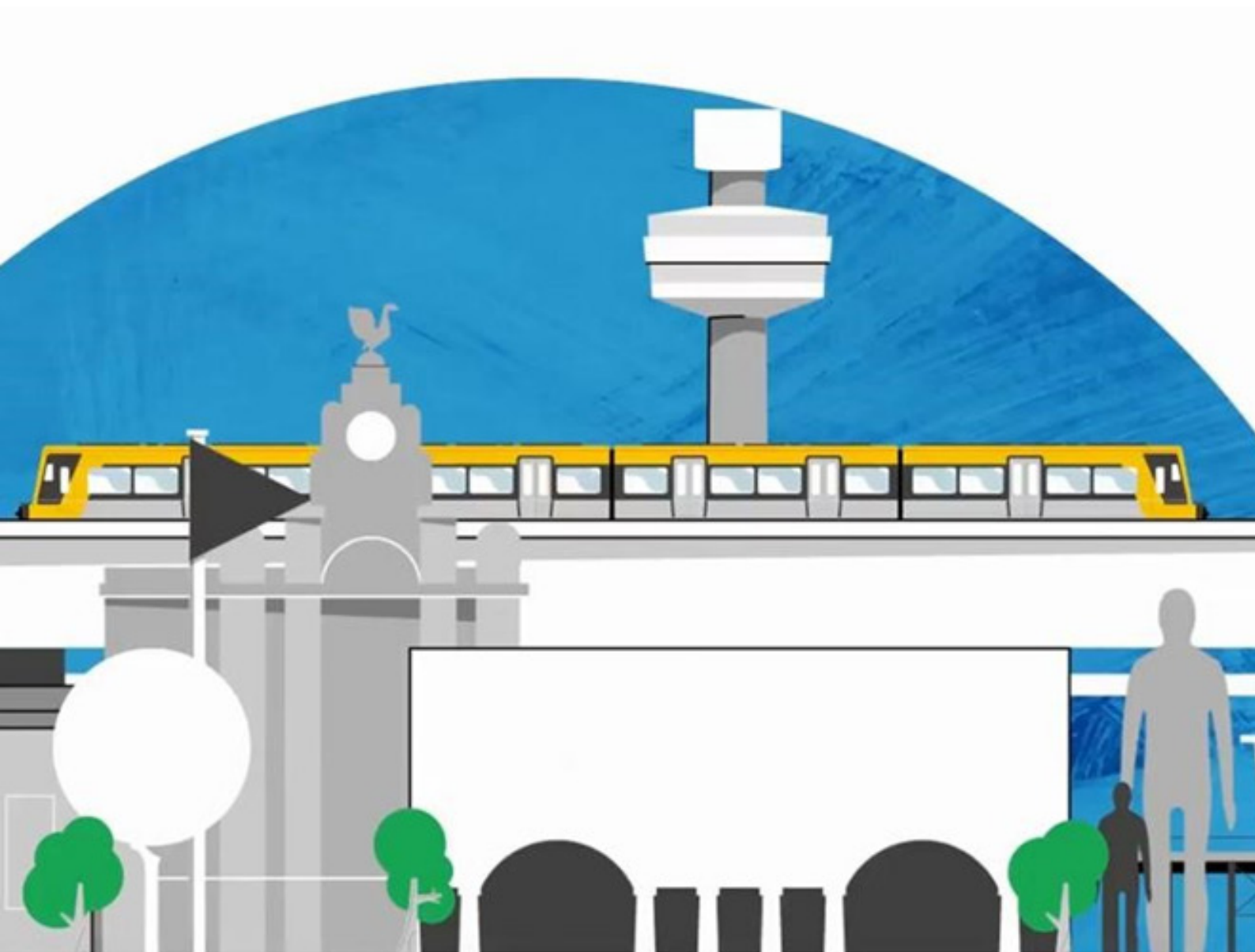


Liverpool City Region Strategic Rail Study

Continuous Modular Strategic Planning

October 2020



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Part A Executive Summary

Highlights

- *The Liverpool City Region Strategic Rail Study is a key part of the rail industry's Continuous Modular Strategic Planning process*
- *It sets out proposals and choices for funders for the next 10 to 30 years*

At the heart of a vibrant region

The Merseyrail network is at the heart of the Liverpool City Region's public transport system. It provides some 34 million passengers a year with access to employment, education, tourism, culture and leisure opportunities.

The network is one of the most reliable and highest performing strategic routes in the UK (96% Public Performance Measure Moving Annual Average, November - December 2019). Benefiting from the long-term Merseyrail franchise, overseen by Liverpool City Region Combined Authority, the network is a significant part of the wider success story of the region. This reflects Merseyrail's role in supporting the renaissance of Liverpool City Centre and the region's increasingly vibrant economy. That said, meeting this growing demand is not without its challenges.

Serving a busy, growing city

Merseyrail provides high frequency services to the north of the city centre via the 'Northern Line' to Southport, Ormskirk and Kirkby, as well as Hunts Cross to the south east of the city centre. The 'Wirral Line' serves routes between Liverpool City Centre and New Brighton, West Kirby, Chester and Ellesmere Port.

This busy, intensive service is operated by a train fleet which, at the time of writing, is amongst the oldest passenger rolling stock in use on the UK national rail network and is near life-expired. Merseyrail runs through densely populated urban areas and crosses the River Mersey, with significant sections of the network in tunnels. Adding capacity to the existing network through more trains, or even the traditional solution of longer trains, can therefore be difficult, costly and disruptive to passengers and to the region. Utilising available network capacity in the most efficient and effective manner, with a continued focus on passenger and public safety, is fundamental to this study.

The challenge of accommodating passenger demand is most acute at Liverpool's bustling, underground city centre stations. Liverpool Central, in particular, is a constrained site due to the layout of the station, the volume of passengers and the congestion associated with the mix of flows between the Northern and Wirral line platforms. Consequently, the study must identify potential solutions to address these issues.

Providing a basis for future strategy development

This study provides a clear, compelling way forward for the Merseyrail network. It is reflected within the Liverpool City Region's own Long Term Rail Strategy and will support the Rail Network Enhancements Pipeline.

Whilst important to the future of the Liverpool City Region's transport system, however, the Merseyrail network is only one component of the rail strategy for the Liverpool City Region.

The 'City Lines', providing more frequent and longer-distance services from Liverpool Lime Street to the east, are not within the scope of this report. However, the study did need to consider whether any additional or different use of the Merseyrail network was required in order to alleviate pressure on Liverpool Lime Street station and the approaches to it, whilst meeting demand and other 'conditional outputs'. The study found that with the recently delivered capacity enhancement (delivering an additional platform and remodelled approach tracks), Liverpool Lime Street and the approaches to it are able to meet forecast passenger demand and deliver the expected level of train service at least until 2026.

However, a strategic approach to the longer-term future of Liverpool Lime Street and the City Lines will be needed to consider the emerging NPR proposition, alongside HS2 train services, and emerging plans for the development and regeneration of Liverpool city centre.

Scope

- Merseyrail Northern and Wirral Lines, plus potential extensions
- Investment priorities for delivery by 2024
- Strategic options for demand and connectivity to 2043

The strategy for the Merseyrail network

- Make efficient use of the existing rail infrastructure
- Deliver capacity to meet demand and sustain economic growth
- Minimise the cost and disruption of infrastructure investment
- Improve the service and safety for passengers

Meeting growing demand through strategic investment in new trains

The cornerstone of the study for the future of the Merseyrail network is Merseytravel's procurement of a new rolling stock fleet, which is currently in production. The new fleet will come into operation in the early 2020s.

The specification for the new fleet allows it to accommodate approximately 60% more passengers per train, alongside improvements in the on-board environment. As a result, the new fleet is capable of meeting forecast passenger demand up to 2043, without the need to provide additional services.

The new rolling stock can also enable safety improvements

Platform-train interface improvements are an integral component of the introduction of the new fleet. The new trains feature a sliding step to reduce the stepping distance between carriage and platform, and other train-borne safety features to further mitigate risk.

Collaborative approach to infrastructure investment

This strategic investment in the new train fleet is supported by enhancements to the infrastructure of the Merseyrail network. This includes improvements to depot facilities at Kirkdale and Birkenhead North, upgrades to the power supply, and platform works which include safety and accessibility improvements for the platform-train interface. This programme is scheduled to be completed in the early 2020s and is an investment of approximately £460 million in the Merseyrail network.

Delivering passenger capacity at Liverpool Central

Previous studies identified station capacity in the city centre stations, in particular Liverpool Central, as “the

most acute issue”. Significant work has taken place to de-clutter usable platform space and provide refurbished escalators (on the Northern Line), which have helped to improve passenger circulation. Current passenger levels are manageable, albeit very high at peak times, particularly on Saturdays, and when other major events are held in the city region.

If the forecast demand on the Merseyrail network up to and beyond 2024 is to be met, significant improvements to passenger capacity and circulation will be required within the next five years. City centre development in close proximity to Liverpool Central only reinforces the importance of an intervention which will support and facilitate economic growth, whilst highlighting the requirement for an integrated and collaborative approach to spatial planning in and around the station.

The key strategic infrastructure intervention is therefore to deliver greater passenger capacity at Liverpool Central, with options in development to understand in more detail the costs and benefits.

Without such a scheme to improve passenger capacity and throughput, it is likely that congestion would require significant controls on passenger flows into the station by 2024. During the course of the early 2020's, delays to services and station closures to manage crowding would become increasingly common, emphasising the importance of an appropriate intervention.

Elsewhere on the network, this study identifies the need for further city centre station strategy development in the context of forecast demand and the emerging High Speed 2 and Northern Powerhouse Rail (NPR) propositions.

Identifying longer-term options for additional connectivity and demand

This study process identified ‘conditional outputs’ of frequency, journey time and connectivity which – if affordable, value-for-money solutions could be found – would help the rail network to do its job of supporting economic growth in the region. The study found that the relevant conditional outputs can be delivered on the existing network, with the current structure of services, with the exception of stakeholders’ aspirations for additional direct connectivity to targeted locations currently off the Merseyrail network.

As such, the study reports potentially feasible options for the extension of the Merseyrail network between:

- Kirkby and Skelmersdale (and/or Wigan);
- Ormskirk and Burscough (and/or Preston); and
- Bidston and Shotton (and/or Wrexham).

Whilst these have not been identified as immediate priorities to meet demand by 2024, they remain strategic choices for funders to consider and look at in more detail. The existing network and new train specifications are

expected to be able to support the assumed services that would operate over the extended routes.

Beyond 2024, notwithstanding how NPR and High Speed 2 (HS2) propositions develop, it is clear that demand for rail into and across the Liverpool City Region can be expected to grow, and in the longer term the Merseyrail network could have a role to play in providing capacity to the east of the city centre.

As such, alongside the planned new train fleet, options identified in the Liverpool City Region Long Term Rail Strategy (2018) to provide additional long-term capacity and connectivity include:

- A new digital signalling system, currently planned to be delivered in in CP8 (2029 - 2034) providing improved capacity and performance;
- A new connection from the Northern Line to the 'City Lines' via a re-opened Wapping tunnel; and
- Additional extensions to the Merseyrail network.

These have not been assessed as part of this study as they will be dependent upon the progression of the NPR workstream, or the progress of other workstreams.

Maintaining focus on passenger and public safety

Passenger safety at stations is a key strategic priority for the Merseyrail network. As such, the system safety priorities identified in this study are:

- Platform-train interface improvements delivered as part of the rollout of new rolling stock; and
- Passenger capacity and circulation improvements at Liverpool Central.

In addition, the study has noted the impact of change on level crossing risk which appears relatively minor due to limited changes to service frequencies, but which will need to be reviewed at the project development stage as individual projects are taken forward.

Priorities for Investment

The priorities for investment identified in this study provide a platform for these wider considerations, and the longer-term strategic options identified above will remain relevant in the context of HS2 and the development of the NPR propositions. Indeed, it may be the case that funders consider accelerating options such as the Northern Line-City Lines connection in this context.

As such, at the time of writing, future rail strategy development for the Liverpool City Region includes:

- Updates to Liverpool City Region's Long Term Rail Strategy;
- Progressing the development of a solution to passenger capacity at Liverpool Central;



Merseyrail: A collaborative approach to the delivery of the new fleet of rolling stock for the Liverpool City Region

- Further city centre station strategy development, in support of HS2, NPR and the Combined Authority's spatial planning; and
- In the future, further modules of the the Continuous Modular Strategic Planning (CMSP) approach to long term planning, incorporating this study's outputs as well as building on the above work to integrate the evidence base and strategy for the wider North West, to reflect stakeholder priorities.

Continuing to deliver through local partnership

This study process has been led by Network Rail but would not have been possible without the significant collaborative input, local knowledge, expertise and insight of representatives of Liverpool City Region Combined Authority, Merseyrail, other passenger and freight train operators, Department for Transport and stakeholders from across the region. This is a fundamental feature not just of the study itself but of the wider success story that is rail in the region.

In the context of the devolution of funding and powers local decision making will support continued economic growth through a collaborative, partnership approach, which will continue to be crucial, both to the successful delivery of this study and to the further strategy development identified above. Network Rail looks forward to working with its local partners to play its full part in those next steps.



Part B Where are we now?

An Introduction

Introduction to the Liverpool City Region network

- *Sets out the future direction for the railway network in the Merseyrail area*
- *Developed through collaboration between the rail industry, funders and stakeholders*
- *Details the governance, structure and scope of the study*
- *Sets out the strategic priorities and goals that underpin this study*

The Merseyrail Network

The Merseyrail network Figure 1 (Page 10) is an entirely third rail Direct Current (DC) electrified network spread over the Liverpool City Region, north Cheshire and south west Lancashire. The network is split in two: the Wirral Line and the Northern Line.

There are four terminus stations on the Wirral Line: New Brighton, West Kirkby, Chester and Ellesmere Port. All stations on this route are connected to Hamilton Square in Birkenhead, and the central Liverpool stations of James Street, Moorfields, Liverpool Lime Street and Liverpool Central, which are served by a one-way, clockwise loop line underneath Liverpool City Centre. Liverpool Lime Street Low Level forms an important link to the mainline Liverpool Lime Street station for interchange with services to a wide range of destinations. Chester is an interchange station for services to Wales, Manchester and London, and Bidston acts as a local interchange station with the Wrexham to Bidston line (known as the 'Borderlands Line').

The Northern Line operates from Hunts Cross in the south to Liverpool Central and Moorfields, with northerly branches serving Southport, Kirkby and Ormskirk. The Northern Line crosses the Liverpool to Manchester line (also known as the 'Cheshire Lines Committee') at Hunts Cross West Junction, on the approach to Hunts Cross station. Under normal operation, this is the only part of the network that directly interacts with the rest of the national network. However, there are other places where platforms can be shared, for example, Southport platform 3 can be used with the Wigan line and Chester platform 7 can be used by other services. Similarly, Ellesmere Port station has access from the Northern network, while

Transport for Wales trains at Bidston use the Merseyrail platform. There are a number of stations that offer the opportunity for interchange on the Northern Line, with links to local services at Southport and Kirkby towards Wigan, at Ormskirk towards Preston, and Hunts Cross for stations between Liverpool Lime Street and Manchester. The route also calls at Liverpool South Parkway for Liverpool John Lennon Airport and connections to Manchester, the east, Crewe and the south.

More detailed information about the route is available in the Merseyside Strategic Route Specification, available on the [Network Rail website](#).

Study Purpose and Scope

The Liverpool City Region Strategic Rail Study sets out a vision for the next 10 to 30 years of a much busier railway that will contribute to the economy and the forecast increase in population in the Liverpool City Region.

The study's scope is focused on the third rail DC network in the Liverpool City Region including its current operations, capacity increases and potential extensions. The following extensions have been considered as meeting connectivity based conditional outputs:

- Wrexham – Bidston (supports conditional outputs of providing direct connectivity between Wrexham and Liverpool / provide connectivity and service improvements between Neston and Liverpool / provide connectivity and service improvements between Shotton and Liverpool).
- Ormskirk – Preston (supports conditional outputs of providing direct connectivity between Burscough and Liverpool).

- Kirkby – Wigan Wallgate (supports conditional outputs of providing direct connectivity between Skelmersdale and Liverpool).

The Strategic Priorities that underpin the Liverpool City Region Strategic Rail Study are:

- Safety and Performance – to help all our customers, staff and suppliers get home safe every day. This is central to the future interventions Network Rail is proposing as choices for funders.
- Economic growth – the railway is integral to the economy and thus a better railway is pivotal in delivering growth in the Liverpool City Region.
- Social value – the railway is crucial in supporting local economies by providing access to employment, education and other social infrastructure as well as the retail and tourism sectors.
- Digital Railway – the rail industry's Digital Railway programme will revolutionise train control, ticketing, fares and information.
- Capacity – to understand how new higher capacity rolling stock can accommodate passenger demand and the impact at city centre stations.
- Connectivity – the role rail can play in connecting communities and making interchanges easier and more reliable, both between trains and between trains and other modes of transport. This is particularly important for the Merseyrail network.
- Connectivity with HS2 / NPR is a key economic driver in the future and this study takes cognisance of this workstream.
- Punctuality and Reliability – Merseyrail continues to achieve very high levels of performance, regularly in the top 3 of all UK rail franchises. The railway system will be much busier in future and the industry needs to plan for this.
- Weather Resilience – future proofing the railway system from the worst effects of climate change is crucial to future plans.

Strategic Context

- The railway in Britain has seen two decades of unprecedented passenger growth and this demand is forecast to increase.
- In particular, Merseyrail network patronage has grown significantly, driven by a number of different factors. Socio-economic factors have a big role to play and have changed the way passengers live, work and commute. Advances in communication technology means people have wider social

networks and are inclined to travel further to meet friends or to enjoy leisure time. The cost of car ownership and the impact of congestion mean greater numbers of people rely on the rail network.

- The rail industry has also played a key role in making train services an attractive way to travel through better services, market segmentation and technology driven changes in ticketing, fares and information.

The railway industry has a responsibility to understand these drivers of passenger growth and how they interact with each other. This understanding is important to inform the future direction of the railway network.

Continuing this success story requires an evidence based and collaborative approach to strategic planning. This approach underpins the work of the Liverpool City Region Strategic Rail Study and the resulting choices for funders.

Planning Approach and Governance

The Liverpool City Region Strategic Rail Study was developed as part of the Continuous Modular Strategic Planning (CMSP) approach to planning the future of the network for the next 10 to 30 years, and provide choices for funders.

This Strategic Rail Study has been completed in collaboration with the rail industry, funders in the UK Government, and with stakeholders in the City Region.

CMSP is Network Rail's response to the Shaw Report recommendation noting the requirement to better plan the railway based on customer, passenger and freight needs.

In order to meet the various funder, service specifier and wider stakeholder needs, the CMSP process allows the industry to become more dynamic and its products more easily accessible. This is in essence creating route-based enhancement plans that better meet the industry's needs by:

- focusing on the needs of passengers and freight end-users;
- engaging operators to represent the voice of those customers;
- using the Continuous Modular Strategic Planning process to inform refranchising, capacity allocation, development and delivery of enhancements and sale of access rights;
- employing a more effective, focused means of consultation;
- providing more granular, targeted market insight;

- developing a ‘service change’ pipeline for future configuration states; and
- making best use of the network focusing on incremental opportunities, synergies and service trade-offs.

The Liverpool City Region Strategic Rail Study is one of a number of modules being developed as part of the CMSP approach across the country to inform the planning process.

Previous study work identified issues and options that might need addressing in Control Period 6 - the Liverpool City Region Strategic Rail Study provides an opportunity to revisit those ideas and develop a revised evidence base to support the case for potential interventions and/or enhancements in the future, e.g work to address crowding at Liverpool Central.

The CMSP approach has a key role in fulfilling Network Rail’s Licence Condition which requires it to plan the future of the network in a way that will deliver:

- a safe railway for passengers and for the people who work on the railway;
- a reliable timetable, including the uncertainties created by climate change; and
- using technology that provides good value for money for users and funders, e.g. digital signalling.

The following section sets out the working assumptions that have been followed in developing the study that underpins the work.

Digital Railway

Network Rail’s Digital Railway Strategy (April 2018) offers the chance to deliver huge benefits for passengers and freight users, and is seen to be the most cost effective way to deliver the future railway needs of Britain.

Digital Railway could deliver the following benefits:

- Increased capacity to meet demand;
- Better performance for passengers and freight customer journeys;
- Enable faster journey times;
- Less disruption from renewals, maintenance and upgrades;
- Enhanced safety for passengers and workers; and
- Better asset sustainability such as lower whole life cost.

For the purposes of this Study, Digital Railway has been considered at a high level. However, in accordance with the Digital Railway Strategy, should any choices for funders identified within the Study be progressed, then the use of up to date technologies should form the basis

of these enhancements. This will enable the assets be sustainable in the long term, whilst delivering the capacity and performance required for our customers in a manner that contributes to Network Rail’s safety principles.

The assessment of any future anticipated network enhancements can inform the development of European Train Control System (ETCS) on the Merseyrail network. The Merseyrail network offers a timely opportunity for the roll out of ETCS once signalling becomes due for renewal in the late 2020s, subject to funding becoming available.

Resilience

A safe, reliable and resilient network underpins Network Rail’s plans for the future of the railway. The resilience of the railway to extreme weather events plays a considerable part in this and is reflected within Network Rail asset policies and plans.

Network Rail has published a series of Weather Resilience and Climate Change Adaptation (WRCCA) plans aligned to the devolved routes of Network Rail. The Liverpool City Region is reflected within the North West and Central (NW&C) WRCCA Plan which identifies a number of appropriate actions required to bolster the resilience of the network. These are based on the need to strengthen Network Rail’s existing asset base. This includes the use of railhead treatment trains which apply anti-icing fluid to the rail throughout the winter season to reduce the risk of ice forming on the DC conductor rail during colder periods. Network Rail will continue to improve the weather resilience of the assets throughout CP6 through seeking to improve the ability to predict weather related events by enhanced risk assessments, remote monitoring and improved weather forecasting combined with a better understanding of the condition of assets.

Network Rail is developing a NW&C Route Extreme Weather Strategy for CP6. This will enable Network Rail to better inform plans for implementation of specific weather resilience works in CP7.

Safety and Performance

All of the choices for funders will deliver improved safety and performance for the Merseyrail network. This includes a review of level crossings on the Merseyrail network as well as the level crossings on potential network extensions. Improved passenger safety is also a key objective, with increased passenger flows predicted on the Merseyrail network, most notably at Liverpool Central.

Extensions to the Merseyrail network have been considered within the study. It should be noted that contact with third rail equipment can result in serious injury and, in extreme circumstances, is fatal. Therefore this study has considered alternative options for power

supply within the development of network extensions.

Although different types of risk are involved in the operation and maintenance of overhead line equipment or independent power equipment, these risks are considered less severe than those associated with traction power supply via third rail. Therefore, any proposal to use alternatives to extensions of the third rail power supply would represent a reduction in risk.

Liverpool Lime Street

Liverpool Lime Street station is a key hub and provides direct access to Liverpool City Centre.

The station has been upgraded during Control Period 5 as part of the £340 million investment in Liverpool City Region under the Great North Rail Project. This will provide extra capacity for new and longer services, driven by the Northern and TransPennine Express franchises and as part of the wider North of England Programme. It accommodates the new Liverpool to Chester, and beyond, service over the rebuilt 'Halton Curve'.

Further enhancements as a result of other changes to train services (including those emanating from the NPR workstream) may be required in the longer term, but analysis completed as part of the Liverpool City Region Strategic Rail Study indicated expected levels of connectivity and capacity at the end of Control Period 6 (March 2024) can be accommodated within the station.

Blackpool – Liverpool services would be forecast to reach 100% of seating capacity by the end of CP6, however this does include stops within the acceptable 20 minute guideline for standing passengers. All other service groups on the 'City Lines', are forecast to remain below the 80% of seating capacity threshold at which we might expect perceptions of crowding and passenger satisfaction to be impacted.

This conclusion is significant for the Liverpool City Region Strategic Rail Study for two reasons:

- The options for further expansion at Liverpool Lime Street are limited – a potential approach could have been to withdraw some services from Liverpool Lime Street and instead merge them with the Merseyrail network (e.g. extend Hunts Cross services to Warrington and/or Kirkby services to Wigan). This reduces the number of options/scenarios required for further development in order to meet the conditional outputs for the study; and
- It means that consideration of the longer-term options for Liverpool Lime Street can follow this study, taking a fuller account of emerging HS2 and NPR propositions.

Merseytravel is in the process of developing a proposal

for re-opening the Wapping Tunnel, which could offer the opportunity to merge mainline and Merseyrail services and also release capacity at Liverpool Lime Street station. The main output for this scheme is enhanced connectivity across the region, Network Rail will consider any conclusions in future strategy work related to the Merseyrail network.

Demand Analysis

The Merseyrail network is a continuing success story, with demand rising and consistent high performance. The network is reflective of the region it serves; the recent transformation of Liverpool City Centre has moved the focus of the main retail and leisure area towards the River Mersey, but there has also been growth in passenger demand in suburban areas and towns in other parts of the region.

Figure 1 shows the "current" demand vs. capacity situation as an average of all high peak services into central Liverpool on a given weekday in autumn 2018. On average, there is enough seated capacity on most services into central Liverpool with some standing (under one person per square metre) on Merseyrail services from Ormskirk and Kirkby. However, this tends to fall within the acceptable 20 minute guideline for standing passengers, as recommended by DfT guidance. As this is just an average across all services, some services will certainly be busier and experience more crowding than others.



West Kirby station: At the heart of the community linking North West Wirral to the Liverpool City Region.

Part C Where are we going?

The Demand for Rail

What does passenger demand growth mean for the Merseyrail network?

Future Demand – 2024 and 2043

The expected total growth in passenger demand across the Merseyrail network is approximately 37% by 2043. This equates to 1.4% growth per annum until the end of Control Period 6 in 2024 and a subsequent 1.2% increase per annum between 2024 and 2043; this would mean over 15,000 passengers arriving in the city centre stations on weekday mornings between 08:00 and 08:59 in 2043, compared to approximately 11,300 in 2018. The rail industry uses Department for Transport (DfT) forecasting guidance, coupled with a regional overlay to arrive at the 37% figure. Without the regional overlay, DfT's forecast for appraisal is 31% to 2043. However, DfT and Network Rail have agreed that additional, well evidenced scenarios can form part of the information presented to decision makers in project business cases.

Growth in passenger demand is good – a positive news story within a wider regional renaissance – but this growth will soon meet, and in some cases, exceed available capacity on trains and at stations. This is particularly the case for the underground (central) Liverpool stations, and the services arriving into them in the peak, which will face severe difficulties with crowding without intervention in the morning peak. Figures 2 & 3 (overleaf) show the forecast detail of passenger demand growth in 2024 and 2043 respectively, in a weekday morning 'high peak' hour (08:00 – 08:59). The service level and rolling stock types are based on the agreed baseline Indicative Train Service Specification (ITSS) shown in Figure 4 (page 15).

By 2024 demand will exceed seated capacity on the majority of Merseyrail services. However, the new rolling stock will provide sufficient capacity, according to DfT guidelines, on all services in the medium term, into the late 2030s. Note that there may be localised factors which could mean individual services on some routes are more heavily loaded than others over common sections of route.

The potential for passenger crowding becomes more apparent by 2043, with no further committed schemes, as would be expected over that timescale through continued background growth in patronage,

as demonstrated in Figure 4. For many of the services, most notably services from West Kirby and Southport, seated capacity may be exceeded however, with more standing capacity available on the new rolling stock, there should be enough total capacity to accommodate growing demand. It should be noted that the delivery of any new station(s) on the network will add additional demand to services which has not been taken into account for this study.

The New Brighton, West Kirby, Ellesmere Port and Kirkby services consist of 4-car trains in the baseline ITSS. When total capacity is exceeded by demand on these services, it may be possible to lengthen them to 8-car services. Further work would have to be done to understand whether this would be the most appropriate use of rolling stock.

The deployment of rolling stock in the future is dependent on a host of issues, however the rolling stock programme does consider the opportunity for the procurement of further carriages. That said, the analysis described only covers demand into Liverpool city centre in the morning high peak. Shorter distance flows, outside the city centre, and weekend peak times will also need to be considered as part of the new rolling stock strategy. The new fleet offers an opportunity for optimised deployment at the appropriate times.



The Liverpool City Region has consistently invested in expanding park and ride provision, including here at Birkenhead North.

With the investment in new rolling stock and infrastructure enhancements, opportunities may exist going forwards to realise journey time improvements across the Merseyrail network. Analysis is expected as part of the new fleet introduction, but there is also an expectation from the Combined Authority that the new fleet will encourage more passengers to use the rail network.

As discussed, increasing demand will mean more passengers standing for longer periods of time. Where this exceeds the 20 minute guideline a range of options could be explored to address seating capacity issues, such as improved journey times, the introduction of semi-fast services on some routes and/or increased frequency of services.

Overall the new fleet will supply enough total capacity to meet demand for morning commuters into Liverpool city centre for the most part, at least until 2043, given that background demand grows at the expected pace. Network extensions will need to be further analysed in terms of demand vs. capacity, as new demand to the network has the potential to reduce available seating for passengers at existing stations close to the city centre.

New rolling stock

Liverpool City Region Combined Authority is procuring new rolling stock for the Merseyrail network. The new trains will comprise 4-car units and each unit will have approximately 60% more total capacity (seated + standing) than the current Class 507/508s, however seated capacity alone will remain at similar levels to today.



Conceptual images of the new rolling stock fleet. The new rolling stock provides a strategic solution to meet the growing demand on the Merseyrail network

The arrival of this fleet (beginning in 2020 and anticipated to be completed in 2021), with enhanced passenger capacity offers a strategic solution to meet growing demand on the Merseyrail network.

Impact on the operational railway

The introduction of the new rolling stock brings with it a requirement to deliver an infrastructure upgrade, most notably a requirement to upgrade the power supply. The scope for the introduction of the new rolling stock includes four new additional feeder points to boost the power capacity for the rolling stock.

Platform-train interface improvements are an integral component of the introduction of the new fleet. The new trains feature a sliding step to reduce the stepping distance between carriage and platform, and other train-borne safety features to further mitigate risk. Infrastructure alterations were required at the majority of Merseyrail stations to reduce the stepping distance for passengers and to standardise platform heights, as well as works at a number of stations to support operation of longer trains. The result will be a smooth transition for passengers with wheelchairs, pushchairs and heavy luggage from the platform to the train (and vice versa), and will remove the need for station staff to provide ramp access to trains.

Conditional Outputs

Demand and capacity issues discussed earlier in this chapter indicate that higher capacity rolling stock will be beneficial in meeting demand for the Merseyrail network. Another potential driver of changes to services are 'Conditional Outputs', which have been used to determine the frequency, journey time and connectivity shown in the 2043 Indicative Train Service Specification to Figure 4 (Page 17).

Table 1 below describes the conditional outputs for the 30 year planning horizon. These conditional outputs have been used to develop the choices for funders up to 2043.

2043 Indicative Train Service Specification

The Conditional Outputs described above have been translated into a 2019 baseline, and an Indicative Train Service Specification (ITSS) for 2043. These ITSS's are detailed in Figure 4 and are representative of an indicative peak hour. Each line represents one passenger train per hour (tph). Work is currently underway looking at the Wrexham – Bidston line which may lead to a review of the service frequency on the Wirral Lines in due course. This work will be reviewed as it emerges.

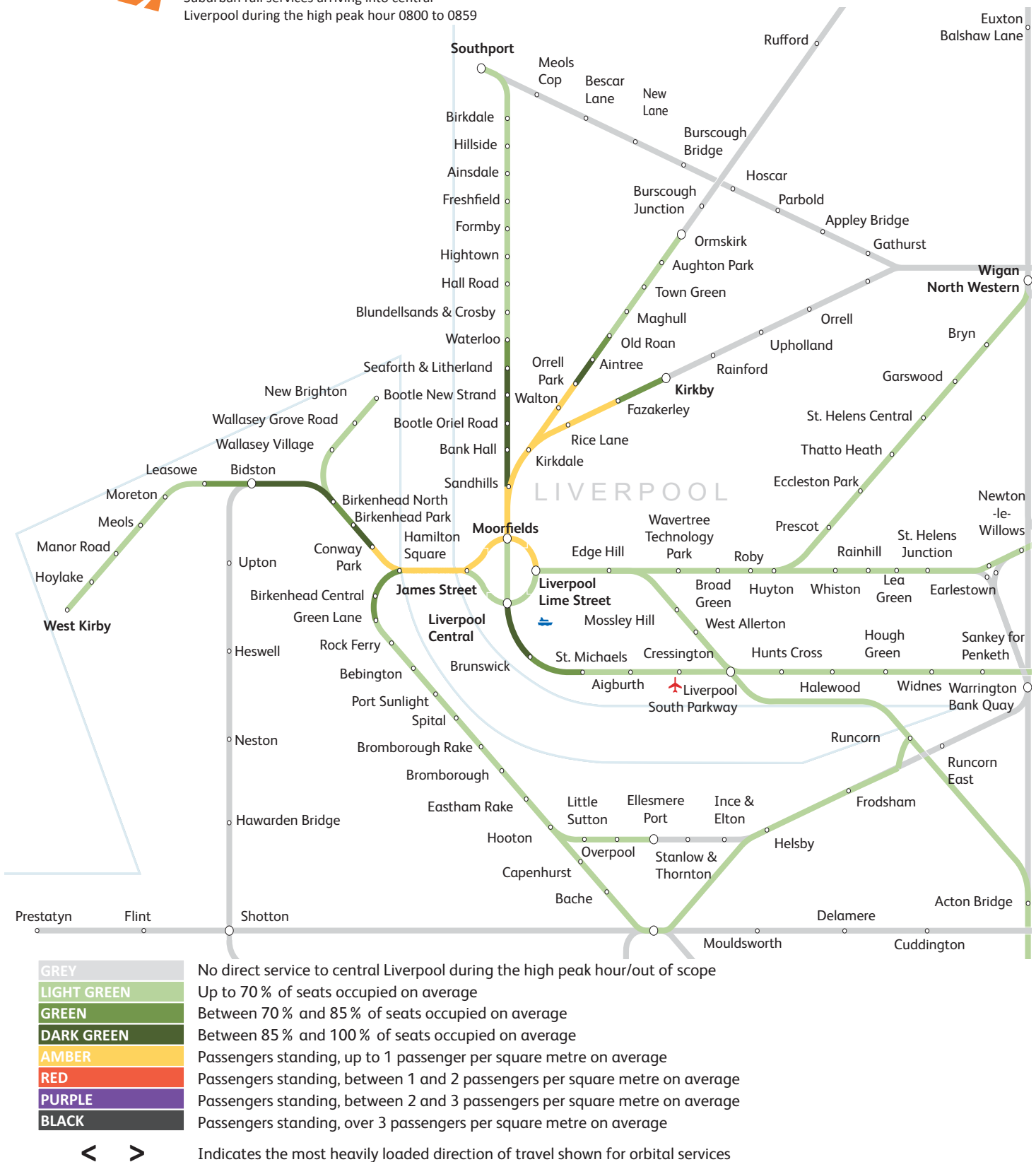
The ITSS sets out the optimum way of meeting the conditional outputs, focusing on making best use of the network before considering options for new infrastructure.

Figure 2 Morning Peak Hour Demand on Northern Wirral and City lines in 2024 (Using rail industry growth scenarios).



Liverpool 2024 capacity

Suburban rail services arriving into central Liverpool during the high peak hour 0800 to 0859



Note: Maghull North not shown due to count data obtained before the opening of the station.

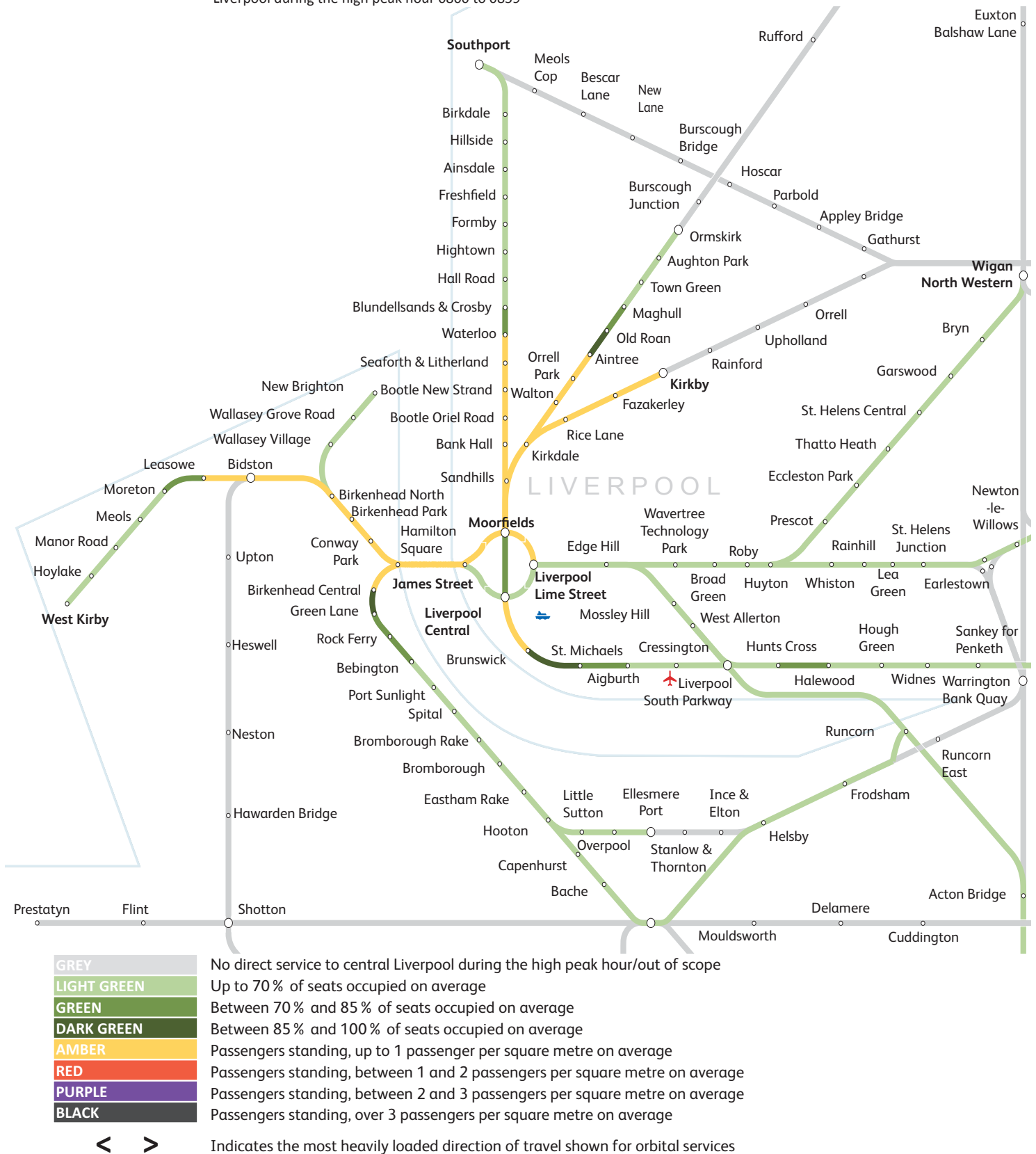
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Figure 3: Morning Peak Hour Demand on Northern Wirral and City lines in 2043 (Using rail industry growth scenarios).



Liverpool 2043 capacity

Suburban rail services arriving into central Liverpool during the high peak hour 0800 to 0859



Note: Maghull North not shown due to count data obtained before the opening of the station.

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In summary, the ITSS can be accommodated on the core Merseyrail network, with enhancements required where services are proposed to extend beyond the existing network limits.

Table 1: Conditional Outputs for the 30 year planning horizon

| Conditional Outputs used for the study | | |
|--|--|--|
| Service Group | Conditional Output(s) | Analysis for service requirement (for 2043 ITSS) |
| Hunts Cross | <ul style="list-style-type: none"> • Increase capacity to meet demand through lengthening or increased frequency. | <ul style="list-style-type: none"> • New rolling stock satisfies increased demand. |
| Chester and Ellesmere Port | <ul style="list-style-type: none"> • Increase capacity to meet demand through lengthening or increased frequency. • Increase Chester – Liverpool average journey speed to 60mph. | <ul style="list-style-type: none"> • New rolling stock satisfies increased demand (Chester). • New rolling stock and lengthened services satisfies increased demand (Ellesmere Port). |
| West Kirby, New Brighton and Wrexham | <ul style="list-style-type: none"> • Increase capacity to meet demand through lengthening or increased frequency. • Provide direct connectivity between Wrexham and Liverpool. • Provide connectivity and service improvements between Neston and Liverpool (target Generalised Journey Time (GJT) < 60 minutes). • Provide connectivity and service improvements between Shotton and Liverpool (target GJT < 60 minutes). | <ul style="list-style-type: none"> • New rolling stock satisfies increased demand (West Kirby and New Brighton). • Wrexham – Bidston services should be extended to support direct connectivity between Wrexham and Liverpool. • Service frequency on 'Borderlands Line' should increase to two trains per hour (each direction).* |
| Southport, Ormskirk and Kirkby | <ul style="list-style-type: none"> • Increase capacity to meet demand through lengthening or increased frequency. • Provide direct connectivity between Burscough and Liverpool to reduce GJT < 60 minutes. • Provide direct connectivity between Skelmersdale and Liverpool to reduce GJT < 60 minutes. | <ul style="list-style-type: none"> • New rolling stock satisfies increased demand (Southport, Ormskirk and Kirkby). • Ormskirk services should be extended to Burscough Junction, and option to extend to Preston should be investigated. • Kirkby services should be extended to Headbolt Lane/ Skelmersdale, and option to extend to Wigan Wallgate should be investigated. |
| <p>*Network Rail is aware of stakeholder aspirations for 4 trains per hour between Wrexham and Liverpool via Bidston, but other studies are considering this. The working assumption for this study is based on theoretical available capacity on the Wirral 'Loop' Line in Liverpool City Centre.</p> | | |

Part D How do we get there?

A strategy for the Liverpool City Region

The future of the Merseyrail Network

- *The new higher capacity rolling stock will play a fundamental role in delivering the strategic priorities for the network*
- *Infrastructure enhancements will be required to support the rolling stock*
- *City centre stations will require further assessment to ensure all parts of the network play their full part in facilitating economic growth*

Context

The highest priority intervention for the Merseyrail network is to roll out the fleet of new higher capacity rolling stock.

The new fleet will be supported by enhanced stations, power supply upgrades and a continuing pursuit of safety risk reduction which are required to ensure the continued success of the Merseyrail network.

In addition, extensions to the Merseyrail network could provide improved connectivity across the region. Stakeholders continue to develop thinking, including, for example, the Liverpool John Lennon Airport link, Bootle Branch Line, and from Ellesmere Port to Helsby. The ITSS for 2043 proposes a number of service changes that require enhanced infrastructure to support them, should funders choose to pursue connectivity aspirations.

Increased train capacity

The new higher capacity rolling stock will cater for the forecast demand across the Merseyrail network to 2043 and offers a strategic solution to meet growing passenger demand on the Merseyrail network.

Impact on Liverpool Central

This study has identified that increased demand will place additional pressure on Liverpool Central, particularly passenger throughput capability on the Northern Line platform.

Clearly an intervention will be required to alleviate this issue and work is currently underway by the railway industry to understand what might be required to meet this need.

A number of options are in development, including deliverability in the context of city centre connectivity, impacts and opportunities at other stations and strategic spatial planning for the city centre.

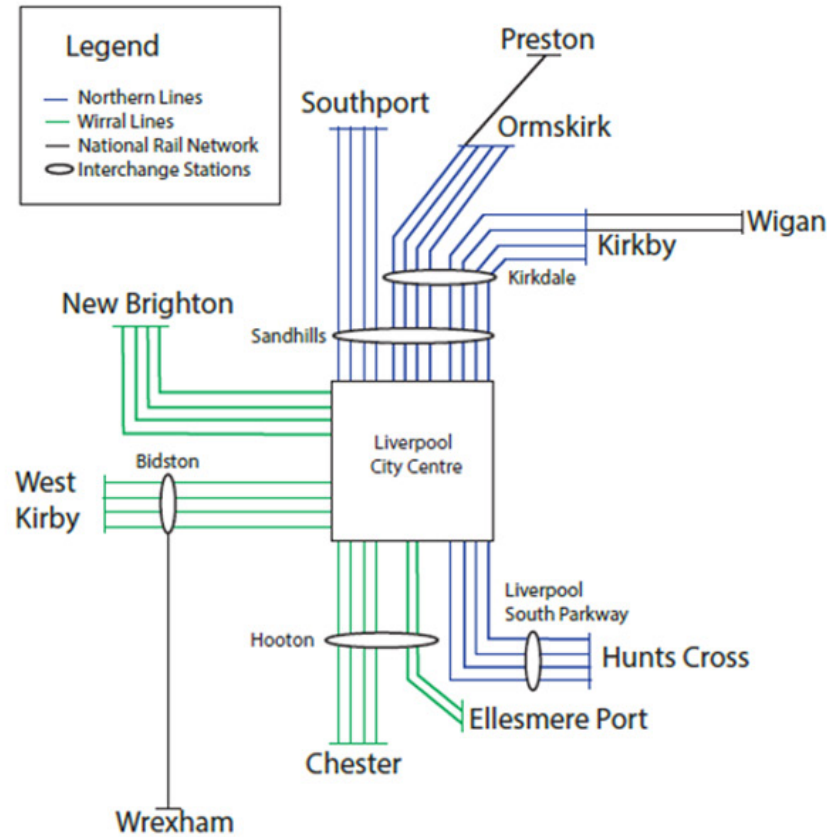
Analysis has identified the following issues:

- Platform crowding – passenger demand, significantly in the weekday PM peak and on Saturday afternoons, can generate levels of crowding on platforms in excess of that deemed acceptable. This is exacerbated by the substantial number of passengers on platforms who do not board the first train, instead waiting for a direct service to their destination. During periods of disruption, platform loads can increase to the point which impedes further passengers entry to the platforms in a safe manner; and
- Platform clearance times – a combination of high levels of passenger demand, and inadequate lifts and escalators from the underground platforms, can result in lengthy times required to clear platforms after the arrival of a train. This is most noticeable at Liverpool Central during the Weekday AM peak, where it can take upwards of two minutes to clear the Northern Line platform of arriving passengers. These impact detrimentally on passengers' journey times through the station and their overall journey experience, as well as affecting platform dwell times and network performance.

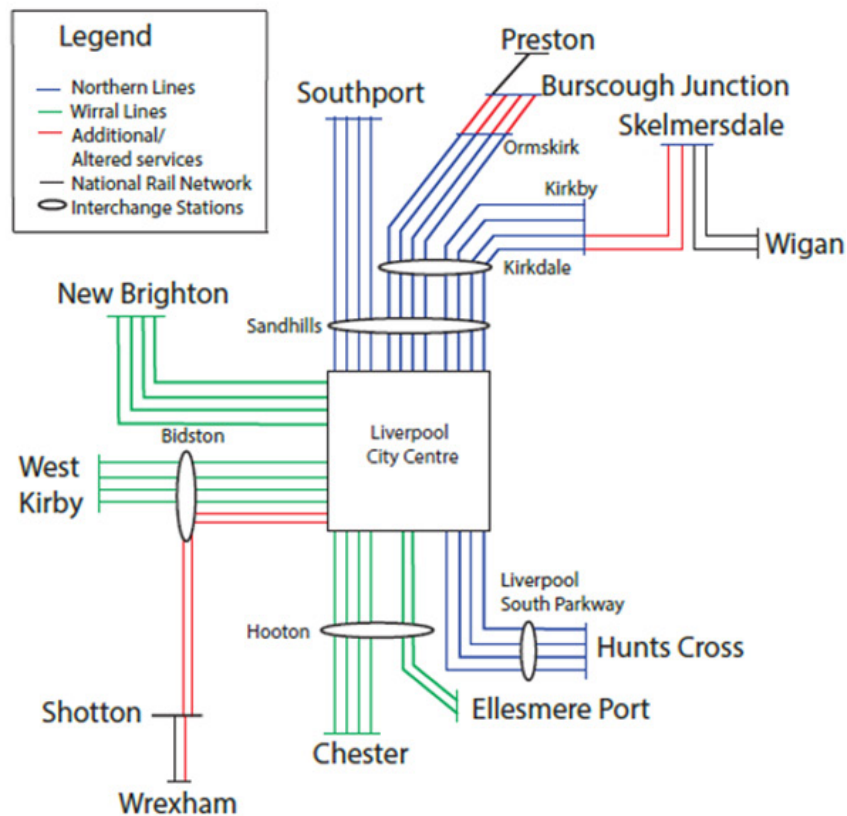
Work is underway to provide detailed quantification of these issues, including estimating the timescales by which appropriate mitigation strategies must be implemented.

Figure 4: 2019 (Baseline) and 2043 Indicative Train Service Specification for Liverpool City Region Strategic Rail Study

2019 Baseline Indicative Train Service Specification



2043 Indicative Train Service Specification



Note: Liverpool City Region Combined Authority are currently working on extension of the Merseyrail network from Kirkby to Headbolt Lane/Skelmersdale.

Other city centre stations

Assessment of potential interim mitigation measures

Infrastructure solutions may include platform

Therefore measures to spread demand away from

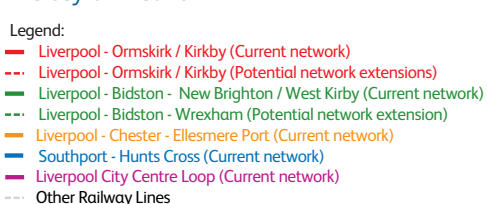
It is recommended that passenger demand at

Extensions to the existing electrified routes

The Liverpool City Region Strategic Rail Study has

Conditional Outputs used for the study

Route 23



Airport link, Bootle Branch Line, Ellesmere Port to Helsby, Wigan, Headbolt Lane/Skelmersdale, Burscough/Preston and Wrexham. Discussions will be taken forward according to stakeholder views.

The study has only considered third rail extensions as this aligns with current technology and is likely to be the most efficient option, however this would require approval from the Office of Rail and Road (ORR) to progress. There could be potential to reduce infrastructure costs by using battery power which Liverpool City Region Combined Authority is currently investigating with other stakeholders to enhance opportunities to link to other areas.

Links to NPR and HS2

It is clear that there is a need for intervention at city centre stations in the medium to long term. The shape and scope of any interventions will need to take into account the latest plans and proposals for both Northern Powerhouse Rail and High Speed 2 (See Figure 6), with specific opportunities including:

- Wapping Tunnel – Liverpool City Region continue to explore the development of a scheme to link to developing a scheme to link the Northern Line and City Line via the disused Wapping Tunnel to extend Merseyrail services to eastern parts of the City Region. The impact of any diverted demand on Liverpool Central is being considered as part of the current Capacity Enhancement scheme.
- Merseyrail network extensions – some NPR scenarios may permit or require the extension of Merseyrail services east beyond Hunts Cross to maintain connectivity at stations on the CLC line. The Liverpool City Region Long Term Rail Strategy considers this as one option for service enhancement on this route, and a related [Continuous Modular Strategic Planning question](#) has considered options for the CLC route.
- Liverpool NPR/HS2 Station – the Liverpool City Region Combined Authority has recently announced the formation of a Commission to bring together a range of experts from transport, business and the public sector to inform the development of new city centre station for High Speed 2 and Northern Powerhouse Rail services. The station aspires to be a world class transport hub and a catalyst for regeneration in the City, encompassing stunning architecture, leisure and recreation facilities, commercial, retail, high-quality office and residential accommodation.
- The commission's remit is to take forward all the key considerations in developing the project such as the size, functions, location and orientation of the station, working with partners on all elements leading towards its development.

In particular, the development of options for Liverpool Central to accommodate forecast passenger demand at the station is a key recommendation of this study. The Liverpool Central Capacity Enhancement Scheme is considering NPR and HS2 induced demand as a sensitivity test within option development.

It is likely that other major rail workstreams will come to fruition in the future and both NPR and HS2 will evolve as assumptions are better understood. Anything with the potential to impact upon services and infrastructure in Liverpool City Centre needs to consider the future role of the Merseyrail network.

The continuing pursuit of safety risk reduction

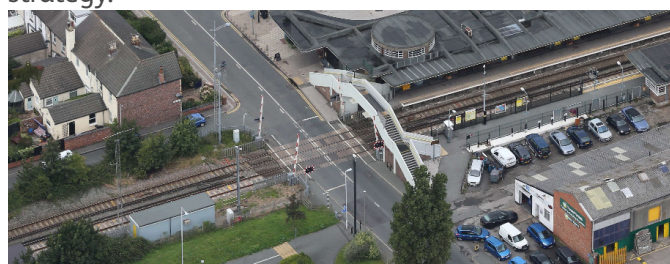
With over 5,900 level crossings across Britain, they perform a safety critical function on one of the busiest railway networks in the world. In line with Network Rail's safety culture and "Everyone home safe every day" focus, Network Rail is working in partnership with national and local organisations to help people use level crossings correctly, to make level crossings safer, and where appropriate, close level crossings.

The Network Rail Long Term Level Crossing Strategy involves a number of goals. These include the following:

- Minimised risk;
- Fewer fatalities, injuries and near misses;
- Reduce the likelihood of human error;
- Change user behaviour and;
- Improve reliability at level crossings.

Within the Liverpool City Region, a number of level crossings exist on the Merseyrail network. As work outlined in this document is considered further, level crossings will need to be reassessed for risk accordingly.

In line with the national policy, Network Rail is continuing to look at opportunities for closing level crossings which remain the single biggest safety risk on the network. As part of this, Network Rail will continue to work in partnership with our stakeholders in the Liverpool City Region to deliver this national strategy.



Hoylake station and level crossing: Level crossings remain a key area of focus for the industry to improve railway safety.

Figure 6 The vision for the Northern Powerhouse rail network identifies the journey times and frequencies sought by Transport for the North



Part E Summary and Conclusions

The future of the Merseyrail Network is bright

- *Enhanced rolling stock, depots, power supply and platform interfaces will transform the network*
- *The importance of developing options for Liverpool Central in collaboration with stakeholders*
- *Choices for Funders enhancing connectivity across the Liverpool City Region*

Summary

The future of the Merseyrail network is very positive. New trains will provide more capacity, a modern environment for passengers to travel for work, leisure and a variety of other purposes.

Enhancements to rolling stock depots, power supply, the platform-train interface and stations to accommodate longer trains is a priority for the Merseyrail network, to facilitate and support the introduction of the new rolling stock fleet from 2020.

Another priority should be progressing the development of a solution to passenger capacity at Liverpool Central, in particular. Increasing demand can be accommodated on the trains, but city centre

stations will be placed under more strain without appropriate interventions. Initially, softer measures such as crowd management may suffice, but such methods will only permit temporary deferral of longer term solutions. The Liverpool Central Northern Line platform is overcrowded at times now, so there is a pressing need to explore and implement interventions that permit ever-increasing demand for access to the city centre. Work is currently underway to understand what interventions may be required.

Northern Powerhouse Rail

Liverpool Lime Street and the main line approaches to it did not form part of the scope of this study. Northern Powerhouse Rail work will continue to develop and the Merseyrail network can play its part in delivering pan-North of England connectivity, in addition to access to HS2. Interventions such as the Wapping Tunnel re-opening could provide opportunities for improved connectivity across the region and could possibly relieve capacity demands at Liverpool Lime Street – the latter benefit possibly unlocking the full potential of the Northern Powerhouse for the Liverpool City Region.

Connectivity enhancements

Extensions to the Merseyrail network to Wrexham, Preston and Wigan have been considered in the study, with the aim of meeting connectivity based Conditional Outputs. It was established that these extensions are feasible from a technical perspective, but further work would be required before a business case could be assessed. Funders, such as central government or local authorities, may choose to explore these options further based on the work of this study.



Maghull North : The newest station opened on the Merseyrail network, opened in 2018.

Conclusions

The following will be prioritised by relevant organisations to ensure capacity exists to meet demand on the Merseyrail network:

- Completion of depot, power supply, platform-train interface and station enhancements to support delivery and operation of the new fleet;
- Progressing the development of options for Liverpool Central. This should bring together Network Rail, Merseyrail, Liverpool City Region Combined Authority, Liverpool City Council and other relevant stakeholders; and
- If required, further crowd management tactics employed at other city centre stations.

Other options that could be further developed by funders or stakeholders (to meet connectivity based conditional outputs) following this Study could be:

- Extending the Merseyrail network to Shotton (and possibly on to Wrexham);
- Extending the Merseyrail network to Skelmersdale (and possibly on to Wigan Wallgate); and
- Extending the Merseyrail network to Burscough Junction (and possibly on to Preston).

Further options discussed in this Study (although not explored in detail) could also be progressed by funders or stakeholders in accordance with City Region priorities, these could include:

- Re-instatement of the Wapping Tunnel, providing a link between Edge Hill and Liverpool Central; and
- Further enhancement of Liverpool Lime Street station (beyond the recently completed enhancement and renewal scheme).
- Extending services, according to stakeholder priorities via the Liverpool John Lennon Airport link, Bootle Branch Line, Ellesmere Port to Helsby, Wigan, Headbolt Lane/Skelmersdale, Burscough/Preston and Wrexham.

Importance of partnership working

For the aforementioned priorities and options to progress, ongoing partnership between Network Rail, Merseyrail, Liverpool City Region Combined Authority and other regional stakeholders will be vital. This includes Transport for Wales, who are accountable for service specification on the Wrexham-Bidston line. There are several local transport scheme prioritisation processes currently underway, and together with the Liverpool City Region Strategic Rail Study, future iterations of the Liverpool City Region Long Term Rail Strategy could

provide an opportunity for stronger links between these workstreams and the organisations involved.

There are also several opportunities for package and scheme re-prioritisation, Digital Railway implementation, the advent of Northern Powerhouse Rail and now, with the evidence and analysis gathered in this study, a better understanding of the emerging options for the Merseyrail network.

The Liverpool City Region Strategic Rail Study provides further evidence that rail, and in particular the Merseyrail network, is a key component to deliver continued economic growth and development in the Liverpool City Region.

Next Steps

The choices for funders reflected within this study are intended to feed into the Department for Transport's Rail Network Enhancement Pipeline / Market Led Proposals approach designed to capture a wide range of approaches to progressing rail enhancement proposals.



Liverpool South Parkway: the station links services on the West Coast Main Line, Manchester and the Merseyrail network to Liverpool John Lennon Airport.



The Merseyrail network is at the heart of a vibrant region

Appendix A Glossary

| Appendix A - Glossary | |
|------------------------|---|
| Term | Meaning |
| CMSP | CMSP is Network Rail's response to the Shaw Review (2016) Continuous Modular Strategic Planning, part of the Long Term Planning Process. Recommendation noting the requirement to better plan the railway based on customer, passenger and freight needs. |
| Conditional Output | Statement of aspirations for the level of service provided. |
| Connectivity | Opportunity to travel between two locations and associated journey time. |
| Control Period 6 (CP6) | Network Rail is funded in five year periods. Control Period 6 is the funding period from April 2019 to March 2024. |
| Control Period 7 (CP7) | Network Rail is funded in five year periods. Control Period 7 is the funding period from April 2024 to March 2029. |
| Digital Railway | The Digital Railway is a rail industry-wide programme designed to benefit Britain's economy by accelerating the use of modern technology in several key rail areas. |
| ERTMS | European Rail Traffic Management System. A system for managing train movements using ETCS (European Train Control System) to signal trains and GSMR (Global System for Mobile Communications – Railway: an international wireless communications standard for railway communication and applications) to communicate with trains. |
| ETCS | European Train Control System. A new signalling control and train protection system. |
| GJT | Generalised journey time (GJT) represents journey time, frequency of service and interchange in a single term and is expressed in equivalent (minutes or hours) of journey time |
| GRIP | Governance for Railway Investment Projects. A Network Rail standard for project managing changes to the infrastructure. |
| HLOS | High Level Output Specification. The Government's statement of what it wishes to buy from the industry over a five year period. |
| HS2 | Proposed High Speed link between London, Birmingham, and beyond to Manchester and Leeds. |
| HS2 Phase 1 | First phase of High Speed 2 to provide a high speed line between London and Birmingham. |
| HS2 Phase 2 | Extension of High Speed 2 Phase 1 network which includes a high speed line from Birmingham to Manchester and from Birmingham to the East Midlands, Sheffield and Leeds. |
| Intervention | Planned works to deliver the desired infrastructure or operational enhancement to the railway. |
| 2043 ITSS | Indicative Train Service Specification. This reflects one possible way in which the Conditional Outputs from the Market Studies could be met, and it is used to test the current network to determine if it can accommodate these outputs. |
| LTPP | Long Term Planning Process. |
| ORR | Office of Rail and Road. The safety and economic regulator for the rail industry in Great Britain. |
| PPM | Public Performance Measure |
| RNEP | The Rail Network Enhancement Pipeline (RNEP) is the approach applied to all rail Enhancements within England and Wales which are in receipt of funding from central government (i.e. from the Department for Transport). |
| Third Rail | A form of power supply which uses a Direct Current (DC) rail in between the train tracks to power trains. |
| tph | Number of Trains per Hour. |

Appendix B Reference Material

Liverpool City Region Long Term Rail Strategy - 2014:

[http://www.merseytravel.gov.uk/Site%20Documents/LCR%20LTRS_Strategy%20Summary_01_08_14_Final%20Issue%20\(6\)_MTravel.pdf](http://www.merseytravel.gov.uk/Site%20Documents/LCR%20LTRS_Strategy%20Summary_01_08_14_Final%20Issue%20(6)_MTravel.pdf)

Network Rail - Long Term Planning Process:

<http://www.networkrail.co.uk/long-term-planning-process/>

Network Rail - Merseyside Route Utilisation Strategy – 2009:

<http://www.networkrail.co.uk/browse%20documents/rus%20documents/route%20utilisation%20strategies/merseyside/merseyside%20rus%20.pdf>

Network Rail – Network and Route Specifications:

http://www.networkrail.co.uk/Network_Specifications.aspx?cd=1

Network Rail – Public Performance Measure: <http://www.networkrail.co.uk/about/performance/> PPM

Network Rail – Route Weather Resilience and Climate Change Adaptation Plans LNW:

<https://www.networkrail.co.uk/LNW-Route-WRCCA-Plan.pdf>

Office of Rail and Road – Estimates of Station Usage:

<http://orr.gov.uk/statistics/published-stats/station-usage-estimates>

Transport for the North – Northern Transport Strategy:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/505705/northern-transport-strategy-spring-2016.pdf

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Northern Powerhouse Rail image provided courtesy of Transport for the North

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