HIGH-SPEED RAIL

Capturing the benefits of HS2 on existing lines

02/2011

GREENGAUGE21

Contents

Cover photo: Charlie MacDonald

Executive Summary

The need for the study

When High Speed Two (HS2) is complete, the longer distance, non-stopping trains on the West Coast Main Line (WCML) will in the main transfer to the new, quicker, route, freeing up valuable capacity. However, until now plans for services on the WCML once HS2 is open have been broad brush *assumptions* made for the purposes of completeness in the economic appraisal.

This report looks ahead in more detail to consider what services *should* operate on the existing rail network once HS2 is open. The aim is to help kick start the development of this wider strategy in which the benefits of HS2 are maximised, not just for those using the new line, but for travellers on the existing railway. The effective re-use of the capacity released by HS2 is a key project benefit. It will allow new local and regional passenger and new freight trains to operate: services that are and will continue to be prevented by network capacity constraints.

Greengauge 21's approach

The approach we adopted in this work had two stages. First, we asked an authority on the design of regular interval timetables to take a fresh look at the WCML – a blank sheet of paper approach, looking forward to the year when HS2 is open. This work was carried out for us by Jonathan Tyler of Passenger Transport Networks (PTN). He used techniques developed in Switzerland to design a regular interval timetable for the southern section of the WCML.

The second stage involved considering this new timetable and the capacity it would release in terms both of infrastructure and rolling stock to consider if there were any further network developments and new services that could be adopted – either for passengers or freight.

A new timetable for the West Coast Main Line

The timetabling analysis by PTN confirms the limitations of the existing timetable of services on the WCML. Because of the speed-up and expansion of the non-stopping longer distance services, the opportunities to serve areas of strong population growth along the corridor are being foregone. In some cases, direct London services have been withdrawn; in others they are only provided in peak hours; in yet others they have had to be removed from the timetable in peak periods because of capacity limitations.

The revised timetable developed by PTN addresses these deficiencies and brings a very wide range of service enhancements. Places where fears have been expressed that services would be seriously worsened by the advent of HS2 – Coventry is a good case in point – would get new services, and find there is more seating capacity available. Towns and cities between Crewe and London (Euston) that currently have limited or no direct trains get new direct fast-line services. Watford, Milton Keynes, Rugby, Nuneaton, Tamworth and Lichfield get frequent regular interval services that will allow them to act as major transport interchanges.

West Coast Main Line: summary of service improvements

Lichfield Trent Valley, Tamworth and Nuneaton

Twice hourly fast services (London and Manchester/Chester) *Today: fast services in peak period only*

Wolverhampton

Twice hourly London service (one via Walsall) *Today: hourly service*

Birmingham New Street

Twice hourly fast service to Milton Keynes, Watford Junction and London *Today: three/hour London, hourly to Milton Keynes and Watford Junction*

Coventry Corridor

Four local services/hour as needed for local stations *Today: twice hourly*

Two Cross Country services hourly *Today: hourly*

Coventry & Birmingham International

Fast London trains on a 30 minute interval *Today: 20 minute interval*

Direct connections hourly to Derby, Sheffield, York and Newcastle *Today: no direct services*

Rugby

30 minute interval fast service to London and the North West *Today: hourly London service, no regular fast service to North West*

Northampton

London service five trains/hour, one non-stop (46 minutes) *Today: three/hour, fastest 59 minutes*

Milton Keynes

Nine fast London trains each hour *Today: 3/hour*

Direct hourly service to Scotland and Liverpool *Today: Scotland 1 per day, Liverpool 2 per day*

Twice hourly direct services to Manchester *Today: 1/hour*

Twice hourly fast West Midlands services *Today: hourly and none in commuter peaks*

Twice hourly service to Clapham Junction *Today: one/hour*

Bletchley and Leighton Buzzard

Twice hourly service to Clapham Junction *Today: one/hour*

Cheddington

Twice hourly service *Today: hourly*

Tring

Six trains/hour *Today: four/hour*

Hemel Hempstead

Six trains/hour *Today: five/hour*

Watford Junction

Seven non-stop London Euston trains/hour *Today: three/hour*

Hourly interval service to each of Liverpool, Manchester and Preston *Today: one service/day (each)*

30 minute interval Clapham Junction service *Today: hourly*

Harrow & Wealdstone

30 minute interval service to Clapham Junction *Today: hourly*

Wembley Central

Twice hourly non-stop service to London Euston *Today: no fast service*

30 minute interval Clapham Junction service *Today: hourly*

Note: the above table is a summary only and relates to day-long service patterns. There will be additional peak services in some cases.

As the summary table above shows, there can be a transformation of services operating on the West Coast Main Line with particular benefit to local travellers.

Providing for the expansion of rail freight

The new timetable developed for the WCML provides for three train paths per hour for freight services throughout the day – a substantial increase on today's demand level. This, together with expansion of freight terminal facilities, would help ensure that rail freight can fulfil its substantial potential as a sustainable logistics network in Britain.

The WCML today is the busiest long distance route for rail freight in the country and analysis of expected growth markets makes clear that the route needs to provide for a major expansion of unitised (container) traffic, for international and domestic freight flows. It has an enhanced gauge to accommodate 9'6" containers on standard wagons, and there is no other suitable route for many of the flows it handles, including between the Channel Tunnel, the Thames ports and the Midlands/North West. It also serves the major national logistics centres in the South Midlands.

Wider network opportunities

Today's network of passenger services can also be expanded. Much of today's longer distance demand will have transferred to HS2 services and it will be possible to operate new services through key junctions – services which are inhibited today by the intensive frequency of through non-stopping services. There will also be freed-up rolling stock available to operate these services.

This makes it possible to develop some important extensions to the services between Euston and the West Midlands, providing new direct London services to:

(i) Walsall
(ii) Shropshire
(iii) Mid and north east Wales.

Such services cannot be fitted on to today's WCML timetable, but the revised WCML timetable post-HS2 would make their operation feasible. These services would also continue the provision of a fast direct service to Coventry in the post-HS2 world.

In addition, there are three network developments that become much more realisable with a revised 'de-stressed' WCML timetable post-HS2. These are:

(i) Double-tracking the Leamington – Coventry line and opening a station at Kenilworth with new services operating to/from and through Coventry. We have identified the potential for a new London Marylebone – Leamington – Kenilworth – Coventry service, providing Kenilworth with a direct London service and Coventry with a choice of London train operating company. There is a current planning application to (re-)open Kenilworth station before Warwickshire County Council;

(ii) The East West Rail link, which has the support of a large grouping of local authorities. With the WCML timetable freed up, operation of services over the reopened line can be readily extended from Bletchley onwards to Milton Keynes;

(iii) The Croxley Link, the benefits of which for Metropolitan Line services would be greatly increased by the substantial intensification of service that is planned for Watford Junction. This could also support a new service from Aylesbury and other Chiltern Line destinations to Watford Junction .

These developments all rest to a greater or lesser extent on the delivery of HS2. Of course, each will need to be subject to careful appraisal. But the business cases for several

of these schemes have already been developed and will only be enhanced by the advent of HS2. Some may be taken forward by the private sector. Their capital costs are modest.

The benefits of an integrated WCML timetable are not restricted to the railway. A sensible repeat-pattern train service creates opportunities for properly coordinated public transport hubs – buses and trains – at stations across Bedfordshire, Buckinghamshire, Northamptonshire, Warwickshire and Staffordshire. There is also considerable potential to create a genuine network of connecting rail services in areas such as the Trent Valley, integrating services at Stafford, Rugeley, Lichfield, Tamworth and Nuneaton.

Future HSR developments

HS2 is the first stage in the development of a national high-speed rail network and future stages of HSR construction will see similar benefits spread across the existing railway – to the Midland Main Line, East Coast Main Line, Great Western Main Line and beyond.

One specific opportunity that will arise in the next stage of HS2 development is a consequence of the future connection from HS2 to Heathrow Airport, which is planned to be constructed at the same time as the routes to Manchester and Leeds. The new line needed to provide this Heathrow link will join HS2 near the existing Chiltern line. A short section of connecting line with appropriate junctions will allow services to operate from Heathrow to all of the stations served by the Chiltern franchise today. The new second-phase HS2 – Heathrow connection would have spare capacity to accommodate these services.

Transforming rail services for all

This research shows that there will be substantial improvements possible on the West Coast Main line, by virtue of the capacity liberated on that route by HS2. Services to most of the stations along the route can be transformed: frequencies typically doubled, connections dramatically improved and in some case, quicker journeys too. Irritating limitations on the commuter peak timetable will become history.

The report also shows that the benefits of HS2 will in practice be spread over a wide corridor. A very broad sweep of geography between London and Birmingham stands to gain, *provided* a wider strategy is adopted alongside the planned project delivery arrangements for HS2 itself. There is the very real prospect of a network of integrated public transport services, enhancing connectivity and access to key employment centres.

Greengauge 21's position has always been that high-speed rail must be developed in a way that benefits the whole nation. This report shows how the gains from HS2 can be spread beyond the centre of Birmingham to the wider West Midlands, and indeed beyond, into Wales.

This report also shows how the areas affected by HS2 between London and the West Midlands can benefit, through the opportunities that arise from freeing up the West Coast Main Line for local and regional services. Of course, the detailed timetabling work and service proposals must be regarded as preliminary and no doubt others will come forward with different suggestions. Whatever the final form of local service development adopted, they will be just as much a part of the HS2 project as the services that are provided over HS2 itself.

New services can benefit the Chilterns, Buckinghamshire, Hertfordshire, Northamptonshire, Oxfordshire, Staffordshire and Warwickshire. Those with electoral responsibility for these places, whether in Parliament or in local government, need to examine these propositions carefully. They are potential elements in a wider strategy that Greengauge 21 believes should accompany the delivery of HS2, and they cannot be provided – except with major fresh capital expenditure – unless HS2 happens.

1. Introduction

Objectives of this study

Work done to date by HS2 Ltd – and others, including Greengauge 21 – has made assumptions about the future use of those existing railway lines that would be relieved by the implementation of high-speed rail (HSR). These assumptions are made in order that the business case appraisals are fully specified and to provide a representation of all of the costs and benefits that arise from investment in HSR. They are, in effect, an expression of what residuary services might look like.

With the plans for HS2 between London and the West Midlands now going forward to full consultation, it is important to move beyond analytical *assumptions* on what might happen with existing railway lines affected by HS2 and develop some alternative *proposals* for consideration. Rather than a conception of High Speed Two in isolation, it can then be seen as part of a wider transport strategy.

There is a general consensus that the capacity freed up on existing lines should be used for the enhancement of local, commuter and regional passenger services, and for the provision of additional capacity for railfreight. But what form should these enhancements take? Is it possible, for example, to confer real benefits, through local rail service improvements, to those parts of the country through which the new HSR line will pass?

The scope to re-use the capacity liberated on existing lines is a key benefit of HS2. There are currently 11 inter-city Pendolino services during peak hours (in a single direction) operating to/from London Euston over the West Coast Main Line (WCML) serving destinations that will be reached around 30 minutes more quickly via HS2. The capacity that these paths consume has a very substantial value. Rather than just assume that in due course some alternative use will be found for these particular train paths, we felt it right to think through the overall use of the West Coast Main Line afresh[1]. We also considered the consequential effects of changes on the West Coast Main Line, which we found opened up valuable opportunities on connecting (and potentially connecting) routes.

In contemplating forward plans for the use of existing railway lines, it needs to be borne in mind that train service timetables are the result of contracts between train operating companies and Network Rail and that these are subject to approval by the independent Office of Rail Regulation. In the case of franchised passenger services, the trains to be operated may be specified in more or less detail by the franchising authority.[2] The point is that insofar as Government wishes to do so, it can procure the provision of rail passenger services.

Here we will be discussing options that would come to fruition in about 15 years time when HS2 is complete and in operation. An advantage of this lengthy lead time is that changes needed to support a radically restructured timetable can sensibly be contemplated: these would include the use of new or different rolling stock, perhaps changes to track layout and signalling, and even new stations and freight terminals.

[1] Work on the potential benefits to the West Midlands has been carried out by Centro.
Centro, *How HS2 will transform the West Midlands,* October 2010.
Available at: http://www.centro.org.uk/rail/HighSpeed2.aspx.

[2] The Department for Transport, in England, and Transport Scotland for the Scotrail franchise.

A new timetable for the West Coast Main Line

The focus of this report is HS2, the route as planned and developed by HS2 Ltd between London and the West Midlands. As will be seen, the scope for beneficial service changes as a result of HS2 is widespread.

The line that will be most affected by HS2 is the West Coast Main Line. This route takes 43% of the nation's railfreight, and local, commuter and regional/inter-regional passenger services – as well as the inter-city Pendolino service already mentioned. It is a very intensively used and complex railway. It comprises (in effect) four tracks between London and Rugby, one pair of which runs through Northampton. The construction of HS2 creates an opportunity for a total recast of the services on the WCML.

One of the ways in which this could be done is through the adoption of a practice first developed in Switzerland, which is the use of an integrated regular-interval timetable (for all public transport, not just rail). Known as *Taktfahrplan*, this approach is commonly adopted across mainland Europe. In Britain, it has an advocate in Jonathan Tyler of Passenger Transport Networks, who has been commissioned by Greengauge 21 to develop an example of how *Taktfahrplan* thinking could be applied in practice to a WCML liberated of the need to accommodate long distance, non-stopping services. His work is summarised in the next chapter.

There is also the important consideration of opportunities for railfreight services and the prospect of reduced reliance on road haulage. One of the great advantages of HSR in general is the capacity released on lines where there are constraints on the operation of freight services and where there are existing rail freight terminals capable of significant expansion. This is an important path to pursue in lowering carbon emissions from the freight sector, with the prospect of rail reducing the need for road haulage. We address this area in Chapter 3.

But the implications of HS2 extend wider than questions of re-timetabling the existing route. Without the need to accommodate longer distance services to the major cities, there is scope to provide connections to the next tier of smaller centres which cannot be provided with through services today because of the capacity limitations on the main line. These wider considerations are identified and developed in Chapter 4.

As Britain's high-speed rail network develops further in the future – the Government already plans to extend HS2 to Manchester and Leeds – the kinds of benefits described here will be extended over other lines. Chapter 5 discusses how future phases of HSR network development will further broaden the benefits to users of the existing railway.

2. A regular interval timetable for the West Coast Main Line (south)

The current pattern of service on the West Coast Main Line is extremely variable. Some destinations (largely those served by inter-city Pendolino trains) have an excellent frequent and fast service; other stations have irregular and patchy services throughout the day. HS2 allows the removal of many of the inter-city services from the southern end of the WCML, freeing up capacity for very different use of the route and providing benefits for passengers at smaller intermediate stations. Without HS2, the WCML does not have the capacity for any significant service development to serve these intermediate stations.

The new HS2-WCML timetable developed for Greengauge 21 by Passenger Transport Networks is illustrated at Figure 2.2 below, accompanied by a description of the timetable development approach at Appendix A and the benefits on a station-by-station basis at Appendix B.

Key concepts

The *Taktfahrplan* approach is based on the concept of a standard hour timetable for the WCML: a basic pattern of services is operated in each hour from start to close of service, with additional peak services overlaid. Services are planned to be hourly, half-hourly, quarter-hourly – or very frequent. This simplifies the provision of information and marketing and builds customer confidence in understanding the timetable.

Efforts have been made to ensure even spacing of trains and brisk connections between services. Connections are not just a matter for branch lines: good interchange between services on the same line of route can secure a reasonable service for flows for which through trains are infeasible and offer a with-change option in addition to through services.

The design of an integrated timetable uses a 'mirror-image' rule, under which the timings of a service are balanced around the 'zero minute'. This ensures that a timetable that works for passengers in one direction will always work – in reverse – in the other (which does not happen with today's timetable).

Assumptions

One starting point for the regular interval timetable was the HS2 service pattern modelled by HS2 Ltd for the business case, as set out in Figure 2.1. This shows three HS2 services between London and Birmingham, three services between London and Manchester, two to Liverpool and one to Glasgow, with extra services to Birmingham and Preston in the peak.

In a separate report[3], Greengauge 21 will set out how these services might be optimised in future, taking account of the planned connections to HS1 and to Heathrow Airport. However, in this exercise, we have largely taken the pattern illustrated in Figure 2.1 as given, with two exceptions:

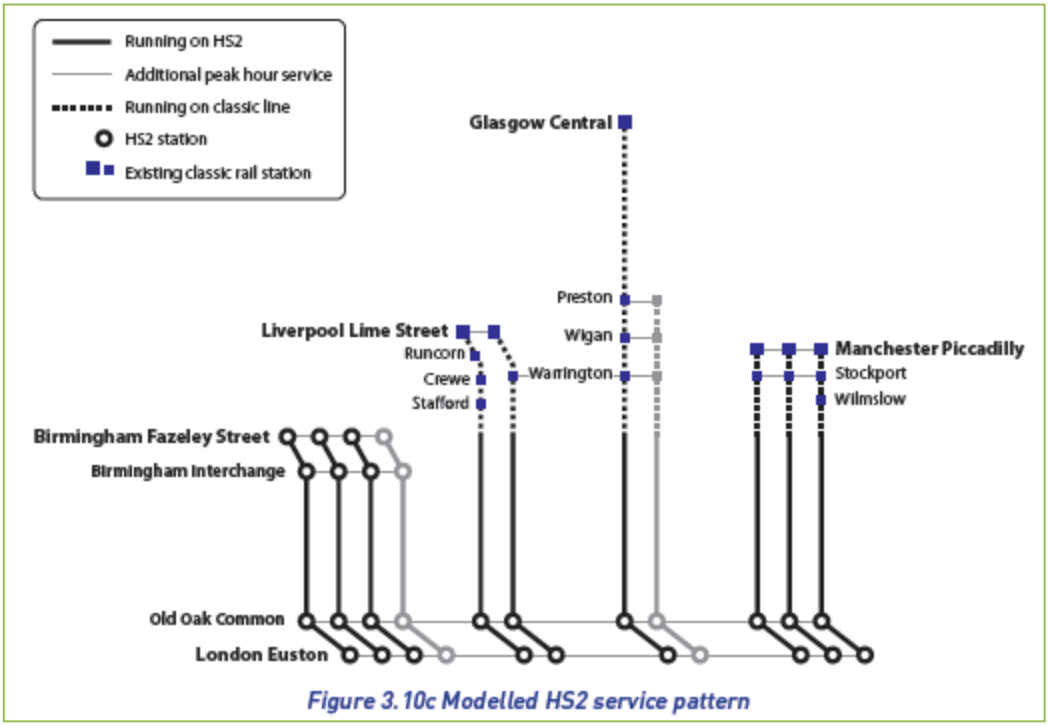
(i) An additional HS2 service is timetabled between London and Edinburgh, given that HS2 will be the fastest route to Edinburgh;

[3] Greengauge 21, forthcoming (February 2011).

(ii) Services are shown to Derby, Sheffield and beyond, taking advantage of Greengauge 21's proposed connection from HS2 to the Birmingham – Derby line as well as the West Coast Main Line at its northern limit near Lichfield[4].

Neither of these changes, which are shown in the timetable at Appendix A, alters the benefits to destinations on the WCML.

Figure 2.1 Modelled HS2 service pattern



Source: High Speed Two Limited, *High Speed Rail – London to the West Midlands and beyond*, December 2009.

On the WCML, the infrastructure is assumed not to be significantly different in 2026, apart from the currently proposed works at Norton Bridge, the new curve at Nuneaton and the junction with HS2 at Lichfield North. This means that in practice the main constraint on the WCML post-HS2 will be the short two-track section between Whitehouse Junction and Colwich Junction, which will be a critical location. The WCML timetable shown in the chapter has been planned around this constraint, but the work has illustrated that considerable additional benefits would arise if works were undertaken to relieve Colwich Junction.

It is assumed that the new HS2 'classic-compatible' trains will run at 200 km/h (125 mile/h) on the classic railway. In practice the timings for these trains on the existing network remain to be devised, since the plan is that these trains will not be tilt-equipped, and therefore typically will be restricted to 110 mile/h on curved sections of route where Pendolinos can operate at 125 mile/h. For this reason, timings shown north of Lichfield for these trains should be treated as notional only. These and the WCML inter-city services are timed using Pendolino performance, while regional and local services will be covered by

[4] See Greengauge 21, *Fast Forward,* September 2009, p39.
Available for download at http://www.greengauge21.net/publications/fast-forward-a-high-speed-rail-strategy-for-britain/

160 km/h electric multiple units. Some regional services will run at 200 km/h on the fast lines.

The improvement of the WCML timetable facilitated by the removal of many of today's inter-city services and the development of an integrated regular interval timetable allows a more efficient service pattern to be operated. In particular, performance allowances can be tightened up, resulting in a network that operates better with less timetable padding needed to maintain performance. In some cases, this means that additional station calls can be made at intermediate stations without lengthening end-to-end journey times.

Assumptions have been made on HS2 and WCML services operated at the northern end of the route. These have been made for technical completeness, in order to establish the overall WCML timetable is robust, but do not represent a firm service proposal. The focus of this work has been on the benefits that can be delivered on the southern end of the route.

Proposed service plans for WCML (South)

The new regular interval timetable proposed for the WCML is illustrated on the 'NetGraph' overleaf.

(i) Trent Valley

The stations on the Trent Valley route – Lichfield, Tamworth, Nuneaton and Rugby – serve important and growing towns but are seen by those setting today's timetable as secondary to the need to provide attractive fast journey times to the major centres in the north west, north Wales and Scotland. As a result, none of the stations has regular stops in the long-distance expresses, with Nuneaton losing its station calls two years ago. The present service pattern is an hourly all-stations service between Crewe and London (Euston) that takes 3h 16 minutes to complete the journey. It is supplemented by a few selective stops in peak-hour expresses – better than many past compromises, and custom has been growing but remains small for now. However the all-stations service is handicapped by a poor path, which partly explains the extended end-to-end journey times.

HS2 opens the opportunity to do something better. The core requirements are seen as being:

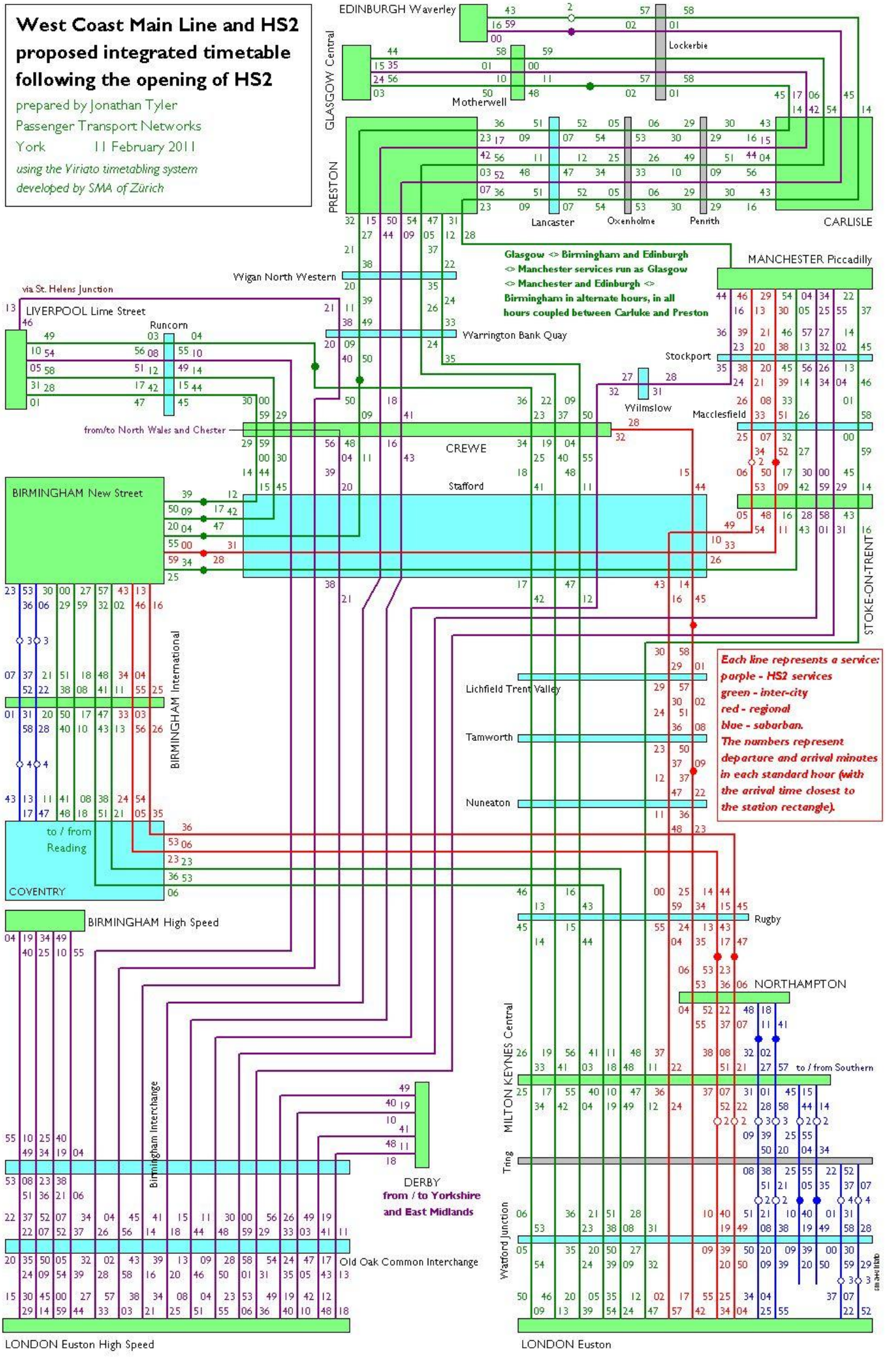
- as fast a London service as possible
- a half-hourly frequency to ensure convenience
- good connectivity to the north and south.

Two separate hourly services at near-even intervals on their common section are proposed to achieve these objectives. One would run from Manchester, calling at Stockport, Macclesfield, Congleton, Kidsgrove, Stoke-on-Trent, Stafford, Lichfield, Tamworth, Nuneaton, Rugby and Milton Keynes. The other would start at Crewe, serve Stafford and the same stations (plus Rugeley and Atherstone) to Rugby and then be routed via Northampton from where it would run non-stop to London. The faster journey time would be 87 minutes between Lichfield Trent Valley and London, compared with 130 mins southbound and 101 mins northbound with today's hourly service – a saving of between 14 and 45 minutes, depending on direction. Both services make good connections with other rail services at Stafford and Rugby.

West Coast Main Line and HS2 proposed integrated timetable following the opening of HS2

prepared by Jonathan Tyler
Passenger Transport Networks
York 11 February 2011

using the Viriato timetabling system developed by SMA of Zürich



(ii) West Midlands to London

An even interval half-hourly service is planned for Coventry and Birmingham, extended alternately to serve Sandwell & Dudley/Wolverhampton and Walsall/Wolverhampton. Both services would stop at Milton Keynes and Watford Junction, doubling the service frequency to these places through the day, and with good onward connections at both. Today's peak period timetable frustratingly has *no* direct fast services between the West Midlands and these important centres because of capacity limits; in the planned timetable post-HS2 there will be half hourly direct fast services linking the West Midlands with Milton Keynes and Watford throughout the commuter peak period. The running times between Birmingham New Street and London and between Coventry and London would be similar to today's times.

Services between the West Midlands and Rugby will be covered by doubling the frequency of the regional service, and Rugby itself will have an improved London service, with two-three extra non-stop peak trains (but no stops in the West Midlands/Coventry – London service).

The local service between Birmingham and Coventry could run every 15 minutes in peak periods and every 30 minutes in the off peak, and provide for passenger interchange into longer distance services at Birmingham International. It would be possible to increase the service frequency to four per hour through the day if needed.

(iii) Regional services between Birmingham, Northampton (and London)

The regional services between Birmingham, Northampton and London, currently operated by London Midland, would be enhanced to run every half-hour, twice the current service frequency, and every 15 minutes in the peak.

(iv) London Outer Suburban services

The Outer Suburban services from London would comprise – every 30 minutes:

- a Northampton - London service calling at principal stations only, including Tring, where connections into the 'all stations' service would be provided;
- a Tring - London 'all stations' service (stopping at Willesden Junction if new platforms on the Slow Lines are constructed – another possibility once the WCML is 'de-stressed');
- Milton Keynes - Clapham Junction/East Croydon service doubled in frequency. Whether this service could be extended to Gatwick Airport where the station is the subject of a current capacity enhancement scheme would need further examination.

The Northampton service would run every 15 minutes in the peak.

(v) Milton Keynes

Milton Keynes is one of the prime beneficiaries of the integrated timetable. As a large and growing centre it is quite poorly served at present, with only three of the nine standard-hour expresses calling. It is proposed that all six of the WCML inter-city trains will call each hour, together with three regional trains. This will secure a high-convenience link with London and excellent connectivity to the north.

The overall effect, together with the East West Rail connections discussed in Chapter 3, is that Milton Keynes will become a 'super-hub' station – an important interchange – as well as offering very high levels of connectivity to the city and its wider catchment itself.

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30 minute interval Clapham Junction service *Today: hourly*

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Freight

The timetable provides for three freight paths per hour south of Daventry and four freight paths per to the north. This will allow for a substantial expansion of rail freight activity over the WCML (see Chapter 3 below).

West Coast Main Line connectional timetabling

We have seen above how regular interval timetabling on a route where longer distance non-stopping services have been removed could bring very significantly improved services to intermediate stations – and allow for an increase in rail freight too. These plans, while developed consistent with the technical parameters for service planning on this line, can be only illustrative: there are many other options and variants that could be considered.

The advantages of a regular pattern timetable extend beyond the rail sector and provide the basis for scheduling public transport services on a sensible repeat-pattern connectional basis. The creation of HS2 creates the opportunity to adopt a properly coordinated public transport service of buses and trains across large parts of the counties of Bedfordshire, Buckinghamshire, Northamptonshire, Warwickshire and Staffordshire.

There are also some very substantial opportunities for better connections between West Coast Main Line services and those operating over connecting routes. The southern section of the WCML has rail interchanges at Watford Junction, Bletchley, Rugby, Coventry, Nuneaton, Tamworth and Lichfield. There is the potential to create a genuine network of connecting rail services in place of the current set of disjointed timetables. Some of these opportunities are discussed in the following chapter.

The impact of the revised timetable for the West Coast Main Line is summarised station by station in Appendix B.

3. Freight

Growing freight markets

The West Coast Main Line is an extremely important route today for freight, with five freight train operators. In future it is expected to carry additional intermodal (containerised) traffic, driven in part, according to Network Rail, by the development of freight facilities in the North West and West Midlands.[5] Much of this traffic uses the ports of Southampton and Felixstowe. There is also growing use of the Channel Tunnel for through freight services between the continent and freight terminals in the North West and West Midlands. The terminals at Daventry – which is the hub of the Anglo- Scottish domestic intermodal rail freight system – and Ditton already have expansion plans.

Overall, growth in unitised port traffic is expected to average +6% per annum over the next 20 years, and an even higher rate, +11% per annum, is expected in domestic unitised traffic.[6] To some extent, this will be addressed through the operation of longer (775m) trains, and possibly with increased use of electric traction. This leads to a projection of a need for over 80 freight train paths/day (in each direction) over the southern section of the West Coast Main Line by 2030.[7] As today, it will be by far the busiest long distance route for rail freight in the country.

According to the Rail Freight Group, besides the expansion of international intermodal traffic through the ports and the Channel Tunnel, the next sector where railfreight could achieve a major switch away from road haulage is in the domestic intermodal sector. Already, there are successful services of this type operating between Daventry and Scotland, but the ambition is much wider. A lot of these freight flows are of consumer goods and are retail (supermarket) related.

The East West Rail link between Oxford and Bletchley, if reopened, could play an important part in expanding railfreight. It offers a better route for container flows between Southampton and North West England than the current route through the West Midlands conurbation. It also opens up the prospect of efficient rail haulage from the national logistics centres in the South Midlands – especially through the freight terminal at Daventry – to the South West and South Wales.

There is a twice daily Royal Mail service operating between Willesden and Shieldmuir in Scotland, operated with 100 mile/h rolling stock, and it is believed that there is potential to grow this market too.

Accommodating forecast growth

The Campaign for Better Transport has argued that the opportunity should be taken to expand the provision of freight terminals. It points out that the availability of suitably located terminals is most critical to determining the share of freight traffic taken by rail as opposed to road. It wants to see a network of Strategic Rail Freight Interchanges established and HS2 creates the opportunity to achieve this, using the West Coast Main Line as a spine route.

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[5] Network Rail, *West Coast Main Line Route Utilisation Study Draft for Consultation,* December 2010, p5.

[6] Op. cit. Table 4.4

[7] Op. cit. Figure 4.13

The post-HS2 timetable for the WCML, developed for this report, provides for a consistent three train paths per hour for freight services throughout the day south of Daventry and for four train paths per hour to the north (subject to constraints at Colwich Junction being addressed). This represents a substantial increase on today's demand and will allow the rail freight markets identified here to expand into the long-term.

4. Wider service network developments

The advent of HS2 with its attendant liberation of capacity on the WCML creates some opportunities for wholly new services to operate and for others to be re-routed . But it is necessary to be careful to avoid claiming improvements that could happen in any event, without HS2. In the following sections, therefore, we take care to explain not only these further service enhancements, but also why these are dependent in the first place on HS2 happening.

Trent Valley

The adoption of a regular interval fast service for the stations along the Trent Valley section of the West Coast Main Line creates the opportunity to achieve a properly inter-connected rail network for much of the Midlands. Currently, there is little attempt made to inter-relate the services operating on the radial routes from Birmingham that reach or cross the West Coast Main Line because they have such a poor service on the WCML to connect into. With a regular pattern twice hourly limited stop service – such as that outlined in Chapter 2 – the services from Birmingham to each of Stafford, Rugeley, Lichfield, Tamworth, and Nuneaton can form part of this wider network, offering rail as a realistic alternative to many more car users. At Lichfield and Tamworth in particular, there is scope to create much more valuable passenger transport interchanges.

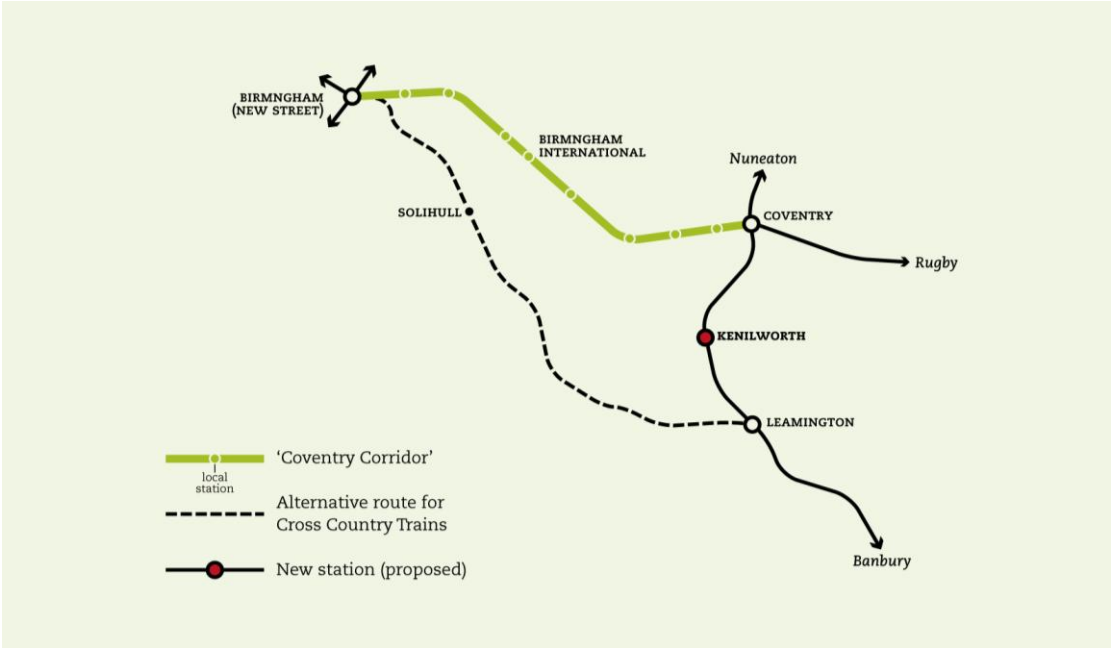
Figure 4.1 – Creating a connected rail network in the Trent Valley

Warwickshire & Coventry

There are some important implications arising from the potential local service improvements identified by Centro.[8] The proposal that both of the two hourly Cross Country service should be routed *via* Coventry rather than one via Solihull becomes feasible with the removal of the 20 minute-interval Pendolino services from the WCML into Birmingham. However, the Cross Country train path can only be reliably introduced on this new routing if the route between Coventry and Leamington is restored to a double track formation. It also then becomes possible to open a station at Kenilworth (for which planning permission has been applied). With these infrastructure improvements, it would become possible to introduce a local service for Kenilworth (as an extension of the service from Birmingham to Coventry). But it would also become possible to introduce a Coventry – Kenilworth – Leamington – London Marylebone service as part of the Chiltern franchise.

These changes would provide Coventry (and Birmingham International) with new hourly services to Newcastle, York, Sheffield and Derby as well as with Bicester and High Wycombe. There would be a station at Kenilworth and it would have a direct service to London.

Figure 4.2 – Kenilworth & the Coventry corridor



Black Country, Shropshire, Mid and North Wales

With HS2 in operation, there would be a continuing need to operate 'fast' services between the West Midlands and London over the West Coast Main Line. To improve connectivity, such services are likely to make an extra station call en route, as shown in the service plan in Chapter 2. But demand would be lower than today, with most of the traffic to/from the West Midlands expected to switch to HS2 services.

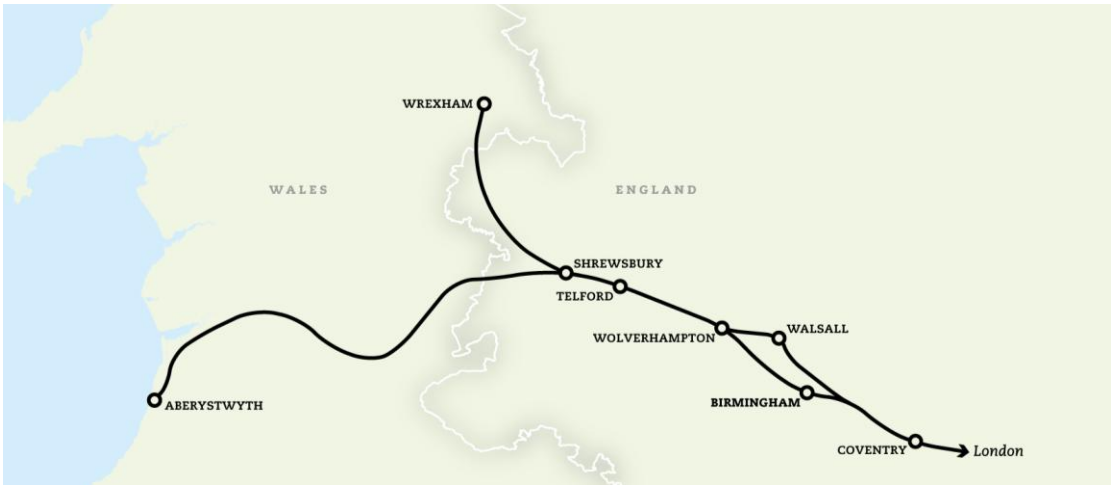
The value of these retained services could be enhanced by their extension westwards from Birmingham. In today's service plans, two out of every three trains terminate at Birmingham New Street. Since the capacity requirements on such services will be reduced following the opening of HS2, it would be feasible to operate such trains with lower capacity Class 221 units (which are approximately half the length of Pendolino trains) or

[8] Centro, op.cit.

other suitable 200 km/hour trains, and extend their operation to locations such as Shrewsbury, Aberystwyth and Wrexham. This will either create long sought after direct services to the capital (in the case of Mid Wales) or provide a sound basis for through London services following the demise of the open access operator (in the case of Telford, Shrewsbury and Wrexham).

The timetable described in Chapter 2 has the two fast WCML services to Birmingham, with one serving Walsall, offering the latter a direct London service. Either of these services could be extended further, as well as providing Wolverhampton with a doubling of London train frequency.

Figure 4.3 – Service extension options for WCML west of Birmingham

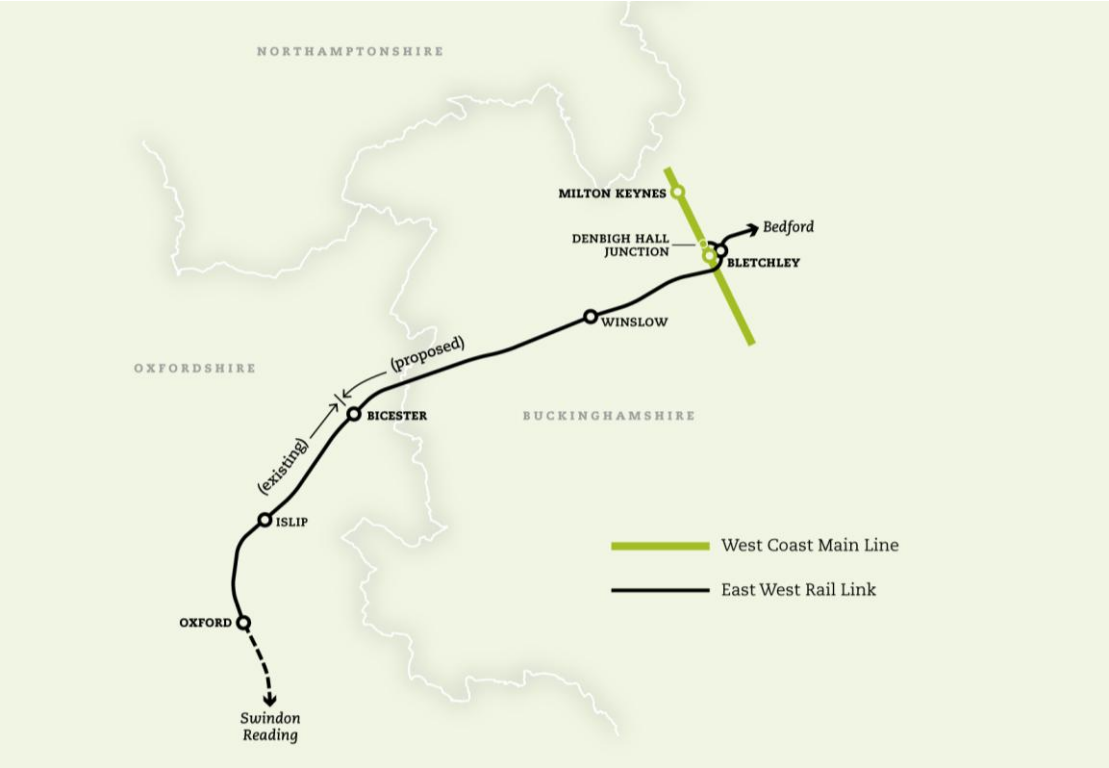


East West Rail link: Buckinghamshire, Bedfordshire and Oxfordshire

The completion of the East West Rail (EWR) link between Oxford and Bletchley has been an ambition of a consortium of local authorities since the mid 1990s. The relevance of HS2 is that for EWR to function effectively there have to be through service opportunities to Milton Keynes. This entails using the WCML between Denbigh Hall Junction and Milton Keynes, where currently it is very difficult to add extra train paths reliably. With HS2, and the total timetable recast that becomes possible, EWR services would be able to access Milton Keynes. This is relevant both to the provision of extra freight paths on the national rail network and to the viability of EWR passenger services. With HS2, it becomes feasible to operate a regular interval service between Oxford, Bicester, Winslow (where a new station would be provided), Bletchley and Milton Keynes; it may be sensible to extend this service westwards from Oxford to provide links to Swindon, Chippenham, Bath and Bristol too (or southwards to Reading).[9]

[9] Such a service extension has been tried under the GW franchise in earlier years when the eastern limit of operations was Bicester; Milton Keynes, with its catchment and onward connections would be a much stronger candidate service.

Figure 4.4 – East West Rail link



Croxley Link

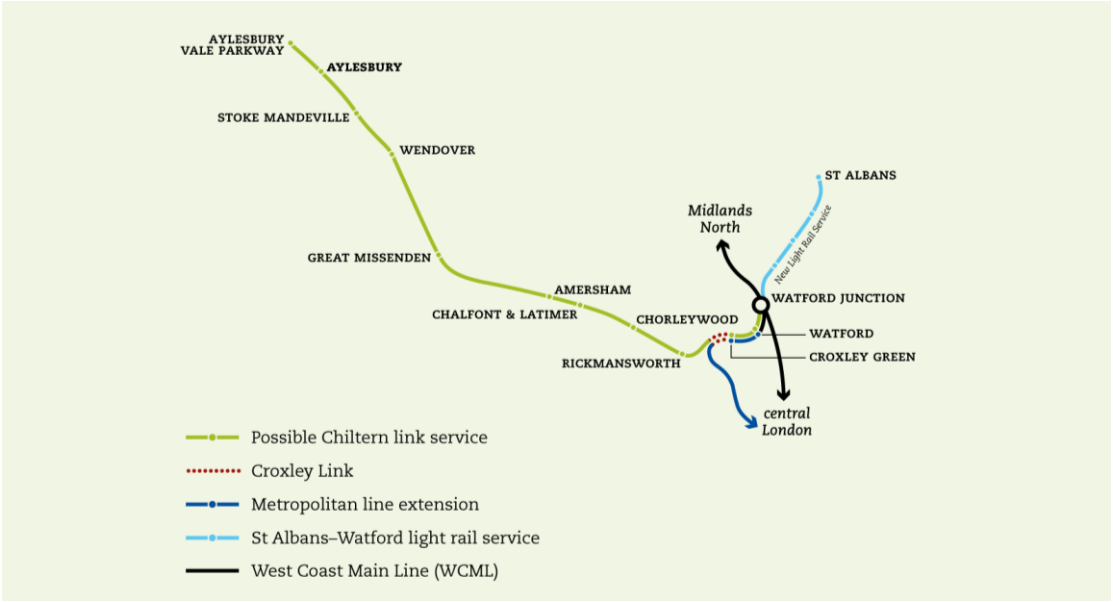
The Croxley Link, which would connect London Underground services directly to the West Coast Main Line at Watford Junction station, is another long-standing aspiration of the local authorities in the area. At present, its function and benefits are restricted by the very limited number of longer distance services for onward connection remaining at Watford Junction. This situation is transformed by the post-HS2 timetable and the value of the Croxley Link and its business case will be enhanced as a result.

New services that could use the Croxley Link and serve Watford High Street and Watford Junction stations include:

- Metropolitan Line services from Moor Park/central London
- New services between Aylesbury Vale, Aylesbury, Stoke Mandeville, Wendover, Great Missenden, Amersham, Chalfont & Latimer, Chorleywood and Rickmansworth.(As an alternative, these stations could be connected directly over the Croxley Link with the 'DC' lines and be provided with new services to Euston or the North London Line).

This is a potentially highly valuable set of connections in an area of congested road networks and where rail connectivity is so poor that only a minority of rail journeys are to destinations other than central London. It directly benefits areas close to the currently proposed line of HS2 but not served by it.

Figure 4.5 – Croxley Link: enhanced business case



That HS2 is built and the WCML timetable changed are not *requirements* for the Croxley Link to happen, but its business case is strengthened by the introduction of a full network of services at Watford Junction. The latter cannot happen without HS2 and the re-organisation of the WCML timetable.

5. Future phases of HSR network development

A national HSR network

High Speed Two is the first stage in creating a truly national high-speed rail network. We have shown in this report how HS2 removes the longer distance non-stop services from key sections of network (in this case, the southern part of the West Coast Main Line) and creates opportunities – both to revise the timetable on the line of route and to provide completely new services which depend on accessibility to the West Coast Main Line to work. There is also capacity created to expand freight services and we have outlined the form that this may take.

So what pattern of equivalent wider gain can be expected as the HSR network is rolled out beyond HS2? The answer depends, of course, on the detailed choices made for future stages of the HSR network and the degree of frustrated demand for train paths over the sections of the existing network relieved by the new HSR lines. The most critical choices in planning high-speed rail lines are, in the first instance, about where connections are made to the existing network.

Greengauge 21 set out an outline of a national network in its September 2009 report.[10] This provided two north-south HSR lines, and some important new connections to be achieved by a mix of new lines and upgrades to existing lines, including across the Pennines and in the Great Western Main Line corridor. It also outlined how a set of connections across Heathrow Airport could be used to create a bridge between the new HSR lines and the existing rail network. The implications of the planned connections from HS2 to Heathrow are discussed below.

Government, through the work of HS2 Ltd, is progressing with planning two HSR lines from HS2 northwards to Manchester (and also to the WCML) and to Leeds (again with connections to the main line northwards, in this case the ECML). As with HS2, no doubt the alternatives will need to be examined. And it will be particularly important to consider whether an element of upgrade rather than total new build would be appropriate. It is this latter option which makes it difficult to be at all specific at this stage on the type of improvements that might be made to services on the existing network from these future stages of the HSR network.

General principles

However, some general principles can be noted, based on the HS2 case reported here. There are some key characteristics that lead to the very wide consequential benefits that have been identified from the HS2 case, namely that:

1. There is a significant proportion of train paths that can be removed from an existing line
2. There is demand pressure to operate additional services (freight as well as passenger) over the line(s) relieved
3. Additional route capacity is created into critical city centre stations.
4. There are large operating speed differentials on the existing line, with the trains removed being at one end of the speed spectrum.

[10] Greengauge 21, *Fast Forward*, op.cit.

The third point is critical if HSR is to be used to help create additional capacity into the centres of the major conurbations. HS2 does this in both London and Birmingham; further sections of HSR could achieve equivalent benefits for Edinburgh, Glasgow, Leeds, Manchester, Newcastle and Sheffield – all places where the scope to add further commuter rail services is inhibited by existing network constraints. Of course, this also serves to emphasise the importance of planning at the city-region level as well as nationally, a practice which HS2 Ltd has in hand.

Elsewhere, the fourth factor is likely to have greater importance than for the southern section of the WCML. This is the question of speed differentials on existing routes. The southern section of the WCML has a pair of fast lines over which the inter-city Pendolino services operate, with limited provision available for other slower services, which primarily use a pair of parallel slower speed tracks. The speed differentials between train types do affect capacity on the southern part of the WCML, but not to the extent that would be apparent if examining (say) the northern part of the WCML between Preston and Glasgow/Edinburgh. Here, 125 mile/h Pendolinos share the same tracks with slower passenger services and 60 – 75 mile/h freight trains. This severely limits line capacity, even though train frequency is lower than is achieved further south. Here, removing the fast Pendolino services and achieving much more uniform operating speeds will deliver a disproportionate increase in capacity.

A fifth factor that may come into the equation is existing line speed. This obviously has an impact on the time saving element that can be derived from building high-speed lines. If low-speed sections of route happen to coincide with a capacity bottleneck, then it may indicate where priorities should lie in terms of sections of new high-speed line. The GWML is a particularly interesting case in point. This is a 200km/h railway from London as far west as Wootton Bassett, but as Network Rail points out, it has severe capacity constraints on the final approaches to London (where it also has to accommodate Heathrow Airport trains).[11] Further west, the Severn Tunnel restricts speed and capacity and limits line availability because of specific maintenance requirements. This would suggest two very differing areas where new capacity would be desirable – one of which would also offer significant time savings and route availability benefits. Such propositions, we suggest, need to be looked at creatively, not narrowly looking at the task that rail services perform today but also at new service opportunities that might be created, This is a key policy path to achieving modal switch and associated wider benefits.

Planning integrated rail services

A key signal of future opportunities is likely to be the scale of the challenges (or 'gaps') that Network Rail identifies in the longer term elements of their Route Utilisation Study programme. Where it is clear that useful additional services would be provided were it not for network constraints that can only be overcome at significant cost, there is likely to be scope to help develop the opportunity through the prudent planning of future phases of a national HSR programme. In other words, HSR routes – at the detailed level – need to be planned in a coherent and strategic way in order to generate benefits over existing lines as well as to the users of the new HSR services themselves.

There is a particularly important policy point to be made here. One of the current objections to HS2 is the belief that while HS2 may assist with stimulating the economy of the largest cities it serves, there may be some unwanted side-effects, including a net disadvantage to surrounding smaller centres which are not served by HSR directly. This

[11] Network Rail, *London and South East: Route Utilisation Strategy draft for consultation*, December 2010.

problem was identified by Greengauge 21 in some early research,[12] and the response that mitigates this problem is to ensure that the HS2 station concerned has very good onwards connectivity to the wider city region. If necessary, this may entail some improvement in local feeder rail services. But what has also emerged in this analysis of HS2 is that this challenge can be addressed more directly through the provision of direct main line services to secondary centres that currently cannot be served because of capacity constraints. In the HS2 case, this allows the addition of new direct fast services to London from Kenilworth, Nuneaton, Shrewsbury, Tamworth, Telford, Walsall and Wrexham, for example.

This would be a very valuable precedent to follow in the further development of the national HSR network. It would be applicable to locations that can be reached by each of the 'trunk main lines': the ECML, GWML, MML and WCML (central and northern sections). It means that there can indeed be a very broad sweep of benefit from adopting HSR, one that ensures smaller cities and towns benefit alongside the large cities that are served directly. These might include for example the cities and towns of Blackburn, Bradford, Burnley, Halifax, Lincoln, and Middlesbrough – places which either have no service or only limited main line services to London today.

On the question of expanding railfreight, there is also a need to find suitable terminal sites, so that the expansion of freight services as anticipated by Network Rail and others can come to fruition. This suggests another factor that needs to be noted in the subsequent stages of HSR development which is to ensure that there is some coherence to the additional capacity created for railfreight, and that its operating constraints (for instance, restrictions in conurbations during commuter peak periods) are recognised at the planning stage.

Heathrow and the towns of the Chilterns

In the second phase of HSR development, there is a very significant new service opportunity which offers widespread benefits across the area of Buckinghamshire most affected by the HS2 proposals. Again it only arises because of the HS2 plans. In this case, the new service concept depends on an augmentation of the second phase scheme under which Heathrow will be joined to HS2.

Direct HSR connections to Heathrow have considerable value, but the new short sections of infrastructure needed to enable HSR to get direct access to the airport will in practice be relatively lightly used, with perhaps a future throughput of (say) four trains/hour in each direction. This means that there will be capacity for other services on these new connections. A new connection from the Chiltern Line, built as part of the second stage of HS2, would allow direct rail services between Heathrow and the following places: Gerrards Cross, Beaconsfield, High Wycombe, Princes Risborough, Aylesbury, Bicester, Oxford, Banbury, Leamington Spa, Kenilworth and Coventry. Services would operate over the existing lines used by Chiltern Railways and the new connections to reach Heathrow.

Since HS2 and the Chiltern Line run in parallel through outer west London, all that is needed is the provision of a short connection from the Chiltern line to new route between HS2 and Heathrow, together with electrification of the Chiltern route. The business case for such an addition would, we judge, be strong based on the addition utilisation it would bring to the Heathrow connections and to the Chiltern line.

[12] Reg Harman, *High Speed Trains and the Development and Regeneration of Cities*, June 2006, Greengauge 21.

Figure 5.1 – Warwickshire & Buckinghamshire direct Heathrow rail link
(using HS2 connection into airport and existing lines)

Of course, the places that can be connected cost-effectively through this connection are not the most significant in terms of Heathrow's catchment. They just happen, by virtue of the HS2 alignment, to be the places to which it is possible to fashion a direct Heathrow rail service at minimal additional capital cost. Birmingham and the other major cities of the Midlands and the North will in due course be connected to Heathrow by HSR.

The Heathrow Interconnection Network proposed by Greengauge 21[13] also envisages that rail services from the north operating into Heathrow would ideally be extended southwards to reach the towns and cities of the wider South East, in the M25 corridor and beyond. These service concepts all depend on the initiative to provide Heathrow with direct high-speed rail access, and 'piggyback' on the infrastructure this requires. This is a planning concept that offers the opportunity to provide a genuine alternative for a diverse mix of travellers to travelling by road on the M25 and the major routes leading to it.

[13] Greengauge 21, *The Heathrow Opportunity*, February 2010.

6. Conclusions

The work presented here has shown that the service offer at existing West Coast Main Line stations can be transformed when HS2 is constructed.

The Pendolino fleet will be available for re-deployment to provide quick and efficient services between those towns and cities that will continue to rely on the West Coast Main Line.

Many places currently have a poor service because the priority has been to allow longer distance Pendolino services to operate with as few intermediate stops as possible. With most long-distance travellers currently on these trains transferred to HS2, the opportunity arises to provide regular day-long direct connections between the places that have previously been neglected. Stations such as Nuneaton that have lost their all-day London services will get them back. Key services such as between the West Midlands and Milton Keynes are currently 'crowded off' the network at peak commuting times: they can be reinstated.

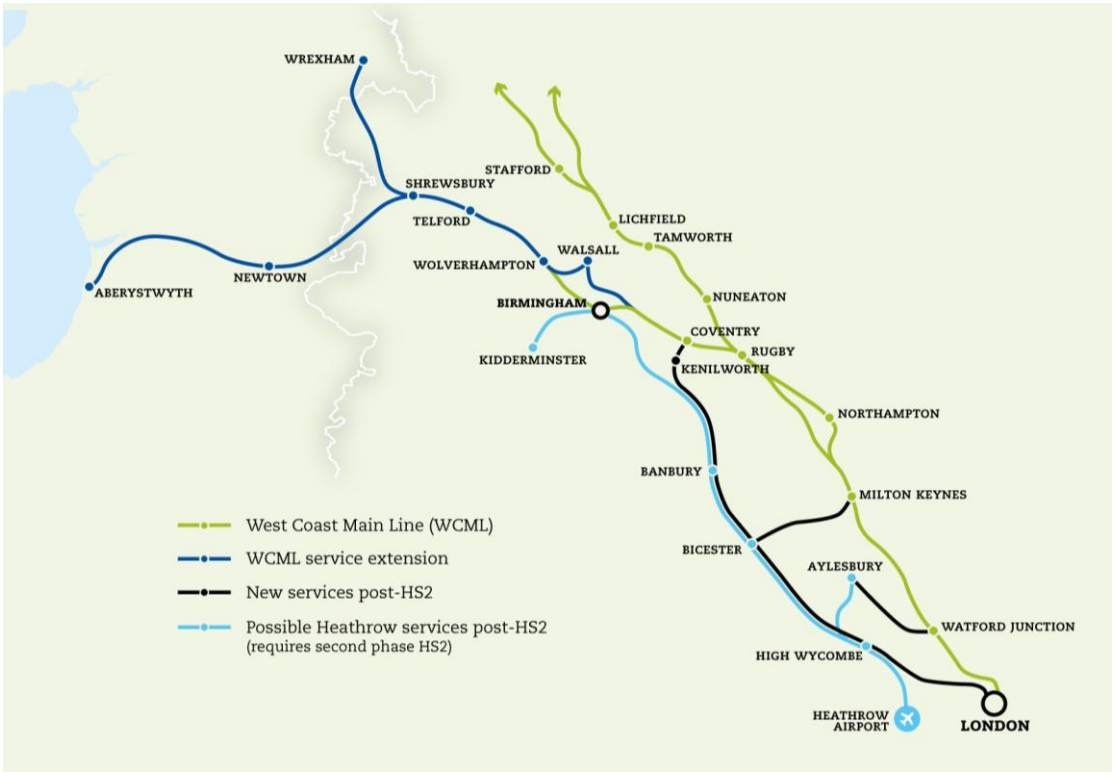
The integrated timetable described in Chapter 2 provides a basis for a connected public transport service pattern over a wide and important catchment area, with buses scheduled to connect with a regular rail service. This allows services to be provided efficiently and addresses better the diverse pattern of customer travel needs.

A revised WCML timetable can also provide for the expansion of rail freight, as described in Chapter 3, with a corresponding reduction in longer distance road haulage. Together these are changes that are important in offering alternatives to road use and in reducing carbon emissions.

There is also the prospect of new stations and new services becoming possible, as discussed in Chapter 4. These could provide valuable new services in the area through which HS2 will pass. Both the East West Rail link and the Croxley Link are aided by the restructuring of train services on the WCML that HS2 permits. There are also enhancements that can be brought about by extending services from the WCML to destinations further afield.

The range of new services that can be provided on the existing rail network once HS2 has been delivered is illustrated in Figure 6.1.

Figure 6.1 – New services made possible by HS2



The various developments are summarised in Table 6.1.

Table 6.1 – New and improved services post-HS2

Location	New/better service
Shropshire and Northeast Wales	New direct Euston service (much faster than recently withdrawn open access service running via Banbury)
Mid Wales (Aberystwyth line)	New direct Euston service (potentially part of the Arriva Trains Wales franchise)
Trent Valley	Fast twice-hourly Euston service (one via Northampton) - currently fast services are limited to peak hours only
Wolverhampton	Twice hourly fast Euston services (doubling today's frequency)
Walsall	New direct London service
Coventry	• Three trains/hour to London in total: two fast to Euston (30 min interval) and new service via Leamington to Marlybone • New hourly Cross Country service to Derby, Sheffield, Doncaster/Leeds, York, Darlington, Durham Newcastle • Frequency to Oxford and Reading doubled

Location	New/better service
Warwickshire: • Kenilworth • Rugby	 New direct London (Marylebone) service (as well as local service to Birmingham) Three fast London trains/hour (frequency trebled)
Northampton	Additional nonstop London Euston service, 15 minutes quicker than today's service
Milton Keynes	• Seven fast trains to London Euston each hour (roughly doubling frequency) • frequency to West Midlands doubled and peak restrictions lifted • new direct services to stations in North West and Scotland • New direct link to Bicester & Oxford • Clapham Junction (East Croydon & possibly Gatwick) service frequency doubled
Bicester/Winslow	New service Milton Keynes - Oxford
Chilterns: • Bletchley – Hemel Hempstead • Aylesbury – Amersham - Rickmansworth	 • Clapham Junction service frequency doubled to two trains/hour • Better service at Tring, with enhanced frequency and connectivity • New service direct to Watford High Street/Watford Junction via Croxley Link
Watford Junction	• Five services every hour to Midlands and the North • Clapham Junction service frequency doubled
Willesden Junction	New platforms on 'slow lines' for outer suburban services

Appendix A

Timetabling HS2 and the West Coast Main Line: an exercise in designing integrated services

Description of Approach

HS2 and the planning of timetables

One of the benefits of HS2 is the liberation of capacity on the southern end of the West Coast Main Line (WCML) and the enhancement of the services offered there. In order to ensure that the new capacity is used effectively and to meet the service objectives in an optimum manner it is essential to undertake detailed timetabling. Railways are highly connected systems that by their nature require planning, notably where historic layouts are less than ideal. Thus, although HS2 will be a straightforward piece of railway, timetabling will be made operationally complex by the link with WCML. The implications need to be understood in planning timetables for the 'classic line' services.

Under current timetabling practice in Britain paths are separately identified by independent operators and assumed, *ipso facto*, to have intrinsic merit. Service-patterns and connectivity between different train operating companies are inevitably secondary considerations. This differs from practice in mainland Europe, where the approach is strongly influenced by concepts of a network. The nature of the HS2 proposals, and developments in the economic and social environment, may strengthen the case for offering integrated services. The timetabling was therefore conducted on European principles, using the *Viriato* planning software from SMA of Zürich.

General principles

The methodology for designing an integrated timetable starts with analysis and judicious balancing of all the factors – and with a clean sheet. It considers

- the relative size of flows on different relations (place-pairs);
- the extent to which it is desirable and practicable to raise rail's market share;
- the best use of track capacity (though 'best' is not a simple objective function);
- appropriate frequencies for each type of relation;
- connections between services;
- the efficient utilisation of rolling stock and train crews; and
- operational issues such as the organisation of services at difficult junctions.

From an understanding of the factors and their interactions comes the concept of an 'offer', that is, the pattern of services and their association with each other that will form the 'product' offered to travellers. 'Standard-hour' timetables are taken as given, and every effort is made to ensure even spacing of trains and brisk connections between services. This may not always be feasible because of geographic and timing actualities, but the focus helps to identify good solutions and may identify schemes that could enable a specific improvement to be realised.

Strategy and priorities

In applying this methodology it became clear that it is necessary to begin with the classic line and then to follow through the implications for HS2. This is counter-intuitive and needs explanation.

On HS2, timetabling is largely a matter of arranging flights of trains with almost identical specifications. WCML will remain as a mixed-traffic railway. and it has a number of flat (not grade-separated) junctions. Above all, the urban geography of the route necessitates high degrees of connectivity and good frequencies. If the paths on HS2 were determined first the best solutions for WCML could be compromised. This is a 'total railway' approach. It is a plan for integrated services, and it would set the framework for the timetable in the rest of Britain. Note that a planned timetable does not preclude competition for the concessions to deliver it.

The economic and social context

There is expected to be a continuing increase in demand for rail travel. It is possible that some non-London flows may grow particularly fast, since lower modal shares for rail present greater opportunities for capture if the standard of services can be improved. In addition, trends in land-use and commuting behaviour may expand flows such as Milton Keynes <> London.

Sustainable economic growth implies extensive personal mobility with a preference for rail as a lower-carbon mode, but consumers will expect convenience so long as the super-flexible private car remains available. The timetable must therefore afford the shortest practicable journey times and the greatest possible choice of opportunities to travel, while the benefits of the HS2 through trains must be spread widely by planning their paths in association with the classic services,

Timetable principles

The current WCML timetable is uneven in the quality of its service-offer, ranging from outstanding to poor. Substantial improvement depends on transferring the inter-conurbation flows to HS2. Services should be hourly, half-hourly, quarter-hourly – or very frequent. In order to simplify marketing and information and to build customer confidence the basic pattern should operate consistently from start to close of service, and additional peak services should be overlaid on the pattern. Ideally the same service should operate every day, with adjustments for periods of lower demand. Connections are not just a matter for branch lines: good interchange between services on the same line of route can secure a reasonable service for flows for which through trains are infeasible and offer a with-change option in addition to a through service.

Absolutely fundamental to the design of an integrated timetable is the 'mirror-image' rule, under which the timings of a service are balanced around the 'zero minute'. Thus, if the Glasgow > London high-speed trains arrive in Euston at xx:08 the northbound trains to Glasgow will depart at xx:52 (all pairs of times sum to 60). This ensures that what works in one direction will always work in the other (which does not happen now). Ideally timings will be close to the zero-minute at important interchange stations. For example, if an express arrives at xx:58 and departs at xx:02 in both directions, then a connecting service arriving at xx:56 and departing at xx:04 will secure 6-minute interchange times for travellers in every direction.

Working assumptions

The scope of the exercise did not allow detailed analysis of demand. Instead judgments about appropriate levels of service are based on general knowledge of flows and the scale of growth, supplemented by observation of volumes and patterns.

The infrastructure of the WCML is assumed not to be significantly different in 2026, apart from the proposed works at Norton Bridge, the new curve at Nuneaton and the junction with HS2 at Lichfield North. There is scope for small projects to improve layouts and increase line speeds. The new HS2 trains will run at 200 km/h on the classic railway. These and the WCML inter-city services are timed using Pendolino performance, while regional and local services will be covered by 160 km/h electric multiple units. Some regional services will run at 200 km/h on the Fast Lines.

Timing data has been drawn from Network Rail sources but modified to reflect the industry's commitment to reducing the incidence of infrastructure and rolling-stock failures, and to tighter operating discipline; the need for greater precision (hence tenths of a minute rather than half-minutes); observed evidence of actual performance; and more coherent allowances for delays.

Jonathan Tyler, Passenger Transport Networks, York
January 2011

Appendix B
Revised services – West Coast Main Line station by station

Lichfield Trent Valley, Tamworth and Nuneaton

The Trent Valley service would be doubled throughout the day. One service would continue to run via Northampton while the other would run fast between Rugby and London. The former would run from Chester and Crewe, the latter from Manchester via Stoke-on-Trent. Journey times would be greatly reduced, and connections both north and south would be tighter and more extensive. In addition there would be two or three extra trains in each peak non-stop between Rugby and London, taking only 78 minutes from Lichfield.

Birmingham New Street to Coventry

The frequency of the fast London trains would be reduced from three/hour to two, but both would call at Milton Keynes and Watford Junction, with good connections for all intermediate stations. Each would be closely flighted with a cross-country service, and interposing the half-hourly Northampton regional service would make the overall frequency on this section near-even quarter-hourly. The intermediate stations would have a half-hourly service and this could be stepped up to quarter-hourly in peak periods, (or for longer periods if there is a case to do so).

Rugby

Rugby will have a half-hourly interval service connecting it directly with principal stations in the North West and with Milton Keynes, Watford Junction and London. The journey-time to Euston will be 55 minutes (only 48 minutes by the additional peak period services). Every half-hour a Birmingham <> Northampton <> London train will provide a fast link with Birmingham (calling only at Coventry and Birmingham International) and a regional service to Northampton, Bletchley and Leighton Buzzard, with planned regular connections to every other intermediate station. The doubled Trent Valley frequency will also enhance travel opportunities. The frequency of the regional trains would be doubled in the peak between Coventry and London.

Northampton

Northampton will have five trains/hour instead of three. Two will be the regional service between Birmingham and London. Two will call at all stations between Northampton and Hemel Hempstead, then Watford Junction and Euston. The fifth train will link Northampton with the Trent Valley stations and run non-stop hourly between Northampton and London in 46 minutes. Well-ordered connections at Rugby will give Northampton half-hourly connectivity with the North West. In the peak the regional service would run quarter-hourly.

Wolverton

Frequency is increased to four trains/hour in peak periods: they would overtake the standard-hour trains and reach London in the same time as the fastest trains in the current peak. Timing of one of Wolverton's two off peak direct trains/hour to London will be unchanged and the other will be about 13 minutes slower, but unlike now they will be evenly-spaced and therefore effectively double the frequency.

Milton Keynes

Milton Keynes is one of the prime beneficiaries of the integrated timetable. As a large and growing centre it is quite poorly served at present, with only three of the nine standard-hour expresses calling. It is proposed that all six of the WCML longer distance trains will call, together with three regional trains. This will secure a high-convenience link with London and excellent connectivity with everywhere in Scotland and North West England. Four of the expresses will provide a regular quarter-hourly service to London in 35 minutes, with a call at Watford. The other five trains will fill the gaps, thereby generating a true 'turn-up-and-go' offer.

In each hour the expresses comprise direct Glasgow, Preston, Manchester, Liverpool and (two) West Midlands trains. The regional trains give half-hourly fast links with Northampton and hourly with the Trent Valley. These are complemented by the half-hourly Northampton <> London train and the half-hourly direct link with Clapham Junction and beyond. In the morning two-hour peak there would be 34 departures southbound compared with 13 now.

Bletchley and Leighton Buzzard

These stations would have a fast Watford and London train every half-hour, complemented by a service for the intermediate stations and by the Clapham Junction service. This frequency and its pattern also secures good connectivity at Milton Keynes with all points north thereof. In the peak additional fast London and intermediate services are overlaid on the standard pattern, with slightly different calling points.

Cheddington

The hourly service is doubled.

Tring

Tring currently has four trains/hour, a half-hourly all-stations to Euston, a semi-fast and a service to Clapham Junction. This would increase to six/hour, with the latter two both having their frequency doubled. The regular half-hourly cycle would cut the waiting time for a train to Hemel Hempstead or Watford Junction from a maximum of 22 minutes to a maximum of 14 minutes. There would be two extra Euston trains in each peak hour. Connectivity with almost anywhere north of Tring would be improved by virtue of the structured connections between services: for example whereas there is now only an hourly link with Birmingham, taking 100 minutes southbound and 89 northbound with a change at Milton Keynes, this would become 77 minutes in both directions and half-hourly.

Berkhamsted

Berkhamsted would have four London departures an hour, as now, but within the overall scheme the faster one would be closer to the slower at Euston than at present. Extra capacity would be provided in the peak period by the additional Milton Keynes trains. The station would lose its present stop in the Clapham Junction train, but a doubled frequency by changing at Hemel Hempstead would compensate in part.

Hemel Hempstead

Hemel Hempstead would go from five trains/hour to six with the doubling of the Clapham Junction service. An extra service in each half-hour in the peak would fill the gap created by the proximity of each faster and slower pair at Euston.

Apsley and Kings Langley

These two stations presently have a half-hourly London service off-peak, with one extra train in each morning peak and two in each evening peak. This would remain the same off-peak, but in the peak there would be four trains/hour throughout the 3-hour period, at near-even intervals.

Watford Junction

The plan to stop all but one of the six inter-city expresses here gives Watford the same much-enhanced connectivity with the North West as is achieved for Milton Keynes (the exception is the Glasgow train, which has a good connection for Watford). Together with the half-hourly regional trains this also secures a high-frequency link with Euston. Because the proportion of journeys between points north and Watford can be expected to increase relative to long-distance London journeys there will be a better spread of capacity across a number of trains for Watford <> London travel, thus enabling the operator to dispense with set-down/pick-up-only restrictions. Watford will also benefit from the doubled Clapham frequency and from two extra Euston local trains in peak periods.

Bushey

It is provisionally proposed to retain the existing half-hourly frequency of the one-stop Euston service.

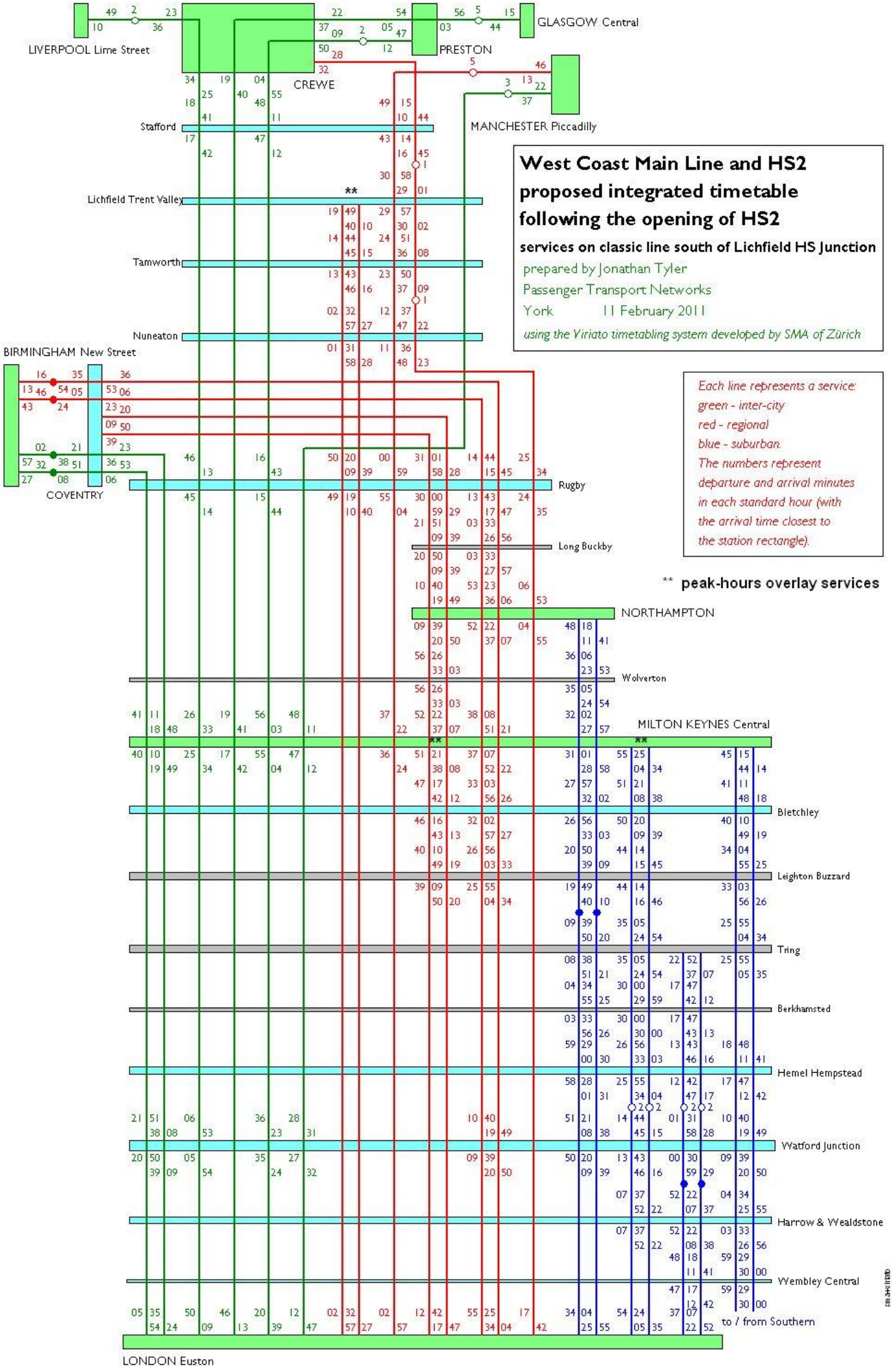
Harrow & Wealdstone

Both in the standard hour and in the peak Harrow gains the second Clapham service, the number of trains being otherwise similar to that now offered. If demand were to grow substantially there is capacity on the Slow Line for at least two Watford <> Euston shuttle paths in each hour (these could also serve Bushey), subject to there being paths and platform space at Euston. A key feature of the proposals is the enhancement of intermediate relations, and Harrow would benefit along with most other centres. For example, in a standard hour, Nuneaton <> Harrow now has one southbound link (excluding a via-Euston option) taking 142 minutes and two northbound in 89 or 107 minutes. This would become twice-hourly in 75 or 81 minutes southbound and the same northbound.

Wembley Central

At present Wembley is only served by the Clapham Junction train. In addition to the doubling of its frequency a stop at Wembley is added to the schedule of the Tring local in place of the connection at Harrow.

The NetGraph overleaf illustrates the proposed service pattern on the southern part of the WCML.


LIVERPOOL Lime Street
GLASGOW Central
PRESTON
CREWE
MANCHESTER Piccadilly
Stafford
Lichfield Trent Valley
Tamworth
Nuneaton
BIRMINGHAM New Street
COVENTRY
Rugby
Long Buckby
NORTHAMPTON
Wolverton
MILTON KEYNES Central
Bletchley
Leighton Buzzard
Tring
Berkhamsted
Hemel Hempstead
Watford Junction
Harrow & Wealdstone
Wembley Central
to / from Southern
LONDON Euston
West Coast Main Line and HS2
proposed integrated timetable
following the opening of HS2
services on classic line south of Lichfield HS Junction
prepared by Jonathan Tyler
Passenger Transport Networks
York 11 February 2011
using the Viriato timetabling system developed by SMA of Zürich
Each line represents a service:
green - inter-city
red - regional
blue - suburban
The numbers represent
departure and arrival minutes
in each standard hour (with
the arrival time closest to
the station rectangle).
** peak-hours overlay services