PROPOSAL TITLE:	Thames Hub Airport	Group:	New
SUBMITTED BY:	Foster and Partners	Reference No.:	46

PROPOSAL

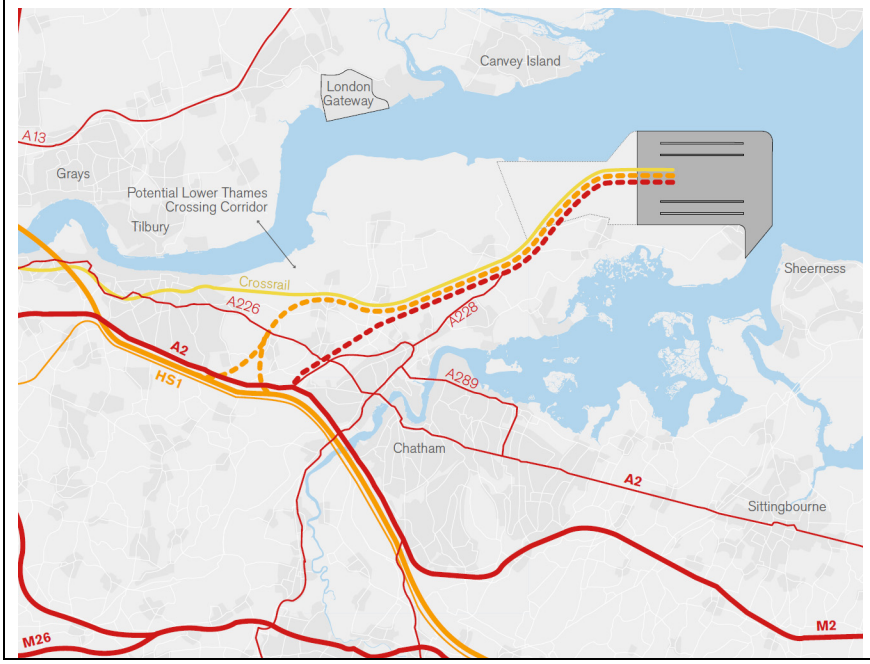
New four runway airport on the Isle of Grain at the eastern end of the Hoo Peninsula on the north Kent coast.

On opening of the new airport Heathrow would be closed and its site redeveloped, with the realised value offsetting the cost of construction of the new airport.

Four runway airport constructed on reclaimed land platform measuring 5.2km by 4.5km. The airport comprises two pairs of parallel runways in an East/West orientation, each 4,000m long. The two pairs are separated by a minimum of 2,000m and runways within each pair are separated by 400m. It is proposed that the airport operate in a segregated mode.

Requires all supporting infrastructure (road and rail links, utilities, etc), plus settlements (with their supporting infrastructure) to accommodate direct and indirect employees to be constructed.

The first phase of development would provide a modest net increase to system capacity (a gross of 110 mppa) enabling it to accommodate the displaced traffic from Heathrow. Later phases would add to system capacity, with the airport providing capacity up to 150 mppa with potential for further growth.



ASSESSMENT SUMMARY

Broadly similar scheme to others on the Hoo Peninsula or nearby in the Thames Estuary, which would provide an east London replacement for Heathrow. All schemes offer a substantial reduction to noise affected populations with the closure of Heathrow. However, all remove protected habitats which would require replacement and a demonstration that there was no realistic alternative and an overriding public interest in the proposal.

Being sited at the eastern side of the peninsula, and partially off-shore, the noise impact from this scheme would affect a small population; its capital cost is broadly in line with other on-shore schemes, though all are substantially higher than developing existing airports or new sites with better existing surface access.

The early phases of the proposed development will only replace the lost capacity at Heathrow, with the fuller build-out adding to capacity of the system. The twin-runway configuration provides among the lowest capacities of the estuary options.

Although the scheme adds capacity, and does so without significantly weakening competition in the London system, its cost, location and environmental impact are challenging.

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OVERVIEW

Approach

Enabling legislation to be provided 2015-2020 with construction commencing in 2022; new airport opened and Heathrow closed by 2029. First phase of Heathrow redevelopment by 2032. Heathrow and the new airport to be regulated as a single entity, with charges smoothed over a 20 year period (2018-38) enabling the capture of the resale proceeds value of Heathrow to the new airport company. Development risks to be underwritten by Government.

Opening Year
2029

Capacity

	Opening		Longer Term	
	Airport	Net	Airport	Net
Runway	**4**	2	**4**	2
ATM	600,000	120,000	830,000	350,000
pax	**110**	20	**150**	60

Cost £bn

Airport	Access	Other	Sub Total	Including Risk/OB
21.8	9.2	1.8	32.8	68.9

Surface Transport

Requires new rail link, major extension to Crossrail 1, expansion at London rail termini, new road link to the M2/A2 and highway enhancements on the A229, M2, A2 and M20 are needed. Key issues include HS1 having sufficient capacity to deliver proposed services, London termini having capacity to receive such services and the scale of highway enhancements needed to adequately meet demand.

1 hr isochrone	13
2 hr isochrone	25
London centre	33 miles

Economic

Borough	Dartford	Gravesham	Medway UA	Maidstone	Swale	Havering	Thurrock UA	Basildon
Unemploy-ment (%)	7.0	9.1	9.5	6.7	7.5	9.6	7.7	8.1
Ave. Salary (£/yr)	29,510	28,106	27,378	28,236	28,085	30,378	28,033	28,553
County	Outer London E&NE	Kent excl. UAs	Medway UA	Essex excl. UAs			Thurrock UA	
GVA (£/cap)	13,428	15,883	13,631	16,707			14,956	

Environment

Smaller footprint than the three other Hoo peninsula schemes with less direct loss of SPA/Ramsar. Impact on SPA/Ramsar a European/international level designation will require significant compensatory habitat. Slightly lower noise population affected than the Isle of Grain option.

	Airport	Net
57 LA_{eq}	4,000	(236,000)
55 L_{DEN}	13,000	

SAC[1]	SPA[1]	Ramsar	CA[1]	AONB[1]	SSSI[1]	Listed Buildings	SAM[1]	Houses Lost
-	2	2	-	-	2	**4** 5	**1** 6	680

[1] SAC: Special Areas of Conservation; SPA: Special Protection Areas; CA: Conservation Area; SSSI: Site of Special Scientific Interest; SAM: Scheduled Ancient Monument.

ECONOMY

Borough	Dartford	Gravesham	Medway UA	Maidstone	Swale
Unemployment (%)	7.0	9.1	9.5	6.7	7.5
Ave. Salary (£/yr)	29,510	28,106	27,378	28,236	28,085
Borough	**Havering**	**Thurrock UA**	**Basildon**		
Unemployment (%)	9.6	7.7	8.1		
Ave. Salary (£/yr)	30,378	28,033	28,553		
County	**Medway UA**	**Kent exc UAs**	**Thurrock UA**	**Essex exc UAs**	**Outer London E&NE**
GVA (£/capita)	13,631	15,883	14,956	16,707	13,428

Impact on Industry

A new airport with four independent runways at the east end of the Hoo peninsular, would provide a net increase of two runways, and so might provide sufficient hub airport capacity to meet expected unconstrained demand until at least 2050. This creates benefits by allowing new short haul and long haul services at the hub and reducing operational costs due to a more efficient airport, and the provision of capacity for resilience, thus minimising delays. This may be offset in part by increased landing charges to recover capital costs of construction, and being less well located for the airlines' prime passenger market. It will free up land at Heathrow to help meet demand for housing land.

Airports	The large capacity of the airport would attract some network traffic away from Gatwick. It may also hold back growth at Southend Airport and London City and inhibit development of Manston, but otherwise there is relatively little impact on other regional airports. It may see an increase in services to airports in the North of England, Scotland and Northern Ireland, which would enhance regional connectivity.
Airlines	As with any other major airport on an estuarial site, airlines using Heathrow and others seeking to use it would benefit from the increase in capacity allowing new direct routes, higher frequencies, reduced delays, because of sufficient capacity for resilience. Greater competition, reduced airline 'slot' values and uncompensated relocation cost from Heathrow will have a countervailing effect on some airlines. Interline traffic would have more potential to increase, enhancing the viability of more direct routes, particularly by airlines based at the new hub. Low Cost Carriers (LCCs) and charter airlines would likely have more choice of airports, as some network traffic may transfer out of Gatwick because of the greater interlining opportunities.
Passengers	As with any other large hub airport on an estuarial site, passengers could benefit from increased capacity at the new site via delay reductions, a greater choice of destinations, enhanced frequencies, more competition (reducing fares) and faster terminal throughput times. However, travel times and costs would increase on average for typical customers. In common with other estuarial sites, there would be reduced travel times in Kent and SE London, also Essex and NE London assuming a new lower Thames crossing.

Local & Regional Economic Impacts

The airport would be located in Medway district, and close to the Borough of Gravesham, an area of relatively high unemployment for the SE and low economic activity Assuming a lower Thames crossing, it is also close by Thurrock, and not far from Havering, the latter being an area of relatively high unemployment for the South East, and the region in general has low economic activity The new site would provide an expanded airport with sufficient capacity to meet expected demand in the near future and would facilitate growth of new and existing industries in aviation, airport and aviation support services and travel, tourism, logistics and other related sectors, to service the growth in passenger and freight demand met by the new airport. Most of these businesses would have relocated from the vicinity of Heathrow. The immediate effect would be to increase commercial property development in the vicinity of the new site, but there will also be significant potential to redevelop the Heathrow site for both commercial and residential purposes. The agglomeration effects of the existing Heathrow/Thames Valley/M4 corridor could be diluted significantly, as such businesses may prefer to locate closer to the new airport around the Thames estuary. Reduced noise impacts are likely to have a modestly positive effect on land prices to the east of the Heathrow site, offset by some smaller negative impacts closer to the new airport. There would be significant dislocation of employment, with many employees needing to relocate, although relative house prices in nearby towns may facilitate this process. Existing commuters in the Thames estuary may experience increased congestion and travel costs, despite the improved transport connections.

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 the indirect effects on inward investment. Increased choices of flights and airlines, reducing travel time and fares should generate significant consumer/welfare benefits. The benefits would be offset to some extent by higher access costs from London (but lower for access from Kent, Essex and East London).

SURFACE ACCESS

Time/Distance to Central London	1 hr isochrone population	Key required upgrade schemes
26 mins 33 miles	13	▪ New rail link from the airport to HS1 at Gravesend ▪ Extension to Crossrail1
Journey times to other population centre	**2 hr isochrone population**	▪ Enhancements to London termini platform capacity ▪ New road link from airport to the M2/A2 J1 interchange
Birmingham 90 mins Manchester 110 mins (via HS2)	25	▪ Highway network enhancements to the A2/M2/M20 corridors and the A229 link between the M20 and the M2

Rail Infrastructure Capacity Analysis

The sponsors have estimated that with four runways and 110 mppa, the airport will generate **165,000 rail passengers per day (assuming: 38% interlining passengers; a 60% rail mode share; an even daily spread over an 18 hour day and equal two-way flows).** The last two of these assumptions are unlikely to be valid. The sponsors have estimated that these 165,000 rail passengers equate to **15 direct train services per hour** in each direction, which could be expanded to **20 direct trains per hour**. Whilst the planned rail connections to HS1 and the extension to Crossrail are appropriate ways of connecting the airport to the rail system and attempting to reach the high 60% public transport mode share target, it is not certain that there is adequate capacity on HS1 and at London termini to cater for this airport-related demand.

Highways Capacity Analysis

A new **D3 highway link** is proposed to connect the airport with the M2/A2 J1 interchange. This junction would be remodelled to provide direct access onto the new highway serving the airport. The DfT is consulting plans for a new Lower Thames Crossing to address highway network congestion issues in the area. Option C would connect the M2 with the A13 and the M25 between junctions 29 and 30. Should this option be chosen, an additional link is proposed to connect the airport with the M2, to facilitate road access from North of the River Thames. The proposals state that a range of highway enhancements would be needed to the existing road network to cater for the road-based airport demand, including**: the A2/M2/M20 corridors; the A229 link between the M20 and the M2** and some existing motorway junctions would need to be remodelled. The sponsors have provided the analysis undertaken to determine that the proposed D3 airport link road has sufficient capacity and that the other proposed highway improvements listed above will be adequate to cater for the wider network impact of these movements. However, further analysis is required as substantial local and sub-regional highway capacity enhancements may be required.

Accessibility to Population & Business centres

The airport is located around 33 miles from central London. Four different train services between Central London and the airport are proposed: **a non-stop high speed service to St Pancras, running every 15 minutes and taking 26 minutes; a limited stop service to Liverpool Street, running every 15 minutes and taking 35 minutes; a limited stop service to Waterloo, running every 15 minutes and taking 40 minutes and an extension to Crossrail from Abbey Wood, running every 8-15 minutes and taking around 35-40 minutes to reach Central London. A new D3 highway link is proposed to connect the airport with the M2/A2 J1 interchange**.

Accessibility to Transport Interchanges

Key transport interchanges directly served by the proposed rail services include: St Pancras; Ebbsfleet; Stratford; Liverpool Street; Canary Wharf; Farringdon; Tottenham Court Road; Bond Street; Paddington and Waterloo. In addition, regular direct train services are also planned to serve stations outside the Greater London area, including Watford, Hemel Hempstead, Milton Keynes, Maidenhead and Reading. The surface access strategy also allows for direct train services to the airport from Birmingham, Manchester and Leeds. Ultimately each of these cities would be expected to have hourly services to the airport using HS2. The proposals also include plans for new rail parkway stations at **Iver, Hemel Hempstead, Swanley and Rainham** designed to attract those travellers to transfer onto rail for the final leg of their journey to the airport. These parkway stations will be readily accessible to road users from the M4, M1, M40 and M25, and thus accessible to a wide catchment area.

Accessibility to Workforce

It is assumed that **the majority of airport workers, particularly those in lower paid manual roles, will live within 40 minutes' travel from the airport, with a firm commitment to encouraging rail access.** This is not considered unreasonable.

Modal Split Assumptions

The surface access strategy is based on a **60% rail mode split of both passengers and airport employees**. This target is high for employees given their likely dispersed home locations and shift hours.

Demand Management

The proposals state that a proactive parking management strategy would be needed to encourage the high levels (60%) of public transport usage to the airport. This will need to include a restrictive parking regime at the airport.

Potential Wider Use

The proposed road and rail connections are airport-specific and are unlikely to have significant wider economic benefits.

Overall noise impact								Airport	Net
							57 LA_{eq}	4,000	(236,000)
							55 L_{DEN}	13,000	
Phase	SAC	SPA	Ramsar	AONB	SSSI	CA	Listed Buildings	SAM	Houses Lost
1	-	2	2	-	2		**4** 5	**1** 6	680

Air Quality

Estimated to reduce health impacts by 60-70% compared to a Heathrow hub due to coastal location with dispersion over North Sea.

Based on the 2003 SERAS study for an airport at Cliffe Marshes, just to the west of the Isle of Grain, no people predicted to be exposed to NO_2 above daily or annual mean objectives. This compares to 14,000 people living around Heathrow affected by annual exceedances (although airport contribution to this is not stated).

Impacts on existing AQMAs that might be affected by additional traffic from the Isle of Grain surface transport for this option are not addressed (these have been considered in the TfL submission).

Other airports: As for all new hub options, potential for some local air quality benefits through removal or reduction of Heathrow airport's contribution to local NO_2.

Mitigation Plan

Recognises further study required to model effects of road traffic from the Hub.

Implies surface access transport with a higher percentage public transport.

Noise

Isle of Grain location generally not subject to significant noise constraints. Only 31,000 people on the Hoo peninsula would be located within the 55 dB den contour (2030 based on 110mppa). This compares to 756,000 living within the Heathrow 55 dB Lden contour (and 280,000 within the 57 dB Lden contour) who would therefore benefit from relocation of the hub.

Numbers of people affected by 90 dB(A) sound exposure level (SEL) would be very much smaller than Heathrow, thus 24 hour operation less constrained.

Independent noise modelling for comparison provided the following results:

- 57 dB LAeq: 4,000 people affected;
- 55 dB Lden: 13,000 people affected.

The population affect by 57 dB LAeq represents a net reduction of 236,000 upon the closure of Heathrow.

Mitigation Plan

Manage new development to minimise incoming population affected.

Reduce passenger vehicle movements.

Mitigation for new /existing rail and road access.

Designations

Internationally important nature conservation sites (SPAs, SAC and Ramsars), nationally important sites (SSSIs and National Nature Reserves), located within zone of influence and within 1 km envelope around airport. Approx. 60% of the site is located within the boundaries of 2x SPA/Ramsar sites and another 2 SPAs are located within 5km. Proposal mentions SACs but it may be that there are none within 5km of the airport itself. **Proposal states 1,700 ha of water bird habitat loss including intertidal and grazing marsh. It also recognises that bird strike risk reduction measures could have further impacts on the designations. However proposal also notes that some of the designated sites are already at risk of habitat loss from sea level rise, storm surges and coastal erosion.**

Would need to follow the process of the Habitats Regulations (implementing EU Habitats and Birds directives) and undertake Appropriate Assessment, demonstrate no alternatives and overriding public interest and provide compensatory measures.

Impact from surface access, associated development and tidal turbines is not covered. Possible further impacts associated with coastal geomorphology changes.

5 designated sites of cultural heritage interest including Grade I listed church, a

Mitigation Plan

Beneficial recharge, managed realignment and habitat creation.

Compensatory habitat creation required for any overall losses – proposal gives examples from elsewhere and states precedents exist.

Proposal states that Hub could provide private funding opportunity for habitats already at risk.

Mitigation through recording/archiving

listed public house, listed WWII shoreline defences, scheduled Coastal Artillery Defences and the listed Grain Tower are likely to be lost and setting affected for many others near the airport or within the transport corridors.	**and possibly in some cases translocation.**
Climate Change **Additional capacity will allow operation of efficient aircraft arrivals and departures from the airport compared to other hubs.** **Enhanced rail passenger and freight services expected to contribute to modal shift with emissions per passenger or freight tonne being reduced** No estimates of changes given and no quantitative estimates related to key construction and demolition activities. General comments on energy consumption provided. Acknowledged that large quantities of material can be a source of significant carbon emissions. **Operation of the Estuary Thames Hub is estimated to require 400 to 600 GWh of energy.** Likely to be less construction and lower related carbon emissions required for this option compared to options within the Estuary.	**Mitigation Plan** Available construction mitigation measures listed. Construction of 1000 tidal energy turbines in the Thames Estuary (but feasibility and impacts of this not addressed)
Other Issues **Significant flood and coastal erosion risk from tidal Thames, which could increase due to sea level rise.** Approximately 35% of airport footprint in Flood Zone 3 (high probability), and 35% in Flood Zone 2 (medium probability). **Large scale impact of hub on undeveloped open marsh landscape.** **Sensitivity of East Thames Marshes is considered high due to characteristic historic ditches, grassland, military and industrial installations and ancient trackways.** Significant impacts from surface transport and additional development, agricultural land loss and agricultural land quality impacts, displacement of industrial development and contaminated land not covered, each of which may be considerable.	**Mitigation Plan** Design of reclamation to take account of sea level rise. Landscape mitigation strategy proposed.

PEOPLE

Housing **The Isle of Grain and wider Hoo peninsula are sparsely populated.** Grain village would be lost.	**Demolished** 680
Vulnerable Groups **Detailed plans required to address needs of vulnerable groups. North Kent area identified as suffering from a lack of employment and poor transport which can affect vulnerable groups. Mitigation measures for vulnerable groups in terms of additional assistance and inclusion of considerations in design.**	
Quality of Life **A 2013 study found that air pollution from Heathrow could be responsible for 100 premature deaths each year, and many more suffer sleep deprivation and difficulty in learning due to aircraft noise. By contrast, the Isle of Grain is one of the most sparsely populated areas of the South East and the majority of flights will approach over water.** **A large number of residents around Heathrow would experience health benefits due to reduction in noise nuisance and improvement in air quality compared to a small number of existing residents around the proposed Thames Hub.**	
Wider Social Impacts **Reference is made to wider economic benefits and associated social opportunities for social mobility, regeneration and increased aspiration.** There are likely to be additional impacts from in-migration of working population in terms of increased pressure on services such as health, housing and education and changes to population mix and health issues. Additional pressure on housing and housing/rental could reduce affordability for the existing population. Social impacts at Heathrow would depend on redevelopment of the airport site and the extent they can provide for housing and employment needs.	

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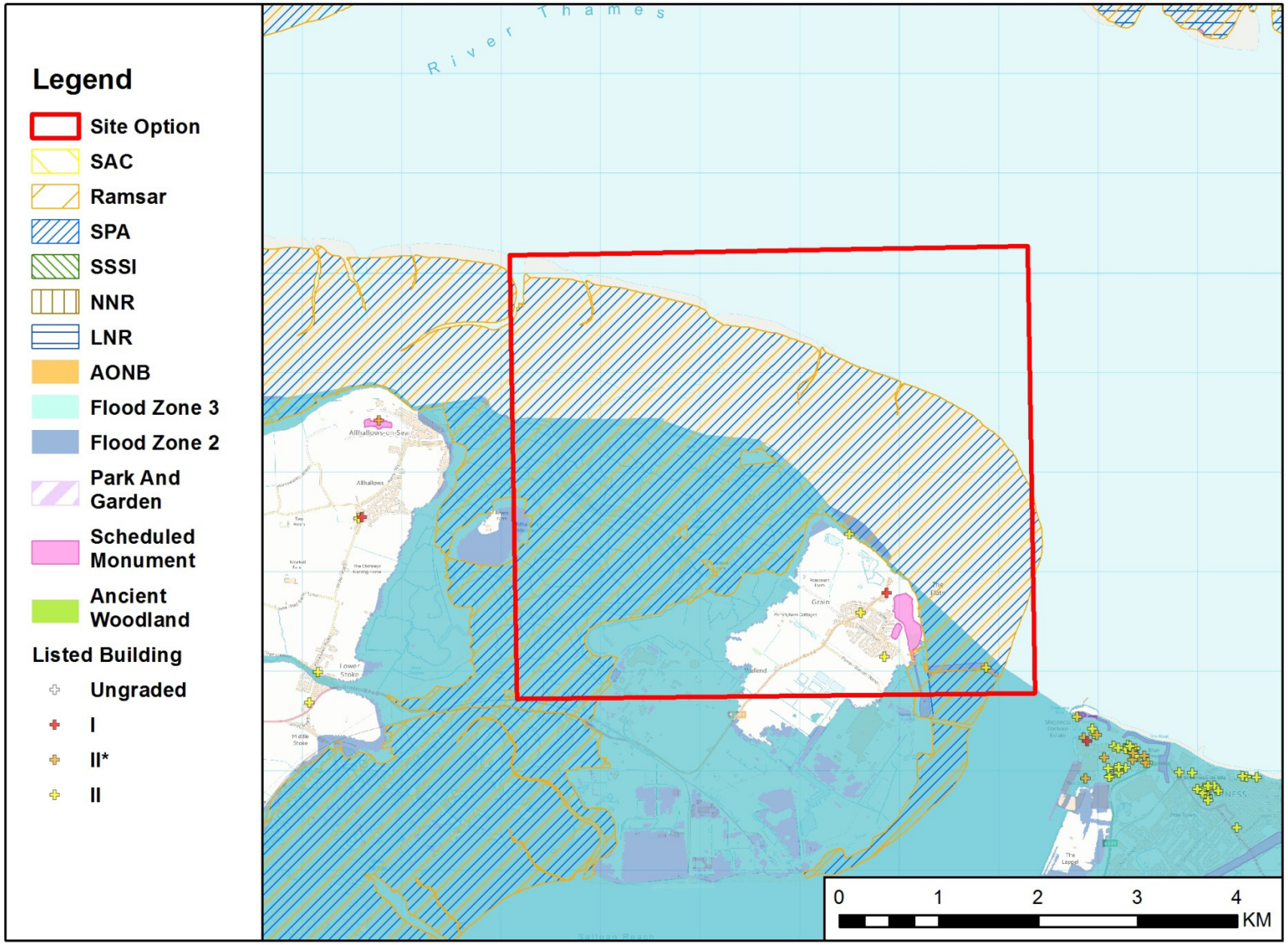

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COST

Capital Cost

Submitter estimates Phase 1 at £24 bn, unadjusted for bias. Contingency based on unknown percentage. Excludes offsite works road, rail, etc and onsite police station, catering, fuel farm, hangers, cargo and hotels, etc.

Independent Cost Analysis assesses the scheme to cost £68.9bn.

	£ bn
Airport	21.8
Access	9.2
Other	1.8
Sub-Total	32.8
Risk	13.1
Optimism Bias	23.0
Total	68.9

Key Risks

- Nature of reclaimed land platform poses increased risk of differential settlement.
- Relocation of LNG facility.
- Surface access.
- Marine habitat compensation and coastal flood/erosion protection measures.
- Sea Bed Licences.

Risk and Contingency Allowances

40% contingency adopted for all costs. 50% optimism bias applied.

Surface Access Costs

£9.2bn estimate for road and rail links based on requirement for infrastructure identified by independent analysis.

Other Off-Airport Costs

An allowance of £0.3bn has been included within the independent cost analysis for marine habitat compensation and coastal flood/erosion protection measures. A contribution of £1bn has been made for the relocation of the National Grid's LNG Facility should it be required. A further £0.5bn has been included to cover other environmental mitigation measures.

Summary Comments

The approach adopted is reasonable; however it is likely to underestimate the total cost.
Costs associated with the closure of Heathrow have been excluded.

OPERATIONAL VIABILITY

Capacity

Capacity to expand, within four runway configuration from opening 110 mppa to 150, with claimed scope for further expansion. Capacity is lower than other configurations providing wider spaced runways.

	Opening		Longer Term	
	Airport	Net	Airport	Net
Runway	**4**	2	**4**	2
ATM	600,000	120,000	830,000	350,000
pax	**110**	20	**150**	60

Resilience, Reliability and Efficiency

The proposal supports independent parallel approaches, but dependent within runway pairs. The proposal could be defined to meet resilience targets.

Safety

The runway configuration requires runway crossings to access the outer runways. There does not appear to be any need to overfly significant population centres on final approach or immediately after departure. The closure of Heathrow would mean that there would be no approaches over central London, which would increase system safety.

The LNG facility to the south infringes the obstacle limitation surfaces and would negatively impact operations, particularly during periods of low visibility. The Kentish Flats wind farm may conflict with radar and may require relocation.

Bird strike would represent an unusually high threat compared to inland airport locations. Fog may also present a significant hazard, although its greatest negative impact would be on capacity.

Scalability

Although the proposal is defined within an identified boundary, it appears that additional capacity could be developed if required, although this would be either further into the estuary, or closer to the LNG facility. More flexible modes of runway operation should support additional movements before further development is required.

Airspace

The proposal would require significant considerable airspace design in terms of relocating the boundaries of the London terminal manoeuvring area (LTMA), SIDs, STARS and interfaces with en route airspace. The LTMA would extend from the new airport in the east to Gatwick in the South, Luton and Stansted in the North. This would be a major reconfiguration and would also require international consultation and agreement. Given the long-term nature of the option and the likely airspace and air traffic management developments under SESAR, restructuring could be achieved as part of the on-going development process, however this is not certain. International boundaries may require amendment.

Timescale

Aviation policy statement 2017; DCO 2018; start construction 2022; Phase 1 open 2029; 2032 redevelopment of Heathrow site complete.

Sources of funding

Funding to be raised from private sources through a development company, but likely to be underwritten by Government. Ultimately from passengers / users / airlines. Assume government funds surface access. Potentially 50% grant, 50% private, of which 20% (10% overall) from private equity. Highly geared approach due to limited availability of construction equity. Debt financing primarily through the bond market, with a combination of fixed rate and index-linked.

Public funding

Comprehensive government guarantee package likely to be required including management of the closure of Heathrow, availability of surface access, financial market disruption, change of law/policy protection, and limitation of cost/time overrun. Direct guarantees of senior debt may be needed.

Private funding

Likely to comprise significant debt funding (mainly bond) and limited equity investment.

Commercial/financial structure (e.g. RAB, PPP, other)

RAB structure for new airport plus PPP/conventional government procurement for surface access and utility company finance for utilities.

Commercial Deliverability

Even with government grants the scale of private financing is significant, but may be achievable with a suitable regulatory structure and a suitable comprehensive government support package. Raises major taxpayer Value for Money questions plus could impact government balance sheet treatment. Without grant funding landing charges would need to rise to levels that are likely to be unsustainable if the airport were to remain competitive. Unclear how the proposed funding/financing strategy and ownership structures would work (e.g. combined Heathrow/Thames Hub RAB). The development of Thames Hub is unlikely to be aligned with the risk requirements of Heathrow's shareholders.