East West Main Line
Strategic Statement

March 2022

NetworkRail

Contents

1.0 Executive Summary

1.1 The East West Main Line Vision

This strategic statement presents Network Rail's position on the long-term opportunity to expand the scope of the East West Rail (EWR) programme - as currently remitted - to more fully integrate with the wider rail network. The statement outlines a vision for an East West Main Line (EWML) which is aimed at gaining the most from the investment made in the new infrastructure and providing a railway that delivers for passengers and freight users into the future.

The statement refers throughout to the East West Rail Programme as the current, Department for Transport (DfT)-remitted scheme to provide new passenger rail services between Oxford, Cambridge, Aylesbury and Milton Keynes. The East West Main Line refers instead to a long-term vision, based on the analysis and principles outlined below, which is not currently remitted and is used as a shorthand for a potential expansion of scope.

The statement does not specify a programme of works, infrastructure projects or a pattern of train service as part of the East West Main Line vision. Likewise, this statement does not recommend any changes to the wider rail network which could compromise performance or the allocation of available capacity, and it should be assumed that no enhancement to the network which may derive from this statement would be progressed if a performance detriment would result. Performance and strategic capacity must be protected on the existing network as per Network Rail's published Strategic Advice and obligations under the Network Licence.

This strategic statement instead suggests areas for further exploration and development work, highlighting the benefits that could be accrued from adoption of the following East West Main Line principles:

a) Passenger services which cover a wider geographic area than currently remitted and thereby remove the requirement for passengers to interchange, either entirely or by bringing more locations within reach of a single interchange,

b) Ensuring that infrastructure changes made as part of the East West Rail programme do not preclude the potential future service of additional locations, which may provide an improved service for passengers and freight users over the long-term,

c) An appropriate service frequency and pattern which best realises reductions in Generalised Journey Times and distributes that reduction over a wider geographic area,

d) Ensuring that infrastructure changes made as part of the East West Rail programme do not preclude exploration of new national routing options for freight that could accommodate anticipated growth, serve existing or new distribution hubs, and improve freight access from major ports to the rest of the nation,

e) Provision of a strategic route for service re-routing, planned diversions, and operational flexibility in times of perturbation,

f) Electrification of the route which offers better rolling stock performance, aligns fully with the Traction Decarbonisation Network Strategy (TDNS), and more fully contributes to net reduction in carbon emissions through reduced use of diesel traction, the promotion of modal shift, especially in the freight sector,

g) Provision for European Traffic Control System (ETCS) digital signalling which enhances future capacity and is integrated with the intended national roll-out.

These principles are determined on the basis that they will more comprehensively achieve strategic outcomes for rail – drawn from government and industry long-term objectives[1] - which include improving transport connectivity, realising whole-system benefits, stimulation of economic growth, and ensuring long-term environmental sustainability (all detailed in section 5). As such, the proposal for an East West Main Line is made on the basis that an expanded scope will deliver greater value from the investment over the long term. This is achieved by spreading the social and economic benefits more widely through comprehensive integration with the existing network, and thus making a more significant contribution toward the required strategic outcomes.

The statement complements the East West Rail Programme as currently remitted, recognising the major improvement in connectivity that will be made by the introduction of new train services between Oxford, Cambridge, Aylesbury and Milton Keynes. This statement is not a request for funding for specific interventions, nor does it request any changes to the interventions planned as part of the East West Rail programme. The East West Main Line statement uses the East West Rail configuration states as a baseline from which the opportunity to expand the remit is explored.

1.2 Method and Analysis

The long-term opportunity for an expanded East West Main Line vision is based within this statement on high-level economic analysis comparing current generalised journey times by rail and estimated generalised journey times using planned East West Rail services (detailed in section 4). The data show the radical improvements in passenger connectivity brought about by the introduction of the East West Rail base service specification (assumed to be configuration state 3 given uncertainty about the status of configuration state 3.5 service groups) within its 'core' geography, that is to say, where new direct passenger connections are introduced between Oxford, Cambridge, Aylesbury and Milton Keynes.

When this analysis is applied within a wider geography (detailed in section 3, with accompanying data in Appendix I) beyond the 'core' East West Rail programme, improvements in passenger connectivity are modest or non-existent, particularly between major urban centres within the 'core' – such as Milton Keynes – and those on the periphery – such as Swindon, Bristol or Norwich. This is due primarily to the continued requirement for multiple interchanges when using East West Rail services. The expansion of scope based on the principles for an East West Main Line would be aimed at

[1] Department for Transport (2017) 'Connecting people: a strategic vision for rail'; Department for Transport (2018) 'Rail Network Enhancements Pipeline: A New Approach for Rail Enhancements'.

addressing the potential for improvement in connectivity within this wider geography, by providing for better integrated passenger services between major urban centres over the long-term.

The statement also considers strategic routes for freight and gives a high-level view on the long-term potential an East West Main Line could offer in generating additional connectivity for moving goods – especially intermodal – by rail. Demand data is drawn primarily from the MDS freight study[2] commissioned by Network Rail (considered in more detail in section 3.2), with the long-term impact additional freight routes could have on the national freight network considered with specific input from Network Rail's Freight and National Passenger Operations function (detailed in section 4.7). As such, the East West Main Line vision is based on achieving improvements in passenger connectivity alongside improved connectivity for freight, enhancing the long-term prospects for modal shift from road to rail and alleviating capacity constraints on existing parts of the freight network.

1.3 Network Rail's Position on Addressing Areas of Interface and Constraint

In order to achieve the East West Main Line vision over the long-term, decisions will need to be made immediately which address emergent constraints. These decisions should be made recognising the need to protect both performance on the existing network and the wider East West Rail business case, whilst also making sure that the benefits associated with an East West Main Line are not precluded by 'locking in' infrastructure options that cannot accommodate future extension of services or would be prohibitively expensive to redesign in future.

Likewise, the East West Main Line vision is presented on the basis that long-term benefits are accrued from comprehensive integration with the wider rail network. Moving toward an East West Main Line could unlock additional benefits that are not currently within the scope of the East West Rail programme at all.

In order to be clear about the constraints which should be addressed with the long-term in mind, this statement provides a summary of Network Rail's position on the following key areas of interface between the East West Rail programme and the existing network:

[2] *MDS Transmodal (2019) 'Rail freight forecasts: Scenarios for 2033/34 and 2043/44'*

- Oxford/Dicot area,
- Aylesbury/Claydon,
- Bletchley/West Coast Main Line,
- Marston Vale Line,
- Bedford/Midland Main Line,
- East Coast Main Line,
- Cambridge,
- Freight,
- Electrification,
- Digital Signalling.

These position summaries highlight the most effective way to accommodate the East West Rail programme specification in the short and medium term without limiting the potential for an expanded scope as part of an East West Main Line vision in future.

The nature of the interface constraints between the East West Rail Programme and the existing network are described in section 2.4. Network Rail's strategic position for addressing each area of interface is then articulated in section 6.

1.4 Next Steps for Development and Future Work

Network Rail will work with the Department for Transport and the East West Rail Company to address the constraints that emerge at interfaces between the East West Rail programme and the existing network, and ensure that a long-term vision based on the principles for an East West Main Line inform decision making.

This statement does not, however, specify a programme of works. It offers a long-term vision which should guide decision-making regarding areas of constraint, and can be achieved either through bespoke, incremental interventions or as part of a larger future programme. The aim of the statement is to highlight the opportunity associated with an expanded scope for the East West Main Line, and the imperative to address current constraints in a way that maximises the benefit in the long term.

Specific interventions will be subject the usual business case process as specified by the Department for Transport.[3] In order to fully integrate the East West Rail infrastructure as part of this wider vision, and to fully address the areas of constraint considered above, further development work should

[3] *Department for Transport (2013) 'The Transport Business Case'*

be undertaken to understand the required services and interventions, the specific benefits unlocked for passengers and freight users, and the level of further investment required (next steps are outlined finally in section 7). Future work will need to be informed by the following:

- A comprehensive and detailed understanding of the markets and flows between major urban centres and the impact of improved passenger service provision between them,

- The specific benefits case and improvements in connectivity made by any consequent expanded train service,

- An assessment of the predicted modal shift to rail resulting from any expanded train service,

- Identification of capacity constraints and specific interventions required on the existing network to unlock any future benefits associated with an expanded train service,

- The feasibility of aligning or interworking proposed services with those existing or planned on the wider network,

- Development of specific or incremental options to present to funders for increased services beyond the core East West Rail scope where a bespoke set of benefits can be identified,

The move toward an East West Main Line should be an iterative process which maximises the benefit for future passengers and freight users beyond the transformative improvement offered by the East West Rail programme. This statement recognises the need to generate an acceptable industry position without prescribing specific service patterns or interventions, whilst also strongly recommending that current constraints are addressed with the long-term vision in mind.

It is intended that this strategic statement should act as a basis for and inform the following:

- Network Rail's collective, cross-regional position on the potential for long-term strategic integration of the East West Rail programme within the wider GB rail network,

- Strategic fit for the East West Rail Company's current programme as they undertake non-statutory public consultation of their programme for central section, ahead of attainment of a Development and Consent Order for construction of the new infrastructure,

- Strategic advice for the Department for Transport which will inform the opportunity to maximise the long-term benefits of new East/West infrastructure, and inform their decision-making as specifier.

2.0 Background to the East West Main Line

There is broad consensus that increasing east to west rail connectivity to the north of London is a strategic priority. It is in this context that the current programme to reopen a rail link between Oxford and Cambridge has emerged. The background to the programme and its development to date is outlined briefly below.

2.1 Historical Rail Operations

The 'Varsity Line' between Oxford and Cambridge opened in stages from 1845 and was operational for passenger traffic until 1967. Having survived the Beeching rationalisation it was subsequently taken out of service in the years following, due primarily to intense competition from road transport which offered a contemporary advantage in economy and efficiency. The route was closed with the exception of the Marston Vale line which currently serves locations between Bletchley and Bedford as a low-frequency branch line.

In the decades since, transport links in the surrounding region have had to support increasing usage of both road and rail - with a specific pressure for regional commuting into large urban centres - as a consequence of sustained economic development. Milton Keynes is emblematic of this growth as a largely new settlement which has burgeoned into significant national market in its own right with important economic links to London and other towns and cities in the region. As a result, the trunk roads which dissect the surrounding area between Oxford and Cambridge have had to accommodate increased usage generating

elongated travel times by road and increased congestion.

Presently, travel by rail between urban centres in the 'arc' area around London from the Southwest to the East, requires passengers to change (primarily at London) with no long-distance direct east to west link available. This has become more efficient in recent decades following major enhancements to the rail network including, but not limited to, West Coast Route Modification, Thameslink, and the Great Western Electrification Programme. Consequently, the growth in demand associated with sustained economic development and the increasing efficiency of the inter-urban rail network has generated significant flows into London, with increased average commuting distances, and consequent pressure at terminal stations and on metropolitan infrastructure where passengers need to interchange to travel onward.

2.2 The Contemporary Transport Context

East to west connectivity around Greater London is facilitated primarily by road, though such journeys are often difficult along a limited number of fast corridors. The regional Motorway Network – including the M4, M40, M1, A1 and M11 – largely present radial routes from London, fostering important logistics and distribution centres along this spine, but meaning east/west road travel remains more difficult. This is most efficiently achieved by use of a number of dual carriage ways, notably the A421 and A428 for locations between Oxford and Cambridge, and the A34 and A43 which offers a route between Swindon and Northampton. The A11 and A14 offer the primary road connections between Cambridge and Norwich/Ipswich respectively. These routes are not continuous across the region and can become congested at peak hours, making longer-distance journeys along an east/west axis difficult by road. For many such journeys, the major road network effectively funnels road users on to the M25 orbital motorway, generating congestion, longer journey times and emissions around the capital. Eastern Main Line. These are supplemented by several low-frequency rural or branch lines.

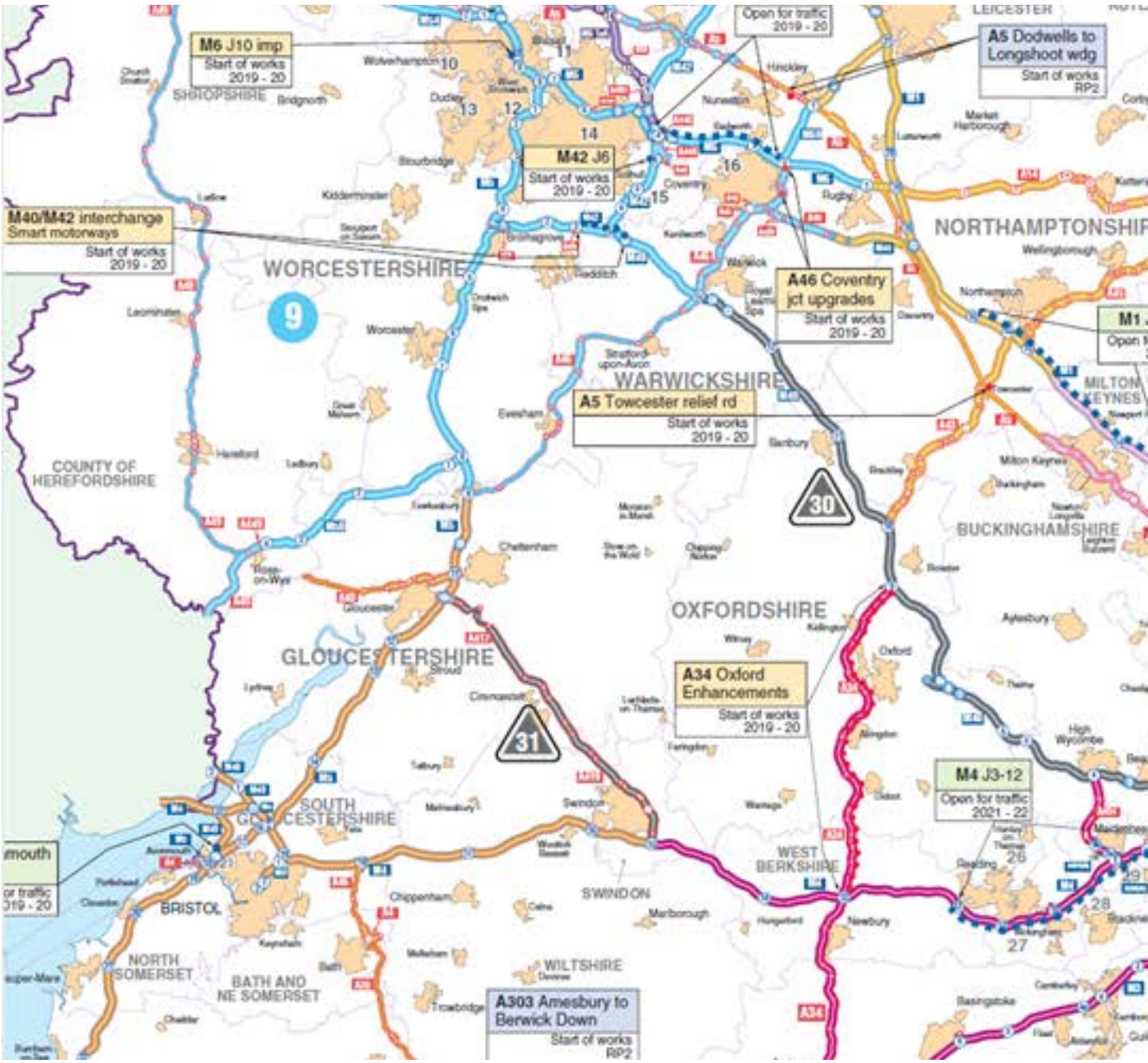
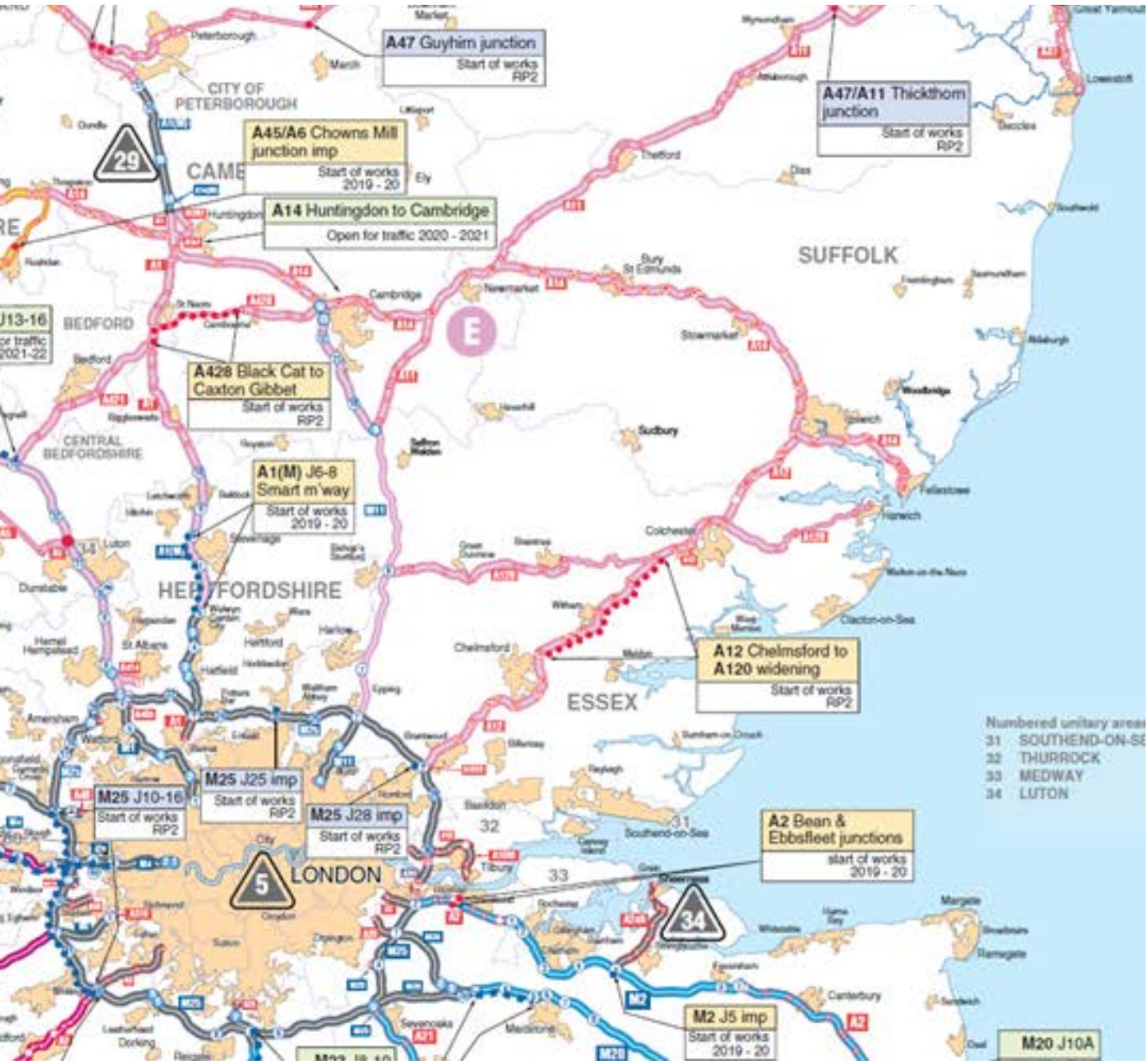


Figure 1: The Strategic Road Network (SRN) to the north of Greater London. Figure taken from Highways England and includes SRN planned enhancements as of 2019.

Road travel between major hubs outside of Greater London is often difficult and lengthy, and public transport options by bus or coach can be complex. Bus services across the region offer an alternative to the private car, but the distances involved for inter-urban travel make the use of them time-consuming and difficult in many instances.

The East West Expressway, a proposal for a new trunk road between Oxford and Cambridge in a similar corridor to that of the East West Rail link, has had further development paused as of 2020. This means that anticipated road improvements that were originally expected to happen in similar timescales to the development of the rail corridor have been postponed in favour of



investigation of more modest changes to the road network instead.

Longer distance travel between high-density, urban markets should be served by rail. However, rail links in the wider region are oriented around several high frequency main lines radiating from London, namely; the Great Western Main Line, Chiltern Main Line, West Coast Main Line, Midland Main Line, East Coast Main Line, West Anglia Main Line and Great Eastern Main Line. These are supplemented by several low-frequency rural or branch lines.

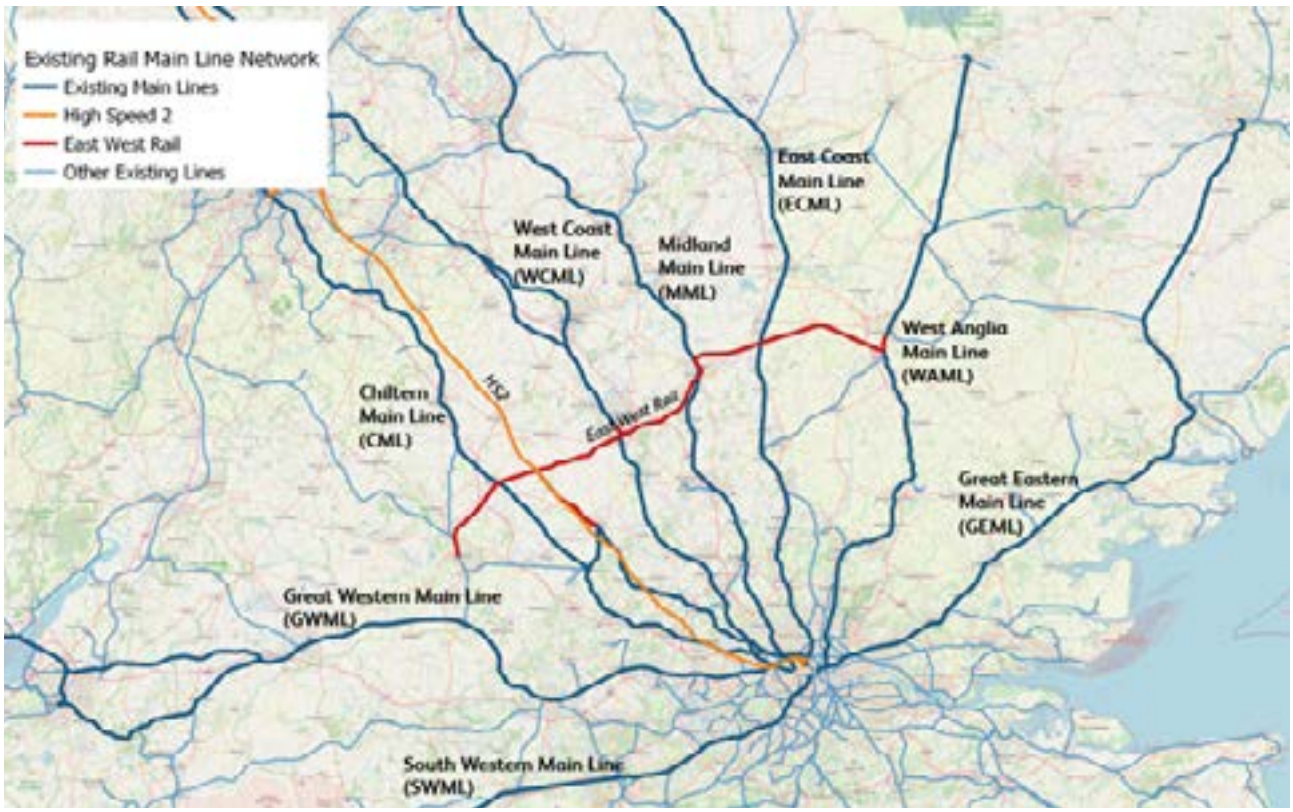


Figure 2: Rail main lines to the southwest, north and east of Greater London (dark blue) and other existing lines (light blue). The High Speed 2 (orange) and East West Rail (red) routes are also shown for reference. Note the East West Rail central section between Bedford (MML) and Cambridge (WAML) is an indicative representation only.

This rail system largely replicates the regional road transport issues considered above. Journeys taken from east to west and vice versa are likely to involve interchange and a combination main line services, resulting in both complicated and difficult journeys for passengers. A journey from Swindon to Bedford for example, will take around 2 hours and 20 minutes and involve taking a service from Swindon to Paddington, transferring to the London Underground, and taking a service from St Pancras to Bedford. This is not competitive with a road journey which takes less than two hours, even before taking into account the propensity for service frequency, late running and perturbation to impact a journey with multiple interchanges. Interchange is an undesirable aspect of rail travel for passengers as it is time-consuming, inconvenient and can be confusing for customers who are unfamiliar with the rail network further diminishing the attractiveness of rail travel.

The orientation of the rail network also makes it difficult for passengers to connect into other transport hubs. Several major airports are located in the region to the north of Greater London, including Birmingham, Stansted and Luton. At present, rail passengers can feasibly travel to these airports provided they are situated on the same main line. If not, travel by rail can be prohibitive given the added necessity of carrying luggage through multiple changes.

Transport connections between Greater London and surrounding regions are also vital for freight movement with the radial motorway network used heavily for the transport of goods by road. In recent decades the market for rail freight has grown as the demand for intermodal, containerised transport has increased. The main

line rail network offers an efficient mode of transport for 'Fast Moving Consumer Goods' over long distances, with good connectivity between ports and inland strategic freight sites in the midlands and the north. As with passenger use, the main line network limits the routes available for freight with cross-country flows often requiring use of London's orbital lines to connect on to main lines which are largely oriented north to south.

2.3 East West Rail Programme

In response to these challenges the East West Rail Consortium was established in 1995 by local authorities with the aim of addressing east to west connectivity through the reintroduction of rail services along the former varsity line corridor. The member authorities which comprise the East West Rail Consortium are listed below:

- Cherwell District Council
- Oxfordshire County Council
- Northampton Borough Council
- Aylesbury Vale District Council
- Wycombe District Council
- Buckinghamshire County Council
- Milton Keynes Council
- Bedford Borough Council
- Central Bedfordshire Council
- Luton Borough Council
- South Cambridgeshire District Council
- Cambridgeshire County Council
- Stevenage Borough Council
- North Hertfordshire District Council
- Hertfordshire County Council
- Norwich City Council
- Norfolk County Council
- East Suffolk Council
- West Suffolk Council
- Suffolk County Council
- Ipswich Borough Council

The Consortium undertook initial feasibility and assessment until funding was allocated by HM Treasury to develop a scheme in 2011, pursued from 2013 as 'phase one' enhancements between Oxford and Bicester. This first phase of the wider East West Rail programme was completed in 2016 and is now an operational railway that provides services between Oxford, Bicester and London Marylebone.

In 2017 the Department for Transport created a new arm's length body, the East West Rail Company (EWRCo), to act as promoter and accelerate the programme for the remaining stages. EWRCo is remitted to create a railway between Oxford and Cambridge. This includes Phase Two works - reopening the disused railway between Oxford and Bletchley, upgrading the single line between Aylesbury and Claydon, and upgrading the Marston Vale line from Bletchley to Bedford – and subsequent phases which will involve the creation of an entirely new rail corridor between Bedford and Cambridge. A preferred route corridor option via a new station on the ECML was announced on 30 January 2020.[4] The planned East West Rail route, as currently remitted by DfT, is shown below in figure 3:

[4] East West Rail Company (2020) 'Connecting Communities: The Preferred Route Option between Bedford and Cambridge'

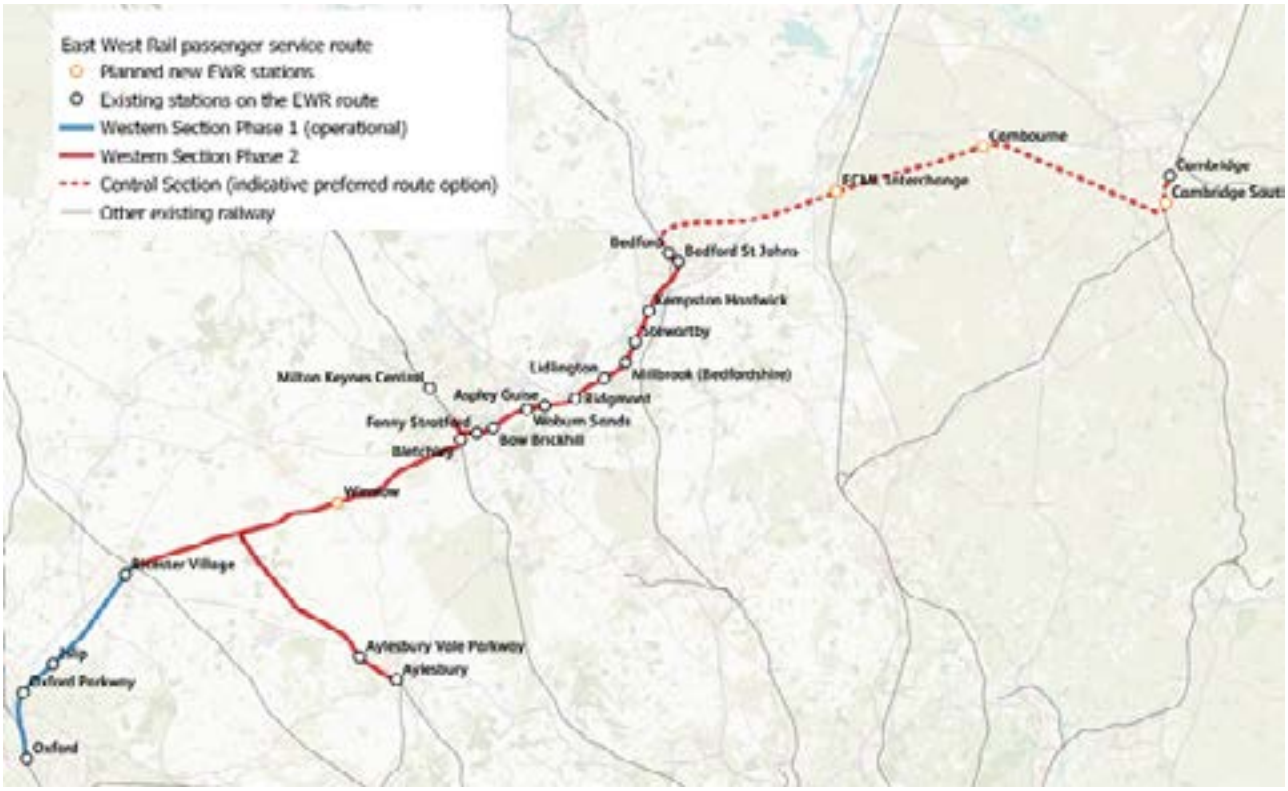


Figure 3: East West Rail route map based on the current base specification. Station rationalisation is planned for the Marston Vale Line between Bletchley and Bedford and no East West Rail services are currently planned to stop at Islip. It should also be noted that the central section preferred route option shown here is indicative only for illustrative purposes, with approximate locations for the planned new East West Rail central section stations.

The final proposed East West Rail service specification is shown below. This is based on configuration states introduced as the infrastructure phases are completed. All configuration states assume an all-stops pattern for every service group but it should be noted that station rationalisation on the Marston Vale Line between Bletchley and Bedford is planned and that configuration state 3.5 could be replaced by train lengthening of configuration state 3 service groups. As such, the economic analysis on which this statement draws assumes configuration state 3 as a final train service baseline for the East West Rail programme.

Delivery of the current East West Rail Phase Two section is being undertaken, on behalf of the East West Rail Company, by Network Rail as partner in the East West Rail Alliance. The Alliance is comprised of a number of primary contractors remitted to deliver the infrastructure required to accommodate train services as specified by the EWRCo.

Since 2016 transport issues for the region have been addressed by England's Economic Heartland (EEH) as the sub-national transport body. Network Rail has produced a rail study on behalf of EEH which outlines current rail connectivity in the 'heartland' region and analyses the impact of future East West Rail services on generalised journey times between key regional urban centres and transport hubs. EEH recognises East West Rail as a key catalyst of improving local connectivity, unlocking economic development and reorienting transport away from a reliance on north to south travel and interchange at London. Their draft transport strategy places distinct emphasis on rail travel as a sustainable mode of public transport, and an appreciation of the need to improve east/west rail connectivity.

Configuration State	Planned Service Groups
Configuration State 1	2tph Oxford to Milton Keynes Central
Configuration State 2	2tph Oxford to Milton Keynes Central 2tph Oxford to Bedford
Configuration State 2.5	2tph Oxford to Milton Keynes Central 1tph Aylesbury to Milton Keynes Central 2tph Oxford to Bedford
Configuration State 3	2tph Oxford to Milton Keynes Central 1tph Aylesbury to Milton Keynes Central 2tph Oxford to Cambridge 2tph Bletchley to Cambridge
Configuration State 3.5*	2tph Oxford to Milton Keynes Central 1tph Aylesbury to Milton Keynes Central 2tph Oxford to Cambridge 4tph Bletchley to Cambridge

Table 1: East West Rail Company proposed Train Service Specification configuration states. *Note that the additional 2tph Bletchley to Cambridge in CS3.5 could be replaced by train lengthening of service groups in earlier configuration states depending on the constraints presented between Shepreth Branch Jn and Cambridge.

Delivery of the current East West Rail Phase Two section is being undertaken, on behalf of the East West Rail Company, by the East West Rail Alliance; a partnership of Network Rail, Atkins, Laing O'Rourke and VolkerRail. The Alliance is remitted to deliver the infrastructure required to accommodate train services as specified by the EWRCo.

Since 2016 transport issues for the region have been addressed by England's Economic Heartland (EEH) as the sub-national transport body. EEH contracted Network Rail to produce a rail study on behalf of EEH which outlines current rail connectivity in the 'heartland' region and analyses the impact of future East West Rail services on generalised journey times between key regional urban centres and transport hubs.[5] EEH recognises East West Rail as a key catalyst to improve local connectivity, unlocking economic development and reorienting transport away from a reliance on north to south travel and interchange in London. Their draft transport strategy places distinct emphasis on rail travel as a sustainable mode of public transport, and an appreciation of the need to improve east/west rail connectivity.[6]

2.4 East West Rail Integration

The current East West Rail base-specification services (outlined in table 1 above) must be integrated with services on the existing network in a manner which adequately protects the performance of the wider network. At present, a number of specific areas of concern have been identified and will be taken into account when considering the future of East West Rail as part of the wider rail and transport network. They are shown in Table 2.

[5] *Network Rail/England's Economic Heartland (2020) 'England's Economic Heartland Passenger Rail Study'*
[6] *England's Economic Heartland (2020) 'Draft Transport Strategy'*

Interface	Strategic Impact
Oxford/Didcot	At present there is no evidence that service changes planned as part of the EWRCo final specification can be accommodated at Oxford in an industry-acceptable way. Insufficient capacity exists at Oxford to enable planned East West Rail services to terminate in a way that would permit further additional services without major station remodelling. Given the constraints posed by the current East West Rail specification, the Oxfordshire Rail Corridor Study[7] has demonstrated the strategic benefits of through-running services at Oxford. This work has identified that even modest station remodelling requires a decision to made on a service specification which in order to assure that the infrastructure end-state can accommodate the train service uplift.
Aylesbury (to Claydon) Line	There is currently a single line between Aylesbury and Claydon. Use of this line will require upgraded infrastructure to allow East West Rail services between Aylesbury and Milton Keynes, with the nature of the enhancement determined by the capacity required over the long-term.
Bletchley/West Coast Main Line	Work done to date on timetable development indicates that the EWRCo base specification will not be able to operate reliably on the West Coast Main Line and that capacity released by HS2 may be required to deliver the balance of paths. If further interventions are required a strategy should be in place which demonstrates how best to incorporate Milton Keynes as a central hub for east/west services, justifying the constraints imposed by the base programme, and generating the maximum level of connectivity for both passenger and freight services using East West Rail and existing infrastructure.
Marston Vale Line (Bletchley to Bedford)	At present, the Marston Vale line is served by a low frequency, all stops service. In order to maintain acceptable journey times and connectivity, this infrastructure will need to be enhanced, potentially alongside station rationalisation which is being considered as an option currently within the East West Rail remit.
Bedford/Midland Main Line	The Midland Main Line is currently heavily constrained with no additional capacity available for use by East West Rail services without a significant and unacceptable associated performance impact. Any intervention will need to protect MML operational performance whilst delivering the benefits of additional stopping services from East West Rail. New infrastructure may be needed to segregate east/west services from existing main lines in order to protect main line operability.

[7] *Network Rail (2018) 'Oxfordshire Rail Corridor Study'*

East Coast Main Line	Currently a new high/low level station is planned at the interface between East West Rail and the ECML with no direct physical connection between lines. While this presents no associated capacity impact from trains moving from one line to the other, the impacts of aligning service patterns at the station will need to be taken into account to facilitate the most efficient potential for interchange for passengers. This may drive timetable requirements to minimise interchange penalties but will need to be undertaken in such a way that protects the performance of existing services on the East Coast Main Line, their fixed timings in the Thameslink core, and wider main line journey times.
Cambridge	Planning for East West Rail services to continue eastwards beyond Cambridge will require significantly more complex and costly remodelling of the railway around Cambridge than the minimum enhancements required to terminate trains at Cambridge. Decisions made now which do not take into account future eastern ambitions may prevent future expansion of services beyond Cambridge without significant cost, disruption to railway services or abortive work. Requirements related to East West Rail's service specification will need to be taken into account as part of the Cambridge re-signalling programme. The programme will provide sufficient interlocking capacity for the Cambridge South station project, but a decision for the long-term between Shepreth Junction and Cambridge will need to be made with a long-term perspective in mind.
Freight	Demand for freight across the national network is set to grow[8] with existing routes nearing capacity in future. Additional connections and infrastructure may need to be considered to provide alternative strategic routes for freight, with other infill projects needed to achieve electrified routes using East West Rail infrastructure in future.
Electrification	At present, East West Rail infrastructure is not planned to be electrified. Changes to scope will need to be considered if fully electrified routes using the new infrastructure are required. Network Rail is currently undertaking an assessment of decarbonising the national network as part of the Traction Decarbonisation Network Strategy (TDNS)[9] which will recommend an option for decarbonisation based on the proposed service specification.
ETCS	The new infrastructure will host services that may use digital signalling in future. The most effective way to integrate the East West Rail programme will be based on alignment with the wider national roll-out plan for digital signalling on the national network.[10]

Table 2: Constraints resulting from the interface between planned East West Rail services and the existing rail network.

[8] *MDS Transmodal (2019) 'Rail freight forecasts: Scenarios for 2033/34 and 2043/44'*
[9] *Network Rail (2020) 'Traction Decarbonisation Network Strategy: Interim Programme Business Case'*
[10] *Network Rail (2018) 'Digital Railway Strategy'*

There are impending key decision points at major locations on the East West rail geography where a choice has to be made regarding the long term capability of the infrastructure. The decisions made now will directly influence the ability to expand the scope of services beyond the specification outlined in the EWRCo configuration states without incurring significant additional cost and disruption in the future, and thus will have an impact on the requirements and business case for other government-funded schemes.

It is imperative that the maximum benefits are gained from the investment made and that the constraints described above are justified by East West Rail's long-term service offering. This must be done as part of a long-term vision which: secures and improves on existing levels of performance on the rail network; is managed in such a way that no detrimental performance impact is generated by any future scope changes; and that the resilience of the wider network is improved.

In order to understand the impact of East West Rail services for future passengers and freight users, the following sections of this statement will: define a wider geography beyond the East West Rail 'core'; consider the connectivity impact East West Rail will have within that wider geography; and suggest a credible long-term strategy based on a vision for an 'East West Main Line' aimed at stepping back from the fixed East West Rail remit to consider opportunities which may generate even greater benefits. The potential benefits are based on the attainment of a number of strategic outcomes:

1. Improved connectivity,

2. Generating modal shift,

3. Integration with the existing network,

4. Contributing to decarbonisation.

These strategic outcomes are drawn from the Government aims for the rail as part of the transport network11 and are returned to in section 5.

[11] Department for Transport (2017) 'Connecting people: a strategic vision for rail'; Department for Transport (2018) 'Rail Network Enhancements Pipeline: A New Approach for Rail Enhancements'.

3.0 East West Main Line Geographic Area

The East West Rail programme will introduce a new double-track railway which permits 100mph running, is gauge cleared for the heaviest and longest freight services, and provides physical connections to a number of existing mainlines. It is important to assess the wider benefits that could arise from the use of this infrastructure given the potentially transformative impact it could have as part of the wider rail network. This strategic statement considers an expanded geography (described from this point as the 'East West Main Line geography') based on a sample of major economic centres which are used to highlight – at a high level – those wider benefits and the opportunity to maximise them.

3.1 Defining EWML Geography: Passenger Service Key Locations

For the purposes of the passenger service analysis, East West Main Line geography is defined by a sample of sixteen 'key locations' – major economic and transport centres – situated in the English 'heartland' region, the Southwest, East Midlands and East Anglia. Key locations are:

- Aylesbury
- Bedford
- Bristol
- Cambridge
- Cardiff
- High Wycombe
- Ipswich
- Luton
- Milton Keynes
- Northampton
- Norwich
- Oxford
- Peterborough
- Reading
- Southampton
- Swindon

This sample is designed to be manageable in terms of the depth of analysis presented whilst representative of the wider connectivity issues this statement seeks to address. The output is a high-level yet robust assessment of the regional connectivity impact of East West Rail services on major urban centres arcing around London.

An overview of population and Gross Value Added figures for the key locations (represented by Local Authority boundaries) considered in this strategic statement is provided below in figures 4 and 5 respectively:

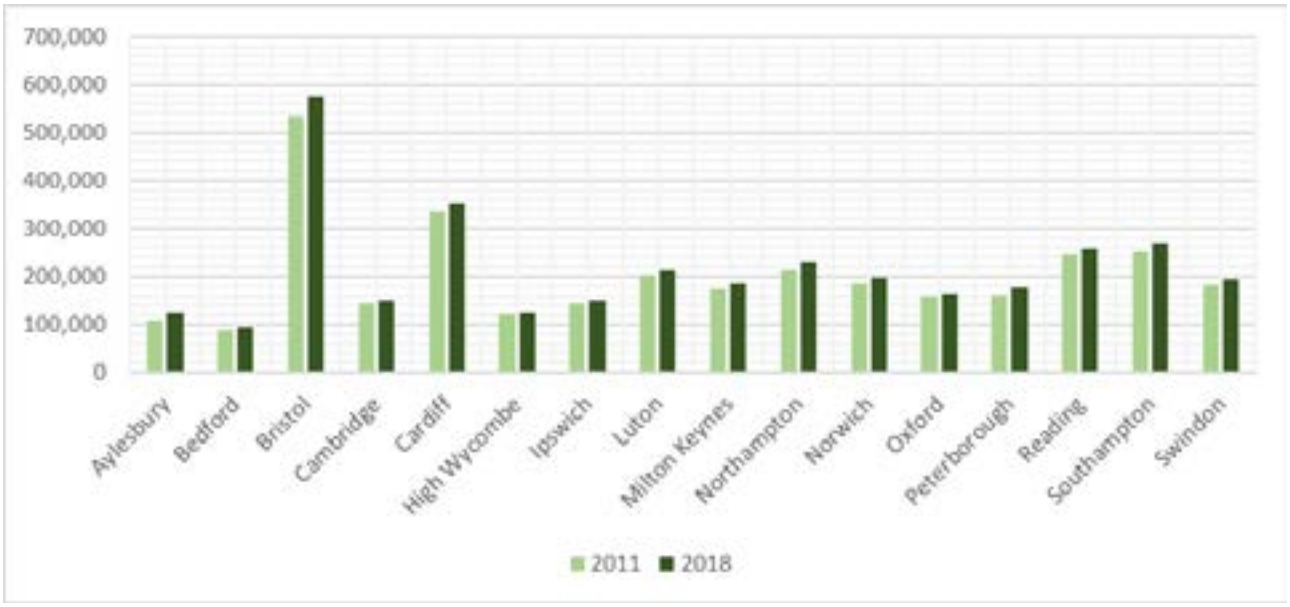


Figure 4: Population estimates for each key location, 2011 and 2018. Data used for each key location is sourced from the Office for National Statistics 'NOMIS' data bank.[12]

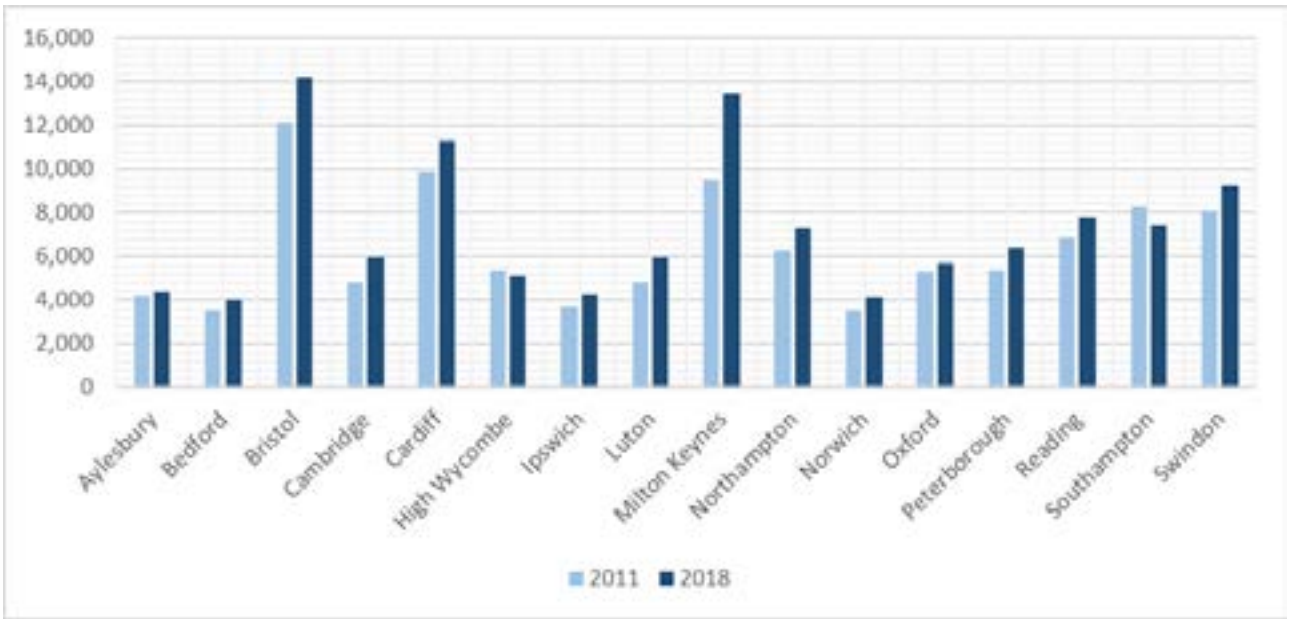


Figure 5: Gross Value Added (£billions) for each key location. Data taken from the Office for National Statistics, 'Regional Gross Value Added by Industry', under the 'CVM pounds' tabular category. [13]

[12] *Office for National Statistics- 'nomis':* https://www.nomisweb.co.uk/query/construct/summary.asp?mode=construct&version=0&dataset=2009

[13] *Office for National Statistics- GVA Regional Gross Value Added by Industry:* https://www.ons.gov.uk/economy/grossvalueaddedgva/datasets/regionalgrossvalueaddedbalancedlocalauthoritiesbynuts1region

In addition to a broad focus on population size and economic value, key locations are also selected on the basis that they all share poor east to west rail connectivity at present and are largely reliant on complex interchange at peripheral locations (namely London) to reach each other. A number of further criteria have been considered in selecting key locations, a combination of which may apply in any one instance:

- Key locations represent areas of major existing economic activity and Gross Value Added for the wider regional and national economy,

- Key locations represent areas with robust local plans for housing growth which should be supported with increased rail connectivity,

- Key locations are heavily populated and likely to experience growth in demand for rail services,

- Key locations offer a collective geographic spread from the Southwest to the East,

- Key locations are important transport hubs where maximising the potential for interchange should be a priority,

- Key locations could be incorporated within a realistic and credible expansion of the East West Rail base specification.

A more detailed explanation for the inclusion of these key locations – based on a brief demographic, economic and transport assessment – is provided in Appendix I.

The current East West Rail base specification will vary in its impact across this geography. Oxford and Cambridge are around 65 miles apart and the proposed East West Rail service specification will link these two cities with two trains an hour. Milton Keynes however, with a higher GVA than Oxford and Cambridge combined, is just 40-45 miles from Reading and Peterborough, 55 miles from Swindon, 80 miles from Southampton and 90 miles from Bristol. All of these locations are as demographically and economically significant as Oxford and Cambridge. Likewise, depending on the infrastructure interventions selected, Bedford will – in the final configuration state - be served by either four or six trains an hour in each direction to Bletchley and Cambridge (with train lengthening an option in the first instance), and two trains an hour direct to Oxford. Aylesbury, which has a demographic and economic significance comparable with Bedford will receive just one East West Rail train an hour to Milton Keynes.

Further analysis is warranted to understand how to best distribute the benefits available from the new infrastructure over the long term. This is considered in more detail within the connectivity analysis throughout section 4.

3.2 Defining EWML Geography: Freight Connections

This statement also considers the nationally important freight hubs that could be served by rail as part of an East West Main Line.

Rail freight moves commodities such as construction materials and intermodal goods, and represents a critical part of the wider economy, offering a cost-effective and low-emission alternative to road haulage over long distances. Providing sufficient capacity for long-distance freight paths is required to sustain wider economic growth and relieve the strategic road network.

Currently rail accounts for 9-12% of freight movement in Britain. The West Coast Main Line is a vitally important artery for freight moving between strategic freight sites and ports in the South, Midlands and the North. Intermodal freight flows are particularly important within

the geography considered in this statement, given the strategic position of the 'Golden Triangle' for freight sites in the Midlands, and the need for effective connections with ports in the East, South and Southeast. At present, significant freight flows use London's orbital lines to access the WCML. The use of alternative routes to accommodate growth of this traffic would leave more capacity available on London's orbital routes for freight traffic from the Essex Thameside facilities (London Gateway, Tilbury and Tilbury 2) and improve direct connectivity by lessening journey times.

Growth in freight usage will be a key determinant in future planning of the rail network, not only due to baseline growth in traffic but in support of modal shift from road to rail given the lack of an available low-emission alternative to heavy goods vehicles. Freight study forecasts, commissioned by Network Rail from MDS Transmodal, indicate that intermodal volumes are expected to increase by 186 % in the period to 2044, under the central forecasting scenario.[14] The transfer of freight movement from road to rail will support the Government's wider decarbonisation agenda – reducing emissions by 60-80 % on average even without electric traction - and allow road transport to be focused on 'last mile' delivery rather than long-distance haulage, particularly salient given the regional importance of intermodal flows at present and in future.

Network Rail's Rail Freight Routing strategy outlined preliminary growth forecasts in February 2020. The high-growth scenario identified the need to accommodate the following on the network by 2043/44:

- A general 72 % growth in freight tonnes, 74 % growth in freight trains, and 90 % growth in tonnes per kilometre,
- An increase from 66 to 119 trains per day from Haven (Felixstowe) and Thames ports,
- An increase from 62 to 84 trains per day from Southampton to the West Midlands and the North.

Significant growth in rail freight will need to be accommodated through corridors in the Southwest, Solent, East and the English 'heartland' region. This freight geography should form part of the scope for any study related to the East West Main Line. Associated outputs should be aimed at providing additional capacity for freight which will help to meet forecasted demand and relieve existing routes (notably via London's orbital lines). Outputs should also be aimed at providing better connectivity for freight in reducing journey times between strategic freight sites and ports, thereby improving economic efficiency and encouraging greater modal shift to rail.

There is a significant challenge to the road haulage industry to provide additional capacity. This is likely to lead to increasing pressure on the rail network to provide capacity for trunk load unit flows and bulk materials. Studies are already underway exploring the opportunity to do this on the A34 corridor from Southampton through Oxford to the East and West Midlands, of which East West Rail infrastructure could provide a routing option and partial solution.

There is also a significant national challenge to decarbonise the transport and rail sectors as part of Britain's environmental obligations. Network Rail has published its Traction Decarbonisation Network Strategy which will provide a programme to remove diesel traction from the network over the longer term. This strategic statement recognises that any proposal for an East West Main Line should conform to the direction set by TDNS[15], and that providing a route for decarbonised freight would further enhance its case on the grounds of long-term environmental sustainability.

[14] *MDS Transmodal (2019) 'Rail freight forecasts: Scenarios for 2033/34 and 2043/44'*
[15] *Network Rail (2020) 'Traction Decarbonisation Network Strategy: Interim Programme Business Case'*

4.0 Connectivity Analysis

Having defined the wider geography into which East West Rail services will be introduced, this statement draws on high-level economic analysis to understand how the East West Rail programme will improve connectivity. It identifies 'gaps' which could be addressed by a more comprehensive rail service offering for both passengers and freight.

The statement uses economic analysis to establish the following:

- An assessment of current rail connectivity between key locations outlined in section 4.2,

- An assessment of rail connectivity between key locations following the introduction of East West Rail configuration state 3,

- A comparison of both states – existing and post-East West Rail - to highlight improvements and gaps, outlined in section 4.3.

The assessment gives a comparative overview and uses Milton Keynes and Bedford as additional case studies to give more detail. Taken together, this high-level analysis then informs the recommendations for an expanded East West Main Line strategic vision in sections 5 and 6.

4.1 Method: Generalised Journey Times

Generalised journey time (GJT) is used within this statement as an effective measure of rail connectivity between given destinations. It is used frequently in transport planning as it takes multiple effects and amalgamates them into one metric. It i s calculated using a combination of average train frequency, in-vehicle time and interchange time between destinations. GJT considers services across the whole day for each origin, destination and ticket type, and the average journey times throughout the day, weighted by a profile of passenger journeys and giving greater weight to the speed and frequency of journey opportunities at peak times. When passengers are required to change trains, it also applies an interchange penalty. These penalties and the service interval penalties are sourced from the Passenger Demand Forecasting Handbook (PDFH) and the penalty increases the longer the total journey is.

Generalised Journey Time = T + S + I where;

T = the total station-to-station journey time (including interchange time),

S = the service interval penalty,

I = the sum of the interchange penalties for any interchanges required.

GJT analysis gives a more accurate basis from which to measure and improve the offer made to rail passengers. In brief, this is achieved by shortening end-to-end journeys, giving passengers trains at the time they want to travel, and reducing the need for interchange; all of which are captured in this single metric.

GJT figures for journeys between key locations using the existing rail network have been generated using the MOIRA1 model based on the component measures identified above wider inputs drawn from the December 2019 timetable. GJT figures for the post-East West Rail scenario have been manually estimated using Passenger Demand Forecasting Handbook 6 methodologies and are modelled by forcing passenger flows between key locations to use East West Rail infrastructure, assuming the East West Rail configuration state 3 train service specification outlined above in table 2.

4.2 Passenger Connectivity using the Existing Rail Network

Table 3 below shows the base generalised journey time figures for each journey pair between the sixteen key locations considered in this report.

Generalised journey times in minutes between locations															
Core East West Rail Stations	Oxford	Bedford	Cambridge	Aylesbury	Milton Keynes	Northampton	Peterborough	Swindon	Reading	Southampton	Bristol	Cardiff	Norwich	Ipswich	Luton
Oxford															
Bedford	234														
Cambridge	284	191													
Aylesbury	142	238	247												
Milton Keynes	161	103	203	224											
Northampton	161	128	236	251	36										
Peterborough	248	193	90	260	187	220									
Swindon	78	234	245	222	216	239	248								
Reading	43	184	197	180	162	184	201	42							
Southampton	120	276	316	282	239	259	291	143	87						
Bristol	135	296	331	287	233	231	294	64	96	143					
Cardiff	172	320	335	317	274	283	325	86	114	195	77				
Norwich	339	297	115	345	299	330	133	342	292	377	404	434			
Ipswich	278	241	121	284	235	266	164	282	228	318	343	374	67		
Luton	210	33	167	216	147	178	175	208	158	245	273	302	279	216	
High Wycombe	74	201	212	78	181	211	218	177	122	211	237	276	306	243	173

Table 3: Base Generalised Journey Times (in minutes) for journey pairings between all sixteen key locations. Figures generated using MOIRA1 based on the December 2019 timetable. Darker cells represent longer generalised journey times, while lighter shades represent shorter.

The data largely evidence the rail transport issues highlighted in Section 2. GJTs between key locations are low where they are connected with direct, high frequency passenger services along an existing main line, or where there is opportunity for minimal interchange. This is demonstrated by the handful of location pairings with GJTs well under an hour. For example, GJT between Luton and Bedford is low (33 minutes) due to the high frequency, fast services operating between them along the Midland Main Line. Generalised journey times between Northampton and Milton Keynes are similarly low at 36 minutes. This is due in part to the shorter physical distance, but also as a consequence of the two direct, off-peak trains per hour with no associated interchange penalty.

Likewise, locations that are physically further apart present relatively low GJTs where they are served by a high frequency of fast services. In such cases GJTs are close to the in-vehicle time as interchange and service displacement penalties are reduced. For example, the fast and frequent services operating along the

[14] *MDS Transmodal (2019) 'Rail freight forecasts: Scenarios for 2033/34 and 2043/44'*

Great Western Main Line result in a GJT of 96 minutes between Bristol and Reading despite a physical distance of nearly 80 miles.

In the main however, GJTs between key locations are lengthy, punctuated by some good main line connections on the existing network. Very poor generalised journey times can be observed between locations which are not physically distant from each other. For example, Peterborough and Northampton have a GJT of 3 hours and 40 minutes while Cambridge and Milton Keynes have a 3 hour and 23 minute GJT despite an approximate distance of 40 miles between locations in both cases. The length of GJTs here is due to a lack of direct rail connection which forces passengers to take a long, circuitous journey via London. The effect of in-vehicle journey times along indirect main lines, physical interchange time and misaligned service frequencies penalise passengers.

Road travel is likely to be a more attractive option for all journeys other than those which involve the longest physical distances where the penalties incurred from interchange and service displacement represent a smaller proportion of the overall GJT. A long-distance journey between for example, Cardiff and Norwich presents a GJT of over 7 hours. While some of this figure can be accounted for by multiple interchanges and associated penalties, a significant portion is simply in-vehicle time reflecting the extensive distance covered. A direct connection between the two locations would improve the GJT and make rail travel more attractive in serving an inter-regional market, but the relative improvement is likely to be smaller than that achieved by the elimination of interchange penalties within shorter distance journeys.

4.3 Comparison of Existing and East West Rail Services

This statement draws on a further set of generalised journey times which are based on the estimated impact of the East West Rail service specification (based on configuration state 3). This permits a direct comparison of GJTs using the existing network as shown Table 3, and a set of generalised journey times where it is assumed that passenger flows will use East West Rail services. Table 4 below shows a direct comparison of these two sets of GJTs – existing and via East West Rail - between all key locations. A difference between the two values can be calculated which shows what impact on generalised journey times East West Rail services will have. A separate table showing only the GJT estimates using East West Rail for each journey pair can be found in Appendix II. As the estimates are generated by forcing flows to use East West Rail services, anomalous results can emerge where direct connections already exist. In such cases figures have been omitted given that no future rail passenger is likely to use East West Rail services for that purpose. For example, use of East West Rail services between Bristol and Swindon significantly raises GJT. Given that future passengers are not likely to ever want to use East West Rail for this journey (relying on GWML services instead), the difference between existing and post-East West Rail becomes irrelevant and so it is omitted from the table.

Only key locations which presently require interchange, and where use of East West Rail infrastructure could offer a feasible alternative route are included in the matrix. This gives a high level overview of where use of East West Rail services as currently remitted will improve on current connectivity for passengers, and where use of existing routes involving interchange (primarily at London) will remain more efficient. The colour scale shows GJTs which are lower than present in deepening green, and those which are higher than present in deepening red.

Generalised journey times in minutes be

Core East West Rail Stations		Oxford		Bedford		Cambridge		Aylesbury		Milton Keynes		Northampton		Peterborough	
Oxford	Existing														
	EWR														
	Difference														
Bedford	Existing	234	77												
	EWR														
	Difference	-157													
Cambridge	Existing	284	111	191	48										
	EWR														
	Difference	-173		-143											
Aylesbury	Existing	142	92	238	105	247	148								
	EWR														
	Difference	-50		-133		-99									
Milton Keynes	Existing	161	61	103	55	203	98	224	69						
	EWR														
	Difference	-100		-48		-105		-155							
Northampton	Existing	161	114	128	99	236	143	251	148	36	79				
	EWR														
	Difference	-47		-29		-93		-103		n/a					
Peterborough	Existing	248	166	193		90	111	260	188	187	124	220	181		
	EWR														
	Difference	-82		-96		21		-72		-63		-39			
Swindon	Existing	78	132	234	217	245	283	222	212	216	194	239	254	248	331
	EWR														
	Difference	n/a		-17		38		-10		-22		15		83	
Reading	Existing	43	74	184	149	197	192	180	137	162	134	184	190	201	255
	EWR														
	Difference	n/a		-35		-5		-43		-28		6		54	
Southampton	Existing	120	149	276	218	316	258	282	230	239	204	259	271	291	338
	EWR														
	Difference	n/a		-58		-58		-52		-35		12		47	
Bristol	Existing	135	195	296	281	331	339	287	288	233	256	231	330	294	414
	EWR														
	Difference	n/a		-15		8		1		23		99		120	
Cardiff	Existing	172	257	320	341	335	394	317	360	274	318	283	409	325	468
	EWR														
	Difference	n/a		21		59		43		44		126		143	
Norwich	Existing	339	264	297	189	115	146	345	301	299	210	330	300	133	252
	EWR														
	Difference	-75		-108		n/a		-44		-89		-30		n/a	
Ipswich	Existing	278	267	241	197	121	154	284	290	235	218	266	305	164	267
	EWR														
	Difference	-11		-44		n/a		6		-17		39		n/a	
Luton	Existing	210	145	33	69	167	110	216	138	147	93	178	162	175	170
	EWR														
	Difference	-65		n/a		-57		-78		-54		-16		-5	
High Wycombe	Existing	74	93	201	134	212	177	78	124	181	114	211	176	218	239
	EWR														
	Difference	n/a		-67		-35		n/a		-67		-35		21	

etween locations																
Swindon		Reading		Southampton		Bristol		Cardiff		Norwich		Ipswich		Luton	
42	200														
n/a															
143	279	87	207												
n/a		n/a													
64	252	96	268	143	350										
n/a		n/a		n/a											
86	324	114	340	195	421	77	336								
n/a		n/a		n/a		n/a									
342	472	292	357	377	430	404	531	434	593						
130		65		53		127		159							
282	461	228	351	318	428	343	522	374	584	67	267				
179		123		110		179		210		n/a					
208	302	158	203	245	289	273	374	302	485	279	270	216	279		
94		45		44		101		183		-9		63			
177	234	122	145	211	240	237	305	276	377	306	340	243	331	173	188
57		23		29		68		101		34		88		15	

Table 4: Table showing a comparison of Generalised Journey Times between key locations when using existing passenger services (left-hand "existing" cells) and when forced to use East West Rail services (right-hand "EWR" cells). The comparison cells are colour coded and show the difference between existing and East West Rail values. Where use of East West Rail would improve generalise journey times figures are shown in green. Where East West Rail would generate longer GJTs than at present figures are shown in red. Flows which are served by existing main line connections or where East West Rail's current final service specification would never present a viable route for passengers (e.g. between Northampton and Milton Keynes) are greyed out as "n/a" cells.

There is clear variation in the potential impact of East West Rail services on connectivity when considering all key locations within the wider East West Main Line geography. In sum, three broad generalisations can be inferred from the above data:

1. East West Rail services will radically improve rail connectivity within a 'core' geography between Oxford, Cambridge, Milton Keynes and Aylesbury (represented by the orange box in tables 3 and 4),

2. East West Rail services will offer marginal or no improvement in GJTs between key locations within that 'core' geography and those further to the east and west,

3. East West Rail services will not offer a viable alternative for longer distance journeys between the extremes of the given geography, where interchange at London remains more efficient.

Table 4, illustrates that the most significant improvement in GJTs is confined largely to the 'core' geography of East West Rail, namely the key locations that will be served by new, direct passenger services which did not exist previously. GJTs between Oxford and Cambridge, and Oxford and Bedford are reduced by over 2 hours. GJT between Oxford and Milton Keynes is reduced by over 1 hour and 30 minutes. The improvement is more modest within that core geography where interchange at Bletchley would be required. GJT between Oxford and Aylesbury is reduced by 50 minutes, and between Milton Keynes and Cambridge by 1 hour and 45 minutes. In both instances the improvement on the existing rail offering is significant but limited slightly by the need to interchange when compared to other, direct East West Rail journey pairings.

For journeys between key locations within this core geography and those external to it, the improvement in generalised journey time is often marginal and in some cases non-existent. For example, GJT between Bedford and Swindon is reduced by just 17 minutes, between Milton Keynes and Ipswich it is reduced by 16 minutes, and between Northampton and Luton it is reduced by 16 minutes. In all instances, travel using the existing route through London termini is far less physically direct, largely circuitous and involves multiple interchanges. Though use of East West Rail services would mean covering less physical distance, it is clear that the need to interchange repeatedly between existing main line services and East West Rail generates compound penalties. To take Bedford and Swindon as an example, a passenger could choose to travel by a circuitous route using high-frequency MML services, change between termini at London, and use high-frequency GWML services. Or they could choose to use the physically more direct East West Rail services, using one of the two trains per hour between Bedford and Oxford, changing to get to Didcot or Reading, and changing again to use a service on the GWML to get to Swindon.

The use of high frequency, fast services via existing main lines effectively cancels out the advantage accrued from the shorter physical distance travelled using East West Rail. This is due to the need to interchange repeatedly and the potential for misalignment between existing and East West Rail services (which are of a lower frequency, particularly west of Bletchley). The result is broadly similar GJTs in a current and post-East West Rail scenario; future passengers are likely to be confronted by a lengthy and complex journey via London, or a lengthy and complex journey via East West Rail. For those journeys where either the origin or destination, or both, lie off the core route, travel by road is likely to remain a more efficient and convenient option given the length of existing journey times and the marginal improvement offered by East West Rail. To return to the previous example, generalised journey time between Bedford and Swindon would – when using East West Rail services – drop from just

[11] *Department for Transport (2017) 'Connecting people: a strategic vision for rail'; Department for Transport (2018) 'Rail Network Enhancements Pipeline: A New Approach for Rail Enhancements'.*

under four hours to just over three and a half hours. Travel by private car would typically take between two and two and a half hours for the same journey. Improvements on present generalised journey times by rail would need to be greater if East West Rail were to offer a competitive alternative to road in this instance.

For some longer distance journey pairings use of East West Rail services generates GJTs that are longer than those drawn from use of the existing network. This is confined primarily to travel between key locations that are within the East West Main Line geographic scope but are beyond the currently remitted scope of the East West Rail programme. For example, GJT between Peterborough and Swindon is 1 hour and 23 minutes longer when routed via East West Rail services than when using existing routes. This is due primarily to the requirement for passengers to interchange multiple times to access East West Rail services at the ECML interchange station, and then to transfer from East West Rail services at Oxford, and a further interchange at Didcot or Reading. Given the long distances involved in this journey, travel via London is more efficient as it involves use of faster and higher frequency services along existing mainlines, and a smaller number of interchanges. The same effect can be observed for travel between key locations in the Southwest – Cardiff, Bristol, Swindon and Reading – and key locations in the East – Norwich and Ipswich. East West Rail does not offer a viable alternative route as it would require multiple interchanges at both ends, and the long distances involved make travel London less circuitous by comparison. Further, the introduction of Elizabeth line ("Crossrail") services in London is likely to improve cross-London connectivity, especially between Liverpool Street and Paddington stations, which will ease the interchange penalty of going via the capital, consequently widening the gap further between use of London's infrastructure and use of East West Rail.

Generalised journey times for these longer-distance markets could be improved by offering direct train services or limiting the requirement for interchange to a single instance. However, given the length of journeys involved between the Southwest and the East, the opportunity to generate a more efficient route when compared to travel via London is limited.

More obvious improvement could be made for journey pairings between key locations that are at the extremes of the geography considered in this statement, and key locations which are within the 'core' East West Rail geography. Travel between these locations is generally as efficient at present via London as it would be using East West Rail services, despite a physically longer and more circuitous journey in the case of the former. There exists a significant opportunity in these cases to reduce generalised journey times and improve passenger connectivity by reducing the number of interchanges. This would make use of East West Rail infrastructure as a significantly more efficient alternative to travel via London, and offer a competitive alternative to road travel between a wider range of major regional urban centres within an expanded geography. The following case studies which consider Milton Keynes and Bedford demonstrate this effect more fully in the subsequent subsections.

4.4 Case Study: Milton Keynes

The relative impact of East West Rail services can be demonstrated in more detail if Milton Keynes is taken as an example. Figure 6 shows GJTs between Milton Keynes and other key locations using the most efficient existing route. Figure 7 shows GJTs between Milton Keynes and other key locations using the most efficient route once East West Rail configuration state 3 services are available.

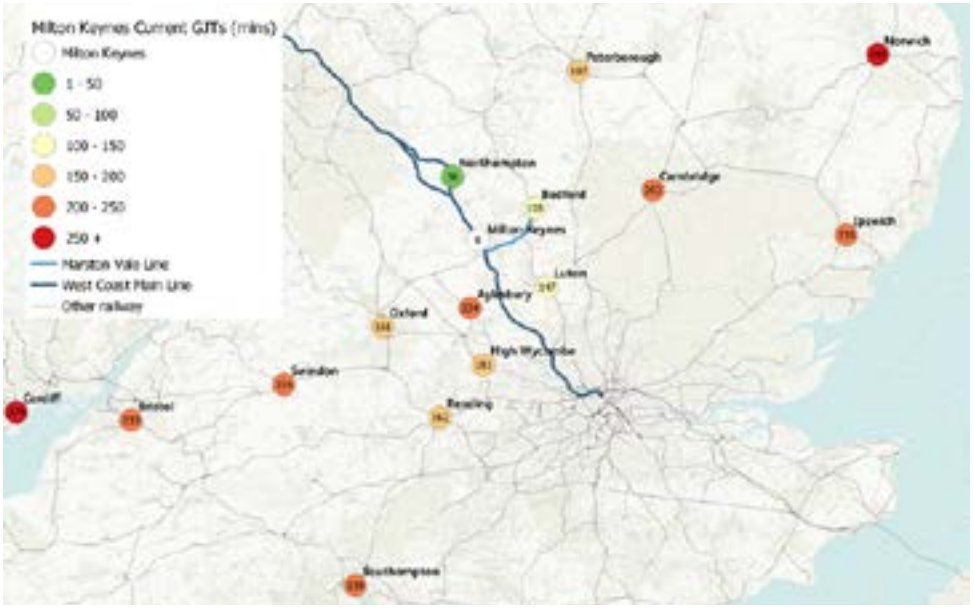


Figure 6: Generalised journey times from Milton Keynes to other key locations using existing rail services, in minutes.

Figure 7: Generalised journey times from Milton Keynes to other key locations using the most efficient route, post-East West Rail.

A comparison of both figures demonstrates the significant impact on passenger connectivity East West Rail services will have within its immediate geography. GJTs between Milton Keynes and Oxford and Aylesbury are improved radically due to the introduction of direct train services which do not exist at present. A similar improvement is observed between Milton Keynes and Bedford and Cambridge where a single interchange at Bletchley will be required. Improvements in connectivity to key locations outside this immediate East West Rail 'core' geography are not as significant, demonstrating in detail the broader picture outlined in section 4.3. For example, GJT between Milton Keynes and Swindon is reduced from 3 hours 36 minutes to 3 hours and 14 minutes while GJT between Milton Keynes and Ipswich is reduced from 3 hours and 55 minutes to 3 hours and 38 minutes. In both instances passengers will have little to choose from when travelling using the existing network or using East West Rail services as both routes involve multiple, time consuming changes.

GJT between Milton Keynes and Bristol, if using East West Rail, will be 23 minutes longer than use of existing main line services and interchange at London, thus the most efficient route for passengers will be to continue to use existing services. Again, this is largely the result of the need for passengers to interchange at both Oxford and then Didcot/Reading to get to Bristol. In all these cases, there is no improvement in GJTs despite an obviously less circuitous route using East West Rail infrastructure, with significantly less physical distance covered.

It will be difficult to prove the case for further enhancements to inter-regional markets within the context of the currently remitted service specification, given that it will not generate a change in travel choice between these locations and therefore will not demonstrate benefits beyond what is offered in today's timetable. Reducing the requirement for interchange by providing more direct connections between major urban centres (including Milton Keynes) would significantly improve outcomes when compared to the present, taking advantage of the shorter physical distance covered when using East West Rail infrastructure to connect on to existing main lines.

Changes in connectivity for rail travel are particularly important when considering competitor modes. Figure 8 below shows a comparison between generalised journey times using the existing rail network, generalised journey times using the rail network following the introduction of East West Rail configuration state 3 services, and indicative peak road travel times (taken from Google Maps).

The dark blue bars in the graph show the generalised journey time between Milton Keynes and all key locations using the most efficient rail route for passengers, post-East West Rail. The light blue is the reduction in GJT attributable to use of East West Rail services when compared to the current timetable. Where there is no light blue bar, the most efficient route remains the currently existing one, for example, between Milton Keynes and Bristol or Cardiff. The grey bars show indicative peak road travel times. The middle column for each key location shows the difference between GJT using the most efficient rail route (post-East West Rail), and travel by road in the peak. In effect green bars represent a journey where rail travel will be more efficient than road travel; red bars represent a journey where rail travel will be less efficient than travel by road.

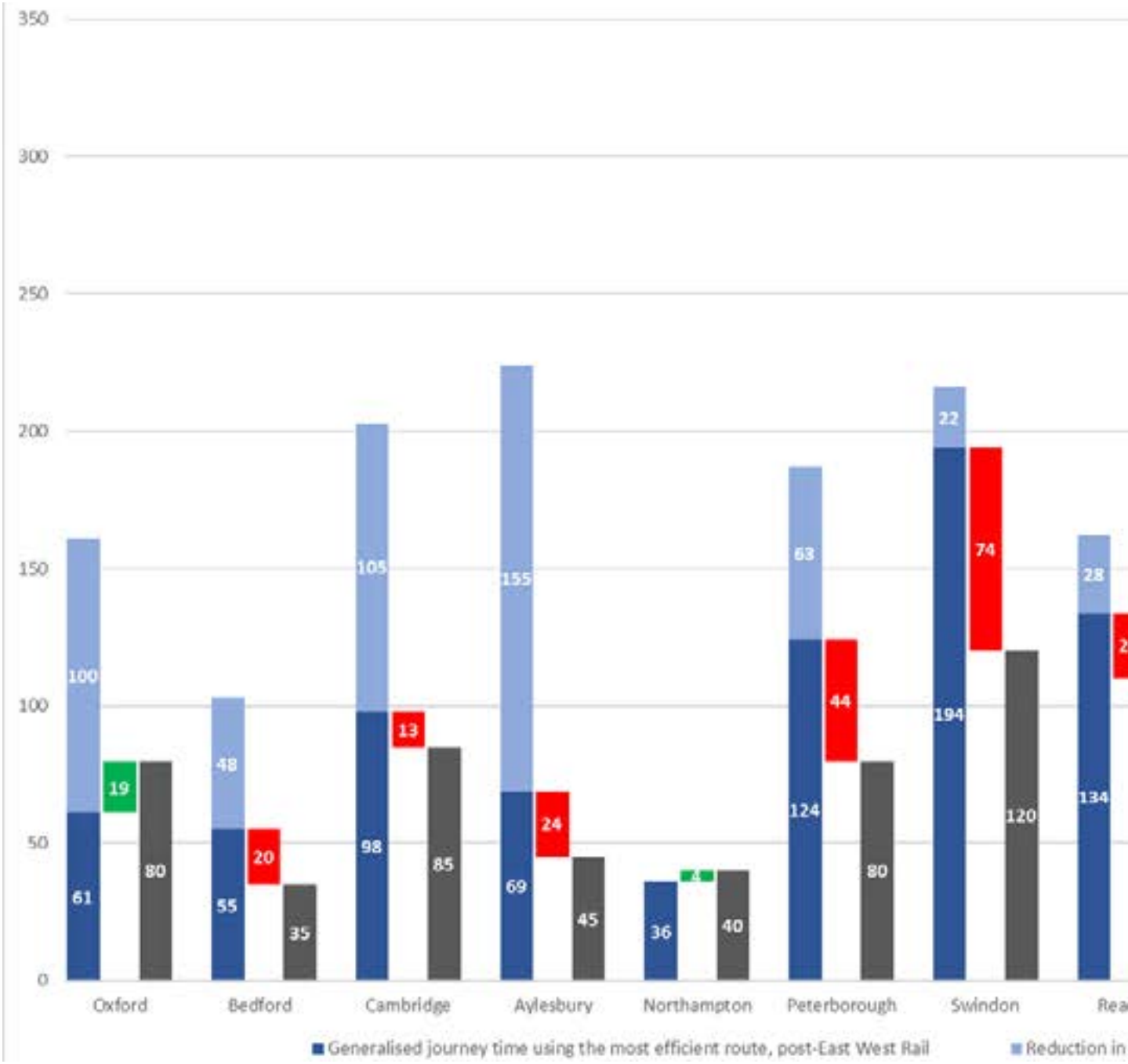
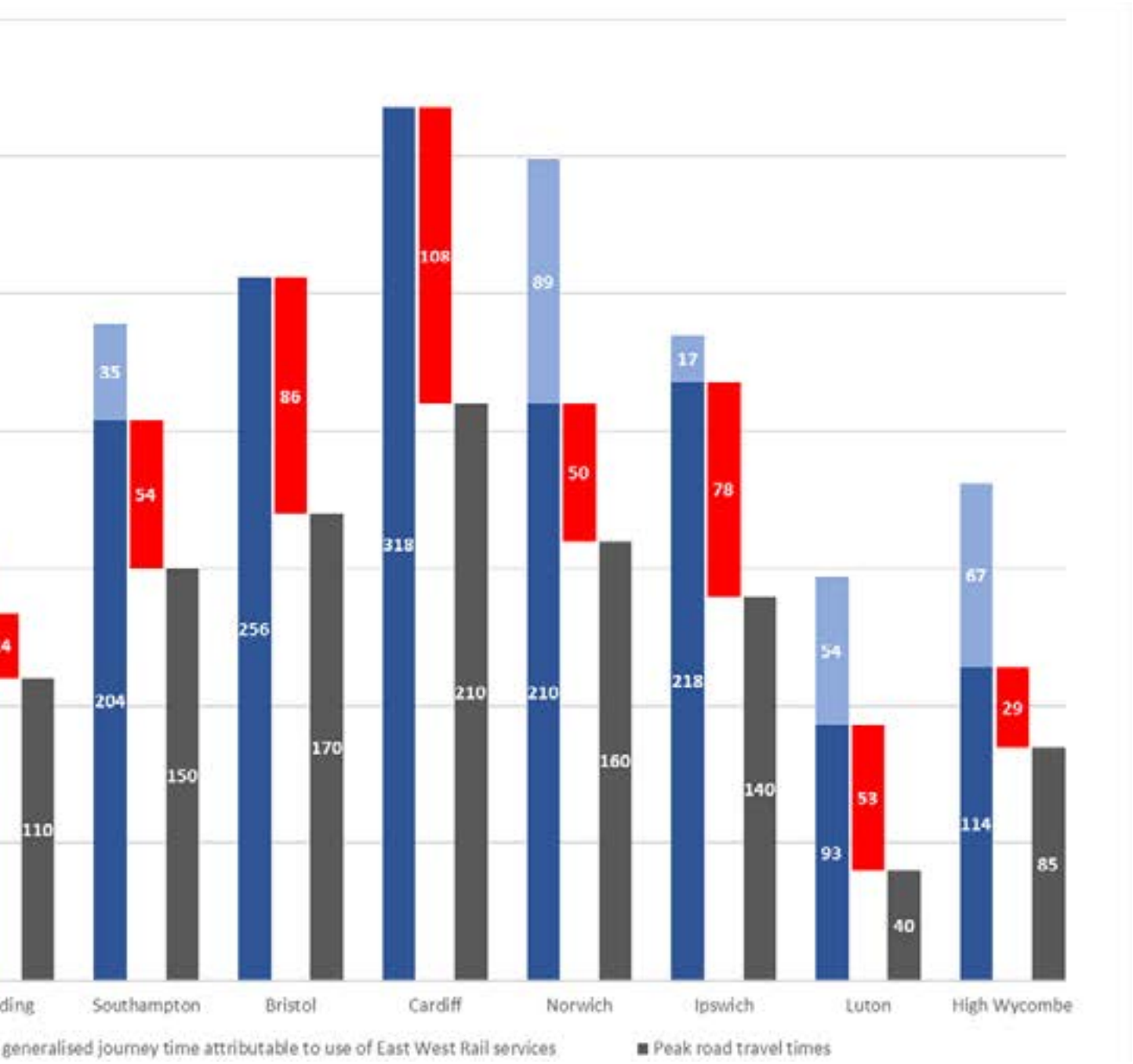


Figure 8: Graph showing; generalised journey times to/from Milton Keynes using the most efficient rail route following the entry in to service of East West Rail CS3 services (dark blue); the reduction in generalised journey time from use of the existing network attributable to use of East West Rail services (light blue); indicative peak road travel times taken from Google Maps (grey); the difference between generalised journey time by rail (post-East West Rail) and travel by road in the peak (green where rail is more efficient, red where rail is less efficient). All values shown in minutes.

The improvement in connectivity within the 'core' East West Rail region is shown in stark relief. Radical reductions in rail GJT translate into a competitive alternative to travel by road. This is true of journeys from Milton Keynes to Oxford where GJT is brought under journey time by road in the peak, and Bedford, Cambridge and Aylesbury where GJTs are very close to journey times by road in the peak.



For key locations beyond the East West Rail 'core' geography reductions in GJT are less significant and in some cases the use of East West Rail services would take longer than the existing route, generally through London. Crucially, this means that for travel between Milton Keynes major urban centres to the south west and east road remains more convenient even at peak hours, and despite the longer distances involved. Key locations such as Cardiff, Bristol, Norwich and Ipswich will still be more quickly reached by car. These markets are those where rail travel would present an advantage if services are direct and frequent enough to make use of higher in-vehicle speed.

The evidence thus clearly suggests that if East West Rail services are confined to the route between Oxford, Aylesbury, Milton Keynes and Cambridge a significant opportunity to reduce GJTs between many key locations will be missed. As a consequence, rail passengers may continue to use existing

routes through London if they travel by rail and no significant improvement on road travel times will be made for those journey pairings. This is a salient point given the importance of encouraging modal shift to rail as part of the government's wider strategy to decarbonise transport and meet its net-zero emissions target for 2050.

4.5 Case Study: Bedford

Bedford is situated roughly in the middle of the planned East West Rail infrastructure and thus gives a good insight into the effect East West Rail services will have on connecting key locations in the 'core' geography and those in the wider region. Figure 9 shows GJTs between Bedford and other key locations using the most efficient existing route. Figure 10 shows GJTs between Bedford and other key locations using the most efficient route once East West Rail configuration state 3 services are available:

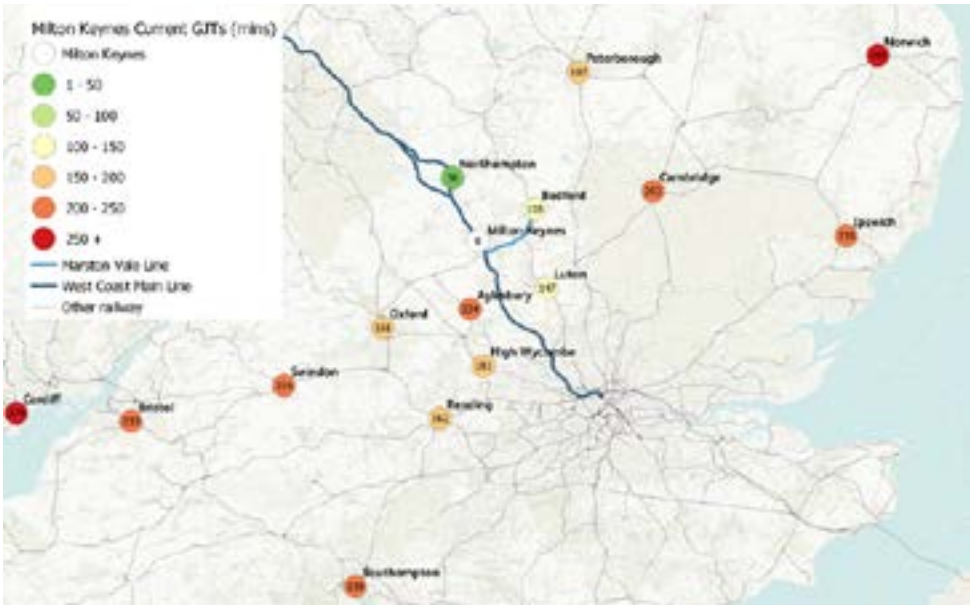


Figure 9: Generalised journey times between Bedford and other key locations using the existing rail network.

Figure 10: Generalised journey times between Bedford and key locations using the most efficient route, post-East West Rail.

There are significant reductions in GJTs within the 'core' East West Rail geography where new direct connections are introduced. GJT between Bedford and Oxford is reduced from 4 hours to 1 hour and 17 minutes, while GJT between Bedford and Cambridge is reduced from 3 hours and 11 minutes to 48 minutes. There is also significant improvement in generalised journey times between Bedford and Milton Keynes, and between Bedford and Aylesbury. Improvements within this core geography are due to the introduction of new direct East West Rail services between Bedford and other key locations, or the possibility of travelling by rail with a single interchange at Bletchley.

Some reduction in GJT is observed between Bedford and locations which will not be served directly by East West Rail services. Both Northampton and High Wycombe will be easier to reach via East West Rail than using the existing network. This improvement is less marked however, given the requirement for an additional interchange on to existing lines at Milton Keynes and Aylesbury respectively. A more significant reduction in GJT between Bedford and these major regional urban centres could be achieved by providing a train service that requires passengers to interchange once or, ideally, not at all.

To the east, the East West Rail central section will enable direct and frequent trains to Cambridge, significantly reducing GJT. Improvement in GJTs between Bedford and Norwich, and Bedford and Ipswich will be less pronounced with both remaining over 3 hours. While this is due in part to being further distant, the requirement to change at Cambridge imposes a penalty on passengers, diluting the improvement in connectivity. GJT between Bedford and Ipswich would be reduced from 4 hours to 3 hours and 17 minutes. While this is a significant face value improvement, it could be much more significant given the far more circuitous route via London at present.

For key locations further west beyond Oxford, reductions in GJTs are negligible and in some cases use of East West Rail services would take longer meaning existing routes would remain the most efficient for passengers. The GJT between Bedford and Reading is reduced by around 30 minutes but will remain around 2 and half hours in total. This could be reduced significantly with a direct connection which circumvents the requirement to change at Oxford. Likewise, GJT between Bedford and Swindon is reduced by 17 minutes, and between Bedford and Bristol it is reduced by 15 minutes. GJT between Bedford and Cardiff is 21 minutes longer than at present. Again, these are poor outcomes given that use of existing routes to these destinations is largely circuitous and passengers using East West Rail services would cover far less physical distance by comparison. The requirement for interchange at both Oxford and Didcot compounds the penalties associated with changing between service groups and the potential for misalignment. Again, this could be addressed by providing a direct connection extended on to the existing main line, or reducing the requirement for interchange to a single change at Didcot.

Figure 11 below shows a comparison between generalised journey times using the existing rail network, generalised journey times using the rail network following the introduction of East West Rail configuration state 3 services, and indicative peak road travel times (taken from Google Maps).

The dark blue bars in the graph show the generalised journey time between Bedford and all key locations using the most efficient route for passengers, post-East West Rail. The light blue is the reduction in GJT from use of the existing network attributable to use of East West Rail services when compared to the current timetable. Where there is no light blue bar, the most efficient route remains the currently existing route, for example, between Milton Keynes and Bristol or Cardiff. The grey bars show indicative peak road travel times. The middle column for each key location shows the difference between GJT using the most efficient rail route (post-East West Rail), and travel by road in the peak. In effect green bars represent a journey where rail travel will be more efficient than road travel; red bars represent a journey where rail travel will be less efficient that travel by road.

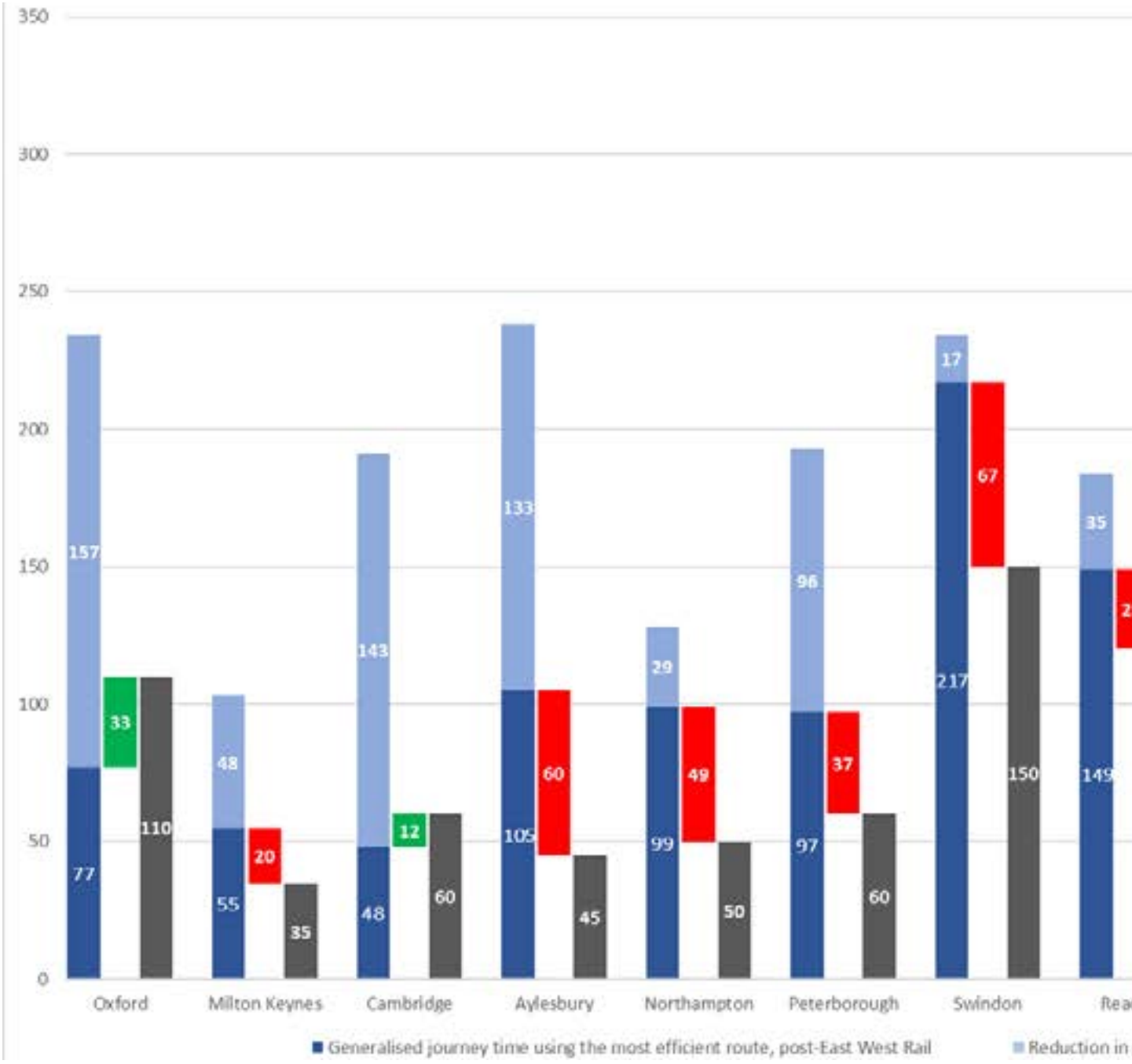
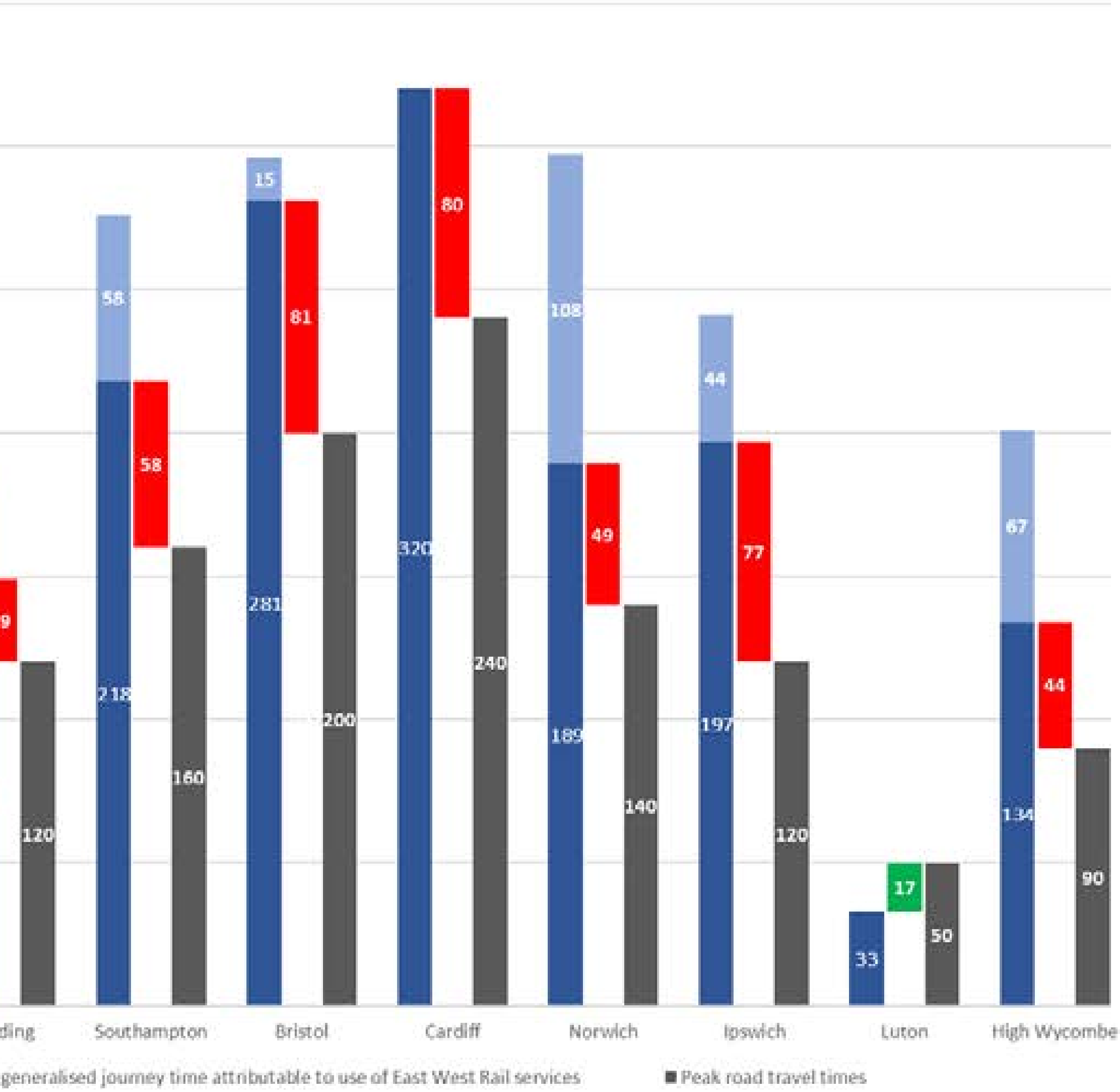


Figure 11: Graph showing; generalised journey times to/from Bedford using the most efficient rail route following the entry in to service of East West Rail CS3 services (dark blue); the reduction in generalised journey time from use of the existing network attributable to use of East West Rail services (light blue); indicative peak road travel times taken from Google Maps (grey); the difference between generalised journey time by rail (post-East West Rail) and travel by road in the peak (green where rail is more efficient, red where rail is less efficient). All values shown in minutes.



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ding
Southampton
Bristol
Cardiff
Norwich
Ipswich
Luton
High Wycombe
generalised journey time attributable to use of East West Rail services
Peak road travel times

Figure 11 shows the extent of improvements in GJTs between Bedford and key locations within the immediate East West Rail 'core' geography. Journey times to Luton are particularly good given the high frequency of services operating along the Midland Main Line – this will not be affected by East West Rail.

GJTs to both Oxford and Cambridge will improve radically, bringing them below indicative road travel times in the peak. Likewise, there is significant improvement in GJTs to Milton Keynes and Aylesbury with figures similar to those for road travel. The introduction of East West Rail services where a direct connection is not available at present will make rail travel more competitive with road transport and is likely to encourage modal shift.

When the geographic scope is expanded the relative improvement is less pronounced. Peak road travel times to key locations external to the 'core' East West Rail geography – notably Swindon, Bristol, Cardiff, and Ipswich – present GJTs by rail which remain significantly longer than travel by road. This is despite the fact that journeys over longer distances should play into the advantage rail has in serving these markets due to the shorter in-vehicle time. Given the marginal improvement in connectivity it is unlikely that a significant modal shift will be encouraged for these journey pairings where there is little for passengers to choose from between East West Rail and existing service groups. This is particularly important given the need to encourage modal shift from road to rail as part of the wider decarbonisation agenda.

4.6 Freight Connectivity

The East West Rail connection on to the West Coast Main Line at Bletchley could accommodate an uplift in freight moving by rail from Southampton, Bristol and South Wales to key strategic freight sites in the 'Golden Triangle' of logistics (Northampton, the West Midlands and East Midlands), sites further North, and the rerouting of existing flows that currently run via London. Within the East West Rail base specification, there is assumed to be a path for one freight train per hour in each direction over the East West Rail infrastructure. Additional freight capacity will be limited given the lack of a direct connection on to the West Coast Main Line northbound for services approaching from the east within the East West Rail base specification. This means that freight originating from locations in the east, notably the port of Felixstowe, will need to use existing routes to reach destinations in the Midlands and the North. A lack of any connections with the East Coast Main Line will provide similar challenges for freight from the south and south-west to reach the north-east.

Accommodation of forecasted freight growth is likely to require additional use of London's orbital routes which presently have capacity issues, or the realisation of the Felixstowe to Midlands and the North programme of planned interventions which will offer an additional route to freight sites in the East Midlands and North East. The limited connections available between East West Rail infrastructure and existing main lines for freight risks missing an opportunity to relieve pressure on existing routes, and create additional capability and capacity available to accommodate forecasted demand.

5.0 East West Main Line: Strategic Vision

The analysis above quantifies the significant impact the current base East West Rail specification will have on passenger connectivity whilst also noting significant gaps within the expanded East West Main Line geography. These gaps should be addressed by assessing the value and cost of providing enhanced onward connectivity, recognising decisions made now will have a significant impact on the future ability to expand operations on the new infrastructure. This could significantly increase the benefits arising from the investment made in the East West Rail programme to date by addressing the constraints outlined in section 2.4 and placing the new infrastructure as the central core of a route that is comprehensively integrated into the national network.

These additions could be incorporated in to a wider programme as one overarching improvement, or could be instigated in an incremental manner; the important element is that investigation into the possible provision of changed infrastructure is done now so that where appropriate, nothing is done now that precludes options remaining open in the future. Capacity on the wider network is already extremely limited and increasing the service scope will require enhanced infrastructure, not just at the periphery of East West Rail but in the form of infrastructure change on the interfacing routes. There may be opportunities to incorporate these with other service enhancements or renewals and as such these changes, and their impacts, need to be investigated as a priority.

Given the points raised above, the proposal for an East West Main Line is based on an expanded scope – subject to further investigation and the protection or improvement of capacity on the wider network - which suggests a long term vision based on the following principles:

a) Passenger services which cover a wider geographic area than currently remitted and thereby remove the requirement for passengers to interchange, either entirely or by bringing more locations within reach of a single interchange,

b) Ensuring that infrastructure changes made as part of the East West Rail programme do not preclude the service of additional locations which may provide an improved service for passengers and freight users over the long-term,

c) An appropriate service frequency and pattern which best realises reductions in Generalised Journey Times and distributes that reduction over a wider geographic area,

d) Ensuring that infrastructure changes made as part of the East West Rail programme do not preclude exploration of new national routing options for freight that could accommodate anticipated growth, serve existing or new distribution hubs, and improve freight access from major ports to the rest of the nation,

e) Provision of a strategic route for service re-routing, planned diversions, and operational flexibility in times of perturbation,

f) Electrification of the route which offers better rolling stock performance, aligns fully with the Traction Decarbonisation Network Strategy (TDNS), and more fully contributes to net reduction in carbon emissions through reduced use of diesel traction, the promotion of modal shift, especially in the freight sector,

g) Provision for European Traffic Control System (ETCS) digital signalling which enhances future capacity and is integrated with the intended national roll-out.

A proposed route map for an East West Main Line is shown below in figure 12 with possible service extensions targeted to significantly reduce GJTs between all key locations. As outlined above, an appropriate service pattern along with direct extensions would radically improve connectivity between key locations, though specific calling patterns and timings would require further analysis work as part of the development of a business case, and a detailed understanding of the effects on capacity and performance and the mitigations or interventions required.

Figure 12: An East West Main Line route map showing expanded service scope sections (in orange) which should form the basis of further investigation based on the connectivity analysis considered in section 4.

An East West Main Line could be oriented around 'core' stopping services which serve all stations between Oxford, High Wycombe, Aylesbury, Milton Keynes and Cambridge, and fast services which operate using the infrastructure as a core section between Bristol, Southampton and Cardiff, and Northampton, Peterborough, Norwich and Ipswich, with Milton Keynes acting as a hub for both stopping and fast services. A secondary raft of extended services between Oxford and Aylesbury, and Northampton and Luton could be explored to improve connectivity between those key hubs and, in the case of the latter, Luton Airport.

More detailed proposals for a wider service pattern should be made on the basis of subsequent development work, noting here only that the above would better distribute reductions in generalised journey times based on the high-level economic analysis provided.

This vision for the East West Main Line should be considered on the basis that it more comprehensively achieves the strategic aims for rail set by government,[16] and pursued by the wider industry and Network Rail. They are considered in this chapter.

[16] Department for Transport (2017) 'Connecting people: a strategic vision for rail'; Department for Transport (2018) 'Rail Network Enhancements Pipeline: A New Approach for Rail Enhancements'

5.1 Increased Connectivity

The East West Main Line comprehensively targets an improvement in Generalised Journey Times within a wider geography, and could be based on the following:

- The requirement for a single or no interchange between key locations through the extension of direct services using a mixture of the new infrastructure and existing main lines,

- Provision of an increased frequency of passenger services which allows passengers to more easily get a train when they want one particularly along the core section,

- Provision of a mixed pattern of fast and stopping services which more evenly distributes reductions in generalised journey times across a broader geography,

- More effective integration of major urban centres with Milton Keynes acting specifically as a central hub.

In addition, an East West Main Line could also offer significantly improved connectivity for freight services by utilising additional connections between East West Rail infrastructure and existing main lines, particularly important for cross-country flows such as those between the port of Felixstowe and the Midlands/North.

5.2 Encouraging Modal Shift

The East West Main Line proposal is targeted at making rail journeys, particularly over longer-distances between key locations, directly competitive with the existing road network along the key corridors outlined below in fig 13:

Figure 13: Map showing road corridors from which extended service scope sections may generate additional modal shift from road to rail.

There is a significant opportunity to encourage a shift from road to rail by providing the following as part of an East West Main Line:

- Direct and more frequent long-distance passenger services bringing generalised journey times by rail under the equivalent by road,

- Significant reduction in the requirement for interchange making rail travel less onerous and therefore more attractive for existing and new passengers,

- An increased quantum of services across all sections which more effectively provides trains for passengers when they want them,

- Significantly enhanced connectivity for freight which offers new, economically viable routes for freight between strategic sites across the country.

The East West Main Line vision is targeted at comprehensively encouraging modal shift within markets that otherwise would remain more efficiently served by road travel given the currently-remitted East West Rail programme specification.

5.3 Integration with the Existing Network

The new East West Rail infrastructure offers the potential for new journeys and additional rail capacity. The constraints that emerge as part of the East West Rail base specification at Oxford, Cambridge, Milton Keynes and other areas of the existing network should be addressed comprehensively in way that generates further capacity for rail passengers and freight, and which helps to accommodate future demand as part of a whole-system view. The East West Main Line vision as such is based on a whole-system approach, which helps relieve bottle necks and points of constraint elsewhere on the national network.

Specifically, the introduction of longer-distance, direct services which use East West Rail infrastructure as a core section will provide an alternative route for passengers the effect of which will be to relieve existing routes (particularly via London) whilst opening up new markets to rail travel. Likewise, additional paths and connections for freight services will help to relieve existing infrastructure, notably the North and West London Lines which are heavily used at present for freight joining the WCML from strategic locations in the East.

Integration with the existing network would be achieved by maintaining or improving current levels of performance and determining that appropriate capacity is available for extended services or diversions. Further development work would need to be based on options which achieve benefits through greater whole-system integration, but protect capacity and performance throughout.

5.4 Decarbonisation

The East West Main Line proposal would contribute to the government's decarbonisation strategy for transport by encouraging a modal shift from road to rail, to reduce the more intense emissions made by road vehicles per kilometre (notably Heavy Goods Vehicles). However, it is crucial that the long-term vision for an East West Main Line is also based on use of non-carbon emitting rolling stock thereby maximising the potential contribution to emissions targets.

Electrification would offer rolling stock performance benefits alongside better alignment with Network Rail's ongoing Traction Decarbonisation Network Strategy in making sure that the new infrastructure does not form a 'diesel island' within the wider network.[17] Further infill electrification projects would be required on the wider network to achieve fully electrified East West Main Line routes and should be factored into a long-term strategy which places East West Rail infrastructure as a significant core section of a decarbonised network.

[17] *Network Rail (2020) 'Traction Decarbonisation Network Strategy: Interim Programme Business Case'*

6.0 Network Rail's Strategic Position on Interfacing Areas

To move toward an East West Main Line vision it is very likely that additional infrastructure is required to accommodate an enhanced service beyond the interfacing connections. The benefits and costs of major interventions should be subject to the required process for establishing a business case.

It will be critical that Network Rail and the wider industry address the interfaces between East West Rail infrastructure and existing main lines. This should be done in a way that makes interventions fit for future use and does not preclude longer-term aspirations to improve connectivity as part of a wider system. As such, the following subsections detail Network Rail's strategic position at key areas of interface within the East West Rail programme, considering the constraints introduced as part of the currently-remitted scope and what should be explored to address them with a long-term view in mind.

6.1 Oxford/Didcot Area

East West Rail has a major role to play in improving connectivity in Oxfordshire, and across the key Oxford to Cambridge Arc. Network Rail has worked extensively with EWRCo to date, including as partners in the Oxfordshire Rail Corridor Study,[18] acknowledging that the service specification promoted by EWRCo will bring significant benefits to Oxfordshire. However, the benefits generated by Configuration State 2 services specifically could be substantially greater if the principles in this statement were adopted. East West Rail services cannot be introduced in a way that compromises either performance in the corridor or other identified service enhancements and as such alternative destinations for East West Rail services beyond Oxford may be required.

The scheme known as 'Oxford Corridor Capacity Improvement Phase 2' is underway to improve capacity and journey times for both passenger and freight services along the Didcot – Banbury corridor. The scheme was deferred from Control Period 5 for delivery in Control Period 6. Key elements are shown in Table 5.

[18] *Network Rail (2018) 'Oxfordshire Rail Corridor Study'*

Phase 2 Interventions	Strategic Impact
Level crossing closures north of Oxford	• Provide 2tph additional freight paths • Capacity for additional Birmingham to Oxford passenger services • Increased maintenance access and safety improvement
High speed crossovers at Oxford North junction	• Support East West Rail Configuration State 1 service provision to Oxford (2tph) • Support freight services toward Bicester (1tph)
Oxford station works, western entrance, and track works	• New down-side twin-face platform • Western entrance from Roger Dudman Way • Capacity for East West Rail Configuration State 1, other services and overall Oxford Corridor requirements • More efficient turnback facilities for terminating services
Botley Road bridge	• New span to accommodate additional west side island platform • Passive provision for eastern span to support future additional services

Table 5: Summary of Oxford Corridor Capacity Improvement Phase 2 outputs.

There is a key interface at Oxford station with East West Rail configuration state 1 and configuration state 2 services terminating at Oxford, with some concerns about timely access to and from platforms. East West Rail is considering what interventions might be effective to resolve this for configuration state 1. During the Design stage of Oxford Phase 2, due consideration will be given to what passive provision could be included to assist East West Rail services should additional interventions be identified. However, Oxford Phase 2 scope is not expected to change, and funding for any additional interventions or other solution would need to be funded by East West Rail or separately. Delivery of these additional interventions might be required for East West Rail configuration state 2 to support the current EIS date of 2027
From 2028, the Oxfordshire Rail Corridor Study recommends a suite of new services to address rail connectivity deficiencies in Oxfordshire that constrain growth. In particular these include connections across Oxford, especially between Bicester Village and Didcot Parkway, and between Hanborough and Didcot Parkway; all recognised key growth hubs for the area.

The optimum system solution for East West Rail configuration state 2 services is likely to involve running beyond Oxford to address regional and inter-regional connectivity requirements and at the same time reduce the

network capacity pressure around Oxford. This would preclude other new services or require further, substantial interventions. To that end, the Oxfordshire Rail Corridor Study identifies an integrated vision for aligning East West Rail services with those delivered by the Birmingham Airport Connectivity, Solihull Corridor Capacity, and North Cotswolds Line Transformation programmes – which have submitted business cases to RNEP – and the Cowley Branch Line aspirations.

Without the Oxfordshire Rail Corridor Study specification and suite of interventions implemented, delivery of the above services will prove mutually exclusive; it remains essential that the programme and connectivity benefits delivered by East West Rail also permit complementary aspirations to be realised. Accordingly, a programme of investment across Oxfordshire's rail system – Oxfordshire Connect – is being developed to coordinate these strategically-vital requirements, drawn from the Oxfordshire Rail Corridor Study. This includes the introduction of East West Rail services and considers potential alternative destinations for configuration state 2 beyond Oxford station to align with the connectivity requirements across the region to Didcot, and the reintroduction of passenger services to Cowley, whilst maintaining the wider ambitions of the Oxford-Cambridge Arc. This service arrangement would address the local and regional findings of the Oxfordshire Rail Corridor Study and the ongoing Oxfordshire Connect programme, whilst contributing to the broader East West Main Line principles outlined in this statement by improving rail connectivity within a wider geography.

The Oxfordshire Connect programme will identify the best system solution to maximise the passenger and economic benefits of the railway in Oxfordshire with an SOBC intended for 2021, taking into account a slight misalignment in timeframes between East West Rail configuration state 2 in 2027 and the specification and programme of Oxfordshire Connect in 2028. The development of electrification between Didcot and Hanborough, including Cowley - with options for extension to Banbury - is also underway as part of this programme. This will be considered alongside the electrification of the East West Rail western section, which could release a range of other industry benefits in combination. The Oxfordshire Connect programme will work closely with all stakeholders including EWRCo - taking forward the principles outlined in this East West Main Line Strategic Statement - and must inform the configuration of East West Rail services.

6.2 Aylesbury/Claydon

Aylesbury is a garden town in Buckinghamshire with a planned growth in excess of 16,000 homes by 2033, and that is due to benefit from East West Rail connectivity with one train per hour between Aylesbury and Milton Keynes Central. The addition of East West Rail services to Aylesbury will be the first step in offering better connectivity to the north and east; all links which are not present today. Currently, Aylesbury is served solely by rail services linking the town to London Marylebone via Princes Risborough (1 tph) and Amersham (2 tph). Most of these services start and terminate at Aylesbury, with one tph extending onto Aylesbury Vale Parkway (AVP).

Both Aylesbury and Princes Risborough have been identified for, and are currently experiencing, extensive housing growth which needs to be reflected and accommodated by the rail service provisions. For example, AVP alone would benefit from; the extension of the existing Chiltern Railway Aylesbury terminating services onwards to the station by providing a better service frequency, helping to alleviate crowding issues on existing peak services, and improving the service options by opening up North Buckinghamshire to the rail market. The West Midlands and Chiltern (WM&C)

Route Study has outlined aspirations for two tph operating between Milton Keynes and Old Oak Common (via Aylesbury and Princes Risborough), which could in part be formed for an extension of the proposed East West Rail service. This would improve the connectivity and economic opportunities to the people and businesses across Buckinghamshire to neighbouring counties and beyond.

There are multiple constraints that are currently preventing an uplift in, and limiting the extension of services beyond Aylesbury. Most notably, the proposed single line between Aylesbury and Claydon Junction which connects the town to the core East West Main Line and limits the service to 1 tph. The doubling of this track is essential to provide anything above 1 tph north of Aylesbury.

A more frequent service to wider destinations, in addition to the improved connectivity to the Chiltern Main Line and Old Oak Common station, enables an opportunity to deliver significant benefits to a wide range of locations beyond Aylesbury. Additionally, these improvements in connectivity and frequency would promote a significant modal shift from private road transport, which currently dominates the county's travel, to rail. Furthermore, freight will continue to be a key user of capacity in the Aylesbury area. The infrastructure needs to equally accommodate the nature of the dynamic rail freight market and maintenance requirements.

6.3 Bletchley/West Coast Main Line

Network Rail is committed to achieving Control Period 6 and Control Period 7 industry performance targets on the West Coast Main Line, ensuring that interface with East West Rail at Bletchley can provide efficient options for interchange without compromising main line operation. At present, modelling has shown that planned East West Rail services for configuration states 1 and 2.5 cannot be accommodated on the West Coast Main Line between Bletchley and Milton Keynes without a restructure of the main line timetable, the capacity released by HS2, or major additional infrastructure.

Network Rail is committed to finding a solution which permits East West Rail services to use the West Coast Main Line and serve Milton Keynes, recognising the major connectivity improvements that would be made available for passengers through the introduction of CS1 and 2.5 services. Ahead of High Speed 2, this solution may involve timetable change if it is proven feasible, or the interim termination of services at Bletchley. It should be recognised that the latter is not a desirable long-term outcome, and that over the long term Milton Keynes should be the primary central 'hub' for east to west services on the grounds that Milton Keynes is a nationally significant and rapidly growing market, and that the need to align service groups to facilitate interchange at Bletchley represents a sub-optimal use of the capacity released by HS2.

As such, decisions regarding current East West Rail scope should be made in light of the East West Main Line principles outlined in this statement, recognising:

- The importance of Milton Keynes as a central 'hub' for east to west services, and the need for direct connections that do not require interchange at Bletchley,

- The potential for improved connectivity by extending services beyond Milton Keynes to other key markets, namely Northampton,

- The potential use of capacity released by HS2 to introduce additional and/or extended east to west services on West Coast Main line over the longer term,

- The potential for additional passenger and freight routes that could be made available

by an additional east to north connection at Bletchley, further improving connectivity.

Due consideration should be given to the significant benefits for passengers and freight users in providing high capacity connections between East West Rail infrastructure and the West Coast Main Line. In the short term, immediate consideration should be given to the provision of an east to north connection at Bletchley that would facilitate an additional strategic route for freight services between Felixstowe, the Midlands 'Golden Triangle', and the north following the introduction of the full East West Rail route including Central Section. This would also provide a future option for direct passenger services approaching the WCML from the east; those currently planned to terminate at Bletchley within configuration states 3 and 3.5.

Over the long term, the potential for capacity released by HS2 to accommodate services approach from both the east and west should be considered given the significant economic benefit associated within connecting both Milton Keynes and Northampton as part of an East West Main Line vision.

Consideration should also be given to options which could address capacity constraints on the West Coast Main Line beyond HS2, or if the capacity released by HS2 may be more efficiently used by other service groups. High capacity connections at Bletchley should not preclude further major investments on the existing main line which may comprehensively realise the benefits associated with an increased quantum of additional services. Additional track and infrastructure north of Bletchley could be considered to provide additional capacity, effective segregation of service groups, and the potential for a greatly expanded quantum of passenger and freight services over the very long term.

All options, both short and long term, would need to be subject to feasibility, development work, and the generation of a business case.

6.4 Marston Vale Line

Network Rail recognises that it is not possible to realise the required journey time improvements needed to encourage modal shift over the proposed East West Main Line without a rationalisation of the number of station stops on the Marston Vale Line. As such Network Rail would consider station rationalisation to reduce East West Rail journey times done in consultation with local stakeholders, and would recommend that all remaining stations on the Marston Vale Line are served by no fewer than two trains per hour in either direction in the final configuration state.

6.5 Bedford/Midland Main Line

The Midland Main Line through Bedford is a key corridor linking South Yorkshire and the East Midlands with London. Network Rail is currently working with EWRCo to identify options which support the preferred routing of the line through Bedford whilst protecting train performance and strategic aspirations on the MML. The MML is formally declared as congested infrastructure, and the key priority for Network Rail on it is protecting and improving the performance of the existing network in line with industry targets, whilst facilitating improved passenger interchange with East West Rail. As such, it is anticipated that an industry acceptable East West Rail scope at Bedford will provide segregated lines to the east of the station diverging from the MML to the north, and will have a nil or net positive impact on the performance and capacity of the existing MML. This is likely to require segregating East West Rail trains from existing services during normal operations by avoiding sharing track. The principle is especially important because additional pressure on capacity is expected over the coming years for Bedford; growth in freight services is forecast and multiple parties

have strategic aspirations to run additional passenger services via the MML.

Further, the Bedford area has been identified by the industry as requiring additional depots and stabling provision over the coming decades. It is therefore crucial that the industry works as one to plan for the future of the area, and Network Rail plans to produce a holistic strategic plan which presents choices to deliver growth at Bedford based upon these principles.

The scope of the post- East West Rail layout should be based on MML slow and fast lines trains calling at Bedford as per the planned future timetable. Beyond this, opportunities should be explored which further improve connectivity by moving toward the East West Main Line principles as set out in this document. Whilst segregation of MML and East West Rail flows during normal operation is required to protect performance, the feasibility of a connection between the new lines and the MML slow lines to the north of Bedford should be explored during development on the basis that it would:

- Improve operational flexibility,

- Retain the potential for future direct connectivity between locations served by East West Rail and those on the MML, through service substitutions or additional trains, with further required to make sure that available capacity is provided on the MML and that the performance principles set out above are not compromised.

6.6 East Coast Main Line

The key priority for Network Rail on the ECML is protecting and improving the performance of the existing network in line with industry targets, whilst facilitating improved passenger interchange with East West Rail at a new ECML interchange station. As such it is anticipated that industry acceptable East West Rail scope at a new ECML interchange station will achieve this through the creation of new segregated East West Rail lines which do not impact operations or performance on the ECML.

It is unlikely that ECML fast-line services could call at any new station without unacceptable detriment to journey times or capacity. Assessment of stopping other trains must mitigate any impacts of the additional call on, amongst other factors, performance, ECML journey times, timetable constraints and rolling stock, and work with the industry to make sure connectivity benefits are deliverable. Achieving this may necessitate additional interventions being delivered on the ECML to resolve any increase in journey time as well as protect train performance. Any proposed layout must further provide infrastructure for maintaining passenger interchange during the ECML two and four track possession regime and in times of perturbation.

Any East West Rail layout could also consider potential for future addition of a high capacity connections onto the ECML slow lines over the long term, contributing to the delivery of the East West Main Line vision outlined in this strategic statement. The provision of an ECML interchange station could consider future options for direct connection between infrastructure built as part of the East West Rail programme and the existing ECML which would permit additional services or service substitutions. Delivery of a physical connection onto the ECML would be subject to the same principles of industry acceptance set out above, and should not compromise performance or capacity on the existing main line.

6.7 Cambridge

The proposed East West Rail interface scope between Shepreth Branch Junction and Cambridge presents a strategic decision which must take into account both affordability in the immediate future, and longer-term aspirations

or options for through-running at Cambridge. The East West Rail train service specification determined for Cambridge will require largely exclusive infrastructure interventions, with the main options outlined below in Table 6:

Train service level	EWR platform use	Expected infrastructure requirements
4tph terminating at Cambridge	West side bay platforms (western approach)	• 4 tracking from Shepreth Branch Junction to Cambridge station • 2 additional through platforms
4tph calling at Cambridge and continuing north/ east	East side through platforms (eastern approach)	• Grade separation of Shepreth Branch Junction • 4 tracking from Shepreth Branch Junction to Cambridge station • 3 additional through platforms
6tph terminating at Cambridge	West side bay platforms (western approach)	• Dedicated lines for East West Rail services • 4 tracking from Shepreth Branch Junction to Cambridge station with areas of 6 tracking • Potential additional platforms at Cambridge South (subject to East West Rail calling) • 1 additional bay platform • 2 additional through platforms
6tph calling at Cambridge and continuing north/ east	East side through platforms (eastern approach)	• Grade separation of Shepreth Branch Junction • Dedicated lines for East West Rail services • 4 tracking from Shepreth Branch Junction to Cambridge station with areas of 6 tracking • Potential additional platforms at Cambridge South (subject to East West Rail calling) • 3 additional through platforms

Table 6: Infrastructure options for accommodating future East West Rail services at Cambridge.

Options which are based on turning back services at Cambridge on the western side are unlikely to be upgradable to permit through-running beyond Cambridge without substantial rework and abortive spend. Therefore, planning for east-west services to continue (eastern approach) beyond Cambridge will require significantly more complex and costly remodelling of the railway than the minimum enhancements required to terminate those services (western approach). To

avoid abortive costs and disruption these works would need to be undertaken by the East West Rail Central Section.

Future eastern extension of services to Norwich and Ipswich would need to be undertaken with the aspirations of local stakeholders in mind, and would require consideration of the capability and capacity at several key points, including;

- Cambridge carriage sidings
- Coldham Lane Junction
- Cambridge North station
- Single line through Newmarket, including the single-track bore Warren Hill Tunnel
- Haughley Junction
- Ipswich station capacity
- Ely junctions
- Trowse Lower Junction and single-track swing bridge capacity
- Norwich station capacity

This strategic statement has highlighted the potential benefits that could be accrued by extending East West Rail services beyond the currently remitted scope, and providing a greater range of connections for freight services. While the option selected at Cambridge will need to take into account potential costs alluded to above, the layout specified for Shepreth Branch Junction/Cambridge should be determined cognisant of a long-term vision based on the East West Main Line principles outlined in this strategic statement. Decisions made now should be based on the potential alternative strategic routes for freight and the improvement in connectivity which an extended passenger service specification could deliver over the long-term, subject to the protection of performance and robust future assessment of costs.

6.8 Freight

Demand for rail freight is expected to increase significantly, with the highest growth predicted in intermodal (containerised) traffic, considered above in section 3.2. East West Rail infrastructure will immediately provide a better routing option for two intermodal flows: Southampton to Northamptonshire (currently Daventry, but potentially new freight interchanges at Northampton in future – part of the so-called 'Golden Triangle' of logistics), and Felixstowe to Bristol and South Wales. The existing domestic intermodal service between Daventry and South Wales could also benefit. Volumes on each of these flows are currently one or two trains per day in each direction, but there is scope for growth. There is a substantial opportunity to make East West Rail base infrastructure available for larger freight flows and thereby contribute more comprehensively to national environmental targets, given that the transfer of goods from HGV to rail freight reduces carbon emissions by circa 78 % .

East West Rail could play a more substantial role in supporting rail freight by accommodating trains on the Felixstowe to the Midlands and North corridor. This corridor is set to see demand for 60 intermodal trains per day in each direction by the 2040's under the central scenario of the FMSR forecasts, with the potential for this to be higher still due to net zero carbon targets. In order to play a major part in accommodating this traffic, an east to north connection at Bletchley is essential in addition to the full East West Rail route. This would provide a direct route from Felixstowe to the 'Golden Triangle' for the first time, bringing the potential for a significant modal shift from the A14. It would also provide an alternative route to destinations further into the West Midlands

and the North West. This could reduce the level of intervention required on the route via Ely, or enable higher levels of growth than can be realised purely by enhancing the Ely route. The routeing analysis of the FMSR forecasts predicts demand for up to 25 freight trains per day in each direction on this section of East West Rail in future. Use of an east to north connection at Bletchley for freight movement would be a significant step toward the East West Main Line principles outlined in this statement by providing an alternative freight route, thereby improving connectivity and capacity on the crucial freight corridor between Felixstowe and the Midlands and North.

A further major intermodal corridor which could benefit is from Southampton to the Midlands and the North. As noted above, East West Rail will immediately provide a shorter route from Southampton to the 'Golden Triangle'. For destinations beyond Northamptonshire, East West Rail would not be the shortest route. However, this could be outweighed by other benefits such as avoiding capacity constraints on the route via Leamington, or depending on how decarbonisation programmes are phased, electrification. A connection from west to north onto the WCML already exists at Bletchley, but consideration would need to be given to whether the current layout is sufficient to accommodate the required volumes, and in particular whether there is a suitable holding point to align paths between East West Rail and the West Coast Main Line.

The wider constraints associated with a more intensive use of East West Rail infrastructure for freight should be understood, noting the imperative to protect performance on existing main lines over the long-term. Further work would be required to determine the following:

- Whether there is a strategic case for freight using any potential connections between East West Rail infrastructure and other main lines (beyond the WCML at Bletchley),
- The available capacity for additional freight services on existing main lines (taking into account the capacity released by HS2),
- The requirement for suitable long-loops and regulating points at key interfaces which would assist with the 'meshing' of timetables,
- Additional requirements for gauge clearance on the network, notably between Chippenham Jn and Cambridge, via Newmarket,
- The potential for alignment with suitable electrification projects to provide electrified routes for freight and thus more comprehensively contribute to the wider decarbonisation agenda.

[19] *Network Rail (2020) 'Traction Decarbonisation Network Strategy: Interim Programme Business Case'*

6.9 Electrification

It is Network Rail's view that all new railways should aim to be introduced without the use of diesel traction, or with diesel traction as a temporary measure only[19]. In order to conform with the principles for an East West Main Line as laid out in this statement, East West Rail infrastructure should contribute fully to the wider decarbonisation agenda. The maximum decarbonisation benefits would be realised by removing diesel traction from both freight and passenger services, achieved by providing full electrification on all areas of the East West Rail infrastructure.

If East West Rail electrification over the full geography is delivered alongside Didcot area electrification as part of the Oxfordshire Connect programme it would permit an electrified route between Southampton and the West Coast Main Line. Likewise, a fully electrified route between Felixstowe and the West Coast Main Line could be achieved alongside electrification of Chippenham Junction to Coldham Lane Junction (Newmarket single line), Ipswich to Chippenham Junction, and Felixstowe to Ipswich in combination with a physical connection to the WCML.

The realisation of these projects would provide a foundation for fully decarbonised services which either use East West Rail infrastructure as an alternative route or are extensions of the currently-remitted East West Rail scope, should service extensions such as those considered in previous sub-sections be realised in future. This would be a significant step toward an East West Main Line vision based on the principles articulated in this strategic statement and would ensure the most comprehensive future alignment with the government's net zero emissions target.[20]

6.10 European Traffic Control System (ETCS)

It is Network Rail's view that all new railways should aim to be introduced as digital railways, provided staged installations are cost effective, safe and do not introduce unnecessary disruption or multiple system changes.

A comprehensive ETCS roll out strategy for an East West Main Line, which considers Network Rail's wider digital roll out plan for interface areas,[21] should be developed before any section-based decisions are made for individual East West Rail configuration states. A pragmatic plan should be created which realises 100% digital railway benefits for the whole East West Rail mileage and any extended service groups should they be realised in future.

[20] *Department for Transport (2020) 'Decarbonising Transport: Setting the Challenge'*
[21] *Network Rail (2018) 'Digital Railway Strategy'*

7.0 Further Analysis and Next Steps

This strategic statement outlines the opportunity to comprehensively address future rail connectivity within a wider geography, through the future expansion of scope beyond that currently remitted by the DfT as part of the East West Rail Programme. This outline vision for an East West Main Line should inform decisions made in the immediate future at interfaces with the existing network, as outlined above. Future work should be undertaken in close co-operation with the East West Rail Company, recognising the significant improvement in rail service offered by the East West Rail base specification and that nothing in this strategic statement contradicts or undermines the case for East West Rail as currently remitted. It is intended that this strategic statement should act as a basis for and inform the following:

- Network Rail's collective, cross-regional position on the potential for long-term strategic integration of the East West Rail programme within the wider GB rail network,

- Strategic fit for the East West Rail Company's current programme as they undertake non-statutory public consultation of their programme for central section, ahead of attainment of a Development and Consent Order for construction of the new infrastructure,

- Strategic advice for the Department for Transport which will inform the opportunity to maximise the long-term benefits of new East/West infrastructure, and inform their decision-making as specifier.

It should be stressed that this statement does not outline a programme of works or specify a train service pattern. The vision for an East West Main Line could be achieved on an incremental basis, with further benefits attained by expanding the scope of the currently remitted East West Rail programme on a case-by-case basis. Potential additional schemes or projects which unlock specific benefits – and move toward an East West Main Line – have been identified within the position summaries in section 6.

Any expansion beyond the East West Rail base specification will require further development work as part of the process to generate a business case. This strategic statement does not prescribe any specific interventions which could contribute to an East West Main Line but does note that further work should be informed by the requirement to establish the following:

- A comprehensive and detailed understanding of the market flows between key locations and the impact of improved passenger service provision between them,

- The specific benefits case and improvements in connectivity made by any consequent expanded train service specifications and associated infrastructure interventions,

- An assessment of the predicted modal shift to rail resulting from any expanded train service specifications,

- Identification of capacity and performance constraints, and specific interventions required on the existing network to unlock any future benefits associated with an expanded train service provision,

- The feasibility of aligning or interworking proposed services with those existing or planned on the wider network,

- Development of specific or incremental options to present to funders for increased service provision beyond the core East West Rail scope where a bespoke set of benefits can be identified.

Appendix I: Economic and Demographic Information for Key Locations

Aylesbury

Aylesbury is the county town of Buckinghamshire and over recent years it has grown into a thriving commercial town combining traditional character with modern development and progressive economic aspirations. Aylesbury holds a Garden Town status and is a growing urban centre situated within Aylesbury Vale; a district that produces £4.5 billion (2018) Gross Value Added to the wider economy. Aylesbury's population grew from 108,756 in 2011, to 123,732 in 2018. Aylesbury Vale is expected to experience an increase of 27,400 in new homes in the period to 2033.[22]

Aylesbury will benefit from the new Aylesbury Vale Enterprise Zone, which will enhance the infrastructure at Silverstone Park, Westcott Venture Park and Arla/ Woodlands sites. All three sites have been designated strategic employment sites within the Buckinghamshire Local Enterprise Partnership's Strategic Economic Plan.[23] The Arla/Woodlands site specifically is set to deliver 166,000 square metres of new commercial floor space and is expected to stimulate the creation of 2,500 jobs alone.[24]

At present, Aylesbury is situated on the end of the two different routes to London. While there are typically 3 trains per hour to London, journeys are long given the number of stops on either route. Direct services to the other key locations considered within this statement are non-existent. Rail passengers must interchange at either High Wycombe or London to travel by rail to other locations to the north, east and west. Naturally, this makes road travel a more attractive option with key corridors along the A418/A40 to Oxford, A41 to Bicester and A418/A4164 to Milton Keynes offering heavily used radial routes out of the town.

Expanding rail service provision is likely to relieve pressure on these road corridors through modal shift, and stimulate growth by providing better, longer-distance connectivity when compared to travel by road.

Bedford

Bedford Borough's economy is worth more than £4 billion GVA per annum and is an area of significant planned housing growth, with 14,550 new homes set to be constructed between 2015-2030.[25]

Bedford is home to the Millennium and Cardington Film Studios and the University of Bedfordshire; an institution with a reputation for helping develop local businesses, having engaged with more than 800 SMEs in recent years. This strong offering is set to be further enhanced by the university's £40 million investment in a new STEM building providing 6000 square metres of teaching and laboratory space.

Bedford is well-served by rail to the north and south along the Midland Main Line. It is a northern terminus for Thameslink services,

[22] *Vale of Aylesbury Local Plan:* Vale of Aylesbury Local Plan
[23] *Buckinghamshire Local Enterprise Partnership Plan:* Buckinghamshire Local Enterprise Partnership Plan
[24] *Aylesbury Vale Enterprise Zone:* https://www.aylesburyvaleez.co.uk/about/
[25] *Bedford Local Plan:* Bedford Local Plan

which offers 6 trains per hour to London, in addition to intercity services which connect Bedford with towns such as St Albans and Luton. To the north, direct connection with major hubs at Leicester and Derby are available. Bedford is served by a 1 train per hour branch line service to Bletchley. This gives some westward connectivity, but given the low frequency and requirement to change, rail connectivity with centres to the west is poor. Likewise, Bedford lacks any direct rail connectivity immediately to the east at present. This broader picture means road travel, particularly along the A421 corridor, is more convenient for east or west-bound travel while Peterborough is best reached using a combination of the A421 and A/M1.

Providing direct connections to locations to the east and west of Bedford will open new markets to be served by rail and offer a more attractive option than lengthy interchange from the MML.

Bristol

Bristol is a major U.K urban city, with a population of 576,813 (2018) and an economy worth more than £14 billion (2018). The provision of new homes in Bristol will be in accordance with Bristol City Council's 'Core Strategy'. It is envisaged that 30,600 new homes will be provided in Bristol between 2006 and 2026, the absolute minimum target will be 26,400 homes between 2006 and 2026.

In addition, new employment land in Bristol will be provided in the period 2006-2026. This will include up to 236,000m² of net additional office floorspace;

- Around 150,000m² in the city centre.
- Around 60,000m² in South Bristol.
- Around 26,000m² focused on town, district and local centres in the rest of Bristol[26]

Fast passenger services to London serve the market between Bristol, the capital and intermediate locations along the Great Western Main Line. To the west these serves continue to provide direct connectivity with major urban locations in South Wales. Connectivity with other key locations other than Cardiff, Swindon and Reading (all located on the Great Western Main Line) requires interchange. Oxford can be reached by changing at Didcot or Reading and using Chiltern services. For other key locations, interchange using London termini and the London Underground is most efficient. The opening of the Elizabeth Line will improve connectivity between Paddington and Liverpool Street for long-distance journeys to East Anglia.

Cambridge

Cambridge is a nationally important centre for Britain's knowledge economy and is home to a world-leading university. The city's population stands at 149,643 (2018) and Cambridge's economy is worth £5.9 billion GVA (2018) with a life sciences cluster worth £2.9 billion per annum, that employs 15,500 people.

[26] *Bristol Local Plan- 'Core Strategy':* https://www.bristol.gov.uk/documents/20182/34540/Core%20Strategy%20WEB%20PDF%20(low%20res%20with%20links)_0.pdf/f350d129-d39c-4d48-9451-1f84713a0ed8

Cambridge Research Park, situated at Waterbeach just north of Cambridge, is an exciting, self-contained community with the capability to provide office, laboratory, hi-tech and industrial accommodation. To date, over 330,000 square feet of business space accommodation has been developed or is under construction at Cambridge Research Park and the redevelopment of the nearby Waterbeach Barracks is underway, which is intended to deliver up to 8,000 homes with associated retail and amenity functions. 'Cambridge South' (in the area around Addenbrookes and Trumpington), contains the Cambridge Biomedical Campus, which is the city's biggest employer and the largest centre of medical research and health science in Europe.[27]

The need for new housing in Cambridge is high and consequently large-scale housing developments are underway on sites at Trumpington Meadows, Clay Farm, Glebe Farm, the National Institute of Agricultural Botany (NIAB), and the University of Cambridge's North West Cambridge site. The Cambridge New Local Plan Strategy proposes to build 35,773 homes in total between the years 2011-2031.[28]

Cambridge is situated on the West Anglia Main Line and a branch of the East Coast Main Line. Services to London are frequent – 8 trains per hour – and destinations to the north are well connected. Additionally, CrossCountry services provide connectivity to Norwich and Ipswich and major conurbations in the East Midlands, albeit at a lower level of service frequency for the latter. However, direct rail connectivity with other key locations considered here is absent, and requires lengthy interchange at London, or circuitous routes through the East Midlands. Westward travel is more feasible by road using a corridor comprised of the A428 to St Neots, and the A421 to key locations beyond like Bedford and Milton Keynes, and a combination of the A14 and A/M1 to Peterborough.

Cardiff

Cardiff, the capital of Wales, it is a major U.K economic centre with a value of £11.3 billion GVA (2018) and it holds a population of 351,884 (2018), which has grown steadily over the past 20 years.

The Local Development Plan makes provision for 45,415 new dwellings (including a 4,000 dwelling flexibility allowance) and 40,000 new jobs in Cardiff between 2006-2026, which illustrates the continued growth of the city in the years to come.[29]

Cardiff is served by fast passenger trains using the Great Western Main Line, with direct connectivity to Bristol, Swindon, Reading and London Paddington. Travel by rail to other key locations requires interchange. This can be achieved at Oxford via interchange at Didcot or Reading, and use of Chiltern services. For other key locations, interchange using London termini and the London Underground is most efficient. The opening of the Elizabeth Line will improve connectivity between Paddington and Liverpool Street for long-distance journeys to East Anglia.

High Wycombe

High Wycombe is the largest town in Buckinghamshire and is a key economic hub for the south of the county, with a GVA of £5.1 billion (2018) and a population of 123,987 (2018). The Wycombe Economic Development Strategy has set a challenge for the economy to grow to £7 billion GVA by the year 2027. The local economy holds strengths in advanced engineering, life sciences/medical devices/ biopharmaceuticals; software/ IT/ telecoms; and Food/Drink. High Wycombe is the home of a highly developed software and a digital consultancy cluster and it is also home to Buckinghamshire New University.[30]

The Wycombe District Local Plan has set a

[27] *Cambridge Research Park:* http://www.cambridgeresearchpark.com/wp-content/uploads/2016/09/crp_brochure.pdf
[28] *Cambridge Local Plan:* https://www.cambridge.gov.uk/media/6890/local-plan-2018.pdf
[29] *Cardiff Local Development Plan:* Cardiff Local Development Plan
[30] *Wycombe District Economic Development Strategy:* Wycombe District Economic Development Strategy

target under Policy CP4 for the development of 10,925 new homes between the years 2013-2033. This target includes the development of 6,350 new homes specifically in the urban area of High Wycombe.[31]

London Marylebone is the terminus for the frequent London-bound services which operate along the Chiltern Main Line from High Wycombe. In the other direction High Wycombe is served by trains direct to Birmingham (via Banbury), Oxford (via Bicester Village) and Aylesbury. Travel from High Wycombe to other key locations considered in this statement requires interchange through London termini, or at Oxford or Birmingham.

Ipswich

Ipswich has an economy worth £4.2 billion GVA (2018), with a population of 149,293 (2018). The Ipswich Core Strategy states that least 9,777 new dwellings shall be provided to meet the needs of the identified local housing needs as this will provide a decent home for everyone; with 31% at the Ipswich Garden Suburb and 15% in the remainder of the Borough being affordable homes.

In addition, approximately 12,500 additional jobs shall be provided in Ipswich to support growth in the Ipswich Policy Area between 2011 and 2031.[32]

Ipswich is served by fast and frequent trains via the Great Eastern Main Line to London Liverpool Street. Direct trains also operate between Ipswich and Cambridge, Norwich, with some peak services on to Peterborough. Travel by rail to other key locations to the west presently requires interchange using London termini as the most efficient route.

Luton

Luton is a large U.K town with a population of 214,100 (2018) and an economy that is worth £6 billion GVA (2018).

The town holds particular strengths in aerospace technology centred around its airport, which has an Enterprise Zone. Luton is also a key logistics hub and The University of Bedfordshire is also based in Luton.

Luton Airport's Enterprise Zone, specialising in aerospace, engineering and advanced manufacturing will create over 7,200 direct jobs. The airport currently supports 27,500 jobs and contributes £1.8 billion a year to the UK economy, including more than £1.1 billion for Luton, Bedfordshire, Buckinghamshire and Hertfordshire. Expansion plans could provide 5,600 new jobs at the airport and an additional 10,400 new jobs in supply chains, adding nearly £1.3 billion to the economy of the three counties each year.

A key issue facing Luton in terms of planning for new homes up to 2031 is population growth and as a result the Local Development Plan states that 17,800 new dwellings are needed in the Luton Borough by 2031. Policy LLP15 from the Development Plan states that provision will be made for 8,500 dwellings in Luton to help meet the growing housing demand of the population between 2011-2031. However, due to limited space for housing construction, the 17,800 new homes requirement is a challenge to meet.

Luton Airport Parkway represents the major calling point for rail services to the airport via the MML. 2021 the station will be linked directly via the airport via a new people mover that will halve the current bus transit time.

Milton Keynes

Milton Keynes is a nationally significant economy worth more than £14.3 billion GVA per annum (2018), with particularly high productivity per worker (GVA per head); almost 45% higher than the national average

[31] *Wycombe District Local Plan:* Wycombe District Local Plan
[32] *Ipswich Core Strategy:* https://www.ipswich.gov.uk/sites/www.ipswich.gov.uk/files/adopted_core_strategy_and_policies_dpd_review_1_march.pdf
[33] *Luton Local Plan:* Luton Local Plan

outside London. The composition of the Milton Keynes business base is evolving. Although the largest sector by employee number is in both retail and wholesale, there are now growing concentrations of jobs in administration, education, professional services, warehousing and transportation. More than 34 % of Milton Keynes's employment is part of the 'knowledge-based sector', this includes creative industries, knowledge services, science and technology. Milton Keynes is also home to many global brands, most notably Coca Cola, Fossil Group, Volkswagen and Santander. It is also a key logistics hub and The Open University is also based in Milton Keynes.[34]

Consequently, the population of Milton Keynes is growing; from 184,355 in 2018 to an expected 500,000 in 2050.[35] This rapid growth places great demand on the housing market and Milton Keynes Council has prepared a Strategic Housing Market Assessment to objectively assess the housing need for the Borough over the plan period of 2016-2031. The assessment concluded that for the plan period 2016-203, approximately 26,500 (figure rounded up) dwellings, which equates to approximately 1,765 dwellings per annum will be required.[36]

Milton Keynes is well served by rail along the West Coast Main Line, and acts as a major calling point for stopping and fast services. As such, it is a gateway for the region, with fast and frequent connections to London, Birmingham and the North. To the east and west however, Milton Keynes is not directly connected to other key locations. The A421 offers a more effective alternative in both directions by road where interchange at London is generally required or, in the case of Bedford, passengers could use the service from Bletchley. Additionally, Milton Keynes' proximity to the M1 means that travel to St Albans, Luton and Luton Airport is most effective by road, lacking a direct rail connection.

The level of growth anticipated at Milton Keynes is currently confined to a limited rail service along the West Coast Main Line. This is likely to constrain any benefits in agglomeration or connectivity with other areas of regional and national economic importance and would add further pressure on the infrastructure into and within London if improvement in direct east/west connectivity is not made.

Northampton

Northampton's economy is worth more than £7.3 billon GVA with particular contribution from the high-performance motorsport and technology sectors. The Northampton Waterside Enterprise Zone is located near the University of Northampton and hosts companies such as Cosworth, Mahle Powertrain and GE Precision Engineering. Further, major retail businesses such as House of Fraser, Marks and Spencer and H&M have been brought into the area within the Rushden Lakes shopping centre.[37]

Northampton has a population of 229,837 which, stimulated by a dynamic local economy, is expected to grow. The West Northamptonshire Joint Core Strategy identifies a provision of 18,870 new homes to be built within Northampton Borough from 2011 to 2029.[38]

Currently Northampton is served by a slow-line loop of the West Coast Main Line which is also used heavily for freight accessing the Daventry International Rail Freight Terminal. While Northampton is well served with semi-fast services between Liverpool, Birmingham and London, no long-distance inter-city services stop here. Generalised journey times to Milton Keynes are good, but connectivity with other key locations to the east and west is poor, with no direct connections. Interchange is required primarily at London to reach destinations further afield. Travel by road, particularly along the A43 to the west is preferable in many cases. Likewise, the slow stopping services which call at Northampton are less competitive with road

[34] *Milton Keynes Economic Development:* Milton Keynes Economic Development
[35] *Milton Keynes Draft Strategy for 2050:* Milton Keynes Draft Strategy for 2050
[36] *Milton Keynes Development Plan:* Milton Keynes Development Plan
[37] *Northampton Economic Development:* Northampton Economic Development
[38] *Northampton Local Plan Part 2:* Northampton Local Plan Part 2

travel north to south via the M1 than would be the case if Northampton were served by fast, inter-city trains.

Better rail connectivity between Northampton and other key locations which circumvents the need to interchange repeatedly at London termini will be essential in incorporating an area of significant growth within the wider region.

Norwich

Norwich has a £4.1 billion (2018) economy in GVA and a population of 197,013 (2018). The Norwich Local Development Plan sets out an objective to build new homes, all of which will be built in the Norwich Policy Area (around 33,000 out of the total 36,820 will be built between 2008 and 2026). Smaller sustainable settlements will accommodate smaller-scale growth in Norwich.[39] It hosts the Space to Innovate Enterprise Zone which specialises in agricultural technology, food and health, offshore energy, and digital/creative sectors.

Fast services to London operate along the Great Eastern Main Line, calling at Ipswich. An infrequent stopping service connects Norwich directly with Cambridge, at which point interchange is require for any onward travel. Direct rail travel to the west is not available for any other key locations and would require interchange at London Liverpool Street.

Connecting Norwich to other key locations with better rail services would offer a step-change, giving a direct and fast connection to some of the major areas of growth to the north of London and the south west. At present, such locations are not effectively reached by rail as a circuitous route must be taken through London, and road journeys are exceptionally lengthy given the greater distances involved.

Oxford

Oxfordshire, as a county, has one of the most robust economies in the UK, contributing £20.4 billion GVA to the UK economy.[40]

It is expanding rapidly with an average of 3.9 % growth year-on-year since 2006, and is home to 31,000 VAT registered businesses, and a world-leading bioscience cluster comprised of over 330 companies in R&D and associated industries. The Science Vale, which encompasses Didcot, Wantage, Harwell and Culham is the base for a number of distribution businesses and it is forecasted to experience significant growth. The area immediately surrounding the city of Oxford is critically important to Britain's knowledge economy. There are currently four innovation centres; the Oxford BioEscalator, the Begbroke Accelerator, Harwell Science and Innovation Campus, and Culham Science Centre.[41]

Within Oxford itself two major universities contribute to a city-wide economy that contributes around £5.7 billion GVA alone (2018), with a population of 163,938 (2018). The area is experiencing rapid and intensive economic growth, with a consequent pressure on demand for housing is increasing. Therefore, the Oxford Local Development Plan states that a provision will be made for at least 10,884 new homes to be built in Oxford over the plan period of 2016-2036, under Policy H1.[42]

Rail services at Oxford are comprised of the cross-country route which connects the South Coast with the Midlands and the North, and services between the Midlands and London which operate along both the Chiltern Main Line into Marylebone, and the Great Western Main Line via Reading into Paddington. Oxford is now also connected with East West Rail services to Bicester. Connectivity with London and Birmingham – and intervening destinations along those main lines – is very good with fast and frequent services. However,

[39] *Norwich Local Development Plan Objectives:* Norwich Local Development Plan Objectives
[40] *Oxfordshire GVA:* Oxfordshire GVA
[41] *Oxfordshire LEP Local Industrial Strategy:* Oxfordshire LEP Local Industrial Strategy
[42] *Oxford Local Development Plan:* Oxfordshire Local Development Plan

key locations to the West such as Swindon and Bristol require interchange onto the Great Western Main Line at Didcot. As a result, travel by road using the A420 to Swindon, and joining the M4 thereafter, can offer a better journey time.

To the East, key locations along existing main lines such as Northampton, Milton Keynes, Bedford, Cambridge and Peterborough all require a series of changes within London. Journey times are long by rail, lacking direct connections and making road travel a more attractive option. In particular, a corridor comprised of the A34, M40 and A43 offers a route by road to Northampton where no rail equivalent exists. Likewise, the A421 corridor provides journey times far shorter than any equivalent by rail for other key locations to the east.

Oxford's rail connectivity is oriented largely around an arc between London and Birmingham. Addressing this orientation must depend on significant reductions in journey times to major economic hubs in the Southwest and those to the north of Greater London.

Peterborough

Peterborough has a diverse population, with just under 177,683 residents and an economy that is worth £6.3 billion (2018) GVA per annum. Key sectors for the local economy include advanced engineering, manufacturing, food and drink, digital creativity, energy and environment, financial services and logistics.[43] The city is also home to a campus of Anglia Ruskin University.

Peterborough is predicted to be the sixth fastest U.K growing economy in 2020 by Irwin Mitchell.[44] As a consequence, Peterborough is experiencing demographic growth and the Local Development Plan proposes the need for 17,470 new homes between the years 2018 to 2036.[45]

Peterborough lies on the East Coast Main Line and is a principal station for services to Scotland, the North, the East Midlands and East Anglia. Thameslink services provide a direct link with the south of England via London Bridge. Rail connectivity with other key locations is poor however, both circuitous to Cambridge along the East Coast Main Line branch and requiring interchange at London for major hubs such as Bedford, Milton Keynes and Northampton. Travel via the A/M1 and A421 offer journey times to key locations to the west that are far shorter than equivalent by rail.

As an area of significant future growth, greater direct rail connectivity to other major hubs which is not dependent on repeated interchange should be a priority.

Reading

Reading is a major U.K urban centre, it has a population of 258,721 (2018), which grew from 245,472 (2011). Reading has an economy worth £7.8 billion (2018) GVA and it was described as the fastest growing U.K urban economy in 2020 according to Irwin Mitchell.[46]

It is a commercial centre in the Thames Valley region and is home to the University of Reading and the Thames Valley Science Park. The growth witnessed in the local area is driving housing demand, therefore, a provision will be made for at least an additional 15,847 homes (averaging 689 homes per annum) in Reading Borough for the period 2013 to 2036.[47]

Reading is a major interchange hub for passengers who wish to travel to the wider rail network, with a high frequency of direct services per hour available to London Paddington. There are a number of direct services available from Reading to major destinations, such as Southampton, Cheltenham, Gloucester, Bristol, Wales and the West Midlands. Connectivity with key locations to the east, north of London is not direct, however. Oxford is served by four

[43] *Peterborough Economic Intelligence Report:* https://www.opportunitypeterborough.co.uk/peterboroughs-economy/
[44] *U.K Power House Report- Irwin and Mitchell:* https://irwinmitchell.turtl.co/story/uk-powerhouse-january-2020/page/6/4
[45] *Peterborough Local Development Plan:* Peterborough Local Development Plan
[46] *U.K Power House Report- Irwin and Mitchell:* https://irwinmitchell.turtl.co/story/uk-powerhouse-january-2020/page/6/4
[47] *Reading Borough Local Plan:* Reading Borough Local Plan

trains per hour from Reading on the cross-country and Great Western routes and East West Rail phase one services mean Bicester can be reached via interchange at Oxford. Travel to other burgeoning centres like Milton Keynes, Northampton and Peterborough requires interchange at London.

Better rail connectivity with Reading would offer improved access to a growing economy and better interface with an existing rail hub.

Southampton

Southampton is another key U.K population centre, with 269,781 people present (2018). The economy is also worth £7.6 billion (2018), although this has since fallen from £8.3 billion as of 2011.

The Southampton Development Plan states that an additional 16,300 homes (Policy CS 4) will be provided within the City of Southampton between 2006 and 2026. In addition, the Local Plan aims to identify sites in the City Centre that are capable of delivering office space in the city centre, i.e. at least 110,000 square metre between 2006 and 2026, and further office development sites will be investigated beyond 2026 (Policy CS 6).[48]

Southampton is currently served with frequent trains to London Waterloo via the Southwestern Main Line. There are also direct services to Cardiff, and the Cross Country route provides direct trains to Manchester via Birmingham. Southampton is presently directly connected by rail to key locations along the Great Western Main Line and Oxford, but interchange is required to reach those further east. The most efficient route is via London termini.

Swindon

Swindon is a major regional economy worth £9.2 billion GVA per annum (2018). It has a population of 192,599 (2018) which grew from 183,001 (2011). Swindon's Local Development Plan states that housing growth will be delivered through the provision of no less than 22,000 dwellings between 2011-2026. The Development Plan also states that between 2011-2026, 119.5 hectares of employment land will be delivered, this includes 90,000 m4 office space in the central Swindon area.[49]

Swindon has an important knowledge sector and is also a key market for financial and professional services with Zurich, Capita and Nationwide all based in the city. Swindon's Honda manufacturing plant is also evidence of the importance of the engineering sector in the town.[50]

Swindon is an important calling point on the GWML with fast direct connections to London and Reading to the east. There are a range of connections to the west to Cheltenham, Bath, Bristol, Cardiff and destinations beyond, additionally there are services to Salisbury and the South Coast. There are currently no direct services to key locations outside of the South West and, with the exception of Oxford, travel to major urban centres to the north of London requires multiple changes. This leaves rail travel as a competitive alternative to road only for the furthest destinations like Peterborough, Norwich or Ipswich. Improvement of the rail offering would be an important step in connecting core markets between the Southwest and East/East Midlands.

[48] *Southampton 'Core Strategy' Development Plan:* Southampton 'Core Strategy' Development Plan
[49] *Swindon Local Development Plan:* Swindon Local Development Plan
[50] *Swindon's Economy:* Swindon's Economy

Appendix II: East West Rail Generalised Journey Time Estimate Table

Estimated Generalised Journey Times between Key Locations using East West Rail Services															
Core East West Rail Stations	Oxford	Bedford	Cambridge	Aylesbury	Milton Keynes	Northampton	Peterborough	Swindon	Reading	Southampton	Bristol	Cardiff	Norwich	Ipswich	Luton
Oxford															
Bedford	77														
Cambridge	111	48													
Aylesbury	92	105	148												
Milton Keynes	61	55	98	69											
Northampton	114	99	143	148	79										
Peterborough	166	97	111	188	124	181									
Swindon	132	217	283	212	194	254	331								
Reading	74	149	192	137	134	190	255	200							
Southampton	149	218	258	230	204	271	338	279	207						
Bristol	195	281	339	288	256	330	414	252	268	350					
Cardiff	257	341	394	360	318	409	468	324	340	421	336				
Norwich	264	189	146	301	210	300	252	472	357	430	531	593			
Ipswich	267	197	154	290	218	305	267	461	351	428	522	584	267		
Luton	145	69	110	138	93	162	170	302	203	289	374	485	270	279	
High Wycombe	93	134	177	124	114	176	239	234	145	240	305	377	340	331	188

Table shows the generalised journey time estimates between all sixteen key locations considered in this statement. Estimates have been generated using PDFH methodologies by forcing passenger flows to use East West Rail services based on their assumed, publicly available final service specification (outlined in section 2).