 ◀	▶ 18 ◀	▶ 38 ◀
14	12	36
10	14	27
9	13	25
6	16	20

COST / DELIVERY

2030 Risk-Adjusted Total (£bn)	Aero Yield (relative to LHR Q6)
9-13	1.3x
10-13	▶ 1.5x ◀
▶ 13-18 ◀	1.6x
16-22	
50-67	2.4x
82-112	3.4x

PEOPLE

Houses Demolished	IMD (Average within5km
200	26
260	21
▶ 720 ◀	20
800	▶ 19 ◀
1,300	14
1,500	8
1,600	7

PROPOSAL TITLE:	Heathrow Hub – North Runway Extension	Group:	LHR
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OVERVIEW

Approach

Enabling legislation to be provided 2015-2018 with design and procurement commencing, at risk, in 2017, enabling construction to start in 2018 and Phase 1 to open in 2023. Implicit that this would be delivered by HAL through established regulatory capital investment programmes. Novelty of operation may necessitate a longer period for planning and industry acceptance suggesting that c 2028 may be more achievable.

Opening Year

2028

Operational Viability

The mode of operation is untested and therefore, whilst the claimed ATM capacities may be achievable in time, they are subject to considerable delivery risk and may not be achieved.

Capacity	Airport	Net	Forecast Use of Maximum Capacity 2030	Forecast Use of Maximum Capacity 2050
Runways	3	1		
ATM	670,000	190,000	90%	100%
pax	120	30	80%	100%

Cost

£b	Airport	Access	Other	Total	Risk	OB	Risk Adjusted Total	Promoter Estimate
2030	3-5	2-3	~1	6-9	2-4	4-6	13-18	9.1
2050	6-8	2-3	~1	9-12	4-5	6-8	18-25	

Surface Access

- New station on GWML connected to HS2.
- Automated People Mover system from hub station to terminals.
- Extension of Piccadilly Line.
- New junction on M25 north of the M4 and D4 link to the Hub.
- Capacity improvements to M25 J12-J16, M4 J2-4 and local improvements to A4, A30 and A312.

Isochrone	Pop^{n} (million)
45 min	17
1 hr	18
2 hr	38
London centre	15 miles

Economic

Borough	Hillingdon	Hounslow	Ealing	Slough	Spelthorne	Runnymede	Windsor
Unemp^{nt} (%)	7.9	7.5	10.7	8.2	4.4	4.3	4.2
Ave. Salary (£/yr)	31,086	29,323	29,427	26,837	31,569	30,930	37,705

County	Bucks	Greater London	Berkshire	Surrey
GVA (£/cap)	22,125	34,779	31,057	25,432

Environment

- ~20% more people impacted by 2030, at 57dBA compared to the three other Heathrow options.
- Although no direct loss to a designated reservoir, (but possibly affecting the boundary of the designated site), there may be impacts from noise and bird strike risk mitigation which could affect conservation objectives.
- No loss to water storage capacity.
- Loss to river corridor and flood plain area requiring diversion and flood compensation storage.
- Impacts on cultural heritage and residential properties are less than for the other Heathrow options.

57 dBA L_{eq}		
	2012 local	239,600
	2030 local - with scheme	180,900
	2030 Net Local Impact	30,200
	2030 system - with scheme	275,900
	2030 Net System Impact	30,200
55 L_{DEN}	2030	357,100
50 L_{night}	2030	133,600
N70	2030	112,900

SAC[1]	SPA[1]	Ramsar	CA[1]	AONB[1]	SSSI[1]	Listed Buildings	SM[1]
-	-	-	-	-	-	8	-

People

IMD	Houses Lost
19	720

Delivery

Aero Yield Increase	Airport Only	Including Access
Indexation	~5%	~15%
No indexation	~35%	~50%

[1] SAC: Special Areas of Conservation; SPA: Special Protection Areas; CA: Conservation Area; AONB: Area of Outstanding Natural Beauty; SSSI: Site of Special Scientific Interest; SM: Scheduled Monument.

ECONOMY

Borough	Hillingdon	Hounslow	Ealing	Slough	Spelthorne	Windsor	Runnymede
Unemployment (%)	7.9	7.5	10.7	8.2	4.4	4.2	4.3
Ave. Salary (£/yr)	31,086	29,323	29,427	26,837	31,569	37,705	30,930
County	Bucks	Greater London	Berkshire	Surrey			
GVA (£/capita)	22,125	34,779	31,057	25,432			

Impact on Industry

Adding a third runway at Heathrow would provide sufficient capacity for the airport to meet expected medium term forecast demand through to the late 2030's, allowing more services with reduced delays due to improved resilience. This would support growth of aviation, tourism, logistics and related support businesses, and contribute to the agglomeration impacts of industry clustered in the Thames Valley/M4 corridor. It would allow significant expansion of airlines based at Heathrow, and a significant improvement in connectivity to a wide range of long haul destinations, Europe and in connecting other parts of the UK to long haul destinations. It is likely to help increase the share of airline traffic carried by UK based network carriers.

Airports	Adding a third runway at Heathrow would provide a net capacity increase of 190,000 to the existing 480,000 ATM fully segregated operation at Heathrow. The competition dynamic in the London airport system would change. Heathrow could be expected to attract a proportion of traffic from Gatwick. A fourth runway option could be preserved. The Heathrow Hub and north-west options, unlike the south-west, allow for development of a fourth runway without either development of a completely new site or relocation of any of the existing runways.
Airlines	Airlines currently using Heathrow and others seeking to use it would benefit from the increase in capacity to offer more services, with reduced delays due to greater resilience. Airlines would continue to have the same choices of airports as at present. Some network traffic may transfer from Gatwick because of the greater interlining opportunities, freeing capacity at Gatwick potentially increasing airport choice for LCCs and charter airlines. Competition among carriers is likely to increase at the airport and UK airline operations (British Airways and Virgin Atlantic in particular) would be much less constrained in their ability to compete with major network carriers at airports with more capacity (e.g. Air France/KLM at Charles De Gaulle and Schiphol, Lufthansa at Frankfurt and Munich, and Emirates and Etihad at Dubai and Abu Dhabi respectively).
Passengers	Passengers would benefit from increased capacity due to delay reductions and a greater choice of destinations/enhanced frequencies and increased competition, reducing travel times and fares.

Local & Regional Economic Impacts

The new expanded airport would facilitate growth of new and existing industries in airport and aviation support services and travel, tourism, logistics and other related sectors, to service growth in passenger and freight demand. Almost all would be able to continue serving customers of the airport from their existing position on the M4 corridor. This proposal would support agglomeration in the Thames Valley/M4 corridor, given its proximity to existing commercial developments supported by Heathrow. The scale of direct and indirect employment would be in proportion to the numbers of additional passengers. Direct, indirect and induced employment effects would be in the immediate vicinity and along key corridors to Heathrow.

National Economic Impacts

The main national economic impacts come from the provision of new capacity, enabling more flights and connectivity, and the increase in business and leisure trips, and trade in goods and services, and indirect effects on inward investment. Increased choices of flights and airlines, reducing air travel time and possibly fares, should generate significant consumer/welfare benefits.

Time/Distance to Central London	Isochrone	Population (million)	Key required upgrade schemes
Paddington 15 mins Docklands 40 mins 15 miles	45 min	17	▪ New Heathrow Hub station on GWML connected to HS2 ▪ Automated People Mover system from hub station to airport terminals
Journey times to other population centre	60 min	18	▪ Extension of Piccadilly Line ▪ New junction on M25 north of the M4 and D4 link to the Hub
Birmingham 50 mins Manchester 70 mins	120 min	38	▪ Capacity improvements to M25 J12-J16, M4 J2-4 and local improvements to A4, A30 and A312.

Modal Split Assumptions

Currently 41% of LHR's passengers use public transport modes: 18% underground, 13% bus/coach and 10% rail. The surface access strategy is based on building a new Heathrow Hub station on the Great Western Main Line and connecting the terminals via an underground people mover system to this station. The Heathrow Hub Station could be served by up to 50 trains per hour, with connections as follows: HS2 via spur to the main HS2 network to Birmingham, Leeds and Manchester; Javelin high speed services to London and via the planned HS1-HS2 link direct to Kent; Heathrow Express to Paddington; Crossrail to Paddington, Central London, Canary Wharf and Abbey Wood; GWML services to Oxford, Bristol, South Wales and SW England. Additionally, the Piccadilly line would continue to serve the terminals direct. Whilst the Hub would provide a more direct service westwards, trips from London would have to interchange at the Hub station rather than the direct services that currently exists. Furthermore, an HS2 spur is still under discussion. Thus whilst the promoter claims that these increased rail services would increase the passenger public transport mode share to 60%, we believe that 50% is a more realistic assumption, with 40% by rail (significant increase from 28% currently).

Rail Infrastructure Capacity Analysis

Peak hour one-directional rail flows to/from Heathrow Hub on a 'busy day' in 2031 estimated to be ~4,000 passengers per hour in the peak direction. Based on the current geographic distribution of airport-related rail trips we have assigned (separately for passengers and employees) each sector-sector movement to the most appropriate rail service, and estimated the volume/capacity (v/c) ratios for airport-related demand on each rail service. Overall we consider the capacity on the wide range of rail services planned is able to cater for this predicted demand.

Highways Capacity Analysis

Assuming a 50% car passenger mode split, and using a similar methodology as for the rail capacity analysis described above, based on the current geographic distribution of airport-related car trips we estimated the v/c ratios on each motorway link to identify on which links airport-related capacity improvements are required. A new dedicated Heathrow Hub junction is required on the M25 just to the north of the current M4 junction, with a D4 access to the airport. Additional road capacity improvements are required on the following links: M25 J12 –J16 (both directions); M4 J2 –J4 (both directions); A30 London Road; A4 Bath Road east of Tunnel Road; A312 The parkway (M4 –A4); The Parkway (A312) north of M4 and A308 High Street.

Accessibility to Population & Business centres

The existing connections to London would remain with the new Crossrail service serving the airport directly (25 minutes to Central London and 40 minutes to Canary Wharf) and Heathrow Express (taking 15 minutes) offering a premium service in addition to the Piccadilly line (currently being upgraded) which would be expanded to the new intermodal transport Hub Station. The new Hub Station would connect directly to an HS2 spur and the GWML as well as being directly accessed from the M25. The Hub Station could be served by up to 50 trains per hour. It would bring nearby cities such as Reading and Oxford closer to the airport by rail as currently passengers from these areas use coach, or interchange at Paddington. For GWML services there would be journey time savings of 1 hour 45 minutes to the South West and Wales and 40 minutes to Oxford.

Accessibility to Transport Interchanges

A direct connection to HS2 would enable direct services to Birmingham, Leeds, Manchester, Nottingham, Edinburgh and Glasgow, with journey time savings of between 80 and 120 minutes, compared to today's journey times. Key transport interchanges directly served by the proposed rail services to London include: Paddington; Bond Street: Tottenham Court Road; Canary Wharf; Stratford and Old Oak Common. A station on the GWML would provide direct connections westwards to Reading, Oxford, Bristol, Cardiff, Exeter and Plymouth.

Accessibility to Workforce

Currently most of the workforce is located locally, with the London Boroughs Hounslow, Hillingdon and Ealing, and the District of Slough having the highest numbers of workers residing. The catchment area for airport employees is expected to increase, with improvements to rail connectivity, particularly to the west to include Oxford and Reading.

Demand Management Assumptions

Possible demand management measures to achieve the public transport mode shares include various parking management measures.

Overall noise impact

By 2030, of the 180,900 people within the 57 dBA L_{eq} contour; 37,500 people would be newly affected by noise compared to today.

*Net reduction in noise exposure compared to 2012 but largely due to improved aircraft technology. Under 2 runway operations, without the north runway extension, the affected population would have reduced to 150,700; the option increases the number of people exposed at the 57dBA level by 30,200.

57 dBA L_{eq}	2012 local	239,600
	2030 local - without scheme	150,700
	2030 local - with scheme	180,900
	2012-2030 Local Impact with scheme	(58,700)
	2030 Net Local Impact	**30,200**
	2012 system	269,250
	2030 system - without scheme	245,700
	2030 system - with scheme	275,900
	2012-2030 system impact with scheme	6,650
	2030 Net System* Impact	**30,200**
2030 population within 2012 and 2030 57dB contour		143,400
2030 additional population within 2030 57dB contour		37,500
55 L_{DEN}	2030	357,100
50 L_{night}	2030	133,600
N70	2030	112,900

SAC	SPA	Ramsar	CA	AONB	SSSI	Listed Buildings	SM
-	-	-	-	-	-	8	-

Air Quality

Proposer claims that overall emissions are expected to remain within EU limits - due to technological improvements. Other potential mitigations include maximising public transport use, restricting access to low emission vehicles only and working with partners in surrounding areas to ensure air quality limits are not breached. All Heathrow option footprints are partly within 3 AQMAs for Hillingdon, Hounslow and Spelthorne. No significant difference between Heathrow options for meeting air quality standards.

Noise

Proposer states that the noise footprint generated by Night-time approaches is shifted west and results in fewer of the population being exposed to noise that may cause sleep disturbance. A reduction of population affected of approximately 32% is predicted in Phase 1. Proposer suggests continuing existing measures for mitigation complementing them with the following operational measures for which current models are not sufficiently mature to assess the impact:

- Increasing the intermediate approach height from 4000ft to 7000ft and increasing the initial rate of descent prior to joining the current glideslope. By staying higher for longer and then descending more steeply the approach noise contours could be reduced.
- Steeper initial climb-out following take-off would increase aircraft height over populated areas. This proposed mitigation is likely to increase noise for populations closer to the airport while the impact on populations further out is currently not known.
- Adjusted flight paths could avoid populated areas during westerly operations.

2030 Forecast: Independent noise modelling for comparison provided the following results based on 2030 forecast population distribution (adjusted for housing demolished), forecast aircraft mix appropriate for the number of aircraft movements, passenger load and reflecting the respite potential identified in the proposal:

- 57 dBA L_{eq}: 180,900 people affected at this level and 37,500 would be brought into this noise contour. The Heathrow Hub option affects the greatest number of people of all the Heathrow options for this noise contour.
- 55 L_{DEN}: 357,100 people affected. The Heathrow Hub option affects the least number of people within this noise contour (other Heathrow options 381,000-409,000).
- 50 L_{night}: 133,600 people affected, 36,900 less than for Heathrow north-west option and 33,100 less than the Heathrow south-west option.
- N70: 112,900 people affected at the 50 event contour – this is 2,400 more than the Heathrow south-west option, 11,900 more than the north-west option, but fewer than the 4 runway option.

2050 Forecast: From 2030 to 2050 ATMs are expected to increase by around 25% potentially leading to an increase of about 1.2dB in overall noise levels, which would affect all contours equally. However, assuming no further change to the aircraft mix it is considered likely that improvements in aircraft technology would result in quieter aircraft which would off-set this increase. Even without a change to measured noise levels however there is potential for increased nuisance to residents from the greater numbers of flights passing overhead.

Net noise: The net reduction in noise exposure for 180,900 in 2030 compared to 239,600 affected in 2012 is largely due to improved aircraft technology. With continued Heathrow 2 runway operations, by 2030 the affected population would have reduced to 150,700; the Heathrow Hub north runway option therefore increases the number of people exposed at the 57 dBA level by 30,100 whilst increasing capacity.

Designations

Ecology:

- The northern runway extension option avoids direct loss to the Wraysbury or the King George reservoirs although it brings the runway close to and potentially encroaches on the boundary of the Wraysbury reservoir which is part of the South West London Water Bodies SPA/Ramsar SPA/Ramsar site (also an SSSI) and therefore of European/International and national importance.
- The site is designated largely for its importance for birds. There may need to be bird strike risk mitigation measures applied which might not be compatible with the conservation objectives for the designation. The extent of the impact related to bird strike control or noise or lighting on the designation conservation objectives or on other adjacent reservoirs/wetlands is not clear.
- Impacts on the SPA/Ramsar sites would require Appropriate Assessment under the Habitats Regulations to determine significant adverse effects on integrity of the site, if determined as having no alternatives and being of overriding public interest, compensatory measures would be required. Demonstrating no alternatives is an important step given the Dibden Port case.
- The worst case is that the whole reservoir would no longer function as part of the SPA/Ramsar site. It is not clear if mitigation measures might be possible: if complete habitat replacement is needed a minimum compensation habitat required as 1,995,280m^2 to replace Wraysbury was suggested by the promoter. This assumes 1:1 open water habitat replacement but usually the target is to create a larger area to reduce the risk of net loss. The potential mitigation, or the scope for what compensatory habitat should be provided, must meet the underlying requirement of the Habitats Directive. They must maintain the integrity of the Natura 2000 network which would require fully equivalent habitat to be provided which is demonstrably functional before an impact on a European site occurs.
- Given the water storage function of the reservoir would not be lost there may be more flexibility for providing compensatory habitat than for the south-west runway option in terms of lakes and wetland without the same water volume.

Cultural Heritage: The option directly affects around 8 Grade II listed buildings and has the lowest direct loss to cultural heritage interests compared to the other Heathrow options. The Colnbrook Conservation Area is in close proximity to the northern runway and may additionally be affected by surface access changes. Possible impacts on 2 scheduled monuments within footprint but these are located on south side of the existing airport and therefore likely to be possible to avoid.

Landscape and Townscape: No national landscape designations affected.

Climate Change

Operation: Proposer states that emissions for a given number of flights likely to be equivalent to those from other airport solutions. Increased efficiency of aircraft movements (in air, on ground) would improve carbon efficiency per ATM / PAX compared to current operations.

Construction and demolition: Construction related carbon emissions are indicated as 0.75Mt in a central estimate based on runway, taxiway and terminal build, with highways improvements and rail link estimated. This is similar to, but slightly lower than other 3 runway Heathrow options. It is considered that this is likely to be an underestimate if additional compensatory works are required. Impact of demolition works from M25 realignment would affect the net impact.

Other Issues

Water Resources and Flood Risk:

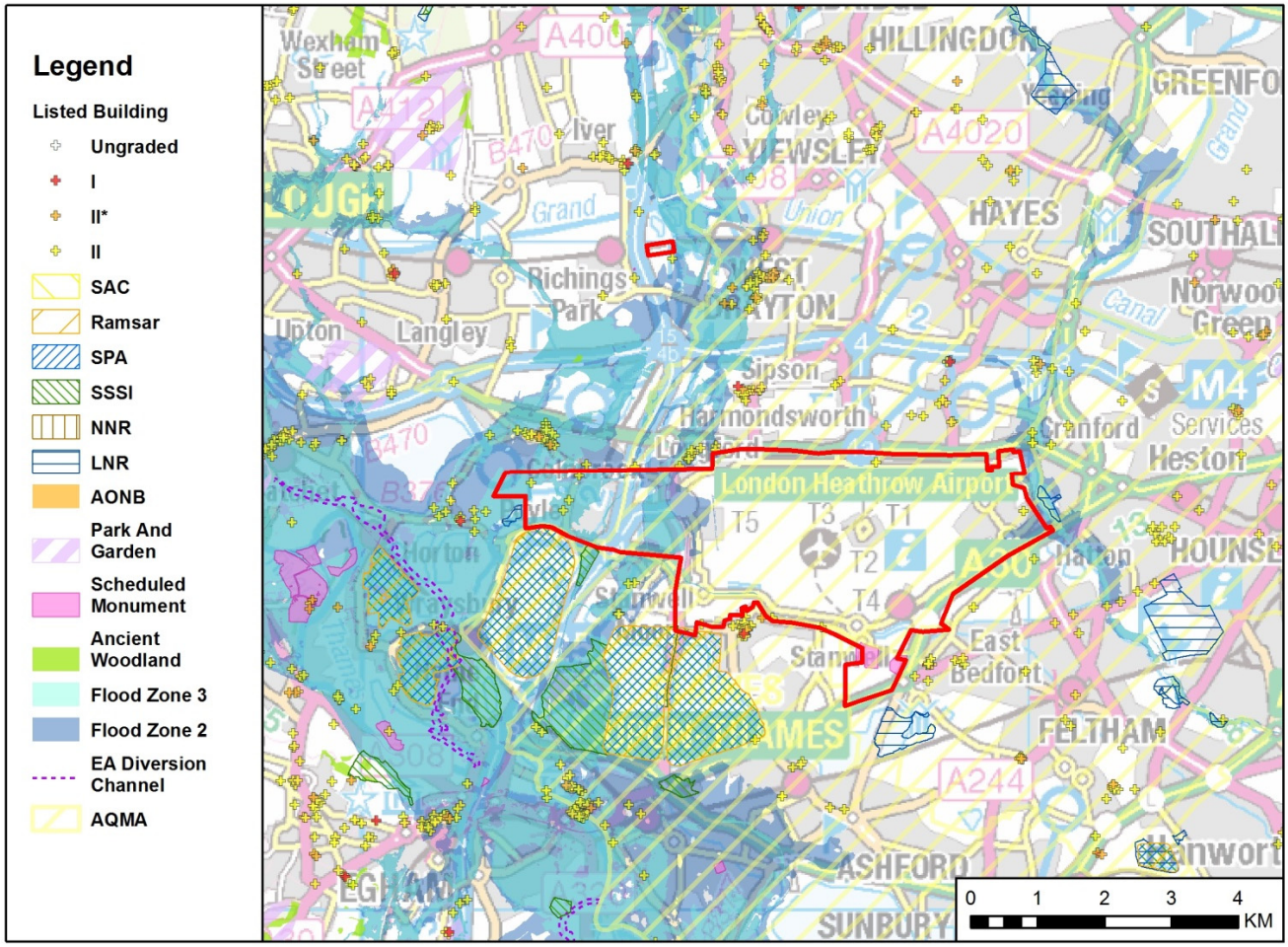
- Flood plain loss (flood zone 2 & 3) comprising 32.2% (i.e. 570 ha) of the total airport area
- Runway crosses the River Colne corridor with loss of flood zone 3 storage. This would require significant compensatory storage in addition to run off attenuation, more so than the Heathrow north-west option but less than the south-west option. The option does not encroach on the Thames corridor however, while it does not affect flood conveyance to the extent that the south-west option does, provision, diversion around or culverts under the runway would be required.
- No water supply storage impact as Wraysbury Reservoir (impacted by south-west option) can be retained.

Land Use and Development:

- Loss of Greenbelt land and open space but much less than for south-west and north-west options.
- Approximately 160 ha of greenfield land would be lost; the a smallest area of undeveloped land compared to all the other Heathrow options. This may include loss of some local landscape and cultural heritage features, hedgerows, protected species habitat, footpaths and archaeological interest.
- Loss of approx.90 Ha of Grade 1 and 2 (best and most versatile) agricultural land.
- Landfill sites within runway footprint (may require relocation).

Surface Access Improvements:

Potential impacts related to all access improvements including those associated with the Heathrow Hub station on GWML connected to HS2 and Automated People Mover system from hub station to airport terminals, extension of Piccadilly Line and new junction on M25 north of the M4 and link to the Hub.



PEOPLE

Housing	Demolished
▪ Residential property in Poyle would be demolished. The northern runway extension option avoids loss to Stanwell Moor. ▪ Along with the increase in employment opportunities, all options at Heathrow are likely to add to housing pressure in the region.	720

Vulnerable Groups

- The Index of Multiple Deprivation (IMD), averaged within 5km of the airport, is 18.7: a greater proportion of the population around Heathrow is affected by deprivation compared to areas around Stansted (7.5) and Gatwick (14.4), but a smaller proportion than around the Isle of Grain (IMD 26.1). The Heathrow Hub option is marginally lower than for Heathrow south-west (19.1) and north-west (19.1) options.
- The area around Heathrow is more densely populated than the area around Gatwick, Stansted or the Isle of Grain and the numbers of people within more vulnerable groups such as elderly and children are likely correspondingly greater. There are no schools located within the footprint area.
- Vulnerable groups may be more sensitive to the negative effects of aircraft noise. However, some vulnerable groups may also benefit from economic opportunities from airport expansion.
- This option would result in the loss of residential areas of Poyle and part of Colnbrook.

Quality of Life and Health

- Approximately 96,800 and 526,000 people located within 2km and 5km respectively of the airport.
- Negative impacts on communities close to the new runway e.g. Colnbrook and Old Windsor from new noise exposure, over flight, and access changes.
- Population noise impact for 57 L_{eq} higher than for other Heathrow options with a greater new population affected at this level. However, this option offers greater respite from night time noise than the other Heathrow options.
- Impacts on open space loss including the river corridor and changes to the setting for local open space.
- All the Heathrow options cause a smaller loss of open space/greenfield than the Stansted and Isle of Grain options.

Wider Social Impacts

Maintains and adds to employment opportunities in the region with related opportunity and access benefits.

COST

Capital Cost

2030 airport cost estimate based upon a 3 runway layout, extending the existing northern runway, with associated infrastructure including the "Hub".

The 2050 cost includes construction of additional terminal and airfield infrastructure to accommodate increase in demand.

Promoter estimates £9.1bn for the first phase, extending the northern runway only.

£ bn	2030	2050
Airport	3-5	6-8
Access	2-3	2-3
Other:	~1	~1
Total	6-9	9-12
Risk	2-4	4-5
Optimism Bias	4-6	6-8
Risk Adjusted Total	13-18	18-25

Key Risks

- Diversion of the M25.
- Construction adjacent to and in line with the existing runways.
- Tunnelling for rail and road links.
- Extensive surface transport works local to Hub.
- Potential for construction in area currently occupied by reservoirs and construction of any relocated facility.
- Potentially identification of a suitable, alternative location for the relocated reservoirs and obtaining planning permission.

Risk and Contingency Allowances

40% contingency and 50% optimism bias applied to risk adjusted cost.

Surface Access Costs

Based upon modifying motorway layouts, capacity improvements of motorway junctions, new transport Hub to the North of the airport and new rail link to the South West of the airport at Staines. Assumes that a new rail connection to the North of the Airport, extension of Piccadilly underground line and HS2 high speed rail connection are schemes that would be funded by others.

Infrastructure investment to 2030 along with wider transport infrastructure upgrades, currently unknown, is expected to accommodate the increase in passenger demand at the airport to 2050.

Other Off-Airport Costs

Significant levels of mitigation and/or compensation required to ensure Water Framework Directive and flood risk storage requirements are met. This includes mitigation measures for compensatory lost flood storage and habitat provision including reservoirs.

OPERATIONAL VIABILITY

Capacity

The mode of operation is untested and therefore, whilst the claimed ATM capacities may be achievable in time, they are subject to considerable delivery risk and may not be achieved.

	Net	Airport	Net	Forecast Usage of Maximum Capacity	
				2030	2050
Runways	3	1			
ATM	670,000	190,000		90%	100%
pax	120	30		80%	100%

Resilience, Reliability and Efficiency

The mode of runway use is novel, however, the broader infrastructure is based upon traditional approaches. Whilst the scheme may permit some increase in resilience and efficiency of Heathrow's operations, the scheme does not fundamentally change the operation given the constraints imposed by the separation between runways.

Safety

Novel, largely untried operational proposal, which whilst not unreasonable may require an extended introduction period to safely fully deliver capacity benefits. Although unusual, it appears likely that the scheme could be designed to comply with safety requirements. The proposal increases the number of flights over central London.

Scalability

The considered third runway option permits the later fourth runway configuration as proposed. The layout however preserves the narrowness of the current airport configuration

Airspace

The proposal would require significant airspace redesign given its novel operating procedures. The London terminal manoeuvring area (LTMA) would be amended and Heathrow's SIDs, STARS and interfaces with en route airspace would be substantially amended to include the additional runways and procedure. However, given the long-term nature of the options and the likely airspace and air traffic management developments under SESAR, restructuring could be achieved as part of the on-going development process. There would not need to be any change of international boundaries.

Timescale

Proposer's timeline suggests enabling legislation to be provided 2015-2018 with design and procurement commencing, at risk, in 2017, enabling construction to start in 2018 and Phase 1 to open in 2023. Implicit that this would be delivered by HAL through established regulatory capital investment programmes. Novelty of operation may necessitate a longer period for planning and operational readiness suggesting that c 2028 may be more achievable.

Commercial Deliverability

Independent high level assessment suggests that, to meet the full debt requirement, aero yield may have to be increased by between ~5% and 15% and indexed at 2.5% per annum thereafter, depending upon the level of contribution to surface access costs. Alternatively, without indexation, an increase of around ~35 to 50% would be required.

Aeronautical yield index relative to Heathrow Q6 to breakeven: 1.5.

The borrowing requirement is large and above precedent for finance to be raised in the context of a wholly privately funded, single transaction. Bond issuance under a RAB model might be possible for the on-airport-only works, although there might be investor concerns about investment concentration in a single asset. Likely therefore that there would need to be an element of Government support.