West Midlands
Strategic Advice

October 2022

NetworkRail

North West & Central

Contents

Executive Summary

ES

The West Midlands Rail Network is at the heart of Britain's rail network. The rail corridors that feed into Birmingham's central stations – New Street, Moor Street and Snow Hill – support a mixture of local, suburban, inter-regional and intercity passenger flows. They also act as both an important hub and transit route for rail freight, with all corridors in the West Midlands carrying all service types. This is a critically important part of the national network and there is a clear and present imperative to improve it; in terms of growing the railway in support of the Government's wider objectives to stimulate long-term economic growth, to decarbonise the transport network, and to bolster the offer made to passengers and end-users by improving network performance.

This imperative is felt at a time of significant change within the wider economy, the transport sector and the rail industry. Passenger demand has rebounded strongly following the impact of COVID-19, especially when considering a number of routes in the West Midlands continue to run at frequencies lower than were available in 2019. Alongside this, the demand from stakeholders to improve rail connectivity locally and nationally remains.

Long-term rail network planning is required to illustrate how rail can fully contribute to government policy and where investment should be targeted, as well as to inform development of the operational railway following the Williams-Shapps Plan for Rail and the consequent establishment of Great British Railways.

This document represents Network Rail North West and Central Region's long-term strategic view of how to enhance the West Midlands rail network. It has drawn on findings from previous work as well as detailed input from industry partners and stakeholders. It assesses the optimum way to utilise future network capacity and determines where infrastructure investment is needed to meet the future demands of both passenger and freight services.

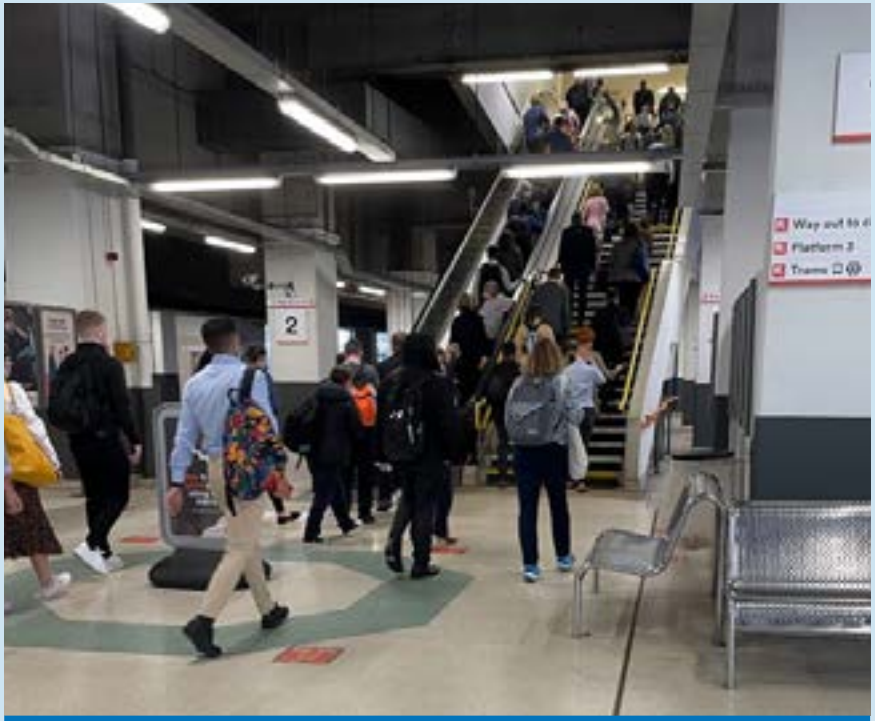

Figure 1: Passengers using Birmingham Snow Hill station in the morning peak in 2022

Figure 2: Bordesley in South Birmingham, the area where two new chords would provide improved rail access to Birmingham Moor Street station

The basis of this advice is a collection of known service aspirations which have been organised on a corridor-by-corridor basis and formed into a holistic, pan-West Midlands strategy. This specification has been used to determine infrastructure and investment requirements, as well as priorities and staging for further development, and should be referred to as the direction of travel for service structure in the region for any intervening changes to the local network. It seeks to address some key issues which are explained in detail in the report, but can be summarised as:

- Enabling new services and improved connectivity in line with previous assessment undertaken by Network Rail, and the aspirations of West Midlands Rail Executive, the Sub-National Transport Bodies and other local authorities
- Improving performance and journey times for cross-national service groups which are routed via the West Midlands,
- Enabling higher frequency, even interval services in the core of the West Midlands, in line with the aspirations of the regional network specifier,
- Supporting known urban development sites and distributing connectivity more widely through the creation of a set of 'regional hub' stations,
- Protecting capacity for freight via the West Midlands and identifying where improvements can be made to support long-term growth in freight demand,
- Maximising integration with the HS2 network by prioritising Birmingham Moor Street as a focal point for interchange with HS2 Curzon Street.

The issues identified above can be addressed in the medium term, but they are fundamentally dependent on the delivery of the central Midlands Rail Hub (MRH) infrastructure scope, that is to say; both east and west-facing chords at Bordesley, additional platforms and associated approach modelling at Birmingham Moor Street, and additional platform capacity at Birmingham Snow Hill. This is because the MRH 'Core' scope unlocks capacity in the centre of Birmingham which – alongside providing up to 12 additional trains per hour - also permits a wider remapping of the train service making more efficient use of central Birmingham stations, especially New Street which is currently at-capacity. Non-delivery of this 'Core' scope limits available capacity and therefore precludes the ability to deliver the medium-term train service specification which enables the rail network to handle up to 96 trains per hour in to the centre of Birmingham.

With capacity unlocked in the centre of Birmingham, this document then steps through the improved train service structure for each of the rail corridors in the West Midlands, implementation of which maximises the capability of the new infrastructure in central Birmingham. Fully achieving the train service specification will require supporting infrastructure on each corridor, but this can be packaged up and delivered in increments, addressing the issues outlined above at each stage.

The basic recommendation of West Midlands Strategic Advice is to deliver the central MRH scope in full as stepping stone to further corridor enhancements which can be developed on a case by case basis and which contribute to a full-scale, positive transformation of the West Midlands rail network.

This report also considers the potential impacts of the proposed train service changes on integration with the wider network and HS2, as well as the impact on passenger experience. In unlocking capacity at Birmingham Moor Street the opportunity for interchange at HS2 will be maximised in the centre of the city, but further work is required – drawing in partner organisations – to provide an appropriate improvement in wayfinding. Likewise, full delivery of the service specification in this document offers the opportunity to improve wayfinding through line identities for passengers, providing a simplified suburban network on top of significantly improved train frequencies.

It is also important to note that the direction of travel outlined in this document has been constructed in light of the wider decarbonisation agenda, and sets out Network Rail North West and Central Region's response to the Traction Decarbonisation Network Strategy. Several routes in the West Midlands are currently unelectrified. A prioritised assessment for decarbonisation has been provided which focuses on unlocking service groups and releasing diesel rolling stock in stages, incrementally reducing carbon emissions as a result. This aligns the target of transport decarbonisation to the West Midlands strategy, whilst also generating incremental benefits in terms of reduced carbon emissions without requiring commitment to large scale route modernisations. This, alongside the mode shift that passenger and freight improvements could enable, will help reduce the emissions of not just rail but the wider transport sector.

Finally, this document notes that the capacity made available in the medium term, both through the MRH 'Core' scope and the subsequent investment in radial corridors, will eventually become insufficient to satisfy long-term rail needs. Having maximised the medium term capability, further options based on entirely new routes for rail including a new underground station, should be considered. This could release saturated network capacity on existing radial routes, provide new direct connections to places that are not directly connected by rail, and connect more of the country directly into the high-speed network.

The immediate next steps following the production of this document should be focused on determining the requirements for each of the radial corridors described throughout this document. These are proposed to be answered in follow-on pieces of localised strategic studies and include recommendations for Strategic Advice to be undertaken covering the following areas:

- Coventry area
- Walsall area

- Wolverhampton area
- Water Orton corridor
- Solihull corridor
- Stourbridge corridor

These studies will determine the infrastructure that is required to fully unlock the train service improvements outlined in this document.

Alongside these is a need for two wider studies that should be pursued as priorities. Firstly, a pan-regional freight routing study undertaken to determine how best to utilise available freight paths through the West Midlands in the medium term. Secondly, an assessment of currently disused rail corridors within the conurbation, given some of the capacity released by investment in the MRH central scope could be most effectively utilised by instituting entirely new heavy rail connections rather than further uplifting services on existing corridors.

Introduction, Context and Background

1

The landscape of the national transport network continues to evolve and the strategy that supports the development of the rail network needs to evolve accordingly. This document offers a refreshed view of the needs of the rail network for the coming decades in order to meet wider policy objectives and stakeholder aspirations that deliver on those objectives.

Net Zero

The government has committed for the transport network to have net zero carbon emissions by 2050. For the rail network there are two key changes that need to happen.

- Decarbonise the rail network
- Encourage modal shift to enable decarbonisation of other modes

Both of the above are significant challenges. The former requires significant investment in rolling stock and infrastructure in a rolling programme just to decarbonise the services that already operate. The latter requires more services to make existing connections more competitive, attractive and to provide new linkages across the network. For the West Midlands this translates into providing significant additional network capacity to enable new stations to be built and additional trains to run.

The Williams-Shapps Plan for Rail

The Williams-Shapps Plan for Rail sets out the proposal to create a new national body, Great British Railways, that will be responsible for infrastructure and train services. The proposals represent a significant shift in the way that train services are procured and operated in Britain and present opportunities to rethink how network capacity can be allocated.

The proposals require an overarching strategy for large areas of the network to support operator geography and rolling stock decisions that will underpin the principles of the new National Rail Contracts, the agreements through which train services will be procured by the government.

This requires a holistic view of the types of service that the network needs to accommodate as part of the wider decision-making processes that will underpin the roll-out of Great British Railways.

West Midlands and Chiltern Route Study (2017)

The West Midlands and Chiltern Route Study is the current long-term strategic document for this section of the network. It sets out the needs of the network as perceived at the time and the opportunities for enhancing the network. In the time since publication, a number of recommendations from that document have been taken forward and more is understood about the engineering that underpins some the key infrastructure interventions that were proposed.

On-train capacity improvements have been or are in the process of being delivered through electrification of the Chase Line and

introduction of the new Class 196 and Class 730 train fleets that meet the short-term capacity demands of the network.

Furthermore, a significant amount of development has been undertaken on a number of the infrastructure interventions proposed in the Route Study. Most notably, the Midlands Rail Hub project has been developed to Outline Business Case status. This develops Birmingham Moor Street station with new approach lines that allows an additional 14 trains an hour in to Birmingham. Using this as a basis gives a mature understanding of the infrastructure design required to deliver additional capacity beyond that project and enables a clearer understanding of the infrastructure legacy that the project will leave for the wider network and the potential to maximise these investments as part of the wider West Midlands network to support a wider suite of aspirations than those that are contained within the business case.

The Role of the West Midlands Rail Network in the National Picture

Birmingham lies at the centre of the national rail network, with direct services from its stations to the majority of British cities. Supporting these intercity markets is a network of frequent regional and local services that feed into the hub of stations in Birmingham providing a large wealth of onward journey opportunities. Most of these journeys are via Birmingham New Street Station, nationally, the fifth busiest in terms of passenger numbers and the busiest outside London. In 2019/20, nearly 47 million entries and exits were recorded at the station with over 7 million using the station to interchange between services.

The other Birmingham stations of Moor Street and Snow Hill provide local and regional services in the West Midlands and towards Oxfordshire, Buckinghamshire and London and fulfil a key role in urban transport in the city. The three locations are well located for the city centre in terms of business, leisure and shopping in an urban area that is well-known for congestion issues that would be significantly worse if it wasn't for the role that rail played in moving people around the city.

The advent of High Speed Two (HS2) coming to Birmingham in the 2030s presents a change to the landscape of the rail system and of the city itself and enables the railways of Birmingham to operate as a whole, with lines bringing people to the parts of the city that they want to reach rather than where is convenient for the railway to deliver them. Key to this is considering how High Speed Two will change the dynamic of journeys within the West Midlands and how to structure the local services and integrate high speed services as part of a national network.

HS2's Curzon Street station in Birmingham, will trigger a large-scale redevelopment of the city centre, expanding it towards the Moor Street and Digbeth areas of the city. Associated local transport improvements including the Midland Metro and bus networks will also contribute to this and the rail network needs to adapt to this change as well.

The railway in Central Birmingham has been operating at or at near to full capacity for several years and is incapable of providing more services without enhancement. Previous attempts to increase services have resulted in a drop in performance and has made the railway harder to manage in times of perturbation. This doesn't just affect the local services but causes a ripple effect of delay across the whole national network as long-distance services can easily transmit delay from the Birmingham area to other national hubs, affecting the whole network.

The Integrated Rail Plan

In 2021 the Integrated Rail Plan (IRP) was published by the Government, outlining a long-term plan of rail investment across the Midlands and the North. This document sets out key commitments to enhancing railway infrastructure to improve connectivity and journey times and sets out areas where further development is required to maximise the transformational commitment that the investment can enable. Key outputs of the IRP for the West Midlands are significant improvements to the Birmingham – Nottingham journey times as well as the commitment to delivery of the full Western Leg of High Speed Two to Manchester which enables a full reconsideration of train services on the Birmingham – North-West axis as part of this document.

The IRP also outlines further investigation into the Midlands Rail Hub (MRH), underlining the commitment to continuing development to deliver improved connectivity to Bristol, Cardiff and Hereford as part of the MRH programme, a project designed to deliver additional network capacity in central Birmingham for a whole suite of connectivity and capacity improvements across the Midlands. This document will set out the potential that this infrastructure can deliver for the wider network beyond the remitted scope of that programme.

Changes in Demand

The impact on rail passenger numbers as a result of the COVID-19 pandemic did see a dramatic reduction in passenger numbers with volumes slow to return on a national scale, in particular in the London and South-East commuter markets. This also happened in the West Midlands markets however, the numbers are recovering quickly and while peak volumes may not return as they were, this may only provide some short-term respite to a system that was already oversubscribed.

There are very few peak-only services in the timetable, with most trains operating throughout the day in similar formations. Therefore, there is very little opportunity to consider the concept of fewer, longer trains to deliver new connectivity and services in lieu of infrastructure enhancement because there aren't many services that can be reduced without undermining the fundamental service offering.

While some corridors have an intense level of service, e.g. Wolverhampton – Birmingham, this route is merely a conduit for a variety of important intercity and local flows to reach Birmingham which precludes much in the way of service

reduction even on these corridors. Where frequencies are proposed to be reduced, these are usually in faster services which release very little in the way of capacity that can be utilised for anything other than the same type of train, particularly on a busy corridor with a strictly flighted pattern to the timetable.

The only route with a high level of local-only service frequency is the Cross-City line with its 6tph frequency. This is the busiest service group in the West Midlands area and appears to have shown the fastest recovery of all lines even with an irregular 4tph pattern. Cross-City South will be likely to need to return to 6tph as soon as possible to cater for demand and the frequency is a key stimulus for demand on this corridor, especially the south end of the route where the Medical and Education campuses around University station are a significant demand driver. Extending trains on this route is extremely challenging with almost all stations needing platform extensions and a number of stations in constrained locations that will preclude train lengthening (Aston and Kings Norton being the most prominent examples).

The Cross City line should also be looked at as an example of how passenger demand can be stimulated if the traditional rail markets of the last 20 years do not return to the same level as a result of changing travel patterns. As a case study, it demonstrates that high frequency electric services stimulate demand and the principles of a high frequency turn up and go service on other routes in the West Midlands should be central to growing the railway market in the future.

In the longer term it is anticipated that, even in the more pessimistic scenarios, by 2030 the rail network will be carrying the same number of passengers as it was in 2019. Whilst this may not be distributed in the same way, it demonstrates that there is an imperative to be able to resolve the network capacity issues in the West Midlands in order to cater for however the market develops.

Geographic Scope

2

The geographic scope of this work is captured in the diagram to the right. This covers all arterial routes of Birmingham.

The geographical limits of the work are:

- Shrewsbury (Exclusive)
- Stafford
- Rugeley
- Burton-on-Trent
- Leicester (Exclusive)
- Rugby
- Leamington Spa
- Worcestershire Parkway
- Hereford (Exclusive)

The West Coast Main Line Trent Valley route between Rugby and Stafford which avoids Birmingham is not in scope for this document. Details on the strategy for that route are captured in the upcoming West Coast South Strategic Advice.

The route south of Leamington Spa will be covered in Chiltern Route Strategic Advice in the future.

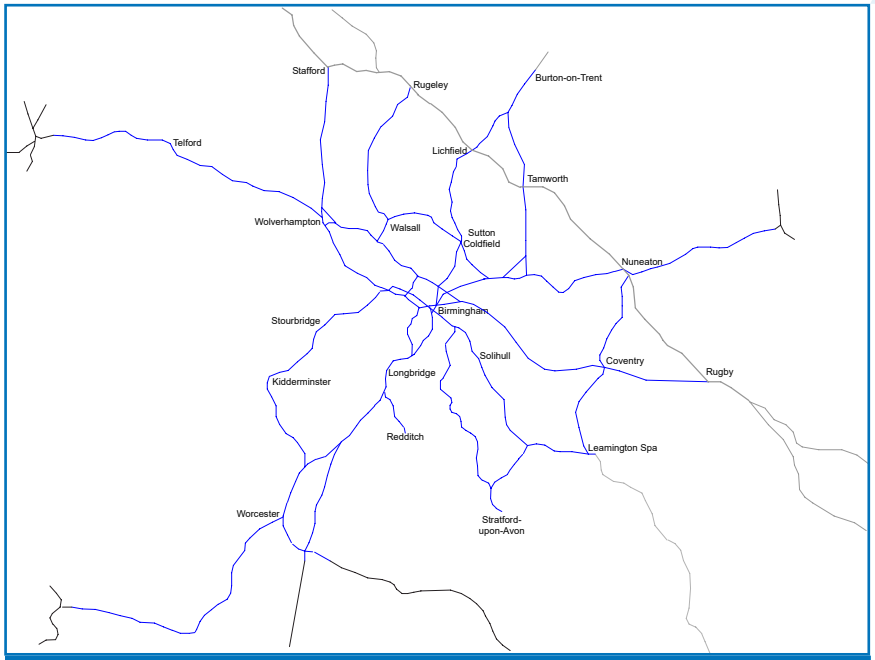

Figure 3: Map of geogrpahical scope

Approach

3

Purpose

The purpose of this document is for Network Rail's North-West and Central Region to have a collated view of how best to trade off competing aspirations for the network from a wide array of stakeholders. It has achieved this by taking a balanced view of how the network could accommodate the aspirations and where it would need to be enhanced in order to deliver on the aspirations.

As well as looking at stakeholder aspirations for the network, this document also looks to input Network Rail's aspirations in to the equation.

The intention is that this document sets the high level direction for smaller geographic scope studies looking at how to resolve specific constraints and what to consider for future proofing when resolving issues in the short and medium term.

These localised pieces of Strategic Advice will look at the choices to be made around sequencing of aspirations to ensure the alignment between shorter term priorities and the longer term view. This document will set out a forward view of the pieces of local strategic advice that will need to be undertaken as a consequence of this piece of work.

Sources

Evidence for this strategic advice has been gathered from the following sources:

- Birmingham Airport Connectivity Outline Business Case (2019) – Network Rail.
- Bristol – Birmingham Strategic Advice (2021) – Network Rail
- Midlands Rail Hub Strategic Outline Business Case (2018) – Network Rail
- Rail freight forecasts: Scenarios for 2033/34 & 2043/44 (2020) – Network Rail
- Solihull Corridor Capacity Enhancement Strategic Outline Business Case (2018) – Network Rail
- Strategic Transport Plan (2022) – Midlands Connect
- West Midlands and Chiltern Route Study (2017) – Network Rail
- West Midlands Rail Investment Strategy (2022) – West Midlands Rail Executive
- Western Gateway Rail Strategy (2020) – Western Gateway

Analytical Approach

This document has assessed the capacity of the railway in the three central Birmingham stations. This, alongside timetable work as part of the Midlands Rail Hub development has given a robust assurance to the capacity ceiling that the core of the West Midlands network will be able to support.

High level capacity analysis has then determined the capacity apportioning across the feeder corridors, noting areas where more investigation will be required, in subsequent strategic advice, to determine capacity constraints and resolutions. However, the capacity analysis that has been conducted has established a theoretically deliverable train service structure for each corridor that won't drive major infrastructure change that would be undeliverable, such as 4-tracking of corridors where it is clearly not viable.

Aspiration Compromises

Network Rail has considered all known service aspirations within the geographic scope in this document. In many cases, the aspirations from different organisations already complement each other, in others they do not. This strategy document has attempted to find ways to align the differences. This may mean that some aspirations are not met in their fullest form but represents a reasonable compromise between competing aspirations within a realistically practicable vision.

Ultimately, within the broad constraints of the existing network, even with enhancements, there is not sufficient capacity to meet all of the aspirations in their fullest form without significantly compromising on other aspirations. This document attempts to provide a cohesive set of train service specifications that work together as a system to spread the benefits across the network in a consistent manner that enables a higher performing network that provides a consistent user experience across the region.

Strategic Fit Guidance

The approach adopted is intended to provide guidance of strategic fit for third party aspirations. By outlining service structures and the elements that are required to deliver that service structure, creates a framework to understand what is necessary to deliver aspirations and how that can fit in around the wider service offer.

For example, a new station proposal can use the service level structures that are proposed in this document as a basis for business case development and to understand the associated dependencies that are required in order to deliver the train service at the station such that it can be demonstrated to have strategic fit.

Governance

This document has been produced with regular engagement with West Midlands Rail Executive and Midlands Connect and Department for Transport.

The wider rail industry has been engaged through the North-West & Central Region Industry Planning and Advisory Group and Regional Investment Review Group prior to publication of this document.

This document recommends further subsidiary strategic advice documents that will each have their own governance structure to assure and agree the recommendations of those pieces of advice as they are developed.

Methodology and Principles

4

A Definition of Capacity

In the context of this document, capacity is defined in two different ways.

- On-train capacity – the number of passengers a train can carry.
- Network capacity – availability of train paths on the network.

In order to provide new connectivity and increased frequency of service on local flows requires additional network capacity. In some cases this will drive additional on-train capacity through more services, however, for the most part this is not the key driver. Consideration has been given to providing additional on-train capacity on some flows and this is covered in the relevant sections.

Network Capacity

Network capacity is finding an optimal middle-ground between:

- Journey Times
- Connectivity (direct services)
- Frequency of services

Prioritising one of these elements results in it typically being harder to deliver in other areas (Figure 1). In order to not compromise, additional capacity is needed in order to meet all the demands. There are also ways to reach better compromises where an increase in frequency can lead to better Generalised Journey Times without significant improvement to the headline journey time of any one particular service. This is a helpful way to address some of the competing aspirations on a capacity limited system.

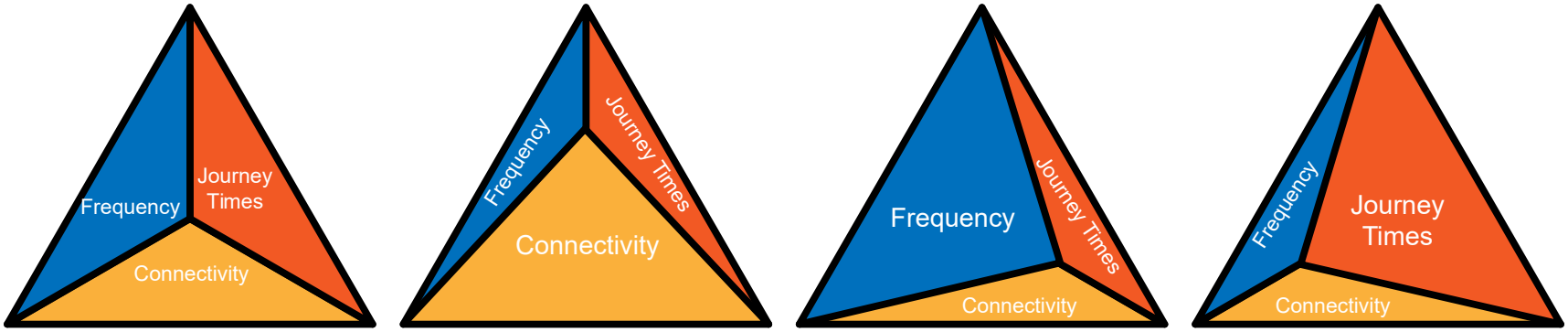

Figure 4: Diagram showing how allocating capacity is determined by the priority of Connectivity, Frequency and Journey. Increased emphasis on providing one component results in trade-offs being required to the other two components within a finite capacity system.

Journey Times

It is a well-established fact that journey times are key decision factor in selection of transport mode, however this can be expressed in a number of different ways. Whilst headline journey times are a useful marketing tool, they are not often representative of a journey that a would-be passenger will actually make. Very few door-to-door journeys align neatly with timetables and the benefits of a comprehensive network of services is the ability to use more than one service to complete a journey. A more comprehensive measure of journey time on offer is Generalised Journey Time (GJT).

GJT is often used in transport planning as it takes multiple effects and amalgamates them into one metric. It is calculated using a combination of average train frequency, in vehicle time and interchange time between destinations. It also adds a penalty for having to change trains, not just the time it takes to physically takes to change services.

Table 1: Generalised Journey Time (GJT) = T + S + I
T = the total station-to-station journey time (including interchange time)
S = the service interval
I = the sum of the interchange penalties for any interchanges required.

It considers other factors as well to give a metric for a whole day to provide a specific number but the key elements are outlined Table 1.

By way of a simplified comparative example, an hourly direct service that takes 35 minutes would have a GJT of 65 minutes. This is because on average a passenger may have to wait up to 30 minutes for a train if they set out without knowledge of the timetable.

Elsewhere a train takes 40 minutes to reach its destination but the frequency is every 30 minutes, the GJT would be 55 minutes. This is because although the headline journey takes 5 minutes longer, the average wait time is reduced to 15 minutes because of the higher frequency.

For the purposes of this strategy this means that if journey time is an aspiration on a corridor, the intention on the majority of flows is to provide at least two trains per hour to keep the GJT as low as practical alongside an improved headline journey time. This also helps to make more effective use of capacity because the speed differential between fast (non/fewer-stop) services and slow (regular stopping) services can be reduced because trains don't necessarily have to run as fast as possible to get improvements in headline time as the improvements to GJT are achieved by increased frequency. This means more stops can be added, evening out the difference between the fastest and slowest trains, helping to enhance capacity. This has the added benefit of also being a way to improve connectivity in some

areas as more station calls can be included in a wider array of services, giving better connections.

An evolution of this is the importance of reducing the interchange time and interchange penalty as much as possible. More frequent services on all routes will reduce the interchange time. Developing a train service that provides more journeys that can be completed in one interchange and also reduce the amount of doubling-back required to complete journeys will help to make major in-roads in to the GJT values and help to increase rail market share.

Frequency

Providing regular interval passenger services makes for an excellent passenger proposition but can compromise on overall capacity on a mixed-traffic railway. The most efficient use of capacity is to 'flight' services. This groups trains of a similar speed profile together in the hour to increase the throughput of a line. Increasing the frequency of services, especially to deliver an even interval service reduces the opportunity to optimally organise train services and therefore the net capacity can decrease or, faster services have to be slowed in order to fit between the regular interval calls.

Connectivity

Connectivity in the form of a direct train service between two locations can be excellent for mobility but can lead to an inefficient use of capacity. This is particularly prevalent at junctions where provision of direct services can result in more conflicting train movements reducing the ability to run other services, either affecting capacity or the frequency on other routes.
Provision of additional station calls in services in order to provide connectivity leads to extended journey times which can compromise on the aspirations of faster journeys on some routes.

The Need for Additional Capacity

Delivering improved connectivity, frequencies and journey times, requires extra network capacity to enable the extra services on each constituent corridor to deliver the service structure changes. The inability to operate more services means very few of the aspirations for the network can be delivered with the exception of very limited changes to the existing services.

In the West Midlands, the biggest constraint to delivering the extra train services is the physical capacity limit of Birmingham New Street which limits the capacity of the whole wider network. The hub and spoke nature of the services centred on New Street is a strong suit, with national interchange opportunities but is also one of its biggest weaknesses. The solution will in part, rely upon diversifying the nature of the network alongside providing additional capacity in the central area. This will enable services to be re-routed and new connections to be achieved whilst maintaining the core strength of the network. This will become even more important when Curzon Street station opens and there is a need to provide access to the whole West Midlands rail

network to increase the catchment of the High Speed Network in order to fully harness its potential.
Looking at developing “out of centre” interchange opportunities also reduces pressure on the central core by enabling some services to be re-routed but also removing the need for passengers to double-back via the centre of Birmingham in order to complete journeys further afield or that aren’t on a current rail corridor.

A further constraint is that the railway in the West Midlands is a key rail freight hub with numerous railfreight terminals and national freight corridors. Freight and passenger traffic is in direct competition for capacity with each other as they both seek increased access to an already full railway. This hampers the ability to grow both sectors and capacity needs to be allocated to enable both to prosper.

The capacity of the rail network in the West Midlands is constrained by the limited capacity of Birmingham New Street station. Whilst capacity constraints exist elsewhere, as the major market is towards the city centre, and the constrained nature of the network there dictating timetable structures nationally, without providing capacity in the city centre, investment elsewhere will unlock very little benefit. It is only when the central area has been relieved that further value can be unlocked in the outlying areas.

Maximising the capacity available will require consideration of how the three existing Birmingham stations of Moor Street, New Street and Snow Hill can operate as combined system of additional capacity, alongside additional capacity enhancements on approach corridors that will enable aspirations for the network to be met.

Providing Additional Capacity

Without additional network capacity, the aspirations set out in the table above are predominantly mutually exclusive. Providing additional station calls, either at new stations or an increased frequency at existing stations will lead to the slowing down of services while there is the aspiration to speed services up. Meanwhile increasing frequency of longer distance services to reduce the GJT consumes capacity that could be used by an

Figure 5: Diagram showing process for utilising addtional capacity

increased local service. Therefore, new timetable paths need to be created. This will allow the following to happen:
The question lies in how to tactically provide extra capacity in the West Midlands that enables this process to develop and how to maximise any infrastructure enhancement to capture the widest benefits.

Another element is creating a distinction, where possible, between service types. The aim is to create a mix of fast and slow services, calling at appropriate stations with appropriate rolling stock to match the service type. This enables the timetable to match connectivity and frequency objectives, economic benefits and capacity constraints helping to improve passenger experience and timetable performance by having a clear distinction between services and destinations.

Thirdly, consideration of efficient operations, both in terms of network capacity, performance of the network and the duplication of operators on corridors can and does present issues when implementing service revisions. Where changes are proposed services are provided, consideration needs to be given to which operator is best suited to operate existing and additional services.

Where is the additional capacity needed?

The long-established solution for additional capacity in Birmingham is to utilise land at Birmingham Moor Street and Snow Hill stations to provide additional platforms and approach tracks with two new chords linking Birmingham Moor Street with the Water Orton Corridor for services towards the East Midlands and the Camp Hill line for services towards the South-West. This creates two new routing opportunities and up to 5 new platforms (4 additional at Moor Street and 1 additional at Snow Hill) that enables better utilisation of the existing platform provision at these stations. These new routing opportunities don't just create new capacity but also provide the ability for more rail corridors to have direct access to Birmingham Moor Street for more convenient interchange with HS2 services from the adjacent Curzon Street station. This is in line with the

Figure 6: Engineering works to provide new infrastructure at Soho North Junction as part of Birmingham New Street re-signalling

infrastructure interventions recommended by the Midlands Rail Hub and aligns with the service outputs it seeks to deliver. However, there are opportunities to utilise these services across the whole network to make better use of the infrastructure to create a network that:

- is easier to understand and use for a passenger
- presents new journey opportunities across the conurbation
- enables more aspirations to be met
- simplifies network operations resulting in better performance
- brings positive change to a wider set of potential users and areas of the West Midlands
- provides a phased approach to delivering service led outputs
- provides improved interchange opportunities reducing the need to travel to central Birmingham to travel to or from the West Midlands.

This is achieved by looking at each corridor and assessing the needs of the train service to meet the demands of that route and its ability to cater for various potentially competing demands. This document will identify areas of constraint and provide recommendations on next steps to resolve specific areas of constraint.

Hub Stations

A key element of how to provide improvements across the board and make the most of capacity is determining where different types of services should call in order to be able to provide a frequent interval of service, better connectivity or faster journey times.

The intention of categorising stations in this manner is to mitigate the impact of not being able to deliver on all the aspirations for the network or potentially the loss in connectivity that may come about as a result of some of the changes proposed.

- Major Hubs – a station where all services call with interchange opportunities with fast, limited stop services to other regions, e.g. Birmingham New Street, Coventry, Wolverhampton.
- Secondary Hubs – a station that is an important destination in its own right or an interchange with more limited rail interchange opportunities, e.g. Tamworth, Nuneaton, Walsall, Smethwick Galton Bridge, University. That means that potentially not all service types need to call.
- Local Stations – all other stations that don't fit the above categorisations.

A key proposal through this document is to create a network of interlinked hubs across the West Midlands that reduce the reliance of the network on Birmingham New Street as a focal

point. Providing services between hubs from one side of the conurbation to the other will provide greater connections and offer different interchange opportunities.

In some areas adequate hubs don't currently exist to meet the needs of the network. Where this applies, recommendations are made for stations that could operate as a hub in the future.

Service Types

The services that serve these categories of station also require a clear delineation of service groups in to three categories to serve these stations:

- Inter-regional/Intercity services: non-stop services operating up to 125mph
- Regional services: limited stop trains linking secondary hubs with major hubs
- Local services: all stations services feeding hub stations.

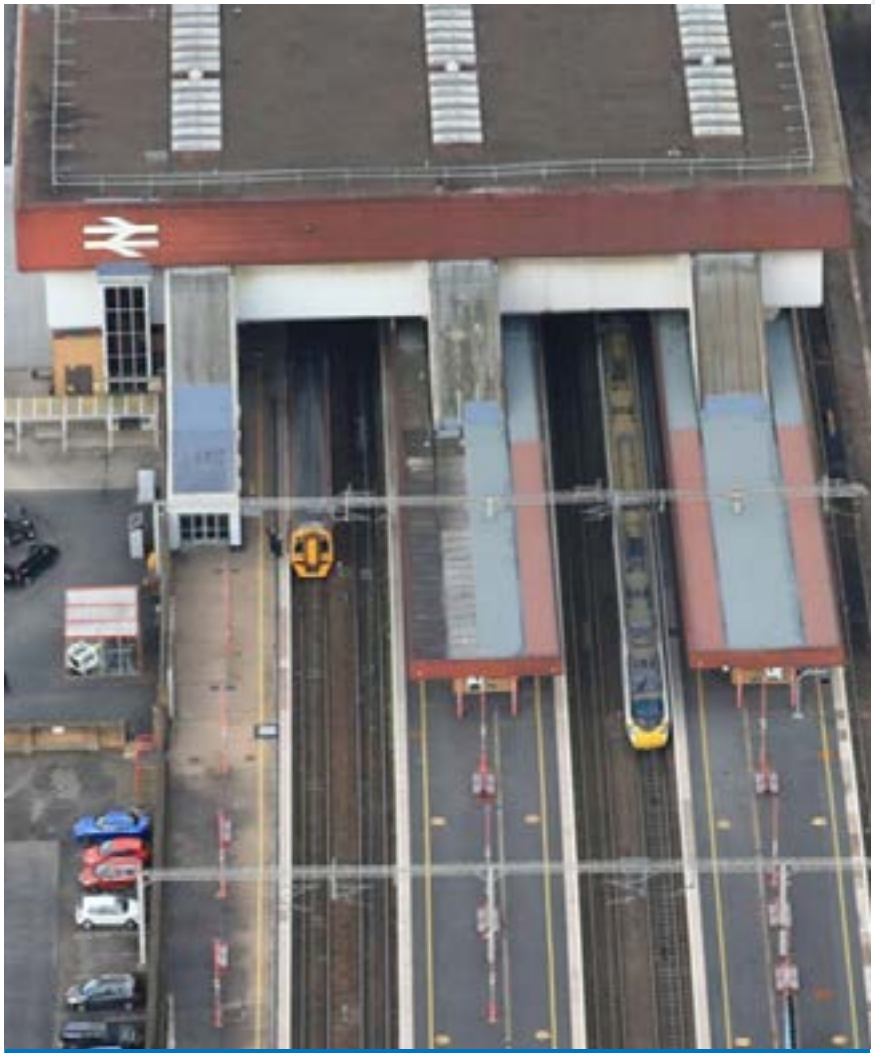

Figure 7: Regional and Intercity services calling at Birmingham International station

The table below outlines the current stations that have been identified as Primary and Secondary Hubs in order to create a hierarchy of service types.

Major Hub Stations	Secondary Hubs	
Birmingham International	Burton-on-Trent	Solihull
Birmingham Moor Street	Kidderminster	Stafford
Birmingham New Street	Leamington Spa	Stourbridge Junction
Birmingham Snow Hill	Lichfield Trent Valley	Sutton Coldfield
Coventry	Longbridge	Tamworth
Leicester	Nuneaton	Telford Central
Shrewsbury	Rugby	University
Wolverhampton	Sandwell and Dudley	Walsall
Worcester Shrub Hill	Smethwick Galton Bridge	Worcestershire Parkway

On some corridors, such as on the southwestern corridor linking Birmingham to Bristol, Cardiff, Gloucester and Worcester, this is already the basic hierarchy of service structure that is outlined above; however on corridors such as the East Midlands corridors to Derby and Leicester, the service structure is less well defined with longer distance services providing local station calls due to the lack of capacity to run additional services both in Birmingham and on these corridors. The least well-defined is on the Wolverhampton corridor where currently up to 12tph operate varying stopping patterns by four different operators to provide connectivity and on-train capacity on this corridor so more comprehensive reorganisation of services will need to be provided.

Impact on Connectivity

In some instances, in order to improve the offering of the wider network, some connectivity that exists today will be changed; however mitigations, either by improved interchange, faster alternatives or increased frequencies to alternatives, will be proposed. The introduction of HS2 services to Birmingham has the potential to dramatically change the way that journeys across the West Midlands and the United Kingdom are undertaken, and the rail network needs to recognise, adapt and influence that change. The Cross-Country network will be amongst the most affected by the introduction of HS2 with the largest flows of the current operation being served by HS2 in the future. This gives the opportunity to reconsider the role of intercity services and whether these present an opportunity to change the way the network operates. On a more local scale, some local services may have to be changed, either by serving a different principal station, or the cross-Birmingham linkage being altered to make a more efficient use of capacity or to provide stronger strategic links.

Access to the City Centre and connections via High Speed 2

The development of Curzon Street station for High Speed Two services is resulting in significant regeneration in the east side of Birmingham City Centre around the station and adjacent to Birmingham Moor Street.

The greater array of services available from this area, plus the planned increase in employment, education and entertainment that is planned in the area will make Birmingham Moor Street a key destination for local services as well as the national high speed services.

Figure 8: The main concourse at Birmingham New Street Station

To maximise the benefit of HS2 for the West Midlands and nationally, it will be necessary to increase the catchment potential of the station to improve journey times across a wider geography. The result is that enabling local services from the wider Midlands area to arrive adjacent to Curzon Street will be crucial to maximising the service. Also bringing improved services from South Wales and the South-West will further strengthen its

role as a major hub station.

The result is an agglomeration effect of running more services to Moor Street strengthens the role of the station and will drive further opportunity. The potential for Moor Street to be of equal importance in the rail network and the city centre as a whole as New Street currently is significant.

This will require the station and the area around to be considered quite differently to how it is today as there will be a large number of interchanging passengers using the area.

Not Via Centre Connectivity

The current passenger network is focussed upon journeys, in all directions, routing via one of the existing central stations in Birmingham. This strategy looks to reduce the need for journeys to have to operate through the centre of Birmingham, especially if it involves doubling back.

To support in this, there need to options that link the radial routes to avoid the need for this. The role of released capacity on the West Coast Main Line via the Trent Valley will be a big factor in this, but there are other lines across the region that could fulfil a role, linking hubs together with services that don't operate via central Birmingham. This includes the routes between Leamington Spa and Nuneaton, the Sutton Park line and the Round Oak – Bescot via Dudley route which could all contribute towards relieving capacity in central Birmingham and providing new journey opportunities.

The role of the hub stations outlined above, and the potential to develop other stations in to hubs will be vital to help break the reliance on all services operating to and through Birmingham New Street. These stations will provide other opportunities to interchange between services, enabling more journey opportunities and to provide additional capacity in the wider network by enabling deconfliction of some rail corridors.

Cross-Country Opportunity

The CrossCountry network serves a series of overlapping flows as well as significant end to end flows. Crucially the current operations provide important inter-regional, cross-Birmingham connections that will continue to play a vital part to completing journeys in the long-term. However, the advent of HS2 services, even if the eastern leg of HS2 isn't built in full, means that there is an opportunity to reconsider the structure of the network to maintain the most important through flows whilst addressing some of the inherent issues with the long distance service operations that include:

- relatively poor performance on a national scale, with delay transmitted over large areas
- lack of timetable flexibility as services must hit specific paths through capacity bottlenecks nationally
- extended journey times as schedules are padded to mitigate poor performance

Addressing these issues will also help to unlock additional capacity and wider performance improvements on the West Midlands railway network but it will lead to trade-offs on some journeys. Furthermore it will help with differentiating services to reduce areas where intercity trains are also catering for short distance local flows.

This primarily achieved by utilising Birmingham Moor Street as a hub for services from the South-West and North-East which enables services from Plymouth, Exeter, Bristol and South-Wales to easily interchange, with HS2 services from Curzon Trains or with classic network trains to the East Midlands, North-East. This would represent a break of connectivity on long-distance through services and to counter the bulk of this impact, it is proposed that some through services are retained through Birmingham New Street on the SW-NE axis. This would retain the most intensively used flows across Birmingham, particularly giving access to and the interchange opportunities that exist at Birmingham New Street. It will also maintain and enhance the direct flows between the Derby, Burton-on-Trent and Tamworth with University, Worcester, Cheltenham and Gloucester.

On the North-West to South-East axis across Birmingham, a similar option is proposed for services from the Thames Valley via Coventry operating through New Street linking with services towards Wolverhampton and the North-West.

There is a notable loss of direct South-West to North-West connectivity and Thames Valley to North-East connectivity under these proposals. Bristol to Manchester being the most prominent stand-out lost direct connection. Once HS2 services start operating between Birmingham and Manchester, the existing classic network service will be able to call at more locations en-route between the two cities. This will lead to an extension of journey times which will make the hourly direct journey less competitive than the HS2 and Moor Street interchange which will have a better generalised journey time, even though it will involve interchange.

On the Thames Valley to North-East flows, enhancement of services to Moor Street via Solihull will give greater access to services to the East Midlands and North East and for Coventry to the East Midlands and North-East, access to these markets via Leicester should continue to be explored as well as the opportunities of HS2 services from Birmingham Interchange. Interchange options will be maintained via New Street for North-West to South-West connections and South Coast to North East alongside some of the through connections but the elimination of the capacity consuming and performance-fragile reversing moves that are required to operate these flows and are potentially of greater benefit to the wider network than the number of journeys that are directly affected. This would enable New Street station to operate, in normal timetable conditions, as two operationally distinct stations, reducing the likelihood of delay passing between routes and enable more capacity to be unlocked.

Despite this, it is not proposed to do any of these changes in

the short to medium-term, with the need to have established a full suite of suitable mitigations that would enable these radical changes to occur. Nor are they a fait accompli and will be subject to more rigorous assessment in subsequent studies. However, it will not be possible to retain all of the connections that are currently provided and be able to increase the capacity ceiling in Birmingham New Street and it is for this reason that it is recommended that the long-distance services are broken up, once suitable mitigations have been established.

Mitigations will include the improvement of the interchange between Birmingham Moor Street and New Street stations and ensuring that interchange between Moor Street and Curzon Street is as seamless as possible. It will also require the development of hub stations on the key intercity corridors radiating from Birmingham that will enable the long distance services to call on the outskirts of the West Midlands to enable interchange on to other services that enable a passenger to complete their journey. This could be on to other intercity services, or on to local services within the West Midlands. This will reduce the burden of interchange that an out of station transfer would introduce. These would be in line with the hub stations concept outlined in Section 5.0 Methodology and Principles and such a concept is essential to enable the services to be considered for more radical remapping.

Reconsidering the network in this manner also gives opportunities to consider new linkages which may enable flows such as Thames Valley to Liverpool or Swindon – East Midlands. The merit of these will need to be considered in a national study of the classic network intercity network and subsequent pieces of strategic advice for specific corridors.

Aspirations for the Network

5

A large number of partners and stakeholders recognise the benefits that the railway can offer to the local, regional and national economy, social mobility and decarbonisation of the wider transport system. These stakeholders also recognise that the current rail offering is holding back economic prosperity and social mobility and the aspirations that they seek are designed to leverage the transformative effects that a regular, dependable fixed transport link can provide. This becomes increasingly important when considering the potential for access to the High Speed Network and how best to leverage its benefits and the opportunity to grow freight when capacity is released for new services by the opening of HS2.

This document collates aspirations for the rail network from a number of different strategies. The purpose is not to reiterate the case for these aspirations, or comment on the respective merits of them, but instead to provide the framework that would enable the aspirations to be met. as a whole system. Each aspiration or set of aspirations will be subject to their own business case(s) as applicable. This document sets out how Network Rail thinks the aspiration could be accommodated alongside the other aspirations for the network.

The aspirations are drawn from Network Rail Strategic Studies, Subnational Transport Body strategies and the West Midlands Rail Investment Strategy as these represent the interests of the constituent members of these organisations. Therefore, there are no inclusions of specific local authority strategies and aspirations unless they feature in the overarching strategies of the sub-national transport bodies.

There are also external developments that don't directly affect the railway associated with wider public realm; urban regeneration or housing developments that may drive additional demand or changes in demand at stations that have also been captured.

Figure 9: Top: Refurbished Perry Barr station, an area of significant regeneration in the West Midlands and bottom, an artist impression of the prospective Moseley Village station soon to be opened on the Camp Hill line (West Mids Rail Executive)

Freight Aspirations

The West Midlands is a key area for rail freight. There are a large number of rail-served facilities in the area, with more in development and the route is a major transit point for the wider network, with traffic between the south and north passing through the West Midlands, in some cases because it is the fastest route, in many other cases due to a lack of alternative viable routings

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Using the Network Rail MDST freight forecast for a high growth scenario (Scenario B). The forecast for the number of freight paths in and around the West Midlands is outlined below.

The diagram shows a level of freight provision on individual route sections between nodes on the network in order to help understand the individual corridor demands. This reflects the fact that freight traffic is a diverse offering of different cargos across a varied geography.

The need to provide viable end to end paths that link up each constituent route section is essential to delivering a credible freight offering. Therefore, provision of adequate access to terminals and looping and regulating capability in order to enable alignment of paths and variances in tonnages to still be able to find a route amongst other traffic will be essential in ensuring that end to end paths can be created for a variety of different origin and destination pairs of varying types of freight traffic.

There are areas of the network where the forecast freight traffic and aspirational levels of passenger service will be in direct competition for scarce capacity. This will either require capacity enhancement, prioritisation of aspirations and considering of alternative routings for passenger and freight services to ensure that capacity is not over subscribed.

Delivery of freight growth in the West Midlands is not just dependent on ensuring available capacity is available in the West Midlands, it relies on capacity being made available nationally through programmes of capacity enhancements that enable freight, be that released capacity on the WCML as a result of HS2, or more traditional capacity enhancement schemes at network bottlenecks elsewhere, such as the sequence of interventions that make up the Felixstowe to the Midlands and the North capacity enhancements.

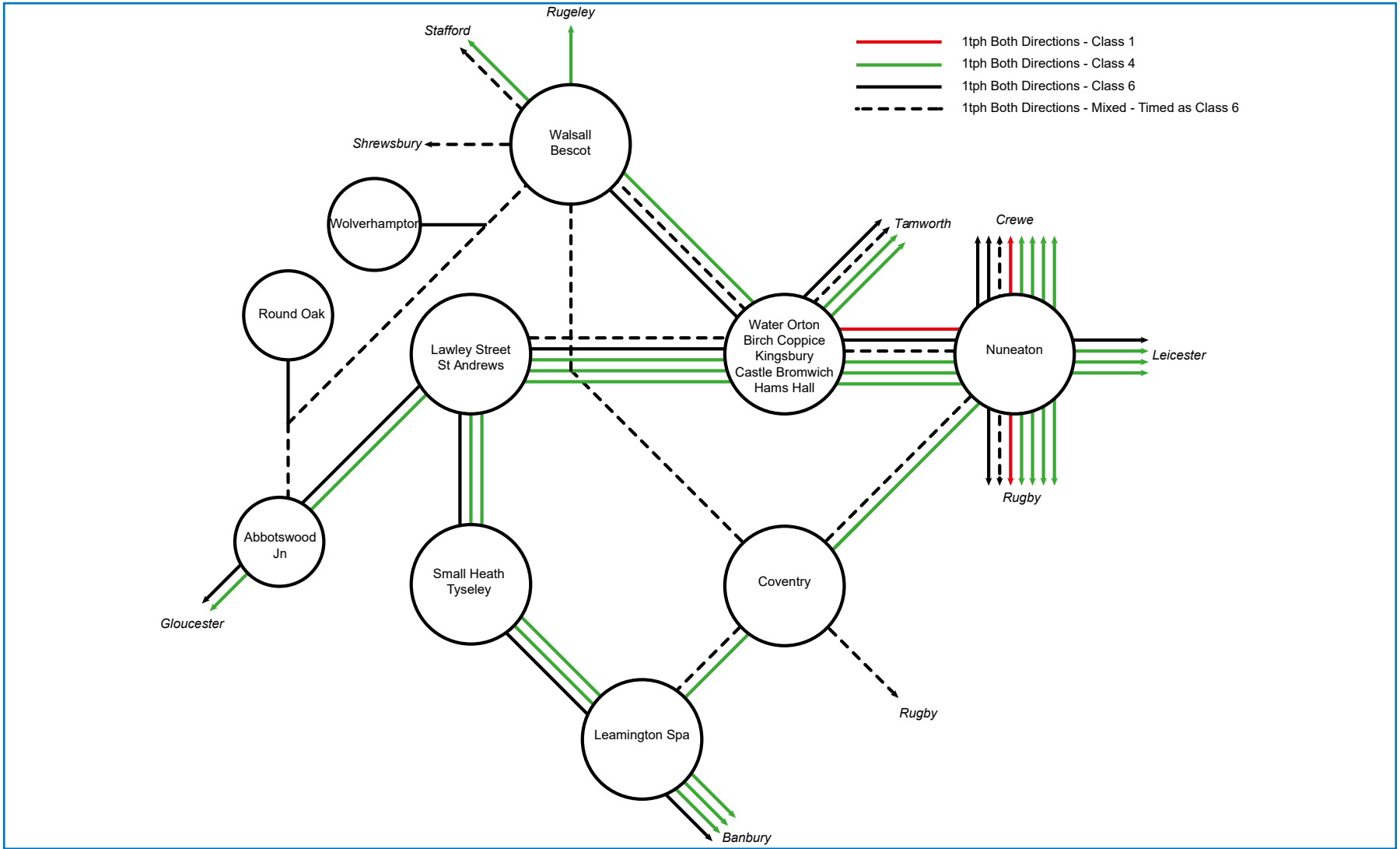


Figure 10: Assumed number of freight paths per hour across the West Midlands network within standard hour timetable development

Passenger Aspirations

All of the aspirations for the wider West Midlands railway network are outlined in the below table:

New Stations	New/Improved Connectivity	Faster Journeys (inc improved GJT)	Urban Development
• Kings Heath, Moseley Village, Pineapple Road	• Improved local service on suburban routes (up to 6tph)	• Birmingham - Liverpool	• Midland Metro expansion to Dudley including interchange at Dudley Port
• Willenhall and Darlaston	• Return to 6tph on Cross-City Line	• Shrewsbury & Telford - Birmingham	• Improved accessibility to Curzon Street station
• Coventry East	• Lichfield to Burton and Derby	• Shrewsbury & Telford - London	• Snow Hill Quarter masterplan
• Rugby Parkway	• Birmingham - Worcester	• Birmingham - Northampton	• Moor Street masterplan
• Fort Parkway	• Birmingham - Hereford	• Birmingham - Leicester	• Digbeth regeneration
• Castle Bromwich	• Birmingham - Oxford and Thames Valley	• Birmingham - Peterborough	• Worcester Shrub Hill masterplan
• Aldridge	• Birmingham - Swindon	• Birmingham - Cambridge	• Perry Barr masterplan
• Sutton Park Line stations (Walmley, Streetly, Minworth, Sutton Coldfield)	• Birmingham International and Coventry - Oxford and Reading	• Birmingham - Nottingham	• Midland Metro expansion to East Side
• Alrewas	• Better links to Stratford-upon-Avon in all directions	• Birmingham - Bristol	• UGC Birmingham International regeneration
• Tettenhall	• Coventry - Nuneaton	• Birmingham - Cardiff	• Redditch station redevelopment
• Dudley Road	• Warwickshire - Oxford	• Birmingham - Hereford	• Solihull Transport Interchange
• Coundon Road	• Coventry - East Midlands	• Birmingham - Stratford-upon-Avon	• Coventry station masterplan
• Foleshill	• Stourbridge & Kidderminster - Worcester & London	• Segregation of fast and slow services in the West Midlands area	• Longbridge redevelopment
• Nuneaton Parkway	• Ironbridge Branch	• Kidderminster - Birmingham	• Walmley/Minworth growth area
• Brownhills	• Lichfield – Walsall	• Birmingham – Swindon	
• Warwick University	• Coventry – Trent Valley	• Birmingham - Watford	
• Galley Common			

Corridor by Corridor Breakdown

6

The proposals for passenger service structure on each of the corridors in the West Midlands are covered in this chapter. In addition to the passenger services shown in these corridors, capacity needs to be provided for freight services outlined in section 6.0 Aspirations for the Network alongside the passenger aspirations.

Each section outlines the aspirations that drives the train service specification accompanied by a narrative of the constraints and trade-offs that may need to happen.

Central Stations Capacity

This strategy has been built upon the baseline of the capacity that is available at the three main stations in Birmingham on the classic network.

Birmingham New Street

No additional capacity is assumed here beyond the scope of the Birmingham New Street Resignalling scheme which will be commissioned in 2023. This leaves New Street with 12 through platforms all of which can be utilised with a fully signlalled 'A' and 'B' section and the bay platform, Platform 4C.

Birmingham Snow Hill

The Midlands Rail Hub layout is assumed for Snow Hill which keeps the existing arrangement and reinstates Platform 4 at the station as a through platform in the space of the former Midland Metro platforms.

Birmingham Moor Street

At Moor Street, it is assumed that the full Midlands Rail Hub intervention at Moor Street is delivered which comprises

- 4 bay platforms on the west side of the formation with a dedicated pair of approach lines from Bordesley West Chord
- Bordesley West Chord which gives access from Moor Street towards Kings Norton via the Camp Hill Line
- 2 bay platforms on the east side of the station with a dedicated pair of approach lines from Bordesley East Chord
- Bordesley East Chord which gives access from Moor Street towards Water Orton via the Camp Hill Line
- 2 through platforms with dedicated approach tracks enabling access from Tyseley through to Birmingham Snow Hill
- A track layout that enables trains to operate to and from Birmingham Snow Hill via Bordesley East Chord via the through platforms at Birmingham Moor Street

Allocation of Capacity

A high level assumption has been used around platform capacity to give a robust operation that is achievable subject to the simplification of flows in to the central stations that reduces the number of conflicting moves in order to maximise capacity. These are arranged by service type, reflecting the need for different service types to have appropriate length of turnrounds.

It has been assumed that (including platform reoccupations):

- Local Services require 12 minutes to turnround, enabling up to 5 turnrounds per platform per hour
- Regional Services require 20 minutes to turnround; enabling up to 3 turnrounds per platform per hour
- Intercity Services require 30 minutes to turnround; enabling up to 2 turnrounds per platform per hour.

This applies to services terminating at the Central Birmingham Stations. Services that are running through are assumed to have typical dwell times at the central stations.

The allocation of capacity has been an iterative process trading off corridor requirements against central platform capacity and has resulted in the following quantum of service.

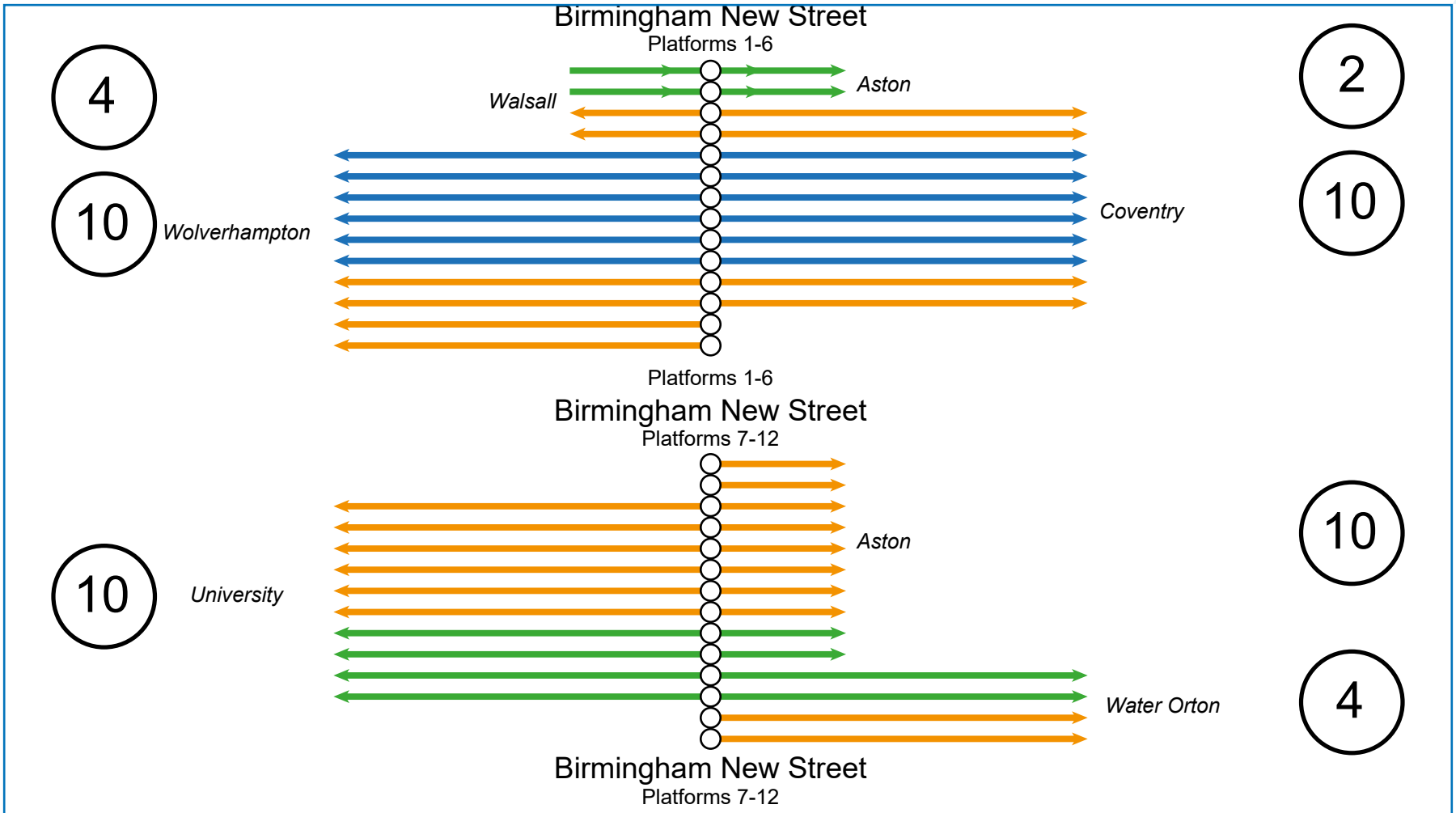


Figure 11: Assumed number of paths per hour at Birmingham New Street. The segregation of flows at the station enables a more efficient use of capacity enabling extra trains to operate. Numbers in circle equate to the number of arrivals per hour operation on each corridor approaching the station. Each line represents a return train path per hour

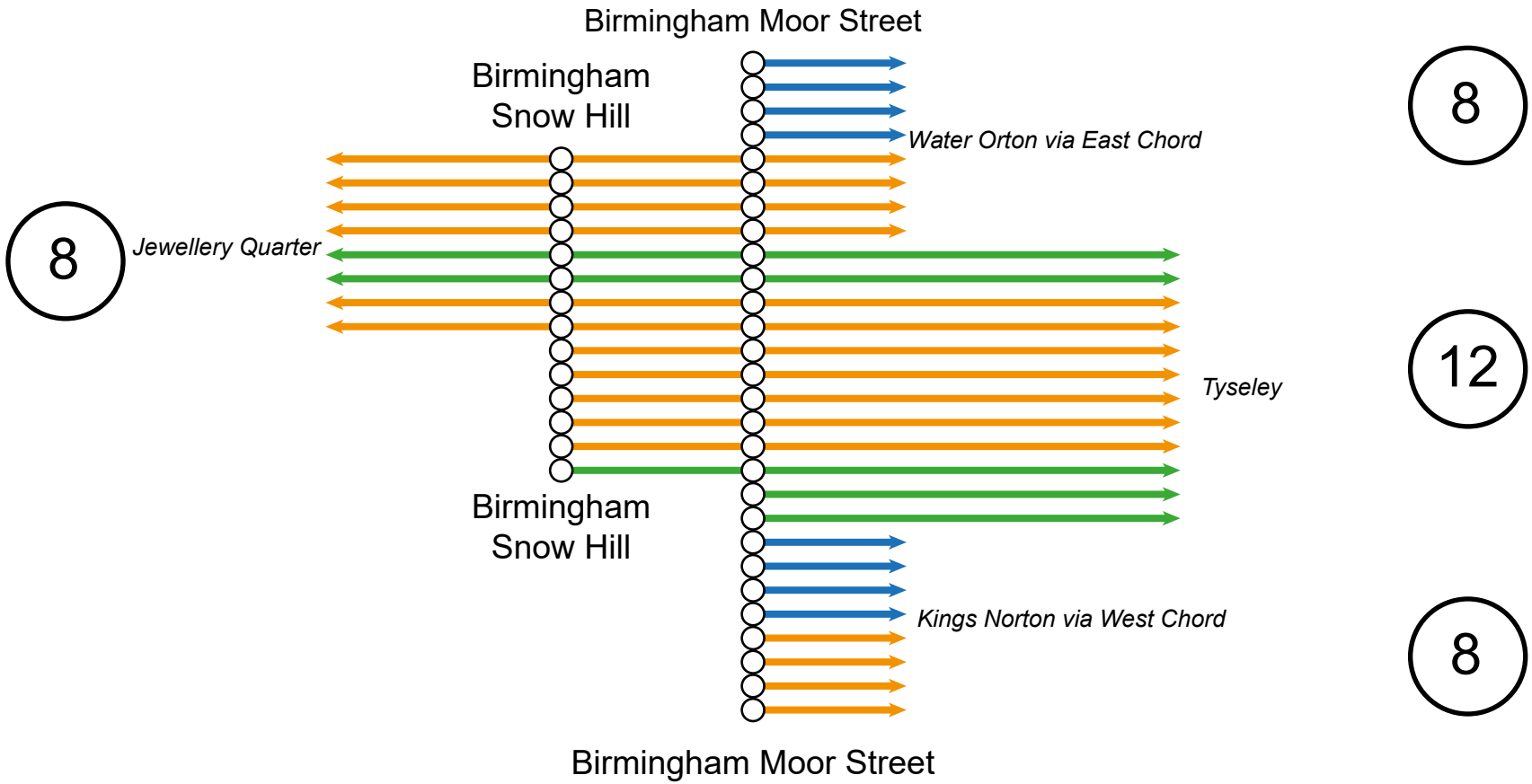


Figure 12: Assumed number of paths per hour at Birmingham Moor Street and Birmingham Snow Hill. The dedicated approach lines to Birmingham Moor Street enables the limited number of platforms to be used much more efficiently Numbers in circle equate to the number of arrivals per hour operation on each corridor approaching the station

	2019	Long Term Potential
Birmingham Moor Street	8.5 (excluding arrivals from Snow Hill)	28
Birmingham New Street	48	50
Birmingham Snow Hill	6 (excluding arrivals from Moor Street)	8 (+4)
Total Arrivals	62.5	86 (+4)

By allocating capacity in this way, the total number of paths available per hour in to Birmingham increases by 50 % from its peak in 2019. The distinction is that in 2019 the infrastructure was incapable of handling even those 2019 levels as demonstrated by the poor performance of the May 2019 timetable.

Simplifying the operational structure through Birmingham New Street enables the capacity ceiling to be increased to enable additional services to be accommodated.

The essential element to this is the full infrastructure scope at Birmingham Moor Street and Bordesley Chords, enabling the comprehensive remapping of services across stations as capacity constraints are relieved elsewhere. Delivery of this level of infrastructure provides the basic building blocks that enables the rest of the strategy to become possible.

It is only once both new chords and the additional platforms at Birmingham Moor Street and Snow Hill are provided that comprehensive remapping of services can be unlocked. Prior to that point, if only one chord is build, it is only possible to add single trains to the existing timetable structure without significant impacts on connectivity and usability.

The scope outlined below in Figure 10 is actively provided for in the Midlands Rail Hub scope.

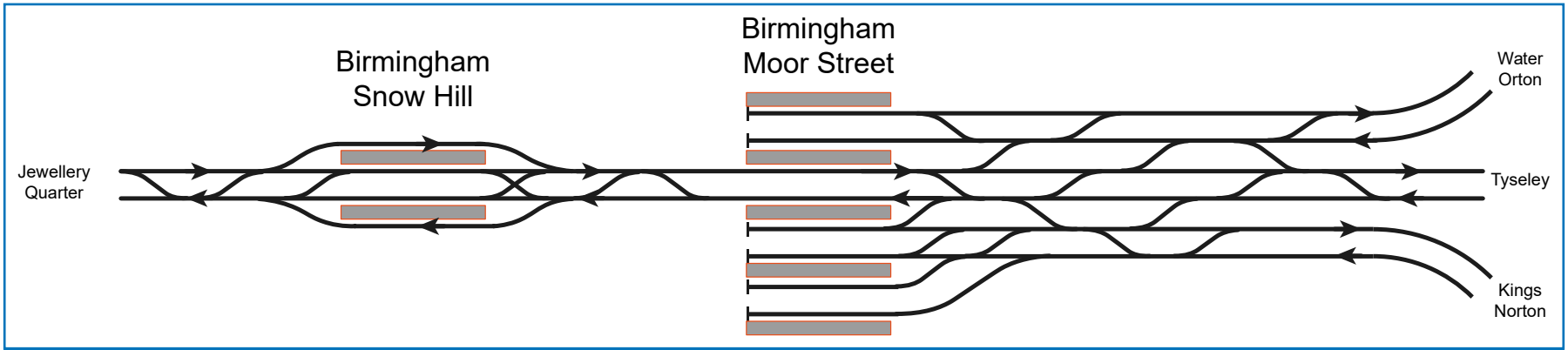
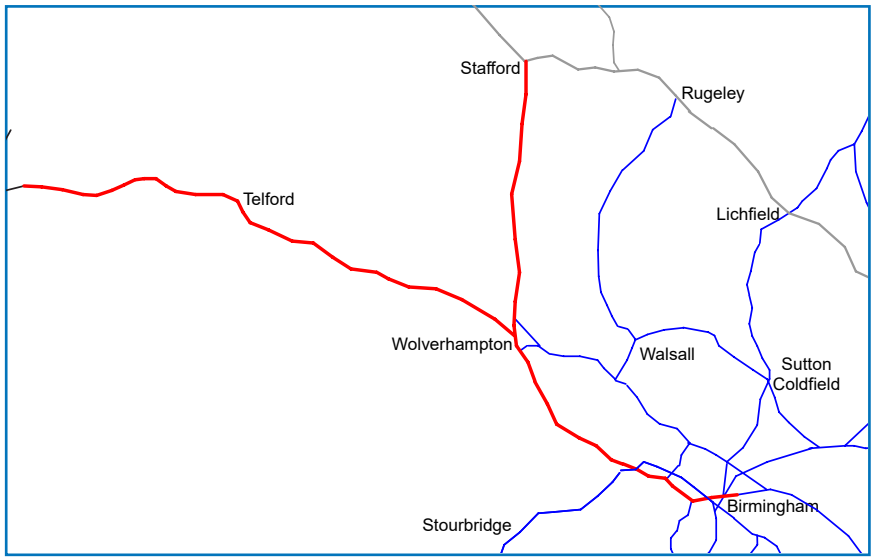


Figure 13: The track layout that Midlands Rail Hub provides for in its indicative design. Whilst not all crossovers are included in the Midlands Rail Hub scope, passive provision is provided for them to enable them to be added as other constraints are relieved

Different Service Types to Meet Expectations

Different tiers of service level enables the consideration in the future for reconsideration of which operator should operate which services. Additionally, there is scope to consider what the service expectation is for each type of train, be it the train configuration or the fare structure to help balance capacity and improve passenger satisfaction on specific corridors. This could be used to try and reduce the number of short local trips being taken on intercity services and encourage demand on other corridors where local services could have different fares as the customer offering is lower than regional or intercity alternatives.

Birmingham to Wolverhampton, Stafford and Shrewsbury



On this corridor, the major hubs are Birmingham New Street and Wolverhampton. There are secondary hubs at Smethwick Galton Bridge and Sandwell and Dudley. The former provides interchange with the Snow Hill lines which will provide opportunities to reach Stourbridge, Kidderminster and Worcester in one direction and Birmingham Snow Hill and Moor Street and Solihull in the other. Sandwell and Dudley is the primary rail gateway to the wider Black Country currently.

Dudley Port will become an interchange with the West Midlands Metro tram network in the future with the extension of the Metro to Dudley town centre. This development promotes the station to the status of a secondary hub in this study; providing new access to the Black Country and consideration will need to be given to potentially calling patterns of longer distance services in the future to maximise this potential.

Aspirations for Corridor	
New Stations	Brinsford Parkway, Tettenhall, Shrewsbury Parkway
New/Improved Connectivity	Up to 6tph at local stations; Improved frequency at Dudley Port for Metro interchange; Ironbridge branch line
Faster Journeys (inc GJT)	Birmingham – Liverpool; Birmingham – Shrewsbury; London – Shrewsbury; London – Wolverhampton
Urban Development	Midland Metro extension to Dudley
Freight Requirements	Hourly Class 6 path between Soho North Jn and Galton Jn or Wolverhampton 2 paths per hour, 1 Class 4 and 1 Class 4/6 to operate between Bushbury Jn and Stafford

Once HS2 services are introduced, there is an opportunity to recast the service specification of this corridor, however there will still be a need to provide longer distance fast services on this corridor to provide for the following markets, amongst others:

- Wolverhampton – London
- Birmingham – Wolverhampton – Stafford – Stoke-on-Trent – Macclesfield – Manchester
- Birmingham – Telford – Shrewsbury
- Birmingham – Warrington, Wigan and Preston
- Birmingham – Liverpool

The latter two could potentially be delivered via HS2 in the future which would reduce the requirement for fast paths on this corridor, opening new opportunities for enhanced local provision or for faster services on the corridor to pick up additional calls.

Further work will determine capacity at Crewe and into Manchester, Liverpool and along the West Coast Main Line North that will identify the best use of capacity in these areas. This will impact directly on this route section, however, the need for up to 6 fast paths between Birmingham and Wolverhampton will required to meet connectivity in the future, regardless of the final Train Service Specification delivered by High Speed 2 services.

Evidence from the West Coast South Strategic Advice, West Midlands Rail Investment Strategy and work by Midlands Connect on the Shrewsbury corridor demonstrate the potential for regular Shrewsbury – London services. This service would deliver part of the need to provide a two train per hour Shrewsbury and Telford limited stop service to Birmingham.

The two-track nature of the corridor limits the route to a maximum of 6 faster paths per hour which hampers the ability to improve the all-stations service between Birmingham and Wolverhampton. Headway is already 3-minutes but the slow approaches to Wolverhampton station and Birmingham New Street and the number of intermediate stations limit the ability to maximise this capability. Adoption of ETCS on the corridor to enable closer flighting of services may enable some timetable flexibility and a more reliable operation but is extremely unlikely to unlock additional capacity in the form of extra train services because the need to deliver a mixed service is the biggest constraint on capacity.

There are aspirations to decrease the journey time between Birmingham and Wolverhampton. However, without providing additional network capacity this could only be achieved by removing trains from the corridor and station calls at intermediate stations which is contrary to almost all of the connectivity aspirations. Reduced journey times are only practicable by providing additional tracks to enable faster trains to overtake stopping services, something that is not possible to do on the existing rail corridor.

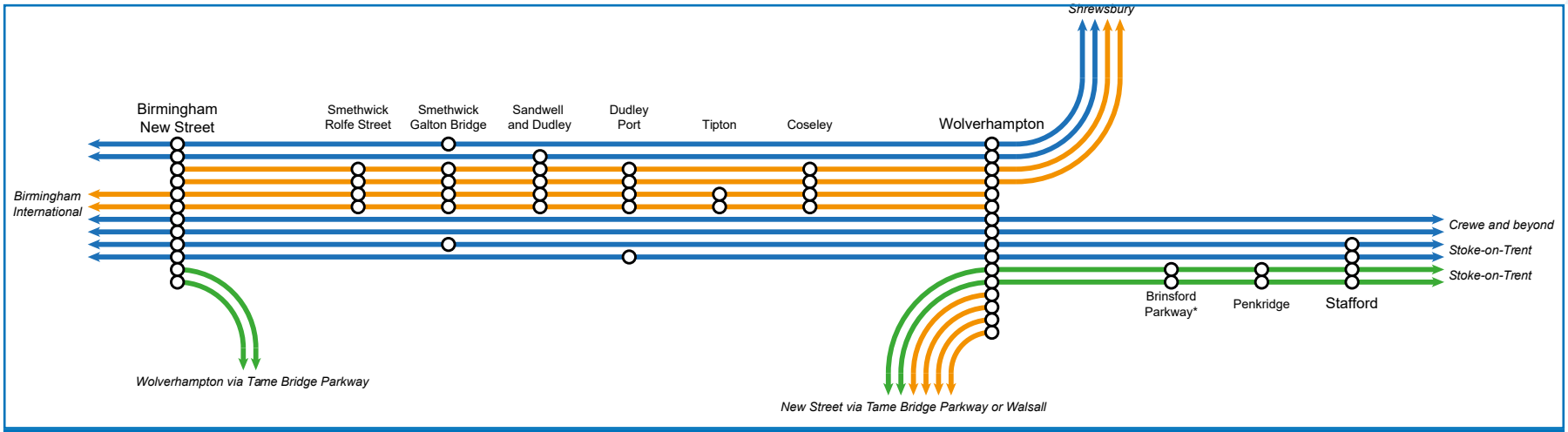


Figure 14: Indicative end-state Train Service Specification that delivers on the combined aspirations for Birmingham to Wolverhampton, Stafford and Shrewsbury. This may require further interventions beyond the central Birmingham area scope.

There is no viable alternative routing to allow trains from this corridor to reach Birmingham Snow Hill or Moor Street stations therefore all services must operate to Birmingham New Street station.

These requirements of the train service and the aspirations to provide at least 4tph at local stations results in the service recommendation set out in the diagram above.

This structure operates on a broadly 15-minute repeating pattern It also provides for new connections for the Black Country via Sandwell and Dudley, Smethwick Galton Bridge and Dudley Port to London, Manchester, Oxford and Reading which previously required interchanges at either Wolverhampton or Birmingham while creating space for more calls at local stations on the route.

The capacity of the two-track railway on this route precludes the ability to call more than 4tph at all stations and even providing 4tph at all stations is not possible without affecting the journey times of faster services. For this reason, it is suggested that Tipton is the station that doesn't have the full 4tph due to its proximity to Dudley Port. Improvement to headways and capacity improvements at Wolverhampton may enable 4tph to call at all stations on the route.

Further, it is not possible to create an even 15-minute stopping pattern, with the all-stations service having to operate at

20/10-minute interval, however, Smethwick Galton Bridge, Sandwell and Dudley and Dudley Port will all be supplemented by calls in longer distance services.

Two of the all-stations trains are shown as operating all the way to Shrewsbury. The assumption here is that these would provide the all-stations service between Wolverhampton and Shrewsbury, however this is subject to further study on that corridor.

Consideration needs to be given to platform length impacts of calling longer distance trains at Smethwick Galton Bridge and Dudley Port as currently the platforms at these stations are too short to enable longer-distance type rolling stock to call.

The train service specification outlined above has a large number of services calling at, and terminating at Wolverhampton station. The station occupies a constrained site and further work will need to be undertaken to determine what is the optimum level of service that can be provided in this area and which services should run as through trains. The large number of services operating between Birmingham – Wolverhampton that it may be required to terminate some services at Wolverhampton from the north, releasing vital capacity on the railways south of Wolverhampton.

Longer term, there is no practical way to provide additional capacity on this corridor as the rail corridor is heavily constrained. In order to increase capacity a new rail corridor will need to be considered, this would enable the ability to:

- Serve new areas of the West Midlands with a new rail corridor
- Provide faster journeys between Wolverhampton and Birmingham and therefore between Birmingham and Stoke and Shrewsbury
- Release capacity on the existing corridor for a more intensive suburban service and new station provision between Birmingham and Wolverhampton.

Figure 15: A West Coast service passing Smethwick Galton Bridge heading to Wolverhampton

Wolverhampton to Shrewsbury

The two trains an hour all stations service to Wolverhampton could both operate through to Shrewsbury, presenting an uplift in service at all stations but with extended journey times to Birmingham, although with electrification of the route, it is possible that this could be off-set by faster acceleration. If a 2tph all stations service is considered overprovision, 1tph could terminate at Wolverhampton, or be utilised for a prospective service on the Ironbridge branch in order to provide an Ironbridge to Birmingham direct service, should this line be reopened for passenger traffic as suggested.

An alternative structure for the Shrewsbury Corridor could involved skip-stopping at stations like Bilbrook and Cosford between Wolverhampton and Shrewsbury, thereby preserving journey times to Birmingham. This would however be at the expense of connectivity on the line itself, but this could be retained by provision of an all-stations service between Wolverhampton and Shrewsbury utilising a reinstated Platform 6 at Wolverhampton.

Another consideration for this corridor is the possibility of consolidation of stations that could enable improved journey times and better service levels at intermediate stations between Wolverhampton and Telford. Currently Cosford and Albrighton are within a mile of each other and each only receives one train per hour. A new station site that could replace both stations could be more accessible, have better parking and potentially have a wider catchment that could justify more services calling

Figure 16: A Shrewbury service approaching the station

there and help support modal shift to rail on this corridor whilst still continuing to serve the existing markets.

A similar consolidation could be considered for Codsall and Bilbrook by providing a new station that is more accessible and has a better service level, thereby improving the both the local and corridor-wide service level and contributing to the growing patronage of the route. However, finding a suitable site for a new station will present a key challenge to achieving a transformational effect.

The route between Wolverhampton and Shrewsbury is not currently electrified. Until the route is electrified the all-stations service would either be required to be operated by diesel stock or potentially bi-mode rolling stock to enable use of the electrified infrastructure between Birmingham and Wolverhampton.

Wolverhampton to Stafford

The railway north of Stafford carries fast services to cities in the North West and local services to Stoke-on-Trent. The intermediate station of Penkridge requires regular local services towards Stafford and Birmingham. Stafford itself will be an important interchange between services on the WCML Trent Valley route and those operating between the West Midlands and the North West.

The construction of the new Strategic Rail Freight Interchange (SRFI) at Four Ashes on this section of route will lead to increased freight services on this section from both directions. Whilst there is significant available capacity on this route, opportunities should be sought to mitigate the impact of increased traffic. A prime example would be renewing Bushbury Jn to enable traffic that is by-passing Wolverhampton station to do so at higher speed, thus reducing the capacity impacts of trains using this junction. This also includes passenger services that are routed via the West Midlands when the Trent Valley route of the West Coast Mainline is blocked either on a planned or unplanned basis.

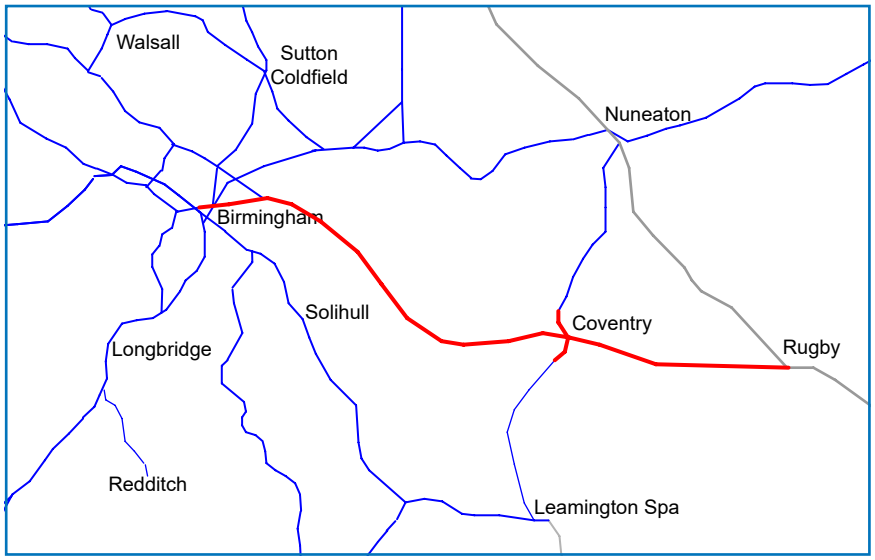
Regional services to Stoke-on-Trent can provide the local calls at Penkridge and the proposed Brinsford Parkway station, however, utilisation of local services that terminate at Wolverhampton by extending them to Stafford would enable Penkridge and Brinsford Parkway to be removed from the regional services to Stoke, potentially providing faster journey times between Staffordshire stations and Birmingham.

Next Steps

Wolverhampton Area Strategic Advice that looks at the opportunities for maximising capacity in the Wolverhampton area ahead of the development of a new rail corridor linking Birmingham – Wolverhampton.

This will need to consider the options for additional platforms at Wolverhampton and improving the linespeed in the station area as well as changes to service structures to be able to maximise capacity.

Birmingham to Rugby via Coventry



This corridor covers important commuter flows in to Birmingham as well as longer distance flows to Milton Keynes, Watford and London. Capacity released by High Speed 2 will enable a change to service structures on the West Coast Main Line and to an extent on this route section too.

On this corridor, the major hubs are Birmingham New Street, Birmingham International and Coventry. There is a secondary hub at Rugby.

Birmingham International will provide access to High Speed 2 via Birmingham Interchange station and there is planned to be significant developments around this area as well as the continued importance of the connection to Birmingham Airport and the National Exhibition Centre.

Aspirations for Corridor	
New Stations	Coventry East, Rugby Parkway
New/Improved Connectivity	Coventry and Birmingham International – Reading, Oxford and the East Midlands
Faster Journeys (inc GJT)	Birmingham – Northampton; Birmingham – Milton Keynes; Birmingham - Watford
Urban Development	UGC Birmingham International
Freight Requirements	Hourly Class 6 path between Stechford and Coventry Hourly Class 6 path between Coventry and Rugby Hourly Class 4 and Hourly Class 6 between Leamington Spa and Nuneaton

Once HS2 services are introduced, there is an opportunity to recast the services on this corridor however there will still be a need to provide longer distance higher speed services to provide for the following markets:

- Coventry – London
- Birmingham – Rugby
- Birmingham – Milton Keynes
- Birmingham – Watford
- Wolverhampton – London

Evidence from the England's Economic Heartland Passenger Rail Study and the West Coast South Strategic Advice show that there is a market for improved Generalised Journey Time between Birmingham and Northampton. Currently, the service between Birmingham and Northampton also provides the local service between Birmingham and Coventry which precludes providing better services now. Aspirations for new stations at Rugby Parkway and Coventry East (Binley) would further lengthen the current Northampton journey times, therefore additional services are needed to be able to provide calls at new stations and speed up the end-to-end journey options.

All services on this corridor must be routed to Birmingham New Street as there is no routing available to Birmingham Moor Street or Snow Hill, however, there are interchange opportunities with HS2 at Birmingham Interchange via Birmingham International station. The remaining fast services on the WCML will continue to provide direct connectivity to London and the north-west to make up for the lack of enhanced interchange opportunities with HS2 by services operating only to Birmingham New Street.

The need to provide a high number of fast services, as well as providing capacity for freight, both across Coventry and between Coventry and Stechford, limits the ability to provide a significant increase in all stations stopping services without infrastructure enhancement. In order to increase the provision of all station calls alongside the need to retain fast services this will require capacity enhancements as detailed in the 2016 West Midlands and Chilterns Route Study, namely elements of four-track railway in the Birmingham International area.

Ahead of providing additional capacity on the corridor, the speed differential between services needs to be reduced in order to provide sufficient capacity to improve frequencies at as many stations as possible. This is probably best achieved in the medium term by not operating fast services at 125mph, although it may be desirable to retain this speed to enable more robust performance in times of perturbation.

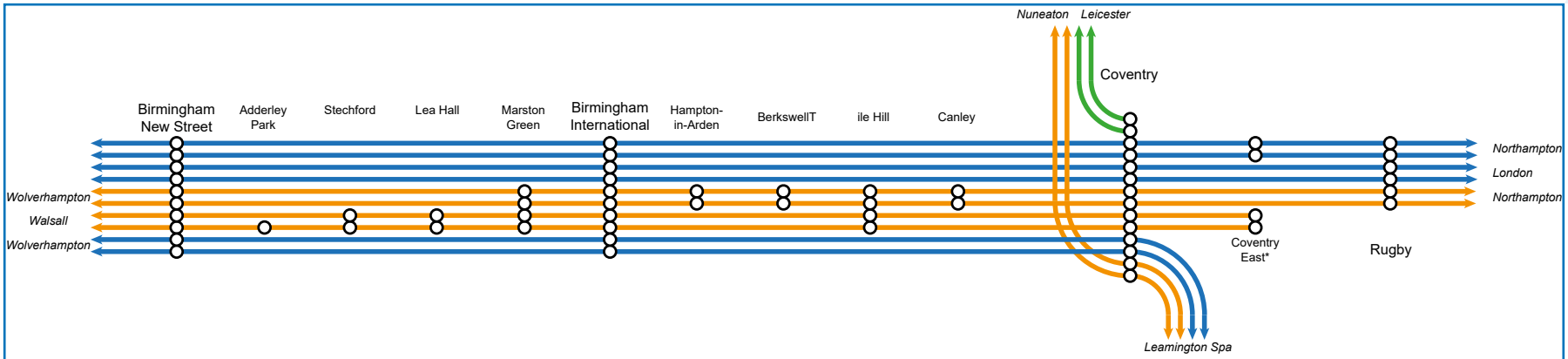


Figure 17: Indicative end-state Train Service Specification that delivers on the combined aspirations for Birmingham to Rugby via Coventry Corridor. This may require further interventions beyond the central Birmingham area scope.

An indicative service specification is shown above. This provides 2tph at all station on the route and 4tph at the busiest intermediate stations at Marston Green and Tile Hill. This structure provides a structure that could enable new station calls at Coventry East and Rugby Parkway should those stations be developed. This structure, incorporating an enhanced local service, could only operate by adding two or three minutes to Birmingham-Coventry fast services. The impact of this headline journey time reduction would however, be mitigated by an improved Generalised Journey Time resulting from a more frequent service.

Consideration needs to be given to providing enhanced turnback facilities at Coventry to make terminating a train from the Birmingham direction more viable. This could be achieved through alterations to the layout at Coventry or potentially by providing turnback options at Coventry East, enabling more services to call at this station while relieving capacity constraints at Coventry.

The service structure is similar to that on the Wolverhampton corridor and the two service groups could potentially operate as through services subject to timetabling constraints; there may be opportunity to link services through the Coventry corridor with those to Walsall at New Street, increasing local connectivity opportunities. At the Northampton end of the corridor, West Coast South Strategic Advice will determine whether there are benefits for operating through services at Northampton from capacity, performance and connectivity point of view. Having a self-contained West Midlands service

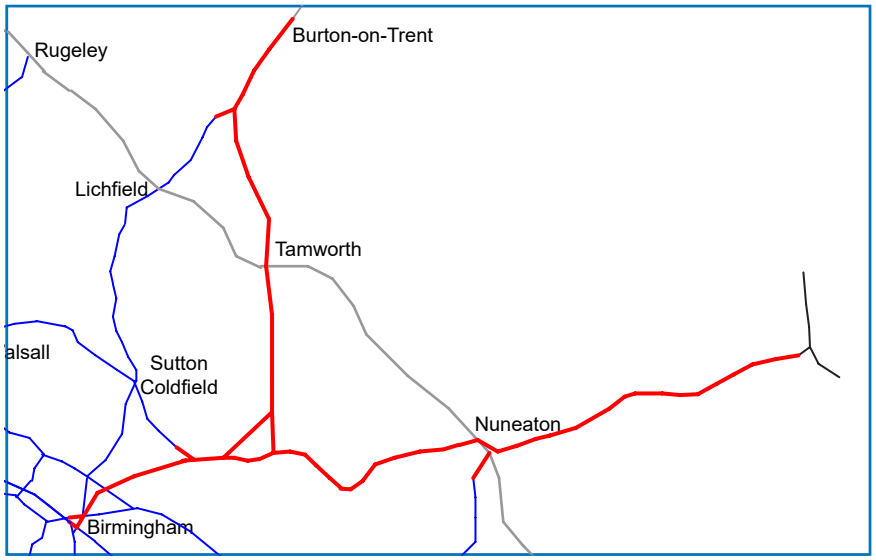
group at Northampton would provide for simpler operations between the WCML and the West Midlands, generate performance benefits to the whole network, and allow better matching of rolling stock to service types.
Provision of an element of 4-tracking between Stechford and Birmingham International would enable a 4tph structure at all stations except Adderley Park, Hampton-in-Arden and Berkswell. It would also enable the fast services to operate on a 15-minute interval rather than a heavily flighted half-hourly structure. This also gives the opportunity for an additional pair of fast paths an hour on the corridor that could be utilised for new connectivity with the West Coast Main Line and East West Rail, potentially linking Birmingham with Cambridge with much faster routing options than the existing route via Peterborough whilst retaining improved connectivity between the West Midlands and Northampton.

Next Steps

Coventry Area Strategic Advice looking specifically at how to cater for the aspirations from this document and West Coast Strategic Advice in the constrained station area and how to incorporate Coventry East station such that it benefits network capacity. The layout that supports additional freight traffic that could use the route once Leamington to Coventry is fully double tracked.

Figure 18: External view of Coventry Station

Birmingham to the East Midlands



This corridor links the West Midlands with the East Midlands and is an important freight and intercity passenger corridor.

Passenger services continue towards Derby, Nottingham, Sheffield, Doncaster, Leeds, Leicester, Peterborough and Cambridge. Freight typically operates from the deep sea ports at Southampton and Felixstowe to distribution hubs across the Midlands and North alongside a diverse mix of construction materials, steel, petroleum and automotive traffic.

The wide variety of traffic on these corridors presents capacity challenges to meet all the aspirations, including numerous new station proposals.

Nuneaton and Tamworth are important population centres which also provide interchange opportunities with other rail corridors. Introduction of HS2 services will release network capacity to provide increased calls at both locations on the West Coast Main

Aspirations for Corridor	
New Stations	Fort Parkway, Castle Bromwich, Galley Common, Nuneaton Parkway, Kingsbury
New/Improved Connectivity	Passenger services on the Sutton Park Line; Improved services to Nuneaton and Tamworth for interchange with WCML Improved local service to Wilnecote, Hinckley, Narborough
Faster Journeys (inc GJT)	Birmingham – Nottingham; Birmingham – Derby; Birmingham – Leicester; Birmingham – Peterborough and East Anglia
Urban Development	Walmley/Minworth growth area
Freight Requirements	Up to 5 paths per hour between Birmingham and Leicester; Up to 4 paths per hour between Water Orton and Leicester and 3 paths per hour between Water Orton and Walsall

Line, opening a wider array of locations for onward travel and underscoring the imperative to maximise options for interchange.

Midlands Rail Hub proposes to double the service towards Leicester from Birmingham to 4tph and to improve the service linking Birmingham and Nottingham, enabling existing services to be sped up by providing more stopping services on the route. This requires a number of interventions along the route including headway improvements, changes to the layout at Water Orton and Kingsbury as well as passenger looping options at Burton-on-Trent.

By more efficiently utilising the proposed Midlands Rail Hub infrastructure the service offering can be simplified for passengers, capacity can be released in Birmingham New Street and greater interchange opportunities provided at Birmingham Moor Street for connections from Oxford and the Thames Valley towards the East Midlands as well as services from the South-West. This would result in the service specification outlined below. This would enable new stations to be planned served by stopping services while enabling longer distance services to be sped up by moving station calls in to the new services.

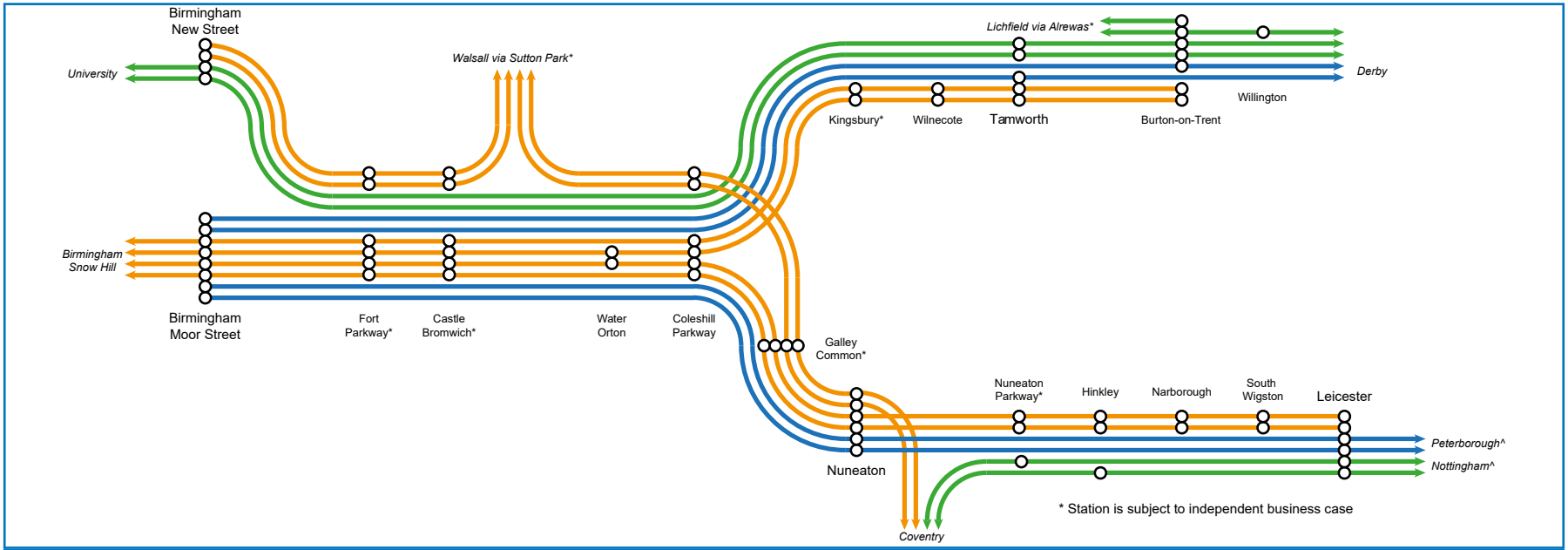


Figure 19: Indicative end-state Train Service Specification that delivers on the combined aspirations for Birmingham to the East Midlands. This may require further interventions beyond the central Birmingham area scope.

Although many stations on the route would lose direct connectivity to Birmingham New Street there are greatly improved connections to Birmingham itself, as well as high frequencies to Tamworth, Nuneaton and Leicester. This structure provides room for the numerous new station aspirations while providing the opportunity for generalised and headline journey time improvements to the East Midlands and beyond.

The TSS doesn't indicate which services should operate Derby to the North-East and Nottingham as this will be heavily influenced by decisions involving High Speed 2 and the Integrated Rail Plan (IRP). The structure itself is largely insulated from IRP as IRP will only affect how far the trains operate beyond Derby.

To maximise connectivity and capacity and to mitigate the loss of local services to Birmingham New Street, it is suggested that the local services on this corridor continue to Birmingham Snow Hill and at least to Smethwick Galton Bridge, providing interchange for services to Wolverhampton and Shrewsbury. The improved opportunities for access to HS2 at Moor Street and WCML destinations via better connectivity at Tamworth and Nuneaton should also help to mitigate the diversions.

Provision of two fast Leicester services sets a pathway to providing improvements to Peterborough journeys although a second train per hour east of Leicester requires improvements at Leicester and beyond as outlined in the Leicester Continuous Modular Strategic Planning document. This is an output sought by both Midlands Connect and England's Economic Heartland.

The TSS does include aspirations for passenger services on the Sutton Park Line and indicates ways that these services could be provided as part of the wider structure however these are dependent upon sufficient capacity being available at either Birmingham New Street or Moor Street to provide capacity and sufficient capacity at Castle Bromwich/Water Orton Junctions to enable the services to access the Sutton Park line.

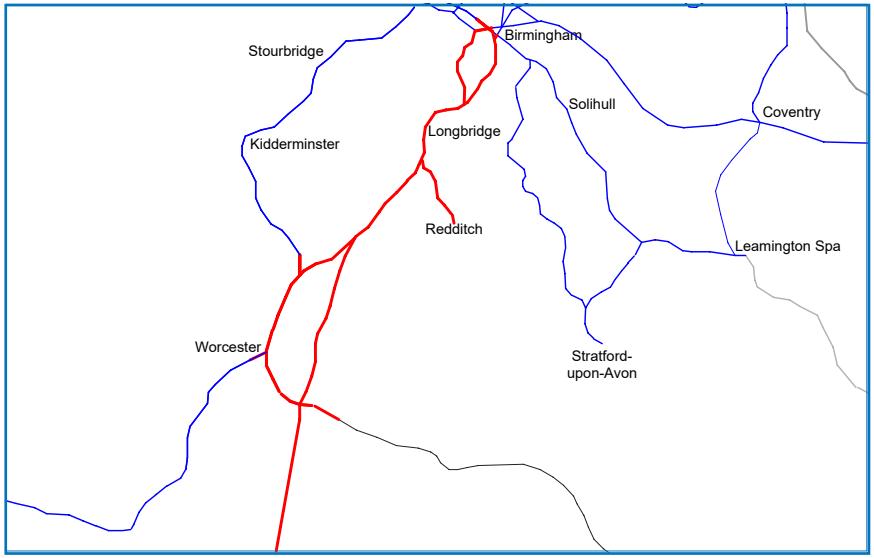
Next Steps

Water Orton Corridor Strategic Advice looking at how to factor in freight and local passenger operations on the Sutton Park line and its interactions in the Water Orton area.

This will need to include options looking at how to run local services out towards Burton-on-Trent to enable service frequency increases at Wilnecote and Tamworth alongside the regional and intercity calls.

Figure 20: Water Orton station and junction, the major constraint to providing additional capacity on this corridor once capacity in Central Birmingham is addressed (Network Rail)

Birmingham to the South West



This corridor that links Birmingham New Street with Bromsgrove Worcester and Hereford. Services continue via Cheltenham to Gloucester, Bristol and Cardiff. The South-West corridor is one of the busiest railway routes in the West Midlands with an intensive stopping service and a mix of intercity services.

The major hub on the route is Birmingham New Street with secondary hubs at University, Bromsgrove, Worcester Shrub Hill, and Worcestershire Parkway.

There is no location on this corridor that enables full interchange between all services currently operating across this route.

In the future services will be able to reach Birmingham Moor Street via the Bordesley West Chord.

Aspirations for Corridor	
New Stations	Moseley Village, Kings Heath, Pineapple Road
New/Improved Connectivity	More station calls at Worcestershire Parkway; Worcester and Bromsgrove to South-West, Birmingham - Swindon; Cross-City 6tph; 4tph at Camp Hill stations; More connectivity to University
Faster Journeys (inc GJT)	Birmingham – Bristol; Birmingham – Cardiff; Birmingham – Worcester; Birmingham – Hereford
Urban Development	Worcestershire Shrub Hill Masterplan, Redditch Station Redevelopment, Longbridge Redevelopment
Freight Requirements	Up to 1 Class 4 and 1 Class 6 path her hour via Longbridge and the Camp Hill line

With the advent of local services calling at the new Moseley, Kings Heath and Hazelwell stations, Kings Norton will become an interchange for local services and provide new routing opportunities for trains on this corridor to reach Birmingham Moor Street but in doing so these trains won't be able to serve stations via University.

Historically, the Cross-City service from Redditch and Bromsgrove has operated a 6tph service through Birmingham New Street towards Lichfield. This has been a success story of electrification and frequency increases driving passenger demand. The amount of through journeys across Birmingham is limited compared to the large numbers using the service to the city centre which suggests there are opportunities to look at retaining some of the through links but to look at how to create direct access to University from other lines on the north side of the city. This is covered in the chapter about Cross-Birmingham Connectivity.

In order to avoid the need for passengers to have to double-back via New Street to complete journeys from local stations on this route and to provide access opportunities to both Moor Street and New Street stations there is a need to provide interchange between all services somewhere on this route. For the purposes of journey time preservation, this should be limited to one location where the majority, if not all services call to provide maximum interchange benefit.

The geometry of the railway at Kings Norton is very restricted and enhancing it as an interchange station with long distance services will be challenging, especially lengthening platforms. The station is also quite far north meaning a significant extra journey time would be required for passengers for Redditch to reach intercity destinations to the south (albeit still better than today).

Barnt Green is a very rural location and again the geometry of the lines would make an interchange challenging to provide. Longbridge, at the centre of the four-track section provides a good strategic location. The current site is very constrained but the proximity to the Town Centre developments provides an opportunity for significant boost to the area. It would also provide a credible interchange not just between local and long distance services in the Birmingham area but also for access to Redditch from the rest of Worcestershire and the wider South-West. However, the railway is very constrained by surrounding development such that significant investment will be required to fit the requisite railway facilities in the constrained rail corridor.

To make the most of an interchange station at Longbridge would require suitable infrastructure to enable the majority of services to call but also extension of Camp Hill services beyond Kings Norton to give access to those stations and Birmingham Moor Street for HS2.

The West Midlands Rail Investment Strategy, WM&C Route Study and MRH SOBC and the Network Rail Bristol – Birmingham study all identify the need for improved services at Bromsgrove and a more frequent service between Worcester to Birmingham.

The Bristol – Birmingham study also identified that more than 2tph on the Worcester – Birmingham flow would be beneficial.

The MRH SOBC proposes running additional services on the corridor to Bristol and Cardiff to serve Birmingham Moor Street to provide connections to HS2 services. This presents a good opportunity to link the South-West and South Wales with the North via HS2 but does leave passengers with the complication of a lack of clarity of which Birmingham station is the best to use for services to the South-West with half the services to Bristol and Cardiff using New Street and the other half using Moor Street.

A revised service structure would enable 6tph to operate through Selly Oak and University while improving the frequency of the new Camp Hill stations. This in turn enables a better service offer to Worcester, Bromsgrove and also provides long-distance from beyond Bristol to Moor Street for HS2 interchange while maintaining cross-Birmingham links with a revised Cross-Country service structure.

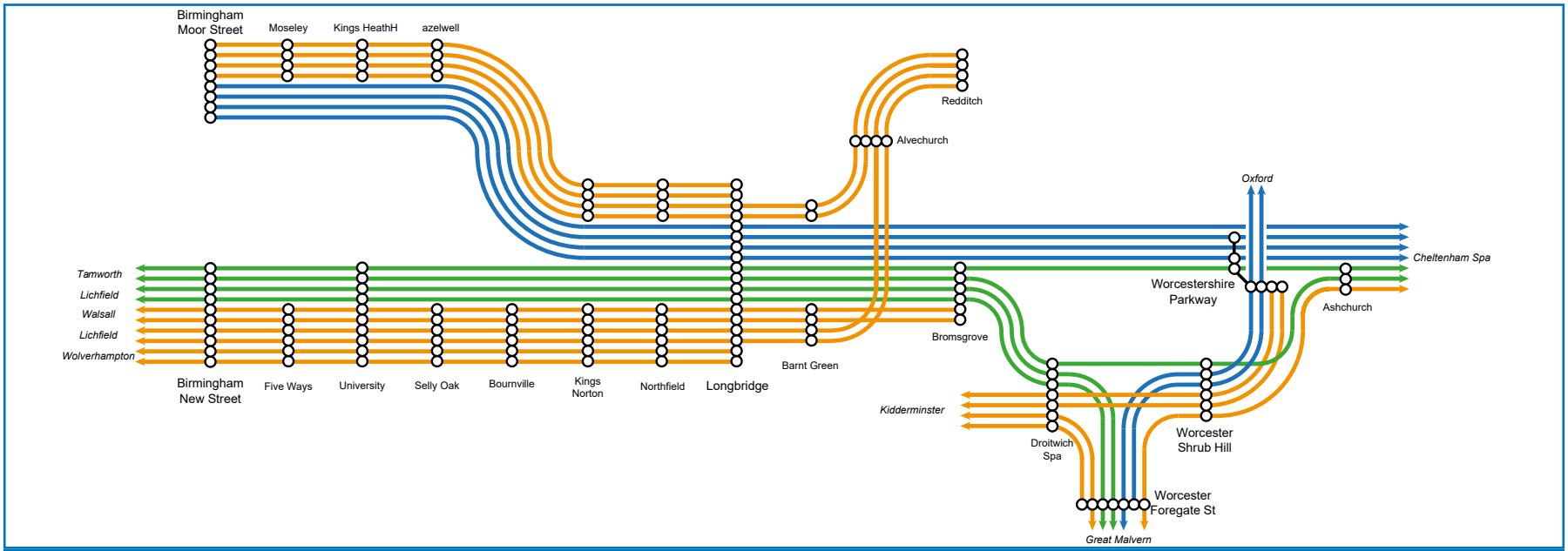


Figure 21: Indicative end-state Train Service Specification that delivers on the combined aspirations for Birmingham to the South West. This may require further interventions beyond the central Birmingham area scope.

Extending two of the four Camp Hill services an hour to Redditch would enable direct access to HS2 interchange from Redditch whilst retaining most of the connectivity via University that Redditch currently experiences.

The two key constraints on this corridor are the two-track section between Birmingham New Street and Kings Norton and the Lickey Incline between Barnt Green and Bromsgrove. The former section is constrained by the high frequency of stopping services, limiting the number of non-stop trains that can run. Non-stop trains either need to have additional pathing time or stations calls to maintain the spacing between services. Calling more inter-regional services at University and Kings Norton will help reduce the speed differential between services, therefore maximising capacity.The MRH SOBC identified that the maximum capacity of the Lickey incline, in order to maintain capacity for one freight path per hour is 10 passenger services per hour. By reducing the Cross-City service at Bromsgrove from 3tph to 2tph, this provides space for an additional inter-regional service by this route, enabling Bromsgrove to have services to the south as well as faster journeys to Birmingham. This additional regional service could operate as an extension of existing services to Worcester Shrub Hill, or as a service that terminates at Cheltenham consequently enabling new journey options for the whole corridor, including the possibility of direct Birmingham – Swindon services or as a more comprehensive connectivity train towards Bristol Parkway.

This structure de-links long-distance services to Exeter and Plymouth from Birmingham New Street, improving performance by not having to thread trains through a busy national hub station and consolidating interchange with HS2 through termination at Birmingham Moor Street.

While this does break cross-Birmingham connectivity, there will be a large array of interchange options at Moor Street and some regional services operating via New Street will remain but on a smaller geography, maintaining the key cross-Birmingham flows but in a more resilient manner. Diversion long-distance services from the South West to Moor Street frees up capacity via University. This capacity can then be used to widen connectivity and provide easier access to the medical and educational campuses served by University Station, reducing the need to interchange at Birmingham New Street. This also reduces the need for passengers to double-back to access longer distance services to regional and national hubs.

Unlocking Longbridge as an interchange, combined with a wider range of Cross-City destinations, also allows places on the north-side of the West Midlands conurbation the opportunity to interchange to long distance services. This avoids the need to change in station at Birmingham New Street or out of station via Moor Street.

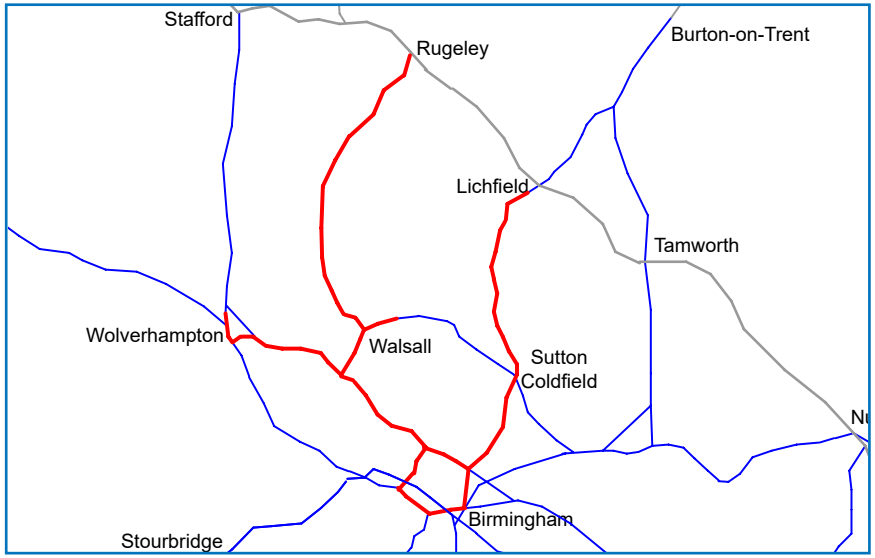
Next Steps

- Longbridge Corridor Strategic Advice, looking at how to provide an interchange between all services in the Longbridge area and how to accommodate the extension of Camp Hill services to Redditch.

- National Freight Routing Study to identify alternate routings for freight traffic away from the Lickey Incline to enable higher tonnages and more capacity for passenger services.

Figure 22: A Hereford service passes Longbridge station on the Fast Lines

Birmingham to Lichfield, Walsall and Rugeley



This corridor links Birmingham New Street to Walsall and Wolverhampton via Tame Bridge Parkway. Services this way are able to approach Birmingham New Street from both the East and West ends. The Cross-City North route to Lichfield via Sutton Coldfield also forms part of this network of local routes to the north of the West Midlands conurbation. Major hubs on the route are Birmingham New Street and Wolverhampton with secondary hubs at Walsall, Lichfield Trent Valley, Sutton Coldfield and Aston.

The route operates as an important suburban corridor and a key freight artery in the West Midlands. The route has no direct access to Birmingham Moor Street or Snow Hill. Provision of additional services is constrained by a lack of capacity in Birmingham New Street.

Aspirations for Corridor	
New Stations	Willenhall, Darlaston, Aldridge, Sutton Park Line, Brownhills; Alrewas
New/Improved Connectivity	Walsall – Wolverhampton; Local stations – Wolverhampton; Walsall – Lichfield and East Midlands; Walsall – Lichfield; Up to 6tph at local stations
Faster Journeys (inc GJT)	Walsall – Birmingham; Walsall – Wolverhampton; Birmingham - Lichfield
Urban Development	Perry Barr Masterplan
Freight Requirements	Up to 1tph Class 4 Walsall – Rugeley; Up to 3tph via Sutton Park; Up to 2tph Class 4/Class 6 via Tame Bridge Parkway

As well as the new stations under development at Willenhall and Darlaston, there are also plans for opening a station at Aldridge, north of Walsall on the Sutton Park Line. Perry Barr station has recently been rebuilt for the Commonwealth Games in 2022 as part of a wider regeneration of the area.

The line to Lichfield has operated a 6tph frequency for a number of years which provides a popular service offering but to the detriment of headline journey times to Lichfield. There are aspirations to operate services from Lichfield to Burton via a new station at Alrewas and longer term there is a desire to reinstate the railway from Walsall via Brownhills to Lichfield.

The train service on this corridor is constrained by the availability of capacity at Proof House Junction at the east end of Birmingham New Street and the western approaches to New Street from Soho South Junction. Utilising the Bordesley East Chord means services on other lines can be diverted to Birmingham Moor Street thereby enabling access to the east end of New Street for an increased number of services on this corridor.

On the Lichfield corridor this presents the opportunity to give a regular 4tph pattern calling at all stations supplemented by a 2tph semi-fast service to Lichfield that could reduce the journey

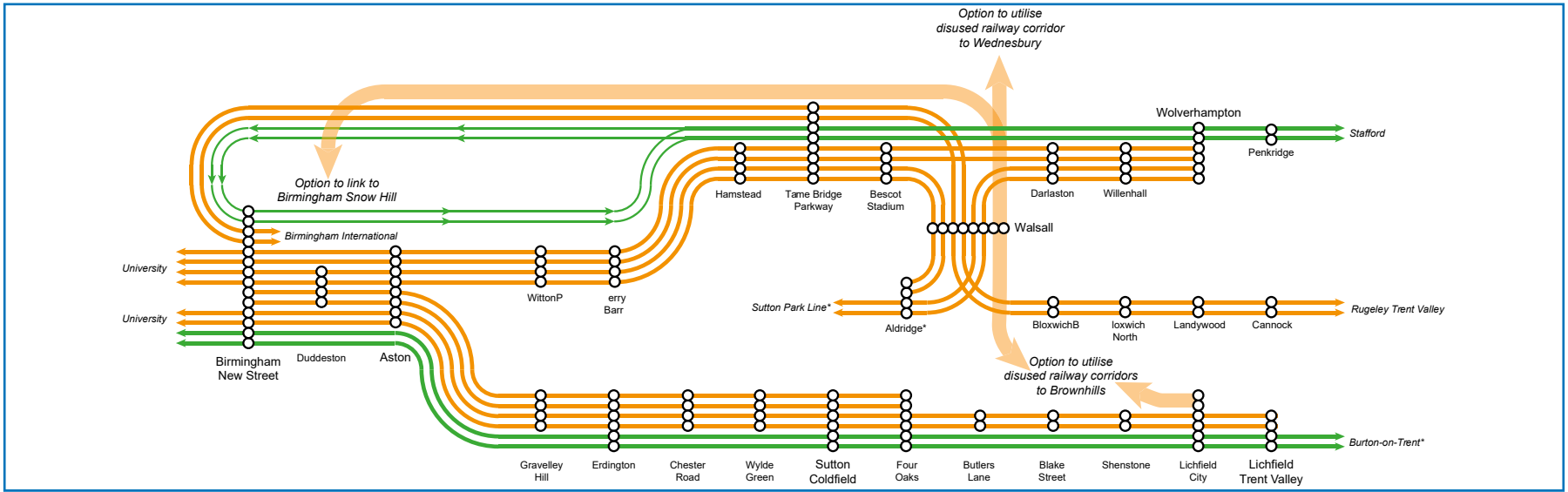


Figure 23: Indicative end-state Train Service Specification that delivers on the combined aspirations for Birmingham to Lichfield, Walsall and Rugeley. This may require further interventions beyond the central Birmingham area scope.

by 10-12 minutes on the end-to-end journey.

It is still possible to provide 6tph at all stations on CrossCity north but it is not possible to also provide a semi-fast service alongside the 6tph pattern.

Provision of services to Walsall via Soho Jn maintains the journey times to Cannock and Rugeley from Birmingham, while semi-fast services to Wolverhampton continue towards Penkridge, Stafford and Stoke-on-Trent without major journey time impacts thus minimising the impact of diversion of these services away from the Wolverhampton Corridor. Further, having no station calls in the semi-fast services between Tame Bridge Parkway and Birmingham New Street enables flexibility of routing, as trains can approach New Street from either direction depending on available capacity at specific times in the hour without impact on frequency at stations. For strategic connectivity purposes it is preferable to have Chase Line services operating through to Birmingham International and Coventry.

The 4tph all stations structure through Perry Barr and Hamstead stations are extensions of services from the Longbridge corridor. This gives all stations on this corridor at least 2tph to University as well as more options to avoid interchange at Birmingham New Street. This is covered in more detail in Cross Birmingham Connectivity.

This specification has a large number of services terminating at Wolverhampton. It is unlikely that 4tph from the Grand Junction line can turnback at Wolverhampton and a bay platform on the east side of the station may be necessary to facilitate the full train service specification to operate. Alternatively there may be opportunity to run some services through to other locations to support aspirations on other corridors.

An alternative option for this corridor is to route the 2tph Birmingham – Wolverhampton via Aston services to operate on to the Chase line to avoid capacity constraints and infrastructure works between Bescot and Wolverhampton. While this would reduce connectivity to Wolverhampton from Witton and Perry Barr, it would enable a service increase on the Chase Line which can either be used to increase capacity or to speed up services to Rugeley by allowing some trains to omit station calls without reducing the service level to Birmingham.

The key to enabling this service structure is to operate most services from the high-numbered platforms at Birmingham Street. This enables the trains to operate as part of the Cross-City service structure and not interact with the Coventry Corridor services.

The service specification has the potential to be challenging with the quantum of freight in the area and careful consideration needs to be made to ensure that freight opportunities are not marginalised in pursuit of passenger services.

There is insufficient capacity in Birmingham stations to provide for a reinstated rail service on the Walsall – Brownhills – Lichfield

Figure 24: Walsall Station looking North

route that operates through to Birmingham New Street or for an increase in frequency on the Chase Line without precluding increases on other corridors.

To achieve these aspirations would require additional capacity both in Central Birmingham and on the Grand Junction line itself which is likely to be very challenging and require major infrastructure intervention to achieve.

Alternative options to serve the Brownhills route to Lichfield would be:

- Operate the lines as a shuttle from Walsall with interchange provided at Walsall for connections to Birmingham and Wolverhampton
- Divert services from other routes to operate to Brownhills instead
- Split and join Chase Line and Brownhills services at Walsall to make efficient use of paths between Walsall and Birmingham but with resultant journey time and performance impacts
- Utilise the former route between Bescot and Wednesbury to operate services along the tram corridors to provide alternative routings to the wider black country and potentially Birmingham Snow Hill likely requiring the use of Tram-Train technology or conversion of the light rail corridor to heavy rail.

Next Steps

- Walsall Area Strategic Advice – identifying how to cater for the increase in services on all lines and determine which services should be linked together

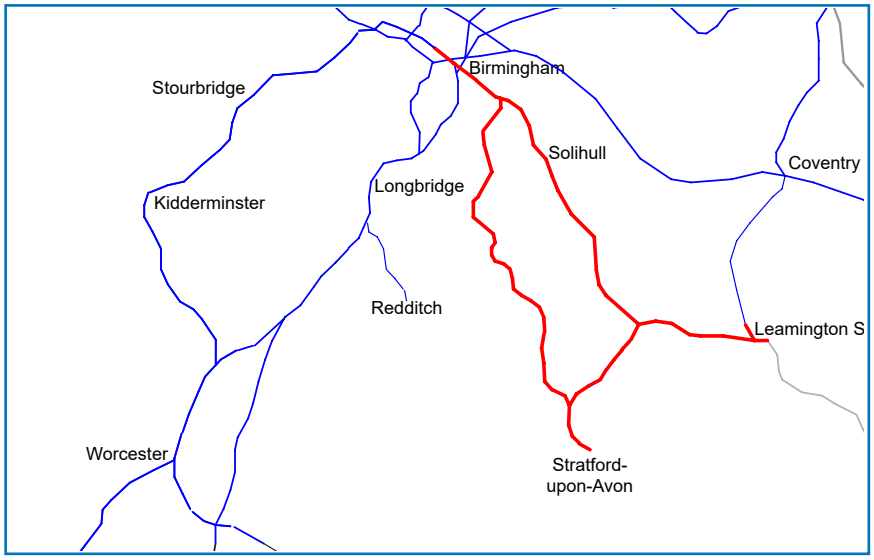
- Water Orton Corridor Strategic Advice – identifying how a Sutton Park passenger service could operate

- Wolverhampton Area Strategic Advice – addressing the ability to operate more services from the Grand Junction route in to Wolverhampton Station

- Former Rail Corridors Study in conjunction West Midlands Combined Authority to determine how to use the Walsall to Lichfield and Walsall to Wednesbury routes

- National Freight Routing Study

Birmingham to Leamington Spa and Stratford-upon-Avon



This corridor links Birmingham to London, Oxford and Reading via Solihull and Leamington Spa. It also provides local services to Stratford-upon-Avon via the North Warwickshire and Hatton – Bearley lines. There are major hubs at Birmingham Snow Hill, Birmingham Moor Street and secondary hubs at Solihull and Leamington Spa.

The route is an important intercity route linking the West Midlands to London, Oxford, Reading and the South Coast Passenger flows served via this route are determined by the need to serve the intermediate markets to London and Birmingham. The route does not primarily support end-to-end markets between the West Midlands and London which are today largely catered for via the West Coast Main Line, and in future via HS2. It is also an important local passenger route with high frequency suburban services and freight corridor, particularly dealing with container traffic form Southampton to the Midlands and North and will continue to be so in the future.

Aspirations for Corridor	
New Stations	
New/Improved Connectivity	Warwickshire – Oxford; Warwickshire – Reading; Warwickshire – Bath/Bristol; Birmingham – Swindon; Birmingham – Bath; Stratford-upon-Avon – London; Stratford-upon-Avon – Oxford; Up to 6tph at local stations
Faster Journeys (inc GJT)	Birmingham – Oxford and Reading; Stratford-upon-Avon - Birmingham
Urban Development	Solihull Transport Interchange; Snow Hill Quarter Masterplan; Digbeth Regeneration; Midland Metro to Birmingham Eastside; Moor Street Masterplan
Freight Requirements	Up to 3tph via Dorridge to Tyseley, 2 Class 4 and 1 Class 6.

Without capacity enhancement it is not possible to run more services on this corridor. There are two major constraints, the two-track railway between Dorridge and Tyseley which prevents any more passenger services from operating than did in 2019. Provision of a four-track section in the Solihull area would enable the local service to be increased to 4tph and provide additional capacity for longer distance services and additional freight traffic.

Diversion of the long distance cross-country service to operate via Coventry would also provide additional capacity as well as giving improved connectivity.

The other major constraint is the single line section between Hatton junctions and Bearley Junction. Any more than four movements an hour on this route would require the line to be double-tracked. This would enable increased frequencies between Stratford-upon-Avon and Birmingham and Leamington Spa. Services to the latter could potentially be extended to London as part of a wider strategy for the Chiltern Route south of Leamington Spa.

The proposal is for a basic 4tph local service structure on the core route sections to Dorridge and Whitlocks End supplemented by regional services that maintain existing journey times and improve connectivity towards London and Oxford.

Extension of some of these local services that terminate at Dorridge to Leamington Spa will improve the service at Warwick and Warwick Parkway and improve the connectivity of the local

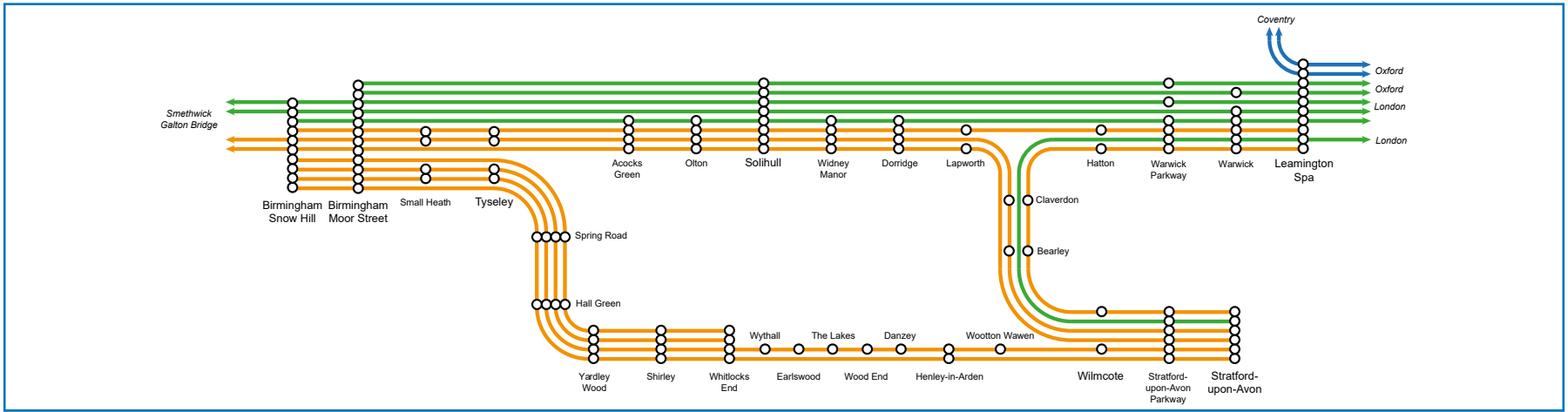


Figure 25: Indicative end-state Train Service Specification that delivers on the combined aspirations for Birmingham to Leamington Spa and Stratford-upon-Avon. This may require further interventions beyond the central Birmingham area scope.

stations towards the south via interchange at Leamington Spa.

At Leamington Spa there would be 4tph to London, two would be semi-fast, preserving the Warwickshire journey times to London while two would provide connectivity across the route by calling at more stations south of Banbury. North of Leamington Spa, of these 4 fast paths from London, 3tph would continue to Birmingham; 2tph limited stop and 1tph as a stopping service north of Leamington. The fourth path would operate to Stratford-upon-Avon.

Additional services to Oxford with calls at Solihull and either Warwick Parkway or Warwick create the opportunity to develop Solihull as a hub in the south-east of the West Midlands, maximising the utility of the proposed transport interchange at this location and reflecting the status of Solihull as a destination in itself. These trains would also provide important connectivity from Oxford to HS2 via Moor Street and could continue beyond Oxford towards Swindon, Bath and Bristol to bridge a long-standing gap in rail connectivity from this route.

Capacity at Moor Street will be limited and so to utilise it most efficiently most trains on this corridor will need to run through to Birmingham Snow Hill. Some trains will need to terminate at Snow Hill and some will need to continue towards Kidderminster to provide improved connectivity and make the most of capacity available. The latter is covered in more detail in the Birmingham to Worcester via Kidderminster section.

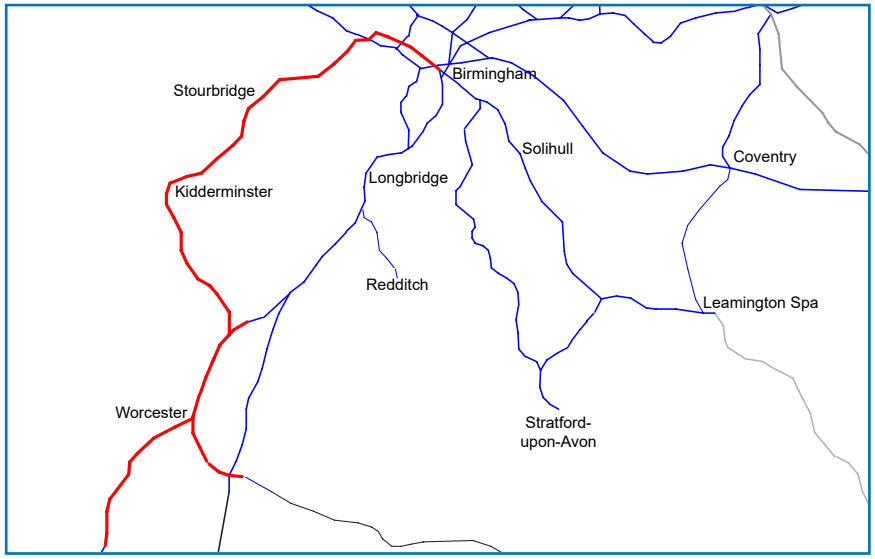
Next Steps

Solihull Corridor Strategic Advice that determines the infrastructure required to deliver the train service specification and consider the sequencing of interventions.

Chiltern Route Strategic Advice to build on the Solihull Strategic advice, looking at the rest of the route via Banbury and High Wycombe to London Marylebone.

Figure 26: A Northbound Freight train passing through Olton on the Solihull Corridor

Birmingham to Worcester via Kidderminster



The Kidderminster route has benefitted from a 6tph service for a number of years although smaller stations only receive 2tph in favour of provision of faster journey times to and from Kidderminster and Worcester.

There are a number of large park and ride stations on the route which see high usage that can be developed further, especially with better access towards the south via Worcester stations.

The fastest services from Worcester and Droitwich to Birmingham will be via Bromsgrove and University. Under the concept for the Longbridge corridor, there will be no direct trains to Moor Street via that route so there will be no opportunities for direct interchange with HS2. However, the route via Kidderminster does provide that opportunity, albeit with a longer journey time currently.

Aspirations for Corridor	
New Stations	
New/Improved Connectivity	Kidderminster and Stourbridge – Worcester Shrub Hill and South-West; Kidderminster and Stourbridge – Oxford and London; improved interchange options at Smethwick Galton Bridge
Faster Journeys (inc GJT)	Kidderminster - Birmingham
Urban Development	Worcester Shrub Hill Masterplan
Freight Requirements	Up to 1tph Class 6 between Abbotswood and Galton Junction

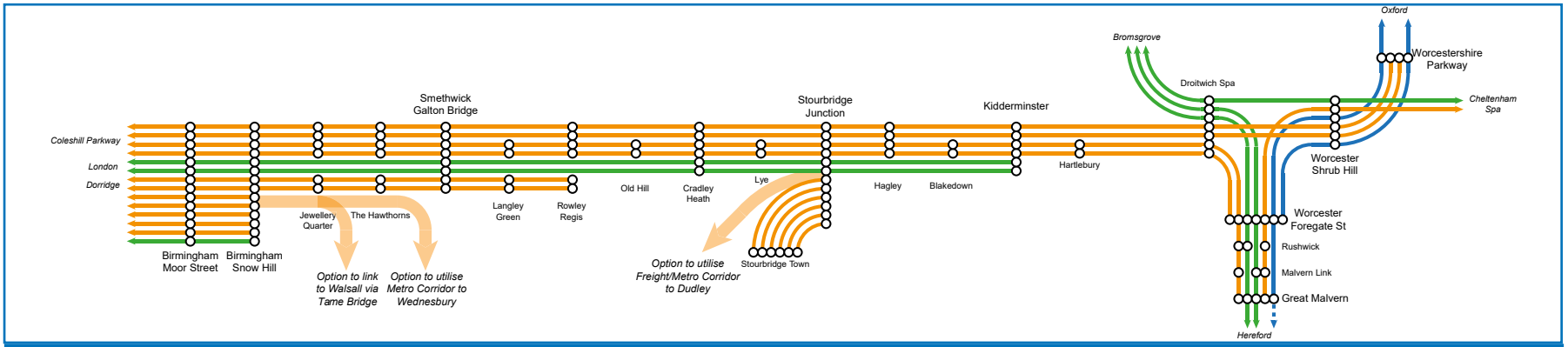


Figure 27: Indicative end-state Train Service Specification that delivers on the combined aspirations for Birmingham to Worcester via Kidderminster. This may require further interventions beyond the central Birmingham area scope.

Providing additional limited stop service on this route will improve journey times for Kidderminster and Stourbridge to Birmingham as well as improved connectivity for the Worcester area to services on the Birmingham to Wolverhampton route through improved interchange at Smethwick Galton Bridge. Provision of a turnback at Rowley Regis would maximise the use of capacity at Snow Hill station and enable Kidderminster trains to be accelerated by removing stops from some services and providing them in other services.

The large number of services that could be routed to Birmingham Moor Street and Snow Hill from other corridors present options for through connections to this corridor, creating new cross-Birmingham links in addition to those that already exist.

Extension of local services from the Water Orton corridor through Snow Hill to this corridor will help promote cross city links and provide interchange with services on the Wolverhampton corridor at Smethwick Galton Bridge. This will help mitigate some of the lost connectivity by not having Water Orton services operating to New Street station.

There are more services terminating at Birmingham Moor Street and Snow Hill from the south than there is capacity or need for on this corridor. This gives the potential to consider links to other corridors. This could provide opportunities to link Walsall and the Black Country more effectively to HS2 and make more efficient use of platform capacity at Birmingham Snow Hill.

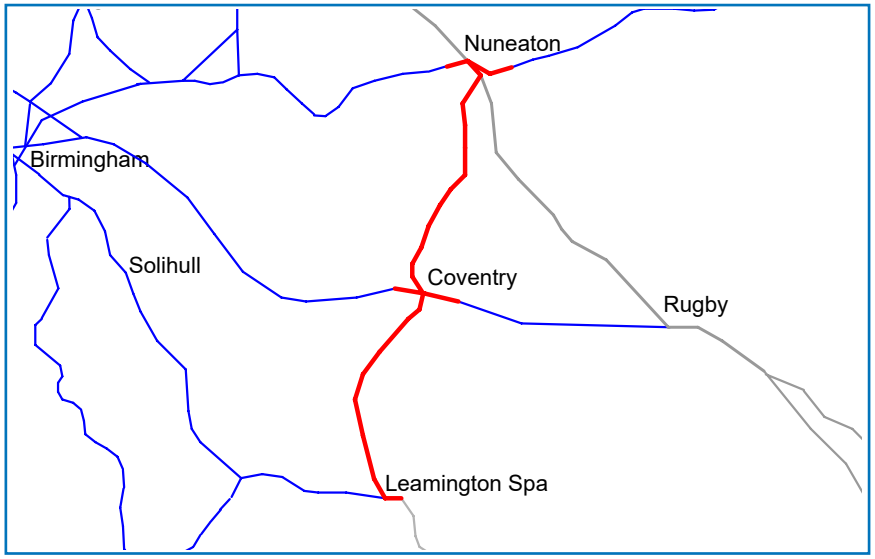
Next Steps

- Worcester Area Resignalling

- Stourbridge Corridor Strategic Advice, looking at different options for local services and providing sufficient capacity for additional terminating trains.

- Former Rail Corridors Study in conjunction West Midlands Combined Authority looking at the best options for utilisation of rail corridors and to determine whether tram-train options could be viable on this corridor.

Leamington Spa to Nuneaton



The Leamington Spa to Nuneaton route via Coventry has a major hub at Coventry and secondary hubs at Leamington Spa and Nuneaton. The route between Leamington Spa and Coventry is a key intercity corridor for cross-country trains towards the Thames Valley and South Coast as well as for freight from the South Coast to the North-West. The route section between Leamington Spa and Coventry has two single-track sections with a passing loop in the Kenilworth area that prevents an increased level of service from operating. It is also a performance issue for the national network.

There is a strong demand for improved freight usage and increases in passenger services for both local and regional flows, but capacity limitations on the route, particularly at Coventry itself, have precluded service uplifts from happening to date. This demand is expected to increase when more paths become available on the WCML Trent Valley route once HS2 releases capacity.

Aspirations for Corridor	
New Stations	Foleshill, Coundon Road, Warwick University
New/Improved Connectivity	Coventry – Leicester direct services; Coventry to Trent Valley direct services; 2tph between Nuneaton and Coventry; 2tph at Kenilworth; 2tph Coventry – Oxford
Faster Journeys (inc GJT)	Faster journeys Coventry - Nuneaton
Urban Development	Coventry Station Masterplan
Freight Requirements	Up to 2tph between Leamington Spa and Coventry, Up to 2tph between Coventry and Nuneaton

There are two key constraints to deliver improved services on this corridor. The first is the single track railway between Coventry and Leamington Spa and the second is the restrictive track layout and shortage of platform capacity at Coventry station itself.

Doubling of the track between Leamington and Coventry would enable a second long distance train per hour to operate over this route from Birmingham to Oxford and Reading. Fully double tracking would also enable a station at Warwick University to be constructed without significant risk to performance and timetable robustness. Although it would be desirable to have more trains that are able to call at the station,without enhancement of the Coventry station area it is not possible to run additional trains on the southern section of the route beyond the single additional long distance service.

The Coventry – Leicester project proposes to reinstate direct services between Coventry and Leicester by provision of a new direct route linking the Coventry – Nuneaton line via a dive-under of the West Coast Main Line.

Matching the identified service aspirations requires a train service specification like the below. The specification shows two services an hour operating across Coventry station to provide cross-Warwickshire links, however, there may be capacity challenges with services operating on the Birmingham – Rugby corridor and the need to provide capacity for freight movements in the area. In this instance it may be necessary to operate Nuneaton – Coventry and Coventry – Leamington Spa with services either terminating at Coventry or running through the station to other destinations to make more efficient use of the limited capacity available in the station area.

Services to Leicester are best suited to not call at Nuneaton, providing faster journeys end-to-end and reducing capacity constraints at Nuneaton. For passengers on the line between Coventry and Nuneaton looking to complete journeys to Leicester, interchange options with trains from Birmingham Moor Street are available at Nuneaton with the 4tph service on the Birmingham – Leicester route.

An option shown is to have the local service on the route continue beyond Nuneaton towards Coleshill Parkway and the Sutton Park route. This would provide orbital connectivity around the West Midlands enabling interchange between multiple routes and generating useful direct connectivity.. The options for this are covered in more detail in the Sutton Park Corridor section.

Next Steps

Coventry Area Strategic Advice looking specifically at how to cater for the aspirations from this document and West Coast Strategic Advice in the constrained station area and how to incorporate Coventry East station such that it benefits network capacity. The layout that supports additional freight traffic that could use the route once Leamington to Coventry is fully double tracked.

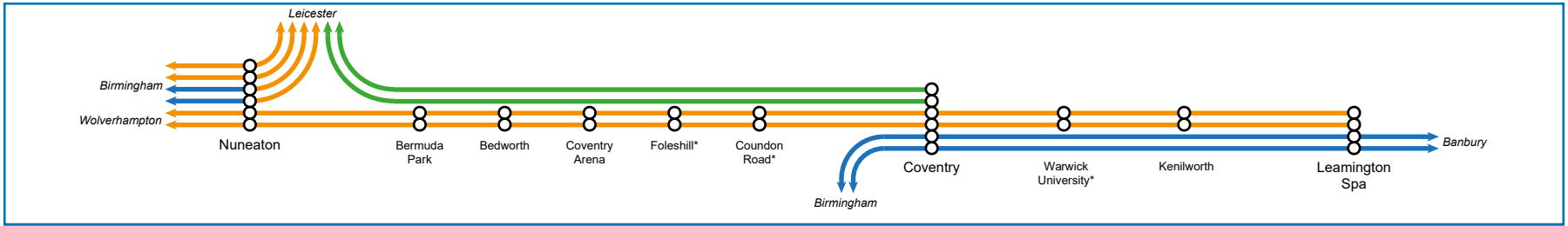
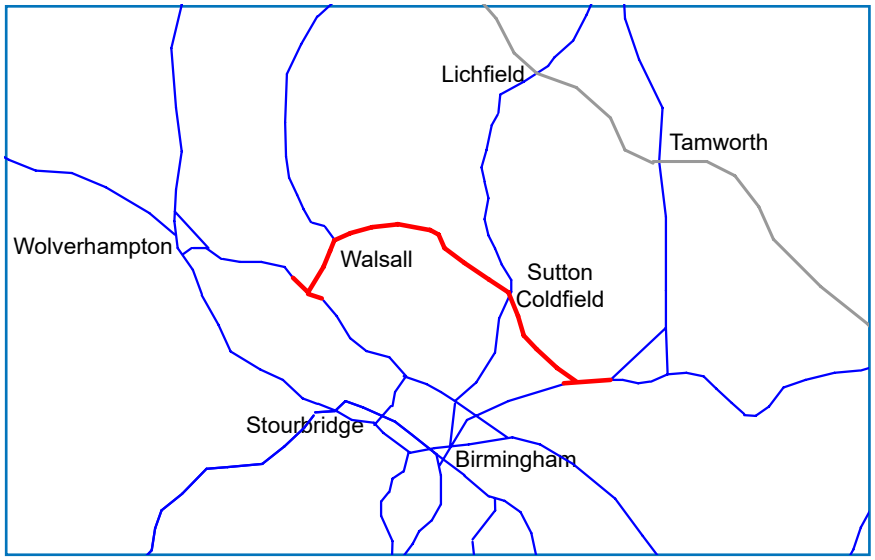


Figure 28: Indicative end-state Train Service Specification that delivers on the combined aspirations for Leamington Spa to Nuneaton. This may require further interventions beyond the central Birmingham area scope.

Figure 29: A calling long-distance service and passing freight train demonstrate the mix of traffic utilising the line between Leamington Spa and Coventry

Walsall to Water Orton via Sutton Coldfield



The Sutton Park line, linking Walsall with the Water Orton Corridor is currently a freight only railway, providing a key route away from the Central Birmingham area for freight to access all routes and is a key regulating corridor for local and national freight flows.

Growth of freight traffic and development of new freight terminals in the West Midlands means that this line will continue to play an important role in providing for freight traffic routing options around the West Midlands.

There is an active project looking to build a new station at Aldridge on the west end of the line to provide services via Walsall to Central Birmingham.

There are aspirations to return passenger services to the route, initially at Aldridge and subsequently on the rest of the route. As the line is not a radial route from Birmingham, journey times will

Aspirations for Corridor	
New Stations	Aldridge; Streetly; Sutton Coldfield, Walmley; Minworth
New/Improved Connectivity	Direct services to Birmingham City Centre
Faster Journeys (inc GJT)	
Urban Development	Minworth and Walmley housing expansion
Freight Requirements	Up to 3 freight paths per hour

be longer compared to other suburbs and therefore providing rail connectivity which is competitive with other transport modes could be a challenge. It should be assumed that the route will need services to Central Birmingham from each end as a consequence.

The route could provide a useful alternative to both the West Midlands motorway network and provide an orbital service linking radial routes to provide new journey opportunities that avoid Birmingham city centre, helping to link lines together that could end up being served from different city centre stations. Maintaining the ability to operate freight services on the route will be key so a passenger service structure and appropriate infrastructure to support both is essential. A key benefit of the Sutton Park line currently is that freight traffic can be regulated at either end to fit in between timetable on the Water Orton Corridor and the Grand Junction lines, this capability will need to be retained with the introduction of passenger services.

To avoid operational and timetable implications of operating circular services, it is recommended to develop a service structure that enables the route to act as an orbital route as well as providing connectivity from both ends of the line to Birmingham city centre.

The TSS option shown above shows one way that both roles could be fulfilled whilst still accommodating for freight. Alternatively, the services that are shown terminating at Streetly could continue on to Wolverhampton to ensure connectivity along the line. Interchange options could also be provided at Fort Parkway/Castle Bromwich station for services to the East Midlands, keeping the overall quantum of service down. It is likely that passenger services operating on to the line from the east end will drive the need for an enhancement of the junctions in the Castle Bromwich/Water Orton area to be able to cope with the increase.

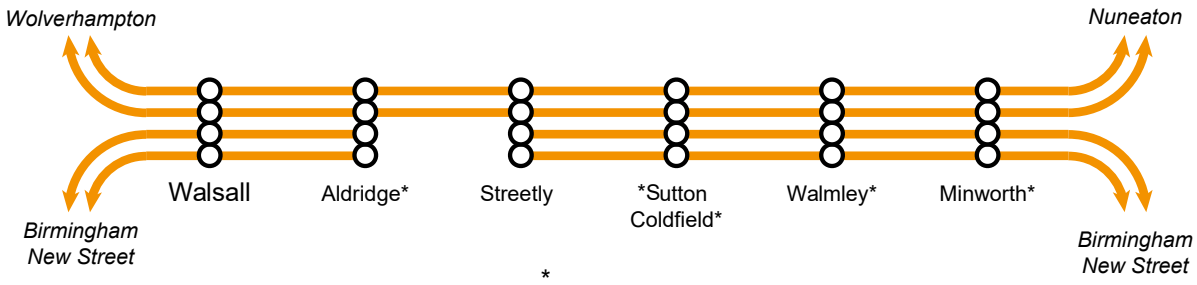


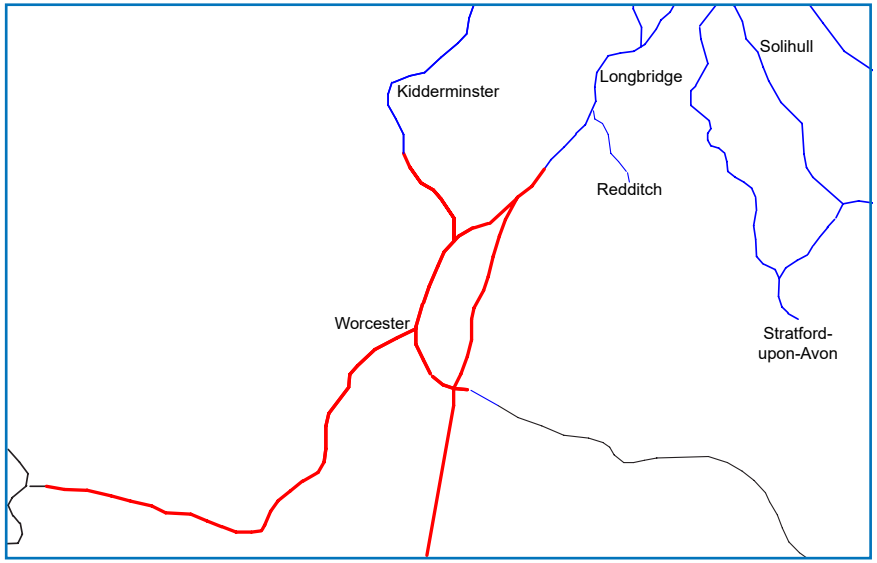
Figure 30: Indicative end-state Train Service Specification that delivers on the combined aspirations for Walsall to Water Orton via Sutton Coldfield. This may require further interventions beyond the central Birmingham area scope.

Provision of Sutton Park services running to Birmingham New Street from the east end of the route is dependent upon releasing capacity in Birmingham New Street by increasing the capacity ceiling. This can only be achieved through the restructuring of services to simplify the operations at the station itself. There will not be enough capacity in Central Birmingham to be able to operate services from the Sutton Park line to Birmingham via the Water Orton corridor without this restructuring.

Next Steps

- Walsall Area Strategic Advice
- Water Orton Corridor Strategic Advice
- National Freight Routings Study

Worcester Area and Great Malvern to Hereford



The Worcester area is on a loop of the main Bristol – Birmingham route but is also at the confluence of the routes from Oxford, Hereford, Birmingham and Cheltenham. The railway infrastructure currently restricts the ability to provide better services while local rail connectivity is complicated further by the geographic location of stations in the city.

Worcester itself has poor connectivity to intercity destinations with only hourly fast services to Birmingham and Oxford. There are no fast services from the city centre towards the south-west with only a local service to Bristol providing connectivity to the south. Worcestershire Parkway station, situated on the main line route, has enabled calls in Birmingham – Cardiff services but the current service structure means that the station largely operates primarily as a park and ride station rather than an option for reliable cross-route interchange and access to the city centre.

Aspirations for Corridor	
New Stations	Rushwick
New/Improved Connectivity	Kidderminster and Stourbridge – Worcester Shrub Hill and South-West; Kidderminster and Stourbridge – Oxford and London; more station calls at Worcestershire Parkway; Worcester – South-West
Faster Journeys (inc GJT)	Hereford – Birmingham, Birmingham - Worcester
Urban Development	Worcester Shrub Hill Masterplan
Freight Requirements	Up to 1 class 6 path and 1 class 4 path per hour south of Abbotswood Junction

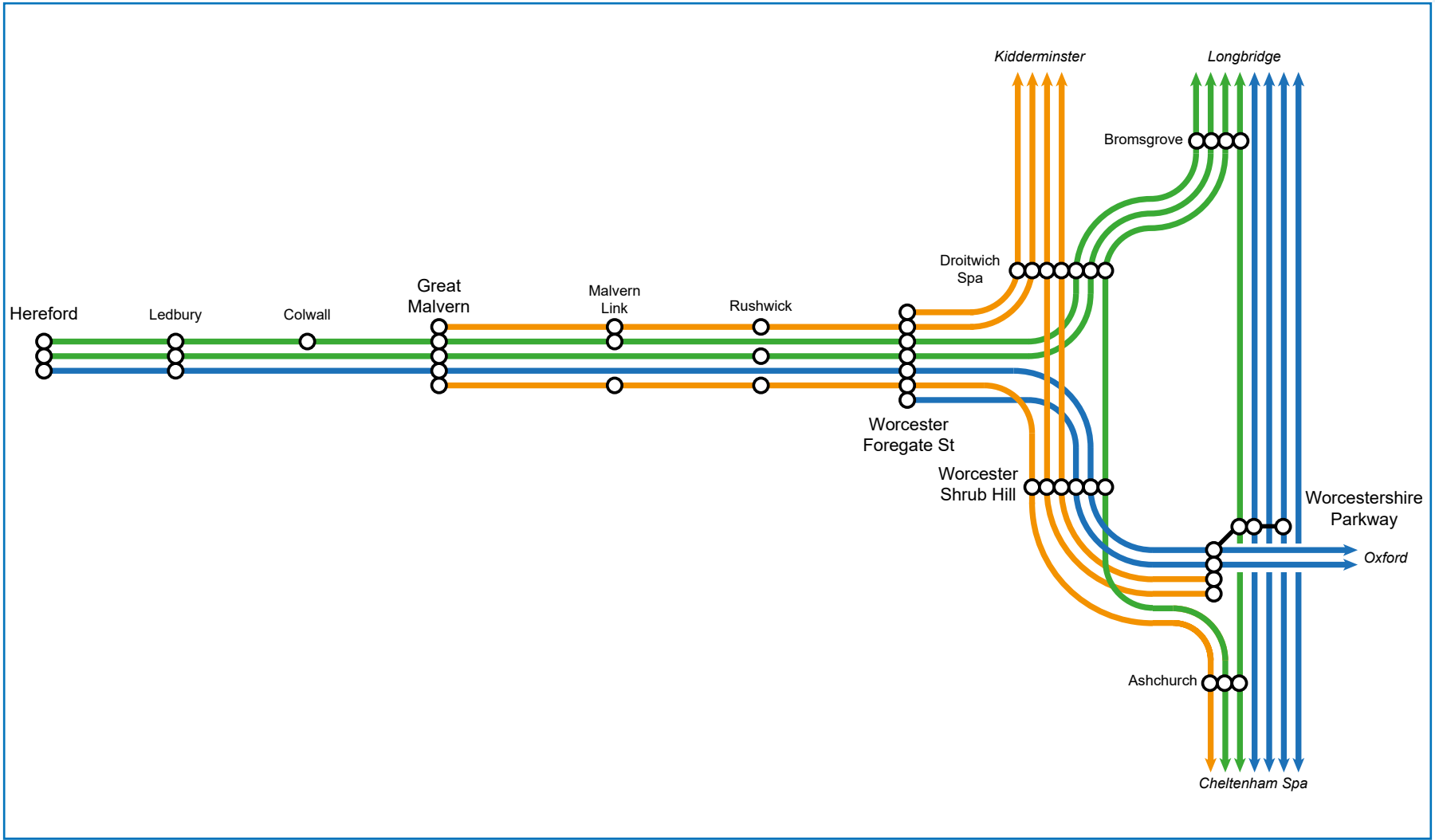


Figure 31: Indicative end-state Train Service Specification that delivers on the combined aspirations for Worcester Area and Great Malvern to Hereford. This may require further interventions beyond the central Birmingham area scope.

The railways in the centre of Worcester are a complicated arrangement of routes converging on both city centre stations (Foregate Street and Shrub Hill) that results in trains on different routes sharing or crossing the paths. In particular, the layout through Worcester Foregate Street, the main station for the city and busiest station in the area as a result, consists of two single lines limiting the throughput of the station and particularly limiting the ability to terminate additional services at the station.

All routes approaching Worcester have some element of single-track railway which contributes significantly to the total number of trains. This presents, alongside the limited signalling capability, a major bottleneck when it comes to managing delay. As a result, small delays can quickly propagate to other services and affect a large area.

The railway stations in the Worcester area are also constrained by their accessibility from wider areas. Station car parking and interchange between modes are limited meaning that first and last mile opportunities are not used to their full potential in the area.

The age of the signalling assets in the Worcester area are such that obsolescence of components is a significant issue with many lacking available spares, Meaning means that failures can have a long-lasting impact on the train service. There is little ability to enhance network capability within the current signalling system due to the scarcity of components and knowledge.

The structure shown above provides a 4tph service from Kidderminster through Droitwich Spa. This continues the service of the important Worcester Foregate Street market whilst also providing new connectivity to the services to the south-west and Thames Valley that will be available from Worcester Shrub Hill and Worcestershire Parkway. Having 1tph continue beyond Worcester Foregate Street to Great Malvern will reduce pressure on Worcester Foregate Street capacity and provide useful cross-county links through Worcester City centre.

In the future the trains terminating at Worcestershire Parkway could extend to Evesham, subject to infrastructure provision, to support housing growth at Pershore and Evesham and enable the speeding up of Worcester to Oxford journey times.

The North Cotswold Line Taskforce business case aspires for an additional service from London to Worcester continuing to Kidderminster to strengthen connectivity to the Wyre Forest. While this would provide benefits for Droitwich and Kidderminster, the alternate option of extension of Snow Hill services outlined previously would provide more connection options than the hourly through train does. Further, a train that operates towards to Kidderminster will not serve Worcester Foregate Street without significant capacity and journey time implications of a reversal. This would mean that Evesham and the large housing developments at Worcestershire Parkway would only have a single train an hour to the prime city centre station at Foregate Street. For this reason, it is proposed to terminate the second train at Worcester Foregate Street. This option would

also provide more onward connectivity options for Hereford and Ledbury to the Thames Valley and London without needing to change twice (at Foregate Street and Shrub Hill).

A further change to North Cotswold services is the proposal to extend the service to Great Malvern and to Hereford every hour. This is currently not possible on the existing infrastructure but the enhancements required for the additional Birmingham – Hereford services may enable the Hereford – London service to operate hourly. This would have benefits not just for Hereford to Thames Valley and London but would provide Hereford and Ledbury connections to a regenerated Shrub Hill area, along with the connections offered at Worcester Shrub Hill and Worcestershire Parkway. the potential amount of double tracking required might driver the need for the London service to operate every two hours. This would however, still provide significant connectivity benefits versus the infrequent service that is currently offered.

Next Steps

The majority of aspirations on this corridor are either directly enabled or partially facilitated by resignalling the railway between Hereford, Worcester and Droitwich Spa. Resignalling will release a significant amount of capacity for additional services and enable changes to the local railway layout. This would ensure network capability is maximised, something currently undeliverable within the constraints of the existing signalling system.

Another next step involves delivery by the Midlands Rail Hub scheme of enhanced twin-track capability between Great Malvern and Hereford in order to a more frequent service to Hereford.

Maximising Central Birmingham Capacity

7

The service structures outlined in this document utilise nearly all of the theoretical capacity available in central Birmingham. The only place where capacity isn't fully utilised is at Birmingham Snow Hill where there are up to 14 paths arriving from south that could be utilised to operate as a through service beyond Birmingham Snow Hill. The Kidderminster corridor section already utilises eight of these paths to provide the necessary provision on that route but there is unlikely to be demand for extra services towards Rowley Regis sending extra trains on this route would be for little benefit. There may be the possibility that some of these 6 terminating paths could continue to operate beyond Snow Hill utilising new connections to other rail corridors. Provision of access from Birmingham Snow Hill to the Soho – Perry Barr railway in the vicinity of Benson Road would enable potential new routings that would provide useful connections, not least with the wider Black Country and Birmingham Moor Street in addition to more cross-Birmingham connectivity.

The other opportunity is to consider these paths in connection with the West Midlands Metro tram network. This would require detailed co-operative engagement with the West Midlands Combined Authority and some of the opportunities are outlined in this section.

Some of the routes will be suitable for light rail operation and others will be better suited for heavy rail or a combination of light/heavy rail because of the potential for some corridors to carry freight or to operate as longer distance passenger routes, for which heavy rail is the only viable solution.

The opportunity to create new cross-Birmingham links is also a possibility for some corridors, depending on the transport option that is identified as the best option.

Former Rail Corridors

There are a number of former rail corridors in the West Midlands where there is potential for re-use as transport corridors. Some of these have been utilised for the development of the West Midlands Metro tram network. The development of this network presents some opportunities and some challenges that will need to be considered, dependent upon the line of route and the destinations that are needed to be served. This section of this document intends only to highlight the potential for these rail services that would need to be considered in any proposals to reuse these corridors for transport purposes. Engagement will be sought with the West Midlands Combined Authority to determine the scope of a wider study of which will establish the optimum use of former rail corridors based on a holistic assessment of all appropriate transport modes.

Some potential options are outlined below where heavy rail may be a desirable solution for reinstatement.

Walsall – Lichfield

Provision of heavy rail on this corridor should be considered given the potential to provide freight capacity and to contribute to the alleviation of capacity constraints on the wider network. Direct access to central Birmingham stations from locations on this route would encourage modal shift and provide economic opportunity for these areas.

Figure 32: Snow Hill Lines service operating adjacent to the West Midlands Metro network

Wednesbury – Walsall

This corridor could operate as an extension of the new Metro line to Dudley but the potential for heavy rail freight should be considered in this section. Any future proposals should investigate the potential for technological solutions to enable access to the heavy rail network at Walsall.

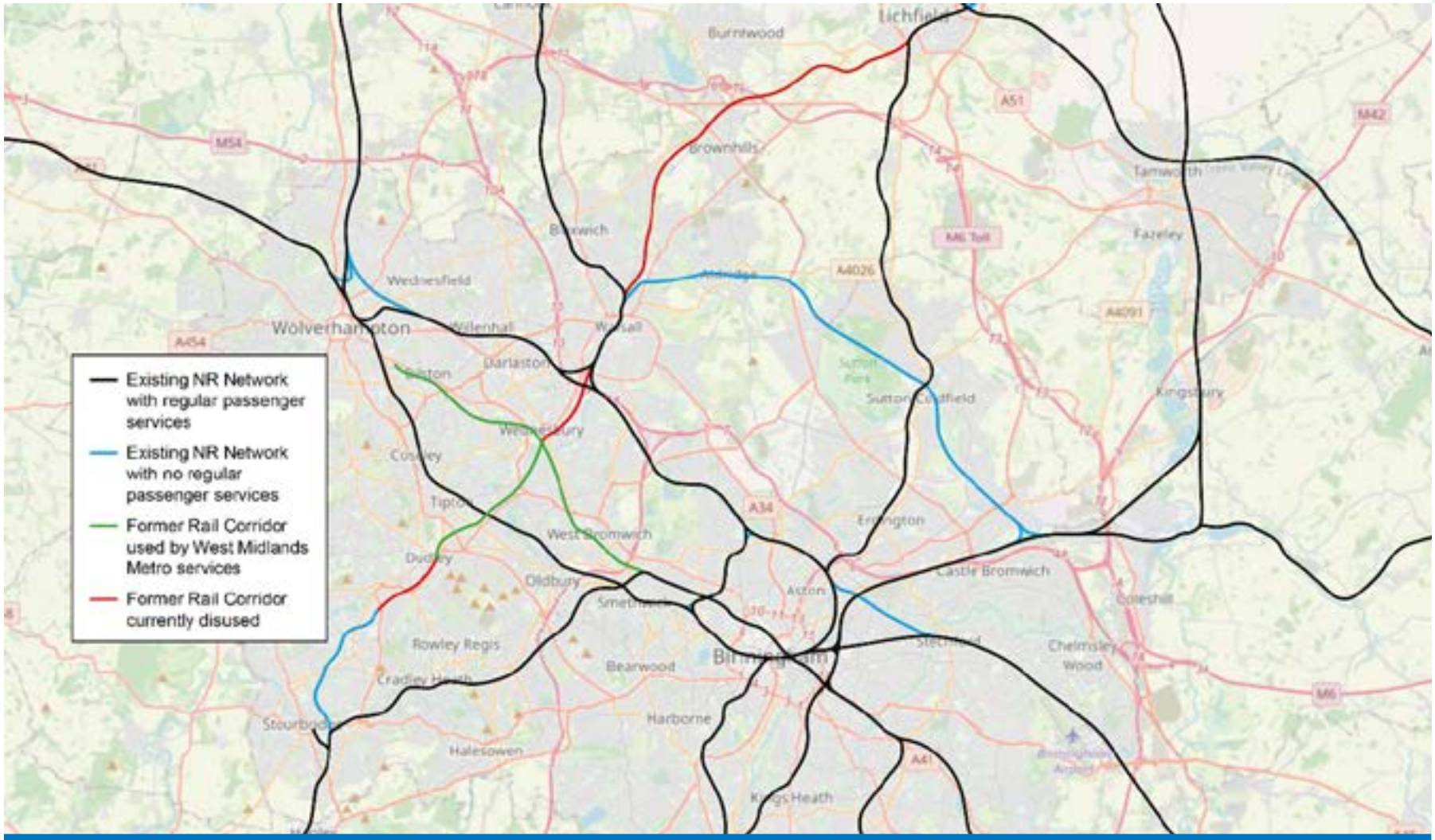


Figure 33: Existing and former rail corridors in the West Midlands that should be considered in a holistic study of best use of the corridors from a multi-mode perspective

Cross-Birmingham Connectivity

8

Additional capacity in the West Midlands provides the opportunity to consider the role of local routes that operate through the city-centre. These provide a vital link between a diverse range of destinations for passengers across the West Midlands conurbation.

The proposal of this strategy to develop an enhanced set of regional hub stations across the network will increase the value of cross-Birmingham links, enabling new access between places that didn't exist before, whilst simultaneously helping mitigate the impact of having two hub stations in Birmingham.

The Cross City service has developed a strong link from the north side to the south side of the city, providing useful connections, particularly to University. The success of this should be used as an example of how to strengthen connectivity across more corridors.

A consideration needs to be made about usability of these connections and how high frequency core services on a single corridor might be used to serve multiple corridors on opposite sides of the city. The intended outcome being t a 4tph pattern nearer to the city centre but providing 2tph direct connections on two corridors on separate sides of the city. This provides the high frequency to the city centre and strengthens the through connections for more places.

In some instances, existing stations could act as out-of-centre hubs providing a focal point for interchange between local, regional and intercity services. On other corridors some stations could act in a similar manner but would require further development to make the most of the benefits of through service connectivity.
There remains a need to consider how the regional connections across Birmingham will continue to be catered for given the changes proposed for the long-distance intercity network outlined in the corridor specific chapters previously.

North to South Connectivity

The existing Cross City services provide substantial cross-corridor north-south connectivity and there is potential to replicate the connectivity observed historically on the cross-city network on Birmingham's other radial routes by implementing the corridor service specifications outlined in this document.

This creates new connections but lessens the impact of diverting services away from Birmingham New Street as it will allow increased interchange between lines away from the city centre.

As discussed in the Longbridge and Grand Junction Corridors the services can be arranged in groups of half-hourly frequencies forming a core service frequency of 6tph from Aston via University to Longbridge.

Extension of Camp Hill Line services to Longbridge and Redditch brings these locations to within easy interchange of the services on offer from Moor Street and HS2 providing

new connectivity opportunities and higher frequencies. It also strengthens southwards connectivity from the stations on the Camp Hill route. Developing Longbridge into a hub on the main line to the South-West would also provide ideal interchange alternative to stations in Central Birmingham., Passengers could take direct trains from the north side of Birmingham to Longbridge and change on to longer distance services here instead.

Most of this service pattern can be unlocked by delivery of the Eastern Chord at Bordesley, vacating platform capacity at Birmingham New Street through diversion of services to Moor Street which in turn enables the restructuring of services through Aston. The changes on the south side of the city involving Camp Hill services extending beyond Kings Norton requires development of Longbridge as an interchange location and additional capacity to Redditch to enable 4tph to operate.

On the Sutton Coldfield route, although the all-stations service would reduce by 2tph, providing 4tph with even intervals and a semi-fast service to Lichfield will off-set the majority of disbenefits of the all-stations service reduction on this section.

Such a restructure not only maintains nearly all the connectivity that presently exists and the frequencies on the core route, but also broadens the direct connectivity to the key sites of University and Longbridge on the south side of the city as well as generating new opportunities to access HS2 destinations via Moor Street for locations south of Kings Norton.

East to West Connectivity

East to West connectivity is covered by two routes currently; Coventry – Wolverhampton and, to an extent, the Snow Hill lines between Solihull and Stourbridge. The development of Birmingham Moor Street provides an opportunity to remap some of the connections to improve cross-city connectivity and link hubs across the wider conurbation, consequently helping to mitigate some of the impacts of diverting services from Birmingham New Street.

The Bordesley East Chord specifically enables services to operating from the east side of the conurbation to be linked to services towards Smethwick Galton Bridge and Stourbridge. This would create connections across Birmingham and providing access towards Wolverhampton via interchange at Smethwick Galton Bridge.

Improved Journey Opportunities and Navigation

The changes in cross-Birmingham services outlined in this document represent a marked improvement in both freqeuncy and connectivity when compared to that provided by the network today While this transformed service structure provides passengers with significantly enhanced choice for rail travel, it does potentially import additional complexity as a consequence of a much greater range of connections.

A potential way to resolve this is with a clear and consistent method of identification for train services as seen in many

other urban areas around the world. This section looks at examples of how this could be achieved in the West Midlands utilising the end state view as a basis, but noting that elements be enacted on an incremental basis as service improvements are delivered.

Line Identities

This strategy sets out how to achieve 4tph service intervals at most West Midlands stations. In most cases however, this is provided by two sets of half-hourly services operating at a 15-minute frequency service. As a result, the principle of using line names alone could be confusing when two differently named lines combine in the core to provide a more frequent service that isn't therefore immediately identifiable.

By using a two-tiered Alpha-numeric numbering system core route corridors can be identified more easily. This involves using a letter which identifies the Central Birmingham station that the service is operating to and from, and a suffix number referring to a branch from the main corridor.

Services operating through University offer an example. It has been proposed that these operate as three pairs of services linking Bromsgrove, Redditch and Longbridge through Birmingham New Street to Lichfield, Walsall and Wolverhampton.

These could all be branded as Line A. That way all passengers heading to the likes of Five Ways, University and Selly Oak know to catch a Line A service from Birmingham New Street and further north. The individual pairs of services can then be further as:

A1: Wolverhampton - Longbridge

A2: Redditch - Lichfield

A3: Bromsgrove - Walsall

This helps create a clear structure of which train does what without needing to know all the station calling points along the way. This would be particularly helpful when considering wayfinding within stations and particularly between stations. A passenger arriving at Birmingham Curzon Street heading for a specific station in the West Midlands can be directed by Line Identity to the correct station rather than needing to know the detailed timetable and final destination of their train as is currently required of passengers.

Expanding this out to other corridors shows the real strength of such an identification system. If the corridor between Longbridge and Birmingham New Street is Line A, then the services via the Camp Hill line could be identified as Line B. Regardless of the end destination, a passenger at Longbridge, Northfield or Kings Norton knows that a Line A train will take them to New Street and a Line B train will take them to Moor Street.

In the opposite direction, if the pairs of service are:

B1: Moor Street – Longbridge

B2: Moor Street – Redditch

It is possible to see how a passenger at Longbridge heading to Redditch can catch either an A2 or a B2 service to Redditch. Other prime corridors are given letter codes with suffix numbers added to identify the branches from the core route section.

Line C: Wolverhampton – Birmingham New Street

Line D: Worcester, Kidderminster and Stourbridge – Birmingham Moor Street

Line E: Birmingham Snow Hill - Whitlocks End

Line F: Birmingham New Street – Sutton Park

Line G: Coventry – Rugeley

It's important to note that the identity proposal above is purely indicative. It is a suggestion of how services could be identified to make the rail network easier to understand by creating clearer distinctions between local and longer distance train service.

As services become more segregated over time, specific identifications for stations can begin to be rolled out to support the wayfinding that such a system enables.

Careful consideration will need to be given on how this branding could be rolled into a wider integrated public transport network in the West Midlands involving bus and tram networks. Such integration may determine that these particular Alpha-Numeric proposals are not entirely suitable but the principle behind them should be explored in more detail, in collaboration with Transport for the West Midlands.

A view of how the local rail services could be linked up in a holistic set of line identities is shown below. This is an indicative view of how such a system could work. Different stopping patterns, identities or changed linkages across the centre may be preferrable subject to wider transport integration and rail network capacity needs.

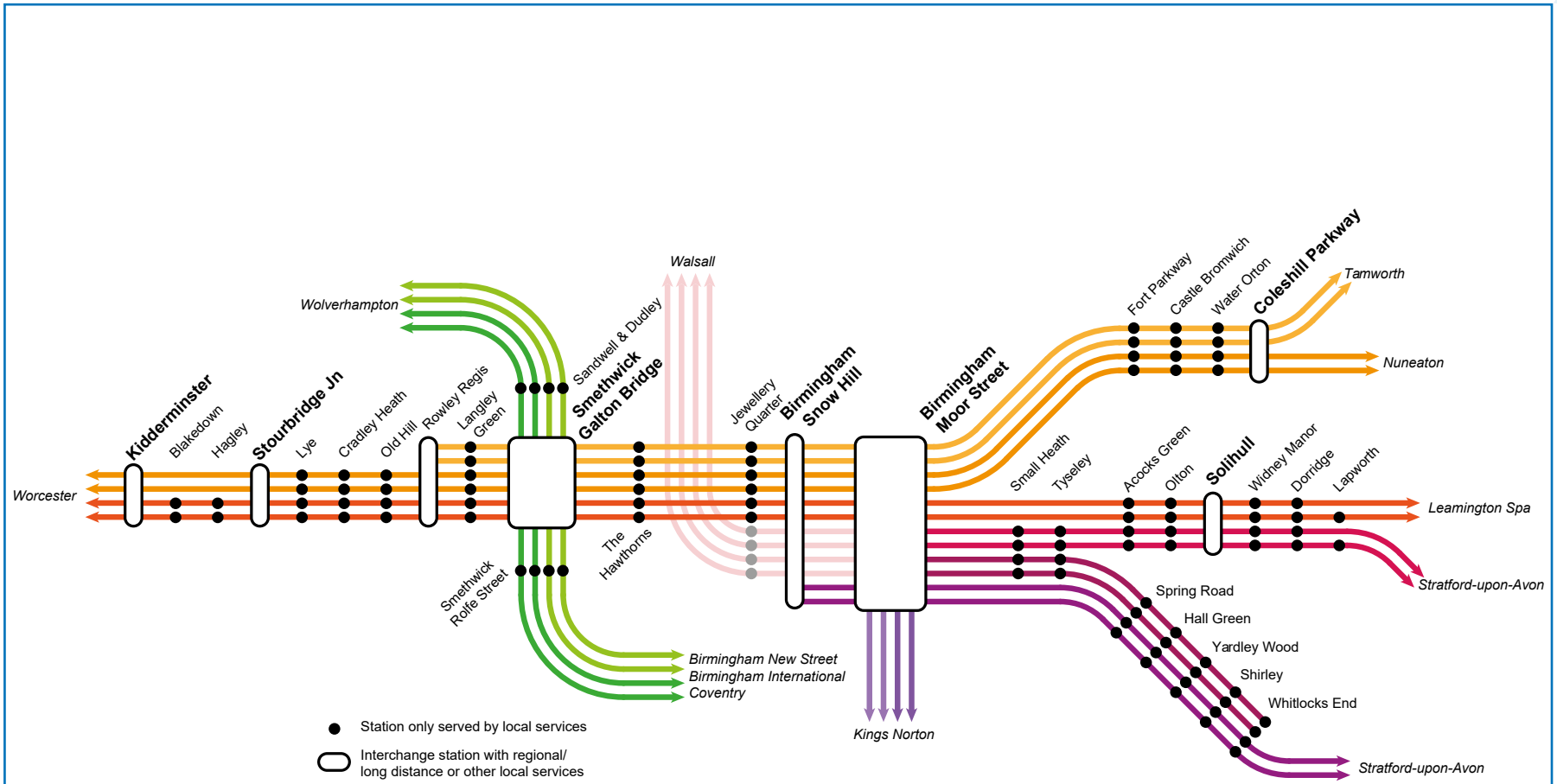


Figure 34: Indicative end-state Train Service Specification providing East - West connectivity across the West Midlands

Figure 35: An existing Cross-City service providing connectivity across Birmingham and the West Midlands

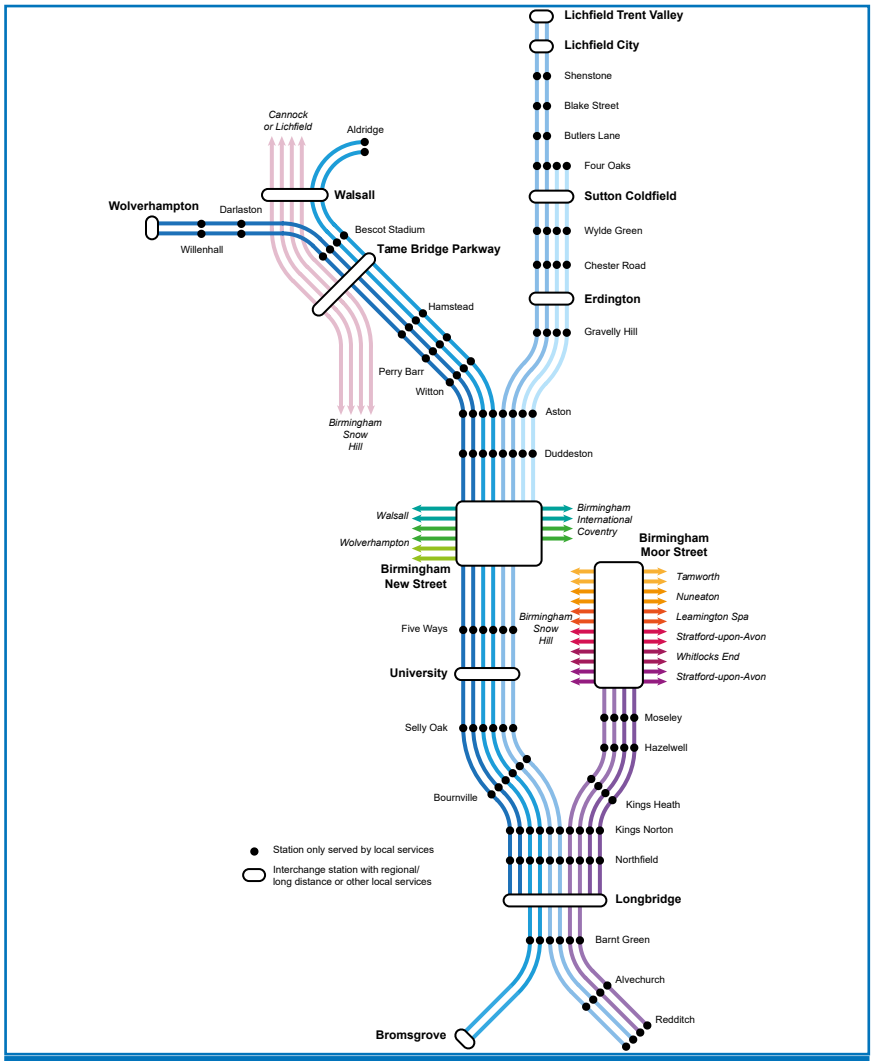


Figure 36: Indicative end-state Train Service Specification providing North - South connectivity across the West Midlands

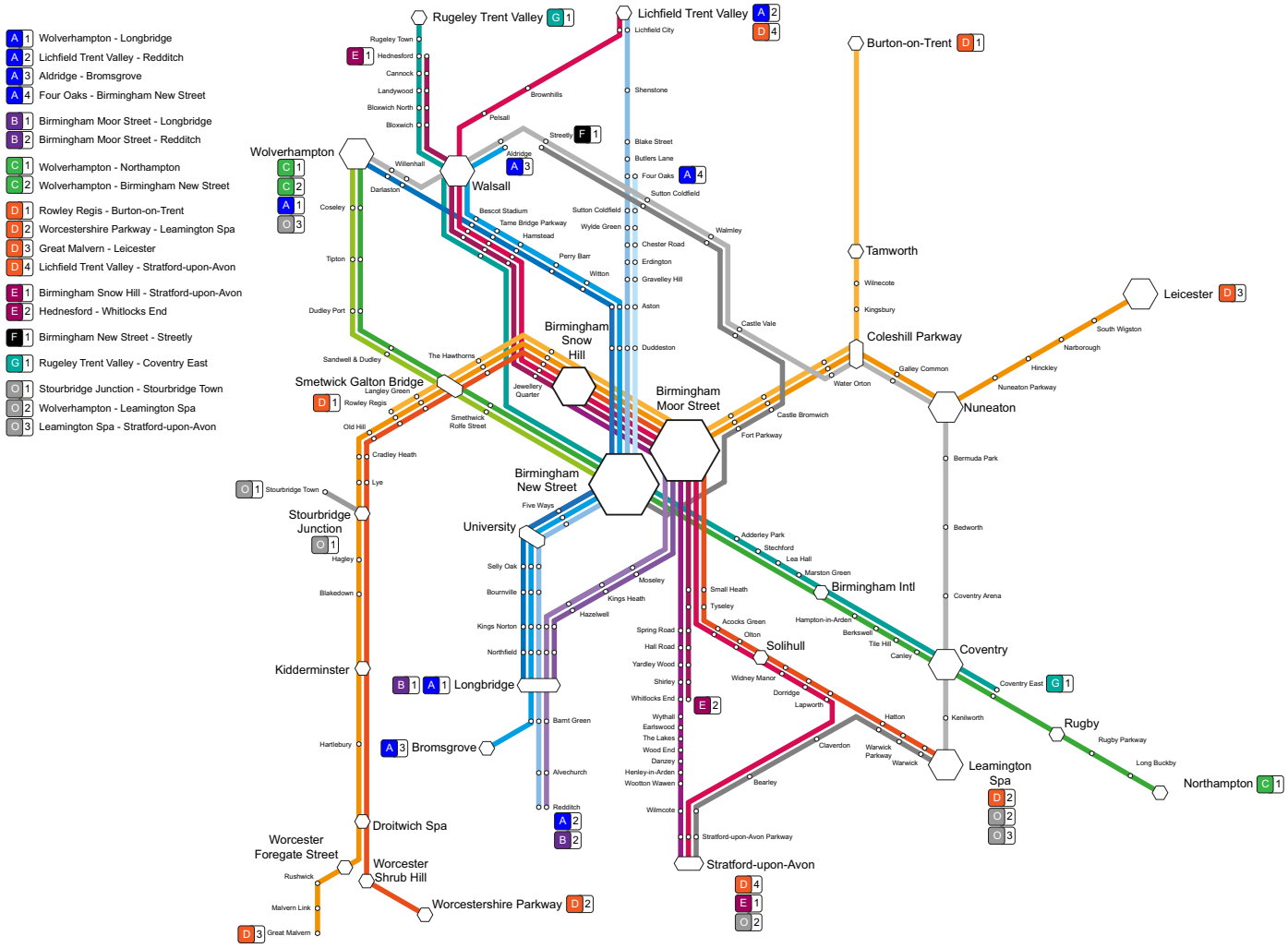


Figure 37: Diagram showing prospective local network line connections and identities for cross-Birmingham connectivity in an indicative end-state

Whole West Midlands Network View Medium Term

9

This document has taken the central Birmingham stations capacity and looked to utilise it in a manner that enables stakeholder aspirations across the network to be met. It has also looked at the way in which cross-Birmingham flows should be remapped to provide the best connectivity and capacity whilst still providing a high-performing network that is user friendly.

The previous chapter looked at how the local connections across the core of the urban area could be strengthened and presented the opportunity available to significantly improve wayfinding for future passengers using the services identified in the specification. The previous corridor sections of this report have identified the next steps for further Strategic Advice that will identify packages of interventions that enable both the passenger and freight aspirations to be met.

These corridor-based interventions are predicated on the core infrastructure provided by Midlands Rail Hub; namely, both east and west chords, and the additional platforms and Birmingham Moor Street and Snowhill stations. It completion of this core infrastructure that unlocks an initial service uplift and in turn enables the subsequent pieces of strategic advice to be undertaken. To avoid a stasis in railway planning in the West Midlands, it is vital the Midlands Rail Hub core infrastructure is developed in order to enable the next round of planning to happen. Without the additional capacity Midlands Rail Hub provides, there is effectively no ability to deliver on any of the aspirations that this document has identified.

The network map of the West Midlands, below, shows how all the corridor train service specifications work together as a comprehensive local, regional and intercity passenger network. This represents a transformation in rail experience in the West Midlands. The subsequent Strategic Advice work that identifies the specific infrastructure requirements on each corridor will need to make recommendations on business case and sequencing such that the required infrastructure is delivered in an affordable and manageable manner.

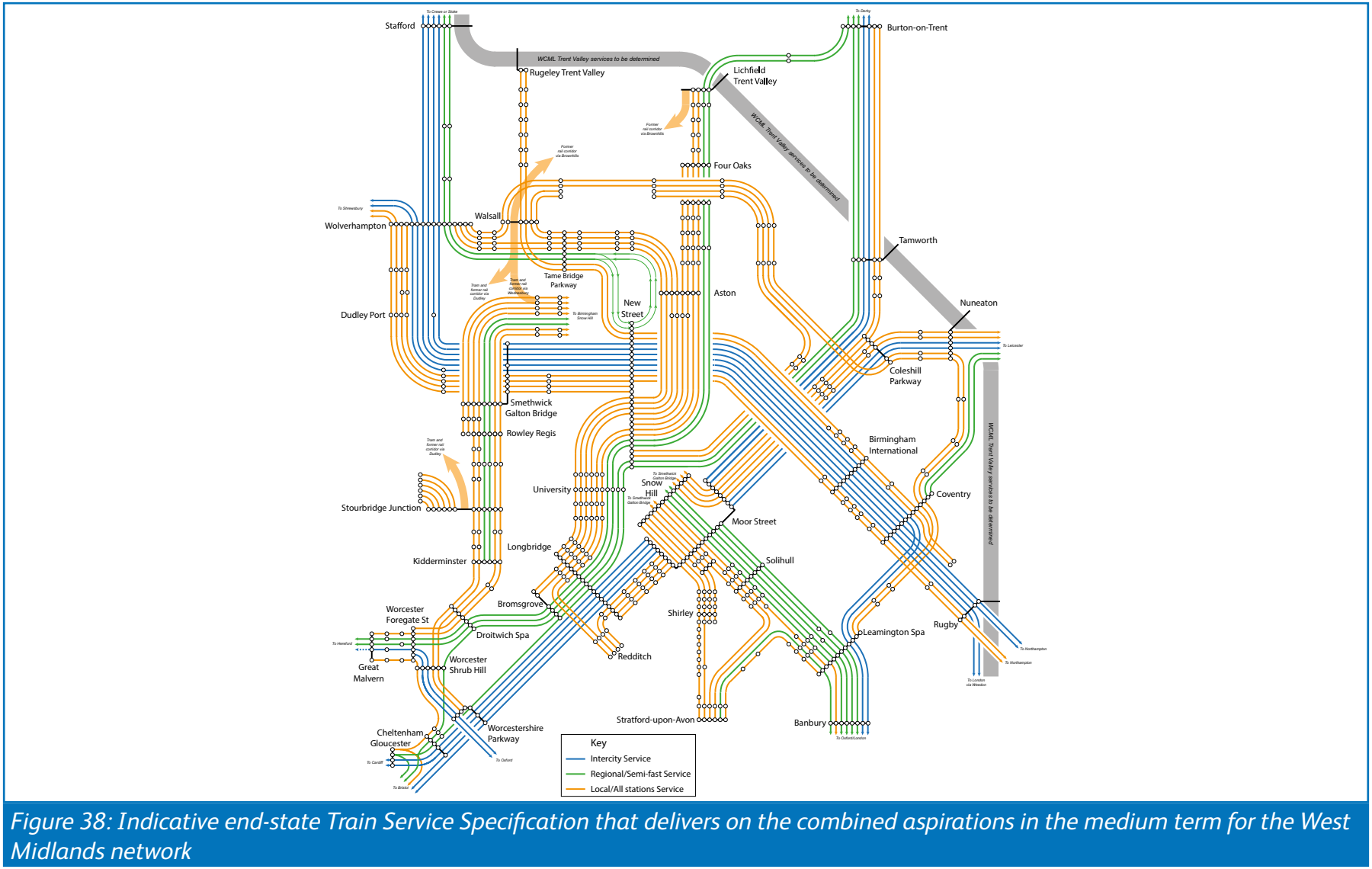


Figure 38: Indicative end-state Train Service Specification that delivers on the combined aspirations in the medium term for the West Midlands network

Interchange between Central Birmingham Stations

10

This strategy document outlines a way to maximise the usage of the railway infrastructure to deliver as many of the aspirations as possible. This is achieved by infrastructure enhancement and rerouting of services, meaning that some stations will have trains to a different station in Birmingham than they do today.

Out of station interchange, the need to exit one station and use public rights of way to reach another station to complete a journey, is a major obstacle to an integrated and easy to use public transport system.

In the most part this is mitigated by the greater connectivity offered from all the Birmingham stations in this strategy, as well as better utilisation of the secondary hubs that provide alternative locations to change trains to complete journeys. There will still be a need for passengers to do out of station interchanges in Birmingham, particularly between Birmingham New Street, Moor Street and Curzon Street stations. It is proposed that all services that serve Birmingham Snow Hill station will also serve Birmingham Moor Street station.

Currently the public right of way that provides the pedestrian route between Birmingham New Street and Moor Street station is unwelcoming with poor wayfinding, crosses busy roads at grade and is a significant obstacle to out of station interchange. It is necessary to undertake work that better ties these two important railways hub to each other and in turn to the HS2 station at Curzon Street as well as the tram and bus services that serve these stations.

All relevant stakeholders need to work together to develop a dramatic improvement in the linkages between the stations to treat the three stations as one interchange opportunity which is easily navigable and provides a welcoming experience to users.

Freight

11

While the options set out for each corridor look to address passenger demands in the West Midlands, the pivotal role that the West Midlands rail network plays in national freight flows must not be overlooked. In addition to any increases in passenger services, all routes will need to continue to provide for freight and where possible developments need to provide for growth in freight above and beyond existing flows.

A common theme throughout the West Midlands is the large number of national freight flows that operate through network bottlenecks, in part due to it being the most direct route but also driven by a lack of alternative routings. Whilst there is a large amount of freight traffic that has its origin or destination in the West Midlands, there is also a significant portion of freight traffic that transits through the centre of Birmingham. This particularly acute on the South Coast to East Midlands, North-East or North-West axes which all travel via the West Midlands by virtue of there being no credible alternative route. As a consequence, the competing aspirations for the railway network in this area mean it is not uncommon for services to be heavily regulated or need to take circuitous routings to reach their destinations.

In the St Andrews area of Birmingham, the increase in passenger services generated by use of the proposed Eastern Chord to Moor Street may lead to an inability to grow freight traffic in this area and consideration may need to be given to changing the current method of operations to maximise capacity.

The Coventry area is another area where capacity is already limited and increases in passenger services would prevent the growth of freight. Provision of a dive-under at Nuneaton linking Coventry and Leicester will in theory provide a beneficial routing option, however the lack of capacity across Coventry station will probably limit its usability for freight traffic without enhancement. Even if the entire route between Coventry and Leamington Spa is doubled, the constraint of the station area itself and the need to cross services on the Birmingham – WCML axis will limit the ability to grow freight traffic on this corridor.

Figure 39: A freight service passing through Aston

A further point of constraint area on the network is the Water Orton area. Here freight accessing terminals in the West Midlands and other flows transiting through the West Midlands interact with the passenger services. While Midlands Rail Hub proposes enhancements these are primarily focussed at delivering increased passenger frequencies through the junction. Should the level of freight growth that is forecast transpire, there will need to be a significant investment in this area to enable the railway to accommodate all traffic. This should be done holistically, considering whether there are credible alternatives to route trains away from the area as well.

The opening of East-West Rail and HS2 released capacity combined will provide new routing opportunities and a potential relief with options for traffic to the West Midlands to be routed via Milton Keynes from Oxford to either reach West Midlands terminals or the North-West avoiding Water Orton. The same routing can also be used to relieve Coventry. However, this will be likely to drive constraints elsewhere.

Flows from the Oxford direction towards the East Midlands and North-East currently don't have a viable alternative to routing via Birmingham and will need to continue via the West Midlands and Water Orton.

Further to the issue of available capacity, it should be considered that freight flows through the West Midlands are slow in the urban area as passenger services are often prioritised. Creating new end to end freight paths via alternative routings could present significant benefits to both freight operations in terms of better average speeds and hence benefit to the whole rail system by supporting or generating further railfreight demand.

A comprehensive view of freight routings is essential to determine the best strategic vision to how to cater for freight growth alongside passenger services and help to create a case for investment in the network to enable this growth to happen. This will need to look at the constraints of routing freight away from some constraints and potentially consolidating traffic into certain areas to maximise the case for investment.

Next Steps

A freight routing strategy looking at the opportunities to consolidate freight traffic into areas that justify investment, releasing capacity elsewhere for growth or passenger traffic. This needs to factor in proposals over a much wider geography and should include options for new or reinstatement of former lines as solutions. The potential for additional/changed freight flows needs to be factored into the localised strategic advice pieces to ensure the full picture of infrastructure interventions is understood.

Role of Midlands Rail Hub

12

This document has established the potential that can be unlocked across the West Midlands by remapping and deconflicting services as a result of the Midlands Rail Hub scheme enhancing Birmingham Moor Street to a national and regional hub.

Partially this is about providing access to HS2 for the wider West Midlands area but also demonstrating how, independently from HS2, Birmingham Moor Street can become an important hub, relieving some of the pressure on Birmingham New Street and, as a conseuqence,enabling an expansion of local, regional and intercity services.

Whilst this document identifies an end state that requires enhancements outside of the scope of Midlands Rail Hub to achieve all of the service aspirations, it states clearly that the Moor Street area interventions are a keystone component to all of the changes proposed. Without the additional capacity that Midlands Rail Hub provides, none of the other interventions can feasibly happen and therefore none of the opportunities for new or faster journeys, enhanced linkages, or new stations can be realised; the capacity ceiling in central Birmingham will remain the limiting factor ruling out the wider transformative change articulated in this document.

Midlands Rail Hub provides a step change in capacity that makes the rail network in the West Midlands much more investable. Smaller scale interventions on the radial routes can utilise the enhanced capacity of the core to provide greater benefits at a lower cost than if these projects had to deal with the issue of the lack of capacity in Birmingham on their own.

The strength of Midlands Rail Hub is in the interchange opportunities it brings to Birmingham Moor Street. This document sets out how Moor Street can become a hub for local services across the entire West Midlands, as well as providing long distance connectivity through Warwickshire to London and the Thames Valley, through Worcestershire to South Wales and the South-West, and through the East Midlands towards East Anglia and the North-East.

The adjacent Curzon Street station will provide High Speed links to the North, East Midlands and London though it should be noted that many HS2 services won't be running for decades yet. However, the classic network needs to be ready for the implementation of HS2 in order to maximise the benefits that High Speed services will bring. Provision of the core MRH infrastructure, including both chords and additional platforms at Moor Street, enables comprehensive service remapping ahead of the full HS2 service level, thereby making Moor Street a hub sooner and preparing the network for the interchange when the first HS2 train runs.

Providing only the west chord has limited benefit to passengers and the wider network until the full suite of HS2 services is operating,generating an interim period of confusing interchange across stations in central Birmingham. Delivering the west chord only would also fully undermine the ability to deliver

Figure 40: Birmingham Moor Street Station, a key component of Midlands Rail Hub

on many of the aspirations identified in this document as the central Birmingham capacity required to make htem a reality is dependent on building the east chord. Construction of the east chord simultaneously with the west chord enables disruption to be minimised and offers the ability to cohesively integrate Moor Street in its end state form with connections to Curzon Street station. It also enables the remapping of local services in line with the end state proposed above, setting the network up for further enhancement in future.

The revised train service specification for Midlands Rail Hub shown (right) also enables the number of diesel trains in New Street to be dramatically reduced. Four diesel services would be displaced to Moor Street to be replaced with electric services and if Hereford services operate through to Lichfield, there is sufficient running under existing overhead line equipment to justify a bi-mode train to operate these services using electric traction between Bromsgrove and Lichfield. This fleet could also operate on the Shrewsbury services which would leave only the hourly Transport for Wales service and the Long-Distance CrossCountry diesel services operated by Class 22x/HSTs remaining in New Street.

With the restructured services in Birmingham set out in the Medium Term view chapter, this also simplifies the integration of an increasingly electrified network through to 2050 when the railway needs to operate as a net-zero carbon network.

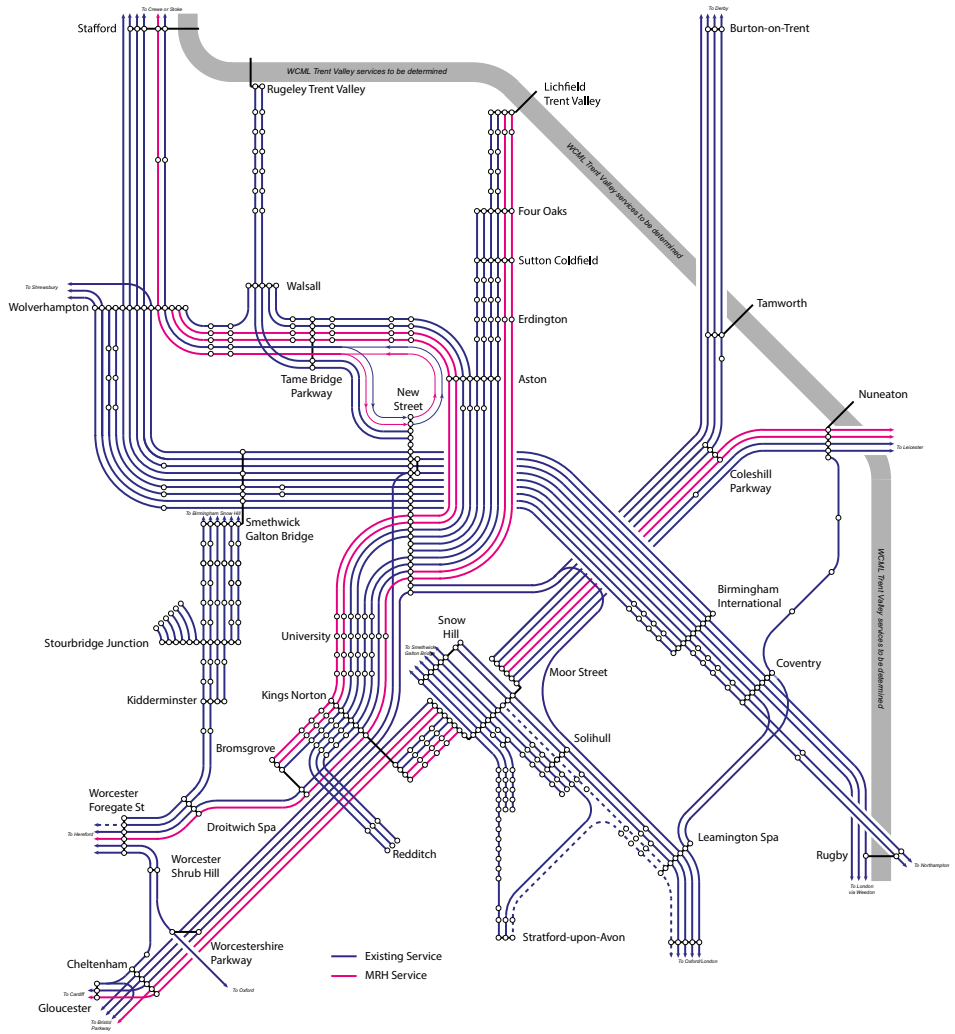


Figure 41: The revised Midlands Rail Hub Train Service Specification delivering additional central Birmingham capacity enabled by the provision of both east and west chords

Fleet and Station Implications

13

The view to 2034 has three tiers of service type which over time, with increasing electrification should be able to be operated by three types of fleet tailored for these specific market segments.

Local Services Fleet

The increased local service provision will require additional EMU rolling stock and consideration needs to be given to the end-state fleet configuration. A number of key locations in this suburban network are physically limited, precluding train lengthening. Aston and Kings Norton are examples that in the future will have a large number of services operating through them from a wider area than previously but are physically constrained by their location preventing more than 150m train lengths. This would suggest that the future standard configuration for local rolling stock would be 6-car, 23m vehicles (138m).

Achieving a standard 6-car length would require lengthening of platforms at the following stations (these stations have one or more platform that is less than 150m in length). This would enable a homogenous EMU fleet to operate across all the local services in the West Midlands area that operate through Birmingham New Street.

- Witton
- Perry Barr (Platform 2)
- Hamstead
- Tame Bridge Parkway
- Bescot Stadium
- Walsall (Platform 1)
- Adderley Park
- Stechford (Platform 1)
- Smethwick Rolfe Street (Platform 2)
- Dudley Port
- Tipton
- Coseley
- Wolverhampton (Platform 5)

Less busy stations between Wolverhampton and Shrewsbury may require some lengthening or consideration of the use of Selective Door Operation as lower patronage may enable these stations not to be extended.

Local services through Moor Street can also follow the same principle once electrified as the platforms on this route are largely compatible with 6x23m operations with only a handful of exceptions. These are:

- Olton
- Old Hill
- Lye
- Hagley
- Blakedown
- Spring Road

Some stations between Birmingham and Stratford-upon-Avon, either via Henley-in-Arden or Hatton are shorter than the required length to platform a 6x23m train, however, due to low patronage, these stations are likely to be better suited to be operated with Selective Door Opening rather than platform lengthening although this will need to be assessed.

Once electrification of the routes within the West Midlands area is complete, this would enable a uniform fleet to operate all local services. With this in mind, the minimum platform length for all new stations in the West Midlands area should be designed with platform lengths of at least 150m in length to facilitate this vision.

Regional Fleet

The Regional services will cover a much wider geography and the trains operate over other routes as well as those in the West Midlands. Therefore, the train type needs to be flexible enough to meet the demands of the routes that it will cover while having sufficient capacity to meet the needs of the semi-fast nature of the services that they will provide in the West Midlands area. This will be likely to result in a number of variants of similar train, depending on the corridor on which they operate in the West Midlands and how they inter-work with services in other regions.

Where possible a homogenous fleet should be sought to simplify the operations and enable strengthening as required. Door configurations should be designed to minimise dwell times although seating configurations should reflect the fact that the trains will travel much further with the expectation that average journey lengths will often be in excess of 30 minutes.

Intercity Fleet

The needs of the Intercity fleet are going to be determined by the long term requirement of the WCML and long distance Cross-Country operations and therefore the requirements for the train types will need to fit with more than just the needs of the West Midlands network. However, in line with the decarbonisation requirement, a bi-mode 125mph configuration should be procured to enable increased usage of existing and future electrification and to enable the possibility of extension of released capacity on the WCML to destinations beyond the current limits of electrification until such times as these locations

are fully electrified.

Where possible the service offer across all Long Distance corridors should be of the same standard regardless of the route corridor that it operates across.

Level Boarding

Currently no train fleet in operation in the West Midlands offers level boarding opportunities, although there are examples of such capability elsewhere on the UK rail network. As well as improving accessibility for all passengers, level boarding also has an operational advantage by providing better performance. This is because there is less chance of an over-dwell while ramps are deployed meaning that the timetable is inherently more robust. There are other advantages, primarily to the passenger about creating a more inclusive railway offer and reputational benefits of reducing the risk of passengers being overcarried if passenger assistance is not available . Furthermore the benefits in the reduction of number of accidents through slips, trips and falls and also to staff that have to operate cumbersome ramps to enable persons with reduced mobility to get safely between train and platform.

It is therefore recommended that new fleets investigate the possibility of level boarding options to deliver on all of the benefits such a system could deliver.

This should be paired with the continued roll out of the Access for All programme which seeks to provide step free access to all platforms across the national network on a prioritised basis.

Recommendations

14

The corridor-by-corridor breakdowns have outlined areas where further study is required to determine the exact service and infrastructure changes that are required to deliver the overarching strategy.

This document has looked at how to allocate capacity in central Birmingham in the first instance. The diagram below, shows how Midlands Rail Hub provides the solution for the centre of the West Midlands from a capacity point of view but there is a consequent need to better understand the radial constraints which will need to be resolved to fully unlock the potential of the core infrastructure.

These subsequent studies will establish the end state infrastructure position and establish phased approaches that enable incremental investment that can make use of the capacity that is available in the central area.

The main areas of further Strategic Advice are:

- Coventry Area
- Solihull Corridor
- Stourbridge Corridor
- Water Orton Corridor
- Walsall Area
- Wolverhampton Area

It has also been identified that there is a need to undertake two other studies that are not directly aligned to the radial route studies that will be useful feed ins to the studies outlined above.

There is a need to undertake a pan-regional freight routings study. This should explore options to route freight that doesn't have an origin or destination in the West Midlands via alternate routes that may yield a benefit in capacity, resource utilisation or mileage.

A study looking holistically at the former rail corridors in the West Midlands and establishing the transport needs of these routes to establish the best long-term use of the corridors to feed into the radial corridor studies. This will need to be undertaken in conjunction with the West Midlands Combined Authority as it will have interactions with the planning of the West Midlands Metro network as well as the heavy rail network.

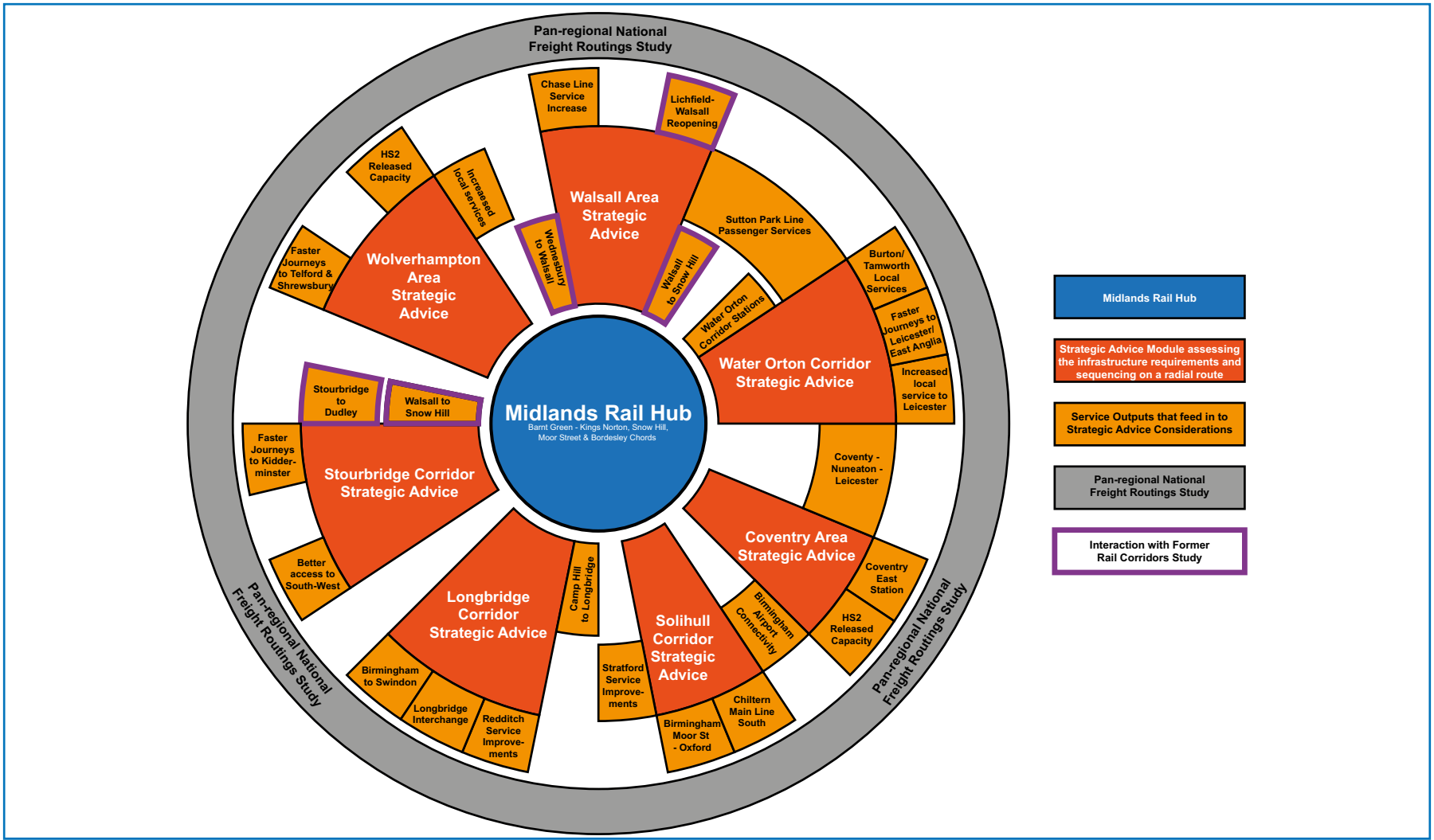


Figure 41: Sequences for prospective future modules of Strategic Advice in the West Midlands and associated service outputs building upon Midlands Rail Hub at the centre of the West Midlands Strategic Advice.

Decarbonisation of the Network

15

The Traction Decarbonisation Network Strategy (2020) is the rail industry's approach to the decarbonisation of the rail network of Great Britain. The study outlines the principles required to achieve the UK government's target net-zero greenhouse gas emissions by 2050 through the consideration of non-carbon traction for currently unelectrified lines.

For the most part, on Central and West Coast South routes, the solution identified is for 25kV Overhead Line Equipment (OLE) although some sections have been identified as possible candidates for other traction types and there may be a need for an interim fleet arrangement until such time as OLE can be delivered.

There is a strong reliance on the decarbonisation of substantial sections of other routes in other Regions being complete before the full service can be decarbonised for several key passenger and freight flows in Central and West Coast South routes. This is particularly pertinent in relation to the Cross-Country network where complete decarbonisation of the service requires a significant amount of work as well as diversionary routes to make removal of diesel operations viable. Therefore, the focus needs to be on delivery of smaller sections that gradually lead to freight and long-distance services being able to be decarbonised with smaller in-fill schemes. This will break down the challenge of meeting the objective into more manageable and affordable sections that contribute to a national pipeline of schemes. A further consideration, particularly in Central Route, is the large number of infrastructure enhancements in the Rail Network Enhancement Pipeline (RNEP) that present opportunities to deliver efficiencies in the delivery of decarbonisation-enabling infrastructure. Additionally, if these projects are delivered with decarbonised outputs, this would also prevent an increase in diesel operated services when the objective is to reduce the size of the carbon-emitting traction towards the 2050 deadline for elimination.

There are seven distinct corridors in Central and West Coast South Routes that need to be decarbonised to achieve the 2050 target.

- Birmingham South West Corridor: Birmingham – Cheltenham – Bristol and Birmingham – Hereford
- Birmingham South East Corridor: Kidderminster - Birmingham – Oxford; Nuneaton – Oxford
- Birmingham East Midlands Corridor: Birmingham – Derby; Birmingham – Leicester
- Marylebone Corridor: London Marylebone – Aylesbury (both via Amersham and Princes Risborough); London Marylebone – Banbury (including proposed link to Old Oak Common)
- East West Corridor: Oxford – Milton Keynes; Aylesbury – Milton Keynes; Bletchley – Cambridge
- Wolverhampton – Shrewsbury Corridor: Wolverhampton – Shrewsbury
- North Staffordshire Corridor: Stoke-on-Trent – Derby

These decarbonisation take into account a series of considerations: Service Groups; current rolling stock; interfacing Infrastructure Projects. Based on these elements, implementation recommendations have been presented for the decarbonisation of each in the relevant corridor sub-sections.

Bi-mode Rolling Stock

Throughout this document reference will be made to bi-mode rolling stock. For the purpose of this piece, 'bi-mode' refers to rolling stock that can take power from the 25kV Overhead Line Equipment (OLE) or provide traction from an independent source (be that diesel, battery, hydrogen or other form of propulsion). This document does not look further at the appropriateness of these although the TDNS strategy does highlight potential applications for different types.

The sheer volume of electrification that needs to be carried out to meet the targets, especially around the West Midlands and Chiltern routes, means that it may be appropriate to adopt bi-mode fleets initially until such time as there is sufficient electrification to enable cascade or conversion to an all-electric fleet. Where possible decisions on rolling stock in the short term should be taken on the basis of providing a practical solution which aligns with the long-term strategy and does not undermine the business case for future electrification schemes. Bi-mode rolling stock, especially when considering battery bi-modes, needs to be considerate of the capacity and performance implications of importing the additional operational impacts of range and turnround times. This rolling stock type should not be considered a panacea for avoiding capital spend that delivers a wider range of benefits above straight decarbonisation outputs.

The Cross Country Passenger Fleet

Decarbonising the Cross Country passenger network relies on aligning a large number of different projects to achieve a fully decarbonised train service. Even if these were aligned, there would still be a long lead time before completion, during which some route sections would be electrified but couldn't be used by electric traction on a Cross Country service because of missing electrification elsewhere.

Therefore, a bi-mode fleet solution is recommended for Cross Country. In North West and Central, this would have immediate benefits without any additional electrification as services between Birmingham and Manchester could take advantage of the existing electrification straight away. Then, as the number of route miles of electrification increases, this bi-mode fleet can gradually increase the use of the available electrification, be that an increase of electrification on North West and Central Region or on other Regions. Throughout this document, references are made to the opportunity for Cross Country to make use of electrified route sections if those services are formed of bi-mode rolling stock and, for the most part, the biggest benefits of electrification will be delivered if all rolling stock is able to make use of the OLE in those sections.

There may be some opportunities to operate pure electric traction sooner than via a wholesale electrification of the

Cross Country network, however this would lead to breaking up services along the limits of electrification, breaking the through journey opportunities and increasing the need for interchange. This is most likely at Birmingham New Street thereby increasing the pressure upon the capacity of the platforms and concourse (both network and passenger capacity). Long term this is undesirable but may be something worth exploring to deliver shorter term decarbonisation benefits to these services and should be investigated in business case development.

Capacity and Performance Benefits of Electrification

This document focuses upon the breakdown of electrification and the diesel traction each section of electrification could help to displace. This does not capture the other benefits electrification can bring which may include but are not limited to:

- Reduced operational costs
- Reduced fleet requirements
- Journey time improvements
- Network capacity benefits

Electrification projects should consider the wider benefits outlined above in their specific business cases to capture the full suite of benefits from electrification programmes.

Power Supply

This document focuses primarily on the unelectrified corridors in the Central and West Coast South routes and how to bring decarbonised services to these routes. However, the challenge of decarbonisation is not just about providing new sections of electrification or alternative traction but also making better use of the existing infrastructure. Increasing the extent of electrification enables this but the capability of the existing system needs to be considered too, assessing the need to support a more intensive electric train service. For example, the West Coast Main Line has been an electric railway since the 1960s and the vast majority of passenger services from London Euston are already operated by electric traction. In order to maximise the potential of the network capacity released by the construction of HS2 an improved system of power supply – including key points of interface like that at Bushey/Acton Lane - is required to enable more passenger and electrically hauled freight to operate as well as protect the long-term performance of the railway.

Freight Loops, Yards and Small In-fill schemes

As with Power Supply, to maximise decarbonisation of all rail services there are elements of the railway that do not fit in to the broad corridors examined in this document. Primarily these are small freight branches and yards or small sections of in-fill electrification within an area that is already mostly electrified that will assist in the overall target of a decarbonised railway. This does

not feature in this broad prioritisation, however, these schemes, such as electrifying the South West sidings at Willesden, should be taken forward as a priority to deliver decarbonisation benefits sooner if a specific case exists for them.

Summary of Route Sections

The analysis of corridor sections has identified the following sections of route that should be electrified incrementally to deliver tangible service benefits. The table on this page lists these by corridor and any potential electrification project should consider these specific route sections as the basis for electrification.

These sections reflect reasonable and practical elimination of diesel services with the opportunity to cascade significant portions of fleet and creating a significant length of electrified railway in order to make the use of bi-mode rolling stock viable. Together these sections of route represent the total route mileage of unelectrified lines that lie within Central and West Coast South routes although individual chords and junctions will be omitted and will need considering on a project by project basis.

South-West Corridor	
SW1	Camp Hill Line
SW2a	Bromsgrove – Great Malvern (including Kings Norton – Barnt Green)
SW2b	Great Malvern – Hereford
SW3	Bromsgrove – Bristol Parkway
SW4	Oxford - Worcester
Birmingham South-East Corridor	
SE1	Droitwich Spa – Birmingham Snow Hill – Leamington Spa/ Stratford-upon-Avon
SE2a	Leamington Spa – Oxford
SE2b	Coventry – Leamington Spa
SE2c	Coventry - Nuneaton
Birmingham East Midlands Corridor	
EM1a	Birmingham – Nuneaton
EM1b	Nuneaton – Leicester
EM2	Birmingham – Derby (including Lichfield – Wichnor Jn)
Marylebone Corridor	
M1	Marylebone – Aylesbury (via Amersham)
M2	Marylebone – Aylesbury and Banbury
East West Corridor	
EW1a	Oxford – Bletchley
EW1b	Aylesbury – Claydon
EW2	Bletchley – Bedford
North Staffordshire Corridor	
NS1	Stoke-on-Trent – Derby
Wolverhampton – Shrewsbury	
WS1	Wolverhampton - Shrewsbury

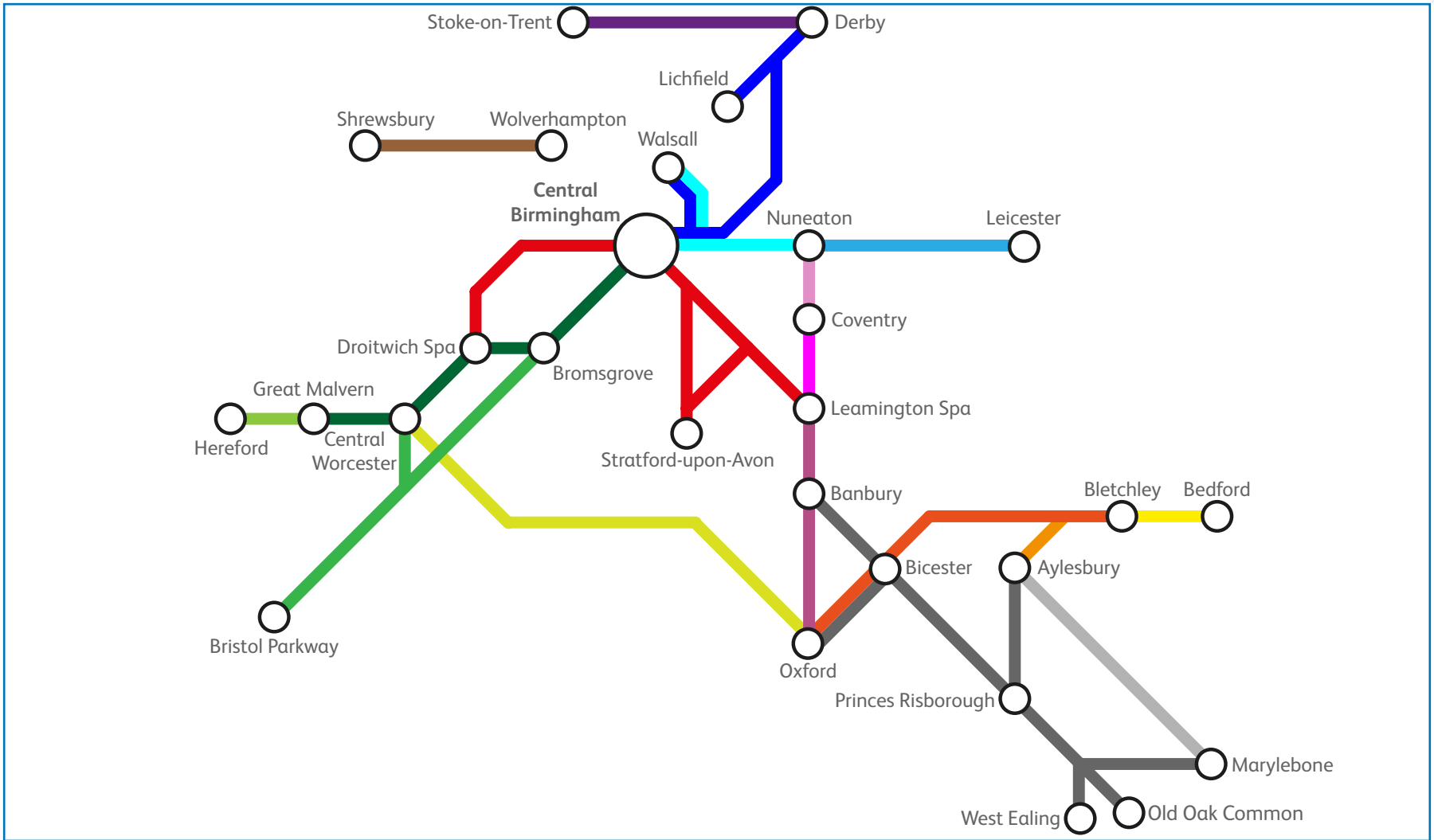


Figure 43: Diagram of the Route Sections for incremental electrification to deliver decarbonisation of the Central and West South network

Elimination of Central and West Coast South Diesel Fleets

The previous sections have focused upon the line of route approach to decarbonisation of Central and West Coast South. However, as has been shown there is an important interplay to achieve total fleet cascade that may drive the prioritisation of electrification. This section therefore looks at how to eliminate the fleets that operate in Central and West Coast South and the sections of route that are required to enable the elimination of those fleets, either for disposal or cascade. Elimination of entire fleets simplifies the operation of depots, competence of staff, provides more vehicles of the same type for cascade to other areas and hence reduces overall industry costs and improves efficiency.

The fleets in question are the Class 196 and Class 172 fleets of the West Midlands operator, the Class 170 and Class 220/221 fleets of the Cross Country operator and the combined Class 165/168 fleet of the Chiltern operator.

Class 196 Fleet

The Class 196 Fleet comprises 12 x 2-car units and 14 x 4-car units (totalling 80 vehicles) built in 2020 – 2021 and serves the routes from Birmingham to Hereford and Shrewsbury. They are also planned to serve the new stations on the Camp Hill Line, when constructed. To release the entire fleet of 80 vehicles for cascade, the following route sections will need to be electrified. The fleet is maintained at Tyseley and Worcester depots.

SW1	Camp Hill Line
SW2a	Bromsgrove – Great Malvern (including Kings Norton – Barnt Green)
SW2b	Great Malvern – Hereford
WS1	Wolverhampton - Shrewsbury

If not all of these sections are electrified some of the fleet will need to be retained or be replaced by bi-mode types.

Class 172 Fleet

The Class 172 fleet compromises 24 x 2-car and 15 x 3-car units (totalling 93 vehicles) built between 2010-2011 and serves the Snow Hill lines between Leamington Spa, Stratford-upon-Avon, central Birmingham, Kidderminster and Worcester. They also operate the Nuneaton – Leamington Spa service. The fleet is based at Tyseley and Worcester depots.

To release the entire fleet of 85 vehicles for cascade, the following route sections will need to be electrified.

SE1	Droitwich Spa – Birmingham Snow Hill – Leamington Spa/ Stratford-upon-Avon
SE2b	Coventry – Leamington Spa
SE2c	Coventry - Nuneaton
SW2a	Bromsgrove – Great Malvern (including Kings Norton – Barnt Green)

Class 165/0 Fleet

The Chiltern Railways Class 165/0 fleet consists of 28 x 2-car and 11 x 3-car units (totalling 89 vehicles) built between 1990-1991 and provides services on all lines that over which Chiltern operates, with the exception of the section between Birmingham Snow Hill and Kidderminster.

To release the entire fleet of 89 vehicles, the following route sections will need to be electrified.

SE1	Droitwich Spa – Birmingham Snow Hill – Leamington Spa/ Stratford-upon-Avon
SE2a	Leamington Spa - Oxford
M1	Marylebone - Aylesbury (via Amersham)
M2	Marylebone - Aylesbury and Banbury
EW1a	Oxford - Bletchley

Class 168 Fleet

The 168 Fleet consists of 9 x 2-car, 9 x 3-car and 10 x 4-car units (totalling 85 vehicles) built between 1998 and 2004. These units operate over the complete franchise area and can feature on every service operated by Chiltern Railways.

SE1	Droitwich Spa – Birmingham Snow Hill – Leamington Spa/ Stratford-upon-Avon
SE2a	Leamington Spa - Oxford
M1	Marylebone - Aylesbury (via Amersham)
M2	Marylebone - Aylesbury and Banbury
EW1a	Oxford - Bletchley

Class 170 Fleet

The Class 170 fleet employed on services operated by Cross Country consists of 5 x 2-car and 16 x 3-car units (totalling 58 vehicles) that operate on services from Birmingham to Cardiff, Nottingham and Stansted Airport. The fleet is based at Tyseley depot in Birmingham.

Elimination of this fleet would require the following routes in North West and Central Region plus additional electrification in Wales and Western Region and Eastern region which is outside of the scope of this document (see Appendices).

SW1	Camp Hill Line
SW2a	Bromsgrove – Great Malvern (including Kings Norton – Barnt Green)
SW2b	Great Malvern – Hereford
SE1	Droitwich Spa – Birmingham Snow Hill – Leamington Spa/ Stratford-upon-Avon
EM1a	Birmingham – Nuneaton
EM1b	Nuneaton – Leicester
EM2	Birmingham – Derby (including Lichfield – Wichnor Jn)

Class 220/221 Fleet

The Class 220/221 fleet comprises of 38 x 4-car and 20 x 5-car units employed by Cross Country. A further 20 5-car sets are also used by Avanti West Coast although these will be replaced in 2023 by new rolling stock bi-mode or pure EMU rolling stock so are not included in this fleet displacement. The total number of vehicles is 252.

Elimination of this fleet would require the following routes in North West and Central region plus additional electrification in Wales and Western Region and Eastern region which is outside of the scope of this document (see Appendices).

SW1	Camp Hill Line
SW2a	Bromsgrove – Great Malvern (including Kings Norton – Barnt Green)
SW3	Bromsgrove – Bristol Parkway
SE1	Droitwich Spa – Birmingham Snow Hill – Leamington Spa/ Stratford-upon-Avon
SE2a	Leamington Spa – Oxford
SE2b	Coventry – Leamington Spa
EM2	Birmingham – Derby (including Lichfield – Wichnor Jn)

Fleet Summary

As outlined above, there are a total of 4 fleets that could be eliminated by electrification within Central and West Coast South region, these are the Class 196, 172, 165/0 and 168 fleets. In the next decade or so the Class 165/0 fleet is going to be approaching life expiry. As this fleet comprises 89 vehicles, nearly equivalent to the 196 fleet (80 vehicles) or the 172 fleet (93 vehicles) this presents an opportunity for a cascade to eliminate the class 165/0 fleet with the Region. Alternatively, the newer fleets 168, 172 and 196 could make significant inroads in to displacing the fleet of 15x fleet across the network if a focus is made on providing sufficient electrification to displace these entire fleets.

Fleet	Total Vehicles
Class 165/0	89
Class 168	85
Class 172	93
Class 196	80

The elimination of the Cross Country fleets relies on a much more comprehensive integrated national electrification programme. This would take a long time to deliver and would need to cover significant route mileage to cover all of the routes over which Cross-Country operate in order to provide sufficient coverage for an all electric fleet. Given all the diversionary routes that would be required it is impractical to consider an electrification to prioritises Cross-Country fleet replacement with a pure-EMU solution from the outset.

However, almost any increase in the amount of electrified route identified in this document would increase the distance that Cross Country fleets operate under wires and therefore make the case for bi-mode fleets stronger. This would maximise the potential decarbonisation benefits until the entire Cross Country network is electrified or where sections that remain unwired are small enough to make alternative traction a viable possibility to fill the gaps.

At each incremental stage of increased electrification, the opportunity to reduce the number of bi-mode vehicles should also be considered as with each additional route section that is wired, the opportunity to have pure-EMUs operating on some CrossCountry routes increases, however the impact on fleet diagramming, depots and maintenance needs to be considered when making such decisions.

Long Term View

16

This document sets out a view of what is achievable in the Central Birmingham area that can be maximised to provide additional services across the whole West Midlands Network.

Beyond this point additional capacity is needed to deliver the next step change in rail connectivity. The most constrained route is the Coventry – Birmingham – Wolverhampton corridor. Here the competition for capacity between longer distance services and local services has a significant negative impact on optimum capacity and prevents improvements to local services. If additional corridor capacity is provided this would allow some better spacing of services but would still come up against the hard limit of capacity at New Street station. Furthermore, the journey time between Birmingham and Wolverhampton is substantially slower than Birmingham – Coventry as shown in the below table:

	Birmingham - Coventry	**Birmingham - Wolverhampton**
Distance (Direct)	17 miles	12 miles
Distance (Rail)	19 miles	13 miles
Fastest Journey with Intercity Rolling Stock	20 minutes (calling at International)	16 minutes (no-stop) 22 minutes (calling at Sandwell and Dudley)
Maximum Line Speed	125mph	75 mph
Average Speed	57mph	35 mph

Increasing the speed of the Birmingham to Wolverhampton route would only further constrain capacity for local and regional services so a new routing should be looked at with the potential to deliver shorter journey times and potentially serve areas of the Black Country that have poor access to the rail network. If this were a mainly two-track railway the number of new intermediate stations should be limited to ensure that capacity is retained to operate fast services operating on the corridor.

On the Birmingham – Coventry section the route is already capable of operation at up to 125mph but there is insufficient capacity to run more services. On this section of route the imperative is delivering additional capacity which could either be via a new corridor or upgrades of the existing route. Birmingham International will remain an important location and should continue to be served.

A new station in Central Birmingham would be required to provide capacity for these enhanced corridors and should look to provide direct access to New Street, Moor Street and Curzon Street concourses that will improve the access between the stations as well as make interchange more viable.

A new station can be optimised to have higher entry and exit speeds which will make a significant difference to the journey times compared to the approaches to New Street, where the current 10mph speed restriction to enter and 15mph exit to the station contributes to a significant journey time extension for all services to Birmingham.

New Street station currently acts as a performance buffer on long distance services, with trains often planned to have long dwells to mitigate late running, as well as for operational reasons such as crew changes and path availability. A new rail corridor and station should enable a better performing railway, coupled with higher speed approaches to the station which would improve not just the Coventry and Wolverhampton to Birmingham journey times but also the Wolverhampton to Coventry journey times, making them much more competitive with the road option via the M6.

A new central station opens up the opportunity for improvements to other corridors that could benefit from a new station that better supports intercity traffic. The most obvious of these is the Longbridge corridor where capacity and journey times are constrained towards the South-West. Long distance services to Cheltenham and regional services to Worcester and beyond will have to slot in between the high frequency of local services. This means that like the Birmingham – Wolverhampton corridor, increasing the line speed will reduce capacity.

As a result of existing rail geography, it is very difficult to provide Redditch with better connectivity as it lies at the end of a commuter railway to Birmingham. As a town of a population of nearly 90,000, the lack of regional connectivity to anywhere other than Birmingham and the slow journey times hamper the ability to make major inroads into modal-shift from road to rail. The Lickey incline, the steepest section of main line railway in the UK is a significant constraint on the capacity of the whole route and adversely affects journey times, particularly freight. Removing high speed passenger services from this section of route would enable more capacity to be given over to freight and local passenger operations.

A new higher speed railway corridor from Central Birmingham could avoid the Lickey incline, provide a mainline connection to Redditch and provide faster journey times between Cheltenham and Birmingham. By linking in to a new subterranean through station at Birmingham there would be opportunities to provide high quality interchange but also provide through links. Finally, a connection from the new station to the HS2 network in eastern Birmingham would enable the prospect of through services from the South-West on to the HS2 network. These could utilise proposed services from the East Midlands and North-West.

Further work is required to understand the feasibility of providing such connections and where such a station could practically be located in Central Birmingham. It is important that initial scoping of this is carried out to be able to inform land use planning and strategic planning further into the future beyond the scope of this document.

Appendix: Worcester Area Constraints and Roles of Stations

A

Current Services

The standard off-peak structure in the Worcester area has the following services operating.

Route	Calls at Worcester			Trains per Hour	Operator
	WOF	WOS	WOP		
Birmingham Moor Street* - Worcester Shrub Hill		X		1	West Midlands Railway
Birmingham Moor Street* - Worcester Foregate Street	X			1	West Midlands Railway
Birmingham New Street - Hereford (via Bromsgrove)	X			1	West Midlands Railway
Great Malvern - Bristol	X	X		1**	Great Western Railway
Worcester Foregate Street - London Paddington	X	X	X	1	Great Western Railway
Cardiff Central - Nottingham			X	1	CrossCountry Trains
Manchester Piccadilly - Bristol Temple Meads				1	CrossCountry Trains
Edinburgh Waverley - Plymouth				1	CrossCountry Trains

*Services operate beyond Birmingham Moor Street to Whitlocks End or Dorridge

**To be enhanced to 1tph as part of Great Western Railway Direct Award in December 2021 Timetable

WOF: Worcester Foregate Street

WOS: Worcester Shrub Hill

WOP: Worcestershire Parkway

This off-peak structure is supplemented in some hours by additional Worcester – Birmingham New Street services, extensions of some GWR Paddington services to Hereford and some Birmingham Moor Street services extend to Great Malvern. Services to Birmingham Snow Hill predominantly operate to Worcester Foregate Street but some trains operate to and from Shrub Hill for operational reasons.

There has been little change in the service in the Worcester Area for some time and this is reflected in the station usage statistics, especially when compared to other similar places with either similar locations, roles or population. While the combined usage of Worcester Shrub Hill and Foregate Street combined rank favourably in outright numbers the trend is that of flat usage while other stations and routes have seen continued growth.

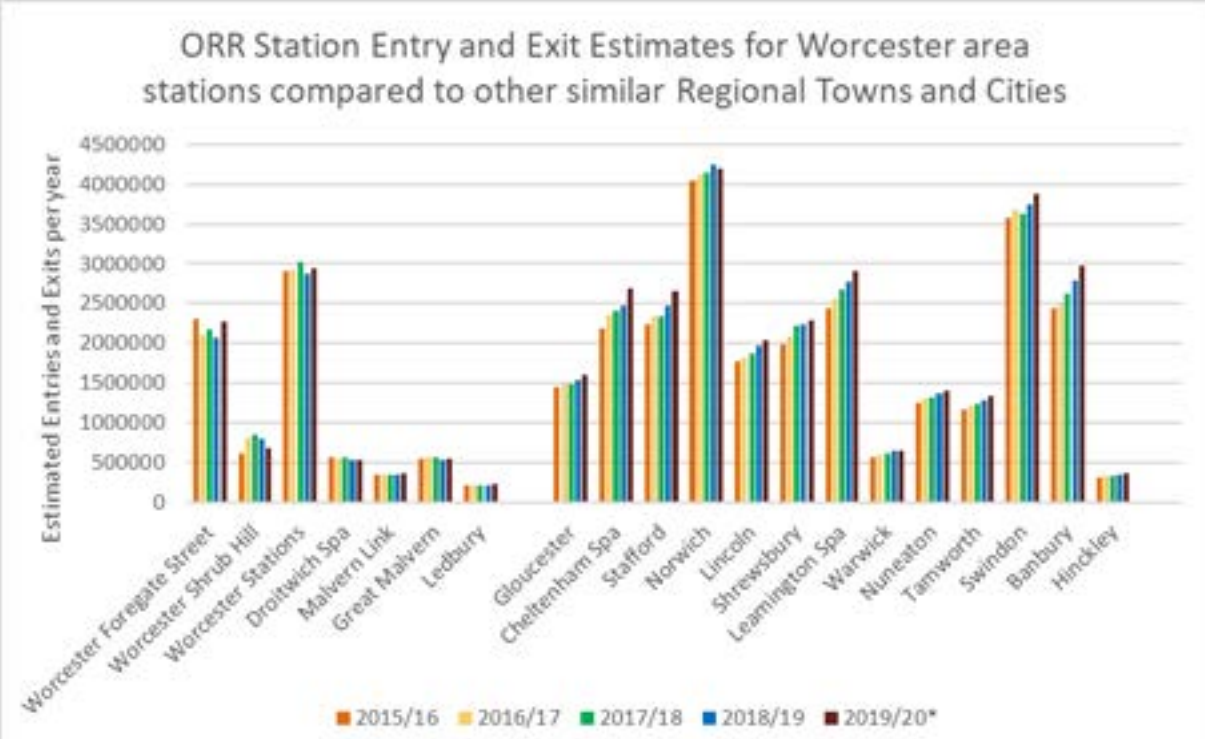


Figure 16: Comparison of Worcester Area Station usage to similar places across the network

Over the past five years, the usage of stations in Worcester has at best stayed flat and in some cases decreased, reflecting the railway's inability to attract new custom despite population growth and for the most part, well located stations.

The service provision is particularly poor in the following key areas:

- Frequency of fast connections between Hereford, Worcester and Birmingham
- Frequency of local connections from Stourbridge/ Kidderminster to Worcester city centre and onward connectivity towards the south-west
- Frequency of connections between Worcester, Oxford, Reading and London
- Frequency and journey time of connections towards Bristol and the south-west

Some of these headline points are addressed through two separate schemes designed to add services to this area, Midlands Rail Hub and the North Cotswold Line Taskforce, however, how these trains fit in to the wider Worcester area to cater for the needs of the city and surrounding corridors needs careful consideration.

Establishing the role of each of the stations in this area is required to determine the correct level of provision of services and how best to divide services amongst the Worcester stations.

Worcester Shrub Hill

From a railway perspective, Worcester Shrub Hill is well located to service as a hub between all of the routes in the Worcester area. However, it is somewhat isolated from the city centre which is better served by Foregate Street. The service specification should seek to maximise the interchange opportunities which will help to regenerate the area around the station, in line with the local aspirations outlined in the Worcester Shrub Hill Masterplan. Consequently, it is important that there are frequent services from all routes to Shrub Hill to make the most of interchange opportunities that the station is ideally suited to deliver.

The only service groups that shouldn't call at the station are those that are intended to provide the fastest connections to Worcester City Centre which, if they did call at Shrub Hill would impose both a journey time and capacity constraint that would hamper the ability to add extra connectivity that can would be more beneficial to the wider Worcester area.

Provision of services from the Stourbridge line are important to support the interchange role, giving access for this route to the wider network via Shrub Hill whilst maintaining the links to the city centre at Foregate Street. Services to Ledbury and Hereford are at present limited (just a handful of services a day continue beyond Great Malvern). A higher frequency of services to Great Malvern from both Gloucester/Bristol and Oxford would enable

services from all directions to create a hub station at Shrub Hill. The station site is expansive with potential for station facilities to be extended on existing railway land to make the most of the opportunity for interchange between services.

Worcestershire Parkway

Worcestershire Parkway has the potential to be an important interchange with long distance services that don't serve the Worcester loop and therefore provide a wider range of connectivity opportunities. With appropriate provision of services from the Stourbridge line, this station would create new journey opportunities that are currently unavailable from that route without multiple interchanges or backtracking via Birmingham. To support the housing growth in this area a high frequency service linking Parkway with the central Worcester stations is important to reduce congestion in the city centre and avoid car dependency in these developments.

Worcester Foregate Street

This station will remain an important calling point for all services to and from Hereford as well as being a vital gateway for access to the city centre for the local area. The station will continue to be constrained by its prime city centre location preventing little improvement of passenger facilities and station facilities. All services that pass through the station will continue to need to call but the focus should be increasing the local connectivity benefits of the station and access to the city centre but that increases of interchange traffic should be focussed upon Shrub Hill which is better equipped for longer distance travellers and interchange passengers.

Rushwick

Rushwick is a new station proposed by Worcestershire County Council to support housing development to the south-west of the city of Worcester and to provide a railhead for west Worcestershire and north Herefordshire. The key drivers for the station are access to Worcester city centre and Birmingham. The limitations of the current signalling system will present a significant challenge to providing a service within the current timetable and even if calls could be accommodated in the existing services, these do not provide the best solution to meet the needs of the station catchment.

Additional calls in Hereford – Birmingham services are possibly the best fit for prospective markets. This would have a negative journey time impact on an already slow journey time that Midlands Rail Hub project is seeking to improve upon, as well as potential on train implications with the services not having sufficient capacity to meet demand.

The GWR local services to Bristol are a good candidate for calling at the station, especially once the frequency is increased to operate an hourly service.

Calling London Paddington trains at what is primarily a local station will again have a detrimental impact on journey time and aside from providing connectivity to central Worcester is unlikely to cater for the majority of associated demand.

Resignalling of the infrastructure, particularly with enhanced turnback facilities at Great Malvern and a more flexible layout at Worcester Foregate Street would enable more suitable services to operate to Rushwick:

- Additional Birmingham – Hereford potentially enabling one of the Birmingham – Hereford services to call at the station giving fast journey times to Birmingham

- Regular extension of Birmingham Snow Hill services to Great Malvern providing higher frequencies to Worcester city centre as well as through connectivity to Kidderminster and Stourbridge.

Malvern Link

Access from Malvern Link to Worcester stations will provide the majority of onward connections that means an increase in calls in longer distance services is unnecessary and would only increase the length of journey times to Hereford. Provision of higher frequencies between Worcester and Great Malvern is important to grow the market and maintaining a fast service to Birmingham is desirable. However, providing calls in both Birmingham – Hereford services will affect journey time and it should be investigated as to whether calls in these trains should be alternated between Malvern Link and Rushwick.

Great Malvern

At the end of the double track section, Great Malvern will continue to act as an important terminus for some services, including of additional trains to serve Malvern Link and potentially a station situated at Rushwick. An important destination in its own right, it is logical that all services call here and this will also enable better use of capacity and therefore more services at Worcester Foregate Street by enabling more through running to Great Malvern.

Colwall

The current level of service is likely to remain sufficient to meet the demands of this station. Its position on the single line section between Great Malvern and Ledbury will mean that additional calls will increase the occupation time of the single line that will negatively impact upon capacity and performance of the route.

Ledbury

Ledbury provides an important railhead for eastern Herefordshire and will continue to be a passing point for services to Hereford. Provision of a half-hourly Birmingham service would be beneficial in improving the connectivity. Regular Hereford – London services would provide access to Worcester Shrub Hill and Worcestershire Parkway. However aside from access to the regenerated area around Shrub Hill, the connectivity is less important as it is a round about route to reach the south west and the Birmingham services would provide better services for connectivity to the north-east and north-west via Birmingham New Street and Moor Street.

Droitwich Spa

Droitwich will continue to need access to both the Stourbridge and Bromsgrove routes to the north but would benefit from improved access to Worcester Shrub Hill and Worcestershire Parkway stations for the onward connectivity benefits that interchange at those stations would offer. For journey time and capacity reasons, it may be that not all services call at Droitwich Spa although there may be benefits to providing t an increase in frequency on all axes.

Appendix: Decarbonisation Route Sections

B

Service Group Decarbonisation by Route Section: Marylebone Corridor

To decarbonise services originating from London Marylebone, the table below identifies which services could make use of each section based upon the 2019 service specification. Where further electrification is required beyond the sections shown in the table below this is captured in the final column.

		Route Section						
	Service Group	Marylebone - Gerrards Cross	Gerrards Cross - High Wycome	High Wycombe - Princes Risborough	Princes Risborough - Banbury	Princes Risborough - Aylesbury	Neasden South Jn - Aylesbury Vale Parkway	Extra OLE required or bi-mode for off corridor operation
	Route Mileage (approx.)	18.5 miles	9.5 miles	8 miles	33 miles	7.5 miles	35 miles (21 miles on LUL infrastructure)	
1	MYB - AYS						Y^	
2	MYB - AVP						Y^	
3	MYB - GER	Y	Y					
4	MYB- HWY	Y	Y					
5	MYB - AYS (via HWY)	Y	Y	Y	Y	Y		
6	MYB - OXF	Y	Y	Y	Y			BIT – OXF#
7	MYB - BAN	Y	Y	Y	Y			
8	MYB - BMO	Y	Y	Y	Y			BAN – BMO*
9	MYB - BSW	Y	Y	Y	Y			BAN – BMO*
10	MYB - SAV	Y	Y	Y	Y			BAN – SAV*

* Section covered by Birmingham South and Snow Hill Corridor
# Section covered by East West Rail Corridor
^ Section partly utilises infrastructure owned and operated by London Underground Limited
Full station names identified by three letter station codes are shown in the glossary on page 152.

Service Group Decarbonisation by Route Section: Birmingham East Midlands Corridor

To decarbonise services operating between the West and East Midlands, the table below identifies which services could make use of each section based upon the 2019 service specification. Where further electrification is required beyond the sections shown in the table below this is captured in the final column.

		Route Section				
	Service Group	Birmingham – Water Orton	Water Orton – Nuneaton	Nuneaton – Leicester	Water Orton - Derby	Extra OLE Required or bi mode for off corridor operation
	Route Mileage (approx.)	7.5 miles	13 miles	18.5 miles	33.5 miles	
1	CDF – NOT	Y			Y	GCR – NWP DER - NOT
2	BHM – NOT	Y			Y	DER – NOT
3	RDG – NEW	Y			Y	BHM – DID DER - YRK
4	PLY – EDI	Y			Y	BPW – PLY DER - YRK
5	BHM – LEI	Y	Y	Y		
6	BHM – SSD	Y	Y	Y		LEI - ELY

Full station names identified by three letter station codes are shown in the glossary on page 152.

Service Group Decarbonisation by Route Section: Birmingham South-East Corridor

		Route Section											
	Service Group	Oxford - Banbury	Banbury – Leamington Spa	Leamington Spa – Dorridge	Dorridge/ Whitlocks End – Birmingham Snow Hill	Birmingham Snow Hill – Stourbridge Junction	Stourbridge Junction - Kidderminster	Kidderminster – Droitwich Spa	Stratford-upon-Avon – Hatton	Stratford-upon-Avon – Whitlocks End	Leamington Spa - Coventry	Coventry - Nuneaton	Extra OLE Required or bi mode for off corridor operation
	Route Mileage (approx.)	23 miles	20 miles	13 miles	15.5 miles	12 miles	7 miles	10 miles	10 miles	17 miles	9.5 miles	10 miles	
1	DDG – WOS			Y	Y	Y	Y	Y					DTW – WOS*
2	DDG – KID				Y	Y	Y						
3	WTE – WOF (GMV)				Y	Y	Y	Y					DTW – GMV*
4	WTE – KID				Y	Y	Y						
5	SAV – SBJ (via WTE)				Y	Y				Y			
6	SAV – SBJ (via DDG)				Y	Y			Y				
7	MYB – BMO		Y	Y	Y								BAN–MYB@
8	MYB – BSW		Y	Y	Y								BAN–MYB@
9	MYB – SAV		Y	Y					Y				*BAN–MYB@*
10	BMO - LMS		Y	Y	Y								
11	RDG – NEW	Y	Y	Y	Y						Y (if diverted via COV)		OXF – DID$ BHM – YRK#^
12	MAN - BMH	Y	Y								Y		OXF – DID$
13	NUN – LMS										Y	Y	
14	(DID) OXF - BAN	Y											OXF – DID$

*Section of route covered in Birmingham South West Corridor
Section of route covered in Birmingham East Midlands Corridor
@Section of route covered in Birmingham South and Marylebone Corridor
Full station names identified by three letter station codes are shown in the glossary on page 152.

$ Section of route lies in Wales & Western Region
^ Section of route lies in Eastern Region

Service Group Decarbonisation by Route Section: Birmingham South-West Corridor

		Route Section				
		Camp Hill	Bromsgrove – Great Malvern	Great Malvern – Hereford	Worcester / Stoke Works – Westerleigh Junction	Extra OLE Required or bi mode for off corridor operation
	Route Mileage (approx.)	6.5 miles	20.75 miles	20 miles	68.75 miles	
1	BHM – HFD	Y	Y	Y		
2	MAN – EXD	Y			Y	BRI – EXD @
3	EDI – PLY	Y			Y	BHM – YRK #^ BRI – PLY @
4	NOT – CDF	Y			Y	GCR – NWP @ BHM – DBY #
5	DDG – WOF (GMV)		Y			DDG – DTW*
6	DDG – WOS		Y			DDG – DTW*
7	GMV – BRI		Y		Y	
8	(HFD) GMV – PAD		Y	Y		WOS – OXF @ %
9	*BMO – HFD*	Y	Y	Y		
10	*BMO – BRI*	Y	Y		Y	
11	*BMO – CDF*	Y	Y		Y	
12	*BMO – KNN*	Y				

* Section of route covered in Birmingham Snow Hill Corridor
^ Section of route lies in Eastern Region
% Bi-mode stock already operates the majority of services between Worcester and Oxford
Full station names identified by three letter station codes are shown in the glossary on page 152.

Section of route covered in Birmingham East Midlands Corridor
@ Section of route lies in Western and Wales Region

Service Group Decarbonisation by Route Section: East West Corridor

		Route Section				
		Oxford – Bicester	Bicester – Bletchley	Aylesbury – Claydon Jn	Bletchley - Bedford	Extra OLE Required or bi mode for off corridor operation
	Route Mileage (approx.)					
1	OXF-MYB	Y				BIT-MYB@
2	OXF-MKC	Y	Y			
3	OXF-BDM	Y	Y		Y	
4	AYS-MKC		Y	Y		
5	BLY-BDM (CBG)	Y	Y		Y	BDM-CBG^

@Section of route covered in Marylebone Corridor
^Section of route lies in Eastern Region
Full station names identified by three letter station codes are shown in the glossary on page 152.

Service Group Decarbonisation by Route Section: Wolverhampton – Shrewsbury Corridor

		Route Section	
		Wolverhampton – Shrewsbury	Extra OLE Required or bi mode for off corridor operation
	Route Mileage (approx.)		
1	BHM – SHR	Y	
2	BHI – AYW/HHD	Y	SHR-AYW* SHR-HHD*
3	EUS - SHR	Y	%

*Section of lies in Western and Wales Region
% Bi-mode rolling stock has been procured to operate this service from December 2022
Full station names identified by three letter station codes are shown in the glossary on page 152.

Service Group Decarbonisation by Route Section: North Staffordshire Corridor

		Route Section	
		Stoke-on-Trent – to North Staffordshire Jn	Extra OLE Required or bi mode for off corridor operation
	Route Mileage (approx.)		
1	CRE - DBY	Y	BUT-DBY#

Section of route covered in Birmingham East Midlands Corridor
Full station names identified by three letter station codes are shown in the glossary on page 152.

Three Letter Station Code Glossary

AVP	Aylesbury Vale Parkway
AYS	Aylesbury
AYW	Aberystwyth
BAN	Banbury
BDM	Bedford (Midland)
BHM	Birmingham New Street
BIT	Bicester Village
BLY	Bletchley
BMO	Birmingham Moor Street
BRI	Bristol Temple Meads
BSW	Birmingham Snow Hill
BUT	Burton-on-Trent
CBG	Cambridge
CDF	Cardiff Central
CRE	Crewe
DID	Didcot
DBY	Derby
DDG	Dorridge
DTW	Droitwich Spa
EDI	Edinburgh
ELY	Ely
EXD	Exeter St Davids
GCR	Gloucester
GER	Gerrards Cross

GMV	Great Malvern
HFD	Hereford
HHD	Holyhead
HWY	High Wycombe
KID	Kidderminster
KNN	Kings Norton
LEI	Leicester
LMS	Leamington Spa
MKC	Milton Keynes Central
MYC	London Marylebone
NEW	Newcastle
NOT	Nottingham
NWP	Newport
OXF	Oxford
PAD	London Paddington
PLY	Plymouth
RDG	Reading
SAV	Stratford-upon-Avon
SBJ	Stourbridge Junction
SHR	Shrewsbury
SSD	Stansted Airport
WOF	Worcester Foregate Street
WOS	Worcester Shrub Hill
WTE	Whitlock's End
YRK	York

Appendix: Decarbonisation Prioritisation

C

		High Passenger Usage	Major Freight Corridor	Major Change to Infrastructure Providing Opportunity	Service Increase Proposed in Short to Medium Term	Fleet Displacement Opportunity	Total	Priority Ranking (1 & 2 = Low, 3 = Medium, 4 & 5 = High)
South-West Corridor								
SW1	Camp Hill Line	0	1	1	1	1	4	High
SW2a	Bromsgrove – Great Malvern (including Kings Norton – Barnt Green)	1	1	1	1	1	5	High
SW2b	Great Malvern – Hereford	0	0	1	1	1	3	Medium
SW3	Bromsgrove – Bristol Parkway	1	1	0	1	1	4	High
SW4	Oxford - Worcester	0	0	1	1	0	2	Low
Birmingham South-East Corridor								
SE1	Droitwich Spa – Birmingham Snow Hill – Leamington Spa/Stratford-upon-Avon	1	1	1	1	1	5	High
SE2a	Leamington Spa – Oxford	1	1	0	1	1	4	High
SE2b	Coventry – Leamington Spa	0	1	1	1	1	4	High
SE2c	Coventry - Nuneaton	0	1	0	1	1	3	Medium
Birmingham East Midlands Corridor								
EM1a	Birmingham – Nuneaton	1	1	1	1	0	4	High
EM1b	Nuneaton – Leicester	1	1	1	1	0	4	High
EM2	Birmingham – Derby (including Lichfield – Wichnor Jn)	1	1	1	1	0	4	High
Marylebone Corridor								
M1	Marylebone – Aylesbury (via Amersham)	1	0	0	0	1	2	Low
M2	Marylebone – Aylesbury and Banbury	1	1	0	0	1	3	Medium
East West Corridor								
EW1a	Oxford – Bletchley	1	1	0	1	0	3	Medium
EW1b	Aylesbury – Claydon	0	1	1	1	0	3	Medium
EW2	Bletchley – Bedford	0	1	1	1	0	3	Medium
North Staffordshire Corridor								
NS1	Stoke-on-Trent – Derby	0	0	0	0	1	2	Low
Wolverhampton - Shrewsbury								
WS1	Wolverhampton - Shrewsbury	0	0	0	0	1	2	Low

October 2022

NetworkRail North West & Central