Heathrow Expansion

Updated scheme design -

Submission to the Airports Commission

by Runway Innovations Ltd and Heathrow Hub Ltd

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FOREWORD

By any measure, Heathrow is one of Britain's world class assets. It is the airport of choice for both passengers and airlines in the UK. Connectivity and flight schedule frequency are unrivalled in Europe and Heathrow has not only retained high quality airlines over time but continues to attract new entrants, often requiring a significant financial investment to secure scarce slots. Heathrow's continued success is crucial to London, the south-east and the UK economy as a whole – it is the natural location for new capacity.

In recent years Heathrow airport has invested heavily in terminals and infrastructure and is well prepared for the future. These capital costs have been readily absorbed by the structure of user charges from close to 500,000 annual aircraft movements on long-haul, business and leisure routes. As a result the airport now enjoys the combination of a large asset base and high passenger and cargo revenues. These factors, combined with pent-up demand from existing airlines and probable new entrants, mean that sensitivity to predicted passenger growth numbers is low. Heathrow's unique benefits also ensure that future funding costs will have a proportionately lower impact on user charges when compared to Gatwick.

Unlike most transport projects, substantial investment at Heathrow can be undertaken by the private sector at low finance costs, with institutional investors demonstrating exceptionally high confidence in the continued success of the airport.

The Runway Innovations proposal for additional runway capacity is the simplest of the concepts being considered by the Airports Commission. Our analysis suggests it has greater and more secure economic benefits, is innovative and is lower risk than alternatives. The operation provides an increase in runway capacity, is safe and can be accommodated by the Air Traffic Control provider. The scheme also gives significant improvements in public transport and surface access and construction can be phased to match demand growth. The land take required for implementation of the plans is small. This not only reduces costs but also minimises the loss of existing residential properties.

The Heathrow Hub proposal for a new rail interchange and transit link to existing terminals is expected to result in significant modal shift of passengers to public transport while the proposed road layout will reduce congestion on the M25. The resulting improvements in air quality will be complemented by other infrastructure developments and improvements, including flood prevention measures, providing a comprehensive package of environmental benefits.

Noise is an inevitable consideration when planning a new runway, and we have given this particular attention. The extended runway will keep the same approach flight paths resulting in no new communities exposed to noise. The use of modern aircraft navigation systems and noise mitigation methods are incorporated in the proposal and a solution is offered to the most troubling concern of early morning noise pollution. These suggestions, in co-operation with Air Traffic Control, will help to reduce aviation noise. The mandatory introduction of modern aircraft types will have a beneficial positive effect and this will be accelerated by the opening of additional slots at Heathrow. Some runway alternation will still be possible and resilience will be improved allowing quicker recovery from disruption.

Politically the privately-funded Runway Innovations proposal is the most deliverable of the short-listed airport expansion options. Jobs are protected and created, local, regional and national economic benefits are substantial and consistent with policy and development strategies, community impacts are relatively modest and can be mitigated, and aircraft noise impacts compare well with the other Heathrow scheme.

Runway Innovations and Heathrow Hub, with their professional consultants will continue to supply data as it becomes available in the coming weeks. Meanwhile we respectfully offer the following submission for consideration by the Airports Commission.

Runway Innovations Ltd and Heathrow Hub Ltd

May 2014

EXECUTIVE SUMMARY

The Executive Summary for this report is contained in a separate volume.

ABBREVIATIONS

Abbreviation	Meaning
AAP	Area Action Plan
AC	Airports Commission
APM	Automated People Mover
ATC	Air Traffic Control
ATM	Air Transport Movement
ATM	Air Traffic Management
BANE	Black and Ethnic Minority
BAP	Biodiversity Action Plan
Bn	Billion
BRIC	Brazil, Russia, India and China
CAA	Civil Aviation Authority
CAGR	Compound annual growth rate
CAPA	Centre for Aviation
CDG	Charles de Gaulle Airport
CEO	Chief Executive Officer
CHP	Combined Heat and Power
CIL	Community infrastructure levy
CIS	Commonwealth of Independent States
CPO	Compulsory Purchase Order
CTA	Central Terminal Area (of Heathrow Airport)
DCO	Development Consent Order
DfT	Department for Transport
ECML	East Coast Main Line
EIA	Environmental Impact Assessment
EIB	European Investment Bank
ETS	Emissions Trading Scheme
EU	European Union
FALP	Future Alterations to London Plan
FDI	Foreign direct investment
GBAS	Ground Based Augmentation Systems
GDP	Gross domestic product
GEML	Great Eastern Main Line
GLA	Greater London Authority
GMP	Gross Metropolitan Product
GVA	Gross value added
GW	Great Western

Abbreviation	Meaning
GWML	Great Western Main Line
ha	hectare
HAL	Heathrow Airport Limited
HEX	Heathrow Express
HGV	Heavy Goods Vehicle(s)
HH	Heathrow Hub Transport Interchange
HQ	Headquarters
HS1	High Speed 1 (rail scheme)
HS2	High Speed 2 (rail proposals)
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
ILS	Instrument Landing System
INM	Integrated Noise Model
IoD	Institute of Directors
IP	Intellectual Property
IROPI	Imperative Reasons of Overriding Public Interest
LAMP	London Airspace Management Project
LCC	Low cost carrier
LB	London Borough
LGB	Lesbian, Gay and Bisexual
LTMA	London Terminal Manoeuvring Area
LVP	Low Visibility Procedures
LZC	Low and Zero Carbon
M	million
MLS	Microwave Landing System
MML	Midland Main Line
mppa	million passengers per annum
NATS	National Air Traffic Services
NM	Nautical Miles
NPPF	National Planning Policy Framework
NPS	National Policy Statement
NR	Network Rail
NSIP	Nationally Significant Infrastructure Project
ONS	Office for National Statistics
p	page
pa	per annum
pax	passenger
PBN	Performance Based Management

Abbreviation	Meaning
PV	Present value
RAB	Regulatory Asset Base
RBWM	Royal Borough of Windsor and Maidenhead
RESA	Runway End safety Area
RIL	Runway Innovations Limited
SIDS	Standard Instrument Departures
SHLAA	Strategic housing land availability assessment
SNCI	Site of Nature Conservation Importance
SPA	Special Protection Area
sqm	square metre
SSSI	Site of Special Scientific Interest
STAR	Standard Terminal Arrival Route
STEM	Science, Technology, Engineering and Mathematics
SuDS	Sustainable Urban Drainage Schemes
SWML	South West Main Line
T2, T4, T5	Terminals 2, 4 and 5 at Heathrow Airport
T6	A possible new terminal at Heathrow to support airfield expansion
TIF	Tax Increment Finance
TfL	Transport for London
TMA	Terminal Manoeuvring Area
TOC	Total Organic Carbon
tph	Trains per hour
WACC	Weighted Average Cost of Capital
WAML	West Anglian Main Line
WCML	West Coast Main Line
WMP	Waste Management Plan
UK	United Kingdom
US	United States of America

1 INTRODUCTION

1.1 Scheme Summary

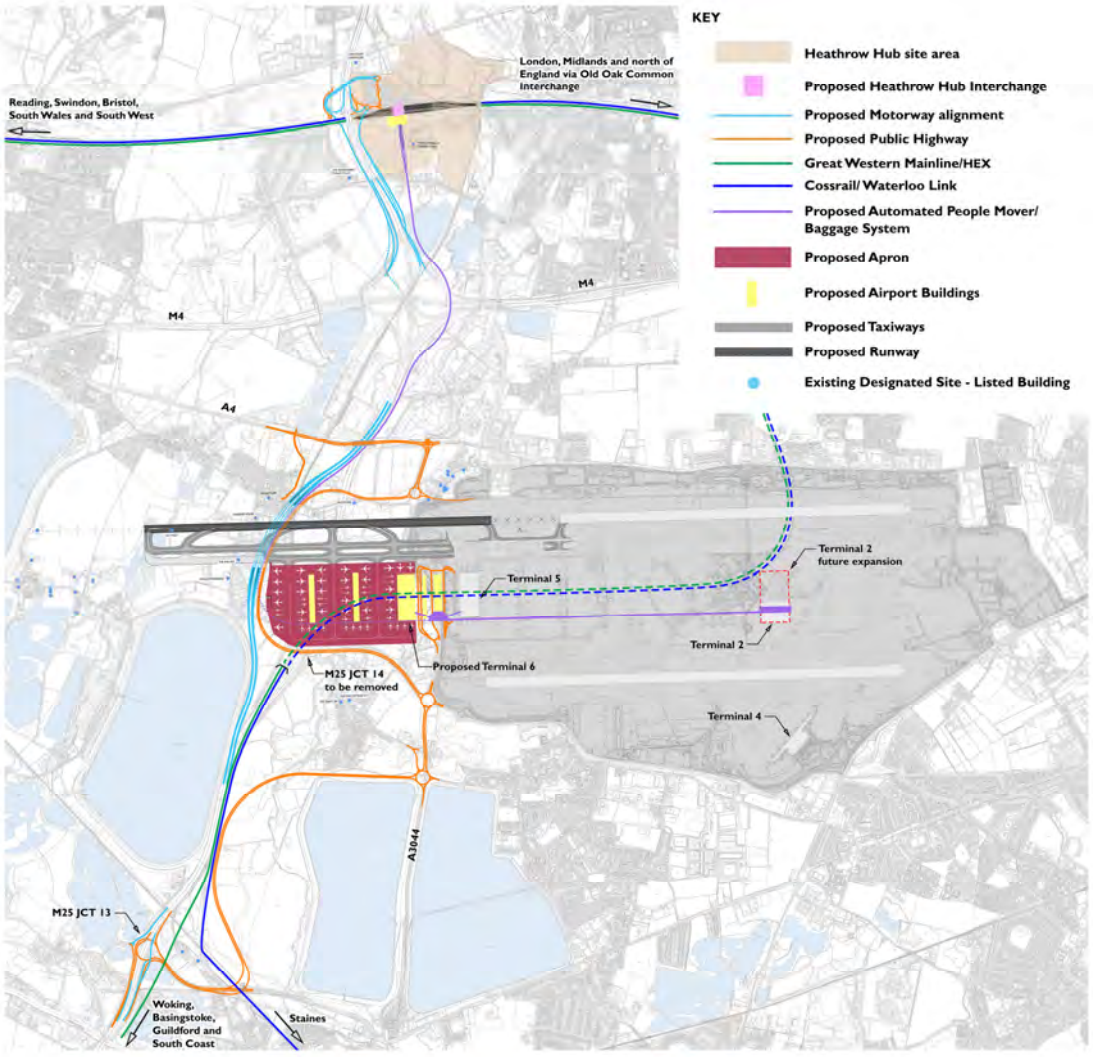
The Airports Commission has identified the need for one net new runway in the south east of England by 2030.

One of the shortlisted options is the development of additional runway capacity by extending the existing northern runway to the west to create two separate in-line runways; one for landing and one for take-off in normal operations.

This proposition has been developed with an associated surface access proposal to provide a holistic solution to the key issues concerning development of additional hub airport capacity to serve the United Kingdom.

The scheme builds on the only hub airport within the United Kingdom - Heathrow Airport. This is to provide capacity where there is a clear and proven demand from airlines.

Figure 1.1 Outline of Scheme



The airfield is developed by providing an extension to the northern runway to the west. This approach limits the impact on surrounding communities from both the physical development by using land that is already on the extended runway centreline and therefore lightly developed and by the operational modes that this arrangement facilitates to mitigate noise impacts.

A coherent site has been created for airfield development and provides the spaces for taxiways and aprons to support a terminal complex of a similar size and nature to the existing Terminal 5. The space can be used flexibly and the development phased to provide services to either airlines offering hub services or those offering point to point services.

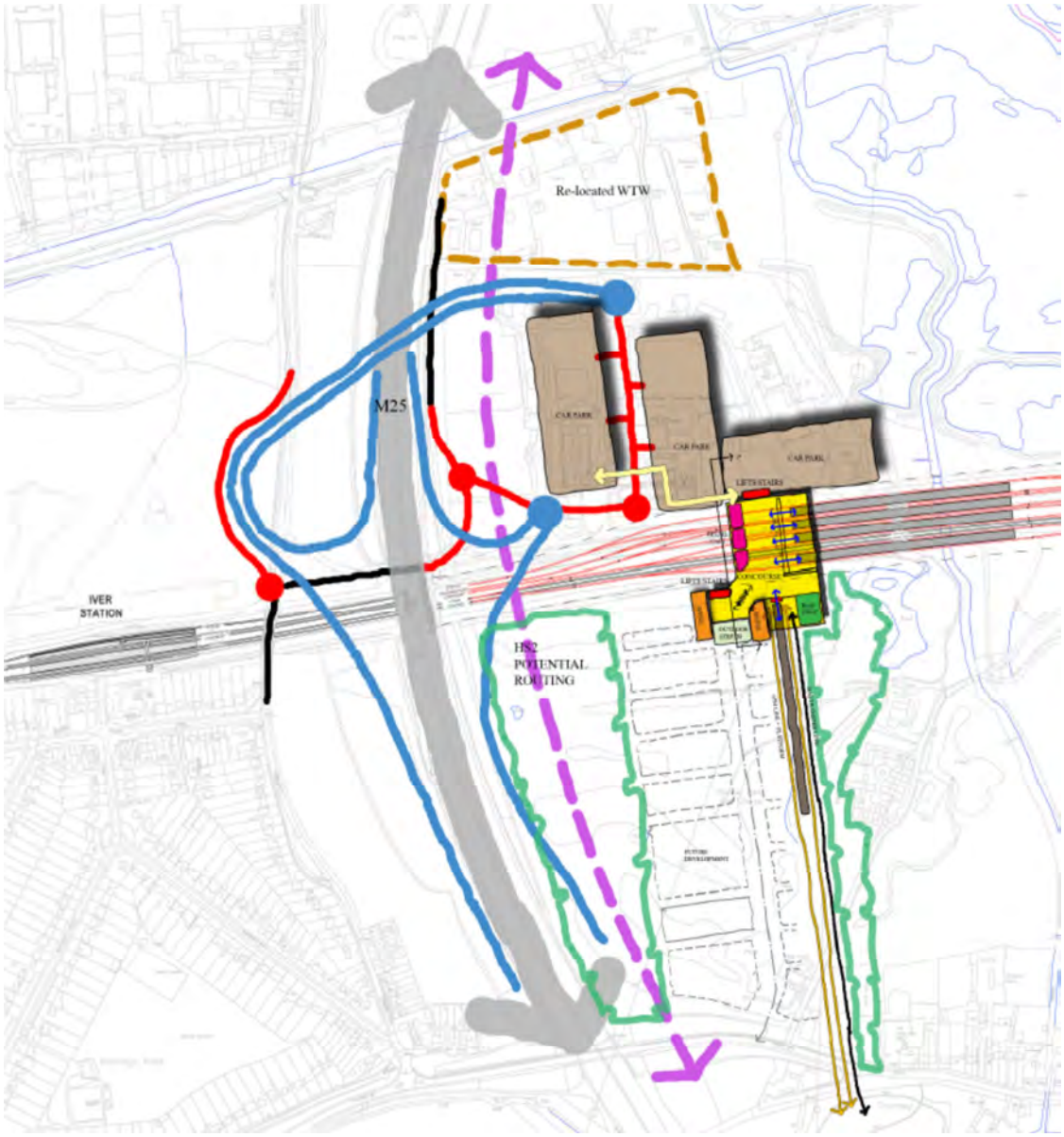
Other facilities support the operations such as a satellite fire station and short term parking and hotels adjacent to the terminals.

Surface access for the substantial additional passengers forecast to use an expanded airport is facilitated in a number of ways. These include the provision of a new transport gateway – Heathrow Hub - and, taking advantage of the opportunities presented by the need to remodel the existing highway network, the dispersion of highway access for cars, taxis and buses/coaches by providing different access points from the south, west and north to the airport bringing relief to the M25/M4 in the vicinity of the airport. Significantly more rail capacity will be made available through the provision of additional Crossrail services, new services from Heathrow Hub and a new southern rail access to south west London and Waterloo.

The core functions and facilities at the hub provide an interchange facilities between surface access modes and the airport and will include:

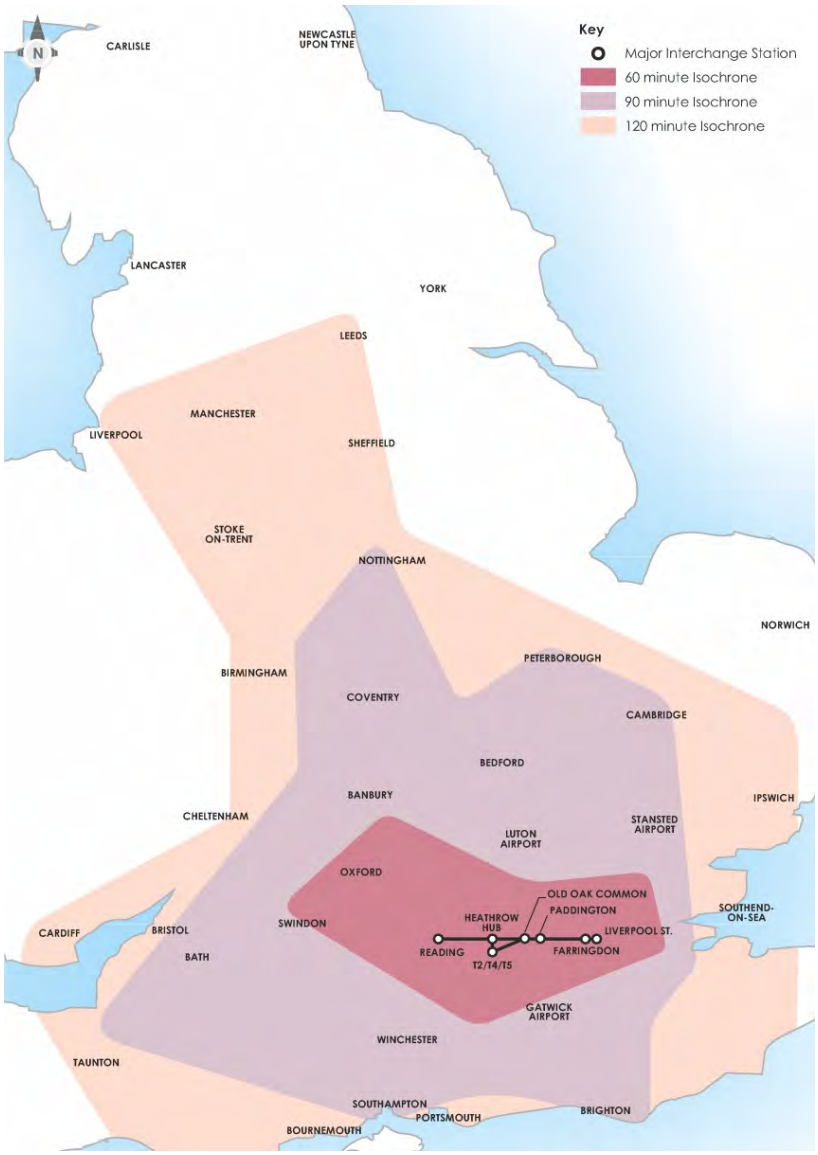
- A railway served by up to 15 trains per hour based on mainline services
- Travellator and lift access directly from platform level to the interchange level with a short distance to connect to the APM that connects the interchange and airport facilities
- Multi airline self-service check in machines could be made available for those who have not checked in online
- The potential for secure baggage drop facilities at the interchange level which could connect directly into the airside baggage facilities of the airport.
- State of the art, high quality, fast, landside APM to transport passengers free of their baggage to the main terminals every 90 seconds at peak with a journey time of around 5 minutes to the T5 (western) campus and 7 minutes to the T2 (eastern) campus.
- Direct access to the interchange from the M25 from the north and the M4 from the west (and possibly from the east) with kiss and ride facilities and up to 10,000 car parking spaces, which would have direct enclosed access via travellators to the interchange level
- Bus and coach facilities. We are not proposing that the CTA bus/coach station should be relocated to the hub, however we will provide bus/coach facilities as the hub is likely to be attractive, particularly for longer distance coaches, as they would have easy access from the motorway network and would only have to serve one location for passengers to access the airport terminals.
- Potential for commercial development including, for example hotel(s) providing a range of price points for overnight accommodation for passengers catching early morning flights or arriving late in the evening.

Figure 1.2 Concept Arrangement of the Hub Site



More broadly our surface access strategy not only caters for the additional demand into London without overstressing the rail network for commuters and inter-city travellers but will transform public transport accessibility across the regions by connecting to the country's key mainline rail routes either directly or with a single same station connection at either Old Oak Common, Farringdon, Clapham Junction or Liverpool Street, will bring an unprecedented 95% of the airport's passengers within 120 minutes of the airport by rail.

Figure 1.3 Rail Access Isochrones



The details of the scheme, including a description of how the core concept has been chosen, are covered in Chapter 3 of this document.

1.2 Arrangement of this Document

This document provides further details of the proposition as requested by the Airports Commission and follows the format set out in Appendix B of the Commission's document covering the appraisal of shortlisted options.

In Chapter 2, the fit between this proposition and the strategic objectives of the Commission's work of providing additional capacity to facilitate connectivity, improving passenger experience, maximising the benefits of competition both to aviation users and the broader economy, and maximising benefits in line with long-term strategies for economic and spatial development are described.

In Chapters 3 and 4, the master planning and engineering work done to develop the physical scheme is described. The core proposition is defined and the reasons leading to the choice of the core options are given.

In Chapter 5, the matters that have not been mitigated either through the master plan or engineering approach are identified and outline mitigation strategies discussed.

Chapter 6 describes some of the issues that need to be considered in taking the scheme from concept to opening. It is anticipated that these will be developed with the Commission to provide the necessary material for consultation.

The location of discussion related to the various Phase 2 Objectives defined by the Airports Commission are set out in the following Table.

Table 1.1 Relationship Between the Submission and Commission Objectives

Phase 2 Assessment Module	Phase 2 Objective	**Assessment Details**
Strategic Fit	To provide additional capacity that facilitates connectivity in line with the assessment of need.	See Chapters 2 and 3
	To improve the experience of passengers and other users of aviation.	See outline in Chapter 3.
	To maximise the benefits of competition to aviation users and the broader economy	See Chapter 2
	To maximise benefits in line with relevant long-term strategies for economic and spatial development	See Chapters 2 and 3
Economy Impacts	To maximise economic benefits and support the competitiveness of the UK economy	See Chapter 2
Local Economy	To promote employment and economic growth in the local area and surrounding region	See Chapter 2
	To produce positive outcomes for local communities and the local economy from any surface access that may be required to support the proposal.	See Chapters 2 and,3
Surface Access	To maximise the number of passengers and workforce accessing the airport via sustainable modes of transport.	See Chapters 2, 3 and 5
	To accommodate the needs of other users of transport networks, such and commuters, intercity travellers and freight	See Chapter 3
	To enable access from a wide catchment area	See Chapter 3
Noise	To minimise and where possible reduce noise impacts.	See Chapter 5
Air Quality	To improve air quality consistent with EU standards and local planning policy requirements.	See Chapter 5
Biodiversity	To protect and maintain natural habitats and bio-diversity	See Chapter 5
Carbon	To minimise carbon emissions in airport construction and operation	See Chapter 5
Water and Flood Risk	To protect the quality of surface and ground waters, use water resources efficiently and minimise flood risk	See Chapters 3 and 5

Phase 2 Assessment Module	Phase 2 Objective	**Assessment Details**
Place	To minimise impacts on existing landscape character and heritage assets.	See Chapter 5
Other	To identify and mitigate any other significant environmental impacts.	See Chapter 5
Quality of Life	To maintain and where possible improve the quality of life for local residents and the wider population.	See Chapter 2 and 5
Community	To manage and reduce the effects of housing loss on local communities.	See Chapter 2 and 5
	To reduce or avoid disproportionate impacts on any social group	See Chapter 5
Business Case	To make efficient use of public funds, where they are required, and ensure that the schemes clearly outweigh the costs, taking account of social, environmental and economic costs and benefits.	See Chapters 2 and 6
Cost and Commercial Viability	To be affordable and financeable, including any public expenditure that may be required and taking account of the needs of airport users.	See Chapter 6
Delivery	To have the equivalent of overall capacity of one new runway by 2030.	See Chapters 3, 4 and 6
	To actively engage local groups in scheme progression, design and management.	See Chapter 6
Operational Risk	To enhance individual and airports system resilience.	See Chapter 3
Operational Efficiency	To ensure individual and airports system efficiency.	See Chapter 3
	To build flexibility into scheme designs	
	To meet present industry safety and security standards.	
	To maintain and where possible enhance current safety performance with a view to future changes and potential improvements in standards.	

1.3 Contributors to the Report

Runway Innovations Ltd (RIL) and Heathrow Hub Ltd (HHL) have commissioned URS and a professional consultant team to provide this technical report in support of the submission to the Airports Commission. Following previous submissions to the Commission in 2013, it provides additional detail on the clients' proposals to increase Heathrow's runway capacity and, by means of a new transport interchange, better integrate the airport with the rail and road networks.

RIL and HHL are the companies that have respectively developed the airport and transport interchange proposals.

The consultant team responsible for this report includes;

- URS – Lead consultant, airport engineering, highways, baggage and transit system design, environmental assessment, and economic appraisal

- Helios – Airport safety and operations
- Think Aero – ATC and airspace
- Aviation Economics – Airline and airport economics
- High Point Economics – Economic regulation
- RDC Aviation – Aviation market assessment
- First Class Partnerships – Rail demand modelling
- Oxford Rail Strategies – Rail operations
- Peter Brett Associates – Rail engineering
- Gardiner & Theobald – Cost consultant
- Maitland – Public affairs
- Quatro – Community engagement
- Guller & Guller – Masterplanning.

2 STRATEGIC CASE

2.1 Introduction

This section addresses the question posed in the AC's Appraisal Framework:

'Why a scheme is well-placed to address the UK's future aviation capacity and connectivity needs, and how it may support the socio-economic development of local areas, regions and the UK as a whole.'[1]

We structure our points and arguments as follows:

- In Section 2.2 we consider the future of global aviation and the implications for the UK, and in particular the importance of the UK having a hub airport.
- In Section 2.3 we set out why we believe Heathrow is the best location for a hub airport in the UK.
- In Section 2.4 we present our constrained (no additional runway) and unconstrained (third runway and extra terminal capacity) demand forecasts based on the expansion of Heathrow as a hub airport.
- In Section 2.5 we set out our assessment of the national economic benefits of a hub airport at Heathrow and the role of the Heathrow Hub proposition in these benefits. In particular we set out why we believe enhanced surface access connectivity plays and linked and similar role to enhanced aviation connectivity in benefiting the national economy, and together they give greater economic benefits than just enhanced aviation connectivity.
- In Section 2.6 we outline our assessment of the regional economic benefits of our proposals, and the fit of the proposition with regional economic and land-use planning policy and strategy, including fit with the London Plan and growth in the M4 corridor. In particular we outline a growth model in which economic growth in the immediate M4 corridor is focused on a continued shift to greater added value activities, and population growth (reflecting environmental and planning sensitivities) and economic and growth tends to be focused elsewhere, including West London.
- In Section 2.7 we summarise the above points and links to wider case.

2.2 The Future of Global Aviation

The key points we make in this section are:

- Air transport has shown long-term growth trends and these are expected to continue in to the future. In particular part of the reason for the long-term growth is deregulation in the industry, unlocking demand. The effects of deregulation, and potential for further deregulation, are anticipated to continue to positively affect demand for aviation in Europe for many years to come.
- Hub airports will continue to play a key role in meeting growing demand.
- There are good reasons to draw the conclusion that growth in point-to-point and the long-haul, low-cost model are unlikely to significantly displace the hub-and-spoke model.

2.2.1 *Long-Term Trends and Effects of Deregulation*

Air transport has proven itself to be highly resilient to major global shock events, showing positive long-term growth multiplies of gross domestic product (GDP) and offering a nearly constant upward trajectory of growth.

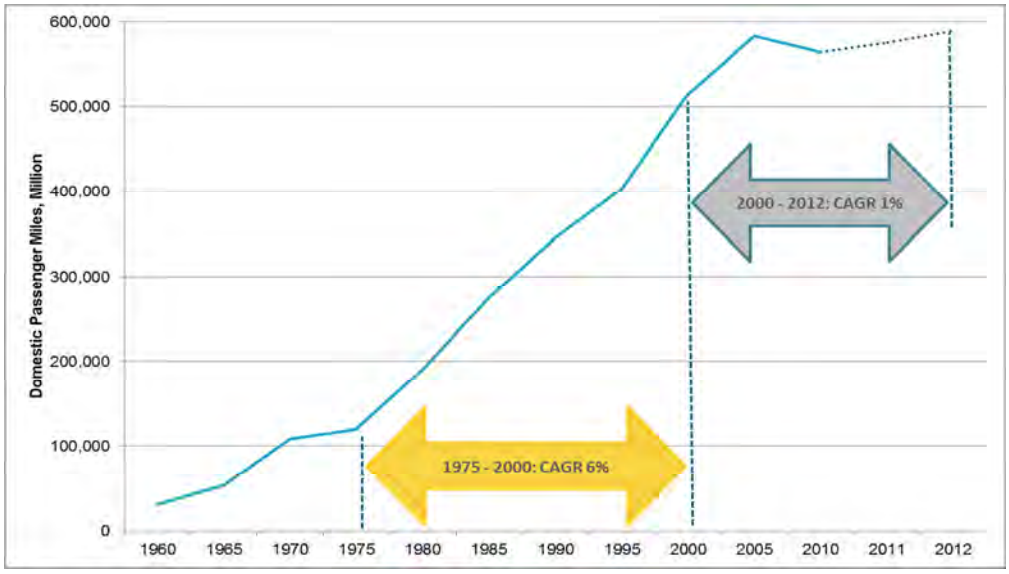
[1] Airport Commission: Appraisal Framework, April 2014, p.123

The industry has always been governed by international treaties that have, over time, regulated various key areas that have often restrained growth, including foreign ownership of airlines and restrictions on airlines on their right to fly between countries or airports.

Throughout the late 20th century significant progress has been made in removing these restrictions. Deregulation, first in the United States (US) and then in the European Union (EU) has seen significant structural changes to the industry particularly in their domestic markets. Tariff liberalisation and more liberal traffic freedoms resulted in a rapid expansion of air services and strong growth in passenger numbers. The UK saw a four-fold increase in the number of destinations served by low-cost airlines between 2002 and 2012[2] and within the EU traffic since deregulation has grown at a compound annual growth rate (CAGR) of 2.8%[3].

Deregulation in the US occurred almost two-decades before Europe and gives a perspective on how markets mature over time. As illustrated in **Figure 2.1** between 1975 and 2000 US domestic passenger-miles flown grew at 6% per annum, producing 400 million additional passenger-journeys and saw a consolidation among the legacy network airlines in the face of competition from the leaner low-cost carriers. However over the period 2000 to 2012 growth in passenger-miles fell to 1% as markets matured and the effects of the credit crunch were felt. This resulted in reductions in capacity and the slowdown in low cost carrier(LCC) growth.

Figure 2.1 US Domestic Passenger Miles, All Services, 1960 to 2012



Source: US Department of Transportation
http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national_transportation_statistics/html/table_01_40.html

Aviation will become increasingly important to the economy as it diversify its international trade in global markets. A report by the Institute of Directors[4] made the following points:

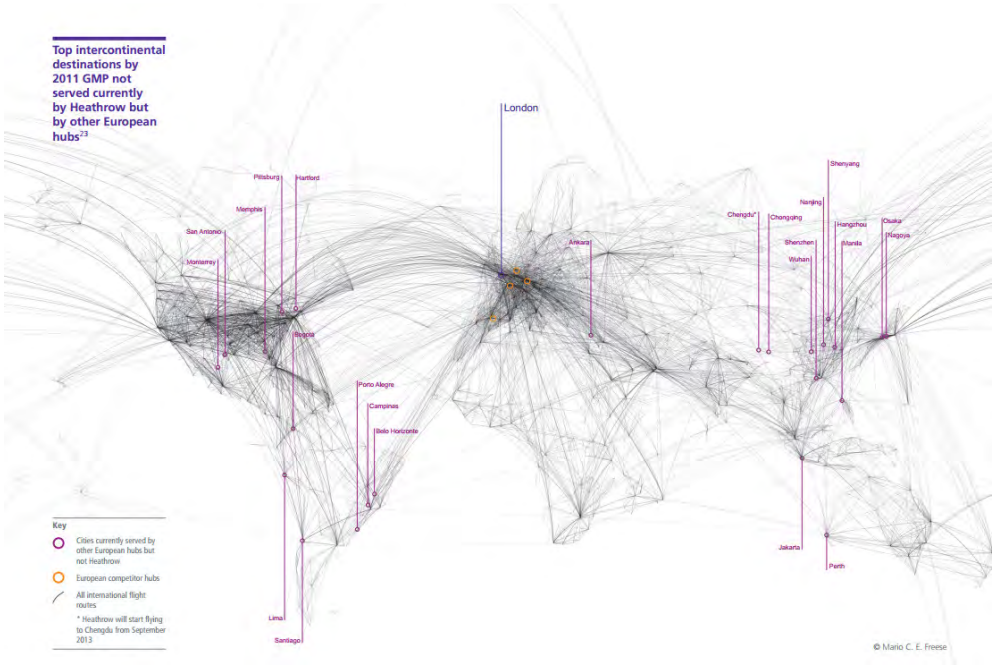
- The world is becoming an increasingly urban place. Over the next 40 years urban areas are set to grow by more than 2.5 billion people, a 75% increase. In China and India alone cities are expected to grow by 800 million people by 2050.

[2] The Optimal Size of a UK Hub, Independent Transport Commission, 2014
[3] EU Transport in Figures Pocket Book, 2012
[4] Flying into the future – Institute of Directors, December 2012

- Global cities and mega regions centred on a key conurbation will become more important economically. Their success will partly depend on excellent transportation links to other global cities. Currently cities such as London and New York are in the lead but there is no guarantee they will remain there.
- The world economy is shifting rapidly towards the high growth markets. Trade with Asia and Latin America will become increasingly important.
- By 2050 Goldman Sachs estimates that the BRIC countries (Brazil, Russia, India and China) will account for nearly 40% of world GDP and emerging markets overall over 70%. According to a recent Citigroup report in 2010 China accounted for 9.5% of world trade. By 2030 that figure is expected to increase to 17.4%. By 2050 China, India and Indonesia combined are expected to account for 30% of world trade.
- The UK trades about twenty times as much with high growth countries with daily (or better) direct flight connections as it does with countries with poor connectivity. A similar pattern holds for investment. It is not just the trade that causes the flights. A recent survey of business leaders in five high growth countries – Brazil, China, India, South Korea and Mexico – found that 92% say that direct flights are important to their inward investment decisions.

The largest cities by Gross Metropolitan Product (GMP) that are not currently served by Heathrow but are served by other European hub airports are shown in **Figure 2.2** below. In a study by Frontier Economics it was stated that *'the difference between UK trade with connected and unconnected growth economies is stark. The UK trades about twenty times as much with growth market countries with daily (or better) direct flight connections as it does with countries with poor connectivity. Similarly, the rate of growth in UK trade is substantially lower where daily flight connections with Heathrow are not available.'*

Figure 2.2 Large Cities Not Served by Heathrow



Source: 'Heathrow – Best Placed for Britain', June 2012, published by Heathrow Airport Limited

2.2.2 *The Role of Hub Airports*

We expect that, whilst there will be some changes in the structure of the air transport industry in future years, there will not be a wholesale shift away from the low-cost and network models at either a global or regional level. We expect to see some development of niche long-haul low-cost routes but the mainstay of intercontinental connectivity will be the hub model.

Our forecasts consider that competition between hub airports will be more intensive than competition from low-cost long haul operations over the next two decades. The European network airlines are likely to re-align their strategies as they come to terms with the threat from the Middle East and Istanbul mega-hubs. These comparatively recent developments show that in the right environment the hub-and-spoke model remains the most effective way to develop long-haul and intercontinental connectivity.

Over the last two-decades we have seen increasing consolidation amongst the European flag carriers into three main competitive groupings comprising IAG, Lufthansa and Air France/KLM. Each of these has a trans-Atlantic joint venture with a US partner carrier, covered by anti-trust immunity, and in some instances similar arrangements with Asian airlines. We see this underpinning the long-haul development of the future, with a pre-requisite for these partnerships being to operate from a strong home hub airport.

2.2.3 *Alternative Scenarios for the Aviation Industry*[5]

Questions have been raised over whether the future business model for aviation will change, with for example a growing importance of point-to-point flights over hub and spoke models, and whether low-cost, long-haul will have implications for hub strategies. We consider these points below.

Almost since the start of European deregulation aggressive competition from low-cost airlines has re-shaped intra-European traffic, resulting in a thesis that the next segment to undergo a similar revolution will be long-haul. However, the structure and costs of long-haul are different to those that prevail in short-haul and there are fewer opportunities for significant economies of scale that can provide a step-change in the operating environment.

Since 2004 several airlines have started long-haul low-cost services from the UK, but most of these airlines have failed and of those that are still operating (Air Asia X, Hong Kong Airlines) have closed their European operations. This context is summarised in **Table 2.1** below.

[5] We agree with the observations of the Airports Commission's interim report on the current and future shape of the aviation industry, although we suggest a note of caution as to the long-term role of 'self-connecting' which we would never see as a replacement of the true interline model. While this works within a defined framework such as UK passengers self-connecting at Gatwick or Stansted, there are limitations to the impact it can have on true international passenger behaviour.

Table 2.1 Selected Long-Haul Low-Cost or Niche Airlines Serving the UK Since 2004

Airline	Main Airports	To	Years
Zoom	Gatwick, Manchester	New York, various	2004-2008
Maxjet	Stansted	New York, various	2005-2007
EOS	Stansted	New York	2005-2008
Oasis Hong Kong	Gatwick	Hong Kong	2006-2008
Silverjet	Luton	New York	2007-2008
Air Asia X	Stansted, Gatwick	Kuala Lumpur	2009-2012
Hong Kong Airlines	Gatwick	Hong Kong	2012

Source: Innovata, Aviation Economics Analysis, 2014

The operating economics of long-haul are very different to short-haul:

- Longer flights burn more fuel – fuel is the largest individual cost item for airlines and has trebled in cost in the last decade, leaving less room for efficiencies elsewhere to make a difference[6].
- Long haul aircraft tend to fly at higher annual utilisation levels than short-haul, meaning that one of the initial advantages of LCCs in short-haul, which was to operate their assets more intensively, is not such an easy option when flying across time-zones.
- The long-haul LCC model is likely to work only if accompanied by more flexible and longer airport opening hours.
- It is harder to achieve cost-efficient use of crew within legal rest requirements.
- A wide network of routes from hub airports makes for efficient use of aircraft, but also means focussing resources on a hub airport.
- Filling aircraft year-round and flying profitably without interline feed is challenging.
- Good patronage of the business class cabins enables network carriers to already offer competitive economy class fares[7] and potentially the scope to compete aggressively on price
- A network of long-haul routes supplemented by short-haul feed gives an airline the opportunity to sell its product in many different markets.
- Low frequency long-haul routes are risky without suitable commercial arrangements with competitors to accommodate passengers in the event of delay.
- There are no opportunities to pick-up a sizeable number of aircraft suitable for low-cost long-haul operations. Production lines are fully committed into the 2020s. One area where both Ryanair and easyJet were able to gain a competitive cost advantage was by placing significant orders with Boeing and Airbus in the aftermath of the 9/11 bombings when market uncertainty meant that they were able to obtain large discounts off list prices. The strength of the manufacturers' order books today means discounts are much harder to come by and therefore there is no cost of ownership advantage that will accrue to new entrant long-haul low cost airlines.
- The international regulatory framework offers significant barriers to new entrants seeking to operate in many existing and emerging markets.

[6] Fuel represents around 20% of sector operating cost for a short haul low cost airline service and in excess of 40% for a long haul route

[7] A brief analysis of fares between London and New York for travel in July 2014 shows an average price differential of 15% between Norwegian and the full service operators

The Airports Commission has already recognised that it would be *'very difficult for a single airline to spread its hub operations over multiple airports*[8] in relation to a network carrier. The same logic applies to long-haul low-cost for the reasons outlined above.

If we accept that airline operating costs are likely to increase in future years as a result of higher fuel and carbon costs, airframe and engine costs, staff costs and airport charges, flying will become more expensive than it is today. Though to an extent this can be offset by increasing personal wealth, in the mature markets (Europe, the US) much of the benefit from economic growth and deregulation may already have had its biggest impact and so the next two decades will see a slow-down in short-haul growth and only a moderate expansion of long-haul, rather than a dramatic increase in the impact of long-haul low-cost.

In an increasingly competitive European environment we expect to see low-cost airlines moving away from secondary and into primary airports where possible, seeking to capitalise on the higher-yield traffic and move away from ultra-price sensitive passengers. This has been evident with the recent change in strategy from Ryanair[9], which is now using more primary airports such as Brussels National; and in a recent interview with The Telegraph, Carolyn McCall, easyJet CEO, stated that the airline does not see itself being 'priced out of Heathrow.'[10]

The future shape of the industry is unlikely to be radically different to today. At a global level – particularly if deregulation occurs across continental borders – consolidation of network airlines into true international carriers is likely. Until that time the major groupings in North American and Europe are already in place, with three major US (Delta, United, American) and three major European (IAG, Lufthansa, Air France/KLM) carriers, each an anchor member of one of the three global airline alliances. The next development will be deeper co-operation with Asian and Middle East network airlines.

2.2.4 *Conclusion: The Importance of a Hub Airport for the UK*

We remain sceptical about the prospects for long-haul low-cost air services to bring significant additional connectivity to the UK, even looking more than two decades ahead. The North Atlantic is currently the world's largest air travel market, within which London to New York is the largest city pair, with over 5.6m seats in 2013. Whilst highly competitive it remains almost wholly served by the network airlines. Likewise the high-growth Asia markets, which are currently experiencing similar growth in short-haul to that which we saw in post-deregulation Europe, have yet to develop a long-haul low-cost model that can serve Europe sustainably. There will always be fierce competition for intra-regional travel, but even here there are limits to the number of airport-pairs that can be flown profitably.

Looking forward over the next decade we expect to see more air services into major and hub airports at the expense of the regional and tertiary sector. This may see low-cost carriers serving primary airports where possible, and will certainly result in significant opportunity for a small number of hub airports, whose role as internationally recognised gateways for their host countries will play a vital part in the economic prospects of those nations in attracting international business and tourism traffic.

[8] Discussion Paper 04 – Airport Operational Models. The Airports Commission, 2013
[9] http://www.reuters.com/article/2014/03/26/ryanair-airports-idUSL5N0MN4PC20140326
[10] http://www.telegraph.co.uk/finance/newsbysector/transport/10728483/easyJet-debunks-Gatwicks-Heathrow-myth.html

2.3 Heathrow is the Right Location for UK Airport Expansion

We believe that Heathrow is the best location for UK airport expansion because:

- It has the highest population and economic output catchment of any of the existing or proposed UK airports
- The Heathrow Hub proposition further enhances the case for Heathrow in terms of regional connectivity and extension of economic benefits.
- Heathrow is already established as a hub and so risks of expansion in terms of demand and wider benefits for the economy are less than in seeking to establish a new/alternative hub
- The costs of developing a new hub elsewhere, covering both immediate airport and transport-related infrastructure and costs of relocations of businesses and workforce, are likely to be significantly greater than expansion at Heathrow.

These points are elaborated below.

2.3.1 *Heathrow has an Optimum Domestic Catchment*

Maintaining a globally recognised gateway for the United Kingdom is the only way to maximise the benefits to the economy. A well-connected hub airport is a national asset that brings opportunities not only to London, but the country as a whole. This means development of a highly accessible facility with excellent domestic connectivity by road, rail and air should be an inherent part of the country's future airport strategy.

Connecting to any major hub airport from Scotland and Northern Ireland is only practical by air, whereas for much of England and Wales it is feasible to reach a UK hub by road, rail or air. Looking at the eight main compass points from London at a 22 mile radius, the optimal location for an airport, when measured by land-connectivity, is north-west or west of London. These two locations can be reached by over 20 million people within 90 minutes and 30 million within 120 minutes' drive-time, which equates to over 54% of the population of England and Wales. This is illustrated in **Figure 2.3** below.

Figure 2.3 Heathrow Passenger Origin and 90/120 Minute Catchment Population

	Drive-Time Population (m)		
Compass point	90 Minutes	120 Minutes	Of England & Wales
North West	21	31	54%
West	20	30	53%
South West	19	28	49%
North	17	25	45%
North East	17	23	41%
South East	18	22	39%
South	18	22	39%
East	17	22	38%

Source: CAA, 2011 Census, Aviation Economics analysis, 2014

According to the Civil Aviation Authority (CAA) over nine million passengers travelling to/from the regions immediately adjacent to the south east used Heathrow in 2012, plus a further 0.8 million from Wales[11]. Further north the key cities of Manchester, Leeds, Newcastle, Edinburgh, Glasgow and Belfast all have air connections to Heathrow. However it is the proximity of Heathrow to the orbital M25 and M1, M3, M4, and M40 motorway corridors that facilitates vital air service connectivity for businesses located within a south-west to north-east arc. For these regions Gatwick Airport is considerably less accessible.

Aside from the importance of Heathrow for the 120 minute surface journey catchment area outside of London and the south east, the area immediately around Heathrow, termed the 'western wedge' (covering the Heathrow area through to the Thames Valley) is an economic powerhouse, generating 10% of UK economic output and supporting over a million jobs. Within this area the one study found that airport itself supports 120,000 jobs and contributes an estimated £6.2Bn to the UK economy[12]. Research published by Heathrow Airport suggests that 202 out of the UK's top 300 companies are located within a 25 mile radius of the airport[13] and closure of Heathrow to make way for a new hub airport to the east of London would jeopardise over a quarter of a million direct and indirect jobs[14].

(The importance of Heathrow to London and the South-East regional economy is considered further in **Section 2.6** below).

2.3.2 *Heathrow Hub can Significantly Increase Public Transport Connectivity*

The Heathrow Hub proposition further enhances the case for Heathrow in terms of regional connectivity and extension of economic benefits.

Heathrow is set at the centre of comprehensive networks of road and rail links. These are critical for connectivity with the majority of the airport's central London market, particularly when compared with other airports in the UK, but there are two critical gaps:

- Many parts of the airport's catchment – compass points to the south, south west, west and north west - are not currently served by fast, convenient and reliable public transport links. Access is possible by rail from some of these markets with a change of train at London Paddington. However few air passengers choose rail, demonstrating the significant impact of an interchange on demand, and resulting in passengers and staff largely using road in the absence of an attractive rail alternative, and
- Key part of the networks are already very congested, especially at commuter peak periods but also – in the case of the principal road network used by bus and coach – at other times. So many of the road and public transport links around Heathrow are already being loaded to capacity. For the airport to expand they will have to accommodate regional growth in population and employment as well as expansion at Heathrow. The approach of just assuming that extra road and airport demand can be channelled through the one of the most congested section of road in Europe is not sustainable.

So while rail has a 45% market share between central London and Heathrow, its modal share is minimal from all other parts of the country, including key catchment areas such as South West London, Surrey, Hampshire and Berkshire.

[11] CAA Passenger Survey Report, 2012
[12] London Heathrow Economic Impact Study, Regeneris Consulting, September 2013
[13] Heathrow – Best Placed for Britain, Heathrow Airport Ltd, June 2012
[14] Heathrow – Best Placed for Britain, Heathrow Airport Ltd, June 2012

The unique position of Heathrow enables:

- More than sufficient public transport capacity to be provided to London through four different corridors (Piccadilly line, Crossrail/Heathrow Express (HEX), Waterloo/Stains (South London) and GWML through Heathrow Hub. This dispersion of demand also means that commuter routes will not be stressed by the growth of the airport.
- Connection to the countries key mainline rail routes (GWML, WCML, HS2, MML, ECML, GEML, WAML, SWML) either directly or with a single same station connection at either Old Oak Common, Farringdon, Clapham Junction or Liverpool Street, bringing an unprecedented 95% of the airports passengers within 120 minutes of the airport by rail.

This is illustrated in **Figure 2.4** below.

Figure 2.4 Increased Connectivity with Heathrow Hub

Rail Journey Time Comparisons

From	Current mins	RIL with Heathrow Hub mins
Leeds	205	116
Birmingham	155	82
Crewe	170	88
Manchester	200	101
Ipswich	145	122
East Croydon	85	61
Welwyn Garden City	94	77
Reading	65	16
Oxford	95	41
Swindon	92	46
Bristol	133	87
Cardiff	163	110
Plymouth	259	190

note: 20 minutes interchange penalty(interchange + wait time) assumed where interchange required

No other airport in the UK can or could achieve such geographic connectivity, delivering the maximum possible public transport surface access mode share in a sustainable manner.

2.3.3 *Heathrow as an Established Hub is a Lower Risk Option*

Heathrow is already established as a hub and so risks of expansion in terms of demand and wider benefits for the economy are less than in seeking to establish a new/alternative hub.

Heathrow continues to be the preferred UK airport for new overseas entrants, with many airlines preferring not to serve the UK at all if access to Heathrow is not possible. Expanding Heathrow therefore provides near-certainty that demand will exist to fill the new capacity and allow competitive user charges. Providing access to new overseas entrants may also prove a valuable negotiating tool for the UK in future discussions on bilateral agreements.

For the long-term prospects of the UK, and for the country to position itself as the number one choice in Europe for business and tourism, it is absolutely critical that the globally recognised name of Heathrow, and its association as the gateway into London and the UK, is able to develop on a par with competing hubs in Europe and the Middle East.

Europe may have too many hub airports in an increasingly competitive global market. Doing nothing, or providing new capacity where experience shows a history of failed attempts to seed routes, risks airlines diverting their inherently highly mobile assets away from the UK. Expansion in the wrong place, and/or at uncompetitive cost, may therefore accelerate the UK's relative decline in connectivity.

LCCs are inherently footloose so increased user charges resulting from Gatwick expansion may actually result in lower demand as carriers switch to other lower cost airports in the south east.

Heathrow's Regulatory Asset Base (RAB) is supported by much higher number of air traffic movements (ATMs) than Gatwick, reducing proportionate increase in charges for expansion. Airlines also more able to absorb increases due to Heathrow's superior catchment: '*British Airways strength at Heathrow is apparent from its premium seating profile, with 13% of all seats (not including premium economy). This is double the world average*'[15]

2.3.4 *Heathrow is the Lowest Overall Cost Location for a Hub*

The costs of developing a new hub elsewhere, covering both immediate airport and transport-related infrastructure and costs of relocations of businesses and workforce, are likely to be significantly greater than expansion at Heathrow.

2.4 Demand Forecasts

Below we outline our demand forecasts for Heathrow with and without a third runway and associated infrastructure. The demand forecasts for Heathrow with a third runway are based on assumptions including:

- Heathrow is the only UK hub airport
- Maximum allowable air transport movements capped at 700,000
- Downshift of passengers per ATM in the initial opening year due to increase in domestic/European flights. Thereafter passengers (pax)/ATM expected to gradually grow at an average of 0.6% pa as long haul movements increase
- Aviation operating within a *carbon traded* environment, either through the EU Emissions Trading Scheme (ETS) or a global International Civil Aviation Organization (ICAO) framework
- The inclusion of Heathrow Hub as part of the offer increases the likelihood of the forecasts and/or could result in higher growth forecasts than presented

In 2013 Heathrow Airport handled 72 million passengers and generated 471,000 air transport movements. Within its current operational limitations passenger traffic could be expected to grow to 78 million by 2022 through combination of reduction in the overall share of

[15] Centre for Aviation (CAPA) 12th December 2012

domestic/short haul flights, increases in the average size of aircraft, and an increase in average load factors.

Assuming no additional runway capacity we forecast that traffic increases slowly, averaging 0.6% pa from 2020 to 2050. One outcome of this is likely to be a loss of connectivity and a reduction in the number of short-haul destinations offered. Airlines will adopt a more cautious approach to starting new long-haul routes, preferring instead to increase the frequency of flights to proven destinations.

The northern runway extension which we propose could open in 2023 would provide a usable capacity of up to 700,000 movements per annum. This level of capacity includes allowance for a reasonable buffer for delays, noise mitigation and respite.

The growth of the additional passengers once the extended runway is operational is based on the assumption of the likely take-up profile of the additional capacity. As airlines will have certainty in the timing of the opening of the third runway many years before the new runway opens we would expect their medium term fleet plan and network strategy to take into account this development. Additionally the prospect that the additional runway capacity at Heathrow will be the only window of opportunity to expand London's capacity for perhaps the next 40-50 years would be taken into consideration by both incumbents and potential new entrant airlines strategies wishing to ensure a strong foothold in the London market specifically and exposure to the UK aviation market in general.

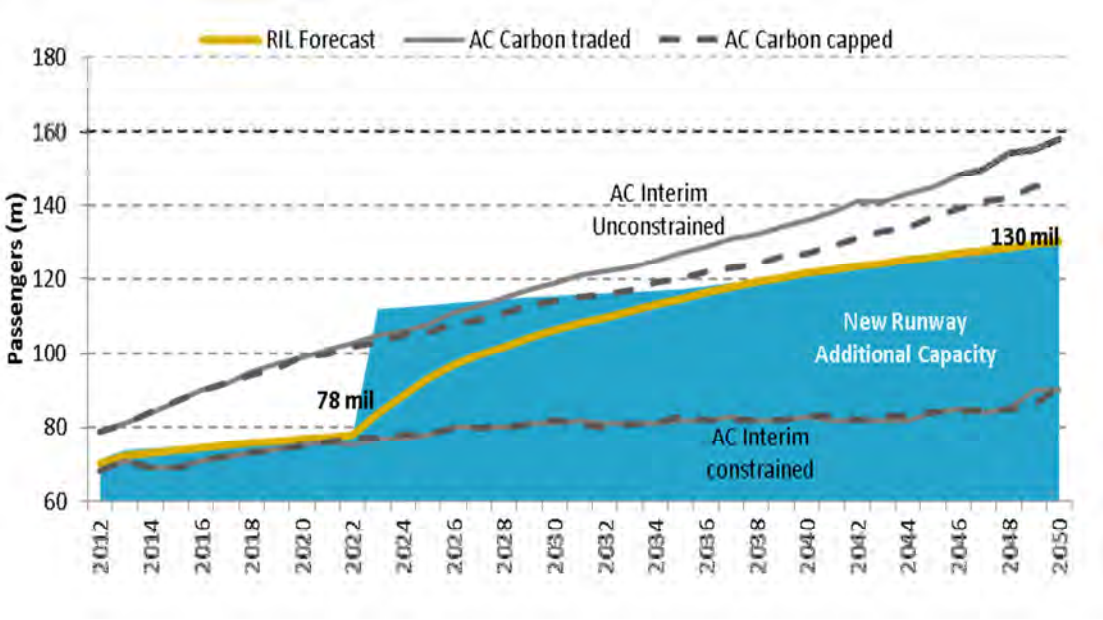
In the first two years after opening of the third runway we would expect a surge of traffic of an additional 5.6 million passengers in year 1 (7.2% annual growth) and 5.0 million passengers in the second year (6.0% annual growth). Overall the average additional increase in passengers for the period 2022-2027 would be 4.4 million passengers per annum (5.1% CAGR).

We project that the underlying demand would push passenger growth to 122 million by 2040 and 130 million by 2050 while the airport's additional runway capacity becoming constrained by 2035 onwards. This is illustrated in **Figure 2.5** below. Forecasting demand for air travel 40 years ahead carries with it much uncertainty. However the proposed expansion of Heathrow offers flexibility in this regard. Potential for an extended southern runway is an option should passenger demand necessitate further expansion. This could also increase opportunities for resilience and noise mitigation even within a cap of 700,000 ATMs.

The inclusion of the proposed Heathrow Hub transport interchange as part of the offer increases the likelihood of the above forecasts and/or could result in higher growth forecasts than presented. The reasons why Heathrow Hub enhance the likelihood of the forecasts/higher forecasts include:

- Heathrow Hub will facilitate easier and more reliable domestic connections to Heathrow, facilitating demand (as well as a domestic travel modal shift)
- Heathrow Hub will take some traffic growth from regional airports
- Heathrow Hub will offer greater overall connectivity, to help national and regional economies grow more than otherwise and hence increasing demand for air travel.
- Heathrow Hub, with its direct rail access to many of the UK's regions (including those such as South Wales and the South West of England which are amongst the most economically disadvantaged in Europe) will transform FDI perceptions of the UK regions as globally accessible business locations, and could increase foreign investment in established or new locations.

Figure 2.5 Heathrow Passenger Forecasts and Additional Capacity



Year	Passengers(m)	Movements('000)
2012	70	471
2013	72	471
2014	73	472
2015	74	474
2016	74	475
2017	75	477
2018	76	478
2019	76	479
2020	77	479
2021	77	480
2022	78	480
2023	84	524
2024	89	553
2025	93	579
2026	97	599
2027	100	612
2028	102	624
2029	104	635
2030	106	645
2031	108	654

Year	Passengers(m)	Movements('000)
2032	110	662
2033	111	670
2034	113	678
2035	115	685
2036	116	690
2037	118	693
2038	119	696
2039	120	698
2040	122	700
2041	122	700
2042	123	700
2043	124	700
2044	125	700
2045	126	700
2046	127	700
2047	128	700
2048	129	700
2049	130	700
2050	130	700

Our forecasts for Heathrow imply a long-term passenger CAGR of 1.7% for the period 2012 to 2050, within which we see growth slowing as the high-volume markets move towards maturity. This contrasts with a 1.8% long-term CAGR in the Airports' Commission carbon traded, capacity unconstrained forecasts. Set against the global forecasts for passenger volume increases, the major manufacturers forecast passenger growth of 4.1% (Boeing) and 4.7% (Airbus) through to 2032, whereas our forecasts show 2.3% over the same period and the Airports' Commission 2.2%.

2.5 National Economic Benefits

2.5.1 *Introduction*

Heathrow is already one of the world's most successful hub airports, supporting an estimated £10Bn GVA pa and 200,000 jobs nationwide in 2010[16]. Its significance as a key economic asset for the UK is highlighted by the fact that 202 of the UK's top 300 company headquarters are located within 25 miles of Heathrow and research suggests that Heathrow is an important factor in the success and location of these companies[17]. It's location to the west of London, adjacent to the Thames Valley, enhances the competitiveness of this productive sub-region, and means good accessibility to the airport from the rest of mainland Britain.

The proposed scheme is anticipated to have significant overall positive economic benefits at the national, regional and local levels. In particular the expansion of Heathrow allows the synergies between the airport and the M4 corridor and West London economies to be enhanced, while the Heathrow Hub interchange gives better connections to and benefits for regional economies, including to the west of London, in the south and south-west of England and South Wales.

Our key points on national economic benefits are:

- We estimate that the benefits to UK Gross Value-Added (GVA) in the form of productivity gains, employment effects, and the gains from trade from airport expansion, and benefits of Heathrow Hub, are likely to be (potentially significantly) over £45bn in Present Value (PV) terms[18].
- Heathrow's strategic location within the UK, and the maturity of its economic links to London and the dynamic Thames Valley region, mean it can offer greater, more certain and less risky economic benefits than non-Heathrow locations.

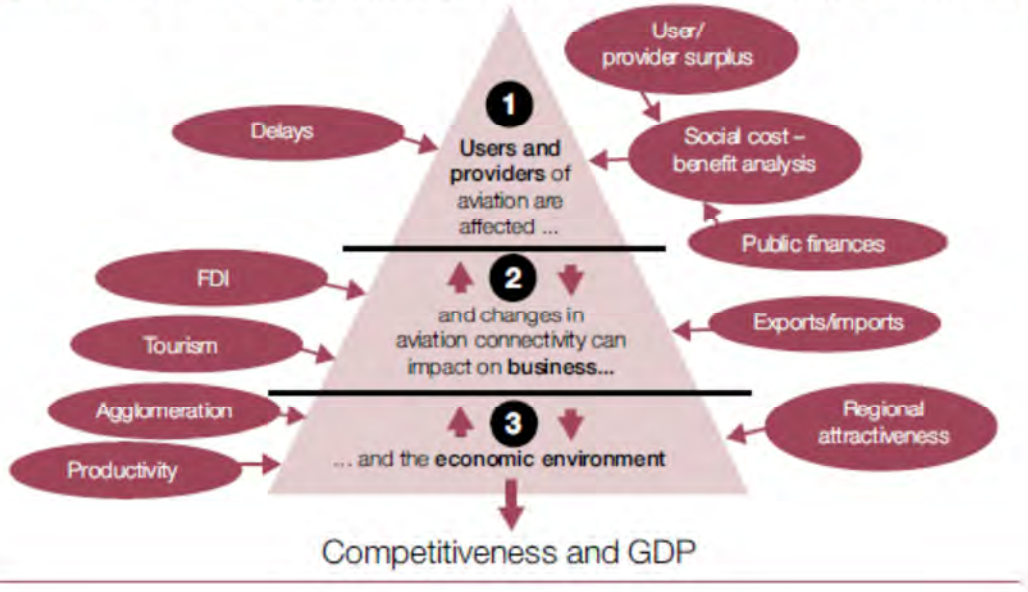
Our analysis at this stage is largely consistent with our Phase I submission and the work of the AC and its consultants. It is based on broad-brush analysis and is intended to inform the more detailed modelling work of the AC and its team.

2.5.2 *Context: AC Work and Framework*

We have reviewed relevant AC documents, including the Interim Report, Appendix 3, Part A and the associated consultant reports. The AC framework is usefully summarised in Figure 2.1 of the Interim Report, Appendix 3 (Part A, Section 2, p8):

[16] 'Heathrow Related Employment', Optimal Economics, p14, September 2011
[17] 'A New Approach', page 17, HAL, January 2014 and Airports Commission, 'Discussion Paper 02: Aviation Connectivity and the Economy', page 26, March 2013.
[18] We note HAL's announcement this week claiming Heathrow will generate around£100Bn on national economic benefits. We expect you will review their information and come to your own view on the benefits. Our main point is that we are anticipating similar national benefits to the HAL scheme, and with *additional* benefits from the Heathrow Hub interchange.

Figure 2.1: **How a change in airport capacity/aviation connectivity transmits through the economy**



Research by the AC has found strong links between increases in aviation connectivity and national economic benefits, particularly in terms of increases in tourism, trade and foreign direct investment (FDI). Using seat capacity as a proxy for aviation connectivity the econometric analysis found that a 10% increase in seat capacity is associated with the following:

- 1.7% increase in UK goods imports and a 3.3% increase in UK goods exports; and a 6.6% increase in UK imports of services and a 2.5% increase in UK exports of services; and
- 4.7% increase in UK FDI inflows and a 1.9% increase in UK FDI outflows
- 4.0% increase in tourist arrivals in the UK and around a 3.0% increase in UK tourists abroad[19].

2.5.3 *Overview of our Economic Analysis*

Our economic analysis is an indicative assessment of the overall potential economic benefits. It focuses on elements 2 (aviation connectivity and economic performance) and 3 (economic environment) of the AC economic impact framework. It uses:

- Our demand forecast figures (see Section 2.3)
- An estimate of the benefits of enhanced aviation connectivity and economic environment benefits, including multiplier and employment effects. This covers the indicators of FDI, trade and tourism mentioned in the AC documentation, but also covers general economic benefits to business in the UK resulting from enhanced aviation connectivity
- Estimate of benefits of gains from increased international trade
- An estimate of the additional economic benefits of Heathrow Hub public transport connectivity drawing upon parallels with other transport infrastructure assessments.

We recognise that the above components could potentially include over-lapping benefits. In our view this is a relevant question to raise in the context of a number of guidance frameworks

[19] Airports Commission, Airports Commission Interim Report, Appendix 3: Technical Appendix, page 18, December 2013.

such as WebTAG. We have not developed a comprehensive, holistic model of the UK economy and the impact of our proposals and so suggest that our assumptions and broad brush estimates are tested against such work. Our intention in presenting our thinking and work is to inform and raise relevant questions for the AC in taking forward its work and analysis.

Our work does not explicitly account for aviation transport economic efficiency[20], the impact on the freight industry[21] and delay impacts[22], which we assume are largely covered by element 1 of the AC economic impact framework. In general terms we anticipate that they are captured through our estimates of overall economic benefits but we understand that the AC may wish to disaggregate and test this in more detail[23].

Our national economic impact work focuses on how the proposals will effect overall national productivity and GVA. GVA can broadly be represented as being made of two principal components:

- additional labour participation and labour force size and
- increased labour productivity.

The former component implies creation of net additional jobs (and once equilibrium employment and participation rates are exceeded this implies additional population and workforce), and the later component implies increased productivity of existing businesses and their workforce and/or the substitution of less productive businesses and sectors for more productive businesses and sectors. The balance of productivity growth and employment growth is considered further at Section 2.6 Regional Economic and Employment Benefits.

2.5.4 *Aviation Connectivity and Enhanced Economic Performance*

We anticipate significant national economic benefits from the proposed expansion of Heathrow, including:

- Direct and indirect employment gains
- Productivity gains from reduced effective distances within and between firms, between firm and their markets, and between firms and the pool of available labour
- A boost to international trade, including tourist flows, and
- Additional inward Foreign Direct Investment (FDI) as more businesses are attracted to the UK as a well-connected place to locate or expand, further facilitated by the significant new rail connectivity with the UK regions provided by the Heathrow Hub interchange.

These effects combine (and overlap to a degree) to boost the UK's long-term growth rate.

Previous research has found that a 10% increase in air connectivity boosts labour productivity and therefore the level of GDP by 0.07%[24]. Work undertaken by the AC[25], which used seat

[20] See Airport Commission: Appraisal Framework, p37
[21] See Airport Commission: Appraisal Framework, p38
[22] See Airport Commission: Appraisal Framework, p38
[23] We have raised a question with the AC Secretariat on whether transport economic efficiencies are modelled as one-off improvements to the performance of the economy, or on-going improvements to GVA (we assume the later is more appropriate), and how these gains relate to wider improvements in the economic performance and added value of sectors in the economy resulting from general increases to aviation (and ground) connectivity.
[24] IATA Economics Briefing No. 8, *Aviation Economic Benefits*, IATA, 2007
[25] Airports Commission, Airports Commission Interim Report, Appendix 3: Technical Appendix, Page 26, December 2013.

capacity as a proxy for aviation connectivity, estimated that a 1% increase in seat capacity is associated with a 0.06% increase in UK GDP when capacity is constrained[26].

Applying this relationship to UK GDP we consider two scenarios for increased connectivity[27]:

- A low-connectivity scenario, in which the proposed scheme increases UK air connectivity by 7%[28], and
- A high-connectivity scenario, where the Proposed Scheme increases connectivity by 10%.

The low-connectivity scenario suggests benefits of £10Bn (2012 Present Value (PV) and prices) to UK GDP between the opening of the runway (in 2023) and 2050[29]. The high-connectivity scenario suggests benefits of £15Bn (2012 PV and prices). This gives a range of £10-£15Bn for the productivity benefits of the scheme, with rounding to account for the provisional nature of the estimates.

In terms of GVA, our estimates, using broad employment multiplier effects, suggest that expanded operations at Heathrow could potentially generate £20-£30 billion[30] of GVA generated by additional employment at the airport, additional activity along the airport's supply chain, and the further spending activity this employment would generate in the wider economy.

The two effects of productivity gains and employment gains are to a degree inter-changeable, depending on how the economy responds to the stimulus.

In total the combined benefits of productivity and employment generation effects could be in the region of £30Bn to £45Bn.

2.5.5 *Gains for UK Trade*

The trade benefits of increased connectivity at Heathrow could also be considerable. Assuming a boost to exports of £1.2Bn a year[31], the overall gain in GVA terms between the opening of the runway in 2023 and 2050 would be £15Bn (2012 PV and prices).

2.5.6 *Economic Benefits of Heathrow Hub*

A key proposition put forward by the AC in its assessment of the potential benefits of additional runway capacity in the UK is that there is a connection between aviation connectivity and national economic performance. It is also relevant to consider how associated land transport connectivity proposals could augment the UK's connectivity. We believe that the Heathrow Hub will contribute significant direct, indirect and induced benefits to the UK economy.

The proposed Heathrow Hub interchange will increase regional connectivity across the UK generating further economic benefits and growth. Connections to the Great Western Mainline,

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[26] The estimates are different as a result of the different definitions of connectivity used: the IATA research used a composite index which included the range and economic importance of destinations, frequency of service and number of onward connections, in order to measure connectivity. Its results were based on regression analysis of 48 countries over the period 1996-2005.

[27] We have produced two scenarios to account for the uncertainty around the exact degree to which the proposed scheme will increase connectivity. The GDP impacts are calculated using the IATA estimates of the impact of connectivity on productivity and therefore GDP.

[28] Assumption made by Colin Buchanan and Partners Ltd for British Chambers of Commerce Report, *Economic Impacts of Hub Airports*, BCC, July 2009, in assessing impact of third runway at Heathrow.

[29] Discount rate applied is 3.5%, the recommended rate in the Treasury Green Book

[30] The exact GVA impact depends on the assumption made for displacement of existing activity. The lower end of the range corresponds to as assumption of 50% displacement.

[31] Frontier Economics, 'Connecting for Growth: the Role of Britain's Hub Airport in Economic Recovery', September 2011

Crossrail and an indirect connection to HS2 via Old Oak Common will provide productivity benefits to businesses through reduced overcrowding and faster journey times, as well as increased benefits to company efficiency as effective distances within and between firms are reduced. We consider these benefits in more detail below.

The proposed scheme could be expected to improve accessibility to the airport via the UK's rail and road networks, resulting in an overall reduction in travel time. Although this reduction has not yet been assessed in full, analysis of adding a Heathrow Hub suggests a benefit of £2.2Bn (in PV terms) in the form of travel time savings from this additional infrastructure alone.

There will also be agglomeration and efficiency gains arising from Heathrow Hub. For example research suggests that the model for manufacturing companies in western countries is increasingly focusing around being niche/sliver players in global markets, often as part of local economic clusters[32]. For this model to work regional companies need to have increasingly good connections with global markets, including good national transport connections, to allow them easy access to their global customers. This suggests that the combination of Heathrow Hub together with expansion at Heathrow could help regional companies and sectors, particularly where they are export orientated, to flourish and grow more than they would do otherwise without the third runway and Heathrow Hub.

To put our assessment in context the assessed benefits of some other rail transport schemes include:

- HS2 (full Y network) estimate it will generate £71Bn PV benefits for the UK[33]
- Crossrail estimated that the project could generate wider economic benefits of at least £50 billion PV, which includes agglomeration effects[34]
- Northern Line Extension estimate benefits of £5Bn[35].

Our preliminary assessment is that the national agglomeration and efficiency benefits of the Heathrow Hub transport interchange could be in the region of £5Bn to £10Bn.

2.5.7 *Overall National Economic Benefits*

The economic benefits described above are summarised in **Table 2.2**. This suggests the proposed scheme will generate significant economic benefits for the UK. Overall the benefit is estimated to be in the range of at least £50-70 billion present value[36].

Table 2.2 Indicative National Economic Benefits

Benefit (2012 prices and PV)	£Bn
Boost to UK GVA from agglomeration, productivity and employment gains	30-45
Boost to UK trade	15
Economic benefits of Heathrow Hub connectivity	5-10
TOTAL (rounded to nearest £10Bn)	**50-70**

[32] 'The New Industrial Revolution', Peter Marsh, 2013, E.g. air bearings companies based around Poole.
[33] Department for Transport, *'The Strategic Case for HS2'*, October 2013. We anticipate that our ratio of benefits to costs will be significantly better than HS2.
[34] Crossrail, Crossrail Business Case Update: Summary Report, July 2011
[35] Steer Davies Gleave, Volterra and Quod, Northern Line Extension Economic and Business Case, p53.
[36] We note HAL's announcement this week claiming Heathrow will generate £100Bn on national economic benefits. We expect you will review their information and come to your own view on the benefits. Our main point is that we are anticipating similar national benefits to the HAL scheme, and with *additional* benefits from the Heathrow Hub interchange.

These benefits are reasonably consistent with the Airports Commission research into the effect of aviation capacity constraints on the economy which found that the whole economy impacts of capacity constraints on GDP could cost £30 billion to £45 billion, in present value terms, between 2021-2080[37].

2.6 Regional Economic and Employment Benefits

We break down regional economic and employment benefits in to the following components/steps:

- Estimate of gross and net direct employment at Heathrow, illustrating that the growth in employment associated with airport expansion will to a degree be off-set the decrease in base employment arising from anticipated productivity gains.
- Regional economic context.
- The role of Heathrow in the regional economy, demonstrating the extent and nature of links between Heathrow and its hinterland.
- Analysis and evidence of process of economic change and flexibility, illustrating that local economies are dynamic, with a fairly rapid rate of change of company formation and closure, mergers, expansions/contractions and relocations. This has implications for the forecast of economic and employment and labour force benefits and requirements.
- An outline regional economic and employment model, illustrating how the M4 corridor can accommodate 'smart growth' with more focus on greater productivity, and West London and the rest of the country can focus on a mixture of productivity gains and employment/development gains in areas such as Old Oak and Park Royal.
- Fit with regional and local spatial and socio-economic development strategies, illustrating how the regional economic and employment model can be consistent with and complementary to strategies such as the London Plan.

In summary expansion of Heathrow's operations will have knock-on employment benefits to the local area, wider region and UK as a whole. We estimate a net additional 19,000 to 42,000 airport jobs will be created by 2050 over the base case (which we estimate gives a fall in airport jobs).

2.6.1 *Direct Heathrow Jobs*

Heathrow airport currently employs approximately 76,500 staff on site, and an estimated 7,700 off site[38].

In the absence of an expansion of capacity, employment at the site is anticipated to fall over the forecast period as a result of productivity gains through technological change[39]. Assuming productivity growth of between 0.5%-1.5% pa, and a baseline capacity forecast that rises moderately to 92 million passengers per annum (mppa)[40], total employment (both on- and off-site) would fall to between 45,800-68,700 by 2050, all else being equal.

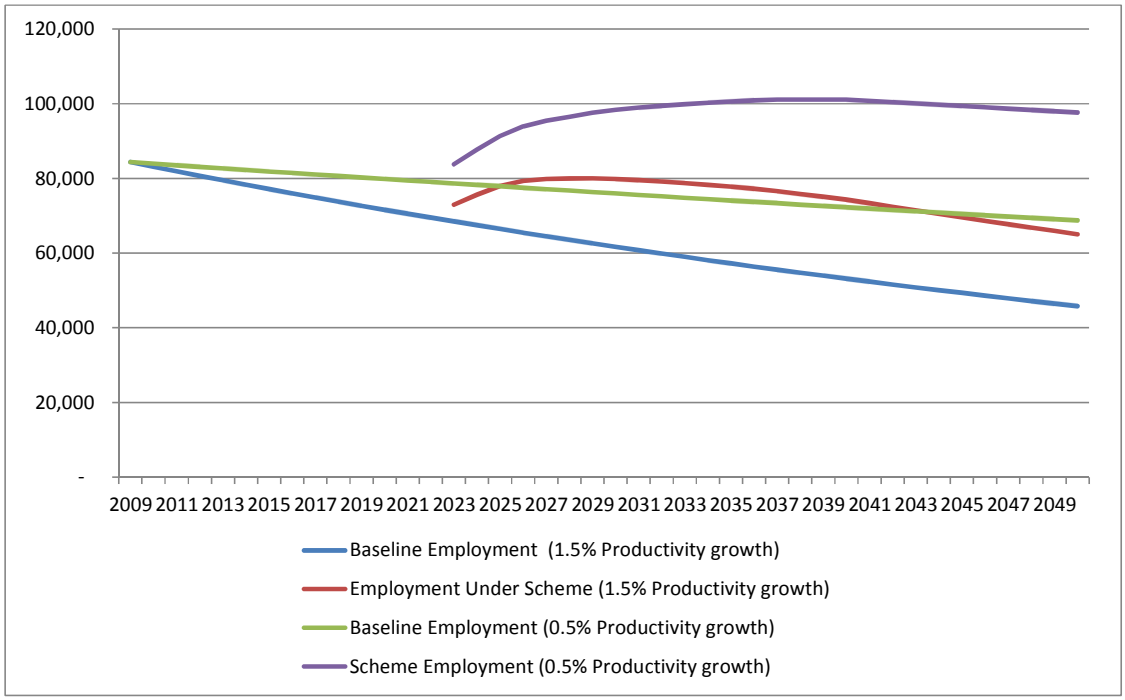
Our forecast for additional operational employment at the airport as a result of the expansion is based on maintaining the same staff/mppa ratio as is assumed in the baseline forecast. We

[37] Airports Commission, 'Airports Commission: Interim Report, Appendix 3: Technical Appendix', Page 6, December 2013.
[38] On-site estimate: Heathrow Airport Ltd., 'Heathrow: On-Airport Employment Survey, 2008/09 Summary Report', 2010; off-site estimate: Optimal Economics, 'Heathrow Related Employment', September 2011
[39] This was the assumption used in the study '*South East Regional Air Services Study (SERAS) Stage Two: Appraisal Findings Report'* (2002). A shrinking workforce at Heathrow due to productivity gains and technological change was also assumed in the base case for the Department for Transport Impact Assessment of adding a third runway at Heathrow: *'Adding Capacity at Heathrow: Impact Assessment'* (2009)
[40] Capacity increases as a result of a higher proportion of long-haul flights (which mean larger aircraft) and technological change meaning aircraft capacity increases.

therefore make no assumptions about economies (or diseconomies) of scale in relation to staffing requirements.

The effect of our proposals on total direct employment on site and off site is that in broad terms the additional employment associated with the third runway will to a degree be off-set by the reduction in employment arising from efficiency gains. This is illustrated in **Figure 2.6** below (which assumes productivity growth of 0.5% and 1.5% pa).

Figure 2.6 Heathrow Employment with Productivity Growth of 0.5% and 1.5% pa)



Source: URS and Aviation Economics analysis

Total direct employment numbers at Heathrow with and without the expansion is presented in **Table 2.3**. Assuming productivity growth of 1.5% pa, an additional 19,000 direct airport jobs will be created by 2050 over the base case but overall there will still be a decline in total direct airport employment from the 2009 baseline. Assuming productivity growth of 0.5% pa an additional 28,900direct airport jobs will be created by 2050 over the base case and there will also be an increase (13,300 direct jobs) in total airport employment from the 2009 baseline. We have also included a hypothetical scenario which assumes 0% productivity growth. Under this scenario, an additional 35,500 direct airport jobs would be created by 2050 over the 2009 baseline.

Table 2.3 Total Direct Employment at Heathrow With and Without Expansion

Year	2009	2050	Change on 2009	Change on 2050 without expansion
Direct Employment Without Expansion, productivity growth at 1.5%	84,300	45,800	-38,500	n/a
Direct Employment With Expansion, productivity growth at 1.5%	84,300	65,000	-19,300	19,200
Direct Employment Without Expansion, productivity growth at 0.5%	84,300	68,700	-15,600	n/a
Direct Employment With Expansion, productivity growth at 0.5%	84,300	97,600	13,300	28,900
Direct Employment Without Expansion, productivity growth at 0%	84,300	84,300	0	n/a
Direct Employment With Expansion, productivity growth at 0%	84,300	119,800	35,500	35,500

Source: URS analysis

2.6.2 *Regional Economic Context*

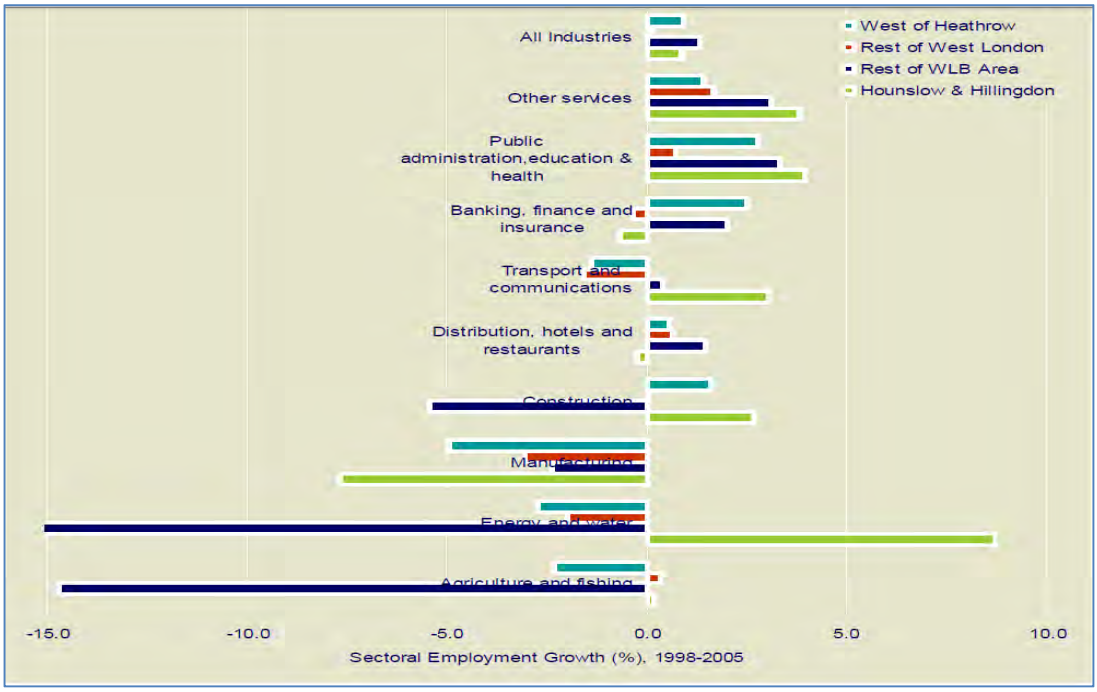
To assess the economic context of the region we review the West London boroughs of Ealing, Hillingdon and Hounslow; and areas west of Heathrow including Spelthorne, Slough, South Buckinghamshire, and the wider M4 corridor. (Areas west of Heathrow along the M4 corridor and in the immediate catchment of Heathrow are represented by Berkshire in some of our analysis below).

In a comparison across the European Union (EU) West London and Thames Valley areas surrounding Heathrow have historically ranked high in terms of GVA per capita and levels of growth. Inner West London, Berkshire and Surrey were within the top 100 from 1,325 areas across the EU in 2004. Between 1995 and 2004 'Outer London – West and North West' demonstrated a total growth of 8.6% over the period and was ranked 19th from 133 areas in the UK[41]. From 2003 to 2008 Berkshire's GVA grew by 16% whereas jobs increased by 8%, illustrating significant productivity gains in the area.

Business activity in the region has been in a broad range of sectors covering knowledge-based and traditional industries, as well as new innovation and R&D clusters. In areas directly around Heathrow, particularly in Hillingdon and Hounslow, the focus has been on communication and transport sectors, which accounted for the largest proportion of jobs in 2005. Banking, finance and insurance, and utilities have been the other traditionally predominant sectors in the region. However, barring Hounslow and Hillingdon, employment growth rates in transport and communications, and utilities sectors decreased across the region in the period 1998-2005. In the same period areas west of Heathrow saw employment growth in banking, finance and insurance and public administration, education and health sectors. This is illustrated in **Figure 2.7**.

[41] Deloitte, '*The Heathrow Phenomenon: Economic Impact Analysis*', September 2007

Figure 2.7 Sub-Regional Sector Growth Rates



Source: Deloitte, 'The Heathrow Phenomenon: Economic Impact Analysis', September 2007

There is growth in higher skilled occupations and a shortfall in availability of skills in boroughs close to west of Heathrow namely Slough and South Buckinghamshire. Bracknell Forest and Reading, areas further west, also display similar gaps. These areas immediately surrounding Heathrow are among those with highest workplace wages and a greater difference between resident and workplace wages.

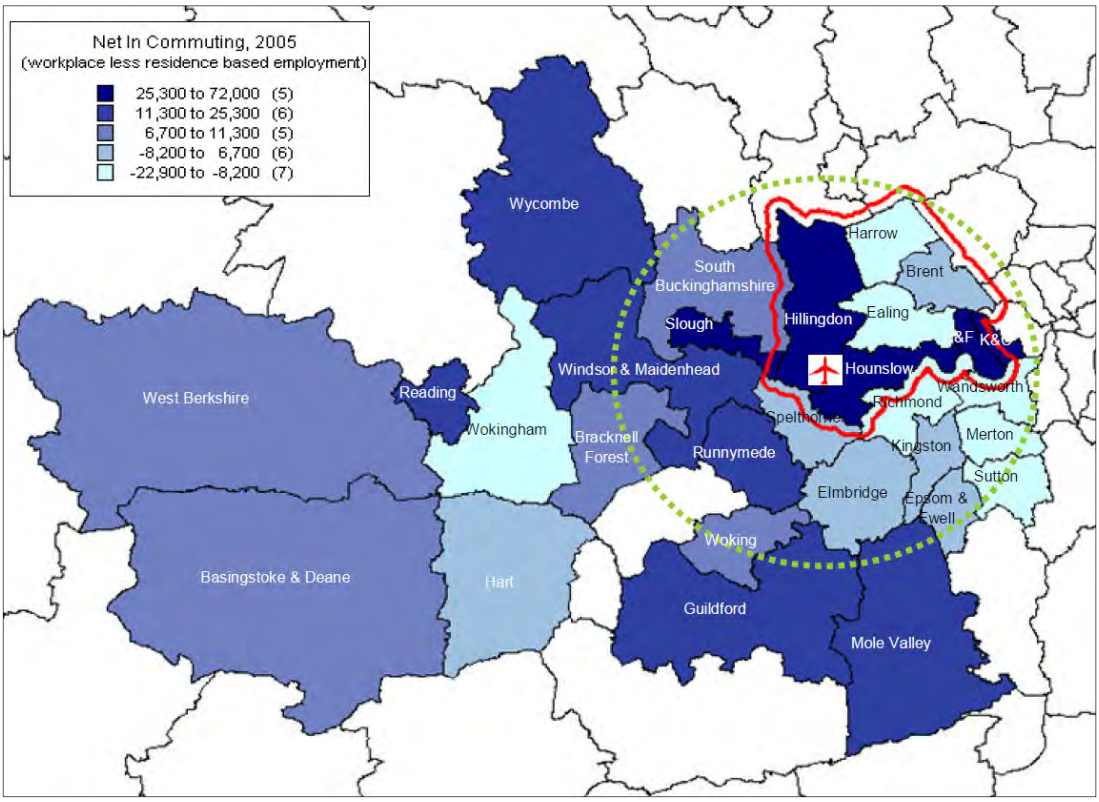
Commuting patterns show that the outer London boroughs of Ealing, Harrow and Brent have a surplus of resident workforce over jobs, whereas Hillingdon, Hounslow and Slough in particular have a surplus of jobs over resident workforce. This is illustrated in **Figure 2.8** below.

In terms of direct employment, the airport accounts for around 2% of the workforce in the region, but over 80% of total workforce directly employed at Heathrow are resident in the catchment area[42]. The travel-to-work patterns indicate a majority of employees commuting in from areas further west within the catchment area.

Indirect influence of Heathrow on the labour market is illustrated by the proportion of workers employed in sectors such as 'distribution, hotels and restaurants' and 'transport and communication'. For instance, in Slough employees in these sectors account for 20-22% all employment[43] and 15% of employees in Spelthorne were employed in 'transport and storage' sector in 2011[44]. A net inflow of workforce to boroughs such a Hillingdon, Hounslow and Ealing suggests the region's dependency on Heathrow for employment among other factors.

[42] Regeneris Consulting, *London Heathrow Economic Impact Study*, September 2013
[43] Parsons Brinckerhoff, Heathrow Employment Impact on Slough, December 2013
[44] Spelthorne Borough Council, Local Economic Assessment, September 2013

Figure 2.8 Net Commuting in Areas Around Heathrow



Source: Deloitte, 'The Heathrow Phenomenon: Economic Impact Analysis', September 2007

2.6.3 *Evidence for Economic Change and Flexibility*

Heathrow and its surrounding areas (particularly the M4 corridor) are supply constrained with limited capacity for physical expansion (in terms of additional homes and employment floor space). Within such a constrained environment the proposed scheme provides an opportunity for the local area to move up the value chain by attracting greater value added economic activity through an influx/expansion of highly productive businesses enticed by locating in close proximity to an expanding global hub airport. These businesses will strengthen agglomeration effects with Heathrow and its surrounding areas building on the existing clusters of technical and knowledge based businesses.

Below we illustrate data suggesting there is the flexibility to allow higher value added activity to focus around Heathrow and for employment growth that cannot be accommodated locally to focus elsewhere.

Our first point is that while Heathrow plays an important part in the wider sub-region, there are many companies that are not dependent on close proximity to Heathrow, and where the wider labour market area is probably a more important factor:

- A number of firms are dependent on Heathrow's supply chain. Authorities contiguous with Heathrow are estimated to account for 25% of total UK supply chain effects[45]..

[45] Regeneris Consulting, *London Heathrow Economic Impact Study*, September 2013

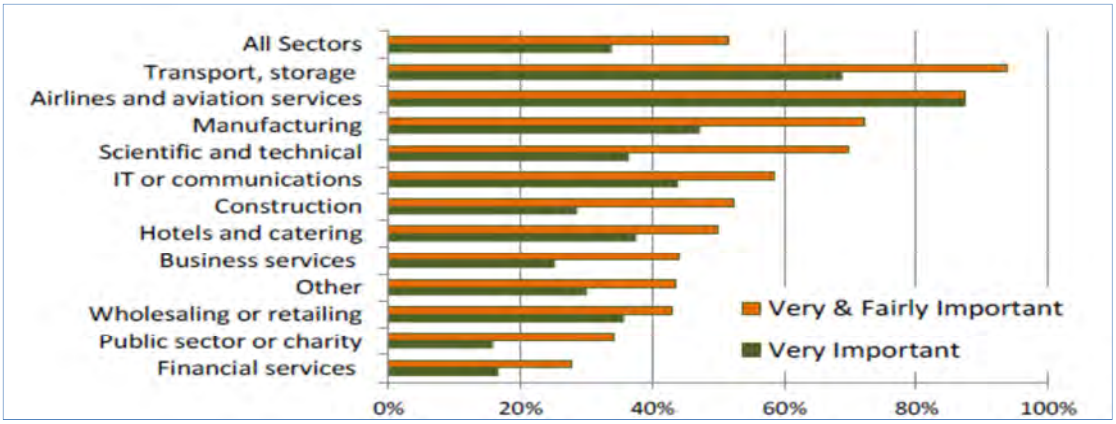
- A Regeneris survey of over 400 businesses conducted in 2013 reveals transport, communications and aviation services sectors to be more reliant on Heathrow for their day-to-day functioning. Compared to these traditional sectors, for most of the growing knowledge-intensive activities Heathrow is 'very & fairly important' to their operations[46]. This is illustrated in **Figure 2.9** below.

- The Regeneris survey found 4% of firms to have reported Heathrow as their customer base and 26% that they supply Heathrow but not as their main customer[47].

- Hillingdon Chamber of Commerce's survey of businesses found that 60% reporting proximity to Heathrow as not being a factor for their location[48].

- A survey of businesses in Hounslow reported only a small minority of companies to have indicated their 'main client at (or intrinsically linked to) Heathrow Airport[49].

Figure 2.9 Importance of Heathrow for Sectors



Source: Regeneris Consulting, London Heathrow Economic Impact Study, September 2013

Our second point is that there is a degree of churn in the economy which particularly over the longer term allows flexibility in response. In recent years the net effect of start-ups and closures is growth in the total number of enterprises in the area. Increased entrepreneurial activity induces growth and competitiveness in the economy and forces incumbent firms to increase productivity, relocate or close[50]. Change can take the form of:

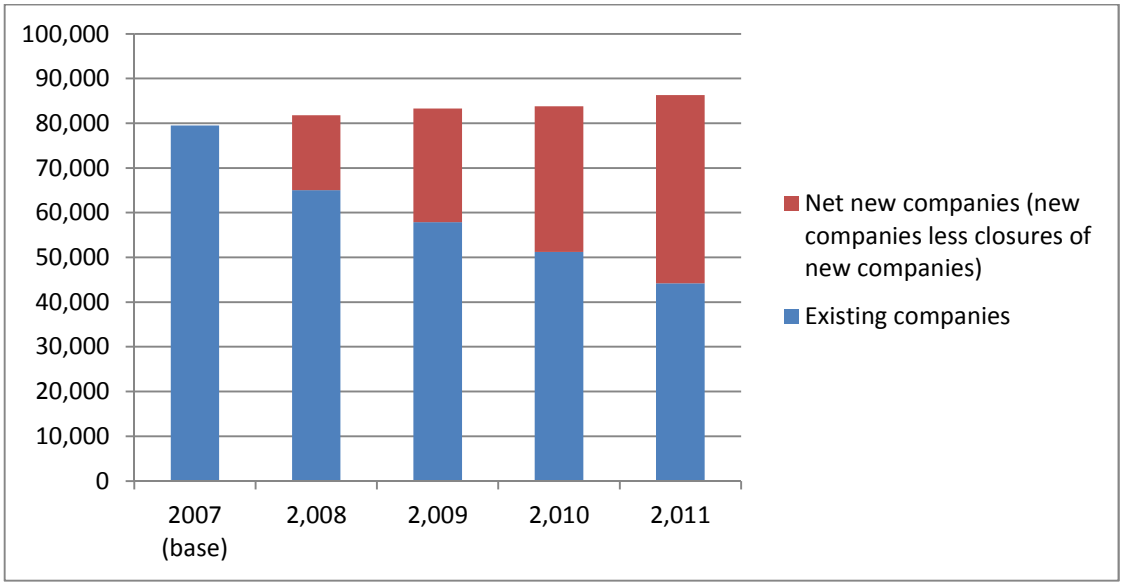
- The proportion of an original base of companies compared to change over time with companies forming and closing
- The proportion of an original base of companies compared to relocations over time
- The proportion of an original base workforce compared to turn-over in companies' workforce.

There is a significant rate of 'churn' in companies. We have analysed the rate of change of companies in the authorities of: Hillingdon; Hounslow; Ealing; Slough; Windsor & Maidenhead; South Buckinghamshire; Spelthorne; Bracknell Forest; Wokingham; Reading; and West

[46] Regeneris Consulting, *London Heathrow Economic Impact Study*, September 2013
[47] Regeneris Consulting, *London Heathrow Economic Impact Study*, September 2013
[48] Hillingdon Chamber of Commerce, *Heathrow Survey Results*, January 2014,
[49] SQW, Hounslow Local Economic Assessment, III: Findings from a survey of 500 businesses, April 2011
[50] J. Gerk et. al. Determinant of Entry and Exit: The Significance of Demand and Supply Conditions at the Regional Level, 2011

Berkshire. This area has seen a 15% increase in net new businesses, and closures ranging between 8,000 and 10,000 each year, over the past five years. In total at the end of the five year period the original companies as a proportion of have reduced to 51% of the total. This is shown in **Figure 2.10** below.

Figure 2.10 Churn in Company Formation and Closure in Heathrow Area[51]



Source: URS Analysis of ONS Business Demography

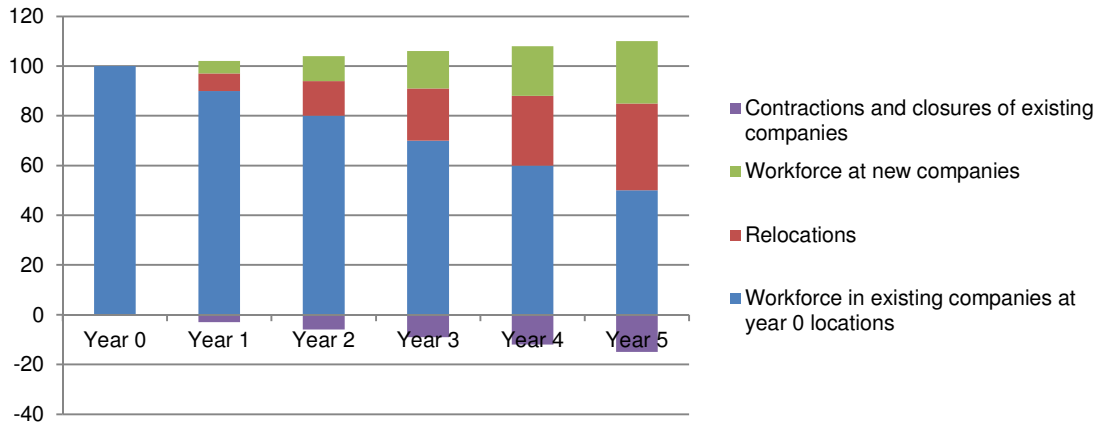
These figures are probably higher than the actual rate of change in the economy with factors including the relative likelihood that it will be newer companies that tend to close[52], and that the companies that tend to survive are likely to be the larger companies. Overall though the results do though indicate a significant rate of change, particularly if this is projected forward to 2050.

Another example of change is illustrated by survey work URS has done in the Lower Lea. Almost a third of the businesses surveyed reported having established themselves at the location in the three years preceding 2004. Young businesses relatively new to the location combined with low vacancy rates in the area demonstrated a high degree of business churn[53].

We illustrate how effects of change could feed through to reduce the extent of workforce based at their original location over a five year period in **Figure 2.11** and **Figure 2.12** below.

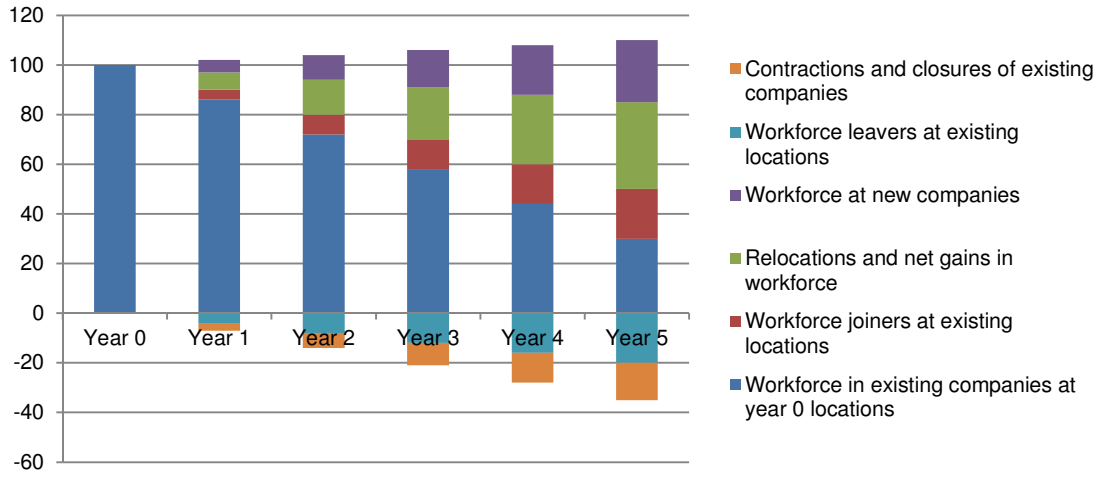
[51] Covering the authorities of: Hillingdon; Hounslow; Ealing; Slough; Windsor & Maidenhead; South Buckinghamshire; Spelthorne; Bracknell Forest; Wokingham; Reading; and West Berkshire
[52] We have taken a conservative approach to our analysis and have already made a significant adjustment for this effect.
[53] URS, Lower Lea Business Survey, January 2004

Figure 2.11 Illustration of Effects of New Companies, Closures and Relocations



Source: URS

Figure 2.12 Illustration of Workforce Churn



Source: URS

Overall this analysis illustrates how there is considerable flexibility over time within the sub-regional economy around Heathrow for companies and workforce to respond to changing demands by relocating to the best locations. This means that any supply constraints in specific areas need not be a constraint on economic performance provided that in overall terms there is sufficient capacity for growth and adaptation. In the next two sections we demonstrate how this can happen and how the regional planning context already has sufficient planned capacity to allow this to happen.

2.6.4 *An Outline Regional Economy and Employment Model*

We have not at this stage estimated total potential additional employment in the Heathrow sub-region. We illustrate though how through a combination of GVA growth and employment growth the area can flexibly respond to varying demands.

As part of the context work carried out by Regeneris in 2013 suggested that, by 2040, a total of around 178,000 jobs (88,000 direct FTE and 90,000 indirect and induced FTE) would be

supported by an expanded Heathrow which was an increase on the baseline figures (76,700 direct FTE and 109,500 indirect and induced) used by this study[54]. The Regeneris study did acknowledge that there would be a decrease in employment for the base case scenario, when comparing impacts in 2040 to those in 2030, due to anticipated efficiency gains.

Similar to the national situation, population in the areas surrounding Heathrow is expected to continue to grow. This is particularly emphasised through the ambitious housing targets which are set out for the outer London boroughs (i.e. Brent, Hounslow, and Hillingdon) in the Draft Further London Alterations to the London Plan (FALP). There are, however, issues relating to the areas which fall within the M4 corridor area, such as Slough, to expand given the Green Belt and environmental constraints context[55].

The impact of an expanding Heathrow provides the opportunity to raise productivity levels, particularly for those areas within the M4 corridor. The proposals will attract a specific type of business, enticed by locating in close proximity to an expanding global hub airport, which generate high levels of value added productivity. These businesses will built on and strengthen the existing clusters of technical and knowledge based businesses within Heathrow, increasing the agglomeration effects already prevalent in the area.

The implications of attracting an increased number of these types of businesses could lead to a rise in average rents/costs on business accommodation in the areas close to the airport and, subsequently, this will lead to an increasing focus of businesses around Heathrow which have a greater added value and can afford these rent and are dependent on proximity to the airport.

The entrance of more businesses into the already constrained economies within the M4 corridor will lead to companies which are less price and location sensitive to Heathrow's activities relocating from these areas. There are a number of businesses within these areas that could potentially re-locate to other areas, such as West London, with fewer constraints as well as offering these types of businesses greater opportunities for economic growth. Opportunity areas, such as Old Oak Common, offer significant prospects for growth and an opportunity for businesses assuming the Heathrow expansion becomes reality.

We have produced an outline regional economic and employment model to illustrate how the M4 corridor could accommodate 'smart growth' with a greater focus on increased productivity, in contrast to West London which could focus on a mixture of productivity gains and employment/development gains in areas such as Old Oak Common. Details are presented below in **Table 2.4**. Workforce and GVA data[56] covering the Outer London (West & North-West)[57] and the M4 Corridor[58] areas has been analysed to represent areas of relevance to Heathrow. **Table 2.4** illustrates the growth of GVA over time but also emphasises the constraints faced by areas within the M4 corridor in terms of the majority of GVA growth is through increased productivity (69%) rather than employment (31%). In contrast, the Outer London figures highlight the greater development opportunities within this area which allows for a more balanced spread of GVA growth between productivity (54%) and employment (46%).

We have assumed changes in GVA per worker could grow in the M4 corridor and Outer London areas by 2.0% and 1.5% per annum respectively (compared to 1.0% per annum

[54] Buckinghamshire Thames Valley LEP, Oxfordshire LEP, Thames Valley Berkshire LEP and West London Business, London Heathrow Economic Impact Study, Regeneris, September 2013.
[55] Slough Borough Council, Local Development Framework, Core Strategy 2006-2026, December 2008.
[56] Data has been drawn from ONS BRES Employment Survey (NUTs, Level 3), ONS Regional GVA data (NUTs, Level 3) and GLA Economics.
[57] Outer London (West & North-West) represents Barnet, Brent, Ealing, Harrow, Hillingdon, Hounslow and Richmond.
[58] M4 Corridor represents Buckinghamshire, Berkshire and Surrey

across England) on the basis that the Heathrow effect, together with other drivers, is allowing for a higher rate of growth for areas which are located close to Heathrow.

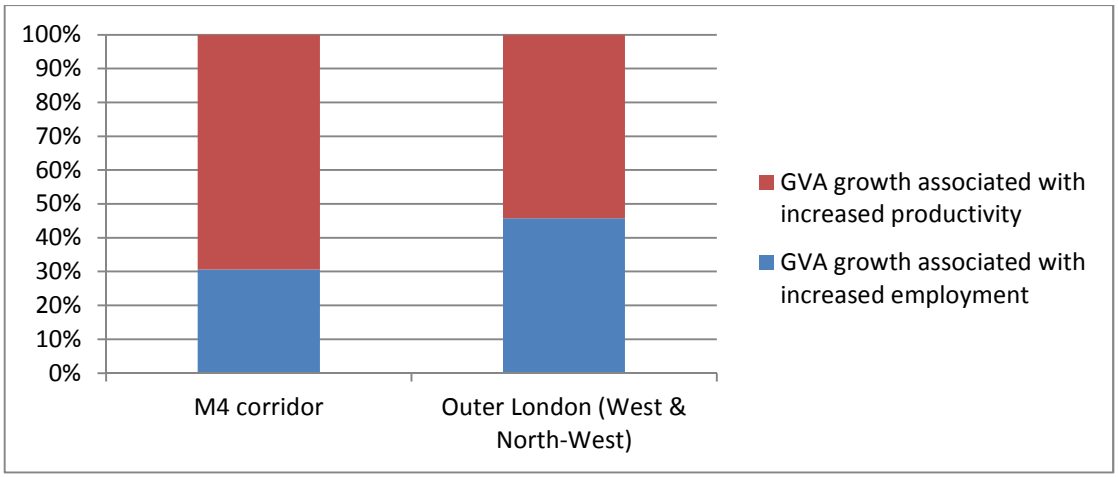
Table 2.4 GVA Growth Associated with Increased Employment and Productivity

Geography	M4 Corridor	Outer London (West & North-West)
Base Workforce	1,200,000	800,000
Change in Workforce by 2050	200,000	200,000
Total Workforce	1,400,000	1,000,000
Geography	**M4 Corridor**	**Outer London (West & North-West)**
Base GVA per worker	61,000	57,000
Change in GVA per worker by 2050	37,000	24,000
Total GVA per worker	98,000	81,000
Geography	**M4 Corridor**	**Outer London (West & North-West)**
Base GVA	73,200	45,600
GVA associated with increased employment (£m)	19,600	16,200
GVA associated with increased productivity (£m)	44,400	19,200
Total GVA growth (£ m)	64,000	35,400
Geography	**M4 Corridor**	**Outer London (West & North-West)**
GVA associated with increased employment	31%	46%
GVA associated with increased productivity	69%	54%
Total GVA growth	100%	100%

Source: URS analysis (2014)

The variance in GVA growth by area in terms of employment and productivity contribution is also illustrated below in **Figure 2.13**.

Figure 2.13 GVA Growth Associated with Increased Employment and Productivity



The above figures are partly illustrative. Further work could develop more specific scenarios. An overall point though is that forecasting by its nature is uncertain and more important is to allow for a number of different scenarios. Our analysis suggests that the inherent flexibility in

the economy, with growth and relocations, and a balance of GVA and employment growth, allows a flexible response. This is provided that more widely there is sufficient capacity/supply and that such effects are within a reasonablly coherent labour market catchment area so that change is not too disruptive.

In our judgement alternative proposals for airports/runways at Gatwick and in the Thames Gateway are largely/totally in new labour market catchments and would add a significant element of additional uncertainty, change and cost that mean that the benefits and flexibility we believe there is in the M4 corrider and West London economy are likely to be jeopardised by such a change.

2.6.5 *Fit with Spatial and Socio-Economic Development Strategies*

We consider that the growth of Heathrow is implicit/incorporated in and consistent with the regional and local planning policy projections and plans for population and employment growth. Our suggestion on a strategy of focusing GVA growth around Heathrow and employment and GVA, together with population growth, in other areas such as the more central West London area, is consistent with these strategies.

Within Greater London housing targets and employment projections are outlined within the London Plan and have recently been updated in the Draft Further Alterations to the London Plan (2014) (FALP)[59]. The FALP outlines that Greater London has the potential to support a total of 5.8 million jobs over the plan period to 2036; a 17.6% growth rate on employment recorded in 2011. In addition the FALP anticipates that Greater London has the capacity to accommodate a minimum of 420,000 new homes by 2025.

For areas outside of Greater London housing targets have been obtained from relevant development plan documents. Employment and housing targets for relevant geographies at the local level are outlined within **Table 2.5**, **Table 2.6** and **Table 2.7** below.

Table 2.5 Employment Projections Greater London

Local Authority / Area	Employment Growth Target (2011-2036)	Employment Growth (2011-36)
Barnet	20,000	13.7%
Brent	26,000	23.2%
Ealing	13,000	9.1%
Harrow	11,000	14.1%
Hillingdon	33,000	17.1%
Hounslow	20,000	14.1%
Richmond	12,000	12.9%
Outer London (W & NW)	135,000	14.9%
Greater London Total	**861,000**	**17.6%**

Source: GLA, (2014); Draft Further Alterations to the London Plan, January 2014

[59] GLA, (2014); Draft Further Alterations to the London Plan, January 2014.

Table 2.6 Job Targets for Opportunity / Growth Areas in Greater London

Policy Document	Job Targets
Brent Core Strategy (2010)	10,000 new jobs in Wembley Growth Area 4,400 new jobs in Park Royal Opportunity Area
Hillingdon Core Strategy (2012)	9,000 new jobs in Uxbridge and Heathrow Opportunity Area
Old Oak: A Vision for the Future (Consultation 2013)	90,000 new jobs within Old Oak Common

Source: Relevant Core Strategy Documents

Table 2.7 Housing Targets

County / Local Authority	10 yr. Housing Target (2015-2025)
Barnet	23,489
Brent	15,253
Ealing	12,972
Harrow	5,927
Hillingdon	5,593
Hounslow	8,222
Richmond	3,150
Outer London (W & NW)	74,606
Greater London	423,887
Surrey (Elmbridge, Epsom & Euell, Guildford, Mole Valley, Reigate & Banstead, Runnymede, Spelthorne, Surrey Heath, Tandridge, Waverley, Woking)	44,930
Berkshire (Royal Borough Windsor & Maidenhead, Bracknell Forest, Reading, Slough, West Berkshire, Wokingham)	60,557
Buckinghamshire (Aylesbury Vale, Chiltern, South Bucks, Wycombe)	40,640

Source: Relevant Core Strategy Documents

It is likely that the employment and housing targets outlined above are based to a degree on the future growth of Heathrow. Significant regional catalytic economic and employment benefits will arise from the proposed expansion of Heathrow Airport the impacts of which will drive the growth of populations and employment within Outer London (West & North West) and within the wider M4 corridor.

Within the Outer London (West and North-West) boroughs in proximity to the airport there is envisaged to be an increase in over 100,000 new jobs to 2036 (a growth rate of 14.9%) including approximately 23,000 new jobs within the Opportunity/Growth Areas in LB Brent and LB Hillingdon. Within Old Oak Common it is anticipated that approximately 90,000 new jobs could be delivered with the new strategic interchange station unlocking 155ha of derelict and underused land benefiting from its proximity to both Heathrow and Central London.

Within the FALP it is expected that of those outer London boroughs in close proximity to the airport, 74,600 new homes could be accommodated by 2025. A further 146,000 homes in the counties of Surrey, Berkshire and Buckinghamshire are also expected to be delivered over their respective planning periods.

The FALP also indicates that the Heathrow Opportunity Area has the potential to accommodate 12,000 new jobs and 9,000 new homes. The airport is recognised as an important driver of economic growth and Heathrow 'North' is identified as an area which could benefit from airport related growth, particularly with regard to transport and logistics, business and hotels and leisure/tourism.

The targets outlined within the regional and local spatial strategies are likely to be dependent upon the future growth of airport operations at Heathrow. The spatial policies within the London Plan indicate that the outer London boroughs closest to Heathrow have the potential to accommodate some of the greatest employment growth within Greater London. In addition the surrounding counties of Berkshire, Buckinghamshire and Surrey are expected to accommodate significant new housing supply. Under the proposed expansion both significant employment and economic benefits will be generated which will help support both regional and local growth strategies and aspirations.

2.7 Strategic Overview/Summary

Below we summarise what we consider to be the key strategic characteristics and benefits of our proposals.

2.7.1 *Aviation and Airport Business Benefits*

In summary our key conclusions and analysis is:

- Air transport has shown long-term growth trends and these are expected to continue in to the future. In particular part of the reason for the long-term growth is deregulation in the industry, unlocking demand. The effects of deregulation, and potential for further deregulation, are anticipated to continue to positively affect demand for aviation in Europe for many years to come. Global aviation will continue to grow, and Europe and the UK will play a key part in this market.
- The hub model will continue to play a key role in the global aviation market
    - Low cost carriers (LCCs) have increasingly demonstrated their ability and willingness to fly from major hub airports where capacity is available at a competitive charge.
    - There are good reasons to draw the conclusion that growth in point-to-point and the long-haul, low-cost model are unlikely to significantly displace the hub-and-spoke model.
    - Even if new long haul models do emerge and are found to be sustainable, these are most likely to succeed where airports serve large established business markets.
- The UK is well placed to continue providing a hub airport that fits well in the existing and forecast overall aviation market
- Heathrow is the best location for UK airport expansion because:
    - It has the highest population and economic output catchment of any of the existing or proposed UK airports
    - It is already established as a hub and so risks of expansion in terms of demand and wider benefits for the economy are less than in seeking to establish a new/alternative hub
    - The costs of developing a new hub elsewhere, covering both immediate airport and transport-related infrastructure and costs of relocations of businesses and workforce, are likely to be significantly greater than expansion at Heathrow.
    - The Heathrow Hub proposition further enhances the case for Heathrow in terms of regional connectivity and extension of economic benefits.

- With Heathrow as the UK's hub we forecast future passengers of 130m and ATMs of 700,000 by 2050. This is in contrast with a forecast of 92m and ATMs of 480,000 by 2050 with no third runway.

Any alternative to Heathrow expansion provides a high risk of failure, as a result of an unacceptably high increase in airport charges to pay for expansion and/or a reliance on the emergence of a single and highly speculative new long haul airline model. The inclusion of Heathrow Hub as part of the offer increases the likelihood of the above forecasts and/or could result in higher growth forecasts than presented. The reasons why Heathrow Hub enhanced the likelihood of the forecasts/higher forecasts include:

- Heathrow Hub provides flexibile and low cost expansion that reduces the risk inherent in very long term forecasts and could result in higher growth forecasts than presented.
- Heathrow Hub will facilitate easier and more reliable domestic connections to Heathrow, facilitating demand (as well as a domestic travel modal shift)
- Heathrow Hub will the offer of greater overall connectivity will help national and regional economies grow more than otherwise.

Heathrow Hub therefore also safeguards a future extension to Heathrow's existing southern runway to ensure long term flexibility and the ability to meet any likely demand scenario.

2.7.2 *National and Regional Economic and Employment Benefits*

In summary our key arguments are:

- We estimate substantial national economic benefits from a third runway at Heathrow. In particular we set out why we believe enhanced surface access connectivity plays a linked and similar role to enhanced aviation connectivity in benefiting the national economy, and together they give greater economic benefits than just enhanced aviation connectivity.
- We estimate that the benefits to UK Gross Value-Added (GVA) in the form of productivity gains, employment effects, and the gains from trade from airport expansion, and benefits of Heathrow Hub, are at least £50-£70bn in Present Value (PV) terms and potentially significantly more.
- Heathrow Hub will play an important part in the overall national economic benefits.
- Heathrow's strategic location within the UK, and the maturity of its economic links to London and the dynamic Thames Valley region, mean it can offer greater and more certain economic benefits than non-Heathrow locations.
- There will be significant regional economic benefits of our proposals, and the fit of the proposition with regional economic and land-use planning policy and strategy, including fit with the London Plan and growth in the M4 corridor. In particular:
  - Heathrow plays an important role in the regional economy but much of the economy has the flexibility to change location/move further from Heathrow.
  - Analysis and evidence of process of economic change and flexibility, illustrating that local economies are dynamic, with a fairly rapid rate of change of company formation and closure, mergers, expansions/contractions and relocations. This gives the ability for the local economy to respond to opportunities by focusing growth in areas such as West London where there is room and plans for major new development.
  - Our outline regional economic model illustrates how the M4 corridor can accommodate 'smart growth' with a greater focus on greater productivity, and West London and the rest of the country can focus on a mixture of productivity gains and employment/development gains in areas such as Old Oak and Park Royal.

- Such scenarios fit well with regional and local spatial and socio-economic development strategies, illustrating how the regional economic and employment model can be consistent with and complementary to strategies such as the London Plan.

In summary expansion of Heathrow's operations will have significant knock-on employment benefits to the local area, wider region and UK as a whole.

2.7.3 *Benefits Compared to Costs and Environmental and Community Impacts*

We will have cost information ready shortly. We anticipate that this will demonstrate that the benefits compared to costs and environmental and community impacts are significant. In particular our view and expectation is that:

- Our costs are lower than the HAL scheme
- Our environmental and community impacts are less than the HAL scheme
- Our benefits are greater and more certain than the Gatwick scheme
- Our benefits including Heathrow Hub are greater than the HAL scheme and extend further in to the UK regions.

We will provide more analysis with our cost information.

3 AIRPORT MASTER PLAN

3.1 Introduction

This chapter describes the key elements of the further master planning work that has been done in response to the invitation of the Airports Commission. Reference should be made to the submission of July 2013 for a number of key considerations, such as runway length and view from the tower, that are not revisited in this report.

The Master Planning work has been informed by a number of considerations. These include the criteria set out by the Commission and those determined by our engagement with key stakeholders.

The major issues are, as anticipated, developing an airport capable of providing the services to connect the UK whist addressing concerns about surface access, noise and disruption to local communities.

In this section, the assumption and baseline conditions assumed are covered in Section 3.2 the development of the core concept is covered in Section 3.3; a full description of the core concept is in Section 3.4.

3.2 Assumptions and Design Parameters

3.2.1 *Airport Master Plan*

The baseline case to be assumed for the development of Heathrow in the period up to the implementation of the proposed additional runway has been advised by the Airports Commission and is a continuation of the current development strategy. The general form of baseline development is illustrated in **Figure 3.1**.

Figure 3.1 Baseline Assumption for Heathrow Development

This leads in due course to the redevelopment of the eastern part of the Heathrow campus in a similar 'toast-rack' style to T5 and will give approximate annual capacities as follows:

Terminal 2 and its extensions	60mppa
Terminal 5 and its development	35mppa
Terminal 4	10mppa

This gives an arithmetic total of 105mppa. Against the forecasts set out in Section 2.4 the demand would be of the order of 130mppa giving a requirement for new facilities to have the capacity of 35-45mppa to provide some slack capacity for scheduling and resilience purposes.

In addition, it is assumed that the T2-T5 baggage tunnel would be operational facilitating transfer connections between the terminal areas.

3.2.2 *Surface Access Baseline*

The Airports Commission, in its paper of 16 April 2014, has identified in outline the schemes that should figure within the base case for the appraisal. This paper is included as **Attachment 3-1**.

Rail Schemes

The **Core Baseline** consists of existing infrastructure and services, combined with those enhancements whose delivery the Commission considers to be inevitable or close to inevitable. This includes schemes to which there is a firm Government commitment and funding plan. This baseline therefore includes the "main" HS2 line (excluding spurs), the entirety of the Control Period 4 infrastructure plan for the railway, almost all of the Control Period 5 infrastructure plan for the railway (excluding Western Rail Access to Heathrow, for which funding is not yet fully committed) and those road, rail and underground schemes for which there are firm policy and funding support. The Commission considers that these schemes will be delivered regardless of any decisions made on airport capacity and will not include their costs as part of the cost of expansion proposals.

The **Extended Baseline** consists of those infrastructure and service improvements which are not firmly committed, but which the Commission considers (having taken advice from Network Rail, the Highways Agency, Transport for London and the Department for Transport) are likely to be required to support background demand absent any airport expansion. In some cases, such as Western Rail Access to Heathrow, the probability of these schemes being delivered appears to be very high. In other cases, the likelihood may be judged more speculative. Where schemes in the extended baseline are relevant to expansion proposals, the Commission will consider on a case by case basis whether the proposal in question would affect the likelihood of an enhancement being required or the timing within which it is required. This will allow the Commission to reach a judgement on whether some or all of the enhancement's costs should be included within the assessment of the airport proposal's costs

Highways Schemes

Following discussions with the Highways Agency, the Commission's view is that the following schemes should be included in the core baseline:

- M25 Junction 23 to 27 "smart motorway" (all lanes running) – complete by 2015;
- M25 Junction 5 to 6/7 "smart motorway" (all lanes running) – complete by 2014; and
- M3 Junction 2 to 4a "smart motorway" (all lanes running) – complete by 2016.

The following schemes should be included in the extended baseline:

- M4 Junction 3 to 12 “smart motorway” (all lanes running) – subject to value for money and deliverability assessment;
- M23 Junction 8 to 10 “smart motorway” (all lanes running) – subject to value for money and deliverability assessment; and
- Lower Thames Crossing – work progressing, but no decision yet as to nature of any option that might proceed.

3.3 Concept Options

3.3.1 *General*

This section sets out the approach and options that have been considered in developing the scheme and the high level reasons for the choice of option.

3.3.2 *Airport - Physical Configuration*

The approach to developing the airfield is, in general terms, driven by the option that has been shortlisted by the Airports Commission.

Some minor variations of the runway alignment are possible and the advantages and disadvantages of these are tabulated below:

Table 3.1 Alternatives to the Core Case for Runway Configuration

Alternatives to the Core Case for Runway Configuration		
Description	**Discussion**	**Develop**
Offset Alignment to the north	Additional impact at Colnbrook	No
Offset Alignment to the south	Potentially reduces impact at Colnbrook if 69dB noise contour is not governing. Offset alignments only marginally impact noise. May facilitate installation of instruments. May facilitate the safety case. Reduces area of airfield including area existing T5.	Develop outline sketches to illustrate.
Combined with Angled alignment to north	Additional impact at Colnbrook	No

Alternatives to the Core Case for Runway Configuration		
Combined with Angled alignment to south	Potentially reduces impact at Colnbrook if 69dB noise contour is not governing. Offset alignments only marginally impact noise close to the airport and provide opportunities to develop respite. May facilitate installation of instruments. May facilitate the safety case. Reduces area of airfield. Increased runway pavement area and costs. May reduces capacity in 09 operations.	Develop outline sketches to illustrate.
Southern Runway Extension	Not shortlisted. May provide capacity to allow additional respite.	Scheme developed to allow extension in the future.

The location of the runway to the west of the existing northern runway also drives the site for the supporting airfield infrastructure to a location between the extended runways to provide an extended airfield without additional runway crossings compared with the existing layout, with limited impact on existing communities, and capable of being extended with the southern runway extension in the future if required.

Ideally, this site should be as large as possible commensurate with the constraints imposed by other factors. This allows a resilient yet efficient layout to be designed and allows for flexibility to respond to changing requirements,

3.3.3 *Airport - Operational Concepts*

One of the most important aspects of the airport operation is the runway mode. Four modes have been developed allowing a flexible and efficient operation. They give respite to local residents whilst providing resilience to the operations at Heathrow.

This section describes the runway modes for westerly operation. For easterly operation, a similar set of modes will be applied.

The westerly runway modes are shown in **Figure 3.2** and are:

- **Early Respite mode:** An arrivals-only mode used between 06:00 and 06:30 on runways 27Rext and 27L.
- **Peak Flow mode:** Making use of all 3 runways, this has the highest movement rate and is used at peak times. It can also be used to provide resilience in the case of abnormal events. It has a flow rate of approximately 130 movements per hour based on typical planning rates for existing procedures, which are exceeded in certain circumstances today and subject to improvement. The exact figure is dependent on factors such as aircraft size, mix and the scheduling of arrivals and departures.

- **Southern Relief mode:** This mode uses runways 27Rext and 27R only. It has a flow rate of approximately 90 movements per hour subject to the factors listed above.

- **Northern Relief mode:** This mode uses 27Rext and 27L for both arrivals and departures. It has a flow rate of approximately 100 movements per hour subject to the factors listed above.

Each mode is intended to be operated strategically, with planned application during the day subject to operating constraints such as weather, abnormally high traffic peaks emergencies or maintenance.

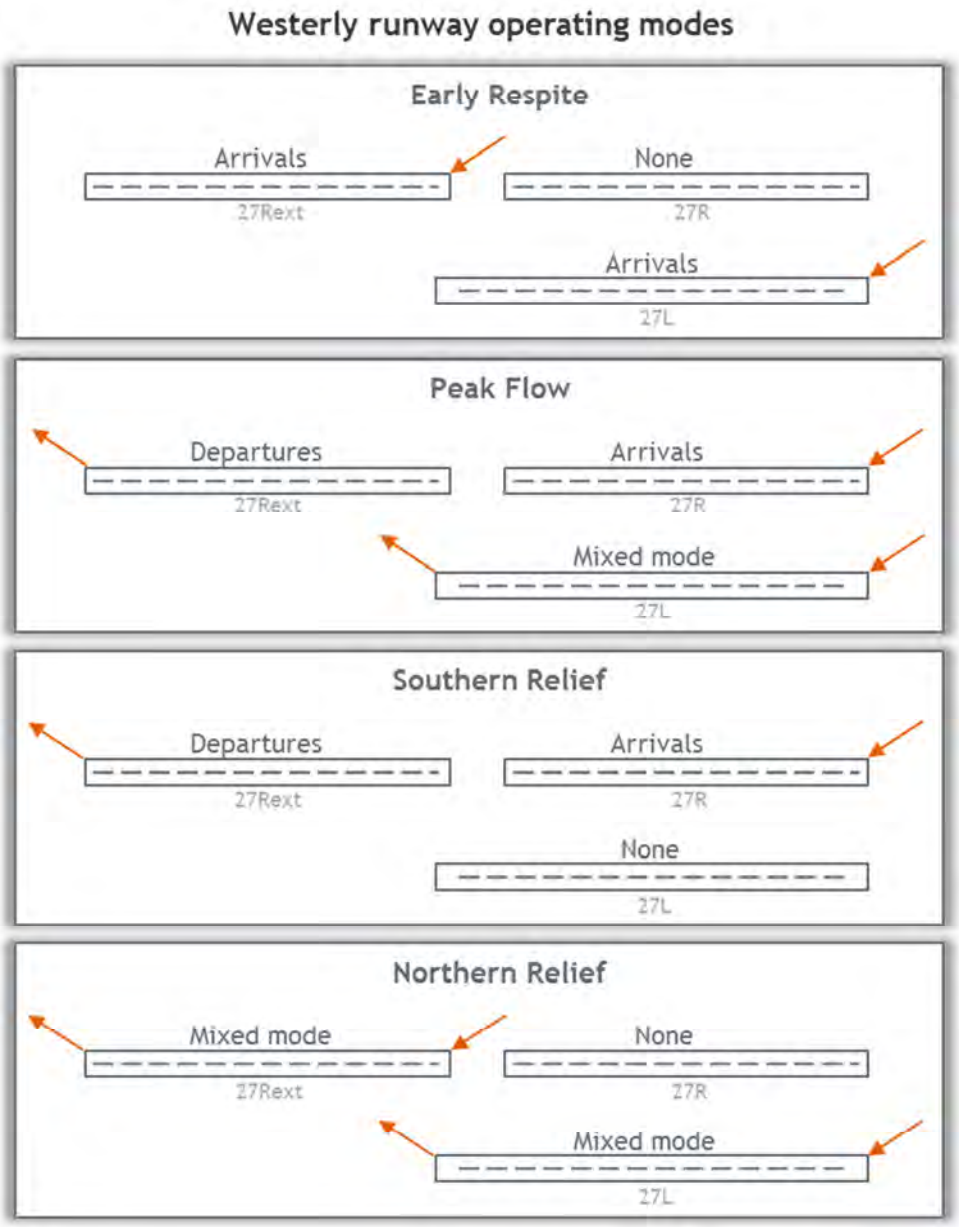
The modes will apply at different times of the day. **Table 3.2** shows example mode timings that have been investigated in the initial concept analysis, although the exact times and mode configurations will depend on flow rate factors described above as well as resilience and respite arrangements.

Table 3.2 Concept Schedule for Operational Modes

Runway mode	Concept times of operation
Early Respite	06:00 – 06:30
Peak Flow	06:30 – 12:00
Southern Relief	12:00 – 16:00
Peak Flow	16:00 – 19:00
Northern Relief	19:00 – 23:00

After 06:30, the exact times of operation of the different runway modes will depend on a number of different factors such as scheduling (which may reduce the achievable rates) and the introduction of new technologies (such as “brake to vacate”) which would increase runway throughput.

Figure 3.2 Illustration of Concept Operating Modes



The benefit of the use of runway 27Rext for “deep landings” is that aircraft are higher over west London and therefore generate less noise for the population under the flightpath. This is illustrated in the following figure that shows the paths of aircraft landing on 27R (in green) and 27Rext (in red). Aircraft landing on 27Rext are about 800ft higher when passing over Kew than aircraft landing on 27R.

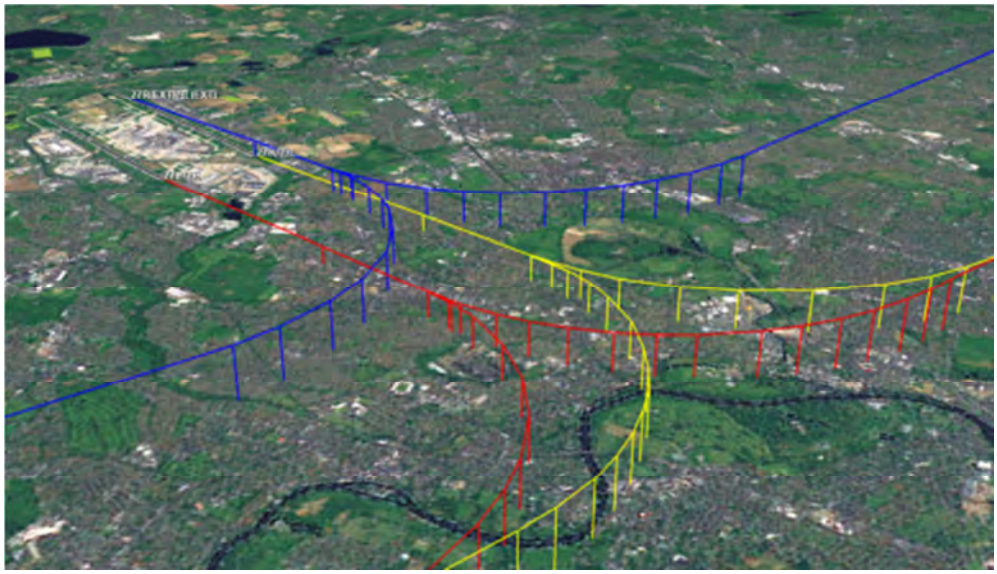
Figure 3.3 Illustration of Benefits of Deep Landings

There are some additional techniques that can be applied to arrivals to reduce their environmental impact.

The first is increasing the glidepath for arrivals from 3° to 3.2°. This change is feasible with current aircraft and is assumed in the analysis for this concept. The environmental benefit of a steeper glidepath is that it keeps aircraft higher during the approach. A steeper glidepath of 5° may also be possible for the earlier part of the arrivals, with the aircraft joining the 3.2°glideslope during the descent.

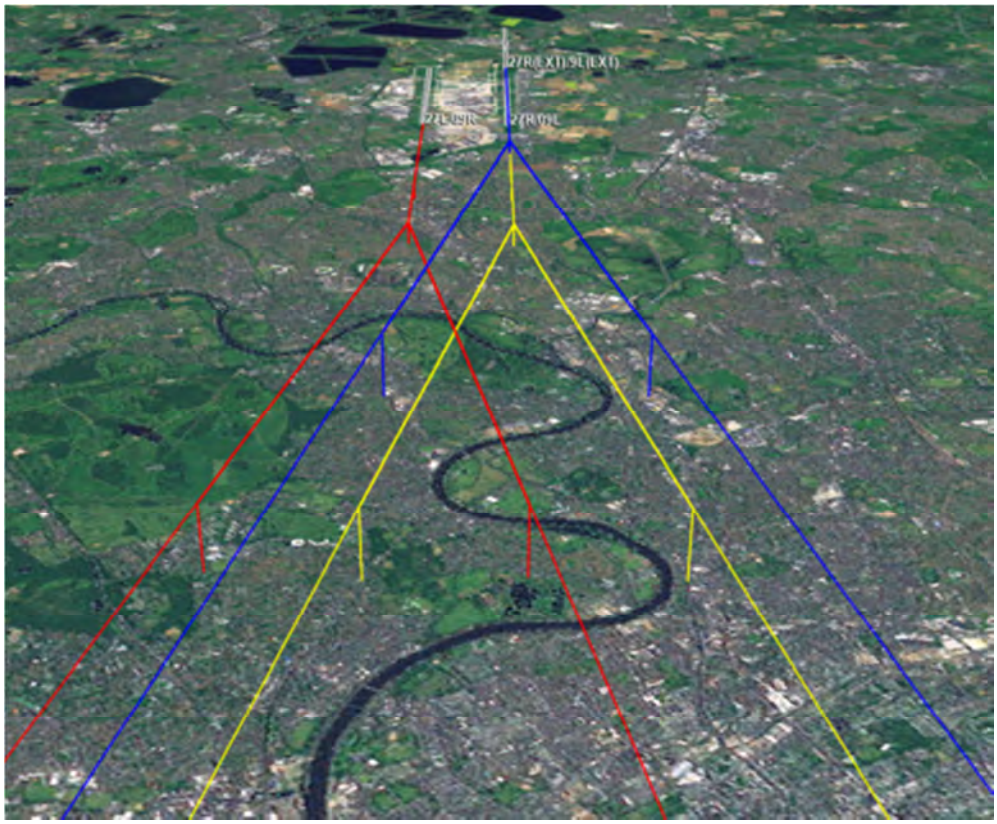
The next technique is that of using non straight-in approaches. There are several options. The use of curved approach paths is illustrated below. In this and the subsequent examples, the approach aligns with the extended runway centreline at a distance of 3NM from the threshold.

Figure 3.4 Illustration of Benefits of Curved Approaches



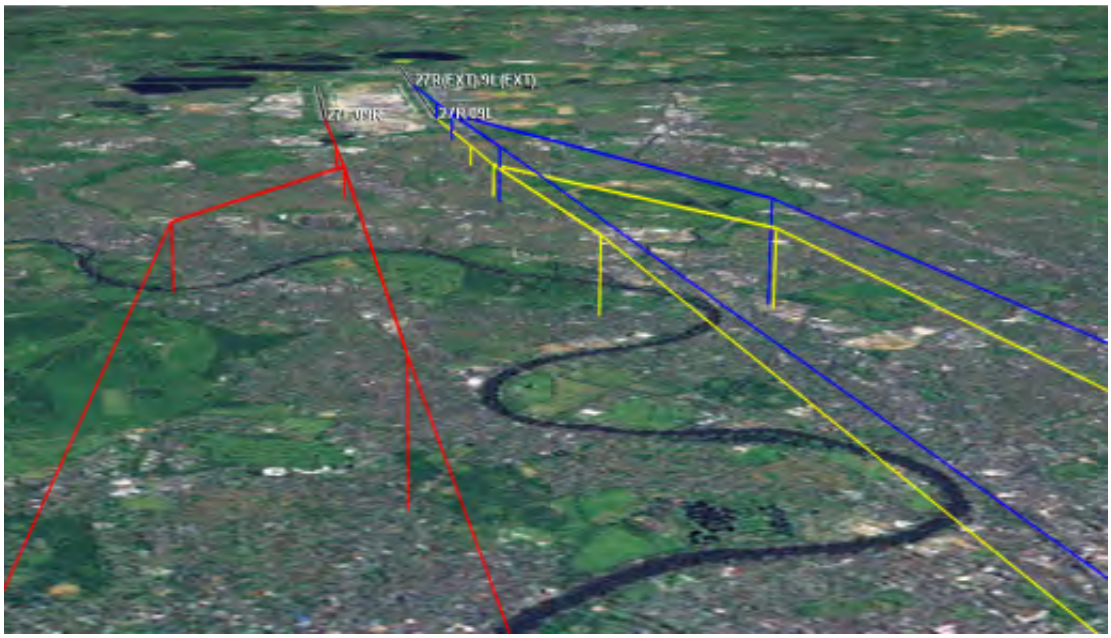
A second technique is angled approaches, illustrated below.

Figure 3.5 Illustration of Benefits of Angled Approaches



A third technique is offset approaches, illustrated below.

Figure 3.6 Illustration of Benefits of Offset Approaches



Each of the different approach paths have different environmental benefits since they move the noise footprint. They can be used to provide respite or move noise to less sensitive areas. The approach paths shown here are illustrative only and are intended to indicate how the noise footprint can be moved.

3.3.4 *Heathrow Hub and Public Transport*

A key part of our approach to the development of the Surface Access Strategy has been to consider the capacity needs of airport passengers and employees, together with accommodation of the needs of other users. We have prioritised our public transport interventions according to need.

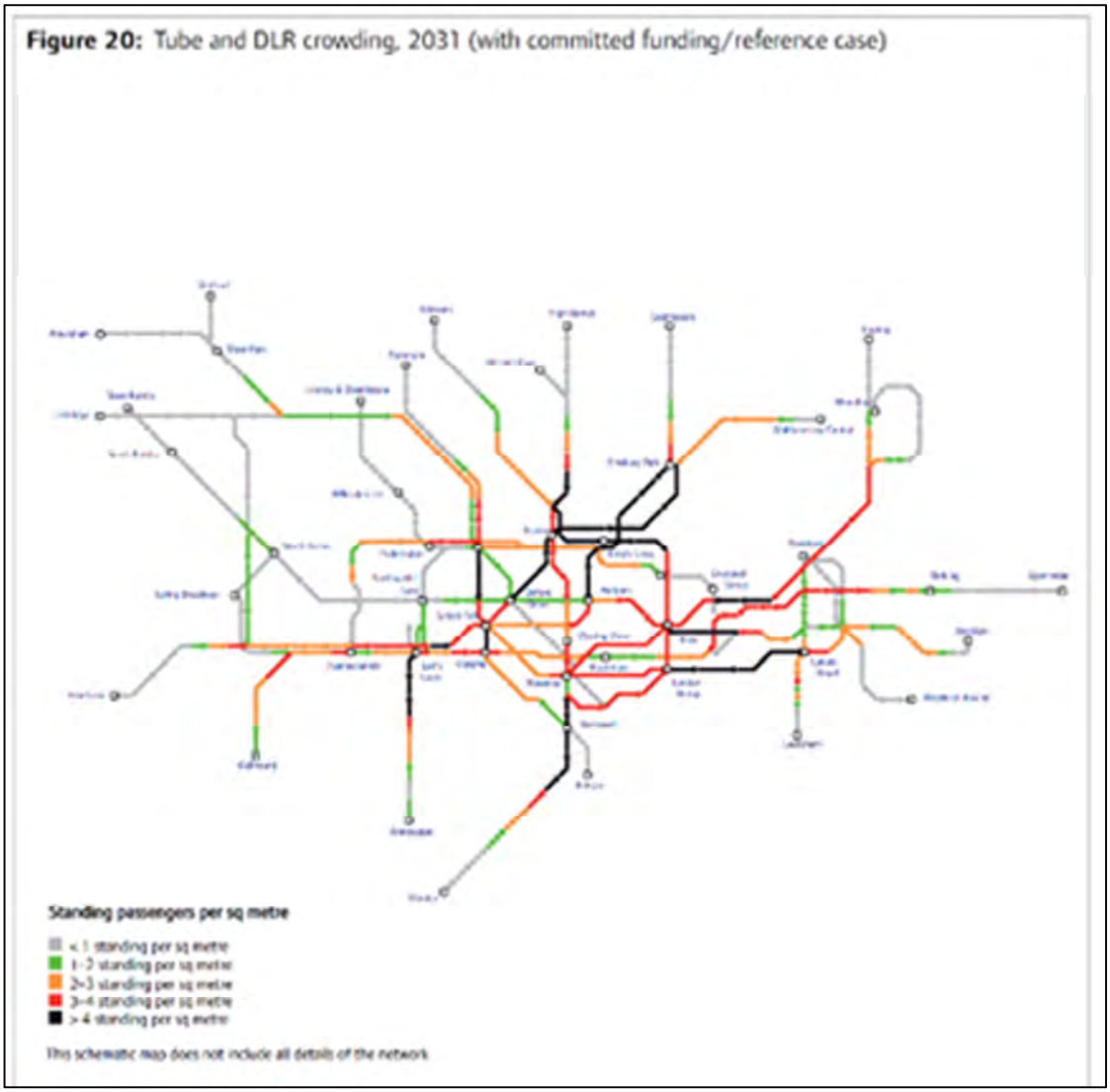
The DfT forecasts[60] for congestion on the strategic road network in 2040 are shown in **Figure 3.7**. Even without a doubling in the number of air passengers at Heathrow the road network will be under major stress in the future. Even though less than 10% of M25 morning peak traffic is airport related, in terms of the Heathrow approaches, capacity is under severe pressure (lines shown in black) from London via M40 and the south via M25. Regular congestion will also be experienced on Heathrow's approaches from the M40/ M25 north and M3. The approach of simply assuming that extra road and airport demand can be channelled through the one of the most congested sections of the highway network in Europe is not sustainable.

[60] Action for Roads - A network for the 21st century, DfT July 2013
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/212590/action-for-roads.pdf

Figure 3.7 Predicted Congestion on the Highway Network

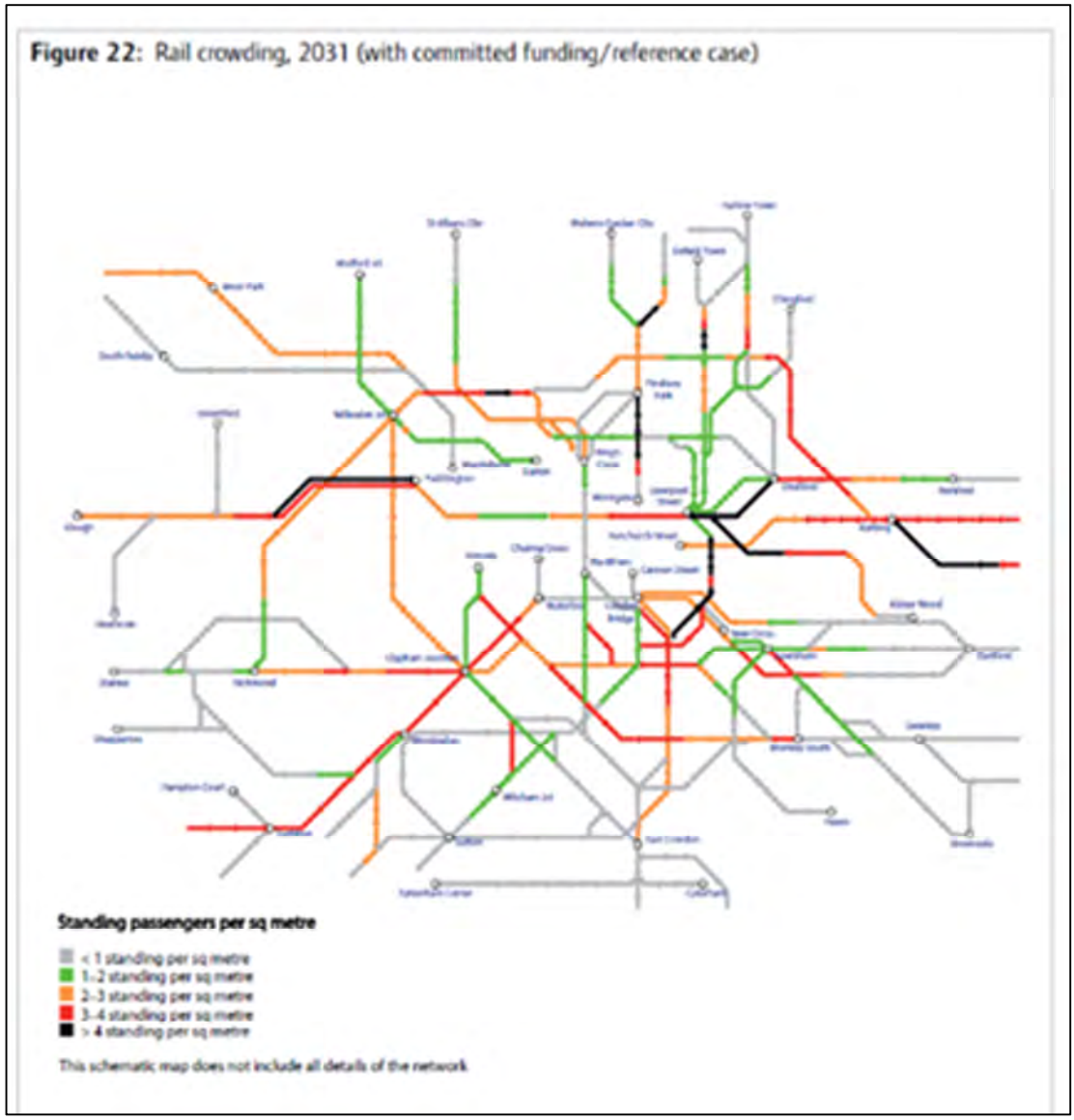
The Mayor's Transport Strategy, shows London Underground forecast crowding in 2031. The Piccadilly Line from Heathrow into central London is shown to be in the second highest category of crowding.

Figure 3.8 London Underground and Docklands Light Railway Crowding



and the National Rail Forecast indicates high levels of crowding between Ealing Broadway and Paddington, however east of Paddington, Crossrail has capacity available.

Figure 3.9 Mainline Rail Crowding



Public transport already has a high mode share (51%) for journeys between Heathrow and Greater London, primarily using the Piccadilly Line (29%) and the Heathrow Express service (16%) from Paddington; bus/coach has a 6% share. However, whilst the Piccadilly Line provides excellent connectivity, journey times are slow, and Heathrow Express is premium priced and terminates at Paddington, which at present is less well served for onward travel than the majority of other London rail termini. Hence taxi has a significant mode share to and from Greater London (32%)

As a result of the problems and constraints outlined above our philosophy has been to develop a strategy around the following key elements:

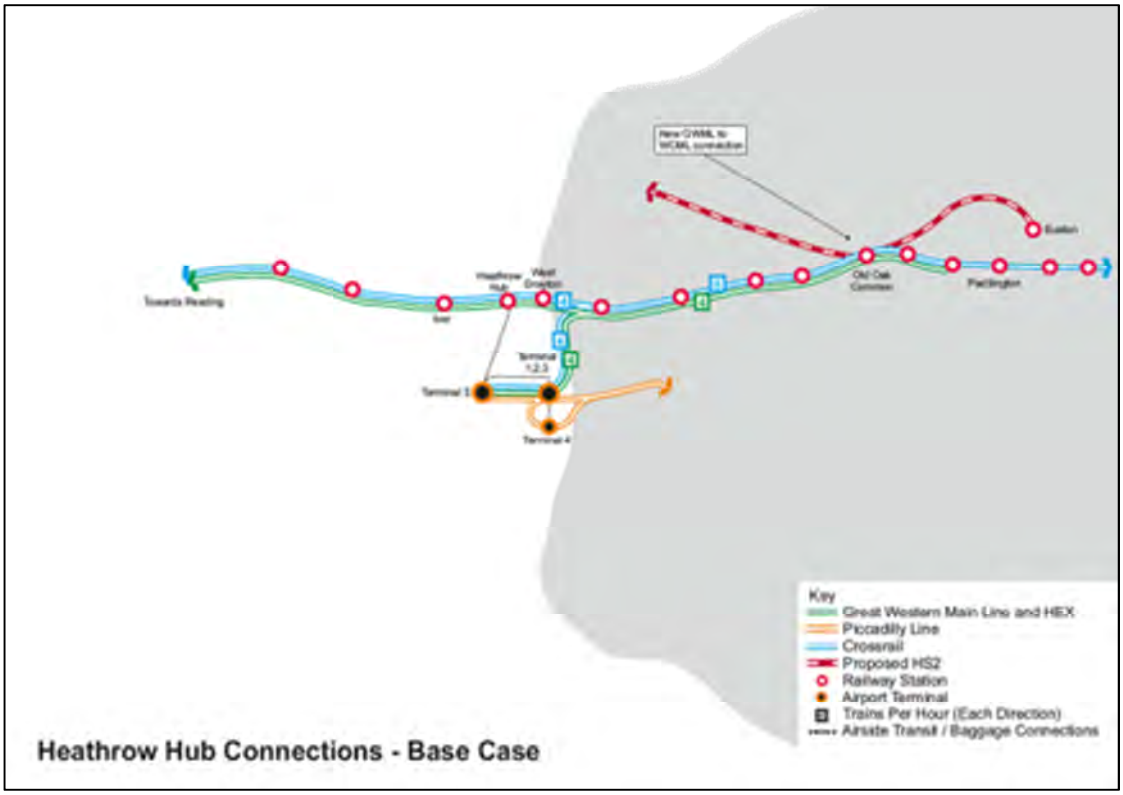
- Avoid over-concentration of traffic on congested sections of the road and rail networks and to provide opportunities for dispersal – spreading high volume flows over a range

of routes through the provision of enhanced existing and new fast, convenient and reliable public transport links;
- Use the committed rail enhancements to provide capacity on the principal rail corridors. Our approach is to work with partner agencies to implement cost-effective incremental schemes are considered in the context of wider strategic rail capacity issues ;
- Develop schemes for additional capacity and new journey opportunities by rail and bus for air passenger and employee trips; and
- Consider both for the needs of growing numbers of airport users and forecast background growth in other non-airport travel (which accounts for the majority of demand).

The following are the core elements within the rail surface access strategy:

- Crossrail and Heathrow Express enhancements - increasing the number of Crossrail trains to CTA/T5/T4 from central London to 6tph plus ending the premium fare / lack of fare integration on 4tph Heathrow Express service, thus maximising the use of available capacity. We envisage that two Crossrail trains will be extended to terminate at a new bay platform at Staines; this further improves connectivity and reduces operational congestion at the Terminal 5 station.
- Piccadilly Line upgrade – TfL have plans for new trains and resignalling which will increase capacity by some 25%. The upgrade is due to be implemented in the next 10 years.
- Heathrow Hub a new integrated transport gateway for the airport served by some 30tph on the GWML, connected directly to the T5 and T2 terminal complexes via an automated peoplemover running every 90secs. Highway connection off the M25 will also provide access for cars, taxi and coaches.
- WRAtH is not needed with Heathrow Hub concept as the Hub provides much better connectivity/accessibility to the Thames Valley, West and South West. This represents a significant cost saving. (estimated at about £0.6Bn of which a pubic funding contribution of £0.5Bn has been confirmed. This could potentially be hypothecated to the other schemes we propose, which provide wider benefits to non-airport travellers and are more likely to provide revenue growth)
- Heathrow to Waterloo new train service – Connection between T5 and Staines and running 2tph in the peak and 4tph in the off peak from the airport to Waterloo, providing excellent access from South London and connection to the broader rail network at Clapham Junction. It will also provide a real alternative to the Piccadilly line for some journeys
- Bus and coach enhancements – Heathrow Hub will be a very attractive destination for coaches as the will only have to serve one location instead of a number of terminals. Addition coach routes will be added to supplement and complement the expanded rail connectivity.
- Incentives to use public transport - a comprehensive range of incentives including use of pricing actions, extensions of live information feeds and expansion of airport worker schemes.

Figure 3.10 Heathrow Hub Connections - Base Case

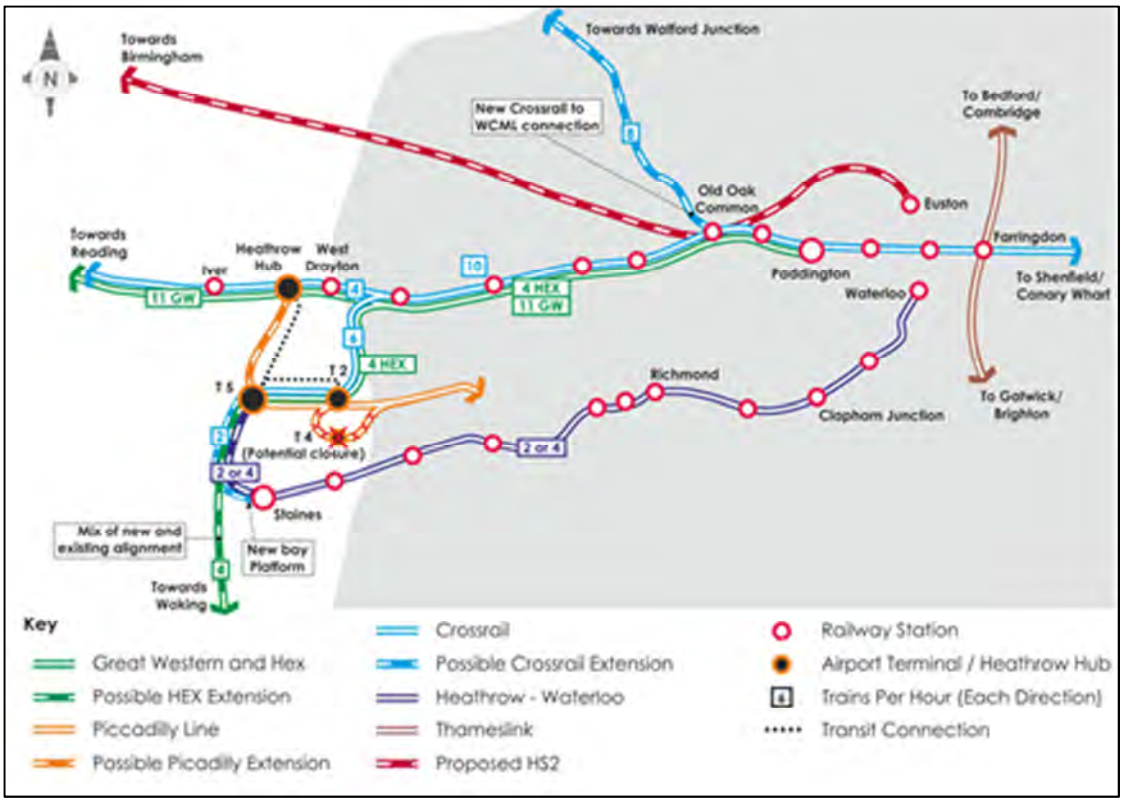


We have also discussed the following Additional Schemes with NR, some of which are being considered as part of other projects and thus are not Heathrow specific but could bring further benefits and the others which could bring added value to the network. NR are not aware, at a strategic level, of any reasons why they could not be deliverable but the schemes have not been subject to any detailed evaluation or development.

- Heathrow to Woking new train service – Connection between T5 and Woking via a new route adjacent to the M25 thus avoiding the problems with the former Airtrack scheme. 4tph would run from Woking/ Basingstoke/Guildford to Heathrow. Grade separation works at Woking would also bring significant relief to Woking which is a major bottleneck on the SWML.
- HS2 connectivity – we provide 6tph from OOC to Heathrow and 6tph between OOC and Heathrow Hub and the Hub layout safeguards the route for the HS2 spur. If built, the spur could terminate at the Hub, bringing a very significant cost saving compared to the current proposal of a terminus west of T5.
- Southampton via Reading to Paddington new train service – The Reading enhancements plus the planned electrification of the Reading to Basingstoke line, may open the opportunity for fast trains to be introduced between Southampton, Winchester, Basingstoke, Heathrow Hub and Paddington.
- Crossrail/ West Coast Main Line connection - Studies are taking place into the provision of a link between Crossrail and the West Coast Main Line, to allow medium distance services to be diverted away from Euston into Crossrail. This would significantly improve accessibility in the WCML corridor and provide stations like Watford Junction, and Hemel Hempstead with a single change connection to Heathrow via Old Oak Common.

- Piccadilly Line extension to Heathrow Hub – an extension of the Piccadilly line to the Hub could could new connections and journey opportunities

Figure 3.11 Heathrow Hub Connection - Potential Additional Services



3.3.5 *Surface Access - Highways*

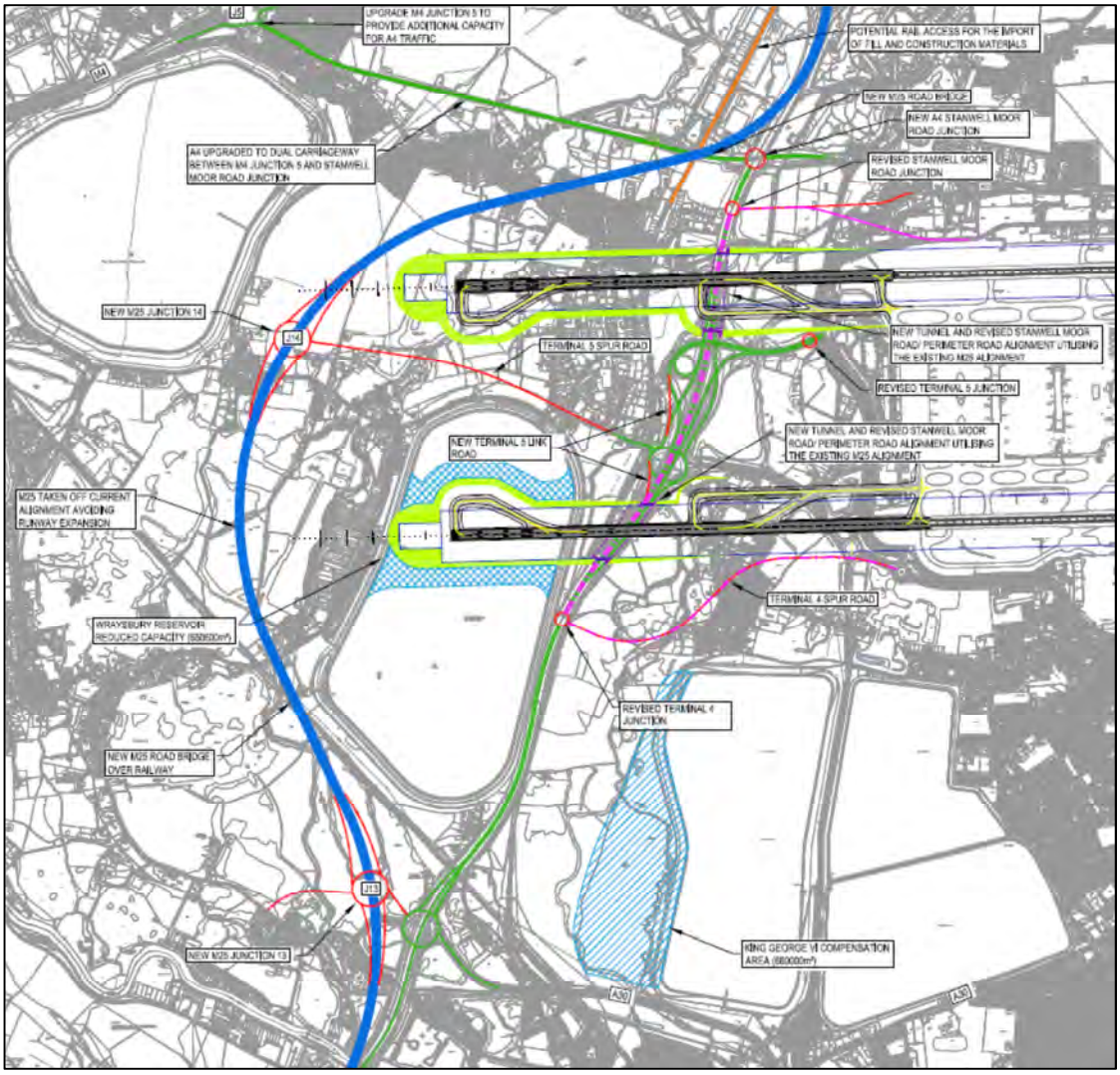
M25 and Access to the Motorway Network

The extension of the runway crosses a number of existing highways including the M25.

A number of options for relocating the M25 have been considered during the development of the scheme. There are two fundamental approaches that could be adopted. The first would be to divert the M25 around the end of the extended runway and the second would be to carry the runway over the M25 which would create a tunnel on the motorway.

A typical diversion option is illustrated on **Figure 3.12**.

Figure 3.12 Illustration of Possible 'Diversion Options'



Although this sort of option provides the greatest potential site for airfield development, it has been rejected for the following reasons:

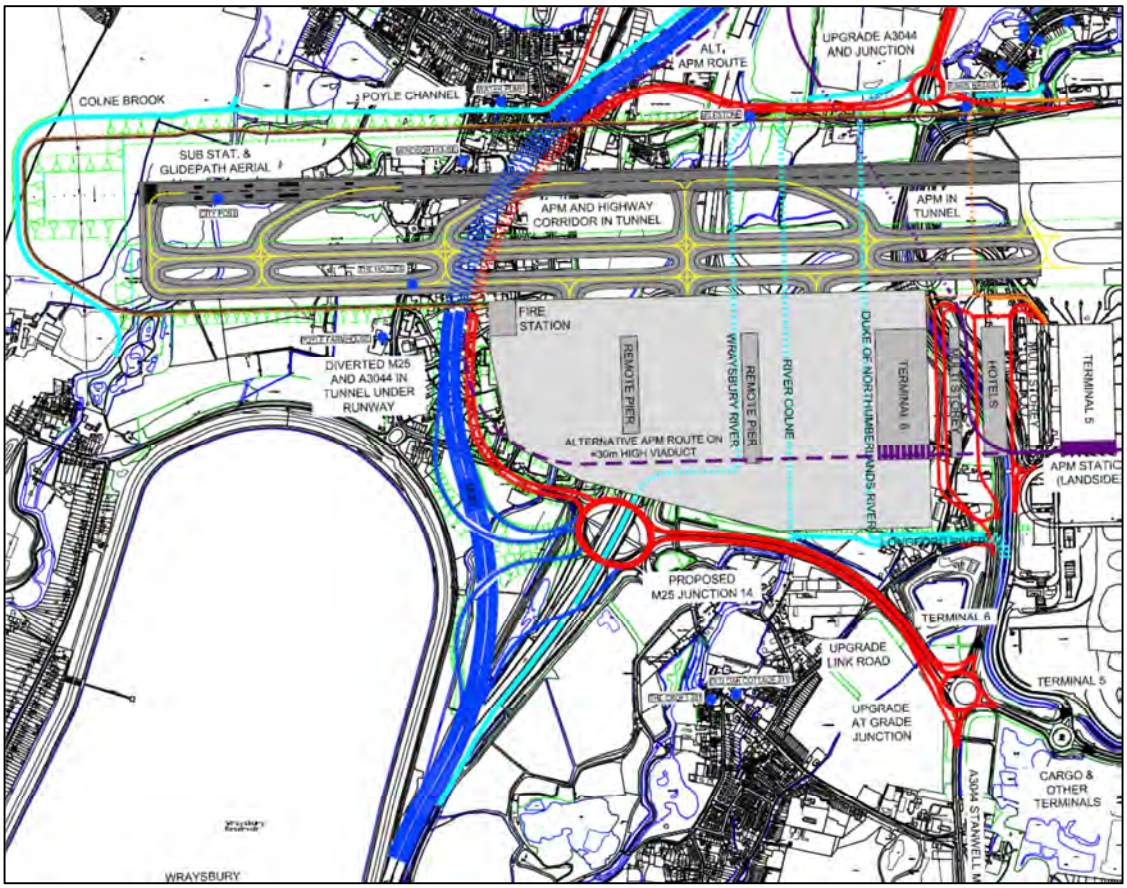
- The extent of land required and the disruption to communities and overall environmental impact.
- The limitation on the runway length that can be achieved given the constraints of the existing Junctions 13 and 15 on the potential for realignment of the M25.
- The possible impact on the Wraysbury Reservoir if Junction 13 is reatained. The reservoir is understood to be a constraint that cannot be overcome within the timescales contemplated by the Airport Commission and which has led to southern extension options at Heathrow not being short-listed.
- The impact on Junction 13 if a route to avoid the Wraysbury Reservoir is adopted.
- Discussions with Transec/CPNI and the Highways Agency have indicated that there is no objection in-principle to a solution that creates a tunnel on the highway.

Tunnel options have therefore been considered. It should be noted that although the structure will create a tunnel on the highway, the construction will resemble a bridge with motorway

level 4-5m below existing ground and the top of the structure above existing ground level. This is shown on the runway long section GA/21 in **Attachment 4-1**. Similar arrangements exist at Manchester, Schiphol, Los Angeles, Atlanta and Leipzig as well as Heathrow itself. To maximise the area available for airfield and hence the long-term capacity and flexibility of the airport alignments as far west as possible have been considered.

Within the tunnel options a range of sub-options has also been considered. The first of these was a like-for-like replacement of the major links and this is illustrated on **Figure 3.13**. In this scheme the weaving lengths currently provided are maintained or increased, but remain below the normal standard. This scheme was subject to consultation with the Highways Agency (HA). The key concern of the HA is that measures would be required to prevent standing traffic within any new tunnel. As this part of the M25 is prone to standing traffic, exacerbated by the sub-standard weaving lengths, alternatives to the like-for-like option are more likely to be acceptable to the HA.

Figure 3.13 Illustration of Option to Retain M25 Junction 14/14A



The implications on the scheme for the M25 are two-fold. The first is that Junction 14/14A of the M25 needs to be removed and the second is that two tunnel cells need to be provided in each direction to provide resilience for maintenance and emergency and assist in the management of the motorway in the event that standing traffic occurs.

The wider implication is that a link road from Junction 13 of the M25 has to be provided to replace the routes currently provided from Junction 14/14A, with traffic from the north being encouraged to use the Hub as a gateway to Heathrow by increases in travel distance. Two

corridors for the route of this link have been identified and these are illustrated on **Figure 3.14** and **Figure 3.15**.

The route shown on **Figure 3.14** follows the M25 corridor and new corridor to the north of the King George VI Reservoir. The route includes a Site of Special Scientific Interest (SSSI).

The route shown on **Figure 3.15** follows the A30 corridor and the A3044. This route passes through a Special Protection Area (SPA).

On balance the impact on the SPA is considered of greater significance and therefore the concept shown on **Figure 3.14** has been selected for the core option. It is intended that this be refined during the period up to consultation.

Figure 3.14 Illustration of Option for New Link from M25 J13

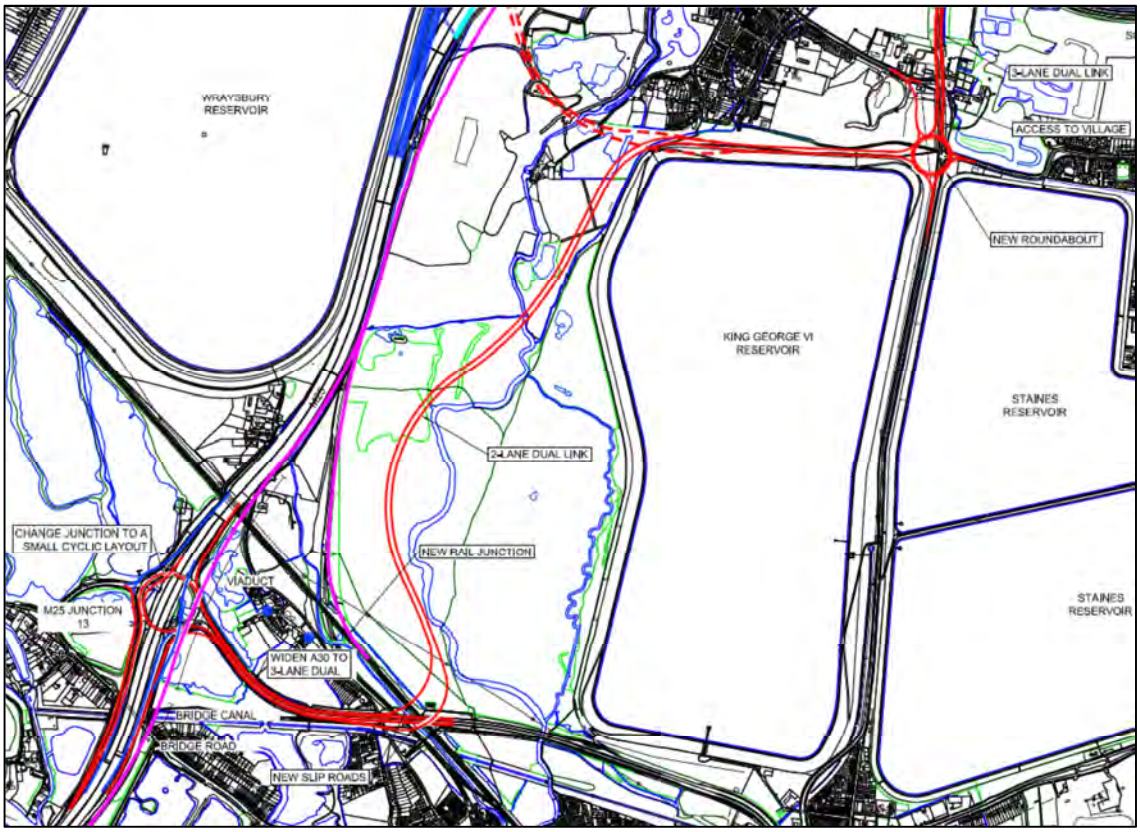
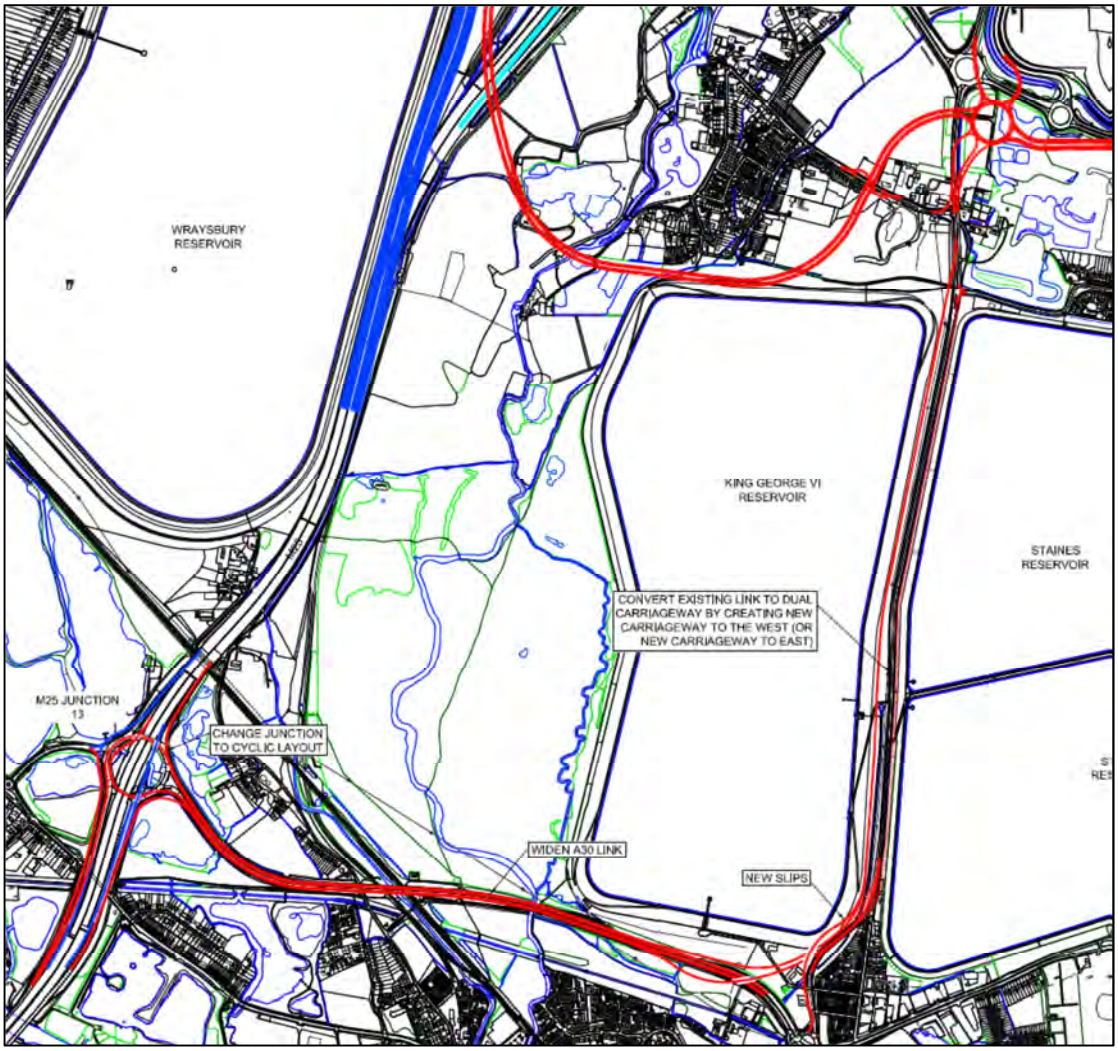


Figure 3.15 Illustration of Option to Improve A30/A3044 Corridor



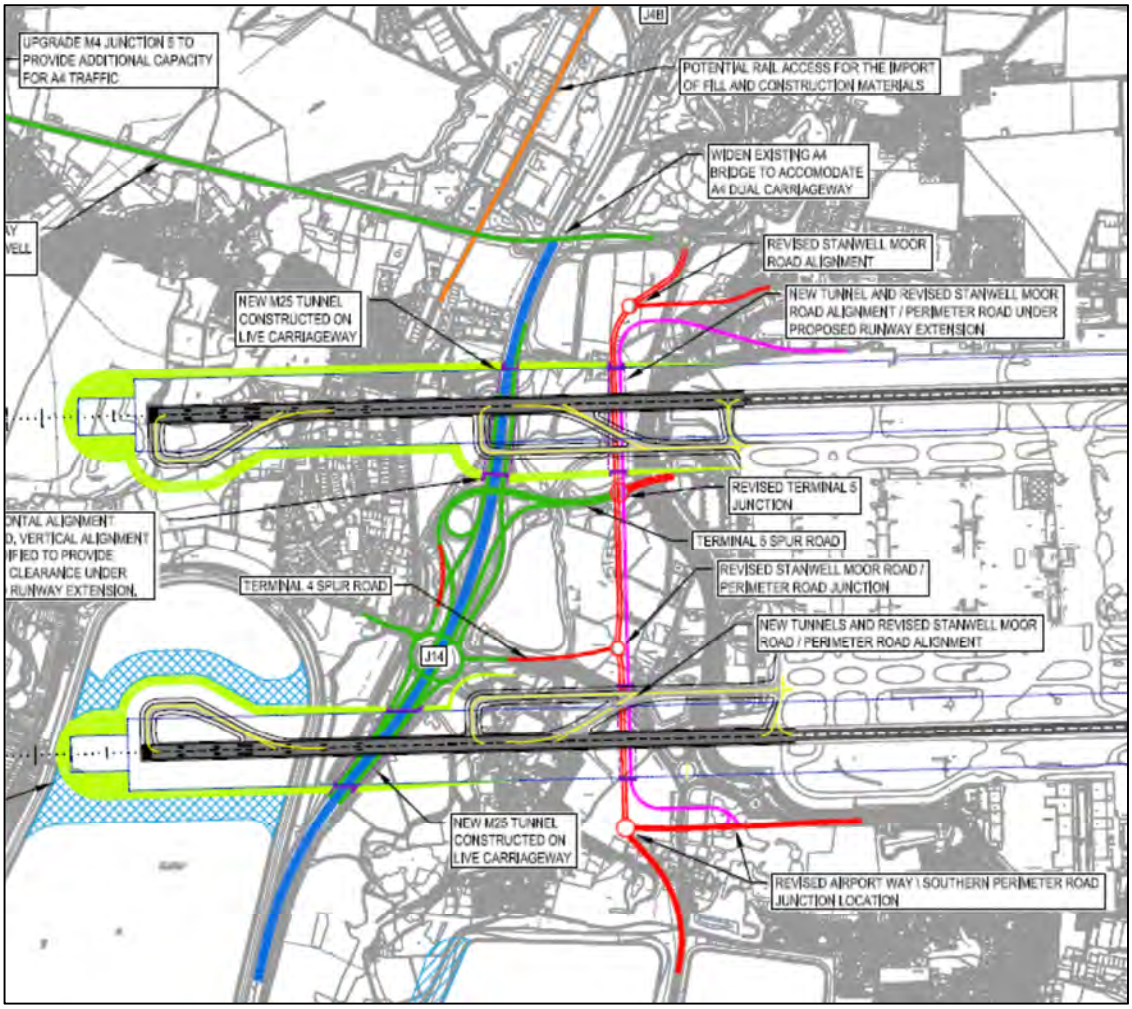
Other Highways

The other roads have either been severed where their purpose has been changed by the airport development or diverted.

The principal diversion is of the roads around the existing airport boundary into a tunnel adjacent to the M25 diversion. This allows the roads to be build off-line, at a location where the roads do not have to be depressed too far below existing ground level with consequent impacts on drainage and so a common control centre for the tunnels can be established.

A more on-line route is illustrated on **Figure 3.16**, but has not been developed in detail as it does not have the features of the core concept.

Figure 3.16 Illustration of More On-line Route for other Highways



It is intended that more detailed consideration of the local highway and bus service impacts be carried out in parallel with the Commission's assessment of surface access.

3.3.6 *Airport Transit and Automated People Mover (APM)*

To create good connections between the Heathrow Hub interchange and the rest of the airport, a high quality, fixed right of way transport system is required. A number of generic alignment options have been considered to provide this functionality and a range of system times.

These are described in Section 3.4.8.

3.4 Description of Core Concept

3.4.1 *Introduction*

The Airports Commission has identified the need for one net new runway in the south east of England by 2030.

One of the shortlisted options is the development of additional runway capacity by extending the existing northern runway to the west to create two separate runways; one for landing and one for take-off. The core concept for this proposition is shown in plan on the engineering layout drawings GA/01 and GA/11-18 and other indicative drawings included at Attachment 4-1.

This section describes the physical attributes of the scheme, the operational modes available, the impact on airspace and airport safety, the other infrastructure required. It also includes an outline of the surface access strategy and initial views on how this would be expected to work.

3.4.2 *Airport - Physical Configuration*

The Core Concept is based on an extension of the northern runway to the west to create two in-line runways each 3,000m long separated by a distance of 600m forming an intermediate safety area. The runway is provided with a full length parallel taxiway, which is required to support the use of the runway for 'deep' landings where this operational mode is adopted (for example for early morning arrivals when there are few if any departures. There is a dual parallel taxiway to allow ground movement of aircraft to and from the apron area.

The dual parallel taxiway could be extended to the end of the runway to provide selection of aircraft in 09 operations if this is required for movement rates or more limited bypasses could be provided.

Airside support facilities include a new satellite fire station to allow access to the runway ends within the stipulated times in the appropriate standards and recommended practices; additional airside substations to serve the new facilities and the appropriate navigational and meteorological instruments together with the supporting airfield roads. There may be a requirement for some facilities to provide assistance to Air Traffic Control.

For the passenger processing area the approach has been to create a large coherent area within the constraints of the runway and highway layouts. This then provides the flexibility in layout to respond to developments within the aviation industry and its regulatory environment. Although there are a number of ways the apron and terminals could be arranged, at this stage a continuation of the existing approach has been indicated. The facilities are of a similar scale to the existing T5 development and therefore sufficient space is available for the 35-45mppa capacity required at the planning horizon assuming similar capacities and levels of services as T5.This concept is based on large terminal buildings to support a coherent group of airlines supported by a 'toast rack' of satellite piers to deliver passengers to aircraft The concept shown is consistent with the approach that HAL has taken in recent years and shown within its 2 Runway Master Plan. This approach allows for high capacity surface access modes to serve the terminals.

A development of this nature would create a base for a large airline alliance to provide the interconnectivity that supports the connections possible within the hub model of airports. The facilities would be designed to provide a suitable experience for passengers and being based on new build would incorporate then current best-practice in terms of energy use, carbon emissions in construction and water use. The layout is capable of being built in phases to match capacity with demand and is inherently flexible as other layouts to serve other airline models can be developed. In particular, it would allow point-to-point routes to operated using Code E aircraft such at the B787 Dreamliner with fine-tuning of the layout rather than fundamental change.

Support facilities are indicated in the terminal area, these include additional short-stay car parks, hotels, energy centre and a central gateway to the Heathrow West area. As the existing road system serving T5 is disrupted by the extension of the runway and its associated

taxiways, it needs to be remodelled. In concept, the roads are replaced by a new loop serving both T5 and the new T6 and the associated car parks.

The concept option for the area includes a new central gateway to this Heathrow West area where the high level APM from the hub would arrive at departures level. This would allow a single station to serve both terminals via moving walkways. Baggage could be offloaded at this site and fed into the baggage systems for each of the terminals via appropriate conveyors.

A single station would improve APM times to Heathrow East compared with two stations and mean that the APM could be provided for T5 traffic before T6 was completed. It would also limit the complexity of modifications to T5.

The extension of the runway crosses the routes of a number of existing watercourses and these have been indicated in separate culverts under the runway or diverted around the end of the runway where considered possible. The adoption of separate culverts is consistent with Environment Agency policy regarding catchments.

3.4.3 *Air Traffic Control (ATC) and Air Space Feasibility*

A detailed report on the ATC and airspace feasibility of a third in-line runway at Heathrow in support of the Heathrow Hub Concept has been prepared by Think Research and is appended as **Attachment 3-2**. This section summarises the work and the conclusions reached.

There are three main threads to the work as listed below:

- Feasibility study
- Missed approach procedures for the scheme
- Modelling of four runways to assess the ability of the concept to be further expanded if required.

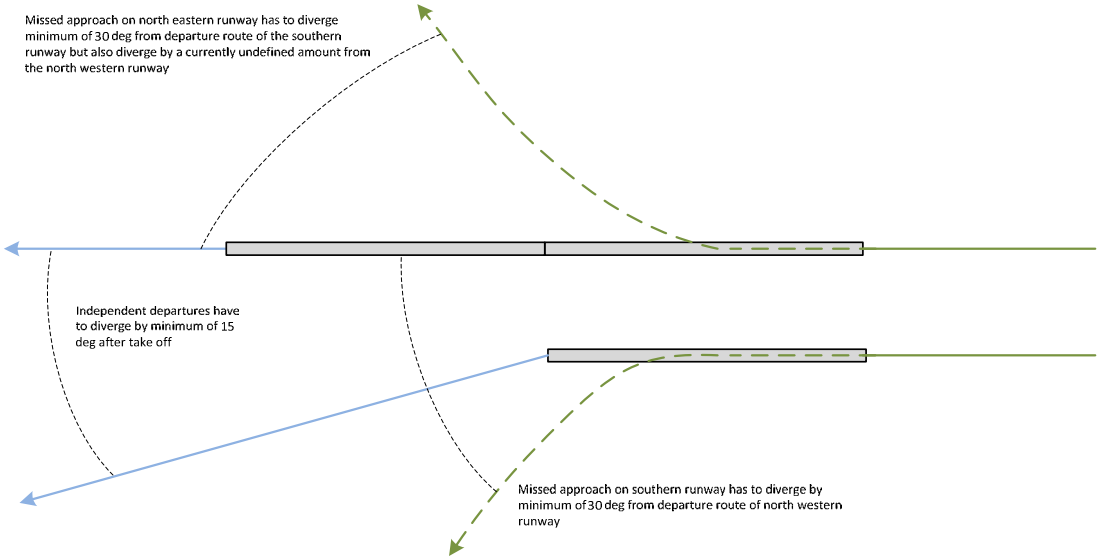
The current airspace structure of the London Terminal Manoeuvring Area (LTMA) will not support an additional runway, regardless of airfield, runway layout and orientation. However, multiple projects either in Research & Development or Implementation stages are expected to deliver an increase in both capacity and efficiency within the LTMA.

In addition, technological advances are aiming to reduce controller workload to enable more flights to be handled. As a result, findings and conclusions within this report are based on the proposed future infrastructure. It is this combination of future concepts and technological enablers that will help meet the demand of future predicted air traffic growth.

The unique design of the Heathrow Hub Concept provides multiple benefits over alternative Heathrow solutions. These include the ability to perform compass mode departures with the potential for reduced taxi times, minimal disruption to current methods of operation, deep landings (for noise mitigation), the addition of a fourth runway very close to the existing infrastructure to support long-term future growth and an ability to cope with changes in fleet mix in the future.

The suggested method for implementing missed approaches within the Heathrow Hub concept is largely compatible with current ICAO recommendations with the exception of missed approaches on the inline runways. Current guidance does not cover a scenario of two independent inline runways operating arrivals from the first runway and departures from the second runway and has been developed by extrapolation. A missed approach procedure in this scenario would need to diverge from the departure track and a safety case will determine how much divergence is required.

Figure 3.17 Illustration of 27 Operations for Air Traffic Review



Heathrow Airport operating with four runways is estimated to be capable of supporting up to 900,000 movements annually on the sets of parallel independent runways.

Overall, the option of a third in-line runway at Heathrow does not present any major obstacles that cannot be resolved. Whilst the workload of Tower, Approach and TMA controllers will increase, sometimes substantially, various projects including Performance Based Navigation (PBN), London Airspace Management Project (LAMP) and Advanced Controller Toolsets will help offset the associated increase in controller workload. The findings of this report conclude that the option of a third in-line runway at Heathrow is feasible from an Air Traffic Management (ATM) perspective.

3.4.4 *Air Traffic Management – Runways and Ground Movements*

The ability of the airport concept to operate safely and in line with international standards and best practices is fundamental to its acceptability within a safety critical domain.

A high level assessment of the risks arising from the concept has therefore been carried out. It focused on the changes from current operations, or unique aspects arising from this particular concept. These are discussed in detail in **Attachment 3-3**. Several elements arising from the assessment will be taken forwards in more detailed study to gather evidence to show acceptable safety levels will be maintained; these are discussed below.

The airport concept, specifically the positioning of the runways and associated changes in taxiways and airspace, can meet all national and international safety regulatory requirements. As with all air traffic procedures, operational mitigations may be necessary in certain situations (eg bad weather). The extent of these operational mitigations, and their impact on the throughput of the airport, will be determined through further analysis, but is not expected to be unduly large.

It must be highlighted that the proposed concept brings changes to current operations that can improve safety. A reduction in the throughput per runway will increase the resilience of the operations and reduce the complexity of the controller task when the new runway comes into operation (2023). The presence of the ultra-long runway (6.6km in total) brings benefits in the

event of known aircraft emergencies, enabling a “recovery” runway to be used safely. Finally, the use of in-line runways with parallel taxiways reduces the necessity for runway crossings. Specifically for Terminal 4 operations, it is expected that a higher percentage of the aircraft arriving/departing at T4 will be able to be sequenced onto the southern runway, reducing the number of crossings compared to current operations.

Of course, a robust consideration of potential risks is critical prior to implementation of the concept. The primary risks for aviation relevant to the changes introduced by this concept include Mid Air Collision, Controlled Flight Into Terrain, Runway Incursion, and Runway Excursion. Under these accepted ICAO headings, a series of more detailed risk factors have been identified for this concept, and are described below:

Go-arounds (Missed Approach Procedures)

Many aspects of missed approach procedures will be no different to the case of a single mixed mode runway such as London Gatwick, where an aircraft lands just after one departs from the same runway. The inline runway concept allows for a larger separation between the landing and departing aircraft than mixed mode on a single runway.

Nevertheless, it is important to assess a possible closest point of approach, and understand the change to the theoretical collision risk (if any). Initial estimates suggest that around 1km separation would still be maintained between the aircraft on the in-line runways, even given an extremely testing set of assumptions (e.g. very late go-around, one engine inoperative thus slow climb rate etc). The Missed Approach Procedures – instrument procedures flown after an aircraft can no longer continue the approach – will need re-designing to ensure sufficient minimum aircraft separation.

It is further expected that the number of go-arounds can be decreased at Heathrow from current operations through effective use of the operational modes available.

Balked Landing Surfaces

These are the obstacle clearance (limitation) surfaces, inclined at an angle of 3.33% above the horizontal, measured from 1800m after the threshold of the arrival runway for a Code 4 runway. No fixed obstacles can impinge upon this area to protect aircraft going around.

The main “obstacle” in the new concept is the tailfin of an aircraft sitting on the departing runway (27R-ext). The principles of the balked landing surface can be applied to this situation to understand any change in risk. An A380 tailfin is 25m in height.

Even taking the conservative case of one engine inoperative and minimum climb gradient (2.4%), this height would be reached by an aircraft going around 400m before the end of the landing runway, leaving 1km to gain extra height as an additional safety margin. The balked landing surface at the start of the departure runway is 50m above the ground i.e. the tailfin would be substantially lower than the maximum height allowable, and therefore meets the regulatory standards.

Runway Excursions and Runway End Safety Areas (RESAs)

The risk of runway excursion is reasonably well understood. For the Heathrow concept, there is no change to the risk arising from side excursions of the runway – existing standards will be used to determine taxiway spacing and runway clearance areas.

RESAs are implemented to protect the aircraft and surrounding areas in case of excursions from the end of the runway (over-runs). In the UK, a combination of standardised values and a risk-based approach is used to determine the acceptable RESA distance. Conservative

assumptions have been applied to the new runway to ensure the RESA of 600m far exceeds the minimum requirements.

Figure 3.18 Illustration of Existing Features in Overrun Areas

For over-runs, it is understood that there is a concern around an aircraft overrunning into a departing aircraft sitting on the in-line runway. To assess the risk, a statistical analysis was carried out. There are approximately 0.5 excursions per million landings worldwide (over the last 20 years); this figure does not differ significantly for European operations, or operations between jet and turbo-prop aircraft. Of these, over 80% occur when flying without a precision approach i.e. using instrument guidance such as ILS. Heathrow operations are assumed to use precision approaches. Also, the excursions very rarely progress beyond 200-300m over the runway end; in fact, only 10% of excursions progress beyond 300m.

Putting these factors together gives an average of 1 excursion running beyond 300m every 280 years for Heathrow. This is conservative since it does not take account the specifics of Heathrow's runways, which are longer than average. The FAA also undertook several studies which concluded that a safety area of greater than 2000' [610m] offered no worthwhile additional safety benefit and did not justify the costs involved.

The likelihood that a runway over-run progresses far enough beyond the arriving runway that it impacts the departing in-line runway is extremely improbable (a standard term denoting the lowest likelihood used during safety assessments in aviation for e.g. certification purposes).

Precision Approach Navigation Aids

The existing Instrument Landing System (ILS) is expected to be sufficient to support the concept. This requires validation for the new in-line runways. Two main areas of concern have been noted: i) the performance of the localiser (antenna) when situated over 6.6km away from the arrival runway threshold – a greater distance than is usually the case – and ii) potential interference in the beam from aircraft between the antenna and the arriving aircraft.

Initial analysis suggests that the performance of the localiser should be sufficient even when placed at the end of the extended runway.

For the interference risk, a potential hazard was identified of the take-off aircraft at 27R-ext (or aircraft waiting to take-off) interfering more readily with the ILS localiser beam, and thereby disrupting the signal to the landing aircraft on 27R. The nominal situation can be compared to single runway airports, where an aircraft may be taking off whilst another aircraft is on

approach. It is particularly critical during Low Visibility Procedures (LVP), where a sensitive area is defined within which all obstructions (including aircraft) are excluded to ensure minimal interference with the beam.

It is recognised that the geometry of the aircraft passing through the localiser beam will be different from the single runway case for this in-line runway concept (both whilst on the ground and in the air). The interference characteristics of this concept will therefore be considered in greater detail for the preliminary safety review for the UK CAA.

It should be noted that the need to define a sensitive area; potential operational mitigations for interference issues in LVP are no different in principle than in current operations.

The concept is not predicated on the use of Microwave Landing Systems (MLS) or Ground Based Augmentation Systems (GBAS). Nevertheless, both systems could bring benefits if deployed on the aircraft fleet and ground. However, it is expected that many aircraft will not be equipped by 2023, and therefore GBAS Cat II/III operations will not be possible for all aircraft in that timeframe. Therefore, solely ILS is assumed at present. A mixed ILS/GBAS (or ILS/MLS) concept could also be introduced if required.

Simultaneous Independent Runway Operations

It has been assumed in the concept that the runways will be able to be used in an independent manner i.e. parallel arrivals and departures which are not constrained by the distance between the runways. Under current ICAO standards, this is likely to require the introduction of monitoring to ensure aircraft adherence with the expected flight paths on approach and departure.

Wake Vortex Separation Requirements on Approach

Standard separations are assumed between aircraft on approach, noting that Time-based Separations will be introduced to Heathrow in the next few years. Current separation standards and time-based separations are assumed with the concept and no new risks are considered to be introduced. A potentially unique element for the new concept is the presence of staggered parallel arrivals into the southern (27L) and extended northern runway (27R-ext). The impact of the wake vortices from the 27R-ext deep landing aircraft impacting the aircraft arriving to 27L in strong northerly wind conditions will need to be considered. This requires further assessment, but is not a particularly unusual situation, since airports around the world operate similar approach sequences (e.g. San Francisco).

Other Impacts on Air Traffic Control – Terminal and Tower Operations

Risks to ATC arising uniquely from this concept include the distance of the new runway to the existing control tower. Mitigations include the use of binoculars per current procedures, remote cameras or possibly secondary control towers, as used in Amsterdam Schiphol airport.

For the terminal airspace, the concept should involve the fewest changes of all the submissions. The use of an in-line additional runway will mean that new Standard Instrument Departures and possibly new Standard Arrival Routes will be defined, but this may need to be the case anyway to allow the increase in throughput in the TMA. Controller workload may increase as a result of the increase in traffic, rather than any element inherent in the runway concept.

Human Factors Elements

A series of perception and situational awareness hazards were identified specific to the new layout of the in-line runway. Many of these are mitigated by clear marking and appropriate

design, which is no different than in current operations. Of particular interest is the possibility of a flight crew misinterpreting the approach guidance, and attempting to land on the wrong in-line runway (e.g. 27R instead of 27R-ext or vice-versa). Clear lighting will mitigate this, as will appropriate precision approach navigation guidance. The markings for the central zone between the runways will also need to be very clear e.g. painted in a different colour.

Other Hazards

Many other hazards were identified through brainstorming with operational and technical experts. These included changing risks from bird strikes, jet blast, Public Safety Zone alterations, any new risks during take-off and departure, and ground movement complexity). No undue risks were identified.

Runway construction/Transition Hazards

Currently, runway resurfacing is carried out during night-time hours at Heathrow to avoid impacting operations. This is assumed to be the case for the areas abutting the existing northerly runway. One element requiring careful management is the shortening of the existing northerly runway to 3000m (recognising that the current assumptions on exact runway length can be iterated depending on further studies into the optimum). Existing practices would be used, such as clear markings for the new thresholds, avoiding disturbing the ILS localiser until absolutely necessary, and disseminating information to all users. For the ILS, a mitigation plan would need to be developed to understand how to transition between the localiser at the end of 27R, and a new localiser at the end of 27R-ext. It is assumed that a sensitive area could be created during operational hours of the runway to ensure the new ILS remains effective.

Any obstacle clearance limitations are not thought to be an issue, for the reasons shown above for balked landing surfaces. Lighting and visual distinction will be important elements in avoiding confusion over the new runway, the new clearance zone, and the existing runway.

Conclusion

Many risks have been outlined above, showing that a robust analysis is taking place into the new concept. More detail is included in a report prepared by Helios at **Attachment 3-3.**

At present, none of these present an insurmountable issue for the implementation of the runway concept.

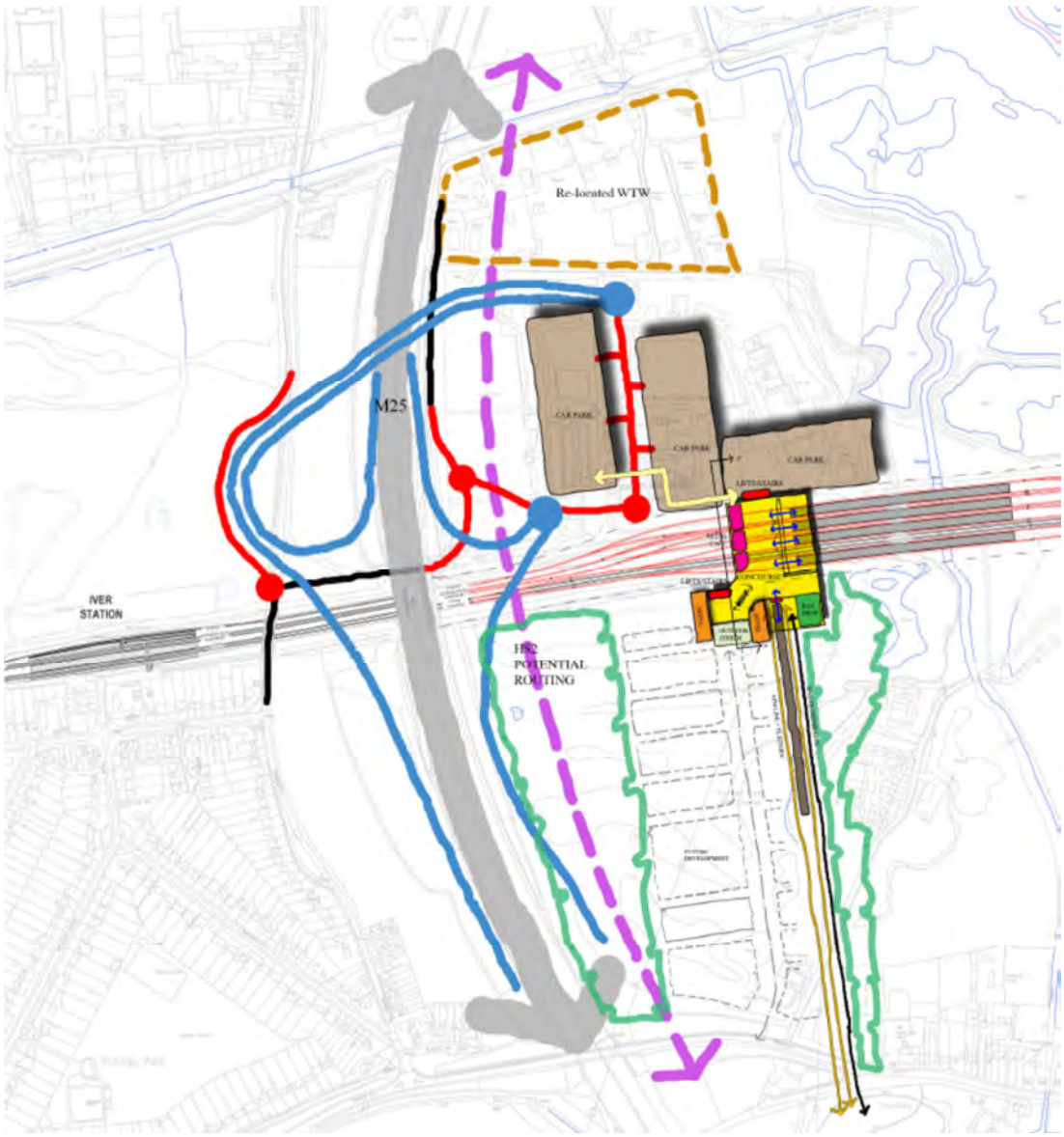
3.4.5 *Heathrow Hub*

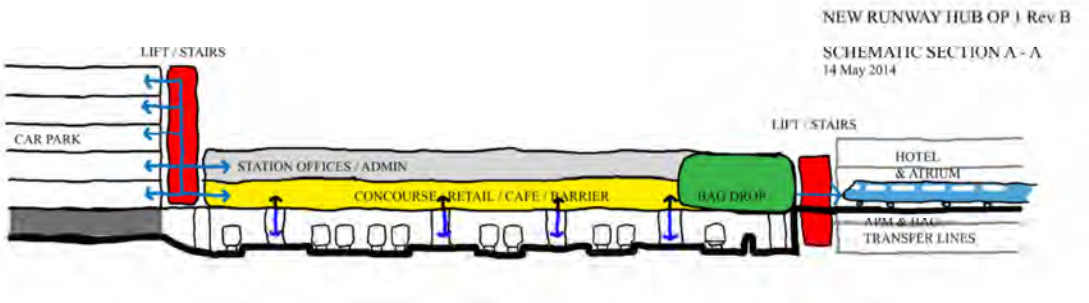
Heathrow Hub brings a number of unique and transformational benefits to any Heathrow 3rd runway proposition. Most importantly it becomes a new gateway to the airport by integrating the national rail network with the airport, delivering a public transport mode share for the GW corridor of some 60%. What makes this even more attractive is it is a deliverable, low risk solution since there is no requirement to make major changes to the rail network or add new services, as the Hub is served by just adding a stop to the existing Great Western and Crossrail services.

Intercepting the airport road traffic from the north, off the M25, before it reaches the M25/M4 junction will make road accessibility to the airport much more reliable and reduce the loading on the M25. Kiss & fly, taxi and parking facilities giving direct access to the interchange facilities and the APM and will be much closer, more secure and superior to those between current long and medium stay car parks and terminals. Coach / bus facilities will also be provided, as access off the M25 will make the Hub an attractive airport option as they will only have to serve one destination, The passenger experience will be much better with covered walkways with travellators vs. open air car parks and bus shuttles.

The Interchange will have all the facilities, style and feel of an airport terminal. Bag drop and check-in kiosks will be provided together with waiting areas, shops and catering facilities. Having these facilities at the hub will reduce the scale of facilities required on the main airport site, maximising the availability of space for aviation purposes. An hotel will provide overnight accommodation for passenger catching early morning flights or arriving late in the evening. Conference and meeting facilities will also be provided. The concourse level will be one level above the station platforms which will be accessed by escalators and lift and the APM will run every 90 seconds from the concourse level with a journey time to T5 of around 5 minutes and an additional 2 minutes to the T2 terminal complex.

Figure 3.19 Illustration of Concept for the Heathrow Hub





3.4.6 *Highways*

The extension of the runway crosses a number of existing highways including the M25. Discussions with the Highways Agency have led to the development of a core concept that has the following features:

- Removal of Junctions 14 and 14A of the M25 to limit the risk of having standing traffic in the proposed motorway tunnels by improving the current sub-standard weaving lengths
- Parallel motorway sections within the tunnel to provide assist in the management of the tunnels in the case of maintenance or emergency
- Provision of new link roads from Junction 13 of the M25. An indication of the route is provided.
- Reprovision of local road routes in a tunnel adjacent to the M25.

The features of this approach are aimed at creating an environment where Heathrow traffic is distributed around the site, encouraged to use the hub for journeys made from the north and the west and reducing weaving in this section on the M25 with consequent benefits to other motorway users

3.4.7 *Heathrow Hub and Public Transport*

We have done significant work to evaluate the options we have identified and discussed them with Network Rail and Transport for London (TfL), both of whom are in broad agreement with the general principles. This is a complex area and further work needs to be done with both Network Rail and TfL.

In our initial development of these options, we have considered whether the proposals are realistically deliverable, both in terms of any necessary physical works and route capacity constraints, and we have carried out some preliminary demand forecasting work.

Capacity to Central London

From analysis of the most recent CAA survey data, rail has a 45% mode share of travel to and from central London, split between the Piccadilly Line (29%) and Heathrow Express/Heathrow Connect (16%), with Heathrow Express load factors averaging only around 30%, despite the current relatively low seating density of the trains. Crossrail will provide a major increase in capacity to and from the airport, with four trains an hour currently planned, and our proposals raise this to six, or possibly eight. In addition, Crossrail will provide a step change in connectivity for travel from Heathrow via Paddington. The attraction of the Paddington route will therefore significantly increase, mitigating the risk of the growth in air passenger numbers putting unsustainable pressure on the Piccadilly Line. We also concluded that Heathrow Express should cease to be a premium fare operation, with the trains potentially reconfigured to a higher density, to ensure that the most effective use is made of the available capacity.

This strategy increase capacity on the Paddington route by more than 100%. Given the step change in capacity achieved with Crossrail, and the proposed higher capacity and lower fares for Heathrow express, coupled with the current low load factors on Heathrow Express, we are confident that the rail capacity to central London delivered by this strategy is fully able to meet the growth in demand, both from the growth in air passenger numbers and increased rail mode share; we are also confident that this can be achieved without putting additional pressure on the Piccadilly Line.

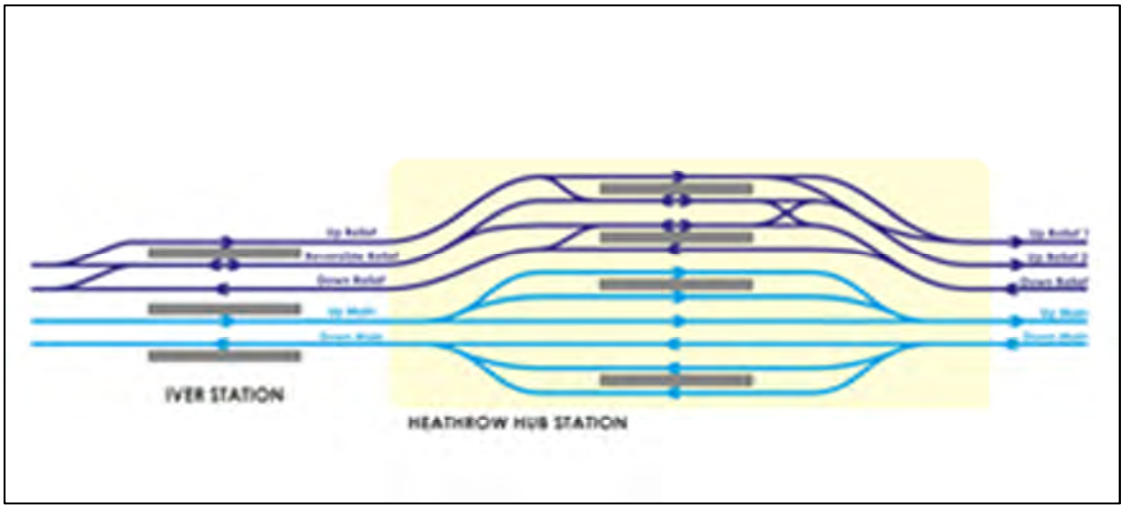
TfL is preparing plans for a Piccadilly Line upgrade that will provide substantial additional capacity. The Underground will remain a very convenient way to travel from central and south west London to T4 and the other terminals. However, we expect a reduction in the Heathrow air passenger mode share of the Piccadilly Line to arise as a result of the committed and our proposed enhanced services via Crossrail and Heathrow Express.

The opening of Crossrail in 2019 will provide greatly enhance connectivity, both as a result of its direct services to the west End, the City, Docklands and the Eastern suburbs to Shenfield, and also through “single interchange” connections with London Underground lines and the National Rail network in the East of England such as Cambridge, Peterborough, Bedford vis Farringdon, Colchester, Ipswich and Norwich via Liverpool Street. We have not at this stage been able to estimate the increase in rail mode share as a result of Crossrail but we would expect that this will lead to a significant modal shift from car or taxi to rail for journeys to Heathrow, as public transport becomes faster and more convenient.

Great Western Main Line

The proposed configuration of Heathrow Hub station is designed to provide maximum flexibility and operational resilience. The Great Western Main Line between Paddington and Reading is a four track route, with two tracks primarily used by InterCity services (the “Main lines”) and two primarily used by Commuter services (principally Crossrail services from 2019) and freight (the “Relief lines”). For the main lines, we propose two platforms in each direction, which will allow successive trains to stop without reducing route capacity; we also propose a high speed through line in each direction without a platform. For the Relief lines, we again propose four platforms in total, to allow Crossrail trains to terminate there if required. We also provide for loops, useable in either direction, to allow maximum length (750 metres) freight trains to be overtaken if required.

Figure 3.20 Heathrow Hub Schematic Track & Platform Layout



We envisage fifteen trains an hour in each direction calling at Heathrow Hub. The InterCity services (11 trains an hour each way) would provide fast, direct and regular services on routes to Exeter, Plymouth and Cornwall; Swindon, Bath and Bristol; Bristol Parkway, Cardiff and Swansea; Cheltenham and Gloucester; and Oxford and Worcester. Almost all of these trains would also call at Reading, providing a frequent service with a journey time of around 16 minutes, compared with the current scheduled coach journey time 40 to 60 minutes (depending on the time of day) and giving excellent interchange opportunities for other routes, as well as serving Reading itself. Crossrail services would serve intermediate stations between Reading and Paddington, providing a vital link for airport employees as well as air passengers.

We recognise that there may be crowding issues on InterCity services at peak periods, although these mainly occur only between Reading and Paddington. However, the electrification of the Great Western Main Line and the associated increases in service frequencies, together with the introduction of the new, higher capacity "InterCity Express" trains will mitigate any increase in overcrowding; furthermore, we believe it would be possible to make tactical adjustments to the timetable at peak periods to minimise overcrowding, for example by not stopping all the trains serving Heathrow Hub at Reading and vice versa.

We have carried out an initial evaluation of the impact of Heathrow Hub on mode share for air passengers and rail passenger numbers, using CAA survey data. Given the time and resources available, and the limitations of the data, these are necessarily provisional, but as would be expected they show a step change in rail's mode share for areas served by the Great Western Main Line, with Rail's mode share increasing from 8% to 38%, and the public transport mode share increasing from 35% to 58%; the evaluation results are summarised below:

Figure 3.21 2035 Surface Access by Mode GW Target (Numbers)

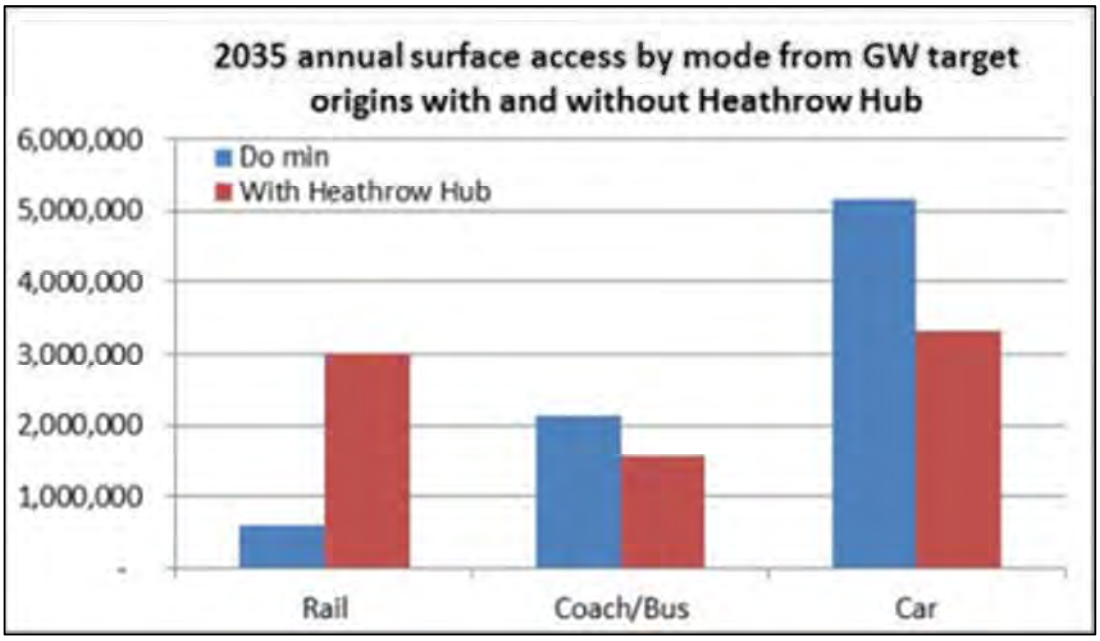


Figure 3.22 2035 Surface Access by Mode GW Target (Share)

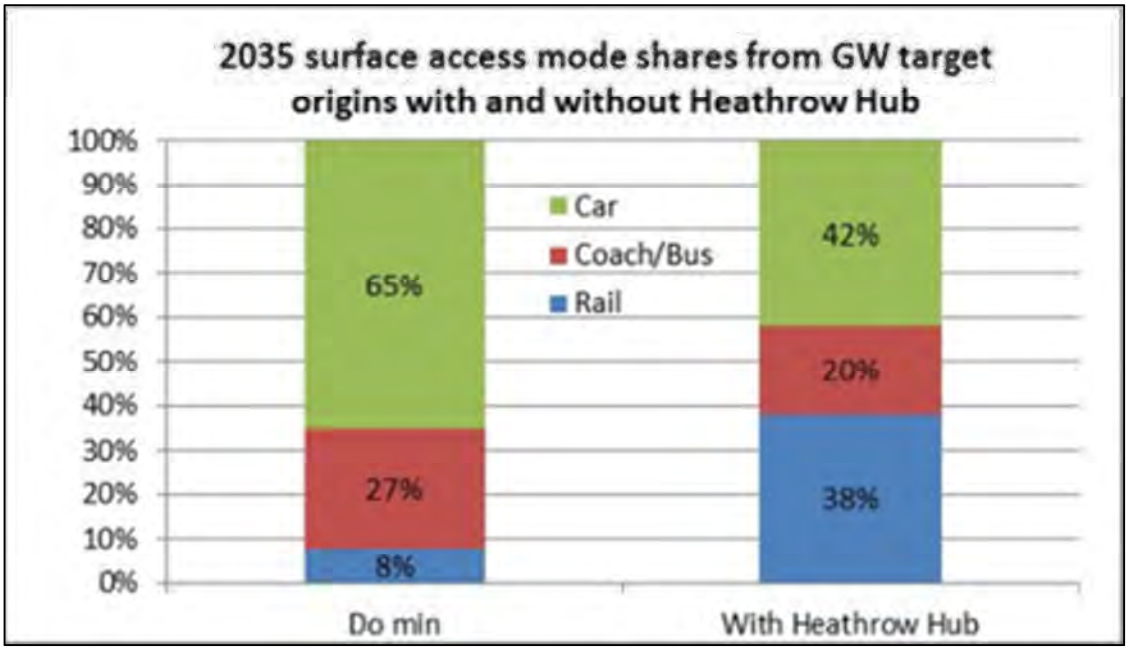
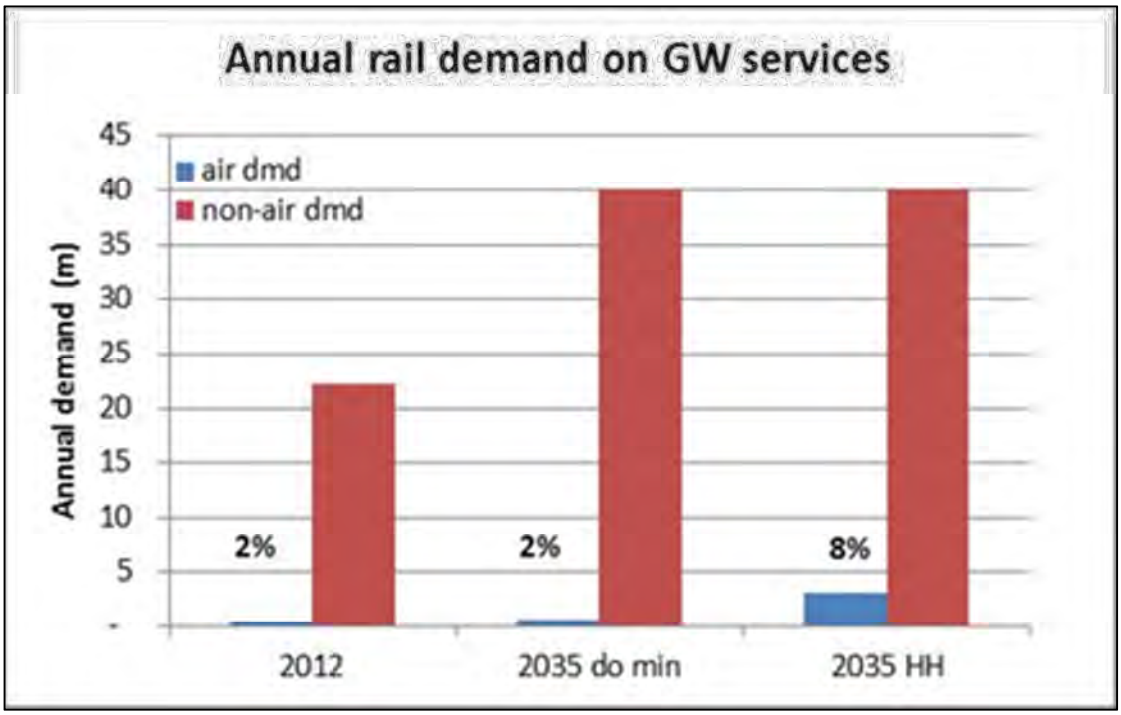


Figure 3.23 Annual Rail Demand on Great Western Services



We would stress that these results are preliminary at this stage, but they do indicate that there is a strong case for Heathrow Hub and that the benefits for air passengers using the station will be significantly higher than the disbenefits for London passengers as a result of the additional stop, particularly as the base case for HS2 has all GWML services stopping at Old

Oak Common, which is not required with Heathrow Hub (see below) – in practice there will be no journey time penalty for GWML London passengers with the Hub compared with the HS2 scheme.

Old Oak Common Main Line Platforms

Old Oak Common station is assumed in the base as part of HS2. However, we would argue that the main line platforms are not required, provided that there are frequent limited stop Crossrail services to Heathrow (eg calling only at Ealing Broadway). We have developed an illustrative service pattern which achieves this while maintaining existing service levels for intermediate stations and safeguarding four freight paths an hour.

Calling InterCity services at Old Oak Common will increase journey times for London bound passengers and have little connectional value; the great majority of journeys from the West of England and South Wales to the Midlands and the North are better served by direct cross country services which will have cheaper fares, will not require interchange and in many cases will still have shorter journey times. Elimination of the main line platforms represents a significant capital cost saving and will reduce the disruption necessary to construct the station.

While we have not analysed the business case for the main line platforms at Old Oak Common, it is likely that there are significant net disbenefits, as the station serves only a very limited purpose for Great Western InterCity passengers, particularly as it will not now provide an interchange for European services via HS1

Western Rail Approach to Heathrow (WRAtH)

WRAtH is unnecessary with Heathrow Hub, which will have much shorter journey times to Reading and beyond, and avoid the need for interchange at Reading. This represents a significant capital cost saving, which could be used to offset the cost of southern access projects.

To South London and Woking

We are confident from the previous development of the stalled “Airtrack” scheme that there are no major problems with the proposed Waterloo service. However, significant work still has to be done to confirm the practicality of the Woking – Heathrow link, both for the new infrastructure between Heathrow and Chertsey and for possible significant infrastructure enhancements at Woking, although Network Rail do recognise that there are synergies between accommodating a Woking – Heathrow services and solving their SWML capacity issues in the Woking area.

We have carried out an initial analysis of the impact on passenger numbers and mode share of through services to Waterloo via Richmond and Clapham junction, and to Woking. The results of this analysis should be treated with considerable caution, as there are limitations in the data and, given the time and resources available, some methodological issues with the analysis. In particular, it is possible that the impacts on the areas directly served are overstated; however, we have not at this stage evaluated the benefits from a single interchange to a direct train to Heathrow at either Woking or Clapham junction – the latter is likely to be particularly significant in giving direct access from the dense airport catchment south of central London..

Nevertheless, the results indicate significant modal shift, principally from car, and are intuitively reasonable, with rail’s mode share increasing from 19% to 42%:

Our analysis of the Heathrow – Woking option does not take into account the potential strategic benefits of this scheme in grade separation at Woking and relieving both the South

Western Main Line into Waterloo and the Underground lines there, as the Woking – Heathrow services can be extended through to central London by integration with Heathrow Express

Figure 3.24 2035 Surface Access by Mode Airtrack Target (Numbers)

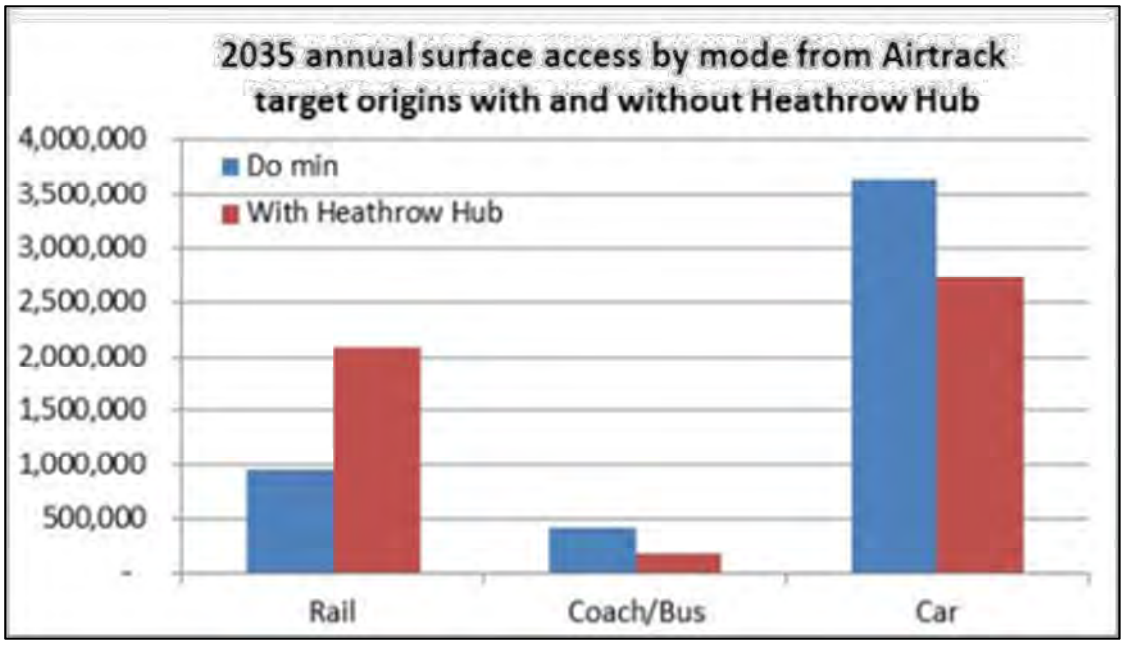
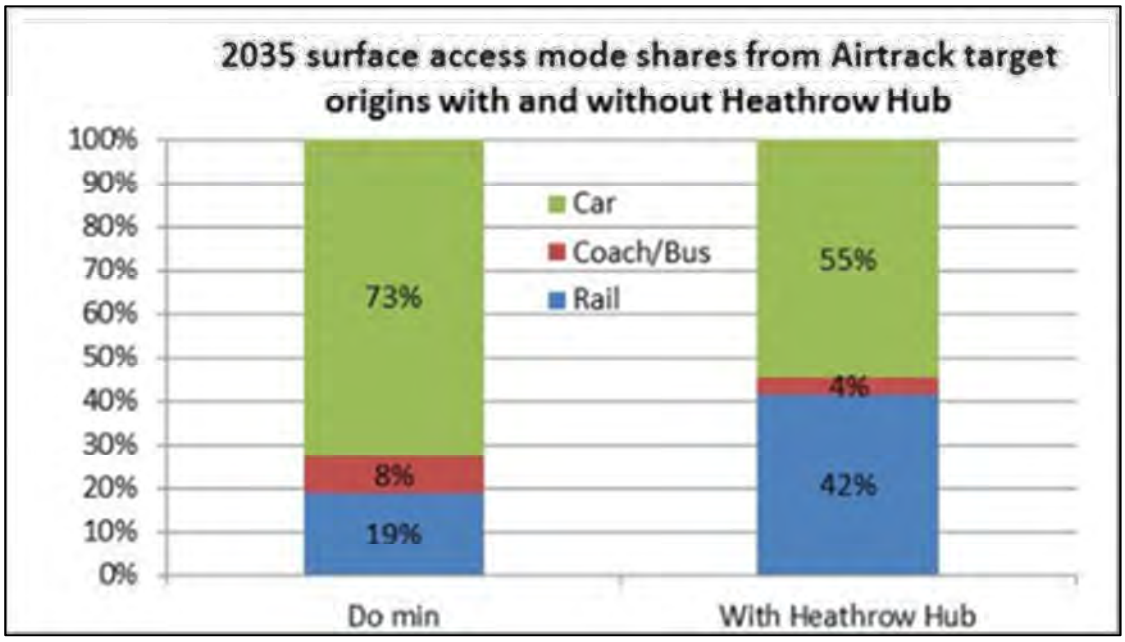


Figure 3.25 2035 Surface Access by Mode Airtrack Target (Share)



Crossrail to West Coast Mainline

Studies are taking place in to the provision of a link between Crossrail and the West Coast Main Line, to allow medium distance services to be diverted away from Euston in to Crossrail. If this is implemented then a further enhancement of connectivity can be delivered, linking

stations such as Watford and Hemel Hempstead to Heathrow by a single interchange at Old Oak Common.

Employee Travel

We recognise the critical importance of good public transport links both to enable potential employees to access Heathrow without having to own or use private cars, but also as a key means of containing congestion in the surrounding road network. The proposed improvements to the rail network, with good rail access from Reading and the Thames Valley, and the proposed rail service from Waterloo via Staines, together with the elimination of premium pricing for Heathrow Express, will significantly improve the availability and attractiveness of public transport for airport employees.

Bus and Coach

Heathrow Hub provides a potential alternative hub for bus and, particularly, for coach services. The time penalty for serving the airport for services operating on both the M4 and M25 is significantly reduced, giving lower journey times, hence higher passenger numbers and revenues, and reduced operating costs. Furthermore, Heathrow Hub provides a single drop off point for all terminals, whereas current coach services either have to call at more than one terminal, or do not directly serve all terminals.

We would also envisage the development of regular coach links to significant centres where we judge there is no possibility of justifying a direct rail link. For example, we would propose a half hourly coach link to High Wycombe, connecting with Chiltern rail services.

Whilst providing less advantages, local bus operation to Heathrow Hub also provides an alternative to serving the Central Terminal Area, and contributes to the development of Heathrow Hub as a railhead for the West of England and South Wales.

3.4.8 *Automated People Mover*

Introduction

This section outlines the airport transit decision making process, pertinent considerations taken into account, and provides evidence to support those decisions.

Decision Process

At this stage of the scheme development, the airport transit decision making process commences with defining the system characteristics and likely future developments, including; station locations, alignment considerations, and system performance requirements, such as capacity and trip time. Once this is established, the most suitable transit type can be ascertained and outline fleet sizing can be undertaken. Finally the broader system requirements of power supply, guideway, train control, maintenance and stations can be developed along with outline costs.

System Characteristics

Station Locations

The proposed station locations are the Hub, T5/6 and T2a and are shown on GA/01. This results in interstation straight-line distances between Hub - T5, and T5 –T2a of 5.3km and 2.6km, respectively. For planning purposes, it is assumed the entire system will be designated landside.

Alignment

Several potential route alignment options have been considered in terms of constructability, environmental impact and operational efficiency. The different alignment options considered both loop and pinched loop track configurations. The loop track configuration, with vehicles travelling in both directions, would have yielded travel times from the Hub to both T5 and T2a of less than 5 minutes. Other measures to minimise journey times included large portions of tunnelled section, allowing direct alignments between stations. The concealed nature of the tunnels would also minimise audio visual impacts of the systems on the immediate environment. However, the relatively high carbon footprint during the construction rendered both the loop track configuration and high proportions of tunnelled section at a distinct disadvantage when compared to the proposed pinched loop track configuration which runs next to the M25 corridor and it elevated for security and flood resilience reasons. Finally, the alignment between T5 and T2a stations is currently proposed as elevated, as opposed to tunnelled, due to; 1) carbon considerations during constructions, 2) geotechnical risks due to dense underground construction currently existing, and 3) ease of passenger circulation from the APM station to the passenger processing areas.

Figure 3.26 - Illustrative Elevated Structure over Taxiways (Gatwick Airport)

Capacity

Estimates for capacity requirements are outlined below for both departure and arrival passengers. While the aggregate numbers of departure and arrival passengers are expected to balance, transit capacity is concerned primarily with satisfying the peak loads to avoid passengers waiting for more than one service.

Departure Demand

Since the system is envisaged to be a landside system, the peak departure demand is expected to come from departing passengers travelling from the Hub to T5/ T2a as outlined in the table below.

Table 3.3 - Development of Estimated Departure Demand

Parameter	Value	Unit
Average rail user demand	1,000	pphpd
Average demand from car parking users	100	pphpd
Average demand from 'kiss and fly'	100	pphpd
Total average hourly demand	1,200	pphpd
Assume peak demand is double the average demand		
Estimated peak hourly demand	2,400	pphpd

Arrival Demand

Peaks in arrival passengers are envisaged to have been largely attenuated through passenger processing at the existing terminals. However, a cross check is provided below.

Table 3.4 - Development of Estimated Arrival Demand

Parameter	Value	Unit
Assume that 15 minute peak demand for at arrivals is typically early morning where up to 10 aircraft can arrive at the same time.	2,350	passenger in 15 mins
Peak hourly rate	9,400	pphpd
Assume attenuation through passenger processing reduces peak demand by 30%	6,580	pphpd
Assume half use APM to travel	3,290	pphpd

Future Capacity Provision

While the exact future capacity requirements are unknown at this stage, experience of other airport systems has shown that ultimate capacity, over the life time of the system (e.g. 50 years), is likely to be significantly greater than initial requirements. Therefore any transit systems will need to be both extendable in terms of length and/or number of stations, as well as expandable in terms of fleet size and capacity.

Trip Time

In order to ensure that the Hub is well utilised, the transit time between the Hub and T5/ T2a is required to be in the region of 5-7 minutes. In addition, since passengers regard waiting time as much more onerous than travel time, the time interval between services is to be kept to a minimum.

Transit Selection

Typical airport conveyance technologies include; moving walkways, buses and automated people movers (APMs). Given the interstation distances and need for journey times to be less

than 7 minutes, moving walkways, buses and cable pulled APMs are not considered further, primarily due to their low speeds.

Suitable conveyance technologies that meet the system performance requirements are self-propelled APMs which are fully automated, driverless vehicles operating on fixed guideways along an exclusive right of way. Self-propelled vehicles or trains use either a rail guideway system with rubber tires on concrete or steel wheels on steel rails. Depending on the supplier, system maximum speeds range between 80 and 100 kph.

While the option of a self-propelled APM system is clear at this stage, the option between technologies (rubber-tired, monorail, steel wheeled) is less clear since the factors affecting the decision making are in early development.

Systems Performance Analysis

To demonstrate that self-propelled APMs can meet the performance requirements, a range of technologies have been assessed using the following parameters.

Table 3.5 APM System Parameters

Parameter	Value
Acceleration	0.981 m/s^2
Mid-station dwell times	25 seconds
Terminal station dwell times	50 seconds
Headway, mins	1.5-3.0
Area per passenger (landside), m^2	0.56m^2
Minimum Headway	90 seconds
Track configuration	Pinched Loop

Utilising data from a range of supplier products and existing systems, the following journey times, capacity ranges fleet sizes have been estimated for preferred alignment option.

Table 3.6 APM Fleet Requirements

		Technology		
		Rubber-Tired APM	Monorail	Steel-Wheeled APM
Journey Times, mins	Hub-T5/6	6-7		4-5
	Hub-T2a	8-9		6-7
Capacity, pphpd	Initial	2,000	3,000	3,000
	Ultimate	13,000	26,000	19,000
Typical Operating Configuration	Initial	12no. – 1 car trains	12no. – 1 car trains	9no. – 1 car trains
	Ultimate	12no. – 6 car trains	12no. – 8 car trains	9no. – 6 car trains
Fleet Size (including hot standby and spares), cars.	Initial	15	15	11
	Ultimate	90	120	70

While all these technologies are potentially suitable to meet the system performance requirements of the likely initial and ultimate demands, the final choice will be a function of several factors including, but not limited to; scope of any future system expansion, potential to link in with existing systems, and requirements for passenger separation. While the length of APM system proposed is not typical (approximately 90% of the 40 plus airport APM systems globally are less than 6km in length), it is certainly not unique, ranking similar to the following systems.

- AirTrain Newark, Newark Liberty International Airport
- OrlyVal, Paris Orly Airport
- Skylink, Dallas/Fort Worth International Airport
- AirTrain JFK, New York–John F. Kennedy International Airport
- Airport Express Train, Beijing Capital International Airport

Figure 3.27 Illustrative APM (Phoenix)

3.5 Summary of Master Planning Work against Assessment Modules

The following table summarises how the master planning work has been carried out to contribute to the objectives set out in the Commission's Appraisal Framework.

Table 3.7 Summary of Master Plan Approach

Phase 2 Assessment Module	Phase 2 Objective	The master plan has been developed to:	Assessment Details
Strategic Fit	To provide additional capacity that facilitates connectivity in line with the assessment of need.	• Build upon the existing services and location of Heathrow to provide connectivity using both the hub model of aviation services or alternative aviation business models • Create a solution of sufficient size to accommodate the forecast demand. • Create a solution that allows phasing of development in line with need.	See Chapter 2
	To improve the experience of passengers and other users of aviation.	• Improve the surface access options to allow choice and the potential for an improved journey to and from the airport. • Include within the scheme of the space for modern built facilities compatible with good levels of service consistent with emerging best practice.	See outline in Chapter 3.
	To maximise benefits in line with relevant long-term strategies for economic and spatial development	• Build upon the existing services and location of Heathrow to provide connectivity using both the hub model of aviation services or alternative aviation business models	See also Chapter 2
Local Economy	To produce positive outcomes for local communities and the local economy from any surface access that may be required to support the proposal.	• Create realistic public transport alternatives to reduce reliance on the highway network • Disperse demand on the highway network to limit impact on any one section.	See also Chapter 2
Noise	To minimise and where possible reduce noise impacts.	• Limit to areas of over-flying to existing • Create opportunities to use different modes of operation to reduce impact on particular communities	See Chapter 5
Air Quality	To improve air quality consistent with EU standards and local planning policy requirements.	• Locate areas of major sources of emissions away from sensitive receptors (for example the location of the start of take-off roll on the extended runway). • Create realistic opportunities for non-road based surface access modes.	See Chapter 5

Phase 2 Assessment Module	Phase 2 Objective	The master plan has been developed to:	Assessment Details
Biodiversity	To protect and maintain natural habitats and bio-diversity	• Limit the overall size and scale of the development.	See Chapter 5
Carbon	To minimise carbon emissions in airport construction and operation	• Limit the overall size and scale of the development. • Use best practice within the detailed design process. • Create an efficient layout.	See Chapter 5
Place	To minimise impacts on existing landscape character and heritage assets.	• Limit the overall size and scale of the development. • Develop in lightly developed or significant areas.	See Chapter 5
Quality of Life	To maintain and where possible improve the quality of life for local residents and the wider population.	• Limit the overall size and scale of the development. • Develop in lightly populated areas. • Include within the scheme items that generate wider benefits such as improvements to public transport and reductions in congestion on the highway network	See Chapter 2 and 5
Community	To manage and reduce the effects of housing loss on local communities.	• Limit the overall size and scale of the development. • Develop in lightly populated areas.	See Chapter 2 and 5
Operational Risk	To enhance individual and airports system resilience.	• Additional capacity increases resilience.	See Chapter 3
Operational Efficiency	To ensure individual and airports system efficiency.	• Layout based on current good practice and is of a size and configuration that promotes flexibility, safety and security.	See Chapter 3
	To build flexibility into scheme designs		
	To meet present industry safety and security standards.		

Phase 2 Assessment Module	Phase 2 Objective	The master plan has been developed to:	Assessment Details
	To maintain and where possible enhance current safety performance with a view to future changes and potential improvements in standards.		

4 ENGINEERING PLANS

4.1 Introduction

This section sets out outline responses to the detailed matters contained within this section of the Appraisal Framework.

4.2 Energy and Utilities

All the development is proposed in an existing serviced area. There will be some reduction in demand owing to the displacement of other facilities and necessary modifications to the network to protect the aviation surfaces will provide opportunities to provide new connections for both demand and resilience reasons.

An energy centre (combined heat and power) may be an appropriate approach for the Terminal area.

We would expect the very detailed questions posed concerning the existing operations to have similar answers to those prepared by Heathrow Airport Limited (HAL), who are in the best position to answer as they have the details of the existing demands and capacities of the existing systems.

For the APM initial estimates of total energy consumption to meet the initial passengers per direction per hour is based on the total number of cars carrying passengers and the total number of hours of operation is estimated to be in the region of 50-70MWh per day. To ensure sufficient redundancy, a number of design practices would be utilised, including dual grid feeds, installation of uninterruptable power supply and potentially generator back up.

4.3 Geo-Environmental

High level geo-environmental appraisal of the site is being undertaken. To date no items have been found which lead to the need for abnormal construction techniques in the context of a very large project to the south west of London. More detail is expected .in due course.

The demands of the airfield geometry are such that in general the levels are significantly higher than existing. Flooding of the airfield is unlikely. The design will include measures to contain run-off safely within the airfield embankment and discharge to existing watercourse at flow rates that reduce the risk of downstream flooding. Appropriate treatment and disposal of polluted run-off will be incorporated within the scheme.

4.4 Surface Development

4.4.1 *Airport Development*

The general arrangement of the scheme is shown on drawings GA/01 and GA/11-18 inclusive. Other supporting drawings are included in Attachment 4-1. The scheme is necessarily at a master planning level of detail and is described in the Chapter on Master Planning.

The drawings have been developed to identify the area of the scheme and give an indication of demolitions and site clearance.

The size of the sites has been informed by the need to conform to relevant standards such as the emerging requirements of the European Aviation Safety Agency (EASA), CAP 168 and the Design Manual for Roads and Bridges (DMRB). The APM is designed to American Society of

Civil Engineers (ASCE) Standard 21 (Automated People Mover Standards). Indications of what is provided is shown on the drawings and allowance included in the cost.

The proposed facilities are intended to be built in large part remotely from the facilities that they replace or augment to limit the need for abnormal buildability issues. We would propose that bulk materials are brought by rail using the existing Colnbrook freight line and stockpiled on the proposed development site. We understand that conditional freight paths are available on the Great Western Relief Lines for the necessary additional services. This sort of approach was used for both the construction of T5 at Heathrow and the second runway at Manchester Airport.

The approach of building most of the new facilities off-line or remote from the existing facilities will also limit the impacts on existing airport operations. The key areas of challenge are the creation of a new road network around T5 whilst maintaining operations and extending the runway.

4.4.2 *Heathrow Hub Station*

The station layout has been designed to a level at which Network Rail are satisfied that the layout can cater for all necessary rail operations including freight. The track layout is shown on PBA drawing 30021/002/SK011 Rev C and the station and track work modification fit within the existing constraints of the M25 and West Drayton High Street.

The station comprises four platforms located between West Drayton and Iver on the Great Western Mainline (GWML). They will offer 8 platform faces 260m long, four each on the Main and Relief Lines. The existing freight line capability is also retained.

The Main line platforms will be on separate Up and Down loops and also allow for through running of trains at 125mph on the existing alignment and separated from the new platforms. The turnout speeds onto the loops will be designed to 90mph to allow stopping trains to decelerate and accelerate predominantly off the main through lines.

The design of the station enables the new relief line platforms to be built without impacting on the current GWML and once they have been built services would be transferred onto the new alignment whilst modification were being made to the existing relief lines. It should be noted that the GW Mainline tracks are unaffected by these proposals apart from tie ins to the new tracks, which minimises disruption to services during construction

Accommodation works will be needed to: widening of the existing River Colne bridge, culvert the Colne Brook beneath the proposed platforms, provide access to the Iver Water Treatment Works and Utility diversions.

Figure 4.1 Heathrow Hub Station Track Layout

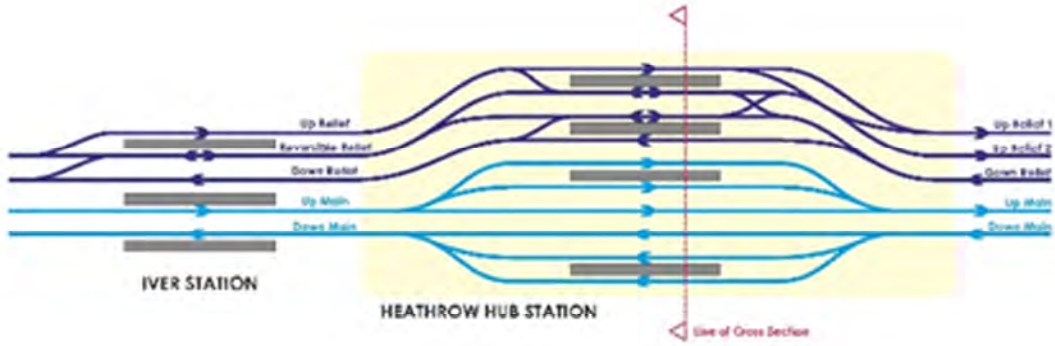
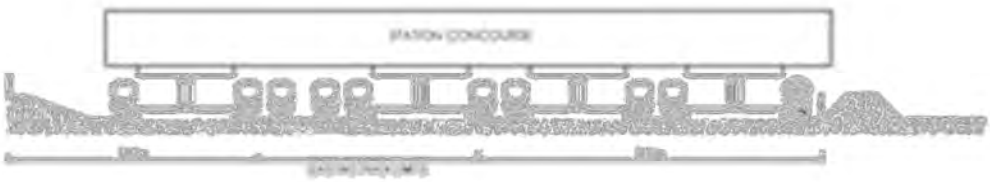


Figure 4.2 Heathrow Hub Station Cross Section



5 MITIGATION STRATEGIES

5.1 Overview

In developing the scheme, the impacts have been limited and mitigated in a number of ways.

In outline, these are:

1. Development of the master plan to limit adverse impacts of the physical configuration of the scheme,
2. Identification of ways of operating the airport which could limit the adverse effects,
3. Provision within the master plan of specific features both to limit adverse impacts and to allow the modes of operation chosen, and
4. Where there are remaining impacts, they have been examined at a level of detail commensurate with the scheme development and approaches to mitigation and compensation indicated.

Examples of the first include the fundamental feature of the scheme which is to use the relatively lightly populated areas along the runway extended centreline for the expansion.

For the second, examples include 'deep' landings on the extended potion of the runway increase the height of aircraft along the approach and consequently reduce noise impacts. The use of fewer than the theoretical maximum number of slots also allows some respite and provides resilience in the schedule.

For the third, examples included provision of an additional gateway to the airport to address the fundamental question of surface access and additional bores have been provided on the M25 tunnel to reduce the impact on road traffic in the event of a tunnel closure.

This Chapter concentrates on the fourth area and provides at Section 5.2 a discussion of the approach to mitigation of the surface access issues; between Sections 5.3 and 5.5 environmental issues and between 5.6 and 5.8 community issues. In cases where the mitigation is primarily provided by the master planning and operational modes considered, cross reference is made to the relevant part of Chapter 3.or 4.

5.2 Surface Access

5.2.1 *General and Public Transport*

The surface access systems around Heathrow Airport are busy at peak periods. The whole approach to the development of the master plan is to provide alternatives and dispersion of surface access traffic to limit the impacts of airport growth on any one element.

The alternatives include improved connectivity to the major rail routes and off-campus gateway to the airport and these are covered in Chapter 3 of this report.

Key factors in the approach are

1. To avoid over-concentration of traffic on congested sections of the road and rail networks and to provide opportunities for dispersal – spreading high volume flows over a range of routes through the provision of enhanced existing and new fast, convenient and reliable public transport links;

2. Provision of Heathrow Hub - a new gateway site which:
    a. aims to limit road traffic on the most sensitive parts of the highway network and distribute airport traffic around the network.

b. provides connection to a wide-range of mainline rail services.
c. takes advantage of the co-location of these elements of the surface access system to provide a high-quality fast link to the major airport terminals.

3. To use the committed rail enhancements to provide capacity on the principal rail corridors. We will work with partner agencies to implement cost-effective increments;

4. To develop schemes for additional capacity and new journey opportunities by rail and bus for air passenger and employee trips; and

5. To consider both for the needs of growing numbers of airport users and other, non-airport, travellers.

Initial discussions with the Highways Agency and Network Rail suggest that the principles of our approach and the practicalities of delivering the strategy, as described, are sound at a strategic level. Journey time, reliability and interchange are key factor is determining public transport mode share. Over the next 20 years the road network will become more and more congested with journey times becoming less reliable.

We have not at this stage been able to model the overall impact on mode share if all our proposed options are implemented. However, we note that Heathrow Airport Ltd (HAL) forecast a public transport mode share of more than 50% in their response to the Commission of 17th July 2013. Given that we propose significantly more effective public transport interventions than HAL, we would expect that we would achieve a higher public transport mode share than HAL's proposals, particularly as HAL assumed the construction of the HS2 spur to Heathrow in 2032, which now looks highly uncertain.

We have also undertaken a very preliminary assessment of the impact of a £5 cordon charge for access to the airport by car and this indicates a further modal shift to Public Transport in the order of 5%.

We set out below how our strategy satisfies the Airports Commission objectives for Surface Access.

Objective 1: *To maximise the number of passengers and workforce accessing the airport via sustainable modes of transport.*

- Our strategy delivers a direct or same station single interchange rail journey to the vast majority of airport passengers in the UK as shown below.
- Connecting the GWML services and the Waterloo/Richmond/ Staines lines to the airport will be a major benefit for the airport workforce.
- Public transport mode share in the GW corridor (the largest catchment outside London) will increase to nearly 60%.
- Rail journey times are transformed compared with any of today's rail or coach times as set out in the examples below

Figure 5.1 Rail Journey Comparisons

Rail Journey Time Comparisons

From	Current mins	RIL with Heathrow Hub mins
Leeds	205	110
Birmingham	155	79
Crewe	170	85
Manchester	200	103
Ipswich	166	125
Reading	65	16
Oxford	95	41
Swindon	92	46
Bristol	133	87
Cardiff	163	110
Plymouth	259	190

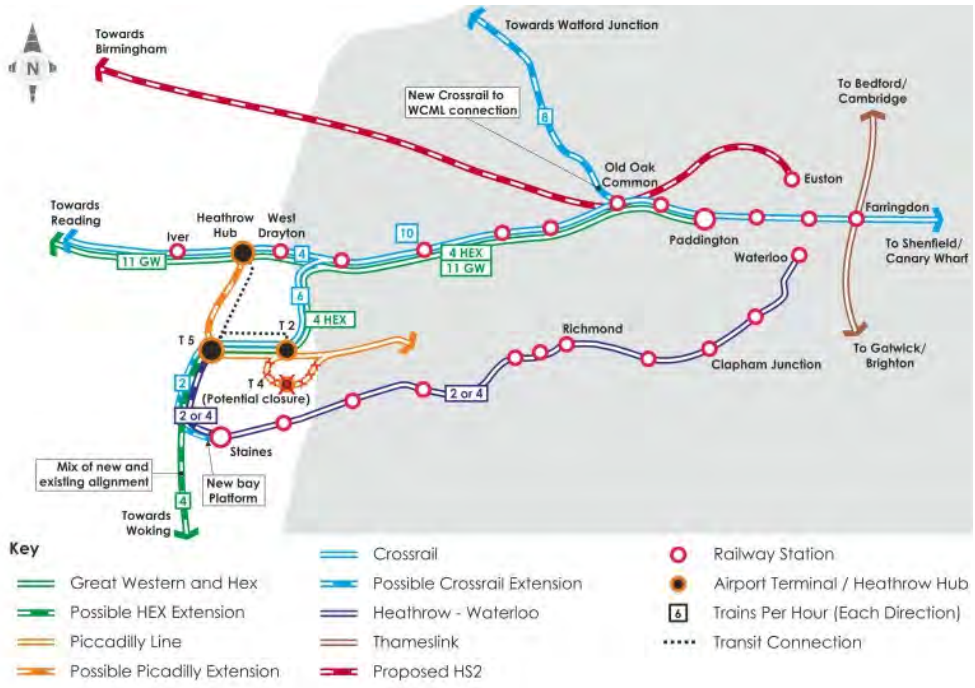
note: 20 minutes interchange penalty(interchange + wait time) assumed where interchange required

Objective 2: To accommodate the needs of other users of transport networks, such as commuters, intercity travellers and freight

- Our dispersion strategy means that rail access to London is spread across 4 different corridors (Heathrow – Paddington / Crossrail (10tph), Piccadilly line, Heathrow via Staines to Waterloo (2tph min) and Heathrow Hub (GWML) - Crossrail (15tph), compared with only 6tph today between Heathrow and Paddington. As a result: our strategy provides high levels of resilience & flexibility; minimises the impact of airport demand on the commuter and inter-city networks and indeed we expect no further loading on the Piccadilly line.

- Network Rail have confirmed that our Heathrow Hub layout is more than adequate for accommodating any freight aspirations on the GWML and we also retain the Colnbrook freight branch.

Figure 5.2 Accommodation of Other Rail Traffic

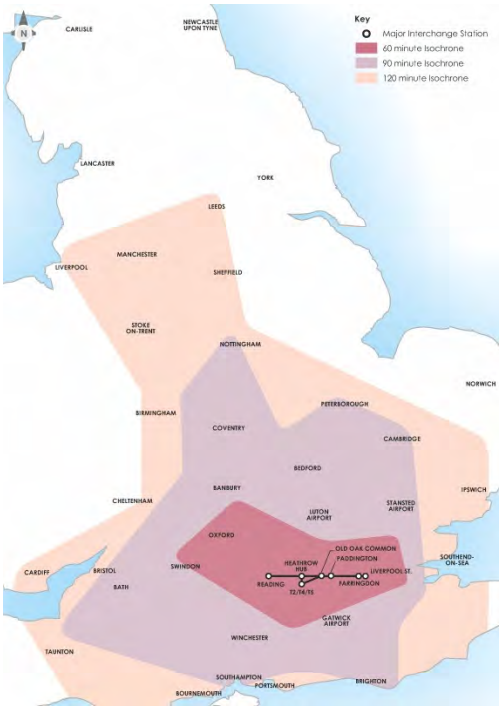


Objective 3: To enable access to the airport from a wide catchment area

- Connecting to the countries key mainline rail routes (GWML, WCML, HS2, MML, ECML, GEML, WAML, SWML) either directly or with a single same station connection at either Old Oak Common, Farringdon, Clapham Junction or Liverpool Street, will bring an unprecedented 95% of the airports passengers within 120 minutes of the airport by rail. No other airport in the UK can or could achieve such geographic connectivity or deliver a greater public transport mode share. The current and future rail catchment isochrones are shown below.

Figure 5.3 Current Rail Isochrones

Figure 5.4 HH/RIL Surface Access Strategy: Rail Catchment Isochrones



5.2.2 *Highways*

Initial, high level analysis of the highway network indicates that the approach has the sorts of benefits envisaged.

The more detailed analysis depends upon the approach adopted by the Airports Commission and we look forward to working with the Commission on this important aspect of the impact of the scheme. We note that the surface access system has impacts in itself and these can be quantified as the assumed traffic levels on the network are established by the Commission.

5.3 Introduction to Environmental Mitigation

This section of the report focuses on the potential impacts on the environment as a result of the proposed scheme and the mitigation strategies which have been developed to address them. The following sections focus on the mitigation strategies put forward as part of the proposed scheme.

A number of measures have already been taken to limit or avoid impacts, through development of the concept design in the first instance or through the refinement of operations within the airport. However for the remaining impacts, mitigation, compensation or enhancement proposals have been developed based on the level of detail commensurate with the scheme development.

The central case for the proposed scheme is formed of three elements: the extended airfield including the proposed runway extension, taxiways, apron and ancillary buildings; highways alterations essential to the scheme including diversion and bridging of a section of the M25 and relocation of associated roads; and the Heathrow Hub site which encompasses the automated people mover (APM), rail station, car parking facilities and hotels.

Consideration of alternative options to this development has been given although this has been examined at a higher level and on a qualitative basis only. For full details of the scheme proposal and alternatives please refer to Chapter 3.

5.4 Environmental Assessment

A high level environmental assessment has been undertaken to inform the proposed mitigation strategies. Based on the information available, the assessment considers the existing baseline and constraints, relevant national, regional and local policies, Appraisal Framework requirements, identifies the potential impacts and likely effects of the proposed development and puts forward measures to mitigate these impacts and reduce their effects. Full details and assessment findings for each environmental topic can be found in **Attachment 5-1**. A summary of the proposed mitigation measures is set out below.

5.5 Mitigation Measures

5.5.1 *Noise*

Aircraft noise has reduced over the last decade around Heathrow. Noise and the perception of noise can lead to complaints arising from disturbance. Whilst noise disturbance can be a very subjective issue, there are a series of ways in which noise can be measured and levels which act as standards from which to take remedial action or apply mitigation measures.

A reduction in noise has been achieved through the introduction of quieter aircraft, operating restrictions, controlled night-time flights, and a balanced approach to noise management. Over time, this has led to a reduction in the noise contour areas while air traffic movements increase. The most widely recognised is the 57dB$_{LAeq}$ contour which identifies the level above which disturbance is more likely to be experienced. Noise disturbance is also particularly acute during the early morning hours - i.e. before 7am – when sleep is more likely to be interrupted. This downward trend in noise levels is expected to continue through the introduction of requirements for all new aircraft (known as Chapter 14 aircraft) to be 7dB quieter than current

standards by 2020. With an operational date of 2023, it has been assumed in the noise modelling that up to 40% Chapter 14 aircraft will be using Heathrow Airport.

There are three broad ways in which the proposed scheme can improve the aviation noise climate:

1. Location and siting of the proposed new runway
2. Operational modifications, and
3. Technological advances.

Location and Siting

The proposed scheme presents a number of inherent opportunities to minimise the noise effects associated with additional runway capacity. These include the following:

- Maintaining the similar flight paths as currently flown
- Enabling deeper landings in the early morning;
- Enabling deep take-offs in the late evening,and
- Runway alternation throughout the day.

Flight Paths

By extending the existing runway the current approach flight paths remain unchanged, which would not be the case with a third runway solution at Heathrow. This means that no new areas of population over central and the densely populated west London will be affected as a result of new approach paths.

Figures 5.1 and 5.2 show the existing and future flight paths respectively and illustrate how the flight paths remain relatively unchanged.

Figure 5.5 Existing Flight Paths

Figure 5.6 Future Flight Paths

Early Morning Improvements

The longer runway will enable deeper landings, particularly in the early morning, which will result in a decrease in the population exposed to noise that may cause sleep disturbance by shifting noise contours westwards. Furthermore, early morning arrivals can begin later than they currently do. With an increase in capacity during the daytime which will further reduce the number of aircraft seeking early morning slots operations can therefore begin at 0600, instead of the current 0430, without affecting the number of arriving aircraft. The introduction of a second in-line runway to the west also has the associated benefit of moving the noise associated with aircraft take-off at night to the centre of the airfield and away from the existing eastern boundary.

Runway Alternation

The location and siting of the proposed runway extension also allows for a unique series of operations. A number of operational runway scenarios have been developed, making best use of the three runways to provide additional respite during the day. This runway alternation throughout the day will provide significant respite over areas of west London.

These are set out in **Table 5.1** below and have been used for the purposes of this assessment.

Table 5.1 Runway Scenarios for Westerly Operations

Scenario	Time of operation	Runway(s) used	Number of ATMs*
Early respite	0600 – 0630	Northern (extended) – landing only	30 ATMs/hour
Peak flow	0630 – 1200 1600 – 1900	Southern runway – mixed mode Northern (existing) – landing only Northern (extended) – take-off only	130 ATM/hour 1105 ATMs total
Northern relief	1900 – 2300	Southern runway – mixed mode Northern (extended) – mixed mode Northern (existing) – no operations	100 ATMs/hour 400 ATMs total
Southern relief	1200 – 1600	Southern runway – take-off (only if required) Northern (existing) – landing only Northern (extended) – take-off only	90 ATMs/hour 360 ATMs total
Late night	2300 – 2330	Northern (extended) – take-off only	30 ATMs/hour

* ATMs – Air Traffic Movements

Given current operational procedures, longer peak periods of operation are likely to be required to meet the projected Heathrow capacity. This will result in the shortening of the southern and northern relief periods to accommodate the need for increased capacity. However, respite can be provided to communities affected by aircraft approach noise through the implementation of different Standard Terminal Arrival Routes (STAR). In the event that increased technology allows NATS to update procedures, the increased capacity may be delivered in the time periods specified in Table 5.1.

Operational Modifications

Noise contours have been predicted that show the $L_{Aeq,T}$ noise contours for each of the following periods of aircraft activity:

- Early morning period (06:00 to 06:30) – the early morning period has aircraft approaches onto the extended runway only. No approaches affect the population on the approach flight path to the 27L runway. The population underneath the extended runway approach path benefit from no aircraft before 06:00 and a shifting of the runway threshold to the west so aircraft are higher when they pass overhead and thus quieter.
- Peak morning period (06:30 to 12:00) – the peak morning period shows the majority of aircraft departure activity to the west and aircraft approach activity from the east. Aviation noise levels will temporarily increase during this period.
- Southern relief period (12:00 to 16:00) – the southern relief period shows a relaxation of aircraft movements on the south runway, which is used only when necessary. The majority of departures take place on the extended runway and approaches take place on the 27R runway. The noise contours for this period show that areas usually affected by aircraft movements associated with the 09R/27L runway experience a significant reduction in noise.

- Peak afternoon period (16:00 to 19:00) – noise contours for the peak afternoon period are similar to the early morning peak period.
- Northern relief period (19:00 to 23:00) – noise contours during the northern relief period show a reduction in the approach and departure contours for the 09L/27R runway and the extended runway. The majority of aircraft utilise the southern runway but, due to the capacity of a single runway operating mixed mode being lower than that of the two northern runways, the reduction in noise during the northern relief period is not as pronounced as during the southern relief period.
- Late night period (23:00 to 23:30) – the late night departure period shows aircraft departing on the extended runway. The departure flight path bisects Slough and Windsor with lateral aircraft noise propagating over parts of each settlement. This could be mitigated by using the existing runways to shift the noise contours to the east and alternating the runways to provide respite.

In addition to alternating use of runways, a number of mitigation measures are built in to the scheme to provide additional respite including:

- Changes to STARs to introduce curved, offset and angled approaches;
- Support for multiple Standard Instrument Departures (SIDs), as currently being trialled by NATS and Heathrow airport;
- Steeper approaches and take-offs;
- Operations management and airport policies.

All noise contours can be found in Chapter 1: Noise at Attachment 5-1.

Changes to STARs

In addition to the alteration provided by the three runways, a series of alternative STARS is proposed. STARs are defined flight routes set by NATS and provide an arrival route as an aircraft approaches the final approach for landing. While the final approach at 3 nautical miles (NM) from each runway remains unchanged each STAR, whether angled, curved or offset, provides a defined descent path up to the 3 NM final approach. These are used for set periods during the day to provide noise respite over different areas across the path of descent towards the airport.

Curved, offset and angled approach paths are all illustrated in Section 3.5. Figures 5.3 to 5.6 below illustrate angled approaches that can used to provide respite in westerly operations. For each runway, there are two approach paths, a northern and a southern one. A period of respite could be provided by, for example, using the northern approaches for a fixed period.

This concept is similar to Heathrow's current trial of new departure routes in which, for example, two departure routes are defined on the 27R in westerly operations. The departure routes are rotated on a weekly basis to provide respite. Modern aircraft have the capability to support this and other navigation options.

Figure 5.7 Curved Approach Flight Paths

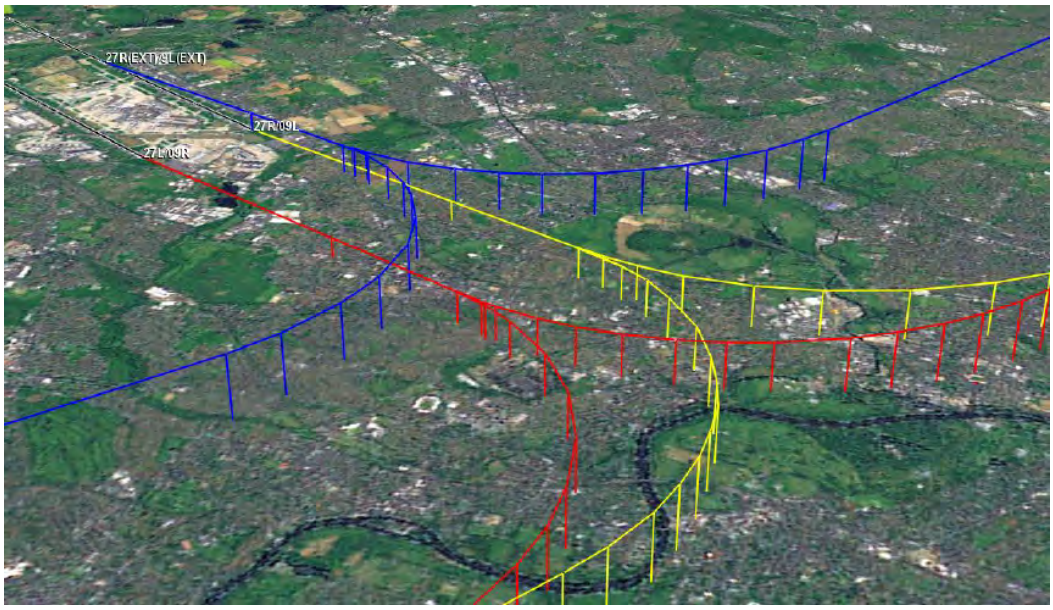


Figure 5.8 Angled Approach Flight Paths

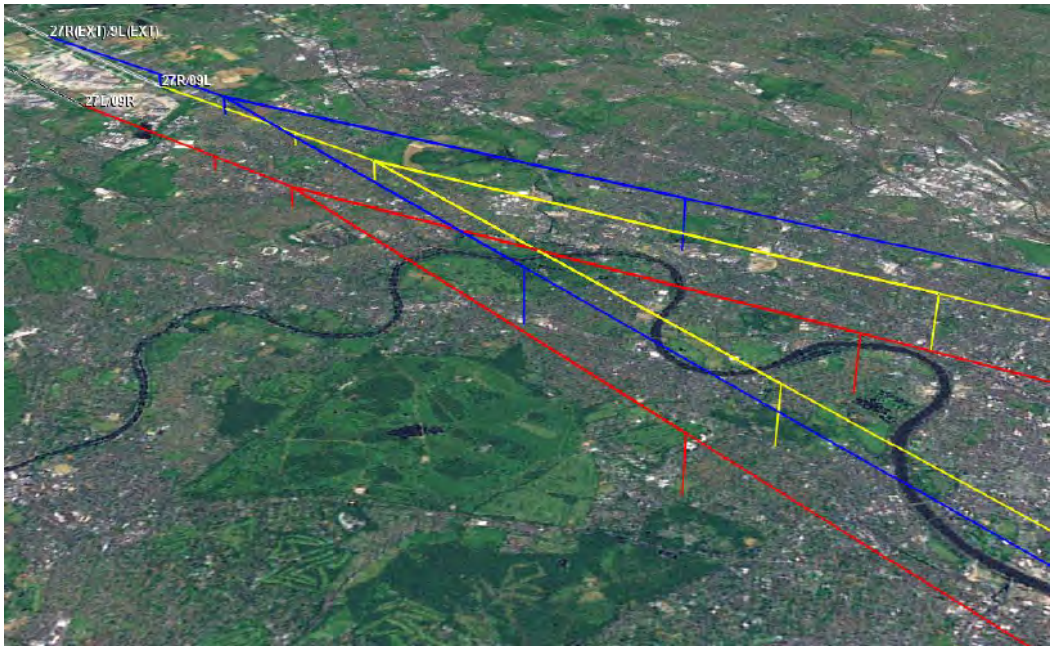


Figure 5.9 Offset Approach Flight Paths

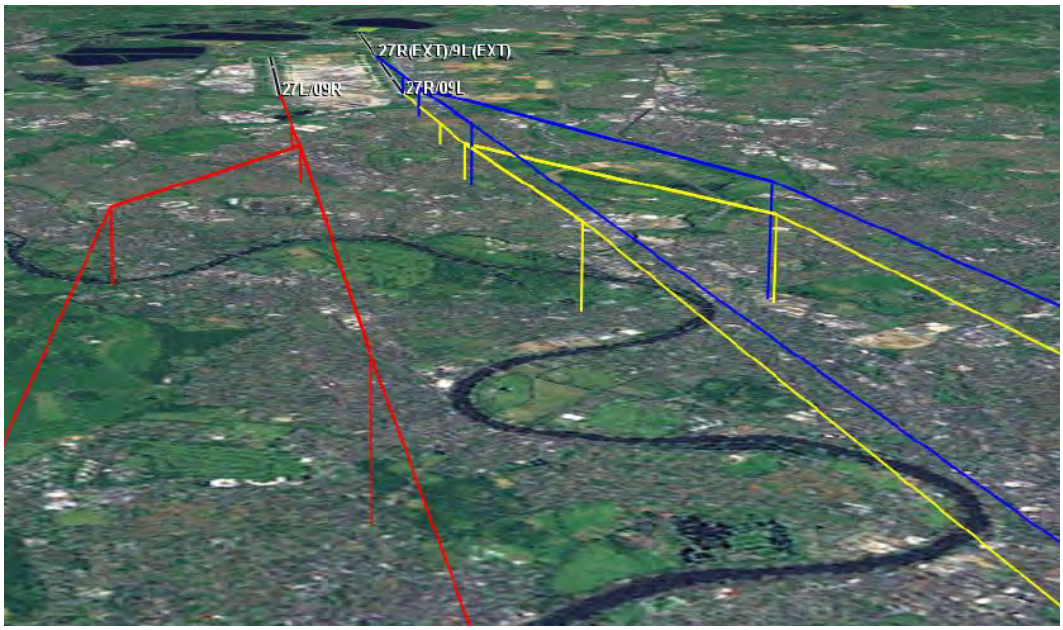
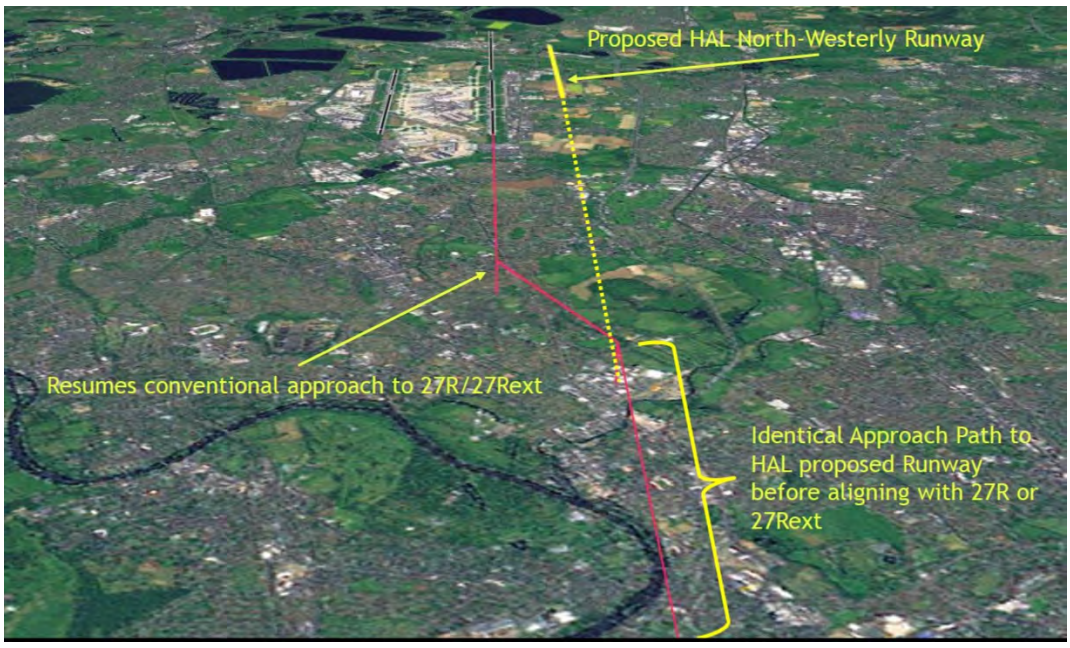


Figure 5.10 Offset Approach Flight Paths



Examples of STARs Options

The following curved angled, and offset STAR options have been modelled to show how respite from noise can be provided through airspace operational changes.

- Southern relief period – curved approach from the north

- Southern relief period – angled approach from the north
- Southern relief period – offset approach from the north
- Northern relief period – curved approach from the north to the extended runway and curved approach from the south to the southern runway
- Northern relief period – angled approach from the north to the extended runway and angled approach from the south to the southern runway
- Early morning period – curved approaches from the north, and
- Early morning period – angled approaches from the north.

In addition to the scenarios modelled, approaches can be switched from north to south and vice-versa to allow further respite options.

The noise contour plots indicate that respite from noise due to aircraft approaches can be obtained through alternation of approach paths.

The effects of respite on the daytime $L_{Aeq,16h}$ and L_{DEN} predicted noise contours may be particularly beneficial to the scheme as extensions to these contours that have been identified along approach paths are likely to be less pronounced. The resultant noise contours are more likely to look like a swelling of the baseline contours rather than distinct protrusions as seen in noise predictions.

These respite measures have a number of beneficial secondary effects on ecological and heritage receptors and provide additional resilience within the airport's operations.

Steeper Approaches and Take-Offs

Future changes to airspace operations could also include an increase in the approach height from 2,000ft to 7,000ft and increasing the rate of descent. By staying higher for longer and then descending more steeply, the approach noise contours could be further reduced. In addition, a steeper initial climb-out following take-off, will increase aircraft height over populated areas and adjusted flight paths can avoid populated areas during westerly operations. Aircraft noise will therefore be increased within the airport boundary only and reduce the overall area and extent of the noise footprint. The benefits of this also apply to ecological and heritage receptors as well as contribute towards reducing the impacts on

Approach noise can be reduced by the better use of speed brakes located on top of the wing to reduce speed rather than the lowering of landing gear, while the aircraft is descending in the terminal area. The major manufacturers of aircraft operating into LHR, namely Boeing and Airbus are aware of the opportunity to change operating procedures to reduce approach noise. It can be expected that their changes in conjunction with those by the airlines will be introduced before the new runway is opened. The result will be the later deployment of undercarriages which are frequently used as a drag increase/speed reduction technique and generate additional ground noise in the process. Instead, the above wing speed brakes or spoilers will be used more commonly. The reduction in noise levels to residents under the approach flight paths will be reduced by the equivalent of a generation worth of technical advance in residual aircraft noise. This equates to at least a 25% drop in noise for some parts of the intermediate approach particularly in the approach path between 12 and 6 miles from touch down.

Operations Management and Airport Policies

While policy for aircraft noise is set by the Department for Transport (DfT), Heathrow Airport Ltd is responsible for managing and mitigating the effects of aircraft noise. Heathrow has an established track record of noise management which ranges from voluntary agreements with airlines to offering lower landing charges for the quietest aircraft. Heathrow is currently

undergoing a planned development which will change operations around a number of its terminals. Whilst these developments may result in changes in the ground noise environment, it is the noise once aircraft are in flight that has the greatest impact and is of most concern to affected residents, schools and other noise sensitive land uses.

Heathrow Airport currently adopts a balanced approach to noise management whereby the following four principles are applied:

- reduction at source (the UK's aviation industry has pledged a 50% reduction in perceived noise levels by 2020 compared to 2000);
- land-use planning and management - local planning authorities have a responsibility to ensure noise is considered in local plan policies which may impact upon airports – including safeguarding and use of public safety zones – pertinent since NPPF publication;
- noise abatement operational procedures - optimising how aircraft are flown and the routes they follow to limit the noise impacts; and
- operating restrictions - preventing certain (noisier) types of aircraft from flying either at all or at certain times

This balanced approach can be applied to the proposed development as discussed below.

European and UK legislation prohibits certain aircraft from operating at Heathrow Airport. It is likely that in the future, other aircraft which currently meet relevant International Civil Aviation Organisation (ICAO) standards will be prohibited, thereby further reducing future noise levels irrespective of local controls. Heathrow Airport has already committed to having no marginally compliant Chapter 3 'high' aircraft by 2015.

Heathrow Airport has a number of noise-related controls introduced by local planning authorities mainly relating to ground operations as well as a number of current operational abatement procedures which provide appreciable mitigation for local communities:

- Adherence of departure noise abatement procedures and ensuring that airport departure tracks remain with published noise preferential routes;
- Continuation of the DfT's night noise policy (night noise Quota Count) to limit the impact of noise at night;
- Fining airlines which breach Government set departure noise limits; and
- Use of respite and bias of runway usage and cessation of the Cranford agreement once appropriate ground infrastructure has been completed.

It is assumed that all of the above are high level controls that will be maintained during expanded operations.

Technological Advances

As mentioned above, improvements in aircraft technology will be required to comply with ICAO standards due to be introduced by 2020 for all new aircraft. Such improvements will lead to significant reductions in noise over time, as the proportion of new, quieter aircraft increases and this will continue the longer-term downward trend in noise footprint despite the increase in air traffic movements.

It is likely in the future that navigational technology will enable departing aircraft to adhere much better to the centre of the departure track swathe and more likely will help to navigate aircraft on the exact SID track. Whilst this concentrates noise, it does mean that the resulting contours will be more defined and of a smaller area.

Whilst navigation accuracy is improving, the options for defining multiple approach and departure paths are increasing.

The navigation systems that provide precision approach may also support curved/offset and angular approach paths. This is the case for the Ground Based (GNSS) Augmentation System (GBAS) that is defined by ICAO as the future precision approach navigation system.

5.5.2 *Water Resources and Flood Risk*

The proposed scheme will impact on water resources in a number of ways: through the diversion of watercourses, loss of floodplain, changes in flood risk due to surface and groundwater and the potential to lead to water pollution and an increased demand on water supply.

In consultation with the Environment Agency, the mitigation put forward as part of this scheme is calculated on the available information at concept design. All culverts will be designed to accommodate a 1.0% annual event probability (1 in 100 year) plus an appropriate allowance for climate change flood event and will be designed to Environment Agency design criteria and advice including avoiding bends, use of single openings and trash screens where possible and minimising water level changes between entrances and exits. Suitable allowance will be made for inspection and maintenance.

Flood plain loss is expected to occur over three zones: areas that relate to the Colne Brook and Poyle Channel; areas on the River Colne and Wraysbury River at the airfield; and areas on the River Colne and Wraysbury River relating to the M25 link road. To mitigate for these losses, the following have been included within the scheme design – all provide compensation at the standard of the 1% annual event probability (1 in 100 year) flood with allowance for climate change:

- Provision for approximately 22,000m³ of storage over an area of 113,000m² in the design to compensate for around the Colne Brook and Poyle Channel area;
- A storage volume of 55,000m³ is required to compensate for losses around the River Colne and the Wraysbury River over an area of approximately 184,000m²; and
- An estimated 23,000m³ of flood storage over an area of 40,257m² due to the impact of the realignment of the M25 link road on the River Colne and the Wraysbury River catchment to the south of the proposed development.

Standard and well-established measures to reduce the impacts on groundwater quality and quantity will be included at detailed design stage including Sustainable Urban Drainage Systems (SuDS), appropriate location and design of underground structures, maintenance and monitoring.

The site has an area of approximately 400ha and, as exists, is predominantly greenfield in nature. The proposed development will increase the percentage impermeable area within the site to approximately 80%. Calculations to establish the increase in run-off volume have therefore been based on a 400ha greenfield site being covered by approximately 80% with impervious surfaces, leaving 80ha of green space. A total long-term storage volume of 68,500m³ is required for long term surface water based on these figures. Rainwater harvesting devices may be used to intercept approximately 9,000m³ of rainfall from the roofs of proposed buildings to be reused within the airport buildings by supplying toilet cisterns and irrigation systems and therefore reducing potable water demand. The remaining 57,500m^3 attenuation storage volume will be incorporated within the airport using SuDS.

The quality of surface runoff from the airport will vary significantly, as runoff from roofs will generally be uncontaminated, runoff from paved areas has potential to contain hydrocarbons

and runoff from runways has potential to contain de-icer and anti-icer contamination. To mitigate for any potential water pollution through surface runoff, the following are proposed:

- Surface runoff from roofs of new buildings to be intercepted and directed to rainwater harvesting systems to reduce potable water demand and prevent this additional runoff from being directed to the receiving watercourses;
- Runoff from paved areas to receive at least two levels of treatment and that runoff containing de-icer and anti-icer contamination is contained and prevented from being directed into the receiving watercourses or groundwater;
- Surface water from adopted highways to be intercepted by source control features, such as filter drains, which will provide a primary level of treatment. The runoff to then undergo secondary treatment using retention ponds or detention basins. Petrol interceptors will be included, should runoff from adopted highways not be passed via two levels of treatment. Pumped systems are only likely to be required where the M25 is directed into a tunnel below the airport;
- Surface runoff from the extended runway and apron to be intercepted by high capacity linear drainage channels before being directed into a network of collector pipes, which will initially convey flows to a petrol/oil interceptor before being directed from the petrol interceptor via an online Total Organic Carbon (TOC) quality monitoring tool to detect the presence of de-icer and directed to clean attenuation ponds or tanks and will be released to a watercourse at the allowable discharge rate. Any polluted runoff to be attenuated within polluted water holding tanks and released for treatment at an agreed rate. As a failsafe, manual diversion of all flows to the polluted water holding tank for the first two-runoff events following any de-icing activities will be possible. The polluted water holding tanks will also provide failsafe storage for spillages or discharges in emergencies, if the capacity of the fuel/oil interceptors is exceeded;
- Surface runoff from other external areas, to initially be intercepted by source control features, such as porous paving to obtain an initial level of treatment and attenuation. A secondary level of treatment to be provided via site control features, such as retention ponds and detention basins, also allowing runoff rates to be restricted to greenfield runoff rates;

The surface water drainage strategy has been developed assuming that infiltration will not be feasible due to the presence of elevated groundwater. Infiltration tests will be undertaken as the design is developed and filter strips, soakaway and infiltration features will be used wherever possible to allow the size of proposed SuDS to be reduced.

The proposed airport extension will require increased potable water resources. The residual increase in potable water demand will be further reduced through the introduction of water efficiency measures; rainwater harvesting; and greywater recycling. These measures will minimise the additional potable water demand of the airport extension and will therefore minimise the effect on local water resources.

5.5.3 *Biodiversity*

The extent of likely habitat loss has been calculated based on the concept design drawings and a series of mitigation and enhancement measures are proposed. In consultation with Natural England, a multiplier of 2.0 has been used as a rule of thumb to compensate for any mature habitat lost. A total of 147ha of land and 6.8km of linear watercourse, in the form of ditches, is expected to be required to compensate for the loss of designated sites, wetlands and terrestrial biodiversity action plan (BAP) habitats. This includes the following:

- 18ha of species-rich neutral grassland to replace the loss of Poyle Meadow (Unit 1 of Staines Moor site of special scientific interest (SSSI));

- 40ha of fen to compensate for the effective loss of the fen within Management Unit 12 of Staines Moor SSSI;
- 4ha of swamp/wet grassland to compensate for loss of 'East of Poyle's Meadow' site of nature conservation importance (SNCI);
- 8.2ha of wetland (including wet woodland) to compensate for the loss of the Arthur Jacob Local Nature Reserve and also provide replacement habitat for any water voles and grass snake present and provide foraging features for bats and birds;
- 26ha of ponds/lakes to compensate for the loss of Greenham's Fishing Pond SNCI, the Memorial Lakes and other standing water;
- 32.4ha of deciduous woodland to compensate for the loss of 16ha of existing woodland;
- 1ha of orchards to compensate for the loss of 0.5ha of existing orchard;
- 17.2ha of lowland meadow (beyond that required for Poyle Meadow); and
- 6.8km of ditch, which would compensate for the loss of existing ditches and also provide replacement habitat for any water voles and grass snake present and provide foraging features for bats and birds.

At detailed design stage, any appropriate discounting will be applied to account for existing ecological value and it is therefore acknowledged that the compensation area may change. This is taken into account in project costs.

It is also recognised that the available assessment timescales have not allowed for any species surveys to take place and it is proposed that these will be undertaken following the Airport Commission's recommendation in mid-2015. These are expected to include an extended habitat survey as well as species specific surveys such as breeding and overwintering birds, badgers, great crested newts, water vole, otters, reptiles and bats. Additional species surveys will be undertaken if identified as required by the extended habitat survey.

These surveys will also dictate the extent to which compensation or enhancement habitat may need to be provided to account for any loss of scrub or pasture/rough grassland used by protected or notable species. At present this is predicted to be in the order of 6ha of scrub and 70ha of grassland on a 1:1 ratio. Figure 3.5 in Attachment 5-1 illustrates the proposed areas compensation habitat.

Flood storage capacity provision will be identified in consultation with the biodiversity team to consider the wetland areas required for ecological compensation; at detailed design these areas will be created to include ecological enhancements and minimise compensatory habitat creation where possible by combining requirements.

To mitigate impacts due to loss of river habitat and the effects on riparian wildlife due to culverting, we propose to input into existing river restoration and improvements works elsewhere in these catchment areas. These could include a contribution to implementation measures identified in the 2015 Thames River Basin Management Plan and/or measures within the Colne Catchment waterbodies to help achieve Good Ecological Status/Potential.

Should any species relocation – such as badgers, great crested newts, reptiles, etc - be necessary, standard techniques would be employed as is routinely applied in development projects across the UK. Bat enhancement measures will also be applied through the creation of artificial bat roosts within newly created habitat.

Appropriate substrates and lighting (where required) will be incorporated within the design of new water channels to manage fish passage. Newly created ditches and water channels will also be designed to ensure it is still possible for water vole and otter to traverse the landscape between the areas north and south of the extended runway.

5.5.4 *Air Quality*

The proposed scheme has already designed in certain mitigation elements in the form of the runway proposals and the Heathrow Hub transport interchange, which is expected to provide a modal shift of approximately 38-50% of passengers from the use of cars to public transport access to the airport. This is a key element within the design aimed at reducing the impacts of the airport expansion on local air quality.

The Heathrow Hub interchange and the opportunity it offers for significant modal shift from road to rail works in two ways: firstly by providing public transport links for passengers arriving and leaving the airport and secondly through the provision of the APM for transfers between the Heathrow Hub and airport terminals.

The proposed mitigation strategy outlined below has been designed assuming that air quality could still be a key issue in 2023 and that baseline air pollutant concentrations do not improve as quickly as currently described by Defra/DfT predictions by the proposed opening year. However, it is currently anticipated that some future improvements in emissions rates from road traffic and point sources will result in improved baseline local air quality, albeit at a potentially reduced rate.

These improvements are anticipated following the uptake of vehicles which are compliant with Euro 6 Emissions Standards coming into force on 1 January 2015, alongside the implementation of the Draft Sustainable Design and Construction Supplementary Planning Guidance (GLA, 2013) which will include measures to ensure that point source emissions meet set emission standards.

At detailed design stage, additional design refinements will be made to ensure compliance with relevant planning policy and to avoid significant impacts in areas identified as being above or close to the objective values. Operationally, the air quality mitigation measures by Heathrow Airport are assumed will be continued and improved wherever possible.

Design requirements and mitigation measures include:

- Through use of the extended runway the number of take-offs from the existing boundary will be reduced, ensuring that the greatest emissions are closest to the centre of the airport and not at the boundaries closer to receptors;
- Ensuring additional on-site emissions from aviation are minimised through the development of take-off/landing and taxiing schedules to reduce the amount of time planes are sat stationery with engines idling;
- Minimising adverse impacts on sensitive receptors near to the Heathrow Hub by adjusting the proposed infrastructure layout where possible, at detailed design stage, to maximise the distance of new routes and car parking from receptors;
- Incorporating ventilation systems within the proposed M25 tunnel to reduce build-up of emissions at tunnel portals, with vent outlets being located away from receptors;
- Ensuring aircraft using the airport are designed to have the lowest possible emissions and ensuring planes use optimised thrust take-off technique;
- Ensuring additional on-site emissions from support vehicles are minimised through use of low emissions or electric vehicles;
- Ensuring any additional emissions from on-site heat and power generation are suitably mitigated, whether by design or using secondary abatement technologies; and
- Ensuring that strategies to minimise air quality impacts currently being implemented at the airport are included in the operation of any expanded airport – for example providing aircraft power and air conditioning on parking stands so that aircraft do not need to run their engines, operating a Clean Vehicles Programme to promote low and

zero emissions vehicles among airport companies, and incentivising airlines to use the cleanest aircraft through lower landing charges for cleaner vehicles.

During construction, specific measures will be implemented to reduce or offset adverse air quality effects. These include:

- Delivery of materials to be mainly by rail freight to the airport which will help minimise any additional emissions in comparison to delivery of all material by heavy goods vehicles (HGV);
- Following best practice measures to minimise impacts from demolition, earthworks, construction and track out to the extent where no significant impacts occur; and
- Design of access routes used during the demolition, earthworks and construction phases to avoid travel through areas of already poor air quality.

The modal shift offered by the provision of the Heathrow Hub transport interchange will lead to improvements in local air quality; coupled with the proposed mitigation measures and the anticipated improvements in ambient air quality, the proposed development is not expected to have a significant impact on local air quality.

5.5.5 *Carbon*

The proposed development provides a number of opportunities to increase the capacity of Heathrow airport while remaining within the carbon constraints of UK legislation. It is anticipated that the greatest carbon savings will be achieved through:

- Selection of construction materials with lower embedded carbon, particularly concrete and steel;
- Minimising the import of fill material for earthworks and sourcing material locally where possible;
- Maximising transport of construction materials by rail;
- Maximising modal shift from the private car to public transport infrastructure;
- Maximising opportunities for on-site renewable and low carbon energy generation; and
- Maximising opportunities for carbon sequestration through tree planting.

5.5.6 *Place: Heritage*

A small number of Grade II listed structures are likely to be affected and may need to be demolished or removed. Early discussions with English Heritage have identified Historic Building Recording as suitable mitigation. The following listed structures have the potential to be relocated within the scheme boundary:

- Milestone at Madbridge, Bath Road, Colnbrook;
- Waterpump; and
- City Post.

Archaeological excavation and recording will be undertaken prior to construction in all areas to be impacted by construction works that have not previously been disturbed or removed by modern construction, development or minerals extraction activities. The archaeological results will be assessed, analysed, published and disseminated to provide a lasting benefit and legacy to the construction of the scheme.

The noise respite measures – alternating runway operations and the adoption of STARs - will reduce overflight over sensitive heritage assets and receptors, and therefore reduce secondary impacts of noise on the Royal Botanic Gardens Kew World Heritage Site, heritage

assets associated with the Arcadian River Thames between Hampton and Kew, Scheduled Monuments, English Heritage Registered Parks and Gardens and Conservation Areas.

5.5.7 *Place: Landscape*

Whilst there are no national guidelines on the requirement for offsetting the loss of public open space resulting from development, the National Planning Policy Framework (NPPF) requires local authorities to identify specific needs for open space within their area and to determine what open space provision is required. Most local planning authorities apply standards for open space in terms of quantity of provision per thousand people. Using these criteria, the loss of open space to the proposed development will be offset by new open space at least approximately equal in area to the loss order to maintain local standards of provision, assuming there is no net loss or gain in population within each local authority area.

However, it should be recognised that higher quality, more accessible open space can be of greater benefit in terms of landscape character, recreation and amenity than large areas of poor quality, inaccessible land. This new open space will be designed to encapsulate the compensation habitat areas proposed to mitigate for ecological impacts as well as the river flood alleviation mitigation proposals.

To mitigate for any impacts on the Colne Valley Regional Park there is potential to accommodate an extension within the green belt land to the east of the M25 and south of the M4. This would bring the open space within proximity of the settlements of Harmondsworth and Harlington to the north of the airport enhancing local community benefits.

Landscape mitigation will focus on enhancing the character and quality of the park and green belt. To avoid further fragmentation, new green links will be considered as part of the detailed design where possible or existing green links enhanced to promote movement through the park. There is also an opportunity to create a green link by opening up the Colne Brook underpass.

Proposed green links include:

- Horton Road – between Brands Hill and Colnbrook;
- Land between Colnbrook and Poyle; and
- Land between the safeguarded railway corridor and West Drayton.

Opportunities to carry out some limited planting on the southern edge of Poyle will be examined at detailed design to mitigate for impacts on setting, within the constraints placed on planting within 500m of the airport and the potential for nesting birds. Any changes to riparian vegetation along the Colne Brook will also be considered and mitigated as necessary during detailed design.

The masterplan for the Heathrow Hub will be of the highest quality. It will be based on sound principles of architectural and landscape design, responding both to the character and sensitivity of the local landscape and townscape but also delivering bold, iconic design which fits with Heathrow's international identity. Particular consideration will be given at detailed design to the design of buildings and structures, such as the APM viaduct. This structure will be tall and visually prominent and there is an opportunity to create a new landmark feature with strong design. The detailed design will also consider impacts on the setting of the Grand Union canal by enhancing links with the wider landscape.

5.5.8 *Place: Waste*

Construction, Excavation and Demolition Waste

Heathrow Airport has a successful track record of sustainable management of construction waste. The Terminal 5 development is quoted in the Mayor of London's Business Waste Strategy as a positive example achieving a 97% recovery and recycling rate. Building on this example, we expect that similar rates of diversion can be achieved for the proposed development (excluding any contaminated soil).

A Waste Management Plan (WMP) will be developed for the construction phase of the project and will form the basis for mitigating solid waste impacts. The WMP will reflect the principles of the waste hierarchy, placing priority on waste minimisation, followed by reuse then recycling, and then environmentally sound methods of treatment and/or disposal. It will include guidance on: waste prevention and minimisation; identification and segregation of waste types at source; appropriate storage, containment, handling and transportation; reuse and recycling of suitable materials; and treatment and disposal of specific waste streams. The WMP will also include details on the following processes:

- Facilities and locations used for the storage, transportation, treatment and disposal of wastes;
- Waste segregation procedures;
- A system for recording the movement of wastes; and
- Monitoring systems for: waste types and quantities generated; appropriate waste storage arrangements; onsite segregation and any cross-contamination of waste streams; waste management and disposal routes; waste movements; waste management contractors; and sites used for the storage, reuse, recycling, treatment and / or disposal of waste.

An integrated design approach will be developed to use excavated material to satisfy the fill material requirements wherever reasonably practicable. This will include reuse of all topsoil and agricultural subsoil as close to the point of excavation as practicable.

As part of the design process, a series of detailed geo-environmental (contaminated land) investigations will be carried out in order to determine the extent and nature of any contamination to include: a review of historic information to identify potentially contaminative land uses (including landfill sites); intrusive investigations to recover samples of soil and groundwater for chemical analysis; risk assessments, in order to determine whether material is suitable for re-use or whether remediation is required.

If contaminated land is identified which requires remediation, the preferred option will be to treat material on-site such that it is suitable for beneficial reuse within the development. Material which cannot be re-used on site or elsewhere may need to be disposed of to landfill. Data from the Environment Agency indicates that there are almost 70 million cubic metres of non-hazardous landfill capacity in London and the South East (as of 2012) plus an additional 1 million cubic metres of hazardous landfill capacity, which could potentially accommodate any contaminated land requiring disposal.

A Materials Management Plan[61] will be prepared (including sign-off by a designated competent person) in advance of the implementation of the project. This will set out how the suitable excavated material is to be used as a resource within the construction of the project.

[61] In accordance with the CL:AIRE "The Definition of Waste: Industry Code of Practice"

Any residual wastes which cannot be reused or recycled, for example any contaminants remaining after treatment of contaminated soils, will be stored safely on site prior to being disposed of to a suitably licensed waste management facility, located as near as possible to the proposed development so as to reduce the impact of any road transported waste.

As a net importer of fill material, the development could have a potentially significant beneficial impact as a destination for surplus excavated material from other developments in London and the South East. This could potentially include High Speed 2, Thames Tideway Tunnel or the Northern Line Extension if timescales allow. Liaison with developers of other projects will allow for consideration of the available opportunities for a region-wide integrated excavated material management strategy.

Operational Phase Waste

The operation of the proposed development will give rise to the same types of wastes that currently arise and are managed at Heathrow Airport. The target for Heathrow Airport is that by 2020 70% of waste managed through Heathrow Airport Limited's waste contract is recycled and no residual waste is sent to landfill.

Projected waste arisings for 2023 are 208,000 tonnes in total for Heathrow Airport, representing approximately 3.2% of London's projected construction and industrial waste arisings for that period. It is expected that the established approach to managing wastes as sustainably as possible at Heathrow will be extended to the proposed development, e.g. segregation of recyclable materials wherever possible, utilisation of energy from waste technology to manage residual wastes rather than disposal in landfill, etc. This will help to ensure that the targets outlined above are met.

As with the existing operations at Heathrow, a proportion of the operational waste will be generated by individual companies operating at the airport and the remainder will be managed centrally through Heathrow Airport Limited's waste contract. It is anticipated that the proposed recycling and landfill diversion targets will be maintained and can be achieved, working in conjunction with waste management and recycling contractors.

5.5.9 *Ecosystem Services*

The ecosystem services likely to be impacted by the proposed development include: water (supply), hazard regulation, water quality regulation, scientific and knowledge values, climate regulation and wild species diversity.

The application of the mitigation measures proposed by the environmental disciplines (set out above and in Attachment 5-1) will result in low to negligible residual effects for water (supply), water quality regulation and climate regulation (mitigation) during the construction period. During operations, the residual effects on water quality regulation and wild species diversity are classed as moderate and reduced to low for water quality regulation. Whilst they currently remain moderate for wild species diversity and scientific and knowledge values, it is acknowledged that this is a conservative assessment and that refinement of the scheme at detailed design will further reduce the residual effects. For full details of the proposed mitigation measures, please refer to Chapter 9: Ecosystem Services of Attachment 5-1.

5.5.10 *Sustainability*

The development of the proposed scheme presents a unique opportunity for the incorporation of more sustainable technologies or for the design to be such that it allows more sustainable processes during both construction and operation. An initial high level assessment has considered the potential benefits that the following can bring to the scheme:

- Passive design – particularly consideration of building orientation and layout of the building designs to minimise energy consumption for heating, cooling and lighting – applicable across the airfield development as well as the Heathrow Hub;
- Low and Zero Carbon (LZC) technologies to help reduce onsite emissions – these could include the use of solar photovoltaic panels and solar thermal panels, wind technology such as small turbine installation on rooftops around the Heathrow Hub buildings, ground, water and air source heat pumps or combined heat and power (CHP) plant.

Reductions in water use can be achieved through rainwater and/or grey water harvesting systems and reductions in energy use can be secured through lighting controls and use of LED lighting. These options will be assessed fully at detailed design and further details can be found in Attachment 5-1.

5.6 Community Housing

5.6.1 *Direct Impacts on Local Communities*

Homes, communities and businesses which could be affected by the proposed airport expansion were identified through desk top research and a two-day survey of the local area. Consideration of the characteristics of these homes and communities informed the development of the masterplan and mitigation strategies. Community infrastructure and assets were also considered including for example schools, health centres, public rights of way, churches and pubs.

Impacts fall into: land and properties in the land take of the runway, roads and other infrastructure; and areas adjacent or nearby which could be affected by adverse impacts such as noise, poor air quality, or severance.

As set out in **Table 5.2** and **Figure 5.11**[62] it is estimated that up to 246 homes could be lost based under the central case due to the land take of the proposed development. Most of these (205 dwellings) are in Poyle, south of the Bath Road. The majority of the homes in the land take are houses though there are also some flats. The condition of the homes is generally good with a suburban or semi-rural character, though certain properties and their immediate environments are of poor quality and all experience aircraft noise.

The majority of the homes (206) sit within the runway land take (including peripheral earthworks and channel diversions). Of these 38 sit within the M25/A3044 land take, and two in the land take of the apron.

Under the option of the A30/A3044 diversion there is a slip road to the west of the realigned M25 as it emerges from the tunnel to south of the runway. This could result in the demolition of three of the eight static homes located in the Poyle Park caravan park to the south of Horton Road, bringing the total dwellings lost to 249 homes.

[62] With more detailed maps provided in **Attachment 5-2**.

Table 5.2 Homes within the Land Take of the Expanded Runway and Associated Infrastructure

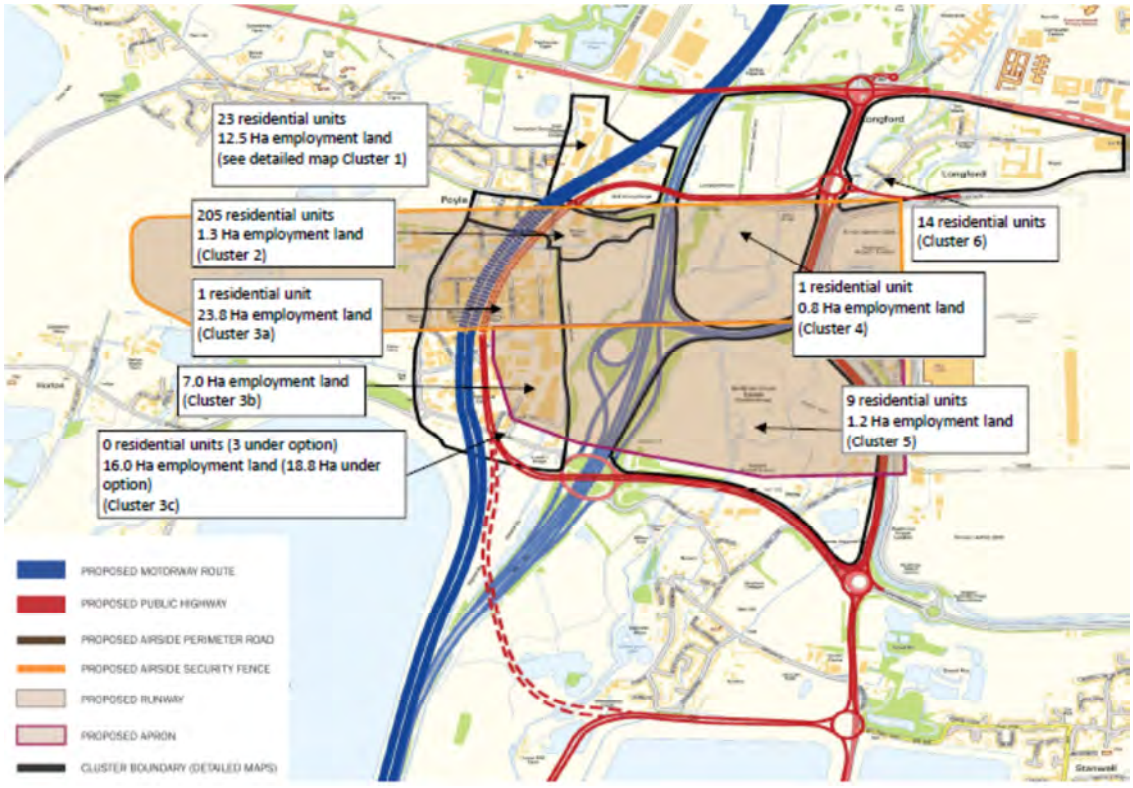
Location	Dwellings	Type
Poyle South of Bath Road	205	Approx. 80% houses, 20% flats
North of/elsewhere on Bath Rd	24	Approx. 85% flats
Longford	14	Houses
North Spout Lane	2	Houses
South of Horton Road/ Poyle Ind Estate	1	Static caravans/ houses
Total	**246**	

Source: URS, 2014

Also shown in **Figure 5.11** is the location of employment land which would be lost – employment land and business are discussed in Section 5.7.

There is no community infrastructure falling within the land take apart from a short section of the Colne Valley Way running from Colnbrook to Horton which would be severed by the western-most part of the new runway and would need to be diverted.

Figure 5.11 Homes and Employment Land in the Land Take



Source: URS, 2014

The proposed development would not render any homes completely inaccessible. The current route to Poyle from the west along Old Bath Road would no longer be available, though an alternative public highway is proposed which would allow Poyle to be accessed from the A4 west of the M25. The expanded runway would sever Poyle Road which currently links Poyle and Colnbrook to the north with Wraysbury and Horton to the south. Traffic would therefore need to travel further west and use Horton Road if travelling north to south. The A3044

(Stanwell Moor Road) would be realigned to the west, implying that traffic coming from the north to access to Stanwell Moor (including North Spout Lane) would have a longer route.

Based on current designs the Heathrow Hub options would not require demolition of any homes. The proposed new M25 junction to the north of the railway line would sever Thorney Lane North running north – south between Richings Park (including Iver Station) and Iver village. However the public highway could be realigned thus avoiding any adverse severance impacts.

5.6.2 *Mitigation of Direct Impacts on Local Communities*

There are a number of options for relocating affected homes. Most of the affected homes are in Poyle, in the section of the village between the Poyle Industrial Estate and Bath Road. If possible it would be desirable to relocate these homes together with the intention of minimising loss of community cohesion and integrity.

There may be potential for relocation in the immediate area (for example, to the north of Poyle or on the edge of Colnbrook). Potential relocation solutions would be discussed with local councils and communities. Much of the local area is designated as Green Belt and is constrained by flood risk, and the Colne Valley Park offers amenity and recreation opportunities for local people. These factors as well other constraints and opportunities would be taken into account in formulating the relocation strategy.

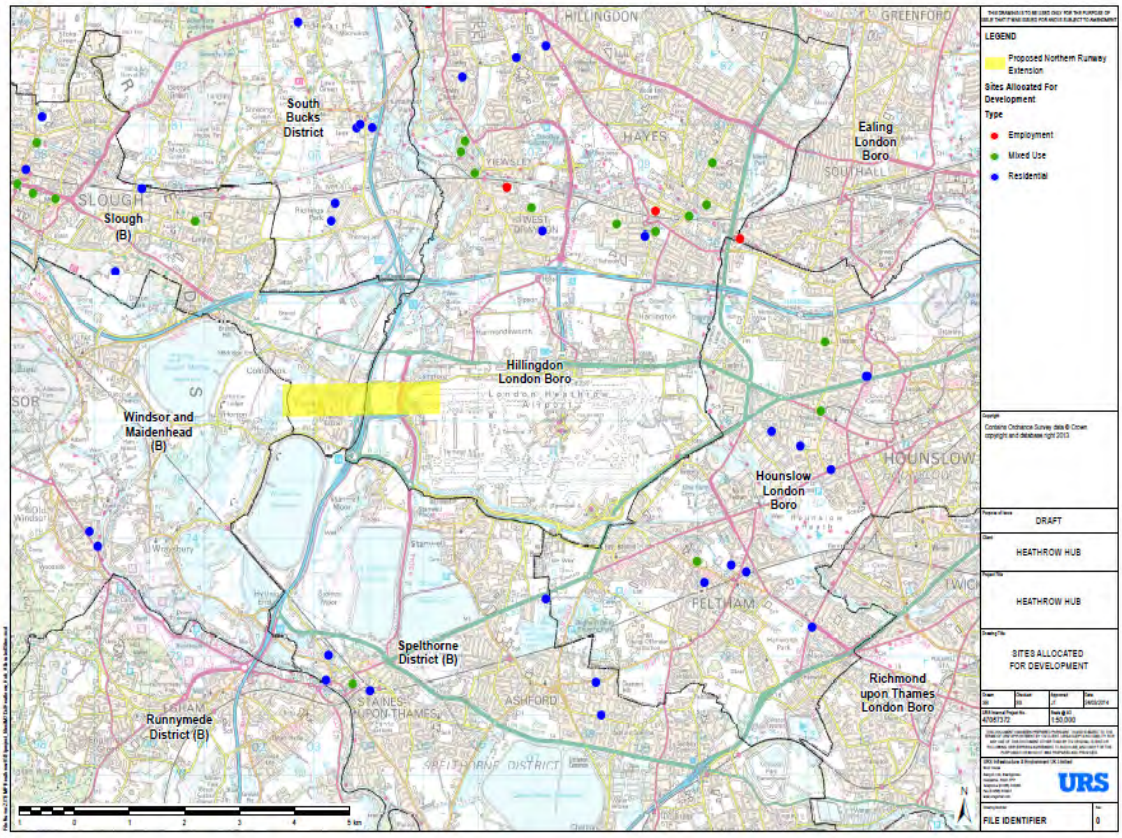
Outside Poyle there are a small number of homes that could be lost. These are scattered in various locations. As there are fewer of these homes there may be more potential to re-provide them near to their current location and reducing disruption to residents. There may also be opportunities for accommodating these dwellings within the local villages such as Horton, Colnbrook, Poyle or Stanwell Moor.

It may be most appropriate to relocate homes adjacent to the land take as well within the land take if this would offer better prospects for maintaining community cohesion.

The relocation strategy would take into account the characteristics of the residents being displaced and in particular consider potential vulnerable groups. For example Census 2011 data for Lower Super Output Area Slough 014D in which most of the displaced dwellings sit has a higher proportion of Black and Ethnic Minority (BAME) residents who may typically experience disadvantage. See Section 5.8 for more detail.

A review of planning policy of the six surrounding local authorities has been undertaken, examining the site allocations within each local authority over their respective local plan periods. There are no sites allocated for residential development within the immediate vicinity. However there are a number of sites further afield which may be appropriate to accommodate the affected dwellings. A long list of allocations was compiled for the six local authorities. These allocations are shown below in **Figure 5.12**. (Employment as well as residential allocations are shown. Employment space and businesses are discussed separate in Section 5.7). Sites were not included if they were deemed as unlikely to be suitable or available for development over the local authority plan period, or if they were not allocated for either residential, employment or mixed-uses. The estimated total capacity (residential dwellings) and allocation in hectares was recorded for each site.

Figure 5.12 Sites Allocated for Development in Planning Policy



Source: URS analysis of local plan documents, 2014

In order to compile a shortlist of possible sites to accommodate affected dwellings and businesses, sites were excluded if they did not meet the following criteria:

- Capacity (excluding those with a capacity of under 200 residential units or employment land of less than one hectare)
- Location (excluding those sites furthest away)
- Surrounding character and local area (for possible residential sites the surroundings and landscape character had to be similar or better than that of the properties to be relocated, acknowledging the desire to retain a community feel and the existing cohesion that dwellings are likely to have, especially within Poyle)

Table 5.3 sets out a shortlist of ten allocated residential sites, situated within the boroughs/districts of Hillingdon, Slough, Hounslow and Royal Borough of Windsor and Maidenhead (RBWM), with varying capacities of between 200-1,500 units. These sites have potential for further investigation in terms of their ability to accommodate housing growth[63]. For example Heatherwood Hospital in Ascot (RBWM) is a 4.0 hectare site with an estimated capacity of 200 residential units. Despite being currently in operation as an NHS hospital, the

[63] Not all sites identified in the boroughs' Site Allocations documents are currently vacant; some are occupied but have been nominated by landowners, and others fall within larger allocated areas (such as Slough Town Centre) and may not be developable in full. While the sites included in both the long and short lists are considered 'developable' by the boroughs over their Local Plan periods (based on what is known about their ownership, lease and use) not all allocated sites may be available or suitable for development.

RBWM Strategic Housing Land Availability Assessment (SHLAA) 2014 identifies the site as suitable for delivery of residential units in a 5-10 year timeframe. The site has good road connections and is situated less than a mile from Ascot railway station and lies adjacent to open countryside and greenbelt land. It has the capacity to accommodate the majority of affected dwellings and could be developed as a new community within Ascot, helping to retain the local character and community cohesion experienced by residents within Poyle.

Table 5.3 Short List of Sites Allocated for Residential Development

Site	Size (hectares)	Possible capacity (units)	Borough/ District
Trout Road, Yiewsley	4.5	Industrial and business led, 200 residential units, live/work units, A1, A2, A3, B1, D1 & D2 uses	Hillingdon
Middlegreen Trading Estate, Middlegreen Road	2.95	200	Slough
Heatherwood Hospital	3.99	200	RBWM
Sawyers Close regeneration opportunity	5.37	200	RBWM
Former Hayes Station Goodsyard, Hayes	2.52	Resi led mixed use (400 dwellings), hotel, retail and office	Hillingdon
Porters Way, West Drayton	17.81	Mixed use scheme, resi, community, employment and retail	Hillingdon
The Heart of Slough, Slough Town Centre	8.8	1598	Slough
Land South of Castleview: Land to the rear of 2-78 Castleview Road, part of Upton Court Park and 36 Blenheim Road	11.8	300	Slough
Cavalry Barracks	14.72	TBC	Hounslow
Maidenhead Town Centre AAP Area		733	RBWM

Source: Various, URS, 2014

Other mitigation measures for private houses which are made uninhabitable or less valuable on the open market could include financial compensation and in-situ mitigation measures such as insulation and double glazing.

5.6.3 *Increase in Housing Demand*

As described in Section 2.6 economic growth associated with the expanded airport is likely to lead to additional jobs in the region. Due to increases in productivity, the on-site and off-site employment associated with the airport is forecast to decline. However there will be a wider increase in employment as investment and businesses are attracted to the area, and this will lead to an increase in demand for housing.

5.6.4 *Provision to Meet Housing Demand*

To consider how this regional housing growth, as well the homes displaced by the runway and associated infrastructure, could be accommodated, a review of planning policy of the six surrounding local authorities has been undertaken. Information was drawn together on

planned allocations of residential land. This is presented in **Table 5.4** below. Information is not consistent or comprehensive across all local authorities (for example the plan period and the status of the development plan document varies) but the exercise allowed a picture of land availability in the next 10-20 years to be assembled.

Across all six local authorities the review found a total of 193 ha of residential land is planned and it is expected that over 7,000 units will be delivered. In addition there is residential development allocated as part of employment and mixed use sites. Slough and RBWM have the greatest amount of allocated land suitable for residential development. While it is not at this stage possible to quantify the additional housing demand arising from wider economic growth generated by the expanded Heathrow, it is likely that this demand could be accommodated as part of planned growth within the surrounding local authorities.

Table 5.4 Housing Land Provision in Local Planning Policy

Provision over plan period	Borough/District						
	Hillingdon	Slough	Hounslow	South Bucks	Spel-thorne	RBWM	**Total**
Hectares	26.1	81.6	17.2	2.5	8	58.1	**193.4**
Residential units (current estimates)	632	2,825	n/a	410	444	2,970	**7,281**

Source: Various planning policy documents for six relevant local authorities

5.7 Employment

5.7.1 *Direct Impacts on Local Employment*

Some demolition of business premises to make way for the expanded airport and associated road and rail infrastructure would be required.

As set out in **Table 5.5** below, and illustrated in **Figure 5.11** above, it is estimated that up to 63.7ha of employment land and approximately 224,300 sqm floorspace accommodating 5,645 jobs would need to be relocated. The majority of this is Poyle Industrial Estate (approximately 47ha) located west of the M25 and to the south of Bath Road. The northern section of the estate would fall within the land take of the runway with the southern section directly affected by the highways. The Gallymead Road and Coln Industrial Estate north of Bath Road form another sizeable employment area (12.5ha). These estates would largely fall under the land take of the highways infrastructure. Some parts of these estates do not fall directly within the land take. However as access and functionality of these areas could be adversely affected the worst case scenario is assumed to involve complete demolition.

The two estates are dominated by transport, storage and distribution businesses. There are also manufacturers (mostly small scale but with some larger firms on the Poyle Industrial Estate), offices and two hotels. The type and quality of accommodation varies from small industrial units in poor condition to new and under-construction warehouse developments occupied by multi-national companies such as Coca-Cola, Fedex and Honda.

Other areas of employment land falling within the land take include approximately 2ha to the south of Poyle Road and 2ha in North Spout Lane. These areas are mostly occupied by low density uses such as parking, storage, and recycling.

Under the A30/A3044 diversion option there is a slip road to the west of the realigned M25 as it emerges from the tunnel to south of the runway. This could result in the loss of an additional 1.8 ha of employment land to the south of Horton Road, bringing the total employment land in the land take to 65.5ha.

Table 5.5 Employment Land with the Land Take of the Expanded Airport and Associated Infrastructure

Area in land take	Employment land (ha)	Floorspace (sqm)	Estimated jobs
Poyle Industrial Estate	46.9	180,000	4,800
Gallymead Road and Coln Industrial Estate	12.5	33,000	725
Rest of Poyle	2.1	4,200	80
Elsewhere	2.2	7,100	40
Total	**63.7**	**224,300**	**5,645**

Source: URS analysis. Floorspace figures draw on VOA data (2014). Standard assumptions on employment densities drawn from HCA Guidance on Employment Densities (2nd edition 2010)

The current designs for the Heathrow Hub interchange is not anticipated to require the demolition of any businesses. However the infrastructure south of the railway line would imply loss of large sections of the west of Thorney Park Golf Course, and Swains Van and Truck Hire could be adversely affected if the road currently providing access is severed by the ATM. The water treatment plant to the north of the railway line would be relocated. Court Road Industrial Estate located immediately to the north may be affected.

5.7.2 *Mitigation of Direct Impacts on Local Employment*

Mitigation measures for business premises which are made uninhabitable or less valuable on the open market could include relocation and financial compensation. Relocation is a viable option for the majority of affected businesses. Research indicates that 88% of businesses affected by London 2012 Olympics site Compulsory Purchase Order continued to trade[64].

The companies and accommodation types which would be directly affected are diverse, and their varying needs, would be carefully considered as part of any relocation strategy. A high proportion of the affected businesses may view proximity to the airport as important. The Slough Core Strategy (2008) emphasises the key role of Poyle Industrial Estate in serving Heathrow airport. A drive-around survey confirmed that many of the businesses located here and in the Gallymead Road and Coln Industrial Estates appear to carry out activities with direct links to the airport. However this was not the case for all businesses, and even for those businesses with names directly linking their activities to the airport a proportion of their business could be unrelated to the airport. Good links to the road network especially the M25 and M4 are likely to be the most important advantage of this location for many companies.

Businesses typically derive benefits from co-location with similar companies and sectors, and so sites for relocation would ideally be of sufficient size to allow the wholesale relocation of the discrete clusters of activity evident within the Poyle industrial area (for example, the Riverside Cargo Centre is made up of warehousing and office headquarter activities in high quality

[64] Research by the London Development Agency into the relocation of jobs and companies due to the London 2012 Olympic Games,
LDA (30th June 2008) Request for Information/Freedom of Information Act by Mr Julian Cheyne, FOI291

accommodation, while the Poyle Technology Centre consists mostly of small manufacturing workshops). Outside of the industrial estates the potentially displaced businesses identified are scattered around the local area and this consideration would be less relevant.

There may be potential to relocate displaced businesses nearby to their existing location. A strategy for relocation would be formulated with key local stakeholders including the local authorities. While the immediate vicinity is somewhat constrained by factors such as flood risk, Green Belt allocation and existing development, there are some potential sites which could be further investigated. For example the site located to the north of the A4 (Colnbrook Bypass) south of the M4 and west of the Lakeside Industrial Estate is current subject to an outstanding planning application for an Intermodal Freight Exchange comprising substantial new warehouse space, but under the scenario that this proposal does not come forward the site could be used for relocations.

Local planning policy was reviewed to identify sites in the surrounding local authorities allocated for employment-led use which might be suitable for relocation of displaced businesses. **Table 5.6** sets out a shortlist of sites and illustrates that there are potentially suitable sites in Hillingdon, Slough, Hounslow and Spelthorne, ranging from 1.5 to 100+ hectares. For example Bourne Avenue, Hayes (LB Hillingdon) is a 15.9 hectare site allocated for mixed use, employment led development. The site is occupied by former (now disused) government buildings and has been identified in the Southern Hillingdon Area Action Plan (AAP) as having the potential to accommodate a strategic logistics park or similar uses. Given the types of businesses which may be affected in Poyle (many of which are logistics or airport associated freight operations), this site offers considerable potential for relocation, especially given the site's close proximity to Heathrow Airport.

Table 5.6 Shortlist of Sites Allocated for Employment-led Development

Site	Size (Ha)	Borough
British Gas Works, Cowley Mill Road, Cowley	4.4	Hillingdon
Bulls Bridge, Hayes	3.1	Hillingdon
Bourne Avenue, Hayes	15.9	Hillingdon
Onslow Mills, Chantry Close, Yiewsley	2.4	Hillingdon
Trout Road, Yiewsley	4.5	Hillingdon
Slough Trading Estate, Bath Road, Slough	161.2	Slough
Former EMI Records Site, Blyth Road, Hayes	3.2	Hillingdon
Hounslow West Station	1.5	Hounslow
Morrisons/Safeways former HQ site, Hayes	4.4	Hillingdon
Former Hayes Station goodsyard, Hayes	2.5	Hillingdon
Chailey Industrial Estate, Pump Lane, Hayes	2.5	Hillingdon
Former DRA site, Kingston Lane, West Drayton	1.6	Hillingdon
Porters Way, West Drayton	17.8	Hillingdon
Dairy Crest site, High Street, Yiewlsey	1.6	Hillingdon

Elmsleigh Centre and adjoining land, Staines	6.6	Spelthorne
Hayes Town Centre sites	2.6	Hillingdon

Source: Various

Other mitigation measures for private houses and business premises which are made uninhabitable or less valuable on the open market could include financial compensation and in-situ mitigation measures such as insulation and double glazing.

5.7.3 *Increase in Demand for Employment Space*

It is anticipated that investment and companies will be attracted to the local area by the expansion of Heathrow, leading to an increase in demand for employment space. Supply of employment space to meet this additional demand may be constrained. The Thames Valley sub-region already has some of the highest commercial rents in the country. In this context it is likely that the highest value businesses will locate nearest to the airport. Lower value businesses may take up cheaper accommodation, for example in West London.

5.7.4 *Provision to Meet Employment Demand*

A review of planning policy for the surrounding authorities illustrates that a considerable amount of employment land is likely to come forward in coming years. The review found a total of 237ha of employment-led allocations within these plans. These allocations include some redevelopment of existing employment land and net additional provision may be somewhat less. Nonetheless once the wider sub-region is considered there is clearly substantial provision which could meet demand generated by economic growth associated with the runway.

Table 5.7 Employment Land Provision in Local Planning Policy

Provision over Plan Period	Borough/District						
	Hillingdon	Slough	Hounslow	South Bucks	Spelthorne	RBWM	**Total**
Hectares	67.2	161.2	1.6	n/a	6.6	n/a	**236.6**

5.7.5 *Skills and Training*

Securing the appropriate workers, skills, goods and services is fundamental to the successful delivery of the proposed scheme. It is important that local communities are provided with the necessary assistance to allow them to benefit from the opportunities offered by the proposed development. RIL and its partners will develop a community, skills, employment and training strategy to support the proposed scheme. This strategy will build on existing strategies at Heathrow and be a key element in helping to ensure the proposed scheme delivers the social and economic components of sustainable development. The strategy would be underpinned by a robust evidence base drawing on information gathered through desk top research and stakeholder consultation.

The evidence base would provide the following:

- Planning policy context relevant to economic development, skills and employment from the London Plan and Local Development Frameworks and economic development strategies from relevant local authorities

- Identify the demand for jobs and specific skills as a result of the runway extensions and new transport interchange. A variety of skills will be required. In particular there will be a requirement for skilled construction workers
- Identify skill deficits, unemployment and economic inactivity in the surrounding areas to examine the capacity for demand arising from the proposed development to be met in the local and national economy
- Extent of training infrastructure in the surrounding areas particularly to meet construction training needs
- Potential gaps relating to categories of skills, occupations and supply chain which could have significant implications for delivery of the proposed scheme
- Based on the demand and supply analysis, building on existing and identifying new activities and initiatives for supporting local people and businesses.

We will build upon existing activities at Heathrow which support skills, employment and training for local communities. This will cover activities including:

- Ensuring that a suitable workforce with the appropriate skills is available to deliver the project. This will involve supporting the development of relevant skills and sectors, building the capacity of the workforce and the supply chain where gaps have been identified. Activities would look to build on the existing HAL offer which provides vocational qualifications and specialist retail and engineering apprenticeships as well as provision of training to existing employees working at Heathrow. The Heathrow Retail Academy, for example, provides intermediate and advanced apprenticeships, such as, retail skills, customer service, team-leading, business administration, management, hospitality and warehouse and storage.
- Promote opportunities for local people and disadvantaged groups. This will involve attempting to maximise the benefits of jobs and contracts associated with the proposed development for local, disadvantaged and under-represented people. Activities would include building on the provision currently offered by HAL, for example, pre-employment programmes which enable unemployed people from the areas around Heathrow to access airport employment in retail and construction. These programmes (provided through Gateway Heathrow 2012) provide local people with an insight into a career at Heathrow, interview preparation assistance and basic training in areas such as, customer service and health & safety. There is also the work being done by the Heathrow Retail Academy team supporting local people back into work through the pre-employment 'Routes to Work' programme. Monitoring of opportunities for disadvantaged groups could also include sustainable targets for employment of local unemployed people and ex-offenders within the contractor workforce.
- Support initiatives which promote Science, Technology, Engineering and Mathematics (STEM) education in schools and STEM careers and routes into relevant occupations. Activities would include building on existing provision offered by HAL, for example, primary school construction challenges which provide an insight into construction sector employment at employment and develops teamwork, problem-solving and communication skills. In addition HAL provides a secondary school engineering challenge which introduces and raises awareness to students of an engineering career. Other existing HAL activities envisaged to be continued include:
    - Understanding Heathrow Apprenticeships events that inform both teachers and career advisors about the range of apprenticeships available at Heathrow and provide them with an insight into the airport's working environment.
    - Heathrow Apprenticeship Fairs which enable young people to understand and access apprenticeships provided by companies operating at the airport.

- Support for local community projects to maintain a strong commitment to neighbouring communities around the airport. This support would be along the lines of the activities currently provided by HAL. This could include:
    - Community investment (such as through the Heathrow community fund or a similar mechanism) supporting local projects and volunteers through grant funding activities which focus on education and youth development, environment and employment and skills development. For example, Girlguiding Middlesex North West was awarded £25,000 to help build a new volunteer room at the Willow Tree Centre in Hillingdon. The centre provides facilities for outdoor activities for 12,000 children and young people of all abilities each year.
    - Operating community noise schemes that mitigate the adverse impacts of Heathrow on neighbouring communities, for example, the Residential Night Noise Insulation Scheme is a domestic insulation scheme designed to protect nearby residents regularly exposed to noise from night flights that are within a defined boundary.
    - Engaging with local communities, residents and interest groups to discuss a variety of airport issues and the impacts on the economy, local communities and the environment, for example, The Local Focus Forum meets quarterly providing an opportunity for local resident associations and ward councilors to discuss issues relating to Heathrow with senior management.
- Support for local businesses providing them with the opportunity to benefit from the proposed development. The runway extensions and proposed transport interchange will attract new businesses to the areas around Heathrow whom would benefit from tailored business support.

Support would build on and potentially enhance existing activities provided by HAL such as:

- Supporting local procurement through workshops and networking events, such as, 'Meet the Buyer Events' which connect suppliers from the local boroughs with airport buyers.
- Supporting businesses with local export opportunities, for example, providing support to the Gateway Asia Programme which provides direct business support.

Provision of financial support to business support groups enabling them to improve their outreach and support services.

5.8 Equality

5.8.1 *Overview*

An overview of the equality issues which have the potential to arise from the construction and operation of the proposed development are outlined here, along with consideration of the measures which may be applied to reduce or offset them.

The Equality Act 2010 identifies a number of 'protected characteristics'. The below list provides a supporting definition and identifies the corresponding 'protected groups' for whom potential effects are considered here:

- Sex: This refers to a man or to a woman or a group of people of the same sex. Impacts on men and women are considered; and
- Age: This refers to persons of either a particular age or a range of ages. Impacts on children (pre-school [0-4] or school age [5-17]); young people (18-25 years old); older people (60+ years old), and very old people (75+ years old) are considered

- Race: The Equality Act 2010 defines race as encompassing colour, nationality (and citizenship) and ethnic or national origin. Following the Office of National Statistics (ONS) terminology used in the 2011 Census, impacts are considered for White, Asian/Asian British, Black/African/Caribbean/Black British, Mixed/multiple ethnic and Other ethnic groups. This report also refers to Black, Asian and Minority Ethnic people (BAME) more generally, where impacts may relate to a number of groups in relation to this protected characteristic
- Religion or belief: Religion means any religion a person follows. Belief means any religious or philosophical belief, and includes those people who have no formal religion or belief. Following Office for National Statistics (ONS) terminology, impacts are considered for Christian, Buddhist, Hindu, Jewish, Muslim and Sikh people, as well as those following other religions, and those who have no religion
- Disability: A disabled person is defined as someone who has a physical or mental impairment that has a long-term, adverse effect on his or her ability to carry out normal activities. Impacts on 'disabled people' with a mental or physical impairment are considered
- Gender reassignment: This refers to people who will undergo, are undergoing, or have undergone a process for the purpose of reassigning their gender identity. Impacts on trans-gender people are considered
- Pregnancy and maternity: Pregnancy refers to the condition of being pregnant, while maternity refers to the period after the birth. Protection against maternity discrimination (not in an employment context) is for 26 weeks after giving birth. Impacts on pregnant women and mothers of new babies are considered
- Sexual orientation: A person's sexual orientation relates to their sexual attraction and the expression of that attraction. Impacts on lesbian, gay, and bisexual (LGB) people are considered.

Equality issues are only outlined here where impacts are considered likely to be disproportionate (e.g. while all residents within affected dwellings would be required to relocate as part of the proposed development, not all residents would be impacted to the degree to which they would experience impacts on their equality).

5.8.2 *Direct Impacts on Equality*

The potential for equality impacts has been considered in relation to the anticipated positive and detrimental effects of the option on local communities. Conclusions have been drawn regarding the possible impacts for people belonging to protected characteristic groups, with reference to demographic characteristics from publicly available sources such as Census 2011. Specific data have not been outlined here in detail; however they have influenced the identification of the likely protected characteristic groups which could be affected.

Employment

The proposed development is likely to result in a considerable level of employment generation (in both construction and operation) with opportunities for apprenticeships, construction training and full time jobs across a wide range of professions. This is most likely to benefit those protected groups which traditionally have below average skills and qualifications and who are underrepresented in certain employment sectors (e.g. construction and manufacturing) including young people, women, BAME groups and disabled people[65].

There is also a potential loss of employment as a result of existing employment premises being uninhabitable due to construction works, or rents becoming prohibitive as a result of

[65] Equality and Human Rights Commission (2010) How Fair is Britain? Equality, Human Rights and Good Relations in 2010.

rejuvenation in the area local to Heathrow once operational. Certain protected groups likely to be adversely impacted include young people, BAME groups and disabled people, who may typically experience low socio-economic status and poor standards of living, often due to employment disadvantage (including below average rates of economic activity, below-average skills and qualifications, underrepresentation in certain employment sectors and below average rates of pay)[66]. This could particularly affect young people, women, BAME groups (including BAME run businesses) and disabled people.

Community infrastructure

Housing

The proposed development has the potential to result in loss of a number of residential dwellings during the construction phase (an estimated 246 under option X). Older people, disabled people, children and young people who live in affected properties will be adversely impacted by the loss of their dwellings. Asian and Asian British households could be particularly affected, given the high concentration of Asian and Asian British residents within Poyle (likely to experience the largest loss of residential dwellings) compared to residents of other ethnicities.

Schools

The proposed development may result in increases in journey time for pupils at schools during the construction phase and changes to the outdoor learning environment as a result of construction activity. This is most likely to adversely impact pre-school and school age children, potentially affecting their ability to learn or their concentration during lesson times. Children from BAME groups and disabled children could be particularly affected, as their educational attainment is typically lower than that of children who do not share these characteristics[67].

Pedestrian Circulation Routes

The proposed development may result in loss of access to, or severance of pedestrian footpaths or footways (either temporarily during the construction phase, or permanently as a result of the proposed option layout). Children, older people and disabled people may be forced to make a longer and possibly more complex journey on foot if pedestrian routes are inaccessible. They may also experience greater difficulty than other users when making use of alternative pedestrian routes (e.g. wheelchair users or people with a mobility impairment may be unable to use a footpath which has a steep gradient or involves them crossing a public highway).

Pubs

While pubs may not typically be considered as a key community resource, in rural and semi-rural areas they are often used to hold meetings, community groups and other events. No pubs are anticipated to be lost as a result of the proposed development however there is a possibility that some could cease to operate as a result of construction activity, particularly noise, for example The Punch Bowl in Poyle. Protected characteristic groups likely to be affected in particular include older people, disabled people and women (e.g. mothers or those with young children who may attend groups or events there). For these protected characteristic groups, if affected pubs ceased to operate as a result of construction, they may

[66] Ibid.
[67] Ibid.

lose an opportunity for regular social interaction with people who share the same interests or characteristics and this could lead to isolation.

Isolation

As a result of construction activity and the physical layout of the proposed development in the operational phase, there is the potential for individuals, small groups of homes or businesses, or even whole settlements to become isolated. This is particularly true in smaller settlements, rural or semi-rural areas, or those locations with little community infrastructure. People who are particularly susceptible to isolation effects are those who are reliant on public transport to access daily services, healthcare or education, and may experience delays to their journeys or the removal of regular bus routes or pedestrian footways. Protected characteristic groups particularly likely to be affected are children and older people, disabled people and BAME people, all of whom are likely to make frequent use of public transport and who also may have specific or particular needs to access services (e.g. healthcare).

Noise and Air Quality

People living close to the proposed development are likely to experience noise and air quality effects in residential areas during construction. The composition of groups affected in these residential areas is varied (given that there is the potential for noise and air quality effects to occur in a number of locations) and this means that protected characteristic groups may or may not be impacted. Those protected characteristic groups which have the potential to experience adverse impacts however could include children, older people and disabled people.

5.8.3 *Mitigation of Direct Impacts on Equality*

Mitigation for protected characteristic groups who are likely to experience equality impacts could take a variety of forms, including:

- A skills and employment strategy and training schemes (which particularly target those protected characteristic groups which are traditionally underrepresented or may experience greater difficulty accessing employment or returning to work);
- Help for businesses to find alternative suitable premises and employees to access new jobs for those protected characteristic groups who may be affected if businesses are rendered un-useable (to ensure employment benefits are maximised and protected characteristic groups are not detrimentally impacted);
- Possible relocation of clusters or groups of dwellings which could be affected, aiming to relocate residents in areas which offer a similar quality of environment, also offering the option of retaining existing neighbours (where possible and should residents so wish) in order to try and preserve community cohesion and existing social networks for those people who may be forced to relocate;
- Consideration of the specific needs of protected characteristic groups who may require help with relocation, for example disabled people and older people;
- Re-provision of facilities which are rendered un-useable or particularly severely affected by construction (e.g. pubs or schools) and which provide a key community resource;
- Implementation of replacement pedestrian routes which offer the same level of accessibility as those which are disrupted, including engagement with mobility impaired users to ensure their suitability and ease of access;
- Use of signalised crossings and traffic calming measures where pedestrians may be subjected to heavier traffic flows when crossing roads.

Designed in mitigation (particularly in relation to air quality and noise) to minimise impacts for residents in residential areas. While the above suggestions outline a number of key opportunities to mitigate adverse equality impacts for protected characteristic groups, any mitigation measures should respond to the effects identified by topic specialists (e.g. noise or transport assessors) as part of an overall impact assessment of the scheme. In order to fully assess the equality impacts of the proposed development, an Equality Impact Assessment should be undertaken once the scheme design is finalised, in conjunction with an Environmental Impact Assessment of the overall scheme.

6 DEVELOPMENT STRATEGIES

This section covers some elements of the requirements outlined in the AC Appraisal Framework Appendix B. We will follow this up with supplementary information including cost analysis.

6.1 Construction

6.1.1 *Construction Programme*

An outline permitting and construction programme is given in **Figure 6.1** below.

Figure 6.1 Outline Permitting and Construction Programme

Outline Code	Description	Early Start	Early Finish	Original Duration
1	**Key Dates**	01JUL15	01JUL15	0
1.1	Davies Commission Reports	01JUL15		0
2	**Government Determines Policy**	01JUL15	31DEC15	132d
3	**Planning & Permitting**	01JUL15	03JUL18	785d
3.1	Preliminary Design	01JUL15	30DEC16	393d
3.2	Initial Safety Case	18NOV15	23AUG16	200d
3.3	Environmental Statement	01JUL15	30DEC16	393d
3.4	Planning (DCO)	02JAN17	03JUL18	392d
3.5	Compulsory Purchase	02JAN17	03JUL18	392d
4	**Other Orders**	02JAN17	03JUL18	392d
5	**Design Development & Procurement**	02JAN17	25SEP18	452d
5.1	Design Development	02JAN17	29DEC17	260d
5.2	Approval to Tender	01JAN18	26FEB18	41d
5.3	Procurement	27FEB18	25SEP18	151d
6	**Construction & Commissioning**	26SEP18	31MAR23	1178d
6.1	Construction	26SEP18	30SEP22	1048d
6.2	Commissioning	03OCT22	31MAR23	130d

The programme shows a political decision to proceed in 2015, planning permission secured by 2018, construction commencing in 2018 and completing in 2022, and commissioning in 2023. This is based on assumptions including:

- The Commission reports in summer 2015. The magnitude of the issues suggests that it is unlikely to be able to conclude its work earlier.
- The Commission's recommendations are sufficiently clear to allow early adoption as policy and for development work, including for example ecological baseline surveys, to be progressed. Basing the proposal on existing facilities means that, with a clear policy direction, the time period for action is reduced compared with non-airport sites where an appropriate organisation will need to be put in place.
- Our working assumption is that permission for the scheme would be sought by applying for a Development Consent Order (DCO) under the Planning Act (2008)[68]. This would be the appropriate planning route as the scheme would be considered a Nationally Significant Infrastructure Project (NSIP) and would take the typical timescale for developments using this route.
- Development of the Safety Case, design and procurement would be undertaken with a certain degree of risk, primarily in respect of the mitigations required rather than the principle, which would be a matter of policy. A clear policy direction through an Aviation National Policy Statement (which we anticipate would be prepared by the government following the Davies Commission's final report) and the benefits to the industry of an early opening date lead us to consider this reasonable. Substantial work would have already been done to prepare for the Development Consent Order

[68] The alternative would be a hybrid bill.

Application and the other permissions required, such as Compulsory Purchase, Highways Orders and the like. Continuing the design work would be likely to be cost-effective even at risk. The clear policy direction would facilitate the involvement of stakeholders such as the Highways Agency, local highway authorities and utility companies in advance of final permissions.

- The Safety Case would be developed in parallel to the preliminary design, because it is both informed by the design and may have consequence on the design. As this proposition has limited impacts on airspace in itself and does not involve the risks associated with the use of three parallel runways it is assumed that it would take no longer than the safety case for other Heathrow options.
- Construction and commissioning would take 54 months based on outline consideration of the work.

The programme indicates that the earliest opening date would be around 2023, some seven years following the report of the commission.

Risks are outlined in Section 6.3.7 below.

6.1.2 *Transition Period Arrangements*

This proposition is for incremental development of an existing airport. Significant parts of the development are remote from the airport boundary which will limit the impacts on operations whilst these are constructed.

All airports are subject to development and have procedures in place to manage construction projects. Heathrow Airport Limited is no exception to this and is used to delivery of major projects within a constrained environment including Terminal 5 and the new Terminal 2.

The masterplan has been conceived to develop additional facilities relatively quickly to reduce the need for transitional arrangements between now and when capacity can be developed. It has also been developed with phasing in mind and this will allow some of the development to be made in line with demand.

6.2 Financing Plans

6.2.1 *Introduction*

This section is currently under development and will follow separately.

6.2.2 *Costs*

We are in the process of finalising our cost plan. This will be provided separately.

RIL have engaged Gardiner & Theobald LLP to provide masterplan level cost advice for this stage submission. Through engagement with the URS led team a cost plan structure has been established that provides clear distinction between the principal areas and elements for the proposal.

The cost plan contains the following sections:

- Executive summary
- Cost estimate
    - Airport
    - Heathrow Hub
    - Automated People Mover (APM)
    - Southern rail access
    - M25 diversion

  - Heathrow Hub remote bag transfer (optional)
  - Phasing allowance
  - Other development cost (including land acquisition)
  - Fees (professional, planning & building control)
  - Contingency
- Notes and exclusions
- Basis of estimate.

The cost plan responds to the level of detail available for respective elements of the scheme. The following bullet points express the basis for costs included against indicative substantive scope items:

- Overall gross area allowances for ecology/environmental, enabling works and utilities
- Spot allowances for major scope items (without design at this stage) e.g. relocation of water treatment works at the Heathrow Hub site
- Facility/elemental level benchmark rates where design scope evident e.g. linear rate for rail permanent way, area rates for airfield apron construction, area rates for terminal development, satellites and stands
- Percentage based allowance for preliminaries and on-costs
- Risk factored into cost plan through individual assessment of each area of cost (indicated in columns throughout). Range of risk provision associated with respective elements.

6.2.3 *Charges to Airlines*

This section is currently under development and will follow separately.

6.2.4 *Investors and Private Sector Finance*

This section is currently under development and will follow separately.

6.2.5 *Public Sector Finance*

This section is currently under development and will follow separately.

6.2.6 *Outline Financial Model*

This section is currently under development and will follow separately.

6.2.7 *Reactions of Rivals/Competitor Analysis*

This section is currently under development and will follow separately.

6.2.8 *Risks and Uncertainty*

This section is currently under development and will follow separately.

6.3 Planning

There are currently two routes the government can follow for obtaining planning permission for a scheme of this type: a Hybrid Bill; or a Development Consent Order (DCO) under the Planning Act 2008. Whilst Hybrid Bill would enable the scheme to become an Act of Parliament, the process can be lengthy and is more commonly applied to linear projects such as High Speed 1 and Crossrail.

For the purposes of this proposal we have made the assumption that the scheme will be considered a Nationally Significant Infrastructure Project (NSIP) and permission will be sought by applying for a DCO. However further review is needed to decide which is the most

appropriate route. Part of this work needs to consider whether Heathrow Hub is a separate or combined application with the runway extension proposals.

Current guidance from the Airports Commission has outlined that a recommendation on the scheme to be taken forward will be provided in the summer of 2015 and it is anticipated that this will inform an aviation National Policy Statement (NPS). From this point, should this proposal be taken forward, we would expect to undertake work as soon as possible on the DCO pre-application process in order to meet the timeframes stipulated for the operation of the additional runway.

6.3.1 *DCO Process*

The planning application process for a scheme of this nature can be rigorous and involves consideration of many elements of planning legislation. We would seek to engage with the Planning Inspectorate at the earliest opportunity to ensure the process is in line with the legislative requirements and aviation NPS.

The proposed scheme spans five local authorities. This introduces challenges around potentially conflicting priorities from each of these authorities who will be key stakeholders alongside other statutory consultees such as the Environment Agency, Natural England, etc., throughout the DCO application process.

One of the risks with a DCO application is the length of time required for the process to be completed. This would mean that for a construction commencement date of 2018, pre application planning would need to start immediately alongside the environmental assessment and design work. This is not unusual however and the benefit of a DCO application is that all consents, including land Compulsory Purchase Orders (CPO), Highways Orders, Environmental Impact Assessment (EIA) and any necessary environmental permits are wrapped up within a DCO application.

A critical part of an infrastructure scheme of this scale is a detailed and accurate understanding of the land, its existing use, services, constraints and interests both in order to gain consent but also to correctly identify key stakeholders for consultation. As the detailed design is developed, land referencing searches will need to include any mitigation and/or compensation areas and potentially within the CPO.

6.3.2 *Other Legislative and Policy Requirements*

Although a DCO application includes all necessary statutory requirements, there are two areas which fall outside of this consenting regime: the de-designation of Green Belt land and compliance with European Directive Habitat Regulations.

Elements of the proposed scheme, including some mitigation areas currently sit in areas which are currently designated as Green Belt land. Should there be no viable alternatives outside of this designation at detailed design, we would submit representation to the relevant local authorities asking them to go through the process of de-designation to release this Green Belt in advance so that it does not act as a barrier to scheme development. This submission would consider the reasons for designation – such as whether the land has been designated as such in order to prevent unrestricted sprawl of large built-up areas, to prevent neighbouring towns from merging, to assist in the safeguarding the countryside from encroachment, to preserve the setting and special character of historic towns/features or to assist in urban regeneration by encouraging the recycling of derelict and other urban land. Green Belt boundaries can be altered through the local plans and we would work with the relevant local authorities to redefine if necessary through considering a sustainable development approach that would not lead to further urban sprawl. The risk associated with this process is that by running in parallel

with the preparation of a DCO application, there is the potential for a delay in granting consent until de-designation has been completed.

As this scheme is situated within 365m of the South West London Waterbodies Special Policy Area (SPA), a Habitats Regulation Assessment Screening would be required to ascertain whether there will be any adverse effects to the SPA as a result of the proposal. This process would be undertaken in parallel with the EIA. Should a full Habitats Regulation assessment be required it would need to demonstrate that alternative scenarios had been considered and a case made to establish that the principles of imperative reasons of overriding public interest (IROPI) were met.

6.4 Engagement

6.4.1 *Introduction*

The proposals have been the subject of a wide-ranging community engagement programme. In particular, Heathrow Hub Ltd has engaged directly with local councils (councillors and officers), Members of Parliament, members of the London Assembly and local groups and other stakeholders to both inform them of the proposals and to seek their views on the key issues of concerns and how these concerns might be overcome.

In addition, the community engagement programme has sought to explain the benefits of the proposal and how these might improve the current situation for many people living in the Heathrow area.

6.4.2 *The Community Engagement Programme*

The key elements of the community engagement programme to date have been:

- A programme of face-to-face meetings with local councils (members and officers), Members of Parliament, members of the London Assembly and local groups and other stakeholders, the majority of which were led by Captain Jock Lowe, Director of Heathrow Hub Ltd. The details of these meeting are set out below in Section 3 of the **Attachment 6-1** with the key issues raised at the meetings included in its Appendix 1.
- The publication of a factsheet, including details of the proposals, together with further details in the form of 'questions and answers' responding to the key issues raised during the community engagement programme. The factsheet has been available in hard copy format and electronically and is attached in **Attachment 6-1** as Appendix 2
- An interactive website http://www.heathrowhub.com/. The website includes details of the dedicated phone number +44 (0) 845 262 0159 and Email address, heathrowhub@quatro-pr.co.uk.

6.4.3 *The Programme of Face-to-Face Meetings*

A Programme of face-to-face meetings has been arranged with the following councils (councillors and officers), Members of Parliament, members of the London Assembly, local groups and other stakeholders:

- 17th October 2013 - Meeting with Kwasi Kwarteng MP (Conservative, Spelthorne)
- 14th January – Presentation to Spelthorne Borough Council
- 22nd January - Meeting with Alok Sharma MP (Conservative, Reading West)
- 3rd March – Meeting with John Stewart of HACAN
- 4th March – Meeting with Stanwell Moor Residents Association
- 5th March – Meeting with Bucks County Council
- 6th March – Meeting with Richings Park Residents' Association
- 12th March – Meeting with Mary Creagh MP, Shadow Transport Secretary

- 13th March – Presentation South Bucks District Council
- 24th March – Meeting with Hounslow Council
- 24th March – Presentation to Mole Valley District Council
- 25th March – Presentation to Surrey County Council
- 7th April - Meeting with Mary Macleod MP (Conservative, Brentford and Isleworth)
- 8th April – Meeting with Andy Slaughter MP (Labour, Hammersmith)
- 10th April - Meeting with Dr. Onkar Sahota MLA (Labour, Ealing and Hillingdon)
- 14th April – Meeting with Seema Malhotra MP (Labour, Feltham and Heston)
- 16th April – Meeting with South Bucks District Council (Meeting with Officers)
- 22nd April – Meeting with Slough Borough Council (Meeting with Officers)
- 6th May – Meeting with Hounslow Council (Meeting with Officers)
- 8th May – Meeting with Ealing Council.

In addition further meetings have been arranged with the following:

- June - Presentation to Colnbrook with Poyle Parish Council (date to be arranged)
- 11th June - Presentation to Windsor & Maidenhead Council Aviation Forum
- 29th July - Presentation to all Members of South Bucks District Council
- 15th September - Seminar for Surrey County Councillors

Unfortunately, a number of local authorities declined to meet members of the Heathrow Hub team because of their 'in-principle' opposition to Heathrow expansion, as follows:

- London Borough of Hammersmith & Fulham
- London Borough of Hillingdon
- Reading Borough Council.

Details of their written responses are included in a more detailed report on engagement contained at **Attachment 6-1**.

6.4.4 *The Key Issues Raised during the Community Engagement*

The key issues raised during the community engagement programme were:

- **Noise**, particularly in respect of night flights and early morning landings and the need to maintain the current ability to provide respite for residents living in the area
- **Surface Access** – more passengers should be arriving by train, there should be less congestion on the roads
- **Safeguarding** existing jobs and businesses in the Heathrow area
- **Minimising** the impact on local communities
- **Keeping** local disruption to a minimum, particularly around the M25.

Further detail of the concerns raised is included in the more detailed report on engagement containing in **Attachment 6-1**.

6.4.5 *Future Engagement*

We will continue to engage with local communities, their elected representatives and local stakeholders through a programme of further meetings, presentations and briefings. This will be supplemented by further information updates on our website and factsheets which will be distributed around and within the community. Our community telephone hotline will remain available for individual enquiries, as well our community email link through which local residents and groups can give their views and request further information. In addition we will providing the local, regional and national media with regular updates.

We will also work to develop a future programme of consultation and engagement on the specifics of proposals with the aim of taking on board feedback, achieving an appropriate consensus, and securing consents.