hs2 engine for growth

HIGH SPEED RAIL: INVESTING IN BRITAIN'S FUTURE

Consultation on the route from the West Midlands to Manchester, Leeds and beyond

July 2013

HIGH SPEED RAIL: INVESTING IN BRITAIN'S FUTURE

Consultation on the route from the West Midlands to Manchester, Leeds and beyond

July 2013

Department for Transport

High Speed Two (HS2) Limited has been tasked by the Department for Transport (DfT) with managing the delivery of a new national high speed rail network. It is a non-departmental public body wholly owned by the DfT.

Department for Transport
Great Minster House
33 Horseferry Road
London SW1P 4DR

Telephone: 0300 330 3000

General email enquiries: FAX9643@dft.gsi.gov.uk

Website: www.gov.uk/dft

The Department for Transport has actively considered the needs of blind and partially sighted people in accessing this document. The text will be made available in full on the Department's website. The text may be freely downloaded and translated by individuals or organisations for conversion into other accessible formats. If you have other needs in this regard please contact the Department.

To order further copies contact:
DfT Publications
Tel: 0300 123 1102
Web: www.dft.gov.uk/orderingpublications

Product code: P2C01

recycle

Printed in Great Britain on paper containing at least 75% recycled fibre.

Contents

Foreword – Rt. Hon. Patrick McLoughlin

HS2 will be a vital part of our infrastructure. This new high speed line from London to Birmingham and then Birmingham to Leeds and Manchester will open up opportunities for this country that we have not seen in generations. Its scope to transform this country is enormous.

The delivery of a state-of-the-art, safe, reliable high speed network will not only better serve our great cities but will return Britain to the forefront of engineering and construction. We must seize the chance to deliver it. We can generate jobs, support regeneration and growth in cities and unite regions. This will enable them to better compete with the capital, building a stronger Britain.

HS2 is a project that is rapidly gathering pace. Since I announced my initial preferred routes for the HS2 lines to Manchester and Leeds in January the HS2 programme has made significant progress.

In recent weeks the High Speed Rail Preparation Bill received the overwhelming backing of the House of Commons when it voted on whether it should proceed to the next stage, demonstrating the extent of Parliament's support for HS2. This Bill allows us to proceed with detailed design work, ground investigations and ecological surveys, so that no time is wasted in delivering the project. HS2 will be a powerful engine for growth and we are determined to keep up the pace of its delivery.

However, we must ensure that everything possible is done to mitigate the impacts of HS2 on people and the landscape. This is why in May we took the unprecedented step of publishing a 5,000 page draft Environmental Statement detailing the impacts of the HS2 Phase One route between London and Birmingham. Responses to the consultation will ultimately inform the Environmental Statement included with the hybrid Bill for Phase One, which will be deposited in Parliament before the year is out.

Alongside the draft Environmental Statement, we launched a consultation on suggested design refinements to the Phase One route. This proposed additional tunnelling in certain areas and, alongside that included in the Environmental Statement, means that 70% of the surface route between London and the West Midlands will include noise mitigation measures (such as cuttings, landscaping and fencing). We have listened and we will continue to listen.

We are also continuing to refine our plans for Phase Two. Following the announcement of my initial preferred route back in January, we have conducted a period of informal engagement with MPs, local authorities, station city partners and environmental organisations in areas that the proposed route passes through. Their views have been incorporated into this consultation wherever possible and we will continue to talk to them as the project progresses.

Today, I am beginning a period of public consultation on this updated Phase Two route. Phase Two will turn HS2 into a truly national asset that we can be proud of. It is vital that we get it right. We need your views so we can continue to ensure that the high speed lines from the West Midlands to Manchester, Leeds and beyond are the very best that they can be.

This is an opportunity to strive for the very best in every aspect – to boost our regions, to embrace new and sustainable technology and to ensure the very best passenger experience. We will provide a long-lasting, secure and efficient rail legacy for future generations, just as our Victorian railway pioneers did for us nearly 200 years ago.

I am determined to find the solutions that benefit the greatest number of people, best support our cities and have the smallest impact on our environment. Our consultations with the public are a vital part of achieving these goals. I very much hope you will join the debate – in this case on Phase Two of HS2 – and help us to shape a network we can all be proud of.

Rt. Hon. Patrick McLoughlin MP,

Secretary of State for Transport

Executive Summary

The number of people travelling by train has doubled over the last decade. Demand for inter-city journeys, commuting and freight rail transport is rising fast and will continue to do so in the future. This means that Britain's railways are already over-stretched and will get more and more overcrowded over the next 10 to 20 years.

HS2 will tackle this problem by building a new railway line and the first line north of London for 120 years. Phase One will tackle the congestion and over crowding on the West Coast Main Line. Phase Two will do the same for the East Coast and Midland Main Lines.

Not only will HS2 provide more frequent inter-city services for passengers. It will also significantly reduce journey times, provide better connections between our major towns and cities, and release capacity on the existing railway network for new inter-city, commuter and freight services.

This improvement will make our railways fit for the next 50 years and beyond. With HS2, our railways will get better and better. Journeys will be shorter, our towns and cities will be closer together, there will be more regular and reliable services, our economy will benefit, and industry will get a boost from the construction of the new railway. Without HS2, our railways will get worse. Journeys will be less reliable and more over crowded. And our economy will not benefit from a modern, high speed transport system.

That is why the Government believes that this project – expensive though it is – is vital for the future well being of our country.

The Project

The HS2 network will provide high capacity, high speed links between London, Birmingham, Leeds and Manchester, with intermediate stations in the East Midlands and South Yorkshire.

Trains will be able to run onto the existing rail network, continuing at conventional speed to a wide range of additional destinations in the UK, without the need to change trains. This means that journeys to and from places including Liverpool, York, Newcastle and Glasgow and Edinburgh will be quicker than they are today.

Under HS2 many long-distance, inter-city rail services will transfer to the high speed rail network, which will allow us to use the capacity freed up on the existing network, especially the congested lines to the north of London, to run extra commuting, regional and freight rail services.

The Need

Our previous investment in rail infrastructure has not kept pace with the growth in our population and changes in our country. The UK has an ever increasing demand for inter-city, commuting and freight travel. Over twice as many inter-city journeys are being made today compared with 10 years ago, despite the recent challenging economic circumstances.

This will only get worse as our population grows and more of the population lives in the main cities of the UK. Our north-south transport links are amongst our most important national assets, but they will be most exposed to future pressures. For the UK to prosper and succeed in the global race, the Government needs to deliver a reliable transport network connecting our population; to allow people to travel easily and quickly between cities for business or for leisure; and to allow goods to be transported to where they are needed.

The Options

We have already looked hard at the alternative ways of providing this capacity:

- Construction of a new motorway network;
- Greater use of domestic air travel;
- The use of telephone and internet communications replacing the need for long-distance travel;
- Investment in the existing rail network; or
- Building a new conventional speed railway line.

We have concluded that none of these options offer an effective long-term solution to the challenges we face, in particular crowding on our main transport corridors. High speed rail networks are in place around the world. The technology has been demonstrated over many years.

The Transformation

HS2 will link eight of Britain's largest cities, with shorter journeys bringing two-thirds of the population of northern England to within two hours of London. This will radically re-shape the economic geography of the nation, bringing our cities closer together and rebalancing growth and opportunities. The shorter journey times will transform peoples' opportunities to travel and work in the UK – Birmingham, the East Midlands, Sheffield and Leeds will all be connected by journeys of less than 20 minutes.

HS2 will be integrated with the nation's airports: direct services to Manchester and Birmingham; a quick, direct 11 minute link to Heathrow via a connection at Old Oak Common, with the option for a spur to Heathrow in the future; and short connections to East Midlands Airport from the East Midlands hub station at Toton.

HS2 is forecast to generate over £50 billion in benefits for the UK[1]. These effects will start to be felt even before the first trains start running in 2026 – some estimates suggest that Phase One alone will add £4.2 billion to the economy between 2011 and 2027[2]. By significantly reducing journey times and boosting capacity, HS2 will help our major cities form a national economic unit that can be globally competitive.

HS2 will help to reshape Britain's economic geography and stimulate development. Overall we estimate that in excess of 100,000 jobs will be created by HS2. However, the Core Cities group – representing eight of England's largest city economies outside London – predict that HS2 will underpin the delivery of 400,000 jobs[3].

The Government is committed to realising lasting benefits from HS2 by supporting the country's engineering base in the construction of the network, bringing new jobs and opportunities for new skills. Our ambition is to make the new network an engine for growth across the country, accessible to all and providing a legacy of jobs, connectivity and growth across the UK.

[1] The Economic Case for HS2, HS2 Ltd 2012
[2] Unlocking potential, maximising growth through infrastructure delivery, Deloitte 2013
[3] http://www.corecities.com/sites/default/files/images/publications/Transport%20infrastructure%20requirements%20report%20final.pdf

This document

This document explains the Government's proposals for Phase Two of HS2 which includes:

- The routes from the West Midlands to Manchester and Leeds with stations at Manchester Airport, Manchester City Centre, in the East Midlands close to Derby and Nottingham, Sheffield and Leeds; the connections to the existing railway at Crewe, south of Wigan and south of York to allow the trains to serve even more destinations; and the supporting infrastructure required, for example depots;
- Seeking your views on whether there should be any additional stations on either leg;
- An explanation of the sustainability impacts of the proposed route;
- Ideas on how the rail capacity freed up on the existing rail network could be used to spread the benefits of HS2 to other towns and cities; and
- How we could integrate HS2 with other utilities, like water or electricity, alongside the line to maximise the benefits of this investment.

WHY THE UK IS INVESTING IN HS2

Capacity By 2025 the West Coast Main Line will be full

Long distance rail travel has doubled since the mid-1990s

18 trains an hour will be run by HS2, doubling the number of seats between London and Birmingham

Connectivity HS2 will redraw the economic map of Britain

8 of Britain's largest cities will be better connected

2/3 of the population of Northern England will be within 2 hours of London

Growth HS2 will help secure future prosperity

For every **£1** invested, the benefits of HS2 will return **£2**

£42 billion

[illegible]

Regeneration HS2 is a major catalyst for job creation

In the West Midlands, HS2 is key to plans to provide **100k jobs**

When open, it is predicted that HS2 will underpin the delivery of **400k jobs**

hs2 engine for growth

Part I

About this document

This document is the primary source of information for the Government's public consultation on the proposed route for 'Phase Two' of High Speed Two (HS2), the UK's new high speed rail network. Phase Two of the network will connect with a high speed line between London and the West Midlands (known as 'Phase One'), and will run on to Manchester and Leeds, along western and eastern legs.

HS2 Ltd has been developing and refining a range of options for Phase Two of HS2 since 2010, with a brief to ensure the benefits are maximised while the impacts on local communities are kept to a minimum. Its advice to Government was submitted in March 2012 and set out all the options the company considered, presenting the greatest detail on those options that had emerged as the strongest. The Government consulted with the station city partners who would be served by HS2 to ensure that its initial preferred options, announced in January 2013, would be those that best supported development and growth in future.

The Government then carried out a period of informal engagement in preparation for the launch of this consultation. Ministers met with Members of Parliament affected by the Phase Two route, station and depot options to explain the context of the January announcement, ensure MPs were sufficiently engaged, understood the process and had an opportunity to raise any initial concerns or local priorities ahead of the public consultation. Through this exercise Ministers looked to ensure that urgent changes required to the route could be made ahead of the launch of consultation, to listen to other suggested amendments and point the interested parties to this consultation as the place to register them formally. In parallel, HS2 Ltd also engaged with the local authorities, Network Rail, Highways Agency, station city partners and key environment and heritage organisations affected by the line of route. This approach ensured that the contributions of various stakeholders and partners were considered as HS2 Ltd continued to develop and refine their engineering designs. Changes were made to the route in two locations:

- close to East Midlands Airport which will reduce the impacts on a proposed planning application for a Strategic Rail Freight Interchange; and
- at Sheffield Meadowhall where we have increased the curvature of the line to avoid impacting on a specialised engineering component maker and their proposed development and a major retail outlet.

However, this is only the very beginning of the engagement process. This consultation is the main opportunity to help shape the proposed Phase Two route.

This document explains how the Government has reached its view on the proposed route. It also describes the ways in which you can submit your views on the proposals and help shape the development of Phase Two of HS2. The questions on which we are consulting are listed at the end of Part I of this document. They are also set out in the relevant sections of Part II and repeated in Part III, along with details of how to respond to them.

1 The need for HS2

1.0.1 The Government's proposals for HS2, the biggest infrastructure project in the UK in recent years, have generated a wide public debate. This is as it should be: HS2 will change Britain, take time to complete and cost money. Parliament will be fully involved, with the Preparation Bill for HS2 which is currently before the House and the hybrid Bills to follow later. But this is not just a debate for Government and politicians. People who will be affected or benefit, cities and businesses, must all have their voices heard too.

1.0.2 The purpose of this document, and of the public consultation events that will follow later this year, is to seek views on the proposed routes from the West Midlands to Manchester and to Leeds.

1.1 Enhancing our existing railway infrastructure is not good enough

1.1.1 A debate about the benefits and impact of high speed rail has to start with a proper awareness of why it is needed.

1.1.2 Until recently, the UK's railway infrastructure has not received the sustained investment required to keep pace with the growth in our population and the changes in our country. A growing economy and a rising population mean that there is an ever increasing demand for inter-city, commuting and freight travel.

1.1.3 Past Governments took a piecemeal approach to upgrading the network. This can not overcome the fundamental limitations of a national railway infrastructure that started to be laid down in the 1830s and which was largely complete by 1900.

1.2 Inter-city travel

1.2.1 The West Coast Main Line (WCML), the main railway line linking Birmingham, Manchester and Liverpool with London, will soon be full. The £9bn upgrade to the line, completed in 2008, resulted in a considerable increase in the number of long distance services, freight paths and a significant reduction in journey times[4], but it will not meet the long term challenge we face. The East Coast Main Line (ECML) and the Midlands Main Line (MML) also face similar challenges.

1.2.2 This challenge comes at a time when the railways have never been so popular. A better service and increased reliability mean that rail travel is now a competitive choice for long distance journeys in the UK[5]. 128 million long distance journeys were made in 2012/13 – double the number made in 1997/8[6].

1.2.3 In some cities, the increase in rail demand has been even greater. As cities like Manchester and Birmingham have transformed themselves into modern urban centres, rail growth has exploded. Long distance rail travel between Euston and Manchester grew by 70% between 1999 and 2009. Between Euston and Birmingham, growth over the same period was 58%[7].

4 West Coast Main Line Route Utilisation Strategy (Network Rail 2011)
5 Rail has a market share of 47% for all trips between London and the North East, 44% between London and Yorkshire & Humber, and 40% between London and the North West (DfT National Travel Survey)
6 Office for Rail Regulation (http://dataportal.orr.gov.uk)
7 West Coast Main Line Route Utilisation Strategy (Network Rail 2011)

1.2.4 And despite the challenging economic circumstances, the long-distance rail market defied expectations and grew by 17% between 2008-09 and 2012-13. There is no evidence to suggest that this demand growth will go into reverse, although the pace of growth may vary[8].

1.2.5 Since 2007, the Government has set out a rail investment strategy that will allow the railway to keep up with current demand[9]. In July 2012 the Government announced more than £9 billion of growth-boosting railway upgrades across England and Wales including investment in stations, trains and infrastructure to keep pace with demand.

1.2.6 The demand forecasts are based on relatively cautious planning assumptions by the Government that between 2013 and 2036 overall rail passenger demand will increase by 70%[10]. Network Rail's view, however, is that the urgent need for significant new railway capacity is far greater than this. The table below shows the expected increase in demand for long distance rail journeys between some major UK cities.

	Birmingham	Glasgow	Leeds	Liverpool	London	Manchester
Glasgow	74					
Leeds	111	93				
Liverpool	80	82	89			
London	81	93	132	119		
Manchester	116	99	104	92	142	
Sheffield	62	*	94	91	132	98

Source: Network Rail Long Term Planning Process Long Distance Market Study for Consultation, March 2013 – global prosperity scenario

* – not reported, too few passengers

Percentage total increase in rail passenger journeys 2012-2043

1.2.7 Some of these projections illustrate even more starkly the urgent need for new capacity. Without major investment in new infrastructure, it is likely that the existing railway would simply be unable to cope with, for example, a 142% increase in passenger demand between London and Manchester. That would make the railway in 2043 unrecognisable from the one we have now.

1.2.8 This will make journeys more crowded and less pleasant[11]. These developments will not be insignificant: research by Passenger Focus shows that the quality of people's experience is most affected by crowding on trains[12]. It is not only that rail travel will be more crowded, without HS2 there is a threat to the current standards of reliability and journey time on our existing railway.

Commuting

1.2.9 Increasing demand and crowding on long distance services has been created not only by growth in inter-city travel but also growth in use of these trains by commuters from places like Milton Keynes, Northampton and Reading. We have seen over generations how improvements in journey times have allowed many people who work in London to take advantage of the lower housing costs in these locations, but this has placed increasing pressure on the rail network. In 2011 there were 3,700 passengers standing during the morning peak into Euston, each and every weekday. That figure is 3,100 into Leeds, 4,000

8 See *Revisiting the Elasticity Based Framework* (Arup/Oxera, 2010) and *A Time Series Analysis of Rail Demand in Great Britain* (MVA, 2009)
9 Delivering a Sustainable Railway 2007 and the High Level Output Specification (HLOS) 2012.
10 Updated economic case for HS2 (HS2 Ltd, August 2012)
11 By 2033 long distance trains will be 80% full across the entire day (High Speed Rail Command Paper, DfT 2010)
12 Future priorities for the West Coast Main Line: Released Capacity from a potential high speed line (Network Rail/Passenger Focus, 2012)

into Manchester and 4,700 into Birmingham[13]. As more passengers use the railway in the next few years, our ability to accommodate them becomes increasingly constrained.

1.2.10 By 2023, it will be normal for a peak time train serving Euston to have all seats taken and a significant number of people standing[14]. But half of trains are also expected to have more standing passengers than the trains are intended to carry. This risks making current commuter patterns unviable. Commuters coming into Euston may simply not be able to get on a train at peak hours. For those that do, the travelling environment and quality of service will be unpleasant. In twenty years there will be almost two people for every commuter seat into Euston during the high peak[15].

Freight

1.2.11 This growing congestion on major rail lines will have a significant impact on the freight industry and its customers. The WCML, in particular, is a key artery for freight services, not least as it serves the UK's "golden triangle" for logistics warehousing between Rugby, Daventry and Northampton as well as several power stations and manufacturing centres. Around half of all UK rail freight uses the WCML at some stage in its journey, including much of the UK's international and domestic intermodal rail freight traffic. The Government's modelling suggests that the vast majority of international containers using national networks between Birmingham and Manchester are on rail rather than road. Total freight traffic is forecast to increase at an average of 2.1 per cent every year to 2043, implying a near doubling of the market over this period[16]. This reflects expected growth in the intermodal and biomass sectors, in particular.

1.2.12 With the M6 north of Rugby carrying some of the heaviest volumes of HGVs on the motorway network, there would be considerable potential, if capacity were available, for further modal shift to rail. However, both freight customers and third party logistics providers have expressed concern about whether there is enough capacity on the line to accommodate likely future freight services. Our inability to accommodate this demand will impact on our economic growth. It has been estimated that by running an extra 40 trains per day on the WCML, with the capacity that is freed by HS2, would deliver benefits of £500 million and remove 1,600 lorries a day from the motorways[17].

[13] DfT Rail Passenger Counts (Autumn 2011) (https://www.gov.uk/government/organisations/department-for-transport/series/rail-statistics)
[14] 85% of all peak services into Euston are expected to have passengers exceeding seated capacity (West Coast Main Line Route Utilisation Strategy, Network Rail 2011)
[15] High Speed 2: A Review of Early Programme Preparation (NAO, 2013)
[16] Long Term Planning Process Freight Market Study Draft for Consultation, Network Rail, April 2013
[17] I Brooker, WSP quoted in Rail magazine, July 2013

1.2.13 The potential impact of HS2 to support growth in rail freight by releasing capacity on the existing rail network has been identified by a Greengauge 21 study, which found that accommodating the increase in rail freight forecast for the WCML will allow significant reductions in HGV traffic and CO_2 emissions as rail freight currently emits 76% less carbon than HGV road freight[18].

1.3 Significant transport capacity is needed to support the development of the UK economy

1.3.1 The clear trend of growing demand for inter-city rail travel and for commuter travel into the main cities in the UK is exacerbated by likely population growth and increasing urbanisation in the UK. The geography of our country means that our north-south transport links are amongst our most important national assets and will be most exposed to these pressures.

1.3.2 The 2011 census showed that the UK population now stands at 63 million, compared to 56 million in 1981. 60% of the population of England and Wales live in built-up areas[19], with 33% living in the 10 largest built up areas in the country. And experts expect this trend to continue – by 2035 it is likely that the UK population will stand at 73 million[20], with the degree of urbanisation also increasing. Between 2001 and 2011, the proportion of the population of England and Wales living in the largest four urban areas increased from 27.5% to 29.5%.

1.3.3 The challenge is clear: for the UK to continue to prosper and to succeed in the global race, the Government needs to ensure investment in a reliable transport system that connects our population. So that people can travel easily and quickly between cities, whether on business or for leisure. So that goods can be transported from manufacturers to the cities where they are needed, or to ports for export. And so that people can easily get from home to their destination, on a transport system that is resilient to the weather, to disruption or to maintenance.

1.3.4 Transport matters for economic growth and there are many ways in which transport investment can influence both the overall level of economic growth and the distribution of activity throughout the economy[21]. HS2 will transform links between cities and will make it easier for businesses to service a number of cities from one office and thus reduce their costs as a result. It will give companies and employees access to a wider range of markets and job opportunities.

1.3.5 The Government has previously carried out extensive work[22] into the available alternatives for improving the capacity and performance of Britain's key inter-city links. Alternatives to High Speed Rail could include:

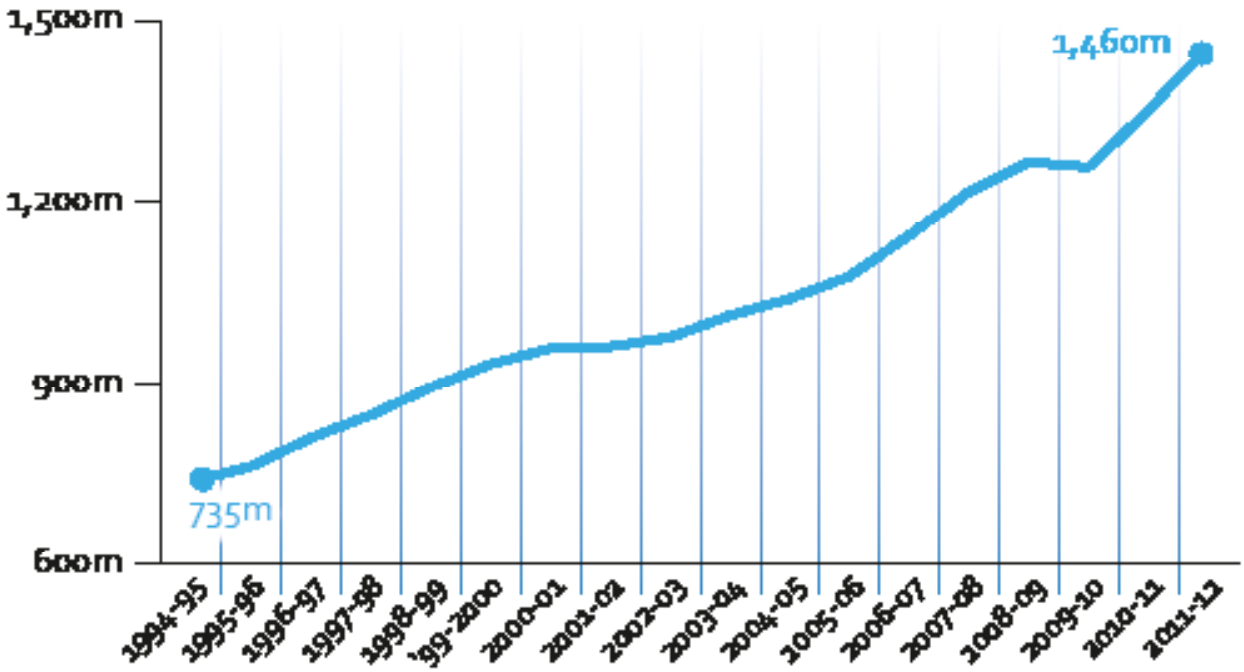
- construction of a new motorway network;
- further shift to air travel for domestic journeys;

[18] High Speed Rail – the Carbon impacts of HS2 (Greenguage 21 report 2012)
[19] Defined as built-up areas with a population greater than 100,000 people (Characteristics of Built-Up Areas, ONS, June 2013)
[20] Summary: UK Population: Projected to reach 70 million by Mid-2027 (Office for National Statistics)
[21] See, for example, Lakshmanan (2007)
[22] Review of Strategic Alternatives to High Speed Two (Network Rail, November 2011)

- an assumption that telephone or internet communication will replace the need for long-distance travel; or
- investment in the existing railway network as an alternative to High Speed Rail.

1.3.6 The Government concluded[23] that new motorways do not offer a sustainable solution to the challenges we face travelling between city centres, as urban congestion results in unreliability and delay. The cost and significant environmental impact of a new national motorway network do not make it a feasible option. Domestic aviation is a more carbon intensive form of transport than rail and offers less competitive journey times for many trips of less than 200 miles between major cities, not least because airports tend to be located well outside city centres. While technology offers significant benefits in keeping people connected and informed, we do not expect that it will replace the need for travel at any time in the foreseeable future as seen in the chart below. In fact, some academics believe that there is a positive relationship between telecoms and travel demand, suggesting that when the demand for telecommunications increases, people travel more, not less[24].

Passenger journey time and changes in technology



Source: Office of Rail Regulation

[23] High Speed Rail: Investing in Britain's Future – Decisions and Next Steps (DfT, 2012) at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/3648/hs2-decisions-and-next-steps.pdf

[24] Choo & Mokhtarian, 2006.

1.4 Can we deliver the capacity that the UK needs through upgrading the existing railway?

1.4.1 As part of our preparatory work in developing the proposals for HS2, the Government has looked at whether building a new conventional speed railway line would be a solution to our transport challenges. We have also considered whether improvements to the conventional railway would provide the same benefits as HS2.

1.4.2 HS2 Ltd's analysis indicated that building a new line along broadly the same route as HS2, but with a conventional line speed of 125mph, would be around £1.4 billion, less than a high speed line[25]. This is because regardless of the speed of a new line, similar infrastructure is needed and also because a slower line would attract fewer passengers and would therefore generate reduced revenues. In contrast, the reduction in benefits as a result of slower journey times and reduced passenger numbers would be expected to be as high as £6.2 billion. The additional benefits from building a new high speed line compared to a conventional speed line outweigh the additional costs by a factor of more than four to one. If entirely new lines are to be built, then the additional benefits from the transformation in connectivity that high speed rail can provide far outweigh the relatively small incremental cost of such an approach.

1.4.3 Enhancing existing railway lines has frequently been raised as a more attractive alternative to high speed rail and the Government has examined these alternatives to HS2 in numerous studies[26]. We have considered the costs and benefits of measures which would:

- lengthen trains on existing services;
- add more tracks to the WCML to deliver more capacity for long-distance and commuter trains; and
- upgrade the Chiltern route to provide more commuter capacity and free the WCML for inter-city traffic.

1.4.4 This work has included extensive modelling of how major programmes of investment in the existing railway would work, including assessment of an alternative proposition put forward by the 51M group of local authorities along the HS2 route.

1.4.5 The analysis of these potential alternatives has shown clearly that no upgrades to the existing line can offer the step change in passenger capacity required to meet long-term demand and which HS2 will provide. Even the best of the alternatives offers less than half the level of benefits of HS2. Neither will they achieve the journey saving times of a high speed railway. Our long term strategy cannot rely on forcing growing demand into just one key economic artery. Other issues with the alternatives include:

[25] HS2 Ltd, *Economic Case for HS2* (2011); at: http://highspeedrail.dft.gov.uk/library/documents/economic-case

[26] New Lines Study (Network Rail, 2008-09) http://www.networkrail.co.uk/newlinesprogramme/; High Speed 2 Strategic Alternatives Study – Strategic Outline Case (March 2010) http://www.dft.gov.uk/about/strategy/transportstrategy/eddingtonstudy/reportbychapters and https://www.gov.uk/government/publications/delivering-a-sustainable-railway-white-paper-cm-7176; High Speed Rail Strategic Alternatives Study – Strategic Alternatives to the Proposed Y Network (Atkins 2011) http://highspeedrail.dft.gov.uk/sites/highspeedrail.dft.gov.uk/files/hsr-strategic-alternative.pdf; "High Speed Rail London to the West Midlands and Beyond: A Report to Government by High Speed Two Limited (March 2010). Review of HS2 London to West Midlands Route Selection and Speed – A Report to Government by HS2 Ltd (HS2 Ltd 2012) https://www.gov.uk/government/publications/review-of-hs2-london-to-west-midlands-route-selection-and-speed; and, High Speed Rail Strategic Alternatives Study – Update Following Consultation (Atkins 2012) https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/3664/hs2-strategic-alternatives-study-update.pdf

- the disruption that will be caused to the existing railway during construction of these options (there were works every weekend, every bank holiday and a series of major blockades);
- the lack of overall resilience to the inter-city transport networks that an upgrade would provide compared to the construction of a brand new railway line; and
- The intensive off-peak service pattern in the alternatives would mean that freight growth could not be accommodated.

1.4.6 Even if some options were to offer good value for money, they fail to offer an effective long-term solution to crowding issues and were therefore not viable alternatives to new lines.

1.4.7 The Government's conclusion is therefore that a high speed network would represent the optimal solution for dealing with the UK's long-term rail capacity challenge on its main north-south lines[27].

[27] *Review of the Government's Strategy for a National High Speed Rail Network* (DfT, Jan 2012)

2 HS2 will transform the transport infrastructure of the UK

2.0.1 HS2 not only meets our capacity challenge, but it gives us the opportunity to create a better railway. It will offer better service, reliability and connectivity. It will have the potential for trains to leave just over 3 minutes apart, and the ability to move around 800,000 people, roughly the population of Leeds, every day which will provide a huge boost to rail travel.

2.0.2 HS2 will not be the traditional railway as we currently experience it. Trains will be up to 400 metres long, over four times the length of a jumbo jet. The new stations will allow passengers to navigate easily and quickly from their arrival at the station to their seat.

2.0.3 Experience shows that high speed rail lines can deliver improved reliability, which is valued highly by rail travellers. HS1, the line between St Pancras and the Channel Tunnel, remains among the world's most reliable railways with an average train delay of between 6 and 8 seconds. This reliability delivers real benefits to those using the service. On the South Eastern high speed rail services that run domestically on this stretch of line, customer satisfaction was at 92%[28]. Door to door journey times will fall and passengers will benefit from modern, more comfortable and less crowded services.

Reducing congestion and efficiently linking our major cities

2.0.4 As we have demonstrated, our rail infrastructure is already straining to cope with demand from both passengers and freight. The only viable response to this challenge is HS2. The longer and larger trains that will be able to operate on the high speed network mean that HS2 will release the pressure building inexorably on these lines, running up to 18 trains per hour between our cities, each train carrying up to 1,100 passengers. As well as these high speed trains there will be trains capable of running on both the high-speed network and on the existing railway. This will spread the benefits of high speed rail far wider allowing people to reach destinations on the existing rail network without the need to change trains, delivering improved journey times and increased capacity.

2.0.5 The HS2 line from London to the West Midlands will tackle the most urgent capacity constraints foreseen by Network Rail at the southern end of the WCML. The full HS2 network will also release significant capacity on the East Coast and Midland Main Lines. Long-distance services to the East Midlands, South Yorkshire and Leeds will switch to the new network, as well as the southern portion of journeys to Newcastle and Edinburgh.

2.0.6 The Government is aware of the importance of ensuring that the towns and cities in the Midlands and the North that do not have an HS2 station have the local connectivity so that they are still able to benefit from the new network. HS2 offers the opportunity to support wider regeneration as well as create new commuter markets. It is essential that the regions consider and plan now for the connectivity with HS2 that they will like to see when it opens. Although there are proposals for the connectivity at stations included later in this document, we want to hear from regions on their views

[28] National Passenger Survey Spring 2013

for the connectivity offering to ensure that the benefits of HS2 are spread as widely as possible.

2.0.7 The benefits of HS2 will not only be felt by those accessing the new high speed services. Many long-distance, inter-city rail services will transfer to the high speed network, which will allow us to run new services on the existing rail network. Understanding how this capacity can be best used will be a key factor in maximising the potential of HS2. There are many options for the use of this capacity including much needed additional commuter capacity; local and regional services that were previously impossible; and increases in rail freight, to boost the economy and take lorries off the roads.

2.0.8 Building on the analysis that Network Rail (NR) and Passenger Focus carried out on Phase One[29], in January this year we asked NR to consider how the existing rail network can respond to the growth opportunities generated after Phase Two of HS2 is open. NR's initial findings suggest that there are a number of possible future journey opportunities that could be created by the capacity freed up by HS2. This is important as it demonstrates that HS2 will not be just about station cities but that it will enhance and improve wider regional connectivity. NR felt that there was potential for around 110 towns and cities to benefit from the released capacity that HS2 will bring. Even an incremental approach could deliver the following benefits:

- Bradford and Wakefield could get improved frequency of trains to Leeds as well as increased services to London;
- Additional services from the South Coast to Manchester stopping at one or more intermediate locations such as Winchester, Oxford, Milton Keynes, Stoke, Macclesfield and Stockport;
- Potential to re-establish Coventry to Leicester and Nottingham through-services;
- Potential for additional freight services; and
- Additional services could be provided between Birmingham, Wolverhampton and Warrington stopping at one or more of the following intermediate locations; Sandwell and Dudley, Wolverhampton, Penkridge, Stafford, Crewe, Hartford, Winsford and Warrington Bank Quay.

More details about the study are in Chapter 10.

2.1 HS2: engine for growth

2.1.1 The economic growth of the United Kingdom has long depended on our ability to develop transport and communication links that promote trade and innovation. The development of the original railway, of our canal network, ports and road network allowed British cities to develop and compete successfully on a global level.

2.1.2 The growth of our country has continuously reflected this principle. International shipping routes helped to open up early phases of world trade; mass transit railways supported the development of cities here and all over the world[30]. In the modern era,

[29] Future priorities for the WCML: released capacity from a potential high speed line (Network Rail 2012)

[30] Crafts and Leunig *The historical significance of transport for economic growth and productivity,* 2005 (http://www.maroulaki.com/transport/UK%20transport%20Study/eddington_researchannex1.1_011206.pdf)

the UK like other countries has benefited from the completion of international airports which provide global connectivity, as well as domestic motorways and highway networks that benefit productivity growth.

2.2 Transport investment: a recipe for success

2.2.1 These lessons from history are borne out in the template for economic growth adopted by Governments around the world. Improving transport infrastructure is widely acknowledged as a key means of supporting economic growth and increasing productivity in major conurbations[31].

2.2.2 The World Economic Forum cites infrastructure as the Second Pillar of economic competitiveness. *"Extensive and efficient infrastructure is critical for ensuring the effective functioning of the economy…"*[32]. The Government's recent National Infrastructure Plan is clear about the connection between infrastructure investment and economic growth: *"Infrastructure is vital to the success of any modern economy; it drives growth, creates jobs and generates the networks that allow businesses and organisations to thrive"*[33].

2.2.3 The crucial role of infrastructure has been emphasised by the Organisation for Economic Co-operation and Development, which suggests that building better transport links can boost gross domestic product more than other forms of investment[34].

2.2.4 There is a consensus in developed economies around the world that the high up-front costs of infrastructure are a price well worth paying in order to access the economic benefits that they can bring. The costs of building the infrastructure and the relatively low payback during the early years of operation can be offset against the long-term foundations for a competitive economy that the investment builds. This can be measured by the value of the concessions that regulated infrastructure assets command when they are sold to the market.

2.2.5 This approach can be contrary to the conventional wisdom of 'sweating' transport infrastructure assets to achieve the highest value for money. But the Government believes that to provide investment in transport infrastructure is to focus on the best way of supporting economic growth more widely rather than to concentrate solely on achieving the highest levels of transport efficiency[35]. This was clearly demonstrated in the 2013 spending round when the Government committed over £70 billion in transport including:

- adding extra lanes to the busiest motorways, the equivalent of at least an additional 221 lane miles in total by opening the hard shoulder to traffic and using new technology;
- continuing to invest over £20 billion in the existing rail network up until 2021; and

31 See *Infrastructure and Growth: Empirical Evidence*, Egert, B., Kozluk, T. and Sutherland, D., OECD, 2009; *Transport infrastructure investment: implications for growth and productivity*, Crafts, N., Oxford Review of Economic Policy, vol. 25, number 3, 2009; *The Rate of Return to Transportation Infrastructure*, Canning, D. and Bennathan, E. in 'Transportation Infrastructure Investment and Economic Productivity', OECD, 2007

32 World Economic Forum (WEF) *Global Competitiveness Report 2012-13* (2012)

33 National Infrastructure Plan update 2013

34 Egert, B. Kozluk, T. & Sutherland, D. (2009). 'Infrastructure and Growth'. OECD Economics Department Working Papers, No.685

35 OECD Public Investment in the UK (OECD), http://www.oecd.org/unitedkingdom/43469354.pdf OECD Going for Growth 2012

- repairing the national and local road network. A total commitment of £10 billion with nearly £6 billion to help local authorities repair the local road network and over £4 billion to enable the Highways Agency to resurface the vast majority of the national network by 2020-21.

2.2.6 In well developed economies, transport can be as important in removing growth constraints as providing new growth opportunities. Running networks at capacity can leave little flexibility to adapt to new challenges. One of the reasons that London has continued to grow and to compete effectively as a global city has been the product of ten years' investment in its transport infrastructure. Upgrades to the infrastructure of the London Underground, the construction of HS1 and of Crossrail have provided London with the transport capacity to develop new trading patterns and to continue economic growth[36].

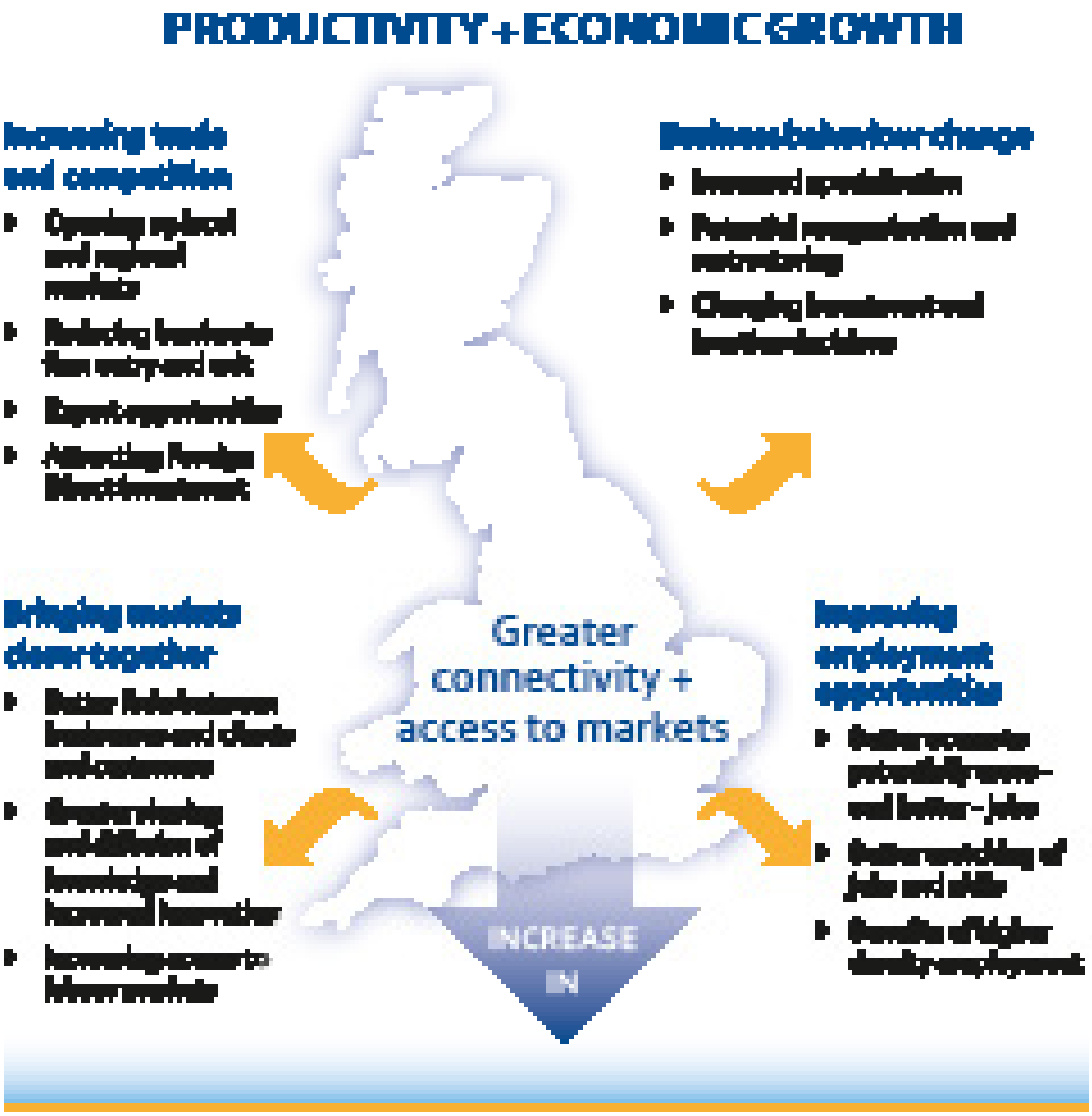
2.3 The benefits of improved transport infrastructure

2.3.1 Evidence shows that there are a number of ways in which investment in transport infrastructure can promote economic growth:

- **Reduced travel times:** transport can reduce the amount of time spent travelling thereby increasing business traveller productivity;
- **Reduced transport costs:** transport can benefit businesses and increase economic output where it reduces the price of inputs/outputs of the transport-using firm. Reduced commuting costs also make it easier for firms to attract labour at a given wage;
- **Improved reliability:** predictability of a journey is one of its most important advantages. Poor reliability has a particularly serious impact in relation to business travellers, causing productive time to be lost to the economy. Arriving on time is clearly important to rail passengers. Analysis of the National Passenger Survey[37], which Passenger Focus carries out twice each year, shows that punctuality and reliability is the most significant factor determining most passengers' overall satisfaction with the journey;
- **Benefits of locating people and businesses closer together:** transport can result in productivity benefits where it increases the proximity of firms and workers to one another. These so-called 'agglomeration benefits' can produce a more dense labour market: with better matching of skills to jobs, better connections between suppliers and markets, information spill-overs between firms and more choice in bigger places. There are numerous global examples of this phenomenon: e.g. Silicon Valley in California, or financial services in the City of London. Increased connectivity gives our cities the chance to increase agglomeration benefits which accrue from increased density. In a global economy, these benefits have the potential to give UK industry the competitive edge through raising productivity[38];

[36] See The Economic Benefits of Crossrail, Colin Buchanan/Volterra (2007), and Economic Impact of HS1, Colin Buchanan/Volterra (2009)
[37] The Spring 2013 survey available at www.passengerfocus.org.uk
[38] Evidence suggests that doubling economic mass (defined as the number of workers within a city or 'travel to work' area) increases productivity by some 4-8% (Rosenthal & Strange, 2003)

- **Increased competition:** transport can improve productivity by increasing competition between businesses by opening up access to markets and promoting innovation and investment; and
- **Influence on location decisions:** transport can improve productivity by encouraging businesses and workers to move to more productive locations (where they may achieve higher output/wages), resulting in further agglomeration benefits, plus potential for positive changes to the composition of the economy[39]. An econometric analysis of location decisions of 30,000 US headquarters by Strauss Khan and Vives (2009) finds that the areas that have received the most inwards moves are those with a high level of business activity, relatively low wages, and above all, good business transport links.



[39] 84% of the 2012 CBI/KPMG infrastructure survey correspondents said that the quality and reliability of transport infrastructure are significant in their investment decisions

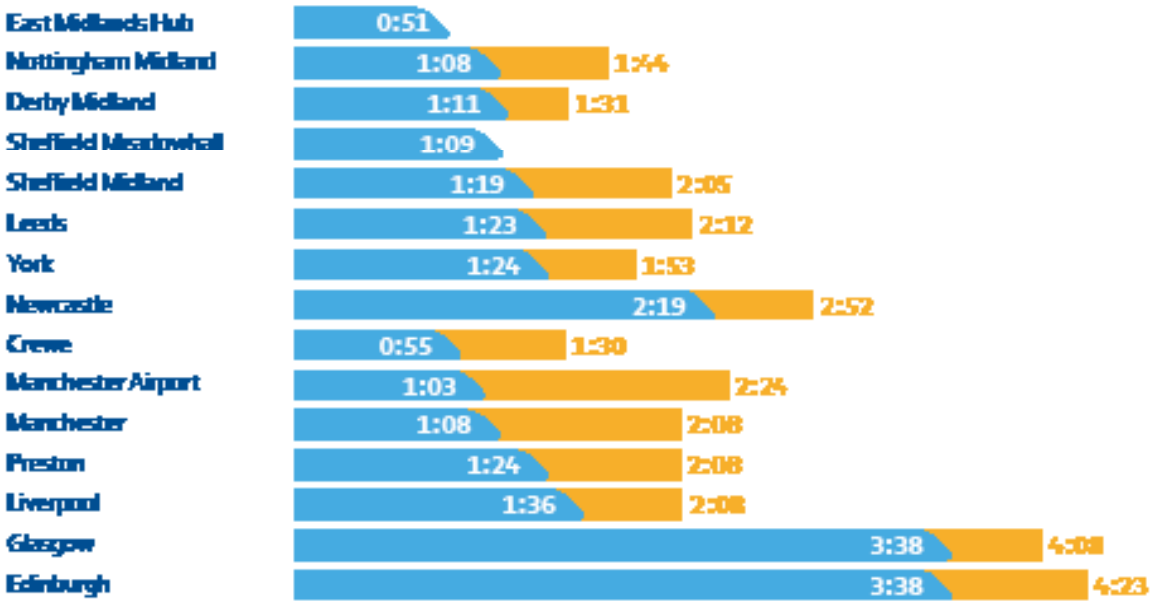
2.4 HS2 – redrawing the map of the UK

2.4.1 HS2 offers the potential to put all of these proven benefits into practice in the UK and to build a national infrastructure which would help to boost productivity, reduce costs, increase efficiency, expand business and labour markets and open up opportunities for increased national and international trade. Most significantly, it would do this on a national level rather than focusing these benefits on London. The proposed HS2 network would transform the UK's national connectivity:

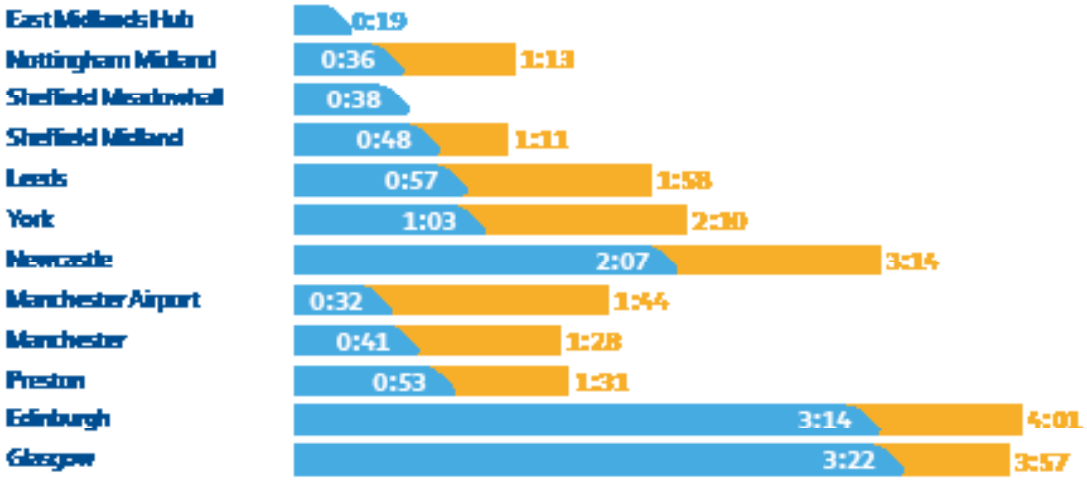
- HS2 will link eight of Britain's largest cities with a reliable, resilient and high-capacity train service, with other cities served by compatible trains running on to the existing rail network;
- Shorter journey times will transform people's opportunities to travel and do business in the UK. The Birmingham, East Midlands, Sheffield and Leeds stations will each be connected by journeys of less than 20 minutes. Each of these cities will be able to gain from the new proximity of its business, academic and cultural resources from one another. Two-thirds of the population of northern England will be within two hours of London and will be able to gain further from the expertise and specialisation of the capital; and
- HS2 will be integrated with the nation's airports, with direct services to Manchester and Birmingham airports and a short connection to East Midlands Airport from the East Midlands hub station at Toton. A quick direct connection to Heathrow will also be provided via a connection at Old Oak Common Hub and an onward 11 minute journey, with the option for a spur to Heathrow in the future.

Comparing journey times

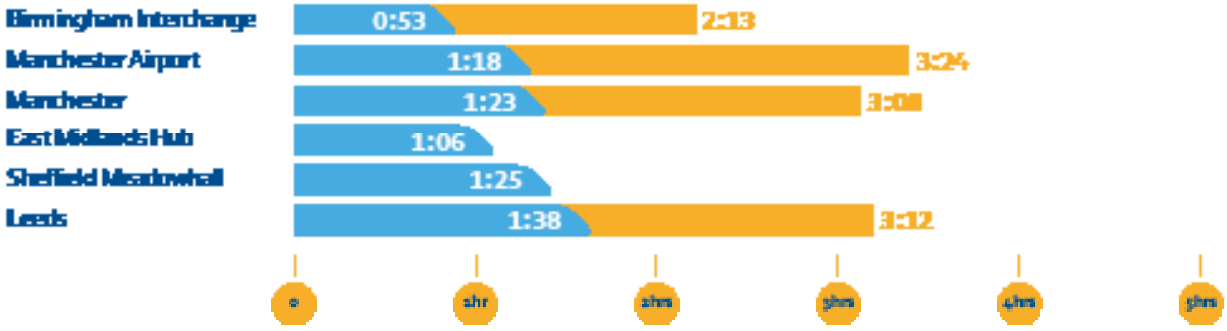
London to



Birmingham to



Heathrow via Old Oak Common



2.4.2 These predicted journey times show the contribution that HS2 will make to changing the economic geography of the nation, bringing our cities closer together and rebalancing growth and opportunities. This will be a step change in links between cities not seen since the completion of the motorway network.

2.4.3 This step change in connectivity is forecast to generate over £50 billion in economic benefits for the UK[40]. And that is only from a narrow transport point of view. The effects of HS2 will start to be felt even before the first trains start running in 2026 – some estimates suggest that Phase One alone will add £4.2 billion to the economy between 2011 and 2027[41]. There are wider economic benefits from improving connectivity between cities, which are not currently picked up in standard transport appraisal: including potential benefits of increased trade and specialisation between cities, and the potential to attract foreign investment.

2.5 Revitalising cities and regions across the UK

Rebalancing regional development

2.5.1 The Government is determined that the benefits of this infrastructure investment should be shared across the UK. London and the South East demonstrated the ability to adapt well and showed resilience as our economy shifted increasingly towards the service sector and a knowledge- and skills-based economy. Victorian-era railway links were already available to deliver people in vast numbers to the city. London and the South East have also seen continued investment (particularly in commuter rail and underground services) which has allowed for a virtuous cycle of growth in employment density, driving ever-greater need to expand commuting capacity. The London success story is self-reinforcing[42].

2.5.2 While it is important to continue to invest in London, the UK's future success depends on our ability to compete as a coherent economic unit in a globalised economy.

2.5.3 Disparities between London and the South East and the rest of the country have continued to grow as the map below demonstrates. But the capital risks becoming a victim of its own success. Other parts of the country have access to labour markets and land not available in London. They have academic and cultural capital as strong as in London[43] [44].

2.5.4 Areas with good accessibility to London markets can exploit their position and may attract inward investment or be able to benefit from specialisation[45].

---

40 The Economic Case for HS2 (August 2012)

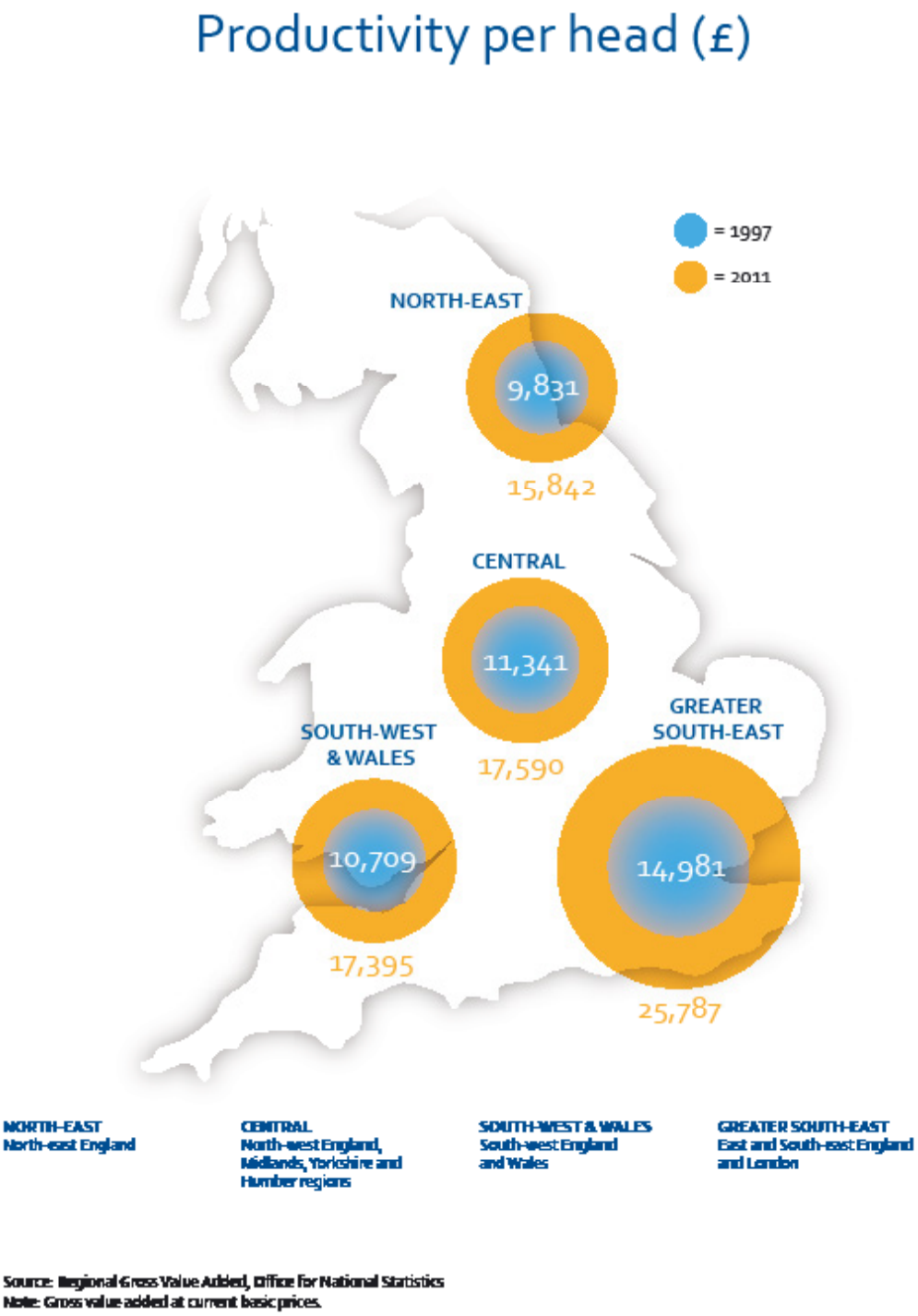
41 Direct Gross Value Added; Deloitte, *Unlocking potential, Maximising growth through infrastructure delivery*, 2013

42 London contributed 21.9% to the UK's total output in 2011 and its output grew 12.4% between 2007 and 2011. London's economy was less badly affected by the recession and is now recovering faster than elsewhere

43 There are geographical clusters of world-class arts organisations, present in the great cities in the North, which act as engines of creativity and innovation. There are also distinctive strengths in work that is inspired by a sense of place or is located outside traditional arts buildings" (Arts Council Plan 2011-15)

44 Manchester University is the largest single-site university in the UK, with almost two-thirds of its research ranked by the last Research Assessment Exercise as world-leading or internationally excellent. (Twenty-five Nobel Prize winners have worked or studied there). Leeds university has been awarded 19 National Teaching Fellowships – more than any other institution in England, Northern Ireland and Wales and co – reflecting the excellence of our teaching continues to appear in the top 100 of the QS world rankings in 2012 – one of only 18 UK universities

45 Recent evidence shows that places within one hour of London have a significant income effect, whilst places within 2 hours of London show a real local economic regeneration effect – see Hall & Chen, 2012



2.5.5 The urban economies of Northern England and the Midlands are vital to Britain's future. Individually, the regions are performing well in many ways – for example, private sector employment has been growing more quickly in the North East, North West and Yorkshire than across the country as a whole[46]. The cities and wider economies to be served by Phase Two are dynamic. Rooted in a strong manufacturing heritage, they are now home to a range of big-name employers, skilled workforces and world-famous brands, as well as cultural and sporting attractions with international appeal. The Leeds city region has one of the most diverse economies in Britain – the reward for successfully nurturing its healthcare, retail, legal, banking and creative sectors[47].

[46] http://www.ons.gov.uk/ons/rel/regional-trends/region-and-country-profiles/economy--june-2013/index.html
[47] Leeds Growth Strategy Getting Leeds working p 3 "The economy's diversity across sectors remains strong"

2.5.6 However, in 2008 a study by development agencies concluded that the North's poor connections are holding it back from fulfilling its economic potential[48].

2.5.7 High speed rail has the potential to significantly change the distribution of economic activity. For example, high speed rail, as part of a wider development strategy, has delivered real change in cities such as Lille, Lyon, Cordoba and Zaragoza.

The Impact of High-Speed Rail in Zaragoza

The city of Zaragoza is one of seven stops on the 'Linea Alta Velocidad' (LAV) between Madrid and Barcelona, lying equi-distant between the two largest metropolitan areas in Spain. With a population of around 700,000, the city grew by over 10% between 2001 and 2011, according to data collected as part of the Census.

The percentage of inter-metropolitan High Speed Rail (HSR) services actually stopping at big intermediate cities is a key factor which determines the HSR contribution to these cities, being a clear measure of their level of connectivity and their relationship with larger metropolitan areas.

Urena et al (2009)[49] estimate that a quarter of high-speed rail passengers travelling between Madrid and Barcelona stop via Zaragoza, equivalent to 750,000 passengers per year. This is a function of the city's location on the high-speed network and the small differences in journey times between direct and non-direct services. This essentially determines the potential of large intermediate cities to attract significant numbers of inter-metropolitan passengers.

Network Effects

An increased accessibility to and from large cities and an influx of inter-city passengers can help these large intermediate cities attract economic activities normally associated with major cities, such as:

- **Meetings of professionals**. Meetings which used to take place in either one of the large metropolises are now often held in the large intermediate city. This cuts the travel time of those who previously had to travel long-distance and requires those who previously do not travel to do so. HSR also allows those that do travel, to do so on a day-return basis. This change in business behaviour from greater connectivity has led to the construction of a well-appointed meeting facility in Zaragoza Delicias station to cater for these types of meetings.
- **Re-location of Mid-Level Business and Technical Consultancy Firms**. Certain types of business benefit more from greater connectivity to their clients and potential customers. HSR allows intermediate cities to maintain high levels of connectivity to their client and customer base without the high office rents and wage costs associated with locating in larger metropolises.
- **Urban Tourism and the staging of congresses.** Anecdotal evidence suggests that Zaragoza is experiencing an increase in urban tourism and the staging of congresses, scientific meetings and seminars since being linked to HSR. The city hosted the 2008 International Expo and has been selected to stage the international Floralia show in 2014.

[48] "A report to the Northern Way: The roles and economic functions of the city regions of the North" (2008); quoted in "High Speed Rail", Department for Transport, 2010

[49] Urena, J.M., Menerault, P. & Garmedia, M. (2009) The high-speed rail challenge for big intermediate cities: A national, regional and local perspective, Cities 26 (2009) 266 – 279

2.5.8 We expect that the HS2 network will help to reshape Britain's economic geography and stimulate development with over 70% of the jobs created by HS2 outside of London.

2.6 HS2 Estimated Jobs

2.6.1 Overall we estimate that 100,000 jobs will be supported by the Y network. However, the Core Cities group – representing eight of England's largest city economies outside London – predict that HS2 will underpin the delivery of 400,000 jobs[50]. HS2 Ltd's current estimates for Phase One of HS2 suggest that 9,000 temporary construction jobs and 1,500 permanent operation and maintenance jobs will be created. HS2 Ltd has also estimated the number of jobs created around the stations of Phase One, although these estimates are conservative and many external parties estimate job creation figures to be even higher. The table below shows HS2 Ltd's estimates of jobs created for Phase One along with estimates from external parties.

	Euston	Old Oak Common	Birmingham Interchange	Birmingham Curzon Street	Phase 1 Total
HS2 Ltd estimate of Jobs created around stations ("supported")[51]	2,000	20,000	3,750	4,700	**30,450**
Total Third Party estimates of Jobs created around stations ("supported")	10,135[52]	90,000[53]	100,000[54]	10,000[55]	**210,135**

Estimates for Phase Two of HS2 have found that 10,000 temporary construction jobs and 1,400 permanent operation and maintenance jobs will be created. HS2 Ltd has also estimated the number of jobs created around the stations of Phase Two based on the predicted net increase in commercial floorspace as a result of HS2. The table below shows HS2 Ltd estimates[56] for jobs created around the stations of Phase Two along with the predicted net increase in commercial floorspace.

	Manchester Piccadilly	Manchester Airport	Leeds	East Midlands Hub	Sheffield Meadowhall	Phase 2 Total
HS2 Ltd estimates of Jobs created around stations ("supported")	29,700 – 42,900	300 – 700	13,200 – 19,700	1,500 – 1,600	4,000 – 5,400	**48,700 – 70,300**
HS2 Ltd estimate of net increase in commercial floorspace (m2)	605,000 – 871,000	12,000 – 25,000	255,000 – 385,000	19,000	77,000 – 106,000	**968,000 – 1,406,000**

50 http://www.corecities.com/sites/default/files/images/publications/Transport%20infrastructure%20requirements%20report%20final.pdf

51 Notes: These figures are published in the Appraisal of Sustainability for Phase 1 (http://webarchive.nationalarchives.gov.uk/20111005090740/http://highspeedrail.dft.gov.uk/sites/highspeedrail.dft.gov.uk/files/hs2-aos-appendix03.pdf). The total figure for this estimate is commonly rounded down to 30,000.

52 http://www.eustonareaplan.info/

53 http://www.london.gov.uk/priorities/planning/consultations/old-oak-common

54 Solihull Masterplan – http://centreofenterprise.com/wp-content/uploads/2013/06/M42-Brochure-Rev-4b-rdu.pdf

55 Benefits of HS2 to the West Midlands region (Centro 2010)

56 Sustainability Statement HS2 Ltd 2013

2.7 Driving local economic growth

2.7.1 There are many examples of where significant investment in transport can help to regenerate city centres and underperforming areas. Evidence shows that the most successful European cities considerably outperform their national average GDP, whereas the majority of UK Core Cities have underperformed in the national context, falling behind London and the national average[57].

2.7.2 Providing better transport links is recognised to be an important factor contributing to urban competitiveness. Transport schemes can potentially unlock inaccessible sites for development[58] and rail station development can contribute to economic growth as land around stations is a natural focal point for additional development due to its inherent accessibility advantages and associated commercial potential[59].

2.7.3 HS2 seeks to enhance and support the cities' own ambitions for growth, whether in creating a landmark for a regeneration area or developing an existing station. The development of railway land around King's Cross station in London shows the scale of the potential opportunity in the UK – a 67-acre site has been completely transformed. Around 30,000 people are predicted to be studying, living and working in the King's Cross area by 2016. It will provide 4.3 million square feet of new workspace, 500,000 square feet of shopping, cafes, bars and restaurants, and 2,000 new homes.

2.7.4 HS2 offers the potential to replicate this success story across the proposed network, in some cases on an even larger scale. That is why it has so much support from the cities and regions of the Midlands and North who will stand to benefit from this new network. The station sites proposed in this document for Phase Two will provide regeneration opportunities in cities in the Midlands and the North, such as in the River Aire waterfront quarter of Leeds or the Lower Don Valley area of Sheffield.

[57] Transport and the Economy – Literature Review – HS2 Ltd 2013
[58] Barrett, G 1999
[59] Steer Davies Geave 2011

HS2 in Manchester

Transport for Greater Manchester (TRGM) expect HS2 to bring increased economic prosperity to Greater Manchester and its surrounding area by:

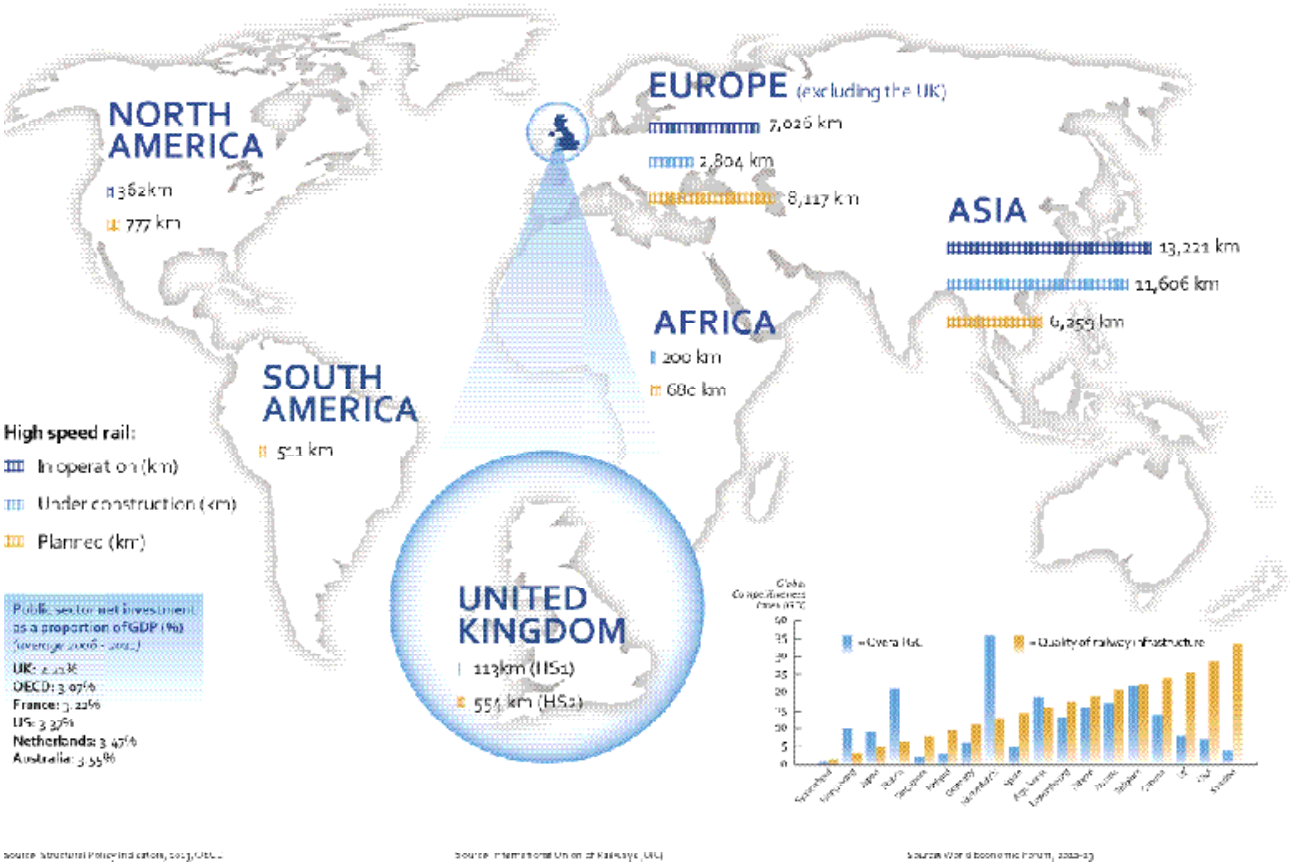
- **Making Greater Manchester a more attractive business location** By reducing business travel-time-related costs and increasing business productivity and connectivity, we expect HS2 to make Greater Manchester a more attractive business location. Work commissioned by TfGM estimated that HS2 will generate approximately 20,000 net additional jobs for Greater Manchester and some £1.2bn Gross Value Added (GVA) in the long term, provided that HS2 stations are built at both Manchester Piccadilly and Manchester Airport.
- **Providing a uniquely well-connected location for businesses at Manchester Airport City** Manchester Airport City has been designated an Enterprise Zone and aims to attract 20,000 new jobs in its first ten-year development programme. The development targets globally mobile businesses that rely on first-rate international and domestic connectivity. Airport City's direct competitors are Frankfurt, Amsterdam, Madrid and Dusseldorf: it will benefit greatly from HS2.
- **Expanding the domestic footprint of Manchester Airport** The enhanced surface access to Manchester Airport achieved by HS2 will enable the UK's busiest regional airport to support a wider and denser international service network. That will – in turn – enhance the region's international connectivity, benefiting businesses throughout the north of England.

Domestic air travel between Manchester Airport and London airports could be replaced by HS2, whilst air travel to international destinations could be provided directly from Manchester Airport. Relieving pressure on London airports will provide further benefits to the economy.

2.8 An economy driven by high speed rail

2.8.1 The development and advancement of high speed rail networks is a major priority for our competitor nations in Europe and around the world. By 2026, the world will have twice the distance of high speed lines that it has today.

International High Speed Map



2.8.2 Developing HS2 will not only help us keep pace economically, but will also give UK-based firms an opportunity to develop their expertise in this field, helping them to compete for a bigger slice of this internationally expanding market.

2.8.3 The Government is committed to supporting the country's world-class engineering base in the construction of the network. We want to emulate the success of Crossrail, the new cross-capital railway which is providing development opportunities in communities to the east and west of central London. Crossrail has also provided an enormous boost to British businesses – 97% of contracts were awarded to UK-based companies and 58% to small and medium-sized enterprises.

2.8.4 HS2 Ltd have estimated that from 2017 HS2 will create 19,000 engineering and construction jobs[60]. This is a conservative estimate and the job numbers expressed by others have been considerably higher. We aim to give similar support to British companies throughout the development and construction of HS2.

2.8.5 A report on Solihull has stated that HS2 will be one of the key factors in making it amongst the best locations in Britain for investment. The concentration of Birmingham Airport, the NEC, an advanced manufacturing and technology centre, an advanced office and commercial area and Jaguar Land Rover combined with HS2 offers an opportunity for growth on a scale that is of national significance[61].

[60] Phase 1 2011 Appraisal of Sustainability and Phase 2 2013 Sustainability Summary

[61] Solihull Masterplan – http://centreofenterprise.com/wp-content/uploads/2013/06/M42-Brochure-Rev-4b-rdu.pdf

2.8.6 We are committed to maximising the economic growth benefits and job opportunities of HS2. An independent Growth Taskforce, led by Lord Deighton, will apply Lord Heseltine's prescription of leaving "no stone unturned" in the pursuit of growth[62]. The taskforce will report on its findings and recommendations early in 2014.

2.8.7 The Government is committed to realising lasting benefits from HS2. We will support cities in their efforts to maximise the available opportunities for the creation of new jobs and opportunities and the development of new skills. Our ambition is to make the new network an engine for growth across the country, accessible to all and provide an enduring legacy of jobs, connectivity and growth. The Growth Taskforce will:

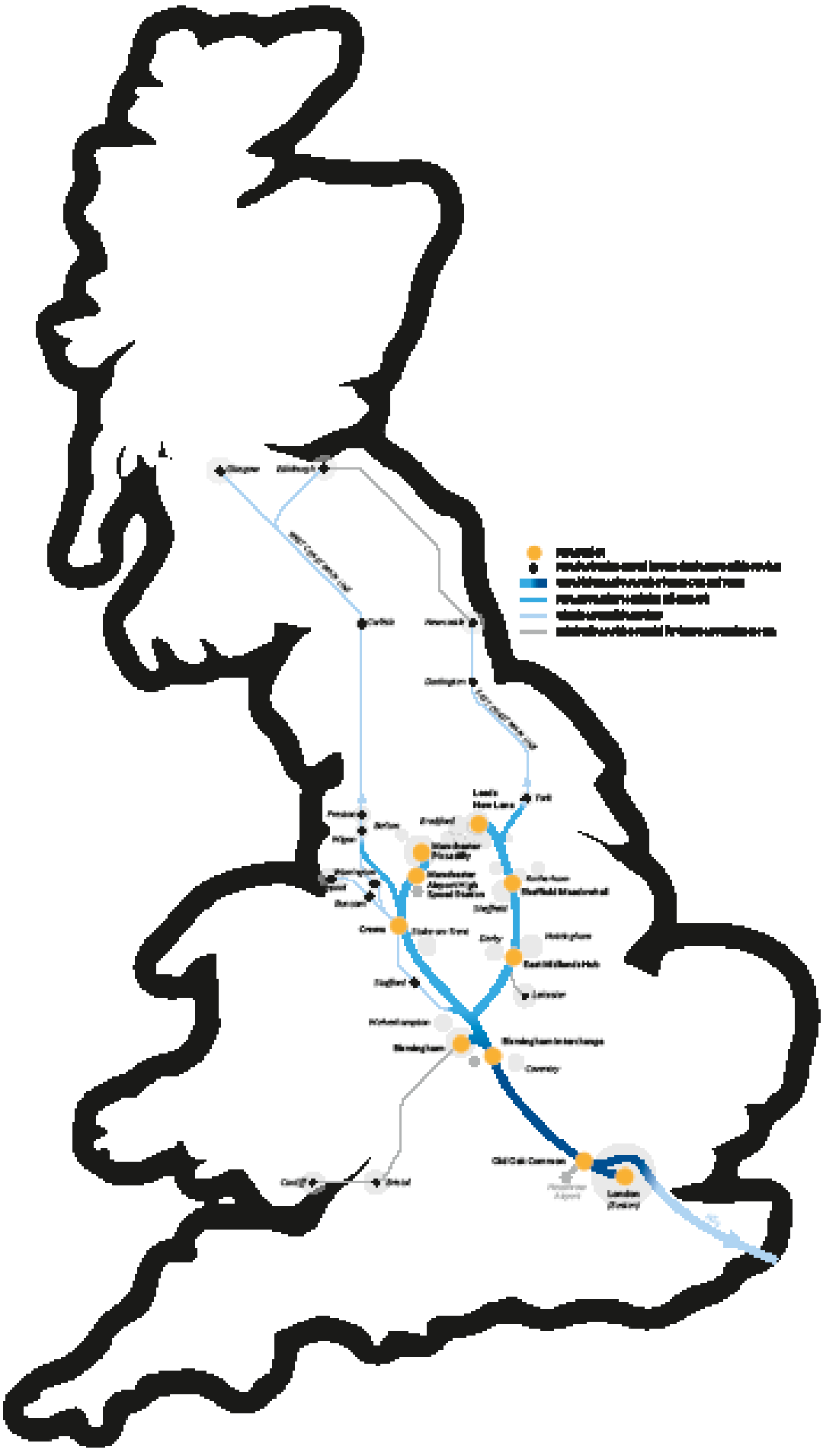
- advise how major infrastructure projects can drive economic growth and how this can be ensured for HS2;
- develop clear advice on how the economic benefits can be maximised; and
- demonstrate to civic leaders, business and the general public the economic benefits for their communities, their business and UK plc.

2.8.8 They will do this by looking and learning lessons from British and international experience of driving growth from major infrastructure investments and by examining how to best leverage private sector capital and existing public funding streams to deliver the project. Further information is available at https://www.gov.uk/government/policy-advisory-groups/hs2-growth-taskforce

2.8.9 The remainder of this document sets out the proposed route for Phase Two that would link together the cities of the Midlands and the North to help bring regeneration benefits and act as an engine for growth for this country.

[62] https://www.gov.uk/government/publications/no-stone-unturned-in-pursuit-of-growth

Map of High Speed Britain



3 Summary of stations and line of route

3.1 Manchester Piccadilly Station

3.1.1 A new station would be built alongside the existing station at Manchester Piccadilly in the heart of the city. This would allow easy connections with regional rail services to places such as Salford, Stockport and Bolton. There would also be excellent easy access to the extensive Manchester public transport network, such as Metrolink services to Bury, Altrincham, Eccles and Salford Quays. Local and regional buses would be on the doorstep and there would be easy pedestrian access to the city.

3.2 Manchester Airport High Speed Station

3.2.1 A new interchange station would provide direct links to Manchester Airport. This station would also give South Manchester and the wider Cheshire area easy access to the high speed rail network, both by public transport and by car. The Government recognises potential for significant development. These developments led the Government to support the station subject to agreeing a suitable funding package with the airport and wider region.

3.3 East Midlands Hub Station

3.3.1 A new station at Toton located between Nottingham and Derby would offer excellent links to East Midlands cities and stimulate growth across the region. The station would be readily accessible by public transport from both Derby and Nottingham with the site close to Junction 25 of the M1 and on rail lines which can be configured to serve Derby, Leicester, Nottingham and many other regional centres.

3.4 Sheffield Meadowhall Station (South Yorkshire)

3.4.1 A new station at Sheffield Meadowhall would be situated alongside the M1, providing convenient access by road from the wider region serving Sheffield and the wider South Yorkshire region. This station is well-placed to encourage jobs and growth in Sheffield and already has excellent connectivity with existing public transport networks including the Super Tram. Trains connect Meadowhall to Rotherham, Barnsley and beyond to Wakefield and Doncaster and stations to Leeds, Manchester and Chesterfield. With the addition of HS2, Meadowhall could become a key transport hub within the region, in a location that allows not only quick access from central Sheffield but also from across the region.

3.5 Leeds New Lane Station

3.5.1 A new station in central Leeds, would be built in the Leeds Waterfront area of the city centre. This would be joined to the existing station via a dedicated pedestrian link, making it just a short walk between the two. This transfer time could be further reduced by the introduction of moving walkways. Leeds station offers connections to a number of regional rail destinations such as Bradford, Halifax and Castleford, as well as to the city's extensive bus network. There would be immediate access to this station from the M621 (Junction 3), providing connections with the city's ring roads and regional motorways.

3.6 Connecting the UK

3.6.1 HS2 would connect the major urban economies of this country, either directly or by high speed trains running on existing rail lines. Connections to the existing railway would be built at the northern end of each leg. On the western route, high speed trains would be able to run onto the classic network to serve destinations such as Wigan, Preston, Lancaster, Penrith, Carlisle, Glasgow and Edinburgh. From the eastern route, the high speed line would continue almost as far as York, making it possible for high speed trains to continue directly to places such as Newcastle, Darlington and Durham.

3.6.2 Further south, HS2 would connect with the WCML at Crewe, meaning key destinations like Liverpool, Runcorn, Crewe and Warrington would benefit from direct services. By calling at the key rail interchange of Crewe high speed train services would also be easily accessible for passengers in North Wales and elsewhere.

3.7 Western route summary

3.7.1 The western leg of the network would serve the proposed stations at Manchester Airport and Manchester Piccadilly stations. The line would connect with the London-West Midlands leg near Lichfield in the West Midlands, before heading north-west past Stafford and on towards Crewe. A connection with the WCML would be provided just south of Crewe, with the main line continuing in a twin tunnel under the town heading north. It would cross over the M6 and then the M56, and then head up past Warrington to a further connection with the WCML south of Wigan. The Manchester stations would be served by a spur off the main line running roughly parallel with the M56 towards Manchester Airport. The Manchester High Speed Airport station would be located between Junctions 5 and 6 of the M56 as the line approaches the main built-up area of Manchester. Heading north from here the line would enter a seven and a half mile twin tunnel, surfacing a short distance from the new station alongside the existing station at Manchester Piccadilly. The total route length would be 94 miles (150km).

3.8 Eastern route summary

3.8.1 The eastern leg would serve stations in the East Midlands, South Yorkshire and Leeds. The line would connect with the London-West Midlands leg to the east of Birmingham, near Junction 4 of the M6, and then follow the M42 corridor north-east towards Derby and Nottingham. The East Midlands Hub station would be located between these two cities at Toton, about a mile from the M1. The line would head north, following the M1 corridor as it heads towards South Yorkshire. The station serving this region would be located at Meadowhall alongside the M1, between Sheffield and Rotherham. From here the line would pass to the east of Barnsley and connect to the East Coast Main Line nine miles to the south-west of York. As with Manchester, Leeds would be served by a spur off the main line. It would run within the existing Castleford to Leeds railway corridor, passing the southern suburbs of Leeds before rising above street level into the new station at Leeds New Lane. The total route length would be 115 miles (185 km).

4 Introduction to the Phase Two consultation

4.1 Help us to develop HS2

4.1.1 The best way to help us develop the proposals for the Phase Two route is to take part in this consultation. Your opinion counts and the responses we receive to the proposals in this document are vital to ensuring that we consider every issue at this key stage of the project's development.

Consultation questions

This consultation is seeking your views on the following questions.

(i) Do you agree or disagree with the Government's proposed route between the West Midlands and Manchester as described in Chapter 7? This includes the proposed route alignment, the location of tunnels, ventilation shafts, cuttings, viaducts and depots as well as how the high speed line will connect to the West Coast Main Line.

(ii) Do you agree or disagree with the Government's proposals for:

a. A Manchester station at Manchester Piccadilly as described in Chapter 7 (sections 7.8.1 – 7.8.7)?

b. An additional station near Manchester Airport as described in Chapter 7 (sections 7.6.1 – 7.6.6)?

(iii) Do you think that there should be any additional stations on the western leg between the West Midlands and Manchester?

(iv) Do you agree or disagree with the Government's proposed route between West Midlands and Leeds as described in Chapter 8? This includes the proposed route alignment, the location of tunnels, ventilation shafts, cuttings, viaducts and depots as well as how the high speed line will connect to the East Coast Main Line.

(v) Do you agree or disagree with the Government's proposals for:

a. A Leeds station at Leeds New Lane as described in Chapter 8 (sections 8.8.1 – 8.8.5)?

b. A South Yorkshire station to be located at Sheffield Meadowhall as described in Chapter 8 (sections 8.5.1 – 8.5.8)?

c. An East Midlands station to be located at Toton as described in Chapter 8 (sections 8.3.1 – 8.3.6)?

(vi) Do you think that there should be any additional stations on the eastern leg between the West Midlands and Leeds?

(vii) Please let us know your comments on the Appraisal of Sustainability (as reported in the Sustainability Statement) of the Government's proposed Phase Two route, including the alternatives to the proposed route as described in Chapter 9.

(viii) Please let us know your comments on how the capacity that would be freed up on the existing rail network by the introduction of the proposed Phase Two route could be used as described in Chapter 10.

(ix) Please let us know your comments on the introduction of other utilities along the proposed Phase Two line of route as described in Chapter 11.

4.2 Supporting documents

4.2.1 This consultation document contains the information you need to consider and answer the questions above. However, the following additional reports and resources may be of interest.

4.3 Sustainability statement

4.3.1 Any new transport infrastructure has consequences for the people and businesses nearby and for the landscape through which it passes. Therefore, in addition to this document, we have published a detailed environmental report on the sustainability impacts of the proposed scheme.

4.3.2 The *Sustainability Statement* describes the extent to which the Government's proposed scheme for Phase Two of HS2 supports objectives for sustainable development as part of the Appraisal of Sustainability (AoS) process. It has been prepared by HS2 Ltd's sustainability consultants, to assist with this consultation by explaining the potential sustainability benefits and adverse impacts of the proposals, as well as to explain how sustainability has helped support the scheme selection and design. Passenger demand figures modelled as part of the economic case will also be used to appraise the predicted carbon footprint of HS2, details of which will be included in the updated economic case due to be published in October.

4.4 Technical report

4.4.1 A technical report, setting out the detailed route description of each leg together with the proposed stations, depots and ancillary infrastructure including the maintenance loops and ventilation shafts for tunnels has been published. This is in addition to the detailed technical information on the routes and the other options considered that was published in January and are available at www.hs2.org.uk

4.5 Factsheets and maps

4.5.1 Factsheets will provide bitesize information on HS2. Some of these will provide information on overarching themes such as noise, the exceptional hardship scheme and train types. Another set of factsheets will be for individual UK regions setting out how HS2 will improve connections, reduce journey times and bring major northern towns and cities closer than ever before and are available at www.hs2.org.uk

4.5.2 There will also be a set of maps that provide a depiction of the HS2 Phase Two proposed route. The bottom portion of each map depicts the profile of the line in relation to the ground. Further details can be found at www.hs2.org.uk

4.6 Network Rail Released Capacity report

4.6.1 This study was commissioned by the Department to understand other options for the future use of the existing rail network after Phase Two of HS2 has opened. Network Rail has undertaken this study at a high level and has consulted with local, regional and industry stakeholders. They have produced a set of indicative options for the possible use of how any future released capacity might be best used. This report is available at www.networkrail.co.uk/highspeedrail

4.7 Ongoing work

Wider analysis documents (due for publication October 2013)

4.7.1 The case for HS2 is kept under regular review, and we will be publishing an update of the strategic and economic cases for HS2 later this year. These reports will set out the strategic and economic reasons for building HS2. They will be published in October 2013 and will be available from www.gov.uk/government/publications. We are not consulting on these documents, but respondents will have sufficient time to take account of the information before this consultation closes.

4.7.2 An important part of the case for HS2 Phase Two is to consider the strategic alternatives to the scheme that could meet the same objectives. With this in mind, the Department commissioned Network Rail to review and develop a range of options for enhancements to the existing network, building on previous work undertaken to support the decisions taken in January 2012 to proceed with the Y network. The results of the Department's appraisal of these options will be incorporated into the updated strategic and economic cases for HS2.

As HS2 Ltd's work progresses, we will continue to make useful information available to the public.

Public information events

4.7.3 All the information you need to respond to this consultation is in this document. However, if you want to know more or to discuss in more detail with HS2 Ltd's technical experts then we will be holding a series of information events from mid-October 2013 to early January 2014. Details of these events will be available at www.hs2.org.uk and will also be publicised in local areas.

5 Phase Two – what happens now?

5.1 Consultation on the proposed route

5.1.1 This document supports the launch of our consultation on the proposed route for Phase Two. The consultation closes on 31 January 2014. Also launched alongside the consultation on the proposed route is the Exceptional Hardship Scheme (EHS), which serves to assist those whose properties may be affected by the publication of the Phase Two plans.

5.2 Exceptional Hardship Scheme

5.2.1 The Government understands the impact that these proposals have on property owners affected by the route. Although HS2 will benefit the whole country, we recognise that it may bring anxiety to those close to the proposed route. Past experience of similar infrastructure projects, particularly the HS1 line to the Channel Tunnel, suggests that impacts on property markets are most significant during a project's early planning and construction stages, but improve later. With sensitive engineering design, the reality of those impacts has often turned out to be less than was first feared.

5.2.2 However, the Government has always been clear that it will assist property owners in the short and longer term. That is why we have already gone beyond what is required by law and today we announced an EHS to deal with cases of property blight caused by the proposals for Phase Two. The introduction of this scheme means that homeowners already being affected by the proposals, who have a pressing need to move, now have recourse to compensation.

5.2.3 Under this scheme, residential, agricultural and small business owner-occupiers whose properties may be affected by the construction or operation of the proposed route, and who can demonstrate that they satisfy the criteria of the scheme, are able to apply to have their properties bought by the Government at their full un-blighted value. More detail on the five criteria is available at www.hs2.org.uk

5.2.4 However, the EHS is just the first step in providing compensation to those directly affected by HS2. It is designed to be an interim scheme which will, in time, be replaced. The Government has undertaken to launch a fresh consultation on long-term compensation options for Phase One. Subject to the outcome of that consultation, we expect new compensation measures for Phase One to be introduced in due course. We will not be ready with our proposals for long-term discretionary compensation for Phase Two until after the final route has been decided. A similar timetable can be expected for statutory compensation becoming available for people affected by the Phase Two route.

5.2.5 The Government is committed to compensating fairly those who are affected, providing a generous and comprehensive package of measures which go above and beyond what is required by law.

5.3 And what happens next?

5.3.1 Following the end of the consultation the responses will be analysed and carefully considered. Refinements to the route will need to take account of the responses received, environmental impacts and economic factors. The Government will then announce a final decision on the proposed route, station and depot options for Phase Two by the end of 2014.

Safeguarding

5.3.2 Once the Government announces its final proposed route for Phase Two, we would consult on safeguarding measures. Safeguarding is an established planning process. In this case, it is designed to protect areas on or around the HS2 route from new or conflicting developments which may either affect the ability to build or operate HS2 or lead to excessive additional costs. Local planning authorities would have to consult with HS2 Ltd before granting planning permission for development proposals that might overlap and conflict with the proposed HS2 route.

5.3.3 Once the route has been safeguarded, 'statutory blight procedures' would apply. This means that for qualifying property interests, there will be an option under existing law to ask the Government to acquire the affected property early, and on compulsory purchase terms, by serving a 'blight notice'. The Government will also consider the introduction of additional discretionary property and compensation measures over and above the current law.

5.4 Hybrid Bill for the Phase Two scheme

5.4.1 A hybrid Bill seeking powers to construct Phase Two would be brought forward in the next Parliament, following the May 2015 General Election.

5.4.2 The Bill would obtain the necessary legal powers to construct, operate and maintain Phase Two. It would provide:

- deemed planning permission for the railway;
- powers of compulsory purchase for land required for the railway; and
- powers to undertake the necessary works.

5.4.3 Before the Bill is introduced into Parliament, we would need to complete the next stage of engineering design; this would include more detailed design of the route, its structures and mitigation measures. In turn, this would form an input to the Environmental Impact Assessment, which provides an overall analysis of the significant effects that the project is likely to have on the environment, plus possible ways to avoid such effects (or reduce them as far as practicable).

5.4.4 Throughout this work, HS2 Ltd would engage with local communities and relevant authorities to help inform measures to mitigate local environmental effects.

5.4.5 Following consultation on a draft Environmental Statement, the results of all of this work would be deposited alongside the hybrid Bill. This would ensure that any significant environmental effects are brought to the attention of Parliament.

Community engagement

5.4.6 We would work with local authorities, communities and stakeholders to develop the engineering design in a way which reduces, as far as practicable, the potential effects and provides value for money to the taxpayer. This would include discussing proposals for mitigation, such as managing noise, and reinstating highways and rights of way that would need to be diverted. We would also identify opportunities for community benefit where possible.

Construction

5.4.7 Following Royal Assent to the Phase Two hybrid Bill, there would be a period to prepare for construction – for example, for land to be acquired and contracts let. Construction itself would take approximately nine years, although, in most places, the split of construction packages would determine the exact duration of construction which in the majority of cases is likely to be much less than the maximum. This period of construction would include a period of testing from early 2031, with Phase Two expected to open in 2032/33.

Part II

6 Introduction

6.0.1 This section covers the proposed scheme for consultation. It is separated into a chapter describing the route, station and supporting infrastructure proposals for the western leg to Manchester and beyond; and a chapter describing the route, station and supporting infrastructure proposals for the eastern leg to Leeds and beyond. There is then a summary of the sustainability impacts of these proposed routes. This is followed by a chapter setting out initial views on the use of the released capacity that would be generated by HS2. The section then looks at the opportunities to introduce other utilities along the line of route, or for the provision to be made for them in the future. Finally, there is a chapter on the costs and benefits of HS2. The consultation questions are included at the end of each relevant section (and are also repeated in Part III).

6.1 Developing the Phase Two high speed lines

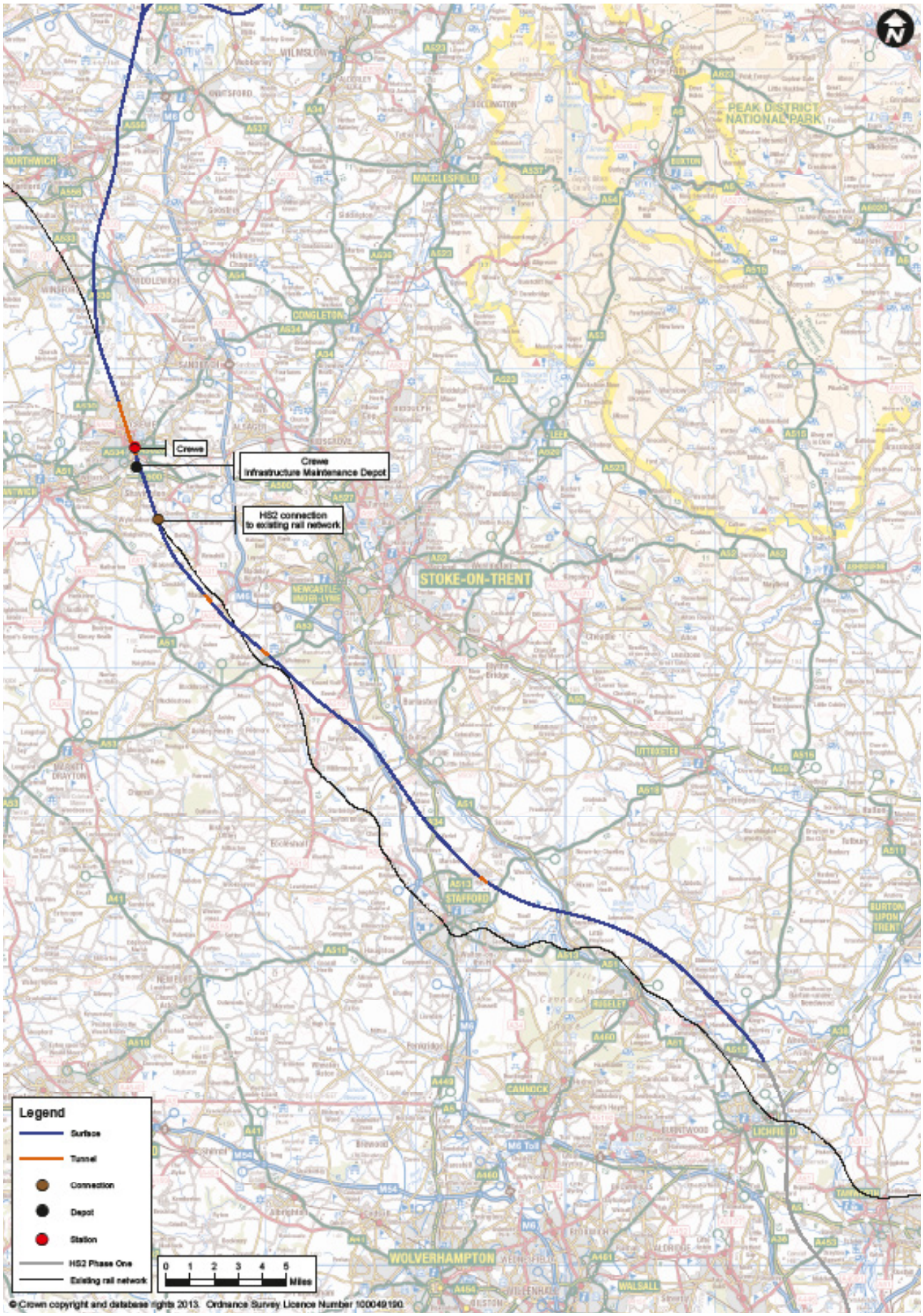
6.1.1 HS2 Ltd was asked by the Government to propose routes for extending Phase One[63], the high speed line between London and the West Midlands, to Leeds in the North East and to Manchester in the North West with connections to the East and West Coast Main Lines for onward services to places such as Newcastle, and for serving Scotland. HS2 Ltd was also asked to provide advice, as part of Phase Two, on a proposed spur from the Phase One route to serve a station in the vicinity of Heathrow Terminal 5[64].

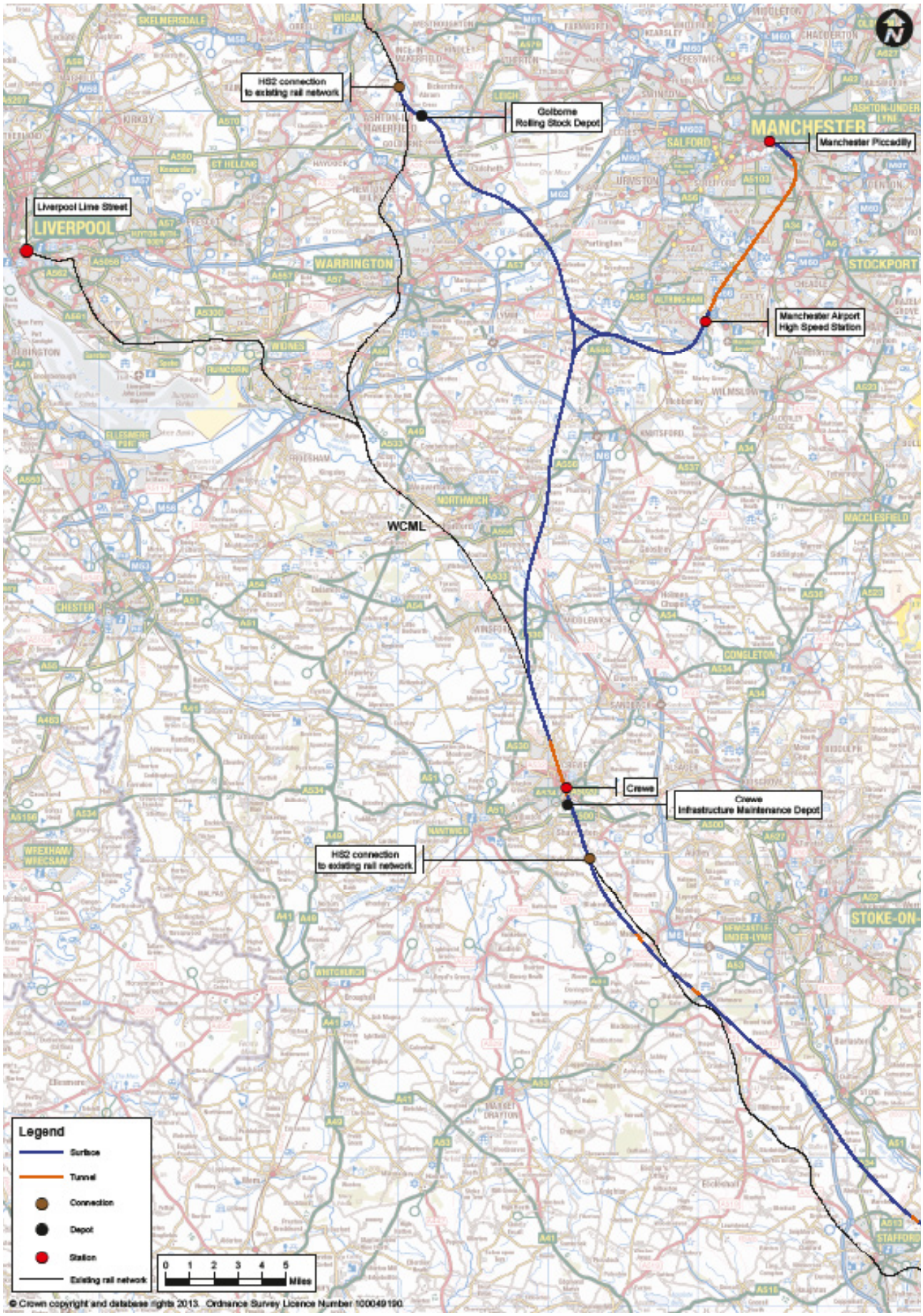
6.1.2 The remit for HS2 Ltd included making provision for station options for Manchester and Leeds city centres and with intermediate stations in South Yorkshire and the East Midlands. HS2 Ltd was also asked to consider providing access to major airports and options for serving cities and regions off the base high speed rail network. Proposed locations for supporting infrastructure, including maintenance and rolling stock facilities were also considered as part of the remit. We have included further details on the principles and assumptions that HS2 Ltd adopted as they developed their proposals and the selection process that they followed in Annex A.

[63] HS2 Ltd.'s remit is set out in a number of publically available remit letters from Government

[64] The January document, High Speed Rail, Investing in Britain's Future. Phase Two: The Route to Leeds, Manchester and Beyond – describes the Government's decision to pause this work and the next steps on Heathrow

Map Western Leg




HS2 connection to existing rail network
Golborne Rolling Stock Depot
MANCHESTER
Manchester Piccadilly
Liverpool Lime Street
LIVERPOOL
WARRINGTON
STOCKPORT
Manchester Airport High Speed Station
WCML
CHESTER
CONGLETON
MACCLESFIELD
Crewe
Crewe Infrastructure Maintenance Depot
HS2 connection to existing rail network
STOKE-ON-
Legend
Surface
Tunnel
Connection
Depot
Station
Existing rail network
0 1 2 3 4 5
Miles
© Crown copyright and database rights 2013. Ordnance Survey Licence Number 100049190.

7 Western leg: Manchester route

7.1 Introduction

7.1.1 This section focuses on the proposed route from the West Midlands to Manchester including new high speed rail stations at Manchester Piccadilly and alongside Manchester Airport. There would be two connections to the WCML:

- to the south of Crewe to serve Crewe, Runcorn, Liverpool and the wider North West; and
- at Golborne, south of Wigan for services further north, including Glasgow and Edinburgh.

7.1.2 This section describes the route and stations in detail, including how HS2 Ltd has sought to optimise the design at this stage of the process to minimise impacts.

7.1.3 The proposed locations for supporting infrastructure are also described. Annex B describes the main route and station alternatives and explains why these have not been chosen.

7.1.4 The ***West Midlands to Manchester Route Engineering Report*** which is available at www.hs2.org.uk provides a more detailed description of the engineering of the proposed scheme.

7.1.5 The ***Sustainability Statement*** which is available at www.hs2.org.uk provides detail on the appraisal of sustainability process and reports on the sustainability performance of the proposed scheme.

7.2 Lichfield to Newcastle-Under-Lyme

7.2.1 The Phase Two route begins immediately north of the Trent and Mersey Canal crossing at the end of the Phase One route for the leg to Manchester. It would continue to head north-west between Handsacre and Kings Bromley on a viaduct and cross the River Trent, again on the viaduct just over one mile in length.

7.2.2 The route would then be in a mixture of cutting, or on embankment and surface level heading to the north of Stafford. It would cross over the A51 at Great Haywood and the railway line to Stoke-on-Trent. It would then run to the south of Pasturefields Salt Marsh Special Area of Conservation (SAC), see text box below, over the River Trent, and then to the south of the village of Hopton, in cutting and green tunnel so as to minimise the visual and noise impacts. The route would then head west to the WCML before converging with the M6 corridor west of Stone and running parallel with the motorway for a short distance. It would then cross over the M6, passing Swynnerton to the east, then under the A51 and A519 heading to the south-west of Newcastle-Under-Lyme where it would pass under the A53.

Pasturefields Salt Marsh Special Area of Conservation (SAC) and Streethay to Millmeece

Pasturefields Salt Marsh Special Area of Conservation (SAC) is a protected site of particular importance because it is one of only two examples in the UK of an inland salt meadow. The salt is derived from natural deposits within the underlying rock, and is carried to the site by groundwater moving through the rock. It is because of the local topography that the salt water rises to the ground surface to form the springs at Pasturefields SAC.

HS2 Ltd asked its sustainability consultants to carry out site appraisal, data gathering and desk top analysis. Following the submission of a Habitats Regulation Assessment (HRA) Screening Report, HS2 Ltd was able to confirm with Natural England and the Environment Agency that routes to the south of Pasturefields SAC could be screened out of requiring a Habitats Regulations "Appropriate Assessment".

The main driver for considering alternative route options through this area was avoiding or minimising potential impacts on Pasturefields SAC. The route described here would run to the south of the SAC and would not affect it.

7.3 Newcastle-Under-Lyme to Crewe

View of HS2 by Madeley Park

7.3.1 After crossing the A53 the route would enter a deep cutting leading to a section of tunnel about half a mile long through the hillside and under Whitmore Heath. It would emerge from the tunnel and head towards the WCML, crossing it to the south of Madeley. It would run to the west of Madeley at a distance of approximately half a mile dropping into deep cutting and tunnel, reducing impacts on the visual amenity of the countryside and would head northwards towards Crewe parallel to and west of the WCML for approximately five miles.

7.3.2 Approaching Crewe, the route would be elevated as it continues to follow the WCML. It would widen to form multiple tracks. Descending again, both the HS2 route and the WCML pass under the A500 and enter Crewe. On entering Crewe, a junction from HS2 to the WCML would allow HS2 trains to continue onto the existing network. This

would also be the location of a link to the infrastructure maintenance depot, which is planned to the west of the route and the existing Basford Hall sidings.

7.3.3 This is described in more detail in below. The HS2 route would descend into a cutting and then a 2.4 miles (3.8km) twin tunnel which would pass under Crewe and would emerge on the northern outskirts of the town, near Parkers Road avoiding demolitions in the Barrows Green area.

Serving Crewe, Liverpool and the wider North West

During their option development work HS2 Ltd considered a number of options, for serving Crewe, Liverpool and other important markets in the North West.

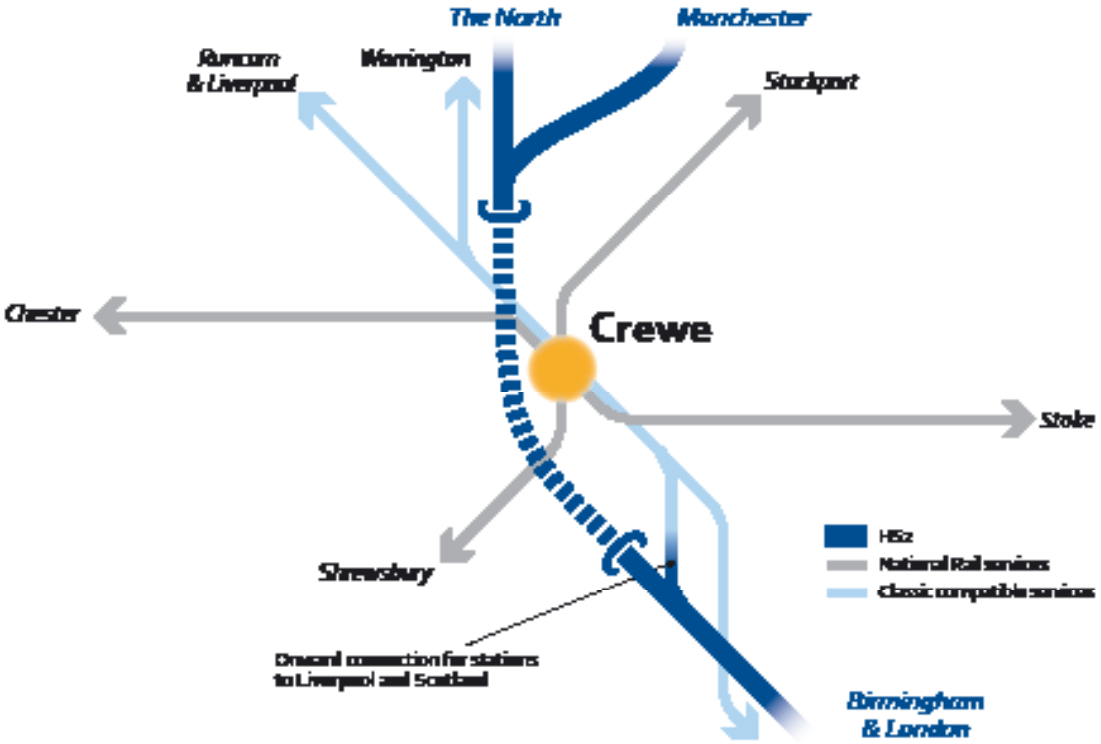
Their reports noted that Liverpool is an important market for HS2 and would potentially warrant two trains per hour. To serve Liverpool, classic compatible high speed trains would run for around 155 miles on the high speed line from London to Crewe and only the last 35 miles on the existing railway as they travel from Crewe to Liverpool. This would reduce journey times from over two hours to one hour 36 minutes.

The potential benefits from also capturing other important intermediate markets such as Crewe, Runcorn and Warrington in the region were also clear. Crewe in particular is a major rail hub which also serves the wider North Wales and West Cheshire regions. HS2 Ltd's work highlighted therefore that capturing these other markets have an important part to play in choosing where to connect to the existing network and what service patterns to run.

As described above, it is proposed that there is connection from the high speed line to the West Coast Main Line at Crewe. This will allow towns across the North West to benefit from HS2 with trains running direct to Crewe, Liverpool, Carlisle, Lancaster, Preston, Wigan, Warrington, Chester and Runcorn. North Wales and elsewhere would also have ready access to HS2 at Crewe.

HS2 Ltd also developed an option which converted Crewe into a high speed station. This could bring significant benefits to passengers wanting to use Crewe station whilst still providing a connection to the existing railway to allow services still able to run on to Liverpool and the North West. Some local stakeholders also believe that it would lead to significant regeneration of the surrounding area. Building a dedicated high speed facility in Crewe would require significant remodelling of the existing station and railway lines; and an additional station on the Y network would need to demonstrate value for money for the investment that is required.

Crewe connectivity



Route Selection

The key driver for the selection of this route between Newcastle-Under-Lyme to Crewe was the potential for the route to serve Crewe, Liverpool and the wider North West. Therefore the proposed route uses the existing station at Crewe to serve the south Cheshire and north Staffordshire markets, whilst also providing connections to other destinations.

However, during the period of informal engagement, Ministers met with representatives from the wider Staffordshire, Greater Manchester and Cheshire areas to listen to their views on how HS2 could best serve them. It is for the representatives of these areas to now make the case for further stations on the line and demonstrate how HS2 can bring maximum benefit to these areas of the country in this consultation.

7.4 Crewe to Golborne

7.4.1 From Crewe the route would run immediately adjacent to the WCML for two and a half miles passing through open countryside at surface level. Heading north it would pass between Middlewich and Winsford onto a long viaduct over the Trent and Mersey Canal and the River Dane floodplain. Bearing north-east the route would run mainly on embankment passing approximately two miles to the east of Northwich before crossing the Altrincham to Chester railway line, the A556 and the A559. The route would then run in either shallow cutting or on the surface for just under two miles before rising onto embankment to cross the M6 to the north of Junction 19.

7.4.2 After the M6 crossing the route would descend into cutting under the A50 west of Hoo Green, where the spur to Manchester would leave the main route using a grade separated junction. The main route would then approach the M56 passing under it in deep cutting. North of the M56 the route would cross the A56 and the Bridgewater

Canal to the east of Lymm. After this crossing, the route would continue northwards approaching the Manchester ship canal on a viaduct just under a mile long and reaching up to 30 metres high to allow navigation clearance for shipping. In addition to the canal, the route would also cross the A57 and the Manchester road between Hollins Green and Cadishead. As the route descends from the viaduct it would cross over the Manchester to Warrington railway line and the M62.

View of HS2 by Culcheth

7.4.3 The route would then bear west broadly following the dismantled railway corridor south of Culcheth in a cutting before rising to cross the Liverpool to Manchester railway line on a bridge. It would then pass under the A580 through the gap between Lowton and Lowton Common and head to the west running to the north of Golborne where a rolling stock depot is proposed. This is described in more detail in section 7.30. The route would rise onto a long embankment, crossing over the A573 before connecting back onto the WCML using a grade separated junction at Bamfurlong, around two and a half miles south of Wigan. This connection would require the two eastern WCML tracks to be realigned to the east so that the high speed lines could pass over them and join the inner two tracks to form a six track railway for a short distance. At this point, through trains would continue to destinations in the North West and Scotland.

Serving Scotland

One of the principal issues for HS2 Ltd in considering proposals for connecting to the West Coast Main Line was the most effective way to serve Scotland. In their advice to the Government in March 2012, HS2 Ltd described its work considering how best to serve the important markets of Glasgow and Edinburgh.

This work noted that both Glasgow and Edinburgh were significant sources of demand in their own right while being able to bring in passengers from elsewhere in Scotland onto the network. As part of Phase One the connection to the West Coast Main Line at Lichfield would enable both Glasgow and Edinburgh to be served, for example by splitting 400m trains at Carstairs into two sets of 200m.

Phase Two provides the potential to connect the high speed network to the West Coast Main Line and the East Coast Main Line as there would be connection points from HS2 to both. HS2 Ltd therefore explored both options to see which would offer the greatest benefits. HS2 trains travelling up the West Coast Main Line could split at Carstairs to serve Edinburgh and Glasgow equally, as in Phase One, but with a much faster journey time resulting from the more northerly connection at Golborne. In contrast, trains travelling up the East Coast Main Line would need to serve Edinburgh first before going on to Glasgow.

HS2 Ltd found that demand to and from Edinburgh was around 40 percent higher than Glasgow, though Glasgow was also a significant market. Serving Scotland via the East Coast Main Line would benefit the Edinburgh passengers with a quicker journey time but would disadvantage passengers who would use HS2 trains to go to Glasgow by at least 40 minutes.

Therefore the proposed route to serve Scotland is through a connection via the West Coast Main Line which would allow both stations to be served equally. Trains that are 400m long could travel up to Edinburgh or Glasgow alternately, another option being to split trains so that one 200m train set served Glasgow and the other Edinburgh, maximising the use of the restricted number of train paths on the trunk network between London and the West Midlands.

A connection via the West Coast Main Line was also in line with the expectations of Transport Scotland and other Scottish Stakeholders' views of how best to serve Scotland in Phase Two.

Towards a truly national high speed rail network

The Government's goal is a national network that brings the constituent parts of our island closer together, both Phases One and Two would be significant steps towards achieving this. The Scottish Government supports taking high speed rail to Edinburgh and Glasgow, and we warmly welcome this enthusiasm and support north of the border. Completion of the Y Network will reduce journey times by at least 30 minutes and up to an hour without the need to change trains, providing benefits to the Scottish economy of around £3 billion.

We consider that there is a real case for examining whether we should go further and develop the network and secure the full benefits of high speed rail for Scotland. The Government is taking forward a study in collaboration with Transport Scotland to look into how best to boost capacity and cut journey times to under three hours. Further work could then develop the most promising options for additional capacity and journey time improvements so that Scotland can gain the most benefit from a High Speed Britain.

Route Selection

The Government's preference for the section of route between Crewe and Golborne was based on the assumption that the benefits of serving the North West should be delivered by a connection at Crewe and serving people further North and Scotland should be included in Phase Two.

One of the main alternative options that HS2 Ltd considered was the possibility of connecting to the West Coast Main Line further north than Golborne. Options included connecting near Preston with the addition of an interchange station or bypassing Preston to maximise the journey time savings to Scotland. The key trade off here is that whilst a connection this far north would deliver a journey time saving for services to Scotland it would come at a significant additional cost, in the region of £1.5 to £2 billion pounds, if it included construction of an interchange station in the vicinity, as well as having additional sustainability impacts. HS2 Ltd found that the journey time savings benefit would not outweigh the additional cost and sustainability impacts.

For these reasons, at this stage in the scheme design, and with future collaborative studies with Transport Scotland being considered and developed, the Government selected the connection at Bamfurlong near Golborne as the best performing option.

7.5 Approach into Manchester City Centre via Manchester Airport

7.5.1 The spur to Manchester would leave the main line just north of the M6 at Hoo Green and would head eastward over the main route with a maximum speed of 145mph (230kph). The route would continue 150 metres to the north of Rostherne Mere running in cutting to the south of the M56. It would then follow the terrain passing over Birkin Brook and the Altrincham to Chester railway before heading north-west to cross under the M56 at Warburton Green, to the north of the Manchester Airport runways. The route would then be in cutting to the west of the M56 running into the interchange station close to the airport and motorway.

7.6 Manchester Airport High Speed Station

7.6.1 The Government asked HS2 Ltd to consider potential access to major airports as part of Phase Two. Following HS2 Ltd's report and further work and engagement, the Government confirmed its support, subject to a suitable funding package being agreed, for HS2 to serve Manchester Airport and the wider area. An interchange station has therefore been included alongside the Airport as part of the proposed scheme.

7.6.2 As a result of the excellent transport connectivity of this location (described below), the proposed station would not only serve Manchester Airport, but would also serve the wider area of south Manchester and north Cheshire.

7.6.3 The Government recognised that there is the potential for significant development around a HS2 station in this location with potential benefits to integrate with nearby employment opportunities in the Manchester Enterprise Zone, including Airport City North, the MediPark, and University Hospital South Manchester, and also with other nearby proposed developments such as Davenport Green. These wider benefits led the Government to make its support for the airport station conditional on agreeing a suitable funding package with the airport and the wider region in order to deliver a fair deal for the taxpayer. Since announcing this support for an HS2 station alongside Manchester Airport, the Government has engaged further with Manchester Airport Group and other Greater Manchester delivery partners. This engagement and collaboration will continue as the project progresses.

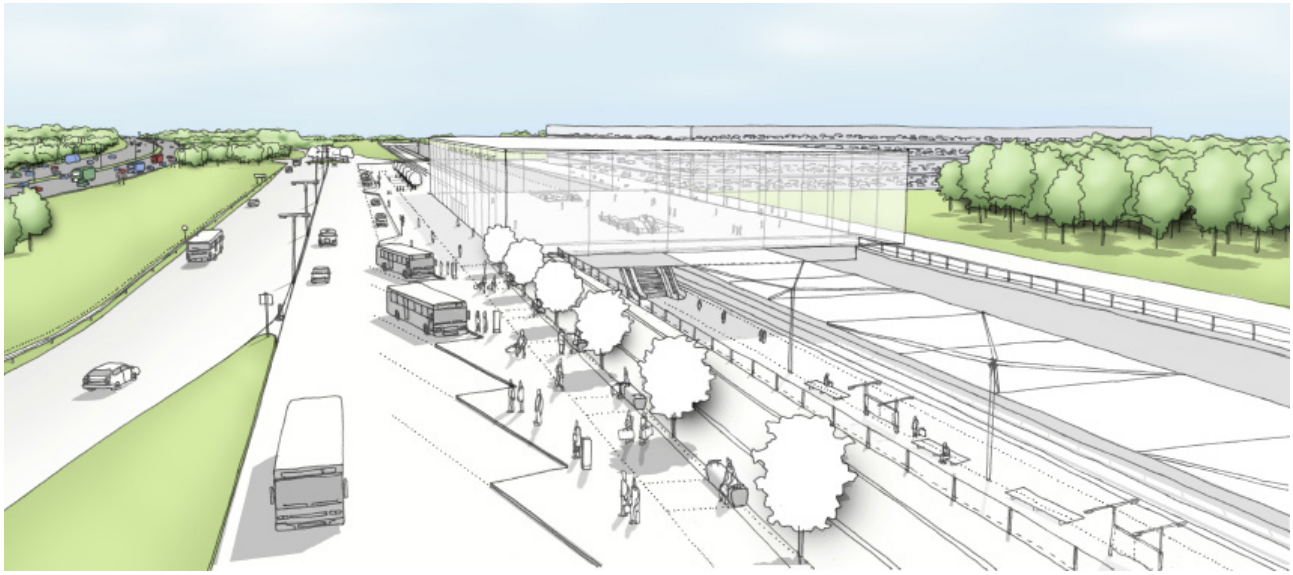
7.6.4 The proposed station would have two platforms plus two through tracks for non-stopping trains, which would be below surface level. The station would lie west of and parallel to the M56, approximately half way between Junctions 5 and 6, and therefore be very well placed for motorway access. The M56 would link the station to the M60 Manchester orbital motorway, the M6 and the wider regional transport network. A new road access would be provided to link the station to the M56 and local road network.

7.6.5 A number of options exist to link the station to the airport terminals and adjacent transport interchange. These include existing proposals for extending the Manchester Metrolink network to serve the station directly and provide a service into both the airport and wider area.

7.6.6 The proposed interchange station at Manchester Airport would support an estimated 300 – 700 jobs according to the methodology used by HS2 Ltd's consultants. This figure could be significantly higher, depending on the aspirations of the local authority and the wider region. Sensitive and high-quality development could provide significant economic opportunities.

Manchester Airport High Speed Station – footprint

Manchester Airport High Speed Station – intermodal connectivity



Manchester Airport High Speed Station – possible station view

Route and interchange station selection

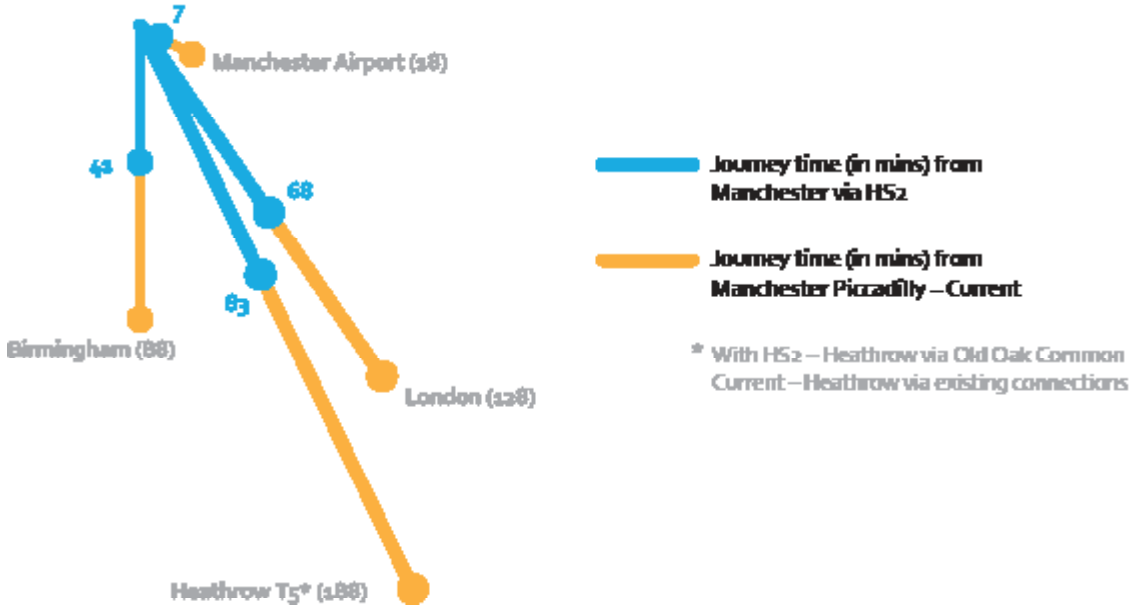
The choice of route approach into Manchester was dictated by two main issues: which city centre station was selected and whether to serve an interchange station. In their reports HS2 Ltd set out a number of options more details of which are set out in Annex B.

As described in this section, the Government's preference is to include an interchange station alongside Manchester Airport. The Government supports the integration of the new HS2 network with existing transport infrastructure and sees potentially valuable benefits from serving Manchester Airport. The Government noted HS2 Ltd's advice that the combination of an interchange station to the south of Manchester, combined with a station at Manchester Piccadilly, would also attract the largest number of passengers.

7.7 Route into Manchester City Centre

7.7.1 From the interchange station at Manchester Airport, the route would continue to head north-east descending into twin tunnels close to Junction 5 of the M56 for 7.5 miles (11.9km) under Newall Green, Wythenshawe, Northenden, West Didsbury, Withington, Rusholme and Longsight. The route would resurface north of Longsight alongside the existing railway line into Piccadilly. It would continue in cutting through Ardwick adjacent to the existing rail corridor, elevating to pass over the Inner Relief Road (Mancunian Way) and approach the new station immediately to the north of the existing Piccadilly station.

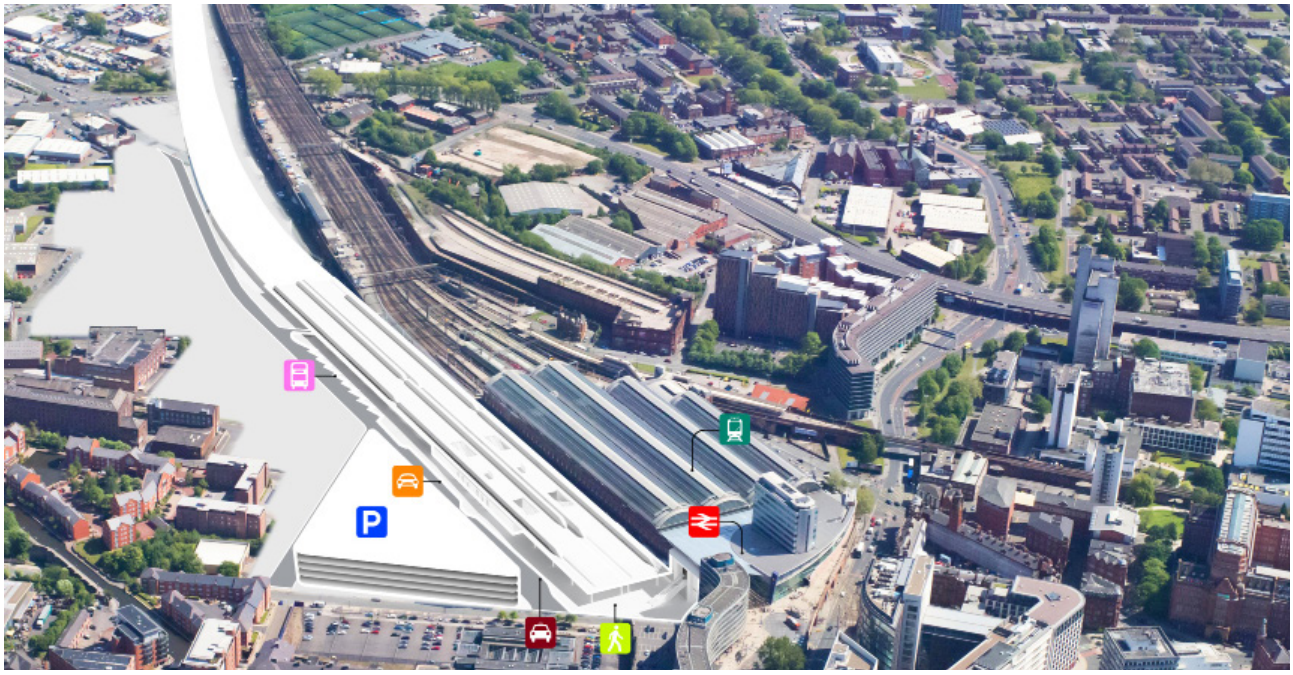
Manchester journey times – comparing HS2 with existing services



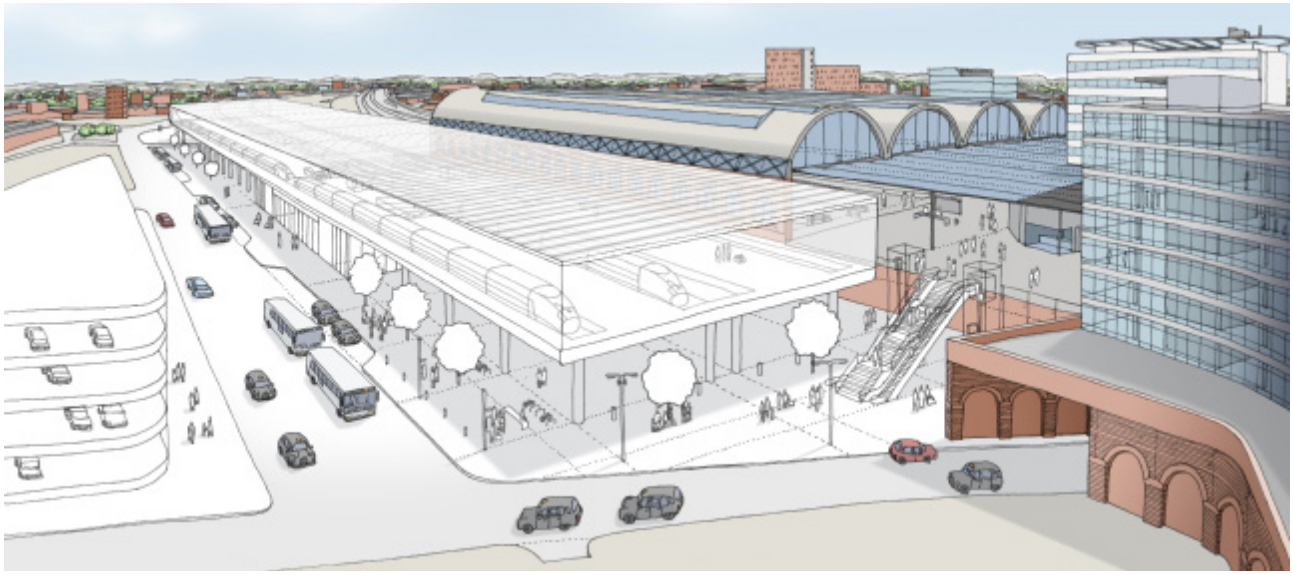
7.8 Manchester Piccadilly

7.8.1 The Government has announced its intention to construct a new Manchester city centre HS2 station alongside the existing main line station at Manchester Piccadilly. The new station would sit immediately to the north of the existing Manchester Piccadilly station. The HS2 platforms would be parallel with, and alongside, platform one of Manchester Piccadilly station. The platforms would be elevated with HS2 concourse facilities located at ground level, beneath the elevated platforms and to the west side of the Metrolink.

Manchester Piccadilly – footprint



Manchester Piccadilly – intermodal connectivity



Manchester Piccadilly – possible station view

7.8.2 Manchester Piccadilly station benefits from excellent transport connectivity. The existing station is served by six train operating companies serving routes across the region, northern England and inter-city services to the Midlands, London, Scotland and elsewhere.

7.8.3 The station currently serves as a terminus for Manchester Metrolink services to Altrincham, Eccles and Salford Quays including MediaCity UK with connections also to Didsbury, Oldham, and Rochdale. Since early 2013, the station has been served by a through Metrolink route from Bury to Droylsden. That service is to be extended to Ashton-under-Lyne (planned opening winter 2013/14) and a further extension to Manchester Airport is planned for 2015. The redevelopment of Manchester Piccadilly would seek to enhance access and connectivity with the Metrolink tram network across the city and region. Vehicular access to the station would also be achievable from the Inner Relief Road.

7.8.4 There are opportunities to enhance the station's already good connectivity with additional bus, coach, and taxi services, and also to improve its access by walking and cycling.

7.8.5 There are also planned improvements for Piccadilly Station as part of the Northern Hub proposals, which will enhance rail services in and around Manchester and the North of England.

7.8.6 HS2 Ltd estimated that the proposed station would support between 29,700 and 42,900 jobs as a result of the development which might be expected to be generated as a result of HS2 of which around 10% would be in areas of relatively high deprivation. This reflects the fact that Piccadilly Station is the main transport hub within the region and at the heart of the city centre, the commercial core, Piccadilly and the Oxford Road Corridor. It has no major development constraints or accessibility problems on key sites. There are potential redevelopment opportunities in the area around Piccadilly Station which could be 'unlocked' and supported by the arrival of HS2. The City Council is leading a fundamental review of the strategic regeneration opportunities in the area, and this will be the subject of public consultation in the late summer/early autumn.

7.8.7 The station would also support development of between 3,100 and 4,100 housing units of which up to 10% would be in areas of relatively high deprivation. Due to its city centre location and potential demolition of commercial properties, the station could displace an estimated 1,900 jobs but it is likely that the majority of these could be accommodated in the region.

Station selection

More detail about the main alternative city centre station options put forward by HS2 Ltd is set out in Annex B. The Government's selection of Manchester Piccadilly drew on HS2 Ltd's advice and the strong support from regional stakeholders for this option.

Manchester Piccadilly benefits from very good connectivity with excellent transport links. When exploring alternative station options for Manchester, HS2 Ltd found that public transport connections would be poorer and require additional works. The option of an HS2 station at Manchester Piccadilly was also notable for creating significantly fewer potential demolitions than the alternatives.

As a result of its connectivity and transport links, the Government noted that a HS2 station at Manchester Piccadilly would offer the best potential benefits and revenue supported by the analysis that Transport for Greater Manchester undertook.

7.9 Proposals for depot locations

Crewe infrastructure maintenance depot

7.9.1 The Government's proposed infrastructure maintenance depot for the western leg would be located approximately half way along the route between the West Midlands and Manchester, south of the existing Crewe station and adjacent to the west side of Basford Hall sidings and would be linked onto the WCML.

Golborne rolling stock maintenance depot

7.9.2 This depot would be located to the north of Golborne, around two and a half miles south of Wigan, between the WCML and the proposed HS2 route and would be accessible from both ends. This is a convenient location to service trains terminating in Preston, Liverpool and Manchester. The site is a relatively flat greenfield farmland site, in the green belt.

Employment Opportunities

7.9.3 Locating the depots in areas with existing industrial and redundant railway land will encourage the growth of associated businesses and new jobs locally. We envisage the depots helping to transform previously neglected areas of land. Jobs and apprenticeships will be created during the construction of these facilities, and then at least 500 permanent employees would be required for the four locations in the day to day running of the operations.

7.9.4 The Government and HS2 Ltd would work with local delivery partners on options for using these depots to leverage in other employment to the area. It is possible that firms in the supply chain who might benefit from proximity to these new depots may be attracted to the area.

Indicative locations for tunnel ventilation shafts

7.9.5 For longer tunnels it is necessary to have shafts for ventilation, maintenance, pressure relief and emergency intervention. Typically, the shafts will be located at 1.3 to 1.9 mile (2-3km) intervals depending on total tunnel length, train operating speed and land take at the surface.

7.9.6 At this early stage in the design we have identified indicative locations for shafts. As the design progresses further detailed aerodynamic modelling will be undertaken to confirm the exact location. Further information about the indicative ventilation shaft locations can be found in the engineering report and plan and profile maps.

7.9.7 The proposed scheme includes a total of five tunnels on the western leg to Manchester. Of these, the tunnels proposed at Whitmore and Madeley would be just over 700 metres in length and a 500 metre raised tunnel at Hopton, none of which would need shafts.

7.9.8 The proposed tunnel at Crewe would be 2.4 miles (or just over 3.8 km) in length and would therefore require one ventilation shaft approximately mid-point. HS2 Ltd has identified a site located in the large grassed area behind Rosedale Manor Care Home with access off Middlewich Street via Ridgeway Street.

7.9.9 The proposed tunnel approaching Manchester city centre would be just over seven miles (11.9km) in length and would require four ventilation shafts at roughly equal spacing. HS2 Ltd consider there would be a viable option at the commercial development at the junction of the Altrincham Road (A560) and the M56. Alternatively it would be possible to use the car parking structure behind this location. The indicative location of the second shaft would be in an area adjacent to the Withington golf course off the Palatine Road. The indicative location of the third ventilation shaft would be on the site of the Public House and its car park at the corner of Lapwing Lane and the Palatine Road. The fourth ventilation shaft would be located close to the corner of Whitworth Lane and Old Hall Lane in an area presently occupied by a University car park and playing fields.

Maintenance Loops

7.9.10 Maintenance Loops are a series of sidings used for the out berthing of infrastructure maintenance trains, and failed trains which cannot readily be pushed through to the next station so allowing the line to be cleared with limited delay. Depots can be used for this purpose however, due to the nature of the lengths between depots and stations on this high speed network, it is necessary to provide maintenance loops between these locations to ensure resilience of the network.

7.9.11 HS2 Ltd indicated that such berthing facilities (be they depots or maintenance loops) should be supplied on the network, at intervals of 37 miles (60km) along the route. The proposed depot locations would require one maintenance loop for each leg.

7.9.12 At this early stage in the design we have identified indicative locations for the maintenance loops. As the operations and maintenance strategy is progressed further work will be undertaken to confirm the exact location. Further information about the indicative maintenance loop locations can be found in the engineering report and plan and profile maps.

7.9.13 For the western leg, the indicative location for maintenance loops is north of Pipe Ridware, immediately north of the viaduct over the River Trent floodplain.

Consultation questions

(i) Do you agree or disagree with the Government's proposed route between the West Midlands and Manchester as described in the chapter above?

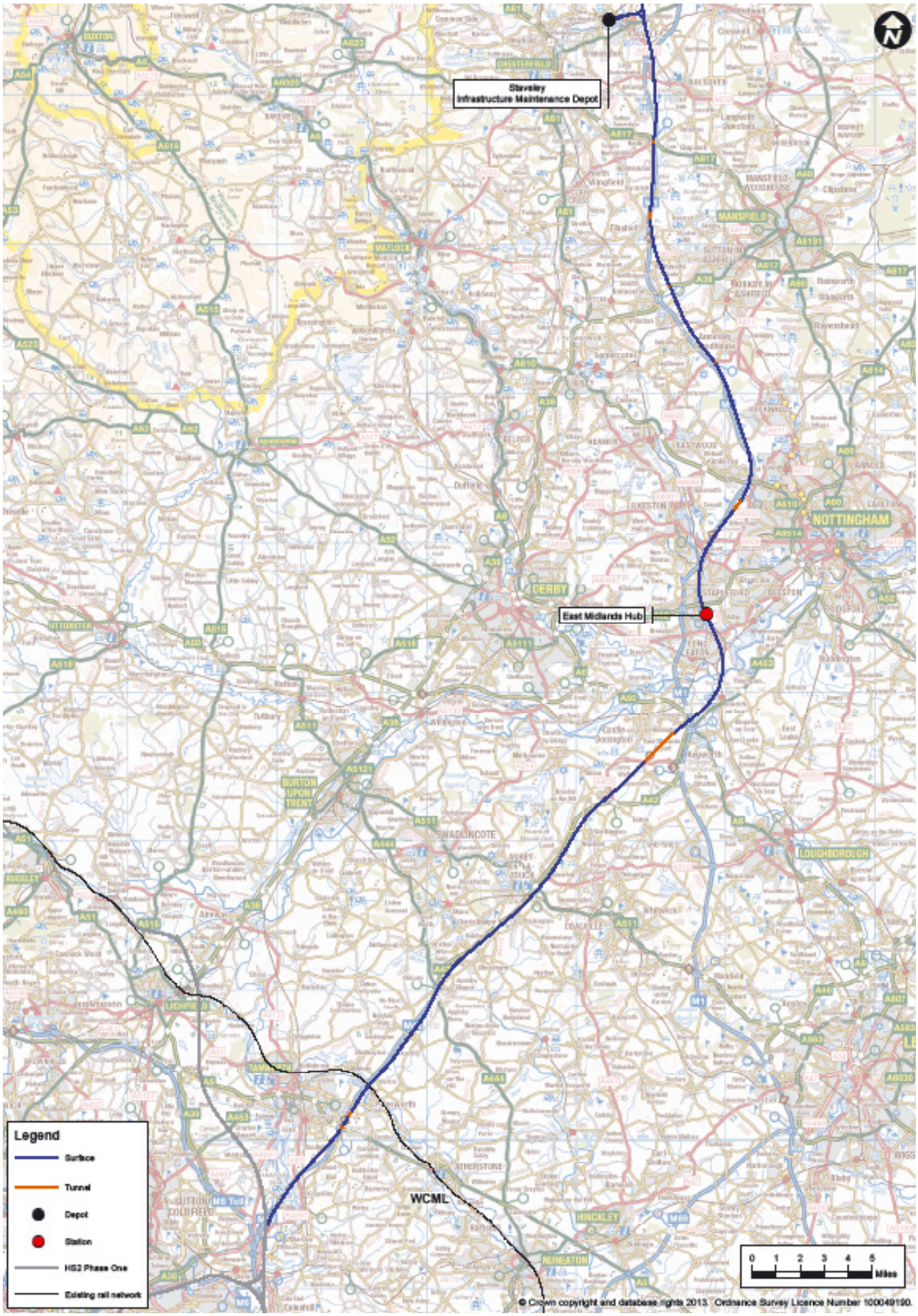
(ii) Do you agree or disagree with the Government's proposals for:

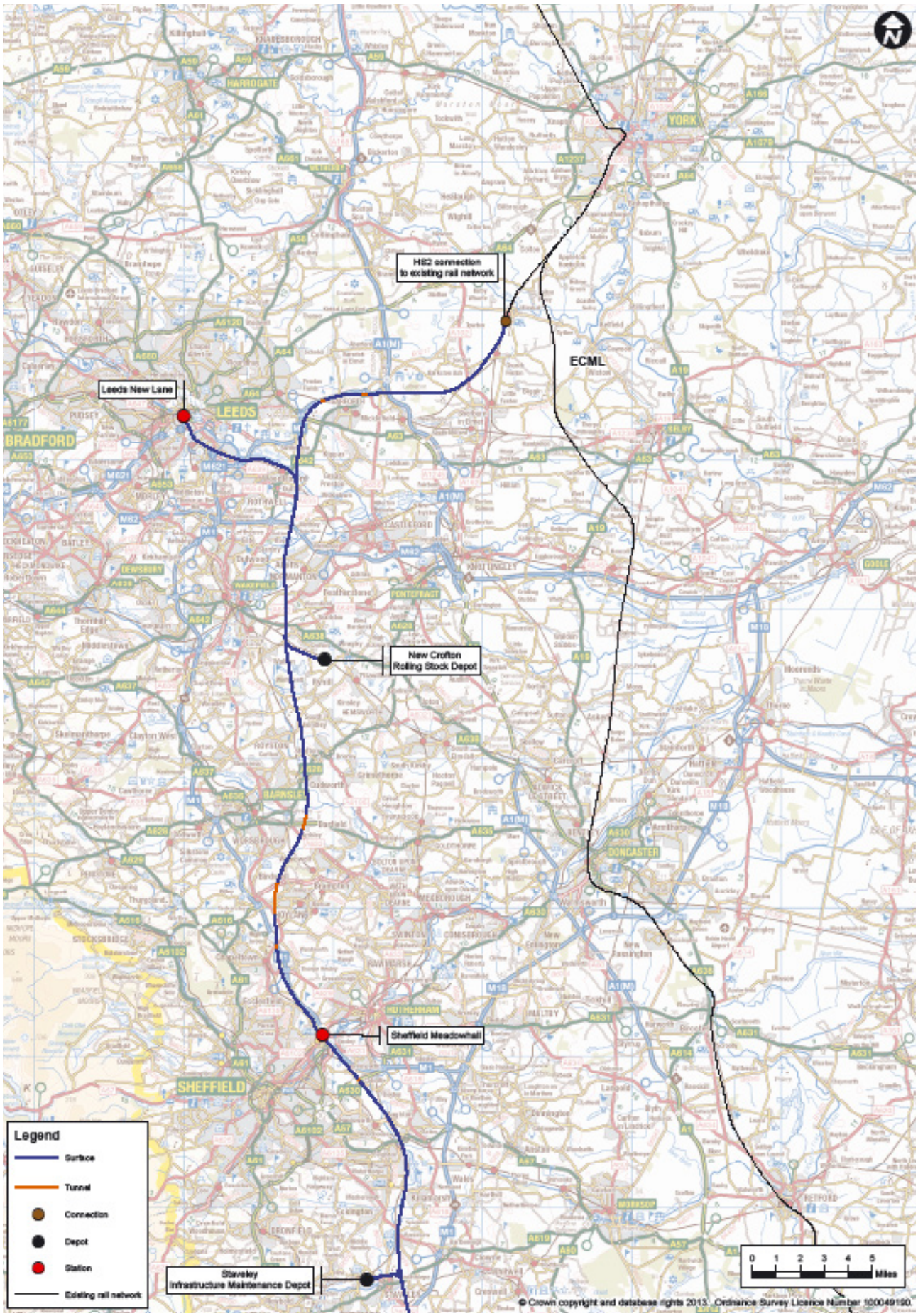
a. A Manchester station at Manchester Piccadilly as described in sections 7.8.1 – 7.8.7 above?

b. An additional station near Manchester Airport as described in sections 7.6.1 – 7.6.6 above?

(iii) Do you think that there should be any additional stations on the western leg between the West Midlands and Manchester?

Map Eastern Leg




HS2 connection to existing rail network
ECML
Leeds New Lane
LEEDS
BRADFORD
HARROGATE
YORK
New Crofton Rolling Stock Depot
BARNSLEY
DONCASTER
Sheffield Meadowhall
SHEFFIELD
Staveley Infrastructure Maintenance Depot
Legend
Surface
Tunnel
Connection
Depot
Station
Existing rail network
0 1 2 3 4 5 Miles
© Crown copyright and database rights 2013. Ordnance Survey Licence Number 100049150.

8 Eastern leg: Leeds route

8.1 Introduction

8.1.1 This section focuses on the proposed route from the West Midlands to Leeds including new high speed stations in the East Midlands, Sheffield and Leeds, and a connection to the East Coast Main Line enabling York, Newcastle and the wider North East to be served.

8.1.2 The route and stations are described in detail, including how HS2 Ltd sought to optimise the design at this stage of the process to minimise impacts. The 'West Midlands to Leeds Route Engineering Report' provides a more detailed description of the engineering of the proposed scheme. This is available at www.hs2.org.uk. Later on in this section, proposed locations for supporting infrastructure are also described. Annex B describes the main route and station alternatives and explains why these have not been chosen.

8.2 Water Orton to Toton

View of HS2 from Breedon-on-the-Hill

8.2.1 The junction for the eastern leg would leave the Phase One route north of Water Orton and south of the M42. Leaving the junction, the route would run north-east crossing the River Tame at Kingsbury and follow the M42/A42 corridor closely, mostly on its eastern side except for a three mile section near Tamworth. The route would cross the River Mease Special Area of Conservation (see text box below) to the north-west of Measham and continue along the east side of the A42 past Ashby-de-la-Zouch. Three junctions along this stretch of highway may need to be remodelled along with temporary and permanent realignments at Birchmoor and Measham respectively. The route would leave the A42 corridor at Breedon-on-the-Hill and pass under East Midlands Airport in tunnel.

8.2.2 The initial preferred route announced by Government at the end of January 2013 included a tunnel under East Midlands Airport with a portal just north of the airport. This option would diagonally cross the site of a proposed East Midlands Strategic Rail Freight Interchange (SRFI) adjacent to the airport. Recognising the importance of this proposal, the Government and HS2 Ltd met with all those concerned following the January announcement to consider whether there were viable options available to minimise potential impacts on the SRFI scheme.

8.2.3 Following discussions, it is proposed that the length of the tunnel is increased by just over half a mile to 1.9 miles (3.0km) in length. The tunnel portal would be extended to the northern boundary of the proposed East Midlands Gateway development site. This option is included here as part of the proposed route for consultation.

River Mease Special Area of Conservation

The River Mease Special Area of Conservation (SAC) is a protected European site of importance because of its valued species which are mainly aquatic. HS2 Ltd worked with Natural England and the Environment Agency to understand the implications of crossing the SAC. HS2 Ltd undertook a Screening Opinion and a draft Appropriate Assessment, the provisional conclusion of the latter which was that the River Mease crossing would not have an adverse effect on the SAC. Natural England has agreed with this provisional conclusion. The Appropriate Assessment will continue through the design process to ensure there are no significant adverse effects.

The route to the north of Measham is considered more favourable than the other options as it crosses a narrow part of the floodplain and makes a more direct crossing of the river with a shorter viaduct structure. A variant option to the south of Measham would impact a larger number of people with noise but would otherwise be comparable to the option to the north. The variant to the east of Measham that avoids crossing the SAC designation directly would generally have more sustainability impacts, including directly impacting Biodiversity Action Plan habitats, ancient woodlands and a Conservation Area.

8.2.4 Soon after leaving the tunnel, the route would pass over the M1 motorway north of Junction 24 near Lockington to cross the floodplain of the River Soar on a 2.1miles (3.4km) long viaduct. There would be a brief cut and cover tunnel through Red Hill, north of Ratcliffe-on-Soar power station, before crossing the River Trent and its floodplain on another long viaduct of 1.1miles (1.7km) in length. The north end of this viaduct would cross the Trent Junction that connects the rail routes from Derby, Leicester and Nottingham. From here the route would pass through Long Eaton along the existing rail corridor towards the East Midlands Hub station option at Toton.

Route Selection

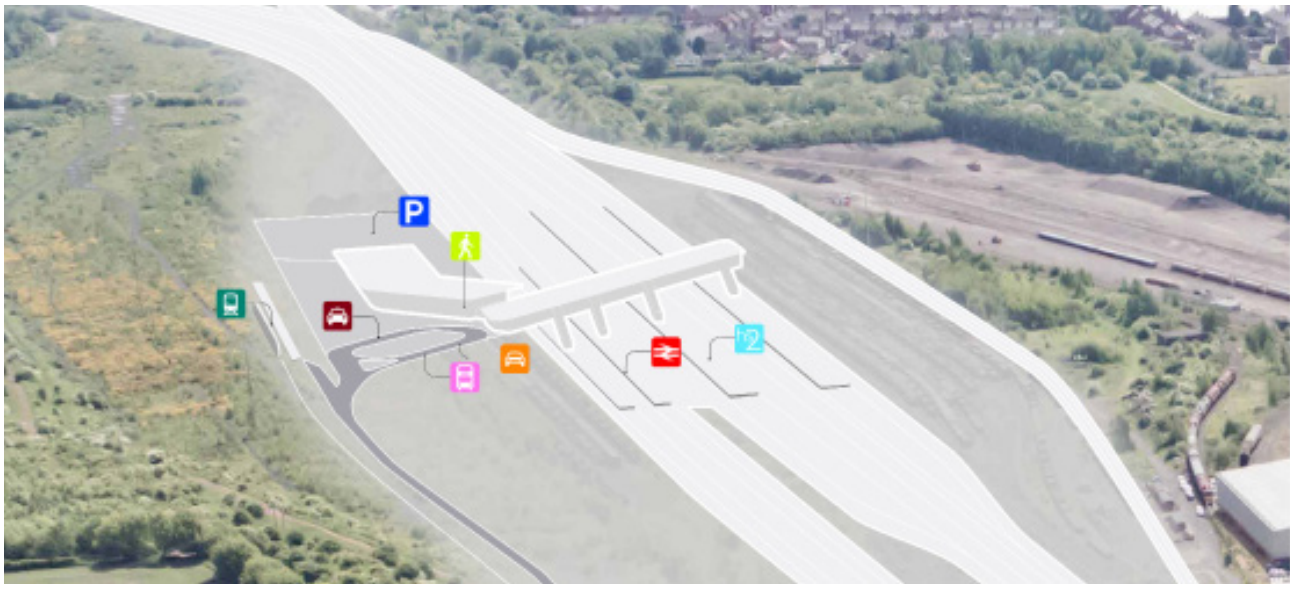
The main alternative route options are summarised at Annex B. The choice of the East Midlands Hub station at Toton, described in more detail below, dictated the route selection through this area.

As described above one of the main drivers for route selection between Water Orton and Toton was how to avoid or minimise any impact on the River Mease SAC. HS2 Ltd provided detailed reports on their work analysing potential route options which is reflected in text box above. As this text box summarises, the Government has selected the route to the north of Measham because it would cross a narrow part of the floodplain and make a more direct crossing of the river with a shorter viaduct structure.

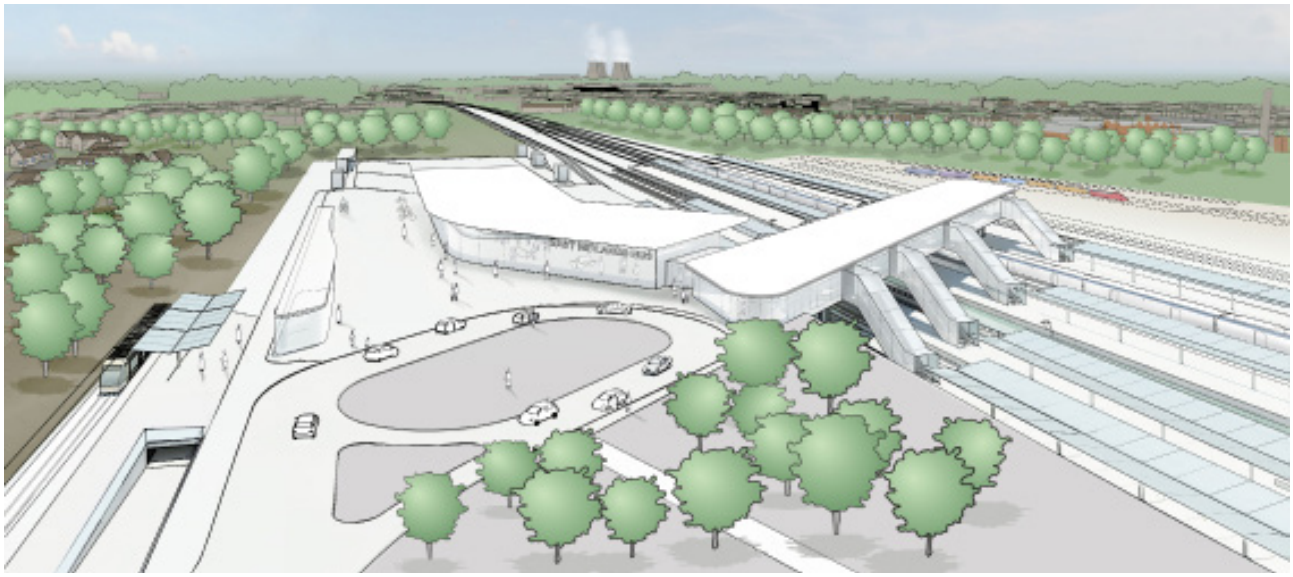
8.3 East Midlands Hub station (Toton)

8.3.1 The Government asked HS2 Ltd to provide advice on the location of a station to serve the East Midlands region. The Government's proposed station to serve the region would be to construct a new HS2 station at Toton, between Nottingham and Derby, making use of existing railway land to the south-west of Nottingham. Toton has good access to the M1 and could be served by a dedicated rail service to Nottingham, Derby, Leicester and other principal stations in the region, as well as bus services and an extension of the Nottingham tram.

East Midlands Hub – footprint



East Midlands Hub – intermodal connectivity



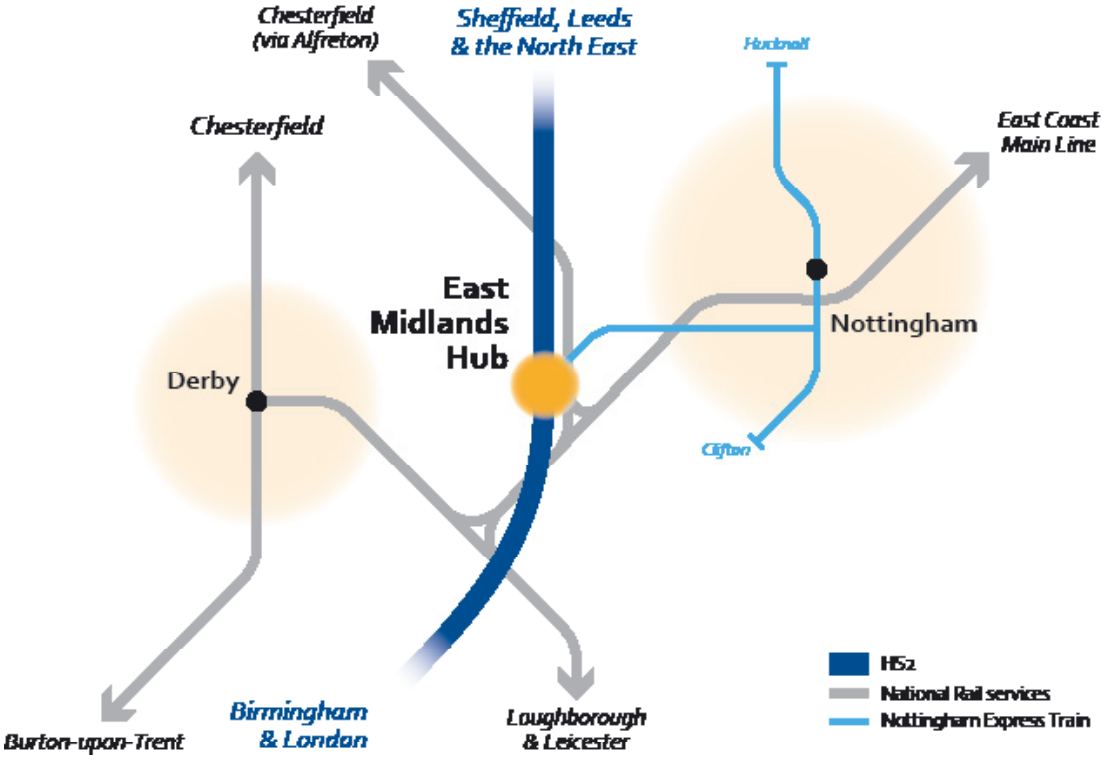
East Midlands Hub – possible station view

8.3.2 The station would consist of four high speed platforms and four platforms for conventional services. There would also be two fast lines through the middle of the station for non-stopping services. The platforms would be at ground level, with the station entrance and forecourt located above and to the east. Passengers would enter the station at the higher level and would descend to the platforms via stairs, escalators or lifts.

8.3.3 A key advantage of the East Midlands Hub station would be the extent to which it would be readily accessible by public transport from Derby, Nottingham and the much wider East Midlands region. Its strong public transport connectivity would allow a significant proportion of passengers to access the station making it the best of all the options for serving the East Midlands generating additional benefits of £500 million over the next best performing option and additional fare revenues of around £190 million. The connection to Derby would also provide easy access for business locations in Derby including Rolls Royce, Toyota, Bombardier and other important businesses.

8.3.4 By incorporating conventional rail platforms it would be possible to run a range of connecting services from existing stations, including Derby, Nottingham, Leicester and other stations in the wider East Midlands region. For example, it would be possible for trains running between Nottingham and Derby to call at the East Midlands Hub station en route, with a journey time of 12 and 15 minutes from each of these respectively. Scoping of the potential configuration of services to ensure the right levels of access would involve the relevant stakeholders and Network Rail. Also Nottingham has a growing tram network which could be extended to call directly at the East Midlands Hub station.

East Midlands connectivity



8.3.5 The site of the proposed station is alongside an existing rail freight yard north of Long Eaton. It is just over a mile to Junction 25 on the M1. The A52 (Brian Clough Way) provides good road access to the M1 and Derby to the west and to Nottingham city centre to the east. Car access would be important and would help to ensure wider access to areas that would not have direct public transport access to the site. Work would be undertaken with the Highways Agency and local authorities to ensure adequate network capacity to support the station in addition to the surrounding area. The station development would include car parking facilities and a dedicated connection from the A52. The proximity to the A52 would also enable good bus services, and potentially regional coach services to operate via the station. Work would be undertaken with the Highways Agency and local authorities to ensure adequate network capacity to support the station and other planned developments.

8.3.6 HS2 Ltd's analysis suggests that the East Midlands Hub station could support between 1,500 and 1,600 jobs and between 150 and 800 houses. Around 600 jobs would be potentially displaced but it is likely that the majority of these displaced jobs would be accommodated in the region.

East Midlands journey times – comparing HS2 with existing services

Station selection

The Government has selected the East Midlands Hub station at Toton because it is the best of all the options HS2 Ltd developed for serving the East Midlands market as a whole. HS2 Ltd's analysis suggested that the hub station would attract over three-quarters of passengers from Derby and four-fifths from Nottingham for journeys to London. In contrast the main alternative put forward by HS2 Ltd, for an HS2 station at Derby Midland, would obviously serve Derby very well, but would see a drop in passengers wishing to travel to and from Nottingham and the wider area.

Overall, the East Midlands Hub would generate additional benefits of around £500m compared to Derby Midland and, by attracting more passengers, it could generate additional fare revenues of around £190 million.

8.4 Toton to Sheffield

8.4.1 Upon leaving the new East Midlands Hub station at Toton, the proposed consultation route would broadly follow the M1 motorway corridor as far as Staveley in North Derbyshire. The proposed route may require around a mile of the M1 to be realigned at Stanton Gate and a temporary realignment is likely to be put in place at Tibshelf with additional impacts also on the motorway junctions along this stretch.

8.4.2 Ground levels through this area are variable ranging from 40 metres to 190 metres above sea level. As a result of the frequent changes in elevation the route is characterised by a series of deep cuttings and high embankments with bridges and viaducts to cross rivers and infrastructure; the highest of which would be the viaduct over the River Erewash at South Normanton at a height in excess of 30 metres above the river.

8.4.3 Further on, the village of Strelley is approximately a mile to the east of the M1 between Junctions 25 and 26 and includes several listed buildings and a conservation area. The proposed scheme would be 360 metres from the M1 and include a half mile cut and cover tunnel under the Strelley Conservation Area to the north-west of Nottingham. The tunnel would be under Main Street, just to the west of the Grade I Listed All Saints Church and Grade II Listed Strelley Hall. The proposed route would emerge as open shallow cutting to the north-east of the conservation area and continue north towards Nottingham Business Park.

8.4.4 The proposed route would then pass through the National Trust land associated with Hardwick Hall, south of Bolsover. The land is extensive, spanning a mile or more either side of the motorway. To avoid passing through this area would result in a significant increase in cost, disruption and potential sustainability impact. The proposed route would therefore run as close as is practicable to the M1 along its west side between Tibshelf and Heath, sitting low in the landscape past the Hall as far as Junction 29 at Heath so as to minimise impacts through this sensitive area, which, in addition to Hardwick Hall, includes Sutton Scarsdale and Bolsover Castle.

8.4.5 The route would leave the M1 corridor at Staveley where it is proposed to site the infrastructure maintenance depot for the eastern leg. This is described in more detail in section 8.37. From Staveley the route would follow the Rother Valley towards the proposed station option for South Yorkshire at Meadowhall.

8.4.6 Running through the Rother Valley, the route would adopt the alignment of the existing Chesterfield to Rotherham Railway which would have to be moved westwards over a length of 2.1 miles (3.4km). The route would pass onto viaduct through the Waverley Major Development site on the former Orgreave Colliery site before entering a deep cutting through the former Sheffield Airport and passing onto embankment along the site of the former Tinsley Marshalling Yard.

8.4.7 North of Tinsley, the route would be on a 2.5 miles (4.0km) long viaduct up to 22 metres high across the Don Valley, this being at a comparable level to the M1 as it runs across its Tinsley viaduct. The route would widen from two tracks to four, and then to six at the station location.

Route selection

As set out in HS2 Ltd's reports, the Government recognised that there are a number of challenges with route options between the East Midlands and South Yorkshire reflected in the wide variety of options through this area that were explored. The Government selected the route option described here because it is a comparable cost to the main alternative, described at Annex B, via the Erewash Valley. As HS2 Ltd set out in their work refining route options, the Erewash Valley option would also pose a significantly greater risk in terms of capital and maintenance costs and engineering challenge due to old mine sites and historic landfills. The Erewash Valley option would also have a higher noise impact on properties than the M1 route option which benefits from following a transport corridor more closely.

The Government accepted HS2 Ltd's evaluation of the route options and on this basis has selected the route option that would broadly follow the M1.

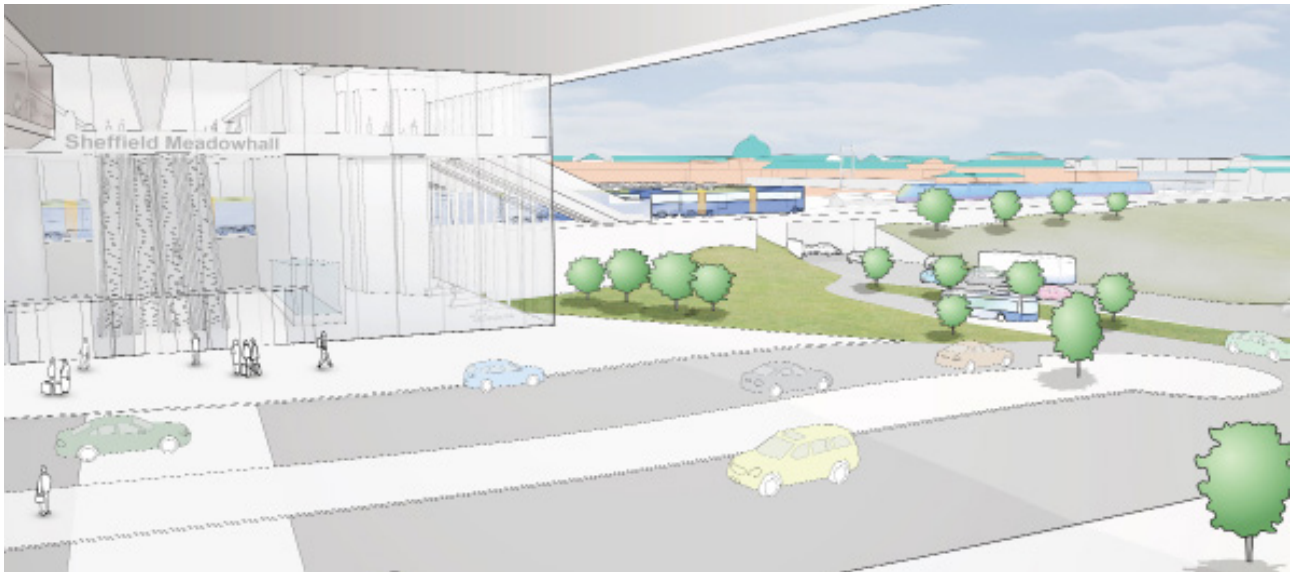
Following announcement of the Initial Preferred Route, a direct impact on the Firth Rixson site located directly north of the proposed HS2 Sheffield Meadowhall station has been identified. The loss of this historical stainless steel forge and the associated jobs (including those within the wider supply chain) conflicts with government policy to promote British industry and consequently the route has been re-orientated in this location to minimise the impacts on the Firth Rixson site, Meadowhall retail complex and residential properties.

8.5 Sheffield Meadowhall station (South Yorkshire)

8.5.1 The Government asked HS2 Ltd to provide advice on a station to serve the South Yorkshire region. The Government's preference for a station serving South Yorkshire would be to construct a new HS2 station close to the Meadowhall retail complex to the north-east of Sheffield. The site is close to Junction 34 of the M1 motorway and is currently served by tram and bus services, as well as by rail services from across the region and beyond.

Sheffield Meadowhall – footprint

Sheffield Meadowhall – intermodal connectivity



Sheffield Meadowhall – possible station view

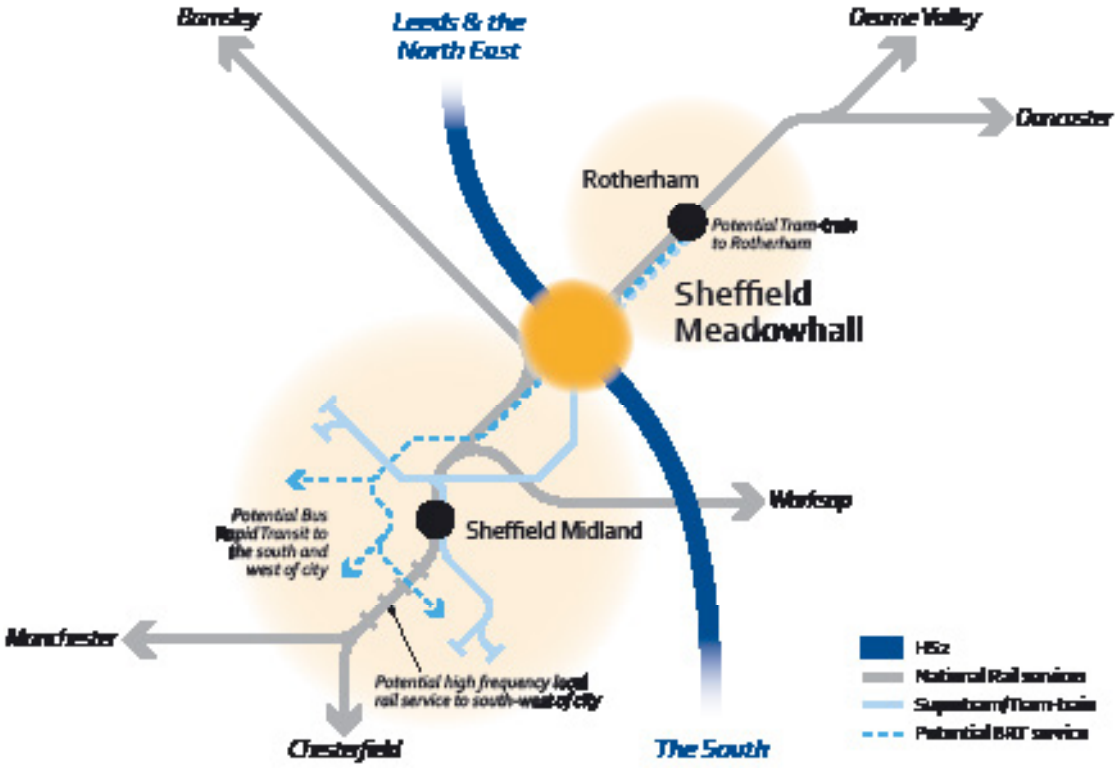
8.5.2 The main high speed line would run from south-east to north-west and be elevated on a viaduct with the four platform faces provided, approximately at the same level as the upper deck of the M1 Tinsley viaduct (23 metres above ground level), arranged as two islands. Two additional central tracks would be dedicated fast lines for trains not stopping at the station.

8.5.3 The refinement of the route to minimise impacts on local industry locates the Sheffield Meadowhall station about 250 metres from the four-platform Network Rail station at Meadowhall Interchange, some 120 metres closer than previously proposed. The station would also continue to provide access to the Sheffield tram lines "Supertram" which would pass underneath the station.

8.5.4 The proposed Meadowhall station would be located between Sheffield and Rotherham, four miles north-east of central Sheffield, three miles south-west of the centre of Rotherham, twenty miles south-west of Doncaster and eleven miles south-east of Barnsley with excellent public transport connectivity.

8.5.5 The existing Meadowhall station already has a frequent rail service. Up to nine trains per hour run into Sheffield Midland station in Sheffield city centre, with a journey time of as little as five minutes. Trains from Meadowhall also serve Rotherham, Barnsley, Wakefield and Doncaster as well as to Leeds, Manchester and Chesterfield. Improved rail access from south-west Sheffield to Meadowhall could also be considered, with the possibility of including a frequent service between Dore and Totley and Meadowhall. Alternatively, extensions of the proposed new Tram Train could be considered, which would offer scope for additional new stops in south-west Sheffield.

Meadowhall – journey time connectivity



8.5.6 The existing Sheffield Supertram also serves the existing Meadowhall station and provides a 20 minute journey time into Sheffield city centre via the Lower Don Valley. Trams currently run every 10 minutes during peak times, providing a high capacity and convenient link to key parts of the city. A new tram stop integrated into the HS2 station would be built. Meadowhall is already a major bus station and an important calling point on the National Express coach network.

8.5.7 The HS2 station at Meadowhall would be situated alongside the M1, providing convenient access by road to and from the wider region. Work would be undertaken with the Highways Agency and local authorities to ensure adequate network capacity to support the station and other planned developments, such as those in the Sheffield Enterprise Zone.

8.5.8 HS2 Ltd's analysis suggests that the Sheffield Meadowhall station could support between 4,000 – 5,400 jobs of which up to 3,750 would be in areas of relatively high deprivation. The station could also support between 250 and 300 housing units of which there could be between 200 and 300 in areas of relatively high deprivation. The Meadowhall station would displace an estimated 800 jobs and a further 50 jobs could be displaced by the proposed depot at Staveley. It is likely that the majority of these displaced jobs would be accommodated in the region and would not be lost. A detailed description of the potential sustainability impacts and benefits of the proposed consultation are set out in the Sustainability Statement.

Station selection

The Government recognised the potential benefits of serving a city centre station in Sheffield. However, HS2 Ltd's advice to the Government was that the benefits would not justify the additional costs of around £1 billion that a city centre station would incur.

The estimated costs were large because of the challenges of serving central Sheffield by HS2. More detail about the alternative station options at both Sheffield Midland and Sheffield Victoria is set out at Annex B. The final alternative HS2 Ltd put forward was for a loop from the main high speed line to a proposed new station at Sheffield Victoria, at an additional infrastructure cost of around £1 billion.

Against this backdrop the Government noted HS2 Ltd's advice that the benefits of the station would not outweigh these costs. HS2 Ltd's analysis was that the market for travel by HS2 to and from South Yorkshire, though important, would be relatively small. This means that a Sheffield city centre station would only support an infrequent dedicated HS2 service.

Overall, given the wider consideration of delivering the best performing Phase Two network, and considering the issues and challenges associated with the city centre options, the Government has selected Sheffield Meadowhall as its preferred South Yorkshire station for consultation.

8.6 Sheffield Meadowhall to the East Coast Main Line and York

8.6.1 North from Meadowhall the proposed route would follow the M1 motorway for a short distance, leaving this transport corridor at Chapeltown to head towards the east of Barnsley where the terrain is less challenging than it would be if the route continued to follow the M1. Nevertheless, the route would still need to climb 70 metres over a distance of two miles before passing below the M1. This section of route would require deep cuttings, high embankments and high bridges and viaducts which are described

in more detail in the Route Engineering Report. Tunnels would also be required beneath Hoyland (1.3 miles) and Ardsley (0.75 miles).

8.6.2 Leaving South Yorkshire and north of Wintersett Reservoir the route would pass New Crofton which is the proposed location of the rolling stock maintenance depot described further in section 8.38. The route would cross the River Calder and the Aire and Calder Navigation on a viaduct up to 18 metres high and 0.6 miles (1km) long at Altofts. The grade separated junction for the spur into Leeds and the mainline connecting to the East Coast Main Line towards York would start once the route has crossed the M62; the mainline would continue almost due north crossing once again the Aire and Calder Navigation and then the River Aire to the east of Woodlesford with almost a mile of elevated structures up to 25 metres above ground level.

8.6.3 The mainline towards York would continue north, rising out of the Aire Valley passing to the west of Swillington and then following the M1 to swing eastwards passing to the north of Garforth. After crossing beneath the A1(M) the route would continue east then north-east, passing to the west of Church Fenton before creating a new junction with the existing Leeds to York railway between Church Fenton and Ulleskelf. The trains would then run on this line briefly before connecting to the East Coast Main Line at Colton Junction to the south-west of York.

Route selection

The Government's proposed route for consultation is based on work by HS2 Ltd that explored a wide variety of options but that ultimately concluded that only one of the options was viable. The Government considered the two main connections to the East Coast Main Line that HS2 Ltd put forward. It selected the Garforth route principally because it would be around £280 million less expensive as a result of the alternative Castleford route to the East Coast Main Line being further from the centre of Leeds resulting in a longer spur and corresponding higher cost. The Garforth option would also generally have fewer sustainability impacts.

8.7 Approach into Leeds City Centre

8.7.1 The spur to Leeds would cross the Aire and Calder Navigation heading westwards to skirt past Woodlesford, running between the Navigation and the River Aire. It would then cross the Navigation again before joining the existing Castleford to Leeds railway corridor where it would pass beneath the M1 motorway. The route would continue through the light industrial and commercial areas of Stourton and Hunslet, leaving the rail corridor once it has passed beneath Junction 4 of the M621. Upon leaving the rail corridor the tracks would rise above the existing street level to terminate at the new station at Leeds.

8.8 Leeds New Lane station

8.8.1 The Government's preference for a station serving Leeds is to construct a new HS2 station in the Leeds Waterfront area, immediately south of the Victoria Bridge over the River Aire, between Bridgewater Place and the Asda headquarters building. The station would be orientated approximately north-south, opening onto a new civic space on the south bank of the River Aire.

Leeds New Lane – footprint

Leeds New Lane – intermodal connectivity

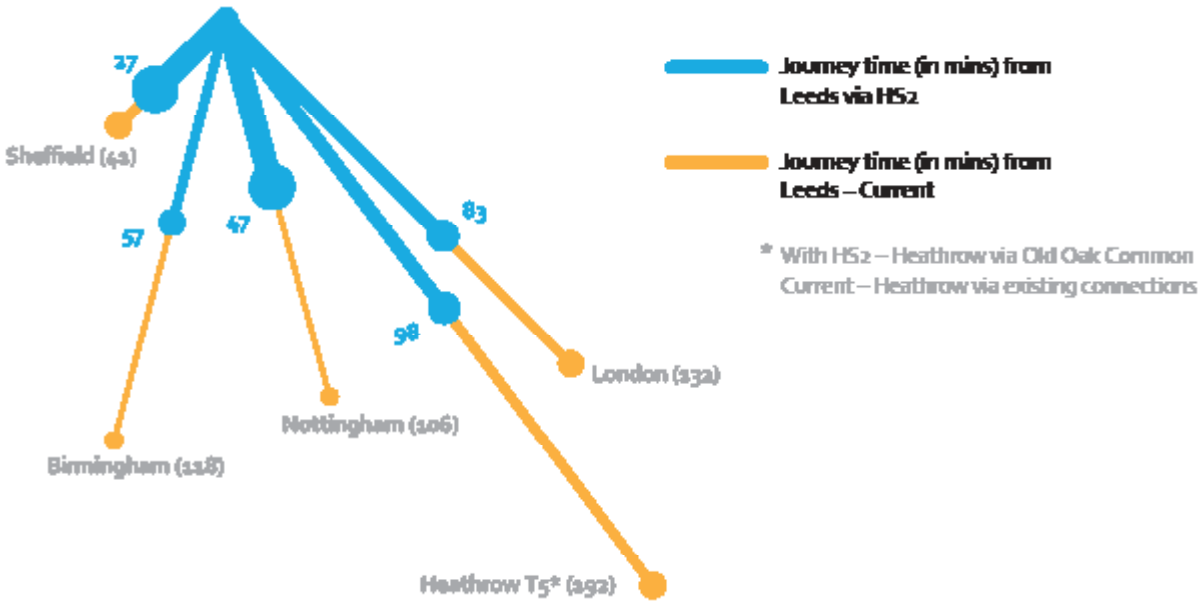
Leeds New Lane – possible station view

8.8.2 The station would comprise five platforms. The platforms would be elevated over the adjacent Meadow Lane to avoid east west severance with changes required to the local road network including Great Wilson Street. A dedicated car park and bus-taxi access would also be provided.

8.8.3 Leeds New Lane HS2 station would be located to the south of the existing Leeds City national rail station, and connected to it by a pedestrian link. This link between the two stations would enable passengers to benefit from the good connectivity to the wider region with frequent services to all major rail destinations in West Yorkshire and the wider Leeds city region, including Bradford, Huddersfield, Wakefield, Halifax, Skipton, Harrogate, Selby, and further afield.

8.8.4 The HS2 station would be easily accessed by passengers using cars from the wider city region, due to its proximity to the Ring Road and the highway network. The southern entrance to the station would have good proximity to the Inner Ring Road, M621 and motorway network, which would provide good highway access to the West Yorkshire region. Connectivity to the South Bank waterfront area regeneration will create an attractive area for cyclists and pedestrians to access the station.

Leeds – comparing HS2 journey times with existing services



8.8.5 HS2 Ltd estimated that Leeds New Lane could support between 13,200 and 19,700 jobs of which up to 3,250 would be in areas of relatively high deprivation. The station could also support between 1,700 and 2,400 housing units of which 300 would be in areas of relatively high deprivation. The proposed station would potentially displace an estimated 1,500 jobs but with the expectation that the majority of these could be accommodated in the region and would not be lost.

Approach and Station selection

HS2 Ltd's studies arrived at three main location options for an HS2 station in Leeds city centre. These were: Leeds New Lane, Leeds Station North and Leeds Sovereign Street.

The proposed option at Leeds Station North would provide the easiest possible interchange with the existing rail network. However, the site is constrained and building the HS2 station here would effectively prevent future long term expansion of the existing Leeds station. The station would also be served by the longer and slower approach with a higher impact on communities. Overall this would also add around an additional near £400 million to costs.

The preferred option for consultation, at Leeds New Lane, has a shorter, faster route from the edge of the built up area, which is cheaper to build. It would benefit from the faster overall journey time and be a less expensive option overall. The station would be well located to both support and enhance the future development of Leeds to the south. The Government also took account of Leeds' stakeholders' view that, of the options to the south of the city, Leeds New Lane was their preferred option. The selection of Leeds New Lane as the Government's preferred city centre station for consultation therefore determined the selection of the approach via Woodlesford.

8.9 Proposals for depot locations

Staveley infrastructure maintenance depot

8.9.1 This depot would be located slightly to the north-west of Staveley on the eastern leg to Leeds. The depot would sit within a brownfield site, a former iron works. The site is designated for industrial and business use and Chesterfield Borough Council is currently preparing the Staveley and Rother Valley Corridor Area Action Plan.

New Crofton rolling stock maintenance depot

8.9.2 This depot would be located to the east of Wakefield, south of the village of New Crofton on a disused coal disposal plant adjacent to the existing railway line. The site offers a good connection to HS2 and the existing electrified rail network providing access to both Leeds and a link to the East Coast Main Line.

8.10 Employment opportunities

8.10.1 Locating the depots in areas with existing industrial and redundant railway land will encourage the growth of associated businesses and new jobs locally. We envisage the depots helping to transform previously neglected areas of land. Jobs and apprenticeships will be created during the construction of these facilities, and then at least 500 permanent employees would be required for the four locations in the day-to-day running of the operations.

8.10.2 The Government and HS2 Ltd will work with local delivery partners on options for using these depots to leverage in other employment to the area. It is possible that firms in the supply chain who might benefit from proximity to these new depots may be attracted to the area.

8.11 Indicative locations for tunnel ventilation shafts

8.11.1 For longer tunnels it is necessary to have shafts for ventilation, maintenance, pressure relief and emergency intervention. Typically, the shafts will be located at 1.3 – 1.9 miles (2-3km) intervals depending on total tunnel length, train operating speed and land take at the surface.

8.11.2 At this early stage in the design we have identified indicative locations for shafts. As the design progresses further detailed aerodynamic modelling will be undertaken to confirm the exact location. Further information about the indicative ventilation shaft locations can be found in the engineering report and plan and profile maps.

8.11.3 The proposed scheme includes a total of three main tunnels on the eastern leg to Leeds. Only the proposed tunnel under East Midlands Airport, being 1.9 miles (3.0km) in length, would likely require a single ventilation shaft, located immediately north of the airport boundary.

8.11.4 Tunnels of 1.3 miles (2.2km) and 0.75 miles (1.2km) length would also be required to take the route under Hoyland and then Ardlsey on the eastern edge of Barnsley but would not require ventilation shafts. In addition to these three twin bored tunnels there would be two cut and cover tunnels at Red Hill, near the East Midlands Parkway Station and at Strelley respectively 200 metres and 770 metres in length.

8.12 Maintenance loops

8.12.1 Maintenance loops are a series of sidings used for the out berthing of infrastructure maintenance trains, and failed trains which cannot readily be pushed through to the next station so allowing the line to be cleared with limited delay. Depots can be used for this purpose however, due to the nature of the lengths between depots and stations on this high speed network, it is necessary to provide maintenance loops between these locations to ensure the resilience of the network.

8.12.2 HS2 Ltd indicated that such berthing facilities (be they depots or maintenance loops) should be supplied on the network, at intervals of 37 miles (60km) along the route. The proposed depot locations would require one maintenance loop for each leg.

8.12.3 At this early stage in the design we have identified indicative locations for the maintenance loop. As the operations and maintenance strategy is progressed further work will be undertaken to confirm the exact location. Further information about the indicative maintenance loop locations can be found in the engineering report and plan and profile maps.

8.12.4 For the eastern leg the indicative location for maintenance loops is at Toton in the vicinity of the East Midlands Hub station. The loops would be located on brownfield railway land to the west of the station.

Consultation questions

(iv) Do you agree or disagree with the Government's proposed route between West Midlands and Leeds as described in the chapter above?

(v) Do you agree or disagree with the Government's proposals for:

a. A Leeds station at Leeds New Lane as described in sections 8.8.1 – 8.8.5 above?

b. A South Yorkshire station to be located at Sheffield Meadowhall as described in sections 8.5.1 – 8.5.8 above?

c. An East Midlands station to be located at Toton as described in sections 8.3.1 – 8.3.6 above?

(vi) Do you think that there should be any additional stations on the eastern leg between the West Midlands and Leeds?

9 Sustainability summary

9.0.1 Since work on the Phase Two proposals commenced in October 2010, sustainability has been central to how route options were selected and progressed. An Appraisal of Sustainability (AoS) process was used specifically to help HS2 Ltd take account of sustainability issues at each stage of the scheme's development. As a result, the proposed scheme integrates considerations of sustainability alongside those of passenger demand, cost, ease of construction and journey time.

9.0.2 The AoS has been carried out independently using a range of environmental and sustainability specialists. The approach followed that used on Phase One and was based around an overarching framework containing some 80 different evaluation criteria. These were introduced at successive stages, so as the number of options reduced, the detail of the appraisal increased. The AoS was used to advise engineers and HS2 Ltd of particular sustainability constraints and opportunities and how to avoid or lessen potential adverse impacts. It provided information at the decision-making stages by outlining the sustainability advantages and disadvantages of different options, and the consequence of potential impacts. It enabled the independent reporting of the sustainability impacts of the options at each stage. In this way, the AoS process has been instrumental in helping to develop route and station proposals that have sought to fit with the environment and communities they pass.

9.0.3 The overall findings of the AoS are reported in detail in the *High Speed Rail: Consultation on the route from the West Midlands to Manchester, Leeds and beyond Sustainability Statement* which can be found at www.hs2.org.uk. This describes both beneficial and adverse effects resulting from the proposed scheme's construction and operation. At a later stage, once the Government has identified its preferred scheme following consultation, a more detailed Environmental Impact Assessment (EIA) would be undertaken.

9.1 People and communities

9.1.1 HS2 has the capacity to transform areas, driving longer-term shifts in economic performance and potentially altering the shape of economic geography. On a more local scale, the introduction of new high speed stations could have profound effects on the surrounding areas, as people and businesses take advantage of new opportunities arising from the transformation in connectivity, with each station designed to link with existing transport nodes, allowing access to wider transport networks. In effect, HS2 has the potential to "unlock" and bring forward development sites that are already proposed, uplift the capacity of these proposals, and support higher density development. In this way, HS2 could support a large amount of additional employment in the areas immediately around the stations.

9.1.2 The AoS has made estimates of the numbers of these additional supported jobs, as well as of new houses, around the HS2 stations. These estimates take account of any job displacements that would occur due to demolition of business properties, although it is expected that the majority of these would be able to re-locate. In total, up to around 70,000 jobs could be supported around the HS2 stations. In addition, up to around 7,500 new homes could be supported in these areas.

9.1.3 The AoS has been mindful of the make-up of the communities potentially affected in these areas. Many of the station locations exhibit higher levels of deprivation, as well as containing groups that are more vulnerable to discrimination and social exclusion. These groups could benefit particularly from new jobs and houses, but equally could be more susceptible to some of the adverse impacts of the scheme. Issues related to equality and health would be explored in more detail going forwards.

9.1.4 The route would inevitably pass through a number of built-up areas in its approach to stations and along transport corridors or river valleys. The design has used tunnels to avoid some of these, for example in passing beneath Crewe and in accessing central Manchester. However, demolitions would be required at certain locations: an estimated 278 residential properties would be demolished by the scheme proposals, including around 70 dwellings in Manchester and 60 in Sheffield. Other demolitions would occur at various locations along the routes. An estimated 227 commercial properties, 11 industrial properties and four community properties would also be demolished.

9.1.5 The scheme alignment would be effective in limiting potential noise impacts at some locations through for example the use of tunnels and cuttings. However, the noise appraisal team has worked with the scheme engineers to further reduce the number and extent of potential noise impacts that were predicted in January 2013, by identifying indicative locations for noise barriers. As a result, the number of dwellings predicted to have noise impacts has reduced by some 80% on both the western and eastern legs compared with the figures published in January. An estimated 1,100 dwellings on the western leg and 7,800 on the eastern leg are predicted to have 'noticeable' noise impacts, meaning a noise change of 3 decibels (dB) or more (3dB being a just perceptible change in total noise over an assessment period) and resulting in a daytime noise level of 50dB or more. Some of these may not be significant, and further work will be undertaken during the EIA, including baseline noise surveys, to identify where the significant effects will occur.

9.1.6 Large parts of the routes would have relatively slight visual impacts, where the alignment is well concealed or where viewpoints are scarce. However, there are a number of locations where, due to the sensitivity of the landscape, the proximity of people and/or the prominence of HS2 structures, large visual impacts would occur. Chief amongst these on the western leg are Hollins Green, where many residents would be close to the HS2 viaduct over the Manchester Ship Canal, which needs to be high at this location to allow ships to pass beneath; and Golborne, where the high embankments and the proposed road realignments for the depot would affect a range of views. On the eastern leg, visual impacts would be most notable at Pooley Country Park; near Trentlock south of Long Eaton, affecting recreational users in the Erewash Valley; at Woodlesford, where the route would pass on viaduct along the Aire Valley; and in Leeds where the new station could affect sensitive views in the Granary Wharf waterside area. The strategy for mitigating landscape and visual impact is outlined below.

9.2 Landscape and cultural heritage

9.2.1 The route would pass through no nationally protected landscapes, such as Areas of Outstanding Natural Beauty; and a number of refinements to the design have sought to limit impacts within areas of more sensitive landscape. Some prominent structures, such as the viaducts across the Manchester Ship Canal and Dove and Aire Valleys and the embankment past Renishaw, would result in adverse change to local landscape character, but as the scheme design is progressed, landscape mitigation will become a key focus. New planting and land contouring will be adopted within designs to help blend the railway into the landscape, especially where these can be integrated with wider objectives for noise screening or habitat creation.

9.2.2 HS2 Ltd has equally given priority to protecting the historic environment. The western and eastern legs have been selected and aligned to have few impacts on known designated heritage assets. They would avoid physical impacts on nearly all of the most significant designated features, including Registered Battlefields and Grade I and II* Listed structures. The crossing of the below ground remains of a Roman Site at Ratcliffe on Soar would be the only physical impact on a Scheduled Monument, although the settings of five other Scheduled Monuments – one on the western leg and four on the eastern leg – would be affected to some extent. There would be no physical impacts on Registered Parks and Gardens, and impacts on the settings of those passed by the routes would be generally low. Several Grade II Listed structures could be demolished, although refinements to the design are expected to be able to avoid impacts to at least three of these.

9.3 Wildlife and ecology

9.3.1 The design has been responsive to numerous, widespread and diverse areas of protected habitat. There are a number of particularly important, European-protected habitats, particularly along the western leg, where water-bodies have been formed within glacial depressions. HS2 Ltd has worked closely with Natural England and the Environment Agency in its selection of routes and designs that avoid impacts to any of these sites. On the eastern leg, potential impacts on the European-protected River Mease, which would be crossed by viaduct, have also been avoided, although later design development will need to be alert to the sensitivity and vulnerability of this feature.

9.3.2 The eastern leg would directly affect one nationally protected Site of Special Scientific Interest (SSSI) at Bogs Farm Quarry. Continued design will seek effective mitigation where practicable, through avoiding landtake and hydrological impacts. No other SSSIs would be directly affected. Risks to other SSSIs that occur near the route should all be mitigable through careful design and use of best practice techniques during construction.

9.3.3 A network of other important habitat is identified by Natural England. HS2 would impact on around 60 of these. Amongst them are 14 woods that are listed on the Ancient Woodland Inventory. A detailed understanding of these impacts within the context of wider regional ecological characteristics will be vital in developing mitigation proposals that seek to ensure no net loss of biodiversity, in line with the HS2 Sustainability Policy.

9.4 Water resources

9.4.1 The proposed scheme would cross a network of watercourses of varying size. In a small number of cases this may necessitate a diversion or modification to the river channel. Further design will seek to avoid the need for diversion and to explore opportunities for environmental enhancement.

9.4.2 The proposed scheme could also exacerbate flood risk where it crosses designated flood zones. Where it does, it has been assumed that viaducts would be used. However, each crossing will be examined in more detail to determine the most appropriate form of alignment. Flood risks associated with stations at East Midlands Hub, Sheffield Meadowhall and Leeds New Lane, as well as the depot site at Staveley will need to be addressed with the Environment Agency.

9.5 Land and material resources

9.5.1 The proposed new railway would make good use of land that has had a previous industrial or railway use. However, some productive agricultural land would be lost. Further work would be undertaken during later design stages to examine how agricultural land take could be reduced and severance to farmland mitigated.

9.5.2 The route would pass through five active landfills and a number of other disused landfills. The design of the route through these areas will need to ensure that potential impacts from possibly contaminated materials are fully mitigated.

9.5.3 The construction of the route would generate and consume large quantities of materials and opportunities would be taken to re-use as much excavated materials as possible as part of embankments and landscaping within the scheme.

9.6 Climate change

9.6.1 National and international studies confirm that rail transport is consistently amongst the most carbon efficient of mass transport modes in terms of emissions per passenger-km, with high speed rail particularly efficient in this respect. For this reason, it is desirable both to encourage greater usage of the rail network and to seek to expand and upgrade the network to satisfy increasing demand for transport. HS2 is therefore an important component of Government transport policy, helping to provide additional low-carbon transport capacity.

9.6.2 The construction and operation of HS2 will give rise – directly and indirectly – to emissions of carbon dioxide, the most significant greenhouse gas. So called 'embedded' emissions would come from things like the fabrication of construction materials and the transport of materials to and from sites. Direct emissions would come from the generation of electricity used to power the trains. These elements are common to all major transport projects, whether they are rail, road or aviation schemes. Most elements of carbon arising from HS2 would fall within the EU's Emissions Trading Scheme (EU ETS). This scheme sets an international cap on total carbon emissions and thereby ensures that carbon is reduced overall across Europe. By bringing a greater number of emissions into the ETS, HS2 will be able to engender a greater influence on the UK's total carbon emissions.

9.6.3 HS2 Ltd has undertaken to construct and operate the full HS2 scheme in line with best low-carbon practices. The presence of HS2 will also induce a move to one form of transport to another of passengers from other more carbon-polluting forms of transport, such as road and aviation, which would help to reduce overall UK carbon emissions. Furthermore, by taking passengers from, and so making space on, existing rail networks (such as the WCML), HS2 could indirectly enable freight or passenger traffic to transfer from road to the existing rail network, giving rise to further carbon benefits.

9.6.4 The carbon footprint of HS2 will therefore be a balance between these new emissions and potential savings due to change in travel movements. This will be determined in due course, reliant as it is on knowing passenger demand figures which are presently being modelled as part of the economic case. It is clear that the carbon footprint of HS2 will depend on numerous factors outside its control. Whatever the outcome, HS2 will undoubtedly provide a fundamental contribution to getting more people onto trains and thereby supporting a low carbon economy.

9.7 Next steps in environmental appraisal

9.7.1 Consultation on the scheme may result in proposed refinements. These proposed refinements would each be subject to further sustainability appraisal to ensure a sound understanding of the relative benefits and disadvantages. Any adopted changes would then be included within the Government's decision on the final scheme. Following a later EIA and the consideration of the likely significant effects of the scheme (as reported in an Environmental Statement), further refinements may be made to mitigate impacts and these will be included in the hybrid Bill submitted to Parliament.

Consultation question

(vii) Please let us know your comments on the Appraisal of Sustainability (as reported in the Sustainability Statement) of the Government's proposed Phase Two route, including the alternatives to the proposed route.

10 Improvements to the existing rail network because of HS2

10.0.1 The opening of the full HS2 network will result in many traditional long distance journeys on the existing rail network being delivered by high speed trains. This could enable additional commuter, regional or freight services to make better use of the existing network. Understanding how this capacity can best be used will be a key factor in understanding how the potential of HS2 can be maximised.

10.0.2 While we are not able to write the timetable for the Phase Two railway today we are keen to explore the appetite for other services, including running high speed trains onto other parts of the existing rail network to widen the reach of HS2, where there is a strong case to do so.

10.0.3 Network Rail, as custodians of Britain's rail network, recognise that HS2 will play an important part in enhancing the existing network and in January this year we commissioned Network Rail to advise the Government on options for the future use of the existing rail network after Phase Two of High Speed 2 has been constructed and is operational.

10.0.4 This work has built on the analysis carried out by Network Rail and Passenger Focus for Phase One and provides a set of scenarios for how rail network capacity could be used once Phase Two of HS2 is open. This work could then be used to inform future decisions on the use of network in areas and routes where rail usage could be affected by HS2.

10.0.5 The study considered how the existing network and the completed HS2 network may be integrated and services modified on the existing network which could provide:

- much needed additional commuter capacity;
- local and regional services that were previously impossible; and
- increases in rail freight, to boost the economy and take lorries off the roads.

10.0.6 The Released Capacity study mainly looked at existing sections of the network – mainly West Coast Main Line (WCML), Midland Main Line (MML) and East Coast Main Line (ECML) where HS2 Phase Two is geographically located (i.e. between Birmingham and Manchester/Leeds).

10.0.7 Network Rail conducted a series of internal and external workshops to determine capacity released by HS2 on the existing network. Using the latest information available, the workshops considered options on how this capacity could be used. The workshops as well as the findings were structured along the WCML, MML and ECML. Network Rail also undertook internal workshops attended by the wider Network Rail teams.

10.0.8 The report describes the analysis at the current level of development and has been limited to a conceptual analysis of potential services (not all of which can be implemented as some conflict). It is not a plan for future timetables or a definitive picture of future services. The study feeds into Network Rail's Long Term Planning

Process and will form part of that consideration into service levels and usage of the network through Route Studies which will be developed over the coming years.

10.0.9 Network Rail identified three different approaches that could be taken in determining how services could be run on the existing network, these are:

- Do Minimum – this broadly maintains the services that exist before HS2 Phase Two becomes operational. This approach would not make the best use of additional network capacity to provide increased services for commuter, inter regional and freight travel as the long distance fast services would continue to constrain capacity;
- Incremental change to the existing network – this would remove train services from the existing network which replicate new HS2 services and substitute these with new or extended services aligning as far as practical with future predicted services. This approach shows that there is some level of capacity released on all routes and has the potential to provide a number of new journey opportunities as well as supporting increased freight paths; and
- Integrated for increased connectivity – this would seek to provide a holistic approach i.e. plan all rail services on the existing network to work in conjunction with HS2 services. The aspiration is that where appropriate, long distance high speed services would be provided by HS2, with services on the existing network set up in a feeder pattern to provide frequent and reliable connectivity between surrounding areas and the HS2 (hub) stations.

More detail about these approaches can be found on the Network Rail website at www.networkrail.co.uk/highspeedrail

10.1 Summary of Findings

10.1.1 While the Do Minimum approach may offer increased choice to HS2 passengers and reduce overcrowding on some long distance services, it does not provide any increased benefits for commuters on regional services.

10.1.2 The Incremental approach demonstrates that there is some level of capacity released on all routes. A few examples of these possible services are described below with a more complete list provided in the report.

- Increased services from London to Wakefield and Bradford
- Additional through services from Liverpool to Glasgow/Edinburgh, Cardiff, Bristol and Milton Keynes
- Additional services could be provided between the South Coast to Manchester stopping at one or more of the following intermediate locations; Southampton, Winchester, Reading, Oxford, Milton Keynes, Stoke, Macclesfield, Stockport
- Connecting Liverpool with Cardiff via Birmingham
- Leeds to Cambridge, East Anglia, Stansted through to Liverpool Street
- Improved London to Lincoln via Newark or Sleaford services
- improved London to Doncaster/Lincoln for commuters

- Re-establish Leicester – Coventry service
- Improve Lichfield to Derby Service
- Intermodal growth for Freight on MML: (east Midlands terminal)
- More even spread of Loughborough/Leicester to London trains

Network Rail's findings indicate that there are many regional benefits and some of the towns are shown in the table below.

South West	**North East**	**South East**
Inter-urban (semi-fast) service from: Bristol Swindon Bedford	Enhanced connectivity from: Newcastle Morpeth Alnmout Berwick	Inter-urban service from London Liverpool street / Stansted Airport) Cambridge Oxford
East Midlands	**North West**	**West Midlands**
Long distance (fast and semi-fast) from: Wellingborough Kettering Market Harborough Leicester Loughborough East Midlands Parkway Long Eaton Beeston Toton Meadowhall	Cross Country (fast) from: Stockport Macclesfield	Enhanced connectivity from: Sandwell & Dudley Wolverhampton Penkridge Stafford Tamworth Rugby

These are a few examples of possible options. A more complete list of options can be found in the report.

10.1.3 The Integrated Connectivity approach could potentially offer benefits to passengers from HS2 and the existing rail network by fully integrating both networks to operate seamlessly. This will require fully integrated transport planning and further analysis of the potential options will be undertaken by Network Rail independently.

The complete report can be viewed at www.networkrail.co.uk/highspeedrail

Consultation question

(viii) Please let us know your comments on how the capacity that would be freed up on the existing rail network by the introduction of the proposed Phase Two route could be used as described in the chapter above.

11 Maximising the benefits of our infrastructure

11.0.1 The recently published *Investing in Britain's Future*[65] describes the Government's proposals to ensure that the UK invests in and gets the most out of its infrastructure. We have been developing proposals for developing and enhancing "interdependencies" in UK infrastructure to boost their benefits and promote long term, sustainable economic growth. Interdependencies are where one network interacts with, impacts on or enhances another, for example where our drinking water supply depends on the proper functioning of the electricity network.

11.0.2 They can save money by combining upfront engineering and planning costs or by using one piece of equipment to do more than one job; increase value by designing projects so that one facility or project can do more; and improve flexibility by creating options to allow for future upgrades at lower cost. For example the decision to use the Channel Tunnel to lay an electrical interconnector to Europe saved £130 to £180 million compared to the cost of running it across the sea bed, with more savings achieved as further upgrades are made.

11.0.3 Introducing such interdependencies can create challenges as well as benefits however, as networks that share the same infrastructure may impact on each other and increase complexity. Disruption to one network may have a negative impact on another, for example any issues with a utility located alongside the railway may require maintenance that interrupted the operation of train services.

11.0.4 HS2 presents an opportunity to make wider infrastructure use of the route between London, Birmingham, Leeds and Manchester beyond running a railway. Where suitable additional uses for the corridor can be found, engineering costs can be shared resulting in significant overall cost savings while resilience and value can be enhanced leading to the creation of infrastructure that would otherwise not be built.

11.0.5 As the Government is determined to maximise the potential value for public investment that HS2 will bring to the country, provisions are already being made for future installation of a communications cable along the 140 miles of track for Phase One if there is commercial demand. Such "future proofing" of the UK communications networks will make a new information superhighway possible, making it easier for even more people to benefit from ultra fast connectivity.

11.0.6 The Government is also working with industry experts to determine how we can better exploit such potential in modern infrastructure. We have been looking into whether provisions could be made along Phase Two of the HS2 network for other utilities such as water, electricity or integration with flood management schemes. This could further enhance the benefits brought to the country by HS2 while creating jobs and driving growth.

Consultation question

(ix) Please let us know your comments on the introduction of other utilities along the proposed Phase Two line of route as described in the Chapter above.

[65] http://www.gov.uk/government/publications/investing-in-britains-future

12 Costs and benefits

12.0.1 HS2 will improve life in Britain by providing a strong foundation for the future economic growth of the nation. The Government is committed to maximising the benefits the project can bring, including opportunities to create new jobs and skill bases, to support and develop our already world-class engineering base and to promote regeneration in the locality of new and redeveloped stations.

12.0.2 The Government is committed to ensuring that the HS2 project offers value for money for taxpayers through implementation of robust cost management measures. This chapter outlines the measures being undertaken by the Government and HS2 Ltd to develop cost estimates and cost controls for Phase Two. In addition, it sets out our approach to securing financial contributions from third parties who stand to benefit from HS2.

12.1 Benefits

12.1.1 HS2 will directly benefit transport users, on both rail and alternative types of transport. This will be achieved through providing improved journey opportunities, journey times and reliability as well as reducing crowding. However, the benefits and opportunities HS2 can bring extend further. The Government attaches a high priority to ensuring that the towns and cities in the Midlands and the North will benefit from HS2 through creation of new jobs and local regeneration. By working with regional delivery partners in the cities HS2 will serve, and beyond, we will be able to maximise the opportunities for enhanced connectivity and additional capacity that will drive growth in the regions. However, the benefits and opportunities HS2 can bring extend beyond transport. The Government attaches a high priority to ensuring that the towns and cities in the Midlands and the North will benefit from HS2 through creation of new jobs and local regeneration. The HS2 Growth Taskforce, led by Lord Deighton, will be working with regional delivery partners in the cities HS2 will serve, and beyond, to examine how the economic growth and job opportunities can be maximised from the enhanced connectivity and additional capacity.

12.2 Costs

12.2.1 Typically in the early stages of a major project there is necessary uncertainty in producing cost estimates. When initial cost estimates are formulated during the early stages of a project, a number of assumptions must be made about the engineering complexity as detailed design work is yet to be completed. These cost estimates are subsequently used to test the feasibility of a project.

12.2.2 Projected costs can be affected by a number of factors. First, the accuracy of cost estimates increases through successive stages of design and as the details of a project become clearer. Secondly, 'unit costs' of particular items, for example parts of the infrastructure such as a mile of tunnel, are subject to variation. This could be the result of increased efficiency of engineering processes or variation in the price of raw materials required for construction. Finally, projects typically undergo changes in scope that change the projected costs. For HS2 this may include the introduction of new stations or additional mitigation.

12.2.3 The Government set a funding envelope of £21.2 billion for Phase Two (at 2011 prices and excluding VAT) in the 2013 Spending Round. Our objective is to design and deliver the scheme within this cost. This includes a significant amount of contingency. Given the nature and early stage of preparation of the project, this will only be achievable subject to future Government decisions on scope and timing of delivery. This is why we are putting cost control and cost discipline at the centre of our delivery plan for Phase Two.

12.2.4 The funding envelope reflects an increase in scope, particularly the potential inclusion of a station at Manchester airport, which is dependent on a significant third party funding contribution being agreed. Similarly, refinements that have been introduced since January this year have also increased costs. The costs estimate remains an early stage estimate, and we would expect this to continue to evolve as the design work develops.

12.3 Funding and financing

12.3.1 The Government is committed to delivering a high speed rail network that provides value for money to the taxpayer, and as the January publication made clear, is following a set of key principles in relation to the funding of HS2.

12.3.2 Due to the scale, complexity and time frame of the project, our base assumption remains that the funding and financing will be provided in large part by central Government. Through the funding envelope allocated to both phases of HS2 during the recent Spending Round, the Government reiterated their ongoing commitment to ensuring the delivery of HS2.

12.3.3 However, where property developers and other businesses, local authorities, Local Enterprise Partnerships or others stand to benefit from the arrival of HS2, the Government expects that contributions will be made to help meet the costs of the project and to ensure that all potential sources of regeneration are maximised. In addition, financial support from those who stand to benefit will also reiterate why the project needs to start now.

12.3.4 As part of this consultation, the Government will take forward dialogue on potential funding contributions with a range of third parties in specific localities, with a view to securing a fair deal for the taxpayer, the localities involved and other interested parties.

12.3.5 Delivering a new station at Manchester Airport would bring significant benefits to not only the airport itself but other businesses nearby and the wider community. The Government proposes to include an airport station in the proposed scheme, but this is subject to the agreement of a package of funding contributions.

12.3.6 There will also be significant local benefits from other station sites on the line of route and we are beginning to engage collaboratively with relevant local authorities and organisations. We would also therefore welcome dialogue with all local stakeholders along the route on the nature and scope of contribution they could offer the project.

12.3.7 These contributions may take the form of funding commitments, the provision of land, or the alignment of local investment plans to deliver the widest possible set of local economic and regeneration benefits from the railway.

12.3.8 HS2 will need to be supported by complementary investment in local transport infrastructure and other works of regenerative investment. Related development

and regeneration schemes will need their own infrastructure separate to that which will be provided by HS2. The Government therefore expects that local third parties will commit funds to ensure that this infrastructure is delivered, bringing benefits to communities in the vicinity of HS2 stations. Contributions might come via new or increased sources of revenue unlocked by HS2, or where local areas have prioritised HS2 in their local investment plans.

12.4 Value for money

12.4.1 The Government continues to keep all aspects of the HS2 Business Case under review, including the economic case which is a key part of it. The main role of the economic case is to consider whether all of the collective impacts delivered by the scheme represent value for taxpayers' money as well as to assess the value-for-money of the various alternative investment options and their ability to meet the economic and strategic objectives of the scheme.

12.4.2 HS2 Ltd is currently undertaking a significant programme of work in order to quality assure and further improve the robustness of the economic case for the scheme. Once this work is complete an updated assessment of the economic case for HS2 will be published in October 2013 on https://www.gov.uk/government/publications

The updated economic case will, for instance:

- Incorporate the latest evidence available and will be consistent with the Department's transport appraisal guidance;
- Include the Department's consideration of the potential benefits that could be secured from more sophisticated pricing policies across both the HS2 and classic networks; and
- Contain an updated assessment of the alternatives to HS2.

Part III

13 Responding to the consultation

13.0.1 The consultation is open to everyone.This consultation seeks views on the proposed line of route and the sustainability impacts from the West Midlands to Manchester and from the West Midlands to Leeds, both of which are set out in Part II. Views are also being sought about how the potential released capacity generated by HS2 could be used and the opportunities to introduce other utilities along the line of route.

13.0.2 The questions on which the Government is seeking views are set out below. In each case, the Government is interested in whether or not you agree with its proposals and why, as well as any additional evidence that you feel it should consider in reaching its final decisions.

Consultation questions

This consultation is seeking your views on the following questions:

(i) Do you agree or disagree with the Government's proposed route between the West Midlands and Manchester as described in Chapter 7? This includes the proposed route alignment, the location of tunnels, ventilation shafts, cuttings, viaducts and depots as well as how the high speed line will connect to the West Coast Main Line.

(ii) Do you agree or disagree with the Government's proposals for:

a. A Manchester station at Manchester Piccadilly as described in Chapter 7 (sections 7.8.1 – 7.8.7)?

b. An additional station near Manchester Airport as described in Chapter 7 (sections 7.6.1 – 7.6.6)?

(iii) Do you think that there should be any additional stations on the western leg between the West Midlands and Manchester?

(iv) Do you agree or disagree with the Government's proposed route between West Midlands and Leeds as described in Chapter 8? This includes the proposed route alignment, the location of tunnels, ventilation shafts, cuttings, viaducts and depots as well as how the high speed line will connect to the East Coast Main Line.

(v) Do you agree or disagree with the Government's proposals for:

a. A Leeds station at Leeds New Lane as described in Chapter 8 (sections 8.8.1 – 8.8.5)?

b. A South Yorkshire station to be located at Sheffield Meadowhall as described in Chapter 8 (sections 8.5.1 – 8.5.8)?

c. An East Midlands station to be located at Toton as described in Chapter 8 (sections 8.3.1 – 8.3.6)?

(vi) Do you think that there should be any additional stations on the eastern leg between the West Midlands and Leeds?

(vii) Please let us know your comments on the Appraisal of Sustainability (as reported in the Sustainability Statement) of the Government's proposed Phase Two route, including the alternatives to the proposed route as described in Chapter 9.

(viii) Please let us know your comments on how the capacity that would be freed up on the existing rail network by the introduction of the proposed Phase Two route could be used as described in Chapter 10?

(ix) Please let us know your comments on the introduction of other utilities along the proposed Phase Two line of route as described in Chapter 11?

13.1 Ways to respond

13.1.1 The consultation starts on 17 July 2013 and closes at 17:00 on 31 January 2014. Please ensure that your response is sent to us by this date.

13.2 Online:

You can submit your response online through the HS2 Ltd website: www.hs2.org.uk.

13.3 By response form:

You can complete the response form and send it by post to the address below.

You can request a copy by calling the document order line on 0300 123 1102 or by ordering online at www.dft.gov.uk/orderingpublications

13.4 Email:

You can email your response to: HS2PhaseTwoRoute@ipsos.com

13.5 By post:

You can post your completed response form and any additional information relevant to your response to:

Freepost RTEL-YAZX-HAZT
Phase Two Route Consultation
PO Box 1152
HARROW
HA1 9LH

13.5.1 When responding, please state whether you are responding as an individual or are representing the views of an organisation. If responding on behalf of a larger organisation please make it clear whom the organisation represents.

13.5.2 Consultation responses and correspondence addressing issues relevant to this consultation that are sent directly to the Department or HS2 Ltd will be forwarded to one of the dedicated response channels detailed above for consideration by our response analysis agency. The Department and HS2 Ltd cannot accept responsibility for responses that are sent to any addresses other than those advertised on our website and on all associated consultation documents.

13.5.3 If you would like further copies of this consultation document or the summary document (including the response form) it can be found at http://www.hs2.org.uk. Copies of the consultation document are available from DfT Publications (Tel: 0300 123 1102, online: www.dft.gov.uk/orderingpublications).

13.5.4 The Department for Transport has actively considered the needs of blind and partially sighted people in accessing this document. The text will be made available in full on the Department's website. The text may be freely downloaded and translated by individuals or organisations for conversion into other accessible formats. If you have other needs in this regard please contact the Department.

13.5.5 If you have any further enquiries please contact the HS2 Ltd enquiries line on: 020 7944 4908 or email hs2enquiries@hs2.org.uk

13.6 What happens next?

13.6.1 A series of information events will be held along the line of route. Further details are available on the HS2 Ltd website and will be publicised locally ahead of the events.

13.6.2 Additional copies of consultation materials can be ordered from: www.dft.gov.uk/orderingpublications or by telephone on 0300 123 1102

13.6.3 The consultation will close at 17:00 on 31 January 2014.

13.6.4 The views and information submitted as part of this consultation will be summarised in an independent report that will be taken into consideration by the Secretary of State in taking his decision on the route.

13.6.5 The decision by the Secretary of State on the route for Phase Two is due to be announced by the end of 2014.

13.7 Confidentiality and data protection

13.7.1 Information provided in response to this consultation, including personal information, may be subject to publication or disclosure in accordance with the access to information regimes (these are primarily the Freedom of Information Act 2000 (FOIA), the Data Protection Act 1998 (DPA) and the Environmental Information Regulations 2004 (EIR).

13.7.2 If you want information that you provide to be treated as confidential, please be aware that, under the FOIA and the EIR, there is a statutory Code of Practice with which public authorities must comply and which deals, amongst other things, with obligations of confidence.

13.7.3 In view of this it would be helpful if you could explain to us why you regard the information you have provided as confidential. If we receive a request for disclosure of the information we will take full account of your explanation, but we cannot give an assurance that confidentiality can be maintained in all circumstances. An automatic confidentiality disclaimer generated by your IT system will not, of itself, be regarded as binding on the Department or HS2 Ltd.

13.7.4 The Department, HS2 Ltd and Ipsos MORI will process your personal data in accordance with the Data Protection Act (DPA). In the majority of circumstances this will mean that your personal data will not be disclosed to third parties.

13.7.5 We will use the contact information that you provide to perform internal checks on the responses to ensure the validity of responses, such as identifying duplicated responses where such responses have been submitted via several routes. We will also use this

information to inform respondents of the outcomes of the consultation, in line with good practice for consultation.

13.8 Consultation Principles

13.8.1 This consultation is being conducted in line with the Government's key Consultation Principles. Full details of the Government's guidance on consultation can be found on the Cabinet Office website at http://www.cabinetoffice.gov.uk/resource-library/consultation-principles-guidance.

13.8.2 Full details of the Consultation Principles are available at: http://www.cabinetoffice.gov.uk/sites/default/files/resources/Consultation-Principles.pdf

13.8.3 This guidance was issued on 17 July 2012 and replaces the Code of Practice on Consultation issued in July 2008.

13.8.4 If you consider that this consultation does not comply with the key Consultation Principles or have comments about the consultation process please contact:

Consultation Co-ordinator
Department for Transport
Zone 1/14 Great Minster House
33 Horseferry Road
London SW1P 4DR

Email: consultation@dft.gsi.gov.uk

Annex A: Details of HS2 Ltd's principles and the selection process

Guiding Design Principles

HS2 Ltd's fundamental guiding principles are set out in a number of their reports with the main technical, operational requirements and sustainability criteria set out in their Technical Appendices[66]. The main guiding principles which HS2 Ltd created initially for Phase One but have been retained throughout their work to ensure a consistent approach include the following:

- HS2 rail services will comprise long distance, city-to-city journeys;
- HS2 will be used by high speed trains only;
- benefits will be extended to destinations further north by running trains off HS2 onto the existing rail network; and
- HS2 must be well integrated with other transport networks to ensure door-to-door journey time savings are delivered.

The main driving factors in the design of HS2 were:

- Providing a safe and secure network for passengers; those who operate and maintain the network; and third parties who may otherwise come into contact with it;
- Ensuring compliance with the EU Directive and Technical Specifications for Interoperability to benefit from standard, proven, competitively sourced high speed rail equipment, systems and trains;
- Providing internationally recognised levels of availability, reliability and speed with a high level of capacity;
- Ensuring that high speed trains can run onto the existing network; and
- Harnessing the principles of sustainable development, where possible avoiding or otherwise minimising and mitigating sustainability impacts.

Key design assumptions

The key design assumptions that HS2 Ltd used for the development of Phase Two were:

Design

- HS2 will be a two track railway (one northbound and one southbound track);
- Up to 18 trains per hour could run in each direction on the opening of the full Y network;
- A mixed fleet of high speed trains will be used, known as 'captive trains', and specially designed 'classic compatible' trains which could run on both HS2 and the existing rail network;
- Trains of up to 2 x 200m long will run on HS2 and will have up to 1,100 seats. Stations will therefore need to be designed to cope with high volumes of people;

[66] Options for phase 2 of the high speed rail network: Available at www.hs2.org.uk

- Specific structure specifications will be used across the design, such as the use of grade separated junctions;
- There will be a separation of maintenance activity from train operations, and the automation of inspection and mechanisation of maintenance activities as far as possible; and
- Line of route design work will seek to follow existing transport corridors where practicable.

Speed

- The route will be designed for speeds up to 250mph (400kph), though on opening, a maximum train speed of 225mph (360kph) will be assumed.

Tunnels

- Tunnels designed for HS2 will allow speeds of up to 250mph (400kph). Long tunnels, greater than 0.625 miles (1km) will require cross-passages which provide emergency exits. Intervention shafts which provide pressure relief, ventilation and access for emergency services will be required every 1.3-1.9 miles (2-3km).

Connecting to Phase One

The HS2 project is developing all the time. The junctions to connect to Phase One would be at Lichfield and Hams Hall, built as part of Phase One to ensure that Phase Two construction does not disrupt the operation of the network between London and the West Midlands. Since publication of the Initial Preferred Route for Phase Two in January 2013, a refinement to the alignment of Phase One in the Lichfield area around the junction has resulted in a small change to the alignment of Phase Two, which now starts to the north of the Junction at Fradley.

The scheme proposed here for consultation is based around proposed junctions for Phase One, which have recently been subject to a separate consultation (design refinement consultation) that closed on 11 July 2013. Clearly, until the exact alignment for Phase One has been set by Parliament, expected in 2015, there remains a possibility that changes to the Phase One alignment could have a knock-on effect on Phase Two, although the likelihood is that any change would be relatively small in terms of distance.

Supporting infrastructure

Since the Government announced the initial preferred scheme in January 2013, HS2 Ltd has looked at the supporting infrastructure that would be needed for the proposed route. That includes the proposed locations for rolling stock and infrastructure maintenance depots. Later on in this section indicative locations for vent shafts for the longest tunnels on the routes and indicative locations for maintenance loops are also described.

Depots

In order for the railway to operate effectively, HS2 Ltd identified the need for infrastructure and rolling stock maintenance depots at key points along the proposed routes.

Infrastructure Maintenance Depots would be used as a base from which to carry out engineering activities to inspect, maintain and renew the infrastructure. Rolling Stock Depots would be used to stable trains overnight, for cleaning and maintenance. The rolling stock depots would be in addition to the proposed Washwood Heath depot that would support both Phases One and Two.

Identifying depot locations

As well as identifying potential options themselves, HS2 Ltd approached relevant local authorities to assist in the generation of potential sites. Following this, HS2 Ltd developed proposals for options. HS2 Ltd used a relatively detailed set of mainly operational criteria for the sifting of both types of depot. No socio-economic or demand appraisal was undertaken as this was not relevant for depot sites and the development of depot options was undertaken later in the overall process, at a stage when a relatively small number of viable route options remained. Depot options were therefore finalised in conjunction with HS2 Ltd's selection of the route options that it reported to Government in March 2012.

HS2 Ltd's assumptions about depot requirements

HS2 Ltd's process for identifying depot options for Phase Two used the following broad assumptions:

- No further infrastructure or rolling stock depot facilities would be required to serve the spur to Heathrow and related services. This assumption pre-dated the Government's decision to pause work on the Heathrow route and station options;
- One infrastructure maintenance depot of a similar size to the Phase One depot will be required on each of the Manchester and Leeds legs;
- An additional rolling stock depot will be required on each leg of the Y network to Manchester and Leeds. These will be smaller than the Phase One rolling stock depot (after its enlargement to support Phase Two) as they will only be required to provide stabling and light maintenance; and
- The rolling stock depot for Phase One will need to be expanded in order to meet the operational requirements of the network and provide heavy maintenance for all rolling stock.

Using these assumptions and initially a relatively simple set of criteria relating to size and broad geographical areas, an initial list of options was created by HS2 Ltd in co-operation with relevant local authorities and station working groups. Options were sifted using detailed criteria covering engineering, operational and sustainability considerations. Options that did not meet key criteria or would not serve a route option were not progressed. A further sifting stage was used based on a full assessment of the remaining options leading to HS2 Ltd putting forward, in March 2012, a set of proposed and alternative options for Government consideration.

Following consideration of HS2 Ltd's advice, the options the Government has selected as the proposed depot locations for consultation are set out at the end of each route description.

The station and route selection process

For each of the elements of the Phase Two remit, HS2 Ltd undertook a separate process of generating options and developing and sifting them following the same broad approach used for Phase One. HS2 Ltd adopted a four stage process generally common to each component. In the early stages of the sifting process, options were considered against only the highest priority issues to establish relative preferences between different options. In later stages the scope and depth of appraisal increased. As less favoured options fell away, the remaining options were worked up

in greater design detail and appraised at a correspondingly increasing level of detail. More detail about each stage of HS2 Ltd's sifting process can be found in their published reports.

As with Phase One, HS2 Ltd developed options based around the four main sifting criteria:

- Engineering and construction feasibility
- Sustainability
- Demand considerations including journey times; and
- Cost

External input and challenge

To support and challenge HS2 Ltd's approach, external stakeholders and advisors were engaged wherever appropriate. Location specific stakeholders were involved on a regular basis in the development and assessment of station options. HS2 Ltd called these bodies their delivery partners and they were made up of:

- local authorities;
- Local passenger transport executives;
- regional Highways Agency representatives;
- regional Network Rail representatives; and
- Regional Development Agencies and Government Offices (up until 2011 when they ceased to be operational).

HS2 Ltd did not engage externally on the development of line of route options due to the potential risk of blight to large parts of the country if multiple route options were placed in the public domain. Much of this blight would be unnecessary as many of the lines of route identified at an early stage in the process were not taken forward.

HS2 Ltd also used external peers and experts to challenge and feed into the approach being taken. Their roles and make-up are described in HS2 Ltd's published reports.

Annex B: Alternative options

Introduction

This annex provides further detail on the main alternative options for stations and routes that HS2 Ltd considered and explains the reasons why the Government chose not to take them forward as part of the proposed scheme for consultation. In Options for Phase Two of the high speed rail network published in March 2012 (https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/68965/options-for-phase-two-of-the-high-speed-rail-network.pdf) HS2 Ltd describe in more detail all the route and station options that they considered with an explanation of how these options were sifted at different stages of the process.

West Midlands to Manchester – Alternative options

Overview of the process

HS2 Ltd initially developed a large number of route options, including those that would follow the M6 and WCML corridors and a 'straight line' following the overhead power lines between Lichfield and a point in Manchester city centre.

For HS2 Ltd the route options between Lichfield and the point where the route might connect to the WCML were described as forming the main line of the Manchester leg of HS2. Options for approaches into Manchester city centre branching off the main line were described as spurs because they spur from the main high speed line to one of the Manchester city centre station options.

In their March 2012 report HS2 Ltd describe in detail the process that they followed to sift options down to a final set of proposals. This annex focuses on describing the main alternatives that HS2 Ltd set out. These were not presented as whole route alternatives but instead were presented as choices for Government depending on its preferences for Phase Two and its view of the analysis HS2 Ltd provided.

In selecting a route between the West Midlands and Manchester the following issues drove the selection of the initial preferred scheme:

- At the southern end of the route options, a key driver in the selection of an initial preferred route was avoiding or minimising any impact on Pasturefields Special Area of Conservation.
- HS2 Ltd proposed that the Government consider the merits of providing a connection at Crewe for services to Liverpool and the North West. An alternative was to consider the merits of an intermediate station with one option presented. This selection influenced route choice.
- HS2 Ltd proposed that the Government then consider the merits of an interchange station which, if a Manchester Airport interchange was selected, would influence the Manchester spur choice.
- The Government needed to select a Manchester city centre station option with HS2 Ltd proposing three final options which again would have an impact on the route selection.
- Finally on the western leg, the Government was asked to select a connection to the WCML and consider how Scotland would be best served from Phase Two.

These issues are now described below with an explanation of the main alternatives and the reasons for the Government's decision not to progress them further.

Pasturefields Special Area of Conservation

In its March 2012 reports, HS2 Ltd noted that the route options would pass close to Pasturefields Special Area of Conservation (SAC). The area is a protected European site of particular importance because it is one of only two known extant inland salt meadows (or salt marsh) remaining in the British Isles. Inland salt meadow is identified as a priority habitat in Annex 1 of the European Council Directive 92/43/EEC Conservation of natural habitats and of wild fauna and flora (the Habitats Directive). Particularly stringent criteria must be met before a project that would cause potential adverse effect can be approved.

In March 2012, HS2 Ltd presented three main final route options with one that would run to the south of Pasturefields SAC and two that would run to the north of the SAC. HS2 Ltd's report to Government noted that it would need to provide further advice on acceptable route options following further studies and engagement with Natural England and the Environment Agency. HS2 Ltd continued those discussions and analysis beyond March undertaking further work on route alignment options.

HS2 Ltd considered the potential impact of the route options on the SAC and other important infrastructure and sustainability issues in the surrounding area; including Sandon Park Registered Park and Garden, the River Trent, the Trent and Mersey Canal and its associated conservation area and listed structure, the WCML and the A51. As a result of the further work, potential impacts on Weston, Hopton, Great Haywood, Hixon and Salt nearby were also avoided and/or limited as far as possible at this stage of design.

HS2 Ltd's further work concentrated on understanding the SAC and its hydraulic setting through the appraisal of existing data and through discussion with Natural England and the Environment Agency. HS2 Ltd also asked its sustainability consultants, to carry out further site appraisal, data gathering and desk top analysis which enabled HS2 Ltd to confirm with Natural England and the Environment Agency that, subject to formal submission of the HRA Screening Report, routes to the south of Pasturefields SAC could be screened out of requiring a Habitats Regulations (which transpose the Habitats Directive). Due to uncertainty and lack of access to additional data, routes that pass proximate and to the north of Pasturefields SAC could not be screened out of further assessment at this stage.

With this principle established, and agreed with Natural England and the Environment Agency, HS2 Ltd undertook further work on the alternative route options between Streethay and Millmeece to address other key sustainability and engineering challenges for routes to the south of Pasturefields. HS2 Ltd developed a route which had a common alignment to a route to the north of the SAC but which would instead divert to the south of the SAC and Hopton, rejoining the original option just north of Swynnerton.

This new route would be to the south of the SAC and have less impact on it. It would also require fewer demolitions, have less potential noise impact and avoid conflict with a railway junction remodelling at Norton Bridge and the Ministry of Defence Stafford development site. HS2 Ltd's further work also demonstrated how the noise and visual impacts at Hopton could also be mitigated through further alignment design of the route. HS2 Ltd proposed a lowering of the alignment through this area in order to minimise the line of sight impacts which resulted in just over two miles of cutting of which 510 metres would be in a cut and cover tunnel which would mitigate the visual and noise impacts during operation.

Therefore through its further refinement of route options in this area, HS2 Ltd was able to recommend a route option that would pass to the south of Pasturefields SAC with several further refinement benefits in the ensuing section of route between Streethay to Millmeece and including Hopton. Noting that the route option to the south of the SAC had the in-principle support of Natural England and the Environment Agency, and considering the additional refinements proposed by HS2 Ltd, the Government accepted this proposed route option.

Serving Crewe and the North West

In Part II the proposition that the high speed line connects just to the south of Crewe is described with an explanation of the potential benefits to Crewe and the wider North West. The main alternative route option that HS2 Ltd set out in its March 2012 report would run from Newcastle-under-Lyme to Sandbach continuing on to Golborne running via the M6. This route option would enable an alternative proposition of adding an intermediate station at Junction 16 of the M6.

HS2 Ltd developed eight options for an intermediate station around this area involving local authorities in the area in confidence on ideas. Following HS2 Ltd's analysis and sifting process only one option was taken forward and presented to Government as an alternative option to the route via the WCML and connection to the south of Crewe.

The option that HS2 Ltd progressed would lie on the route from Newcastle-under-Lyme to Sandbach. The station would be located on a greenfield site on the south east corner of Junction 16 of the M6, to the south of the A500. The station would be just under 7 miles (11km) north-west of Stoke-on-Trent and 5 miles south-east of Crewe. The station platforms would be elevated reflecting the significant elevation of the route on an embankment in crossing the A500.

The station would have good highway access from a new link road, connecting directly with Junction 16 of the M6 which also connects the A500. These highways experience regular congestion though so further work would be required to consider the implications if this became a preferred option. A new bus service would also have to be created to enable public transport access.

Whilst the station would be on a greenfield site within the Green Belt the local council would potentially support its release for development for employment uses. The proposed station would also be in a rural area so would not require potential demolitions. The nearest village, Audley, would experience some minor visual intrusion but this would be in the context of the existing motorway. The station site and four track sections of route required to accommodate it would impact on an area of Flood Zone 3, land at most risk of flooding.

In addition HS2 Ltd assessed a proposal for a spur to the WCML from a point south of Junction 15 which would offer the same connectivity benefits to Crewe and the wider North West as the initial preferred route but with reduced journey time benefits due to longer running on the existing network south of Crewe. Overall HS2 Ltd assessed that this option could have a significant impact on Madeley and Little Madeley and to the conservation area and also on Wrinehill. In addition to these potential impacts HS2 Ltd noted that this alternative proposal would add a greater level of complication risk and cost than a route which would run to the WCML before passing through Crewe.

Therefore HS2 Ltd advised the Government that this proposition was not, in its view, a better option than the station option near Junction 16 described above. However, the Government also noted and agreed with HS2 Ltd's analysis that a proposed HS2 station at Junction 16 of the M6 would capture some of the more distributed market around Stoke-on-Trent and Crewe because of

its good access to the M6. Also considering that a large proportion of people in the urban markets would continue to use existing stations to travel to all destinations, the business case for the station would therefore be likely to be marginal, especially when construction costs were taken into account. In selecting the initial preferred route the Government therefore agreed with HS2 Ltd's advice that the case for using an existing station such as Crewe, to serve the south Cheshire and north Staffordshire markets, whilst also connecting with other destinations was stronger, with lower overall costs and higher benefits. However, it is for the representatives from the wider Staffordshire and Cheshire areas to make the case in this consultation to demonstrate how HS2 can bring maximum benefit to these areas of the country.

Manchester Interchange

HS2 Ltd's remit included consideration of providing access to major airports in the regions served by the Phase Two remit. For this purpose Manchester Airport is a major airport so HS2 Ltd's consideration of how access might be provided focussed on options for an interchange station in the vicinity.

HS2 Ltd's work on interchange options has identified that stations on the outskirts of major conurbations can offer additional benefits to those offered by a central terminal. Phase One incorporates both a station in the central Birmingham area and one on the outskirts that would provide an interchange with Birmingham Airport and Birmingham International station via a people mover system. For Phase Two therefore, in addition to exploring options that would serve Manchester Airport, HS2 Ltd also developed options for an interchange station in the area in and around Greater Manchester. These options were developed on the basis that their inclusion would depend on their providing a net benefit to the scheme when their additional costs were taken into account. Their inclusion in a proposed scheme would therefore depend on demand.

In its March 2012 report, HS2 Ltd explained why their route and station options pass by Manchester Airport in the way that they do. HS2 Ltd noted that the passenger terminal area would be a good place for an interchange station because it would have connectivity with the existing railway serving the Airport and would provide a direct interchange for Airport passengers. However, HS2 Ltd found that it would not be practical to run a route through or immediately adjacent to the terminal area of the airport. This is because it would not be feasible to tunnel under the whole of the Airport area and build an underground station, nor would it be feasible to demolish parts of the Airport infrastructure. HS2 Ltd also noted the following additional constraining factors in developing options:

- Avoiding the demolition of properties in the Mobberley Conservation Area just south of the runway;
- Avoiding the Airport runway and surrounding public safety area;
- Avoiding the Airport strategic site extension areas as part of Manchester City Council's core strategy; and
- Achieving a level and flat location for locating the station and works in order to follow the appropriate route into Manchester Piccadilly.

As with all their station development work, HS2 Ltd identified in the region of thirty initial options covering both options that would provide access to the Airport and options that would serve the wider Manchester region. HS2 Ltd's March 2012 report provides full detail on the station sifting process. A key driver for sifting options was the development of an appropriate line of route. This

was particularly true at the early stages of the sifting process when some route options were not progressed and therefore some station options were not taken forward.

HS2 Ltd's March 2012 reports identified a final set of options that would serve a different combination of the main route options and approaches into stations in Manchester. This meant that the Government's selection of an interchange station was dependent on both its selection of a route and city centre station option. In Part II, the proposed scheme is described including why the Government has selected the proposed Manchester Interchange station and an explanation of the benefits that the Government believes an additional interchange station will bring.

As HS2 Ltd's March 2012 report set out this option offers the best connectivity and proximity to the Airport and at the lowest cost. Of the other potential station options that HS2 Ltd considered, each presented particular challenges (as documented in HS2 Ltd's reports) and none had the support of the wider region that existed for the Manchester Interchange option. In some cases the local planning authorities were also opposed to options since the locations were in green belt land which they did not want to release effectively constraining the potential for development around the station. In terms of ability to serve the airport and the wider region and taking into account the route and city centre station choices, the option selected by the Government performed most strongly.

Manchester City Centre

HS2 Ltd's March 2012 reports sets out all the options that were considered from the initial stage when over thirty options were identified through to the selection of a small set of main options that were put forward to the Government. HS2 Ltd's work identified sites around Salford or Piccadilly that were potentially particularly suitable. The report notes that Manchester Piccadilly offered far more direct heavy rail and Metrolink connectivity to Greater Manchester and beyond. Demand figures and benefits reflect this greater connectivity.

This connectivity means that Manchester Piccadilly attracts demand from the whole of the Manchester area including Stockport. Salford does not provide a good market for the south of Manchester due to the need to cross Manchester city centre to reach the station. Salford would capture more of the market to the north and north-west of Manchester, but this is a smaller market than the south Manchester market. HS2 Ltd's demand analysis therefore highlighted that Manchester Piccadilly, with its city centre location and its excellent connectivity to the wider region, was likely to be the best location for a city centre location. In Part II of this document there is a full explanation of the Government's reasons for selecting Manchester Piccadilly as its proposed station for consultation.

The two main alternatives that HS2 Ltd presented in its March reports were both located in Salford – one comprised the redevelopment of the existing Salford Central station and the other involved a brownfield site, a short distance to the west of the existing Salford Central station.

Whilst HS2 Ltd found that the station and approach to Piccadilly combined would be marginally more expensive to construct than the two Salford options, the additional expense would be significantly outweighed by the benefits it would deliver. As explained above, the Salford options would not be on the existing Metrolink network and the connectivity to the wider region on the existing rail network would not be as good as it is for Manchester Piccadilly. Whilst it would be possible to combine the Salford options with an interchange station option in the Greater Manchester area serving the airport this would necessitate a route with high impacts and an airport station over 2.5 miles to the south-west of the current airport terminal buildings.

In addition to this, the numbers of potential demolitions necessitated by the Salford options was a significant issue. HS2 Ltd's reports highlighted the significant number of potential demolitions that would be created by both options. Whilst future design work could potentially reduce the numbers HS2 Ltd noted that the numbers would remain significantly higher than the Manchester Piccadilly option. Both Salford options would also risk significant impacts on proposals for regeneration at and around the planned station sites. Given the long planning horizons involved with a project like HS2, it was felt that the aspirations for development in this location could not realistically be accommodated with a major new rail station.

Connecting to the West Coast Main Line

HS2 Ltd's remit included providing options for connecting to the existing West and East Coast Main lines for services further north. In selecting a connection to the WCML there were two wider issues which would influence the connection points which were:

- How to serve Scotland from Phase Two; and
- Where to connect to the existing network to provide the best balance between costs and benefits.

Serving Scotland

As set out in Part II, HS2 Ltd's analysis identified that demand from Edinburgh was around 40 percent higher than Glasgow though also a significant market. This meant though that if Scotland was served via the East Coast Main Line, there would be a potentially quicker journey time to Edinburgh, and those passengers would gain benefits, but passengers who wanted to go on to Glasgow would be disadvantaged by at least 40 minutes. This additional time to serve Glasgow via the ECML would effectively erode the majority of the time savings gained by the trains using HS2.

HS2 Ltd therefore concluded that the most efficient way to serve Scotland would be through a connection to the WCML as this would allow both Edinburgh and Glasgow to be served equally. 400m long trains could travel from London to Glasgow or Edinburgh alternately, or 400m long train sets could travel to Carstairs, and then split so that one 200m train serves Glasgow and the other Edinburgh. This would allow maximum use of the restricted number of train paths on the trunk of the network between London and the West Midlands. This proposition is supported by Transport Scotland and other Scottish stakeholders' view of how best to serve Scotland in Phase Two.

Where to connect to the West Coast Main Line

The Government accepted HS2 Ltd's recommendation that a connection to the WCML offered the best way to serve Scotland from Phase Two. The next consideration was where best to connect to the existing network. This decision depended on balancing the range of costs and benefits. Part II explains the reasons why the Government has selected a connection at Golborne as its proposed connection to the WCML. The alternatives to Golborne are briefly described below. In addition, HS2 Ltd also described a connection to the WCML further north than Golborne in the vicinity of Preston – which is set out below.

Connections to the West Coast Main Line in the Warrington and Wigan area

HS2 Ltd developed a range of options for connecting to the WCML area before recommending a connection at Golborne. Connection points were driven by the development of mainline options, so as route options were not progressed then associated connection points were also parked. Whilst there were route options that would connect with the WCML south of Warrington, these

would involve an indirect route to the WCML and result in greater engineering complexity, sustainability impacts and costs.

Routes to Preston and possible interchange station

The main alternative to connecting at Golborne was a connection further north. In their March 2012 reports, HS2 Ltd described the possibility of extending the high speed rail line as far as Preston, also enabling consideration of an interchange station near to Preston and the M55. An interchange station would potentially attract the Preston market onto HS2 though there would also be benefits from bypassing it to achieve as short a journey time to Scotland as possible.

As HS2 Ltd advised in their reports, the key trade off with building a high speed line to the north of Preston, is that it would deliver a significant journey time saving for services to Scotland but it would also mean significant additional costs and sustainability impacts. HS2 Ltd estimated that the cost of building the high speed line as far north as Preston, potentially including an additional interchange station in the vicinity, would cost around an additional £1.5 to £2 billion over and above the connection at Golborne. HS2 Ltd indicated that the benefits would not outweigh this significant additional infrastructure cost and the additional cost would create a significant pressure on the overall cost envelope.

West Midlands to Leeds – Alternative options

Overview of the process

This annex now sets out the main alternative options for the leg between the West Midlands and Leeds. HS2 Ltd's remit for the eastern leg of Phase Two required it to develop route proposals and options for a high speed line between the West Midlands and Leeds, with a link onto the ECML. The remit asked the company to provide options for stations in Leeds and for stations to serve South Yorkshire and the East Midlands. The line of route proposals that HS2 Ltd put forward were therefore influenced by the need to connect with the potential station options that were simultaneously developed to serve each of those locations.

When developing station options in the East Midlands and South Yorkshire HS2 Ltd also considered serving the principal cities directly and also alternative interchange options located to capture the wider regional market. Line of route proposals were therefore developed that would serve both. There are trade-offs here between city centre stations that provide a focussed market with passengers located in and around a single location compared with interchange stations which, in the right location and with good transport access, would be able to offer the possibility of serving a wider region.

In selecting a route between the West Midlands and Leeds the following issues drove the selection of the initial preferred scheme:

- The selection of a route from the West Midlands to the East Midlands was dependent on the East Midlands station that the Government selected.
- Selecting an East Midlands station influenced route choice with options serving all the final stations that HS2 Ltd presented. A common factor with route selection was also the crossing of the River Mease SAC.
- Route selection from the East Midlands to South Yorkshire was also dependent on which station was selected in the East Midlands which would provide the starting point for the onward route and station selection in South Yorkshire and which would define the end point for this section of route.

- Once these start and end points were defined for this section of route there was a need to consider the further advice from HS2 Ltd on the route choice between the Erewash Valley and the M1.
- There was also the potential consideration of serving some locations on the eastern leg by classic compatible rather than high speed services. Classic compatible services serve limited destinations and also use one of the available train paths on the core HS2 route and therefore there has to be high demand for the service. HS2 demand appraisal suggested this was not the optimum use of the limited HS2 services especially when considering the combined markets further north.
- The next issue was to select a route between South Yorkshire and Leeds and a Leeds city centre station which would influence the choice of approach.
- Finally as with the western leg a connection to the East Coast Main Line needed to be selected.

These issues are now described below with an explanation of the main alternative options and why the Government chose not to progress them further at this stage.

East Midlands station options

HS2 Ltd's March 2012 work produced two final options for the East Midlands. The Government selected the East Midlands Hub station as its proposed station for consultation for the reasons set out in Part II. The main alternative option was for a station on the site of the existing mainline rail station in Derby.

This option would require the complete reconfiguration of the existing station, including the tracks, platforms, concourse and forecourt. This would result in a modernised and efficient station, with enhanced public transport connectivity and enabling easy interchange between HS2 and conventional rail services. A city centre station would also bring further benefits in terms of existing public transport connectivity to the site and relative proximity to where passengers begin and end their journeys.

However, the complex construction programme required to reconfigure the station would last a number of years. Effects on existing services could be minimised but some disruption would be inevitable. A high speed station at Derby Midland, although capable of serving Derby and its environs well, would be less able to serve the wider East Midlands region than the East Midlands Hub station option at Toton. Journey times to and from key areas of demand would also be better from the East Midlands Hub, particularly given the proximity to Nottingham which is the much larger source of demand. HS2's forecast was that the East Midlands Hub station at Toton would attract over 20 percent more total demand than the central Derby station.

Serving central Nottingham

Noting that Nottingham is the largest market in the East Midlands HS2 Ltd also considered, without progressing as a main alternative, the option of serving central Nottingham. However, as set out in their reports, routes serving the city centre would be costly to develop, with a spur being the most feasible option. Whilst Nottingham would generate a larger market on its own than Derby, it would still not justify more than one service per hour to London. Nottingham would therefore be better suited as an intermediate stop rather than as a terminus from a spur. Incorporating an HS2 station into the existing station would also be costly, disruptive and would have significant sustainability impacts.

Serving Leicester

HS2 Ltd's March 2012 report offered Derby Midland as a main alternative to the East Midlands Hub and, for the reasons described above, did not propose a central Nottingham station. The third East Midlands city is Leicester, approximately 30 miles to the south of these two cities. HS2 Ltd found in its route design work that serving Leicester on the eastern leg would be challenging. It would also impose a serious time penalty on passengers heading to all destinations further north. Compared to building a station near Nottingham, HS2 Ltd calculated that this would amount to a loss of benefits for passengers of around £1.6 billion and a reduction in revenue of around £700 million. As well as additional journey time for passengers from Yorkshire and further north, the longer route would also involve an extra construction cost of between £400 million and £1 billion and would be likely to generate higher sustainability impacts.

East Midlands Parkway station

As well as considering the East Midlands city centres HS2 Ltd considered a wide variety of alternative options. As HS2 Ltd's reports describe, though not progressed to the status of a main alternative, the intuitive interchange option for serving the East Midlands was potentially incorporating an HS2 station with the existing East Midlands Parkway station. HS2 Ltd therefore compared it directly with the proposed East Midlands Hub station at Toton.

HS2 Ltd noted the engineering and sustainability issues with options at East Midlands Parkway. In particular, as the line of route would curve in that area the footprint of an HS2 station would be longer and wider than at other locations. An alternative option to approach an East Midlands Parkway station from the south would require the realignment of the Midland Main Line eastwards and would have significant sustainability impacts.

East Midlands Parkway also sits within the Green Belt, a designation which HS2 Ltd understood was unlikely to be reviewed. This would mean that development around an HS2 station would not be supported. HS2 Ltd felt that this restrictive planning framework was felt to be a significant differentiating factor compared with the potential for development around a station at Toton.

Routes between the West Midlands and the East Midlands

As set out in Part II the Government's selection of the East Midlands Hub station effectively meant that the alternative option of the station at Derby Midland, and the route serving it, was no longer considered.

Part II described the Government's selection of a route between the West Midlands and the East Midlands Hub that would cross the River Mease Special Area of Conservation (SAC), a protected European site of importance because of its valued species which are mainly aquatic. Part II describes HS2 Ltd's work, and that of its consultants, which considered the options for crossing or avoiding the River with a number of alternatives which were ruled out because of concerns over engineering and complexity and costs.

HS2 Ltd retained one alternative option that would avoid crossing the river. This was developed in case a satisfactory outcome could not be reached with Natural England and the Environment Agency on potential options that would cross the river. Design measures for the route that would avoid the Mease would seek to avoid any significant hydrology impacts and the Habitats Regulations Assessment (HRA) screening report concluded that this route option was unlikely to have a significant effect on the river. However, as HS2 Ltd explained in its March 2012 reports, it was believed this option would have generally greater sustainability impacts than options crossing the river.

HS2 Ltd would design route options that cross the river to avoid or mitigate any impact as far as possible. As set out in their March 2012 reports, HS2 Ltd's consultants HRA screening report could not conclude that the river crossing options would not be likely to have a significant effect on the integrity of the SAC, due largely to the potential shading of aquatic vegetation under a bridge crossing.

HS2 Ltd therefore agreed with Natural England and the Environment Agency that an Appropriate Assessment (under the UK Habitats Regulations and EU Directive) was required to determine whether proposals for the new crossing of the river would have an adverse effect on the integrity of the SAC.

Further work was therefore carried out as part of the Appropriate Assessment on variations to the design of a bridge crossing that would seek to minimise the shading effect on the light-sensitive plant and to better understand the shade tolerance of the key plant species. Field surveys and other work to understand potential effects were carried out. The result of this work was that Natural England and the Environment Agency agreed with the provisional conclusion of the draft Appropriate Assessment that the River Mease crossing would have no adverse effect on the SAC. The Appropriate Assessment process will continue through the design to ensure no adverse effects.

As described in Part II this conclusion was particularly applied to the route to the north of Measham. Subject to further discussion with Natural England and the Environment Agency it could potentially be applied to the route to the south of Measham. However, HS2 Ltd noted, and the Government agreed, that the southern route would have a longer and less favourable crossing of the Mease which may require more mitigation than the crossing for the route north of Measham. The noise from the route to the south would affect a larger number of people although its costs would be marginally lower.

Selecting a South Yorkshire station

As already described, the selection of a route between the East Midlands and South Yorkshire was dependent both on the choice of an East Midlands station and the selection of a station to serve South Yorkshire. Part II described the reasons for the Government's selection of the proposed station at Sheffield Meadowhall. The main alternative to this option put forward by HS2 Ltd was for a city centre station at Sheffield Victoria. This is described below as is HS2 Ltd's work on options at the existing Sheffield Midland station, these were not progressed to the status of being a main alternative.

HS2 Ltd's development of station options in the South Yorkshire region established that demand for long distance trips from the region was concentrated in the urban areas of Sheffield and Doncaster with the majority in Sheffield. In Sheffield there are two big areas of demand – the city centre and the area to the south-west of the city.

South Yorkshire stands to be one of the biggest beneficiaries of HS2. Existing journey times are slow with Sheffield Midland about two and a quarter hours from London. High speed rail could reduce this journey time by around an hour so serving the market is important to the business case. Journey times to Leeds, the second biggest market for services from Sheffield, would also significantly improve.

However, South Yorkshire would be one of the smaller markets on the network. In terms of passenger numbers, HS2 Ltd estimated that the South Yorkshire station on its own would support only one train per hour to London. It was therefore important in HS2 Ltd's development of

options, that trains call at multiple destinations so that South Yorkshire would justify the frequent service and benefits from the significant time savings.

The relative size of the market is also important when considering journey times to locations further north. HS2 Ltd estimated that over four times more passengers would travel on to places such as Leeds, York and Newcastle than would use the South Yorkshire station. This was important in HS2 Ltd's process as many options would offer a trade-off between accessibility for South Yorkshire and journey times further north.

HS2 Ltd found that running all services through central Sheffield would result in a journey time penalty of around six minutes to those going to Leeds or further north compared with a route through Meadowhall. This penalty would apply to over 30,000 single daily trips and would mean a reduction in benefits of around £500 million.

Therefore, the trade-off is that HS2 Ltd recognised that Sheffield city centre offers the most concentrated demand in South Yorkshire region but that the market it relatively small particularly compared to the total of the larger markets further north.

Nevertheless, HS2 Ltd recognised the concentration of demand around Sheffield city centre so considered all the possible ways of serving central Sheffield by high speed rail. These options are described in their March 2012 reports. Set out below is a description of the main alternative to Sheffield Meadowhall that HS2 Ltd put forward, a station at the former Sheffield Victoria railway station served by a loop from the HS2 main line. The consideration of this alternative is described below. Though not progressed to the status of a main alternative, the consideration of Sheffield Midland is also summarised below as an important aspect of the option development process.

Sheffield Victoria

HS2 Ltd concluded that the best performing option for a Sheffield city centre station was on the site of the disused Victoria station on the north side of the inner ring road to the north-east of the city centre. An HS2 station here would sit on the railway arches, although the tracks would be further elevated due to the existing constrained nature of the site. The Grade II listed Royal Victoria Hotel would have to be demolished, along with other buildings in the area. New pedestrian bridges, a bus interchange, road access and a diversion of the tram would be necessary.

However, in order to serve Victoria effectively HS2 Ltd concluded that a loop from the main line would be necessary. Their March reports explain this option and alternative spur and through line arrangements. The loop would require an additional 11 miles of track and a two and a half mile tunnel under the north of the city. The additional infrastructure required would therefore lead to higher costs of over £1billion compared to a station at Sheffield Meadowhall.

A station at Victoria would also be some distance from the main line station at Sheffield Midland, constraining interchange between regional rail services and HS2. Whilst connectivity with the tram would go some way to mitigating this, in order to provide an equivalent level of regional connectivity to a Sheffield Meadowhall station, the city council and other delivery partners, have suggested reopening the disused Sheffield Attercliffe station located 500 metres to the east of the Victoria site. Whilst this proposition is likely to provide benefits it would also involve new costs on top of the £1 billion increment already described above.

HS2 Ltd's analysis of route options for reaching central Sheffield showed significant impacts on a major development site to the south of the city. The site has been identified for major new

industrial development, which the city region views as important to its long-term economic wellbeing. The only available routes that would avoid impact on this site would require extensive residential and commercial demolitions.

As already explained in addition to these factors HS2 Ltd's analysis also noted the journey time disbenefit from serving central Sheffield to journeys going to Leeds or further north. Therefore, whilst the Government recognised that building a station in the centre of Sheffield would bring benefits it would involve considerable additional cost and come with a number of impacts.

Sheffield Midland

Whilst not progressed to the status of a main alternative, HS2 Ltd also considered a range of options for building the HS2 station at Sheffield Midland, the existing mainline station Integrating the HS2 station with the existing mainline station in the city, which provides local, regional and national rail services, as well as the tram, would be an attractive proposition.

The different options for serving Sheffield Midland are described in their March reports. HS2 Ltd found that each of the options would entail a complex programme of construction, with impacts on rail services over a number of years as the existing station would require major reconfiguration. It would also be necessary to widen the footprint of the station, requiring major excavations into the adjoining Park Hill. The station could also only be served by a long, and therefore costly, tunnelled approach. Therefore, whilst HS2 Ltd developed a number of options for a station at Sheffield Midland none were progressed to main alternative stage which concentrated on the development of Sheffield Victoria already described.

Routes between the East Midlands and South Yorkshire

The selection of a proposed station at Toton to serve the East Midlands and a station at Sheffield Meadowhall to serve South Yorkshire, defined the start and end-points for route options. These station selections effectively ruled out the alternative route option that HS2 Ltd proposed from the alternative Derby Midlands station which would broadly follow the A38.

In their March 2012 reports HS2 Ltd presented two route options towards South Yorkshire from the East Midlands Hub station at Toton. One of these route options would broadly follow the line of the M1 corridor and the other via the Erewash Valley railway corridor. Further north, the two routes would start to come together beside the M1 west of Bolsover to become a single route option that would follow the Rother Valley towards Sheffield and the Meadowhall area.

HS2 Ltd reported in March 2012 that the route option following the M1 would be around £280m more expensive than the Erewash Valley route. They also noted though that there would be difficult sustainability and engineering issues with the routes, especially in terms of mining hazards and risks. HS2 Ltd highlighted that, as part of the ongoing design process, it would need to continue to assess the risks around route development. The company felt that this was likely to lead to both routes being of a similar cost which would have a potential bearing on the route that the Government selected for the proposed scheme.

HS2 Ltd noted that from an alignment perspective, the route following the Erewash Valley might be more straightforward than the M1 route option which would cross more difficult terrain and would have some potentially complex interfaces with the M1 motorway. This difference in construction was reflected in the cost differences HS2 Ltd set out in their March reports.

Since reporting in March 2012, HS2 Ltd's further work established that the Erewash Valley route would be potentially far more affected by the legacy of ground hazards presented by outcropping coal seams and past opencast extraction and shallow underground mining activities.

HS2 Ltd also looked further at the landfill issues on both routes and through continued design work have been able to avoid many sites. There would still be a number of remaining landfill sites on the proposed Erewash Valley route option which could not be avoided and one of which would present a high risk. In contrast, the proposed M1 route would have only one landfill site which would be considered a medium risk.

The potential complex motorway crossings and other interfaces between the high speed line and the national motorway network were a further significant factor. On this issue, the route that would broadly follow the M1 would have seven major interfaces, including crossings with the M1 route, compared to three for the Erewash Valley route (with two being common to both). In their analysis, HS2 Ltd made an allowance to cover contractual agreements for the cost of motorway disruption associated with major crossings but this does not fully capture any potential impact on motorists.

In addition to the consideration of the engineering and mining risk associated with both routes, there are also significant sustainability considerations. There would be more potential demolitions along the M1 route option than along the Erewash Valley route. Both routes would also pass a number of cultural heritage features but with the Erewash Valley option directly affecting a greater number of conservation areas.

HS2 Ltd's noise assessment of both routes concluded that there would be a significant difference in the number of people affected by noise. HS2 Ltd estimated that this would be around two thirds higher for the Erewash Valley route compared to the M1. Since mitigation is applied as the design develops it is expected that noise impacts for both route options would be likely to reduce significantly.

HS2 Ltd's further work on the M1 route option past Hardwick Hall identified scope to reduce the visual impact of the route in a way that would not be feasible with the Erewash Valley route. The new alignment would make a simpler crossing of the M1 north of Tibshelf at an angle that would reduce the length of temporary diversion and avoid the realignment of the bridge that carries the Mansfield Road over the M1. The new crossing angle would allow the high speed alignment to run closer to the M1 on its west side and to sit lower in the landscape past the Hall as far as Junction 29 at Heath. As the new alignment passes Long Duckmanton the interface with the A623 would also be simplified by being further away from the M1 at this point and the crossing of Junction 29A would also be simpler.

As set out in Part II the Government selected the route option via the M1 based on the further work that HS2 Ltd had carried out. In particular, the Government noted that the route options were, following HS2 Ltd's further work, estimated to be of similar cost. The Government took into account HS2 Ltd's further advice that the Erewash Valley route option would pose significantly greater risk in terms of capital and maintenance costs and programme with regards to mining issues and historic landfills. The Erewash Valley route would also have higher noise impacts than the M1 route.

Routes from Sheffield Meadowhall to Leeds

HS2 Ltd developed a number of options for routes from the proposed station at Sheffield Meadowhall and the alternative from Sheffield Victoria. The route option process that HS2 Ltd followed is described in full in their March 2012 reports.

HS2 Ltd developed a set of route options to the west of Barnsley and broadly following the M1 corridor. Any high speed alignment through this area would require extensive use of steep gradients, tunnels and significant earthworks. As a continuation of the route broadly following the M1 corridor there were options for passing Leeds either to the east of west.

Route options passing to the East of Leeds would have to be at a reduced speed or in a greater length of tunnel because of the urban nature of the area near the junction of the M1 and M62 . These options would also have a notable sustainability impact.

Route options passing to the west of Leeds were also considered less suitable by HS2 Ltd as a result of the challenging topography through the area with the significant changes in elevation meaning that the length of tunnel and viaduct would increase. The routes into Leeds from the west were also significantly longer and therefore four to five minutes slower than the option HS2 Ltd put forward. Routes to the west of Leeds would also not serve York or create the opportunity to connect with the East Coast Main Line further south. Routes to the west of Leeds would also have a significant sustainability impact.

As a result, although HS2 Ltd explored several options during its route development process it did not put forward a main alternative to the route described in Part II. and selected as part of the proposed scheme.

Leeds city centre station options

In their work developing options for a Leeds city centre station option HS2 Ltd once again noted the importance of connectivity with the existing main line railway station. The existing Leeds station is also well placed for accessing the existing Leeds city centre developments and the commercial and business districts. However, developing approaches into the north of the city is complicated by the river and by the sprawl of development. Avoiding or minimising impacts tends to add to the costs. And in order to access the north of the city successfully, the approach would be longer and slower with an overall journey time impact. HS2 Ltd's main options presented in its March 2012 advice included a station option to the north of the existing Leeds station and two options to the south of the city. Part II described the Government's selection of a city centre station in the south of the city as part of the proposed scheme. Set out below are the main alternatives and a description of why the Government did not select them for the proposed scheme.

Leeds Station North

HS2 Ltd's proposed station at Leeds Station North, immediately to the north of the existing Leeds station, would provide the easiest possible interchange with services at the existing station and would also be located closest to the existing city centre. However, the site proposed for the station is constrained, and building the HS2 station here would effectively prevent future expansion of the existing Leeds station in the long-term. This would be problematic if demand for rail travel in the region continues to grow as expected as there are likely to be limited long-term options for accommodating additional demand and it would it be impossible to expand the HS2 station in the future.

As well as the issue of future-proofing, Leeds Station North would involve a longer connection to the main line that would generate higher impacts on local communities. All the Leeds city centre station options would be served by a spur off the main HS2 line but given the constraints formed by the existing station and the river, it would only be possible to approach this station option from the west. The main HS2 line would run to the east of the city on a north-south orientation heading towards York. Providing a link from this main line through to the Leeds Station North option would require a new line curving through the southern portion of the city. The proposed option at Leeds New Lane would therefore be served by a more direct and less impactful route. The route would also expose fewer properties to increased levels of noise, necessitate fewer demolitions and save travel time.

The longer route and more complex engineering proposition of building the station on the constrained site alongside the existing station would add around £380 million to the cost of serving Leeds. Although the location of this station option, closest to the existing station and city centre, would be likely to generate some additional benefits, these would probably not justify the additional cost.

Sovereign Street South

HS2 Ltd also developed a third station option for serving central Leeds which, as with the option selected by Government, would be to the south of the city. This option, known as 'Sovereign Street South', would sit a short distance to the east of the New Lane option and approximately 200 metres south of the existing Leeds station. The passenger concourse would lie immediately to the east of the Asda headquarters building, extending over the River Aire into the area around Sovereign Street, which is proposed for redevelopment.

HS2 Ltd found that this option was unlikely to generate any additional benefits over the New Lane option, nor would it be any cheaper. However, it would provide a passenger concourse capable of directly serving the city centre to the north of the river.

The city has aspirations to regenerate the 'South Bank' area of the city, and it was felt that a station option would present a significant challenge to those and other development plans. The station would dissect the South Bank area and it was considered that the effect of this would be to significantly reduce the prospects of maximising the potential of the site for the city.

Connecting to the East Coast Main Line

As already described, HS2 Ltd's conclusion, accepted by the Government, was that the connection from the high speed line to the WCML and on to Scotland was the best way to capture both the Glasgow and Edinburgh markets equally. Serving Scotland via the ECML would have enabled Edinburgh to be served directly but would have led to the sizeable Glasgow market being served via Edinburgh which would have an impact on overall benefits.

As a result of this decision, HS2 Ltd's work on connecting to the East Coast Main Line focussed on where to connect and what markets might be served en route to the North East. This work established in particular the benefits to HS2 of capturing the York market which is a potentially significant and valuable market with over six million passengers using York station in 2010/11. HS2 Ltd also considered, at a high level, the option of bypassing York but noted that whilst there was benefit in serving the North East with fast services there would be a significant loss in benefits and revenue from not capturing York. Given the potential benefit from serving the North East market with fast services passive provision was made in HS2 Ltd's scheme design for this expansion in

the future. A full description of the options that HS2 Ltd considered is set out in their March 2012 reports.

HS2 Ltd's work identified a number of different possible locations to join the East Coast Main Line. The initial list of options developed would all have potential sustainability impacts and in some cases would also not offer good journey times or appropriate cost solutions. HS2 Ltd then developed a further range of connection points though noted that the further south the connection the greater the journey time impact on services to York and beyond which, as described in their reports, was identified as an important market for HS2. The more southerly options would also require significant works to the existing rail network as this is a heavily used freight line with some passenger services. Through this work HS2 Ltd settled on a connection point at Church Fenton on the basis that it offered a reasonable journey time saving for services northwards at a proportionate cost.

HS2 Ltd developed two route options to the East Coast Main Line connection at Church Fenton. The selected route via Garforth has been described in Part II. The main alternative option via Castleford would be marginally quicker but would be more expensive because the overall route would be longer. The route via Castleford would also generally perform worse in sustainability terms.

Glossary

Appraisal of Sustainability (AoS) A phased appraisal of the extent to which HS2 options support objectives for sustainable development, including reducing greenhouse gas emissions and combating climate change; natural resource protection and environmental enhancement; creating sustainable communities; and sustainable consumption and production

Area of Outstanding Natural Beauty (AONB) An area of countryside in England, Wales or Northern Ireland whose distinctive character and natural beauty are considered of sufficient value to be designated under the National Parks and Access to the Countryside Act of 1949

Biodiversity Action Plan (BAP) An internationally recognized program addressing threatened species and habitats and is designed to protect and restore biological systems

Classic rail The existing non-high speed railway in Britain

Delivery Partners Stakeholders such as local authorities and passenger transport executives critical to the delivery of the project with whom we have had discussions in confidence

East Coast Main Line (ECML) A major mixed-traffic railway route on the eastern side of Britain, linking London, the South East and East Anglia with Yorkshire, the North East Regions and Scotland

Eastern Leg The Phase Two route from the West Midlands to Leeds and which connects to the East Coast Mainline south west of York.

Environmental Impact Assessment (EIA) An assessment of the possible wider impacts that a proposed project may have on the environment

Exceptional Hardship Scheme (EHS) A scheme to help homeowners whose property value may be seriously affected by the 'preferred route option' of HS2 and who urgently need to sell

Gross Value Added (GVA) A measure of the value of goods and services

High Speed Rail (HSR) A type of passenger rail transport that operates at speeds higher than the normal speed of rail traffic

High Speed 1 (HS1) The high speed railway line running from London St Pancras through Kent to the Channel Tunnel (formerly Channel Tunnel Rail Link (CTRL))

High Speed 2 (HS2) The scheme for a national high speed rail network in Britain, serving London, Birmingham, Manchester and Leeds and a number of intermediate stations, with links to Heathrow Airport and the High Speed 1 line to the Channel Tunnel

High Speed 2 Limited (HS2 Ltd) The company tasked with providing advice to Government on the introduction of a national high speed rail network in Britain http://www.hs2.org.uk/

Hybrid Bill A bill with characteristics of both a public bill and a private bill

January 2012 Command Paper High speed rail: Investing in Britain's future – decisions and next steps. The decisions reached by the Government in the light of the Consultation in 2011 and an outline of the immediate next stages of the project

January 2013 Command Paper "High Speed Rail: Investing In Britain's Future Phase Two – The Route To Leeds, Manchester And Beyond." The Government's Initial Preferences For The High Speed Rail Route To Leeds, Manchester And Beyond For Phase Two Of The HS2 Project. https://www.Gov.Uk/Government/Publications/High-Speed-Rail-Investing-In-Britains-Future-Phase-Two-The-Route-To-Leeds-Manchester-And-Beyond

March 2012 Report "Options for phase two of the high speed rail network." The report submitted to Government by HS2 Ltd in March 2012 which set out the options for phase two of HS2. https://www.gov.uk/government/publications/options-for-phase-two-of-the-high-speed-rail-network

Maintenance Depot A railway depot where rolling stock are serviced and maintained

Maintenance Loop A series of extra tracks running alongside the high speed lines that will be used to house maintenance trains, during the daytime when overnight work is due to be carried out in the area concerned or to stable failed or defective trains in an emergency

Midland Main Line (MML) A major mixed-traffic railway route linking London and Sheffield via Luton, Bedford, Kettering, Leicester, Derby, Nottingham and Chesterfield

Network Rail The company that runs, maintains and develops Britain's tracks, signalling system, rail bridges, tunnels, level crossings, viaducts and 18 key stations http://www.networkrail.co.uk/

Preparation Bill Generally used when the Government needs Parliament's authority to spend money in a preparatory fashion on a new function or service that subsequent legislation is planned to provide fuller powers in order to implement

Phase One A line from London to the West Midlands, including stations in central London (Euston), West London (Old Oak Common), outer Birmingham (Birmingham Interchange) and central Birmingham (Curzon Street). It includes a connection onto the High Speed 1 line to the Channel Tunnel

Phase Two Lines from the West Midlands to Manchester and to Leeds, including stations in South Yorkshire and the East Midlands, and a direct link to Heathrow Airport[67]

Released Capacity Routes and services on the classic rail network that could be made available to franchise operators to develop new markets for passenger and freight services when HS2 becomes operational

Risk and optimism bias Allowances for risk and optimism bias are added to the appraisal costs of projects to take account of the tendency for appraisers to be over-optimistic about the costs and other key parameters of projects

Special Area of Conservation (SAC) – strictly protected sites designated under the EC Habitat's Directive

Site of Special Scientific Interest (SSSI) The country's very best wildlife and geological sites. Natural England has responsibility for identifying and protecting SSSIs

[67] Work on Heathrow now paused, see January 2013 Command Paper

Value for Money (VfM) A broad-based assessment of all the costs and benefits associated with a potential investment. The costs include not only the financial cost of making the investment but also the 'non-monetised' impacts in relation, for example, to the environment and the economy. The benefits include a range of monetised transport benefits (capacity, reliability and journey times, for example) and also wider non-monetised benefits relating, for example, to economic growth. The value for money of a project is considered in light of these and all other aspects of its business case

West Coast Main Line (WCML) The busiest mixed-traffic railway route in Britain, serving London, the West Midlands, the North West, North Wales and the Central Belt of Scotland

Western Leg The Phase Two route from the West Midlands to Manchester and Manchester Airport and which connects with the West Coast Main Line south of Crewe and south of Wigan

Y network A national high speed rail network serving London, Birmingham, Manchester and Leeds, developed in two phases, and also including direct links to HS1 and Heathrow[68]

[68] Work on Heathrow now paused, see January 2013 Command Paper