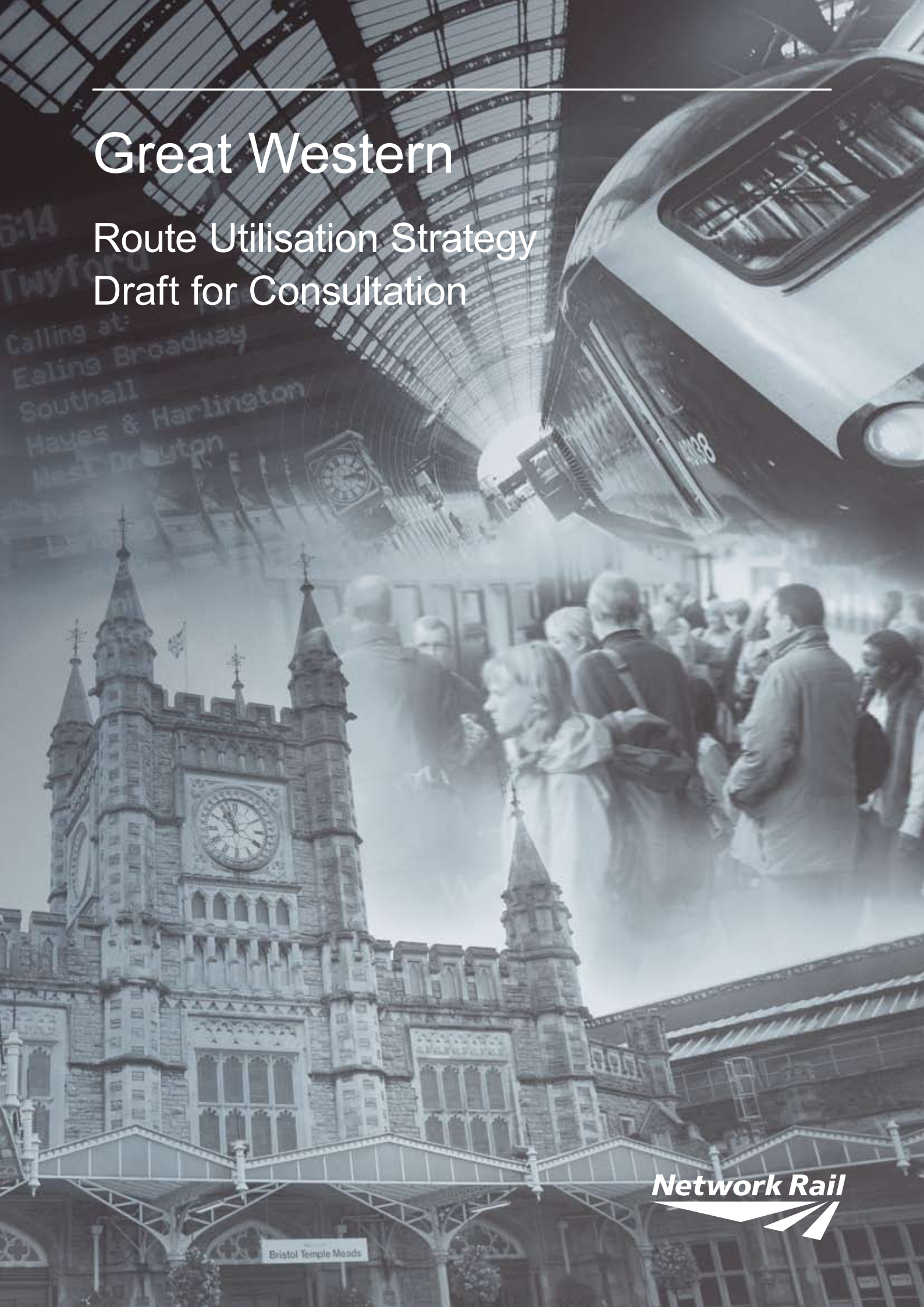
Great Western

Route Utilisation Strategy
Draft for Consultation



Network Rail

Foreword

I am delighted to present the Great Western Route Utilisation Strategy (RUS) Draft for Consultation. This sets out a detailed strategy for a specific part of the rail network over the next decade, with an indicative strategy to 2030.

As well as the Great Western Main Line itself, the document covers the network north to Norton Junction and Bicester Town and south to Basingstoke, Salisbury and Dorchester. The Great Western RUS borders the areas of the network covered by the South West Main Line and Wales RUSs, both of which have already been published, and has a significant interface with the West Midlands and Chilterns RUS, which is currently being developed.

The process that has been followed is well-established. Essentially, this involves developing a detailed understanding of the current situation, incorporating the implications of committed schemes and forecasts of future demand for both passenger and freight services. In this way, “Gaps” are identified, and proposed “Options” are then reviewed and assessed to address these gaps.

The area within the Great Western RUS is about to undergo a period of immense change with a significant number of large, high-profile investment schemes planned or proposed over the next five to ten years, including the Intercity Express Programme, Crossrail and the redevelopment of Reading station. All these schemes have therefore been taken into account. In addition, the RUS has developed a scenario that reviews the railway in light of the recent decision to electrify the Great Western Main Line.

Despite the current economic conditions, overall passenger demand is expected to increase across the RUS area, with high growth specifically predicted at Paddington and in the Bristol area.

The key themes that have emerged through the RUS are the need for additional capacity to handle increasing demand from both passengers and freight users; the need to address performance issues on key parts of the route and local connectivity for improvements in journeys into or between key cities and regional centres, including to and from those outside the RUS area such as Birmingham and Portsmouth.

A number of options were identified for development and appraisal to address these gaps. Options to increase the length of trains, improve service patterns or to provide additional infrastructure are proposed solutions. The recommendations from this process form the basis of the strategy.

Three gaps will be addressed further during the consultation period, including connectivity and capacity between the West Midlands and the South West and the South Coast, as well as the implications of seasonal fluctuations at Paignton. We will continue to work with key stakeholders on developing options to address these gaps with the results presented in the Final RUS document.

As with previous RUSs, this has been developed with the full input of the rest of the industry including train and freight operators. I thank them for their contribution to date. This is a Draft for Consultation so we are now seeking feedback and comments to support and inform our further analysis. Comments are invited before a deadline of 27 November 2009 and we are working towards publication of the Final RUS for the Great Western route in early 2010.

Iain Coucher
Chief Executive

Executive summary

Introduction

Route Utilisation Strategies (RUSs) seek to establish the strategic direction of the railway from a systematic analysis of future requirements of the network. They seek to balance capacity, passenger and freight demand, operational performance and cost whilst addressing the requirements of funders and stakeholders.

Network Rail is developing a programme of RUSs, in conjunction with rail industry partners and wider stakeholders, which when complete, will cover the entire rail network in Great Britain. This programme of RUSs includes a Network RUS which reviews national issues such as stations, depots, rolling stock and electrification as well as presenting scenarios and forecasts for long distance passenger and freight markets and the established Freight RUS providing a strategy to meet anticipated freight demand to 2014.

This Great Western RUS Draft for Consultation provides a further step towards achieving national coverage and has followed the now well-established process.

Scope

The Great Western RUS sets out the strategic vision for a particular part of the rail network. The scope of the RUS is extensive and diverse; the focal element being the Great Western Main Line (GWML) which operates over 320 miles and creates main line links from London to the West of England and South Wales. Extending from this are radial routes to Oxford, Birmingham, the South Coast and South West. Branch lines into the London suburbs, to the Devon and Cornish coast and dedicated freight only lines complete the mix of routes considered.

The scope area adjoins the routes of the South West Main Line; Wessex; South and Central Wales and Borders; the South Wales Valleys; Chilterns and the West Midlands. The RUS area plays a crucial role in the core cross country network, linking the South Coast, Thames Valley, West Country, South Wales and South Midlands with the Midlands, Greater Manchester, Yorkshire, the North East and Scotland.

Timeframe

The Great Western RUS primarily focuses on the next 10 years to 2019 but has also considered the implications of growth in demand over the next 30 years in the context of the Government's 2007 White Paper "Delivering a Sustainable Railway".

The period from 1 April 2009 to 31 March 2014 is Network Rail's current Control Period 4 (CP4). Any known commitments to 2014 that have either formed the recent High Level Output Specification (HLOS) or have committed funding through other funding streams have been included as part of the Great Western RUS base. Such capacity schemes and other enhancements are described further in **Chapter 4**.

CP4 marks a start of a new era for rail in Britain as this is the first review since the passing of the Railways Act 2005, and introduces a new process whereby the Secretary of State issues a High Level Output Specification and a Statement of Funds Available which sets the scene for the next five years. From this, Network Rail has embarked on a national programme of expenditure targeted at building a bigger and better railway through over 500 schemes and projects aimed at providing extra capacity or capability for

passengers and freight customers – this is the biggest expansion of Britain's railways since the 1840s.

Within the Great Western RUS scope area there are a significant number of major, high-profile, high-investment enhancement schemes planned or proposed during both CP4 and which continue into the next control period (Control Period 5 (CP5)) from 2014 to 2019. These major enhancement schemes include the electrification of the Great Western Main Line; the Intercity Express Programme (IEP); European Rail Traffic Management System (ERTMS); the Reading Station Area Redevelopment and Crossrail. Although predominantly within the Thames Valley area, these schemes will resolve a number of current and future issues across the whole of the RUS area. The implementation of these interventions will significantly change the capacity and capability of the network.

Through the inclusion of these improvements in the base, the RUS has been able to identify further prospective gaps. The focus of these being to input recommendations for the longer-term strategy intended to inform the Department for Transport's (DfT) next HLOS for CP5.

Process

The starting point for the Great Western RUS has been to analyse the current base position of the network, combined with any committed schemes and known interventions. Demand analysis has been undertaken to ascertain the expected level of growth over the next 10 years taking into account the anticipated drivers of change. The combined analysis identifies where supply and demand is mismatched now, and where it is expected to be mismatched in the future.

The identified gaps have been analysed to understand how best to address them, taking into account any schemes already proposed. In the course of this work, options have been developed on an interactive basis until feasible solutions have been identified with acceptable operational performance that meets whole-industry value-for-money criteria. In some cases there may be further work required to identify additional benefits in order to demonstrate a sufficiently strong economic return.

The Great Western RUS Draft for Consultation has been developed as a result of considerable analysis and close collaboration between Network Rail, the Department for Transport, the passenger and freight operators, Transport for London, the Office of Rail Regulation, Welsh Assembly Government, Passenger Focus and London Travelwatch.

Gaps

The key themes that have emerged from the analysis of the current railway and what is required of it in the future is capacity (at stations, on trains and of the network), performance pinch-points and local connectivity. The following table presents the gaps identified and taken forward for further analysis under the Great Western RUS process.

1.	Paddington peak capacity
2.	Inner suburban service pattern
3.	Paddington to Reading all day capacity
4.	Paddington to Reading performance
5.	Slough to Windsor all day capacity
6.	Freight capacity and capability: in and around London and north-south
7.	Reading peak capacity
8.	Didcot to Wolvercot Jn performance
9.	West Midlands to South Coast connectivity and all day capacity
10.	Swindon to Gloucester performance
11.	South Wales to South Coast all day capacity
12.	West Midlands to South West connectivity and all day capacity
13.	Bristol peak capacity
14.	Bristol performance
15.	Westbury area performance
16.	Exeter and Plymouth area service pattern
17.	Interurban journey times
18.	Early morning arrivals at key regional centres
19.	Station crowding
20.	Seasonal fluctuations
21.	Impact of Heathrow Airport expansion and western access

A number of strategic gaps were also identified which relate to the overall rail network. These include the Intercity Express Programme (IEP), freight train length and network capability, depot capacity and the Seven Day Railway initiative (to improve network availability). These strategic issues are being managed through other industry processes and as such are not intended to be duplicated by this RUS. However, elements of these gaps have been included, where necessary, within the appropriate gaps and options analysis of the Great Western RUS. Further details on each of the generic gaps are provided in **Chapter 4** and **Chapter 6**.

In developing the RUS, there were a number of uncertainties. This is especially apparent with regards to the timetables for IEP and Crossrail services. Draft service specifications have been used as a basis for the RUS analysis; however these continue to be developed and are yet to be finalised and confirmed. As such, the additional quantum of services expected from these interventions and their proposed calling patterns has not been explicitly modelled. Further timetable work is scheduled to combine and commit the service specifications, along with the predicted freight growth and pathing requirements, to ensure compatibility and accommodation on the network, and as a result, further infrastructure enhancements may be necessary.

The GWML is currently the second busiest freight corridor into London. This is expected to increase substantially with the levels of predicted growth, particularly for aggregates traffic, required for the construction of the Olympic infrastructure and Crossrail. Analysis has included the current forecasts for freight growth from the Strategic Freight Network (SFN) for various route sections within the RUS area to ensure sufficient network capacity and capability to accommodate growth in passenger and freight markets.

The gaps and options identified and appraised as part of the Great Western RUS are summarised below with a more detailed account, along with a description and quantification of the gaps and option evaluation, provided in **Chapter 6**.

Gaps 1 to 4 together with gap 21 and part of gap 6, freight capacity and capability in the London area, were combined to form one option reviewing the corridor between London Paddington and Reading. A scenario matrix was developed to manage the known proposals for IEP, electrification and Crossrail pre- and post-implementation.

Capacity analysis to 2019 showed sufficient supply to cater for forecasted growth on the current Long Distance High Speed (LDHS) services with IEP (either diesel or electric) on the LDHS services and outer suburban services after the implementation of Crossrail. The provision of freight paths in the latest Crossrail timetable proves sufficient to accommodate predicted freight growth as per the SFN forecasts to at least 2030.

The RUS Draft for Consultation describes the demand forecasting and operational modelling work completed under the scenario matrix and references the ongoing work taking place to deliver electrification, IEP and Crossrail projects. **Chapter 8** provides greater detail on these schemes with regards to scope and the effect their implementation will have on the RUS area.

The recent commitment to the electrification of the GWML, provides the opportunity for the extension of Crossrail services west of Maidenhead which would bring significant benefits, by giving the wider Thames Valley direct rail access to central London and the City while also creating extra capacity at London Paddington for longer distance services. The DfT and Crossrail are reviewing this option.

Electrification will also enable the current Thames Valley suburban services into London Paddington to be operated by electric trains instead of the existing diesel trains.

It is proposed that the existing Thameslink four-car electric trains will be transferred onto the GWML, replacing the current two and three-car diesel trains, when the new Thameslink fleet is introduced. It is proposed that suburban services between Oxford, Reading and London Paddington will be operated with these vehicles by the end of 2016.

All day capacity between Slough and Windsor and Eton Central station was assessed in line with the December 2008 timetable which increased passenger services on the branch from two trains per hour to three trains per hour Monday to Friday. This proved sufficient supply to cater for current and predicted demand to 2019. First Great Western have recently introduced an additional unit on a Saturday to extend the current two-car train to three-cars to assist with on-train crowding and are presently evaluating the business case for increasing the service provision on a Saturday to three trains per hour.

Capacity analysis on all services into and out of Reading during the peak periods identified that on-train crowding would exist by 2019 on the Reading to Gatwick Airport corridor. This supports, and is consistent with, the analysis undertaken as part of the Sussex RUS which reviewed the service from Gatwick Airport to Redhill. During the consultation period of the Sussex RUS further analysis is being undertaken to review the extension of services from Redhill to Gatwick Airport. There is a requirement of the Greater Western Franchise, to provide two trains per hour on a standard pattern between Reading and Gatwick Airport and the potential remodelling at Redhill in CP5 would facilitate this, enabling through services to operate to Gatwick Airport on a more ordered pattern of service. A positive business case to extend these services would improve the service frequency on the route between Reading and Gatwick Airport.

Further analysis was undertaken by the Great Western RUS on the North Downs route to review on-train crowding, specifically to address perceived crowding at Guildford. The analysis confirms the recommendation to lengthen four peak services (two in each direction) by two cars to address these overcrowding issues. This enhancement includes the HLOS proposal to lengthen the Reading to Gatwick Airport services to three cars (as this forms part of the RUS base as a committed scheme). However, all proposals to lengthen vehicles are subject to the provision of rolling stock being available. The delivery plan for the extra vehicles is still to be determined with an announcement expected in the autumn. The RUS will take cognisance of the proposed Rolling Stock Plan when released by the DfT and undertake any further rework that may be necessary as a result of this.

Five infrastructure enhancements were proposed to address capacity and performance issues between Didcot and Wolvercot Jn specifically at Didcot East Jn, Didcot North Jn and Oxford. A capacity study assessed the predicted growth in passenger and freight services, using the draft IEP service specification and forecasts of freight growth from the SFN, and the impact this would have on the current infrastructure. From this, the RUS recommends evaluating the options for enhancing Didcot North Jn to provide the additional capacity necessary to accommodate such growth. Further enhancement to Oxford station and the areas into and out of the station area as assessed by the RUS are also recommended as part of the Oxford Area Redevelopment scheme.

To improve capacity and performance on the Swindon to Gloucester route the RUS supports the development of the Swindon to Kemble redoubling scheme with the incremental enhancement of two additional signals between Kemble and Standish Jn (subject to business case evaluation) to improve capacity for normal service provision as well as for diversionary working as recognised under the Seven Day Railway initiative.

Capacity analysis with predicted growth to 2019 for the services between South Wales and the South Coast (specifically the Cardiff to Portsmouth and Bristol to Weymouth services) identified on-train crowding issues for which the RUS recommends the lengthening of five peak services (by either one or two vehicles) on the Cardiff to Portsmouth route and two peak services (by one vehicle) on the Bristol to Weymouth route. This enhancement includes the HLOS proposal for 12 additional vehicles to lengthen services in the West of England.

In addition, a review of the service proposition on the Cardiff to Portsmouth route results in the recommendation of one morning and one evening peak service becoming a faster service through the removal of a number of intermediate station calls between Westbury and Bristol Temple Meads. A separate stopping service would be introduced between Westbury and Bristol to cater for passengers at these stations. This option provides additional capacity as well as a significant improvement to journey times.

To address current and predicted capacity issues to 2019 at Bristol Temple Meads the RUS recommends procuring an additional nine vehicles to lengthen 11 morning and evening peak hour trains. An enhanced cross Bristol service will also be recommended in the RUS as a longer-term option to provide an hourly Bristol Temple Meads to Yate service (subject to third party funding); an hourly Bath to Bristol shuttle (calling all stations) with the possible extension to Clifton Down and the potential of an hourly service from Westbury to either Chippenham or Swindon. The RUS will recommend the further development of these schemes by the scheme promoters.

To improve capacity and performance into Bristol Temple Meads from the north, east and south west approaches, the RUS reviewed four infrastructure enhancements taking into cognisance the proposed IEP service pattern and potential freight growth to 2019. The RUS recommends four tracking between Bristol Temple Meads and Parson Street through the extension and conversion to passenger use of the carriage line from Bristol Temple Meads to Bedminster rejoining the main line just beyond Parson Street.

The development of the business case for the option of a three or four track section between Dr Days Jn and Filton Abbey Wood will also be recommended for completion during the consultation period of the Great Western RUS to enable a complete business case to be provided in the Final RUS incorporating capacity, journey times, performance and Seven Day Railway initiatives.

It is recommended that capacity and performance at Westbury station is improved through the provision of an additional platform face at Westbury by creating an island platform from the existing Platform 1.

To improve connectivity between Exeter and Plymouth, various options were reviewed to extend current long distance services beyond Bristol Temple Meads to Exeter and Plymouth along with amendments to the current local service proposition. The RUS recommends the introduction of a half hourly Paignton to Exmouth service and an hourly Barnstaple to St James Park service commencing 2018 extending cross Exeter journey opportunities. The current IEP proposal could potentially introduce a standard pattern throughout the day from Bristol to Exeter, Plymouth and Penzance. This will address the longer distance connectivity gap whilst introducing a standard pattern timetable.

To address interurban journey times, the development of a linespeed increase to 125mph between Bristol Temple Meads and Bridgwater is recommended. The opportunity for raising the Permanent Speed Restrictions on the route between Gloucester and Severn Tunnel Jn will also be further reviewed during the consultation period.

With electrification and the current IEP proposals, journey time improvements could also be achieved between South Wales and London Paddington through the reduction of station calls and the increased acceleration and braking capability of the new trains. Proposals for changing the calling patterns in the West of England have formed First Great Western's timetable offer in May 2009 with further changes proposed for December 2009.

Earlier arrivals from London Paddington to Plymouth were reviewed. Following a high-level appraisal of introducing an earlier service, the gap was discounted due to the weak business case.

The RUS reviewed the proposed station enhancement schemes for London Paddington, Ealing Broadway, Reading, Oxford and Bristol Temple Meads and concluded that the redevelopments would address current congestion issues and provided sufficient capacity to cater for predicted growth. Options for improving Windsor and Eton Central station included provision of ticket gates and the widening of the current platform, but these failed to achieve the necessary Benefit Cost Ratios and are therefore not recommended.

The RUS reviewed the Devon and Cornwall branch lines where the service offered through the summer differed to that provided through the winter, in particular assessing those branch lines where Long Distance High Speed (LDHS) services also operated, namely to Newquay and Paignton. For Newquay, the capacity analysis showed that there was sufficient capacity on the LDHS services on a summer Saturday to 2019 whilst being able to accomodate an estimated 35 percent growth. On summer Saturdays, there is no local service provision at the intermediate stations on the line from Par to Newquay as the current LDHS service operates non-stop from Par to Newquay. The RUS analysed the operational requirements to provide both a LDHS service and a local stopping service, however, the capital and operational investment required to accommodate this resulted in an insufficient business case to be able to recommend it.

There are three remaining gaps which will be addressed during the consultation period of the Great Western RUS. These are:

- West Midlands to South Coast connectivity and all day capacity
- West Midlands to South West connectivity and all day capacity
- Seasonal fluctuations: Paignton branch.

For the West Midlands to South West/South Coast capacity gaps, the Great Western RUS will assess any existing and/or predicted on-train crowding and review any train lengthening opportunities. For the connectivity gaps from the North to the West Midlands and on to the South Coast, the RUS will review the current service provision from Newcastle to Reading for extensions to the South Coast. The review of extending the long distance services to the South West from Bristol to Plymouth has been completed as part of gap 16 Exeter and Plymouth area service pattern and is included within this RUS.

Capacity on the Paignton branch will be assessed for any existing and/or predicted on-train crowding to 2019 following the completion of passenger counts by the train operators over summer 2009. The results of this analysis and any subsequent recommendations will be provided in the Final Great Western RUS.

From the above, it is clear that the outcomes of the option appraisal stage provide a mix of recommendations for further analysis and an emerging strategy.

The most acute issue evident is accommodating the growth in commuter and leisure journeys at various points across the Great Western RUS area. These are predominantly into London Paddington, Reading and Bristol Temple Meads as the key stations on the route and additionally to, from and within Devon and Cornwall with regards to seasonality.

Options were developed as potential interventions to bridge the identified gaps with the emerging strategy primarily seeking to address the growth in passenger and freight demand progressively over time, identifying changes to service provision and the infrastructure required to meet such growth whilst maintaining performance.

The emerging strategy can therefore be summarised with the following principal recommendations:

Recommendations to 2019

- Implement committed schemes as planned:
  - HLOS capacity and performance metrics
  - HLOS capacity programme (Twyford and Maidenhead platform lengthening; the Cotswold line redoubling and Westerleigh Jn to Barnt Green linespeed improvements)
  - Electrification
  - Intercity Express Programme
  - European Rail Traffic Management System
  - Reading Station Area Redevelopment
  - Southampton to West Coast Gauge enhancement and diversionary route via Andover and Laverstock
  - Crossrail
  - Up and down goods loops and the south facing bay platform at Oxford station
  - Bath Spa Capacity upgrade
- Train lengthening to provide additional capacity on the following corridors: Reading to Gatwick Airport, Cardiff to Portsmouth, Cardiff to Taunton and Gloucester to Weymouth
- Improve connectivity through service changes and enhancements for cross Bristol and cross Exeter services
- Improve capacity and performance through infrastructure schemes at Oxford, Swindon to Gloucester, Westbury and from Bristol Temple Meads to Parson Street
- Reduce journey times between Bristol Temple Meads and Bridgwater through linespeed improvements and between Bristol Temple Meads and Westbury through changes to the service provision

Consultation

Our initial conclusions resulting from the RUS analysis are presented in this Draft for Consultation. Appraisal work will continue throughout and beyond the consultation period, taking account of stakeholder opinion where possible. We are now seeking stakeholders' views, particularly on the gaps, options and emerging conclusions presented, before finalising the strategy which will be published in early 2010. **Chapter 9** provides the necessary contact details and timescales for the consultation period.

This draft, together with all the other RUSs published to date, is available electronically at **www.networkrail.co.uk**


Bristol Parkway

Contents

1. Background

1.1 Introduction to Route Utilisation Strategies

1.1.1

Following the Rail Review in 2004 and the Railways Act 2005, the Office of Rail Regulation (ORR) modified Network Rail's network licence in June 2005 to require the establishment of Route Utilisation Strategies (RUSs) across the network. Simultaneously, ORR published guidelines on RUSs. A RUS is defined in Condition 1 of the network licence as, in respect of the network or a part of the network[1], a strategy which will promote the route utilisation objective. The route utilisation objective is defined as:

> "the effective and efficient use and development of the capacity available on the network, consistent with funding that is, or is reasonably likely to become, available".

Extract from ORR Guidelines on Route Utilisation Strategies, April 2009

1.1.2

The ORR guidelines explain how Network Rail should consider the position of the railway funding authorities, their statements, key outputs and any options they would wish to see tested. Such strategies should address:

- network capacity and railway service performance
- train and station capacity including crowding issues
- the trade-offs between different uses of the network (eg. between different types of passenger and freight services)
- rolling stock issues including deployment, train capacity and capability, depot and stabling facilities
- how maintenance and renewals work can be carried out while minimising disruption to the network
- opportunities from using new technology
- opportunities to improve safety.

Extract from ORR Guidelines on Route Utilisation Strategies, April 2009

1.1.3

The guidelines also set out principles for RUS development and explain how Network Rail should consider the position of the railway funding authorities, the likely changes in demand and the potential for changes in supply. Network Rail has developed a RUS Manual which consists of a consultation guide and a technical guide. These explain the processes used to comply with the Licence Condition and the guidelines. These, and other documents relating to individual RUSs and the overall RUS programme, are available on Network Rail's website at **www.networkrail.co.uk.**

1 The definition of network in Condition 1 of Network Rail's network licence includes, where the licence holder has any estate or interest in, or right over a station or light maintenance depot, such as station or light maintenance depot

1.1.4
The process of RUS production is designed to be inclusive. Joint working is encouraged between industry parties, who share ownership of each RUS through its industry Stakeholder Management Group (SMG). In order to ensure passengers' interests are represented the SMG also includes Passenger Focus and London Travelwatch (where relevant).

1.1.5
There is also extensive informal consultation outside the rail industry by means of regular briefings to a Wider Stakeholder Group (WSG). The roles and members of both the SMG and WSG are detailed further in **Chapter 2**.

1.1.6
The ORR guidelines require options to be appraised. This is initially undertaken using the Department for Transport's (DfT) appraisal criteria. To support this appraisal work RUSs seek to capture implications for all industry parties and wider societal implications in order to understand which options maximise net industry and societal benefit, rather than that of any individual organisation or affected group.

1.1.7
RUSs occupy a particular place in the planning activity for the rail industry. They use available input from processes such as the DfT's Regional Planning Assessments, the Wales Rail Planning Assessment, and Transport Scotland's Scottish Planning Assessment. The recommendations of a RUS and the evidence of relationships and dependencies revealed in the work to reach them, in turn form an input to decisions made by industry funders and suppliers on issues such as franchise specifications, investment plans or the High Level Output Specification (HLOS).

1.1.8
Network Rail will take account of the recommendations from RUSs when carrying out its activities; in particular they will be used to help inform the allocation of capacity on the network through application of the normal Network Code processes.

1.1.9
The ORR will take account of established RUSs, and those in preparation, when exercising its functions.

1.2 Document structure

1.2.1
This document starts by outlining in **Chapter 2**, the dimensions of the Great Western RUS and the geographical context within which it is developed. It also describes the linkage to other associated work streams and studies which relate to the RUS.

1.2.2
Chapter 3 describes the railway today covering passenger and freight demand and the capability of the infrastructure to meet that demand. Gaps which already exist between demand and capacity are identified.

1.2.3
In **Chapter 4** the committed and uncommitted schemes proposed for the future are explained along with known train service amendments for future timetable revisions.

1.2.4
Chapter 5 summarises the main planning documents of relevance to this RUS together with their vision for the role of the railway over the next 30 years and analyses the rail passenger demand and freight traffic that is likely to arise.

1.2.5

In **Chapter 6** gaps between forecast demand and current capability are identified. Options for bridging the gaps pinpointed in the previous chapters are listed, discussed and given an initial appraisal of their likely costs and benefits. In some cases further appraisal work is planned during the consultation period.

1.2.6

The conclusions emerging from this option analysis are presented in **Chapter 7**, together with a view of how the future strategy might take shape.

1.2.7

Chapter 8 describes the longer-term scenario and expands on developments up to 2019 and beyond.

1.2.8

Chapter 9 describes the consultation process and how stakeholders can respond to this document.

1.2.9

Supporting data is contained in the appendices to this document. All information is available electronically from Network Rail's website **www.networkrail.co.uk**


First

2. Dimensions

2.1 Introduction

2.1.1

This chapter details the geographic scope of the Great Western Route Utilisation Strategy (RUS), its purpose, time horizon, the planning context in which it is set, and the linkages to other studies along with details of the management group and stakeholder briefings.

2.2 Purpose

2.2.1

The strategies that emerge through the RUSs have a number of purposes; they inform:

- the optimisation of the output specification for rail infrastructure renewals and enhancements
- the identification of ways in which capacity could be used more efficiently, in the context of the railway and wider public transport
- the development of the Government's High Level Output Specification (HLOS) for the next control period
- address specific socio-economic developments, growth and employment.

2.2.2

The Great Western RUS will therefore:

- propose options to achieve the most efficient and effective use of the existing rail network and identify cost effective opportunities to improve it where appropriate
- enable Network Rail to develop an informed renewals, maintenance and enhancements programme in line with the Department for Transport's aspirations and the reasonable requirements of train operators and other key stakeholders
- enable local and Regional Transport Plans and freight plans to reflect a realistic view of the future rail network.

2.3 Stakeholders

2.3.1

The Great Western RUS has been managed through a Stakeholder Management Group (SMG), the steering group for the strategy, who met on various occasions at key stages during the development of this RUS. The group included the train operating companies (Arriva Trains Wales, Chiltern Railways, CrossCountry, First Great Western, Heathrow Express and South West Trains), freight operating companies (specifically DB Schenker and Freightliner), Network Rail, the Association of Train Operating Companies, the Department for Transport, Transport for London, Crossrail Limited, Welsh Assembly Government, Passenger Focus, London Travelwatch and the Office of Rail Regulation (as an observer).

2.3.2

A Wider Stakeholder Group (WSG) was also established, including representatives from local authorities, statutory bodies, community rail partnerships, rail user groups and other stakeholders. A number of wider stakeholder briefings were held during the process of the Great Western RUS, the purpose of which was to inform the WSG of the developments and progress of the RUS.

2.3.3

In April 2008, introductory briefings took place at Reading, Bristol and Plymouth where the context, scope and objectives of the RUS were outlined along with the standard RUS processes and programme. In June 2008, baseline exhibitions were held at the same locations to enable stakeholders to review

the results of the baseline exercise and share their ideas and insights on the current and future network. This feedback, along with the subsequent further documentation provided by many, provided valuable input into the process of gap identification and subsequent optioneering. The baseline information from these exhibitions is available on Network Rail's website at **www.networkrail.co.uk/routeutilisationstrategies/greatwestern**

2.3.4
An interim briefing was later held in Bristol (November 2008) to update the wider stakeholder group on current progress of the Great Western RUS and present the identified gaps being taken forward for further analysis and appraisal. Further briefings are scheduled after the launch of the Draft for Consultation and will also be arranged for the Final RUS publication.

2.3.5
In addition to the above, a number of individual meetings were held with various stakeholders, both within the SMG and WSG, as required to discuss their aspirations and views and to present developments.

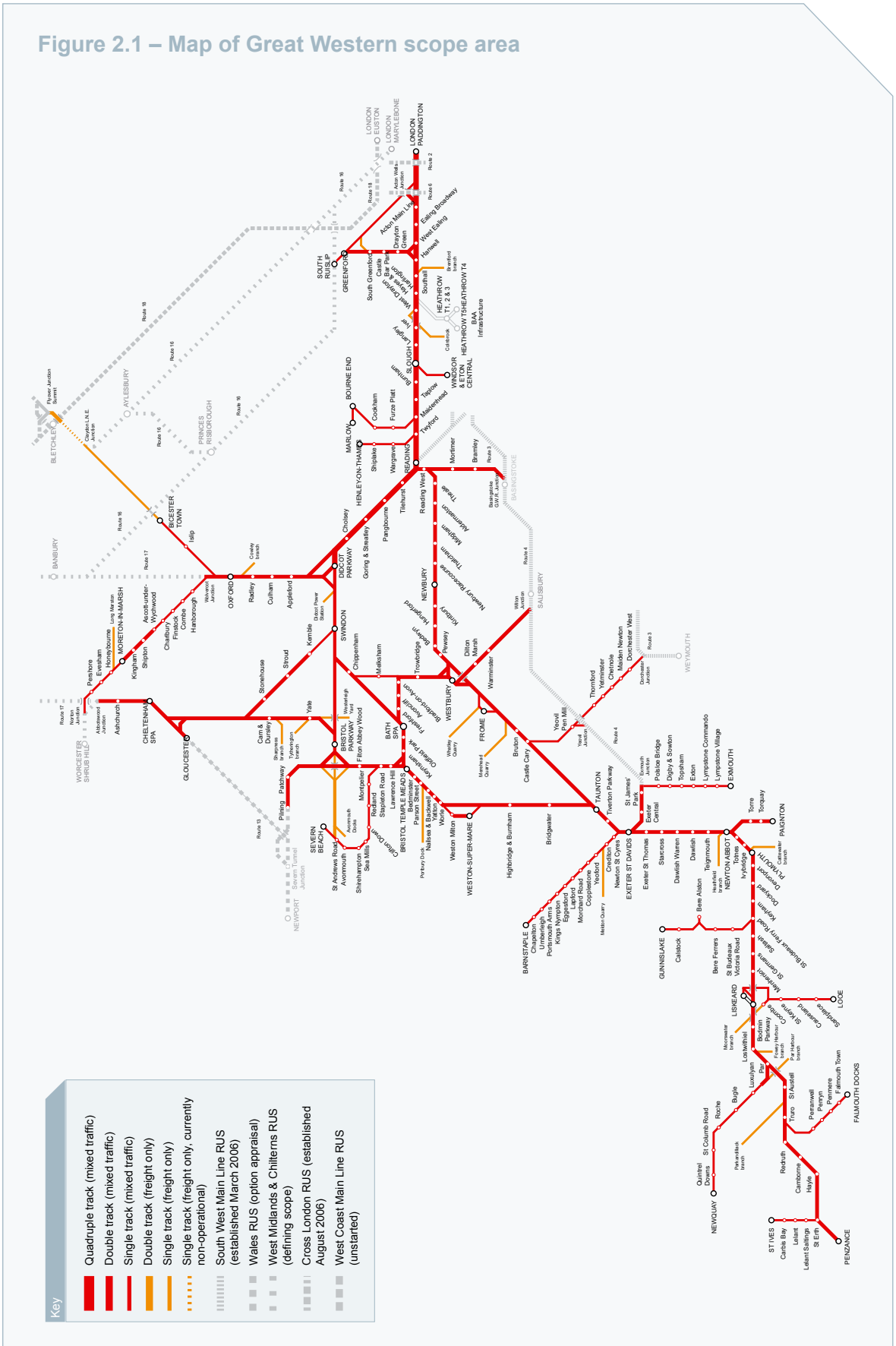
2.4 Geographic scope

2.4.1
Figure 2.1 provides an illustration of the geographic area of the Great Western RUS. The scope area includes lines on the Strategic Route 13: Great Western Main Line as far as the boundary of the Wales RUS at Pilning and Strategic Route 12: Reading to Penzance. The RUS also covers lines on Strategic Route 4: Wessex to the boundary of the South West Main Line RUS and to the boundaries of the West Midlands and Chilterns RUS (Strategic Routes 16 and 17).

2.4.2
The defined scope area of the Great Western RUS therefore includes the following routes:

- London Paddington to:
  - South Ruislip
  - Heathrow Airport
  - Oxford and the Cotswold line (as far as Norton Jn, east of Worcester)
  - Cheltenham Spa (via Swindon)
  - Pilning (via Bristol Parkway)
  - Bristol Temple Meads (via Bath Spa and via Bristol Parkway)
  - Penzance (via Castle Cary and via Bristol Temple Meads)
- West Ealing to Greenford
- Slough to Windsor and Eton Central
- Maidenhead to Marlow
- Twyford to Henley-on-Thames
- Reading to Basingstoke G.W.R Jn
- Oxford to Bicester Town/Bletchley
- Abbotswood Jn (southeast of Worcester) to Taunton (including via Gloucester and via Weston-super-Mare)
- Severn Beach Branch
- Thingley Jn to Bradford Jn
- Pilning (exclusive) via Bathampton Jn and Westbury to Wilton Jn, Dorchester Jn and Yeovil Jn

Figure 2.1 – Map of Great Western scope area



- Barnstaple to Exmouth (via Exeter)
- Newton Abbot to Paignton
- Plymouth to Gunnislake
- Liskeard to Looe
- Par to Newquay
- Truro to Falmouth
- St Erth to St Ives
- Freight branches (Brentford, Colnbrook, Cowley, Long Marston, Sharpness Docks, Tytherington, Avonmouth, Portbury. Whatley, Merehead, Meldon, Heathfield, Cattewater, Moorswater, Fowey, Par Harbour and Parkandillack).

2.5 Scope of services

2.5.1

The RUS considers all services that use these routes for all or part of their journeys to the extent necessary to achieve the route utilisation objective regardless of whether or not the physical infrastructure is within the boundaries of the scope area of the Great Western RUS.

2.5.2

This RUS will therefore include appropriate analysis of those traffic generators outside the scope area which have a significant effect on the pattern of demand within the scope area, for example services such as the Cardiff to Portsmouth.

2.6 Linkage to other RUSs

2.6.1

Network Rail is continuing to work through a programme of RUSs which, once complete, will cover the rail network of Great Britain. As previously mentioned, the Great Western RUS interfaces with other parts of the network where other RUSs have already been established. These are the South West Main Line (SWML); the Wales RUS and to some extent the Cross London RUS. The Great Western RUS draws on input and analysis from these studies. Figure 2.2 presents an illustration of the geographic area and where the relationships exist with other RUSs.

2.6.2

There are further boundary issues between the Great Western RUS and the West Midlands and Chilterns RUS. As such, these RUSs interlink in programme, scope area and services with particular regard to the CrossCountry service group.

2.6.3

Due to the interlinking of these geographic areas and services which operate across routes, a number of cross boundary issues have arisen. The Great Western RUS has led the analysis on the following services:

- Cardiff to Portsmouth
- Reading to Gatwick Airport
- West Midlands to the South West and the South Coast.

2.6.4

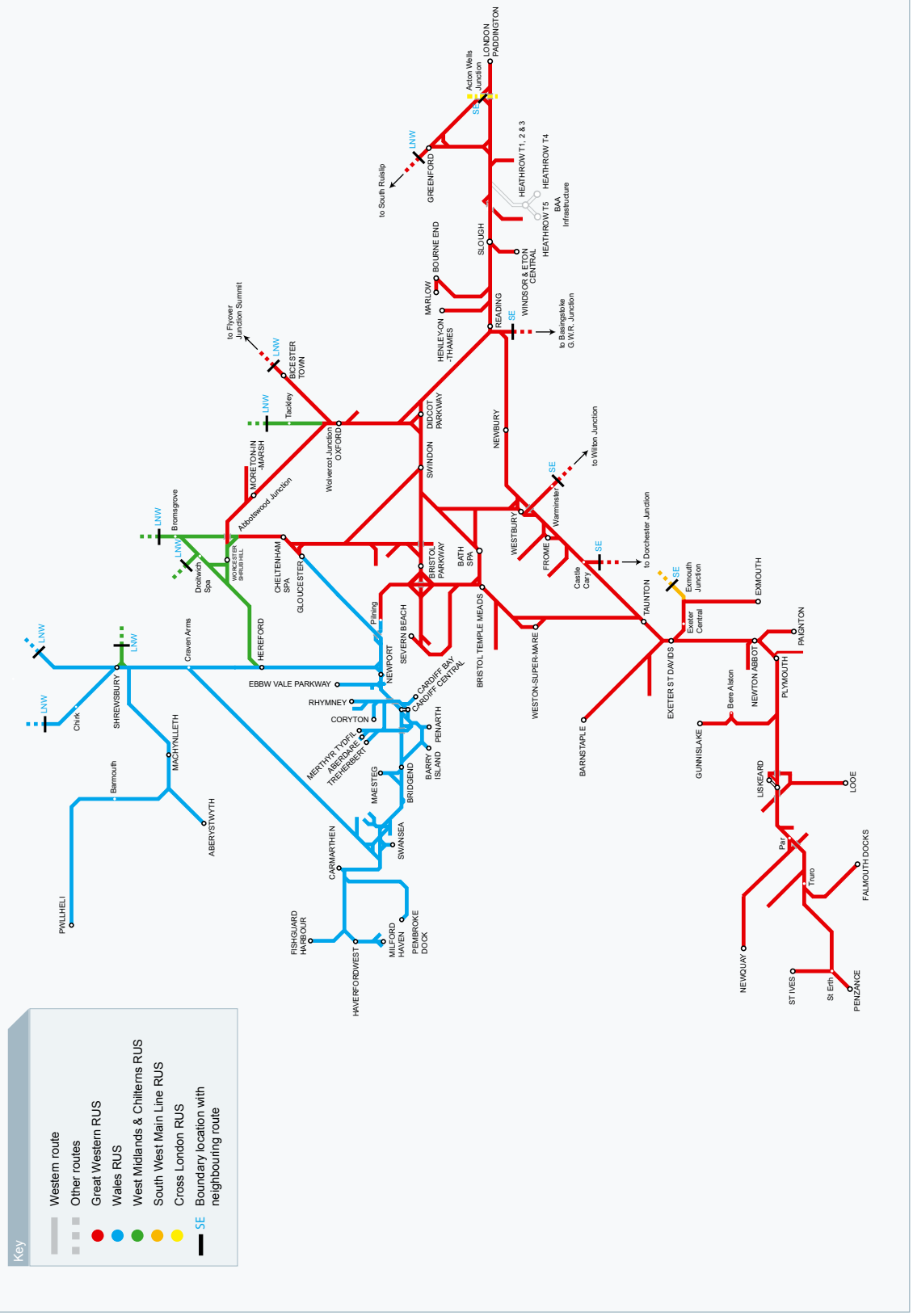
The Great Western RUS also considers input and analysis nationally from both the Freight RUS and the Strategic Freight Network as well as emerging strategies from the high level network-wide RUS assessing national electrification issues; the national rolling stock and depot strategy and station development.

2.7 Linkage to other studies

2.7.1

To be successful, a RUS cannot be considered in isolation. The Great Western RUS is related to a number of other strategies and policies covering rail and other transport modes, land use planning and economics for the area. Several studies have been underway whilst this document has been in production, most notably the draft Regional Spatial Strategy for the South West and the High Level Output Specification Rolling Stock plan. The final publication of these documents is expected later in 2009 and will therefore help to shape the Final RUS strategy.

Figure 2.2 – Map of Great Western RUS scope area with other RUS boundaries



2.7.2
The main documents which have informed the RUS include:

- the **South West** and **Thames Valley Regional Planning Assessments (RPA)**, published in May 2007 and June 2007 respectively. The RPA provides a medium to long-term planning framework for rail. Within this framework, the Great Western RUS is intended to provide a more detailed strategy over a longer term of 30 years. Department for Transport involvement in development of this RUS ensures broad alignment between these studies
- the draft **Regional Spatial Strategy (RSS) for the South West** (covering the period of 2006 – 2026) and the **Regional Economic Strategy (RES) for South West England** (covering the period of 2006 – 2015), provide detailed supportive information with regard to growth and development in the region; the economic framework, and the strategic policies which will help shape this.

2.7.3
Other influential documents include:

- High Level Output Specification (HLOS)
- Rolling Stock Plan
- Transport for London Rail Corridor Plan
- London Plan
- Heathrow Airport Surface Access Strategy
- The Air Transport White Paper
- Civil Aviation Authority Passenger Survey (2007)
- South East Plan
- South West Regional Assembly Rail Prospectus
- The Regional Network Report for South West
- Local Transport Plans
- Delivering a Sustainable Transport System (DaSTS).

2.7.4
More specific studies and proposals which have been undertaken by various stakeholders have also contributed supportive information to the RUS. These are:

- consultancy studies analysing capacity at London Paddington and Reading stations
- First Great Western's HLOS Capacity Study for the West of England
- The West of England Partnership's Bristol Metro proposals
- North Somerset Council's Portishead Rail Line Study
- South West Regional Development Agency (SWRDA) Funding advice 2009 - 2019
- Devon County Council's Regional Funding Allocation Expression Of Interest for Exeter Metro
- passenger surveys undertaken by user groups and customer panels specifically Windsor and Eton Central and the Devon and Cornwall Branch lines
- Passenger Focus "Getting to the train" surveys (March 2009).

2.8 RUS timeframe

The Great Western RUS covers the ten year period to 2019 in detail and then describes broader, high level strategic issues and interventions through to 2039.

The output will be the rail industry's preferred strategy for the next railway regulatory Control Periods 5 (2014 – 2019) and 6 (2019 – 2024) in the context of strategic priorities and considering likely requirements over a 30-year period.

3. Current demand, capacity and delivery

3.1 Introduction

3.1.1

In this chapter, the current function and capability of the rail network in the Great Western Route Utilisation Strategy (RUS) area is described. Profiles are provided for both passenger and freight operations, as well as information about the current infrastructure, capacity and capability; how it performs and how it is maintained.

3.2 Train Operating Companies

3.2.1

At present, seven passenger train operators run scheduled services over the Great Western RUS area – in 2008/09, passenger train miles equated to 87 percent of the annual train mileage accumulated over the scope area. The passenger operators on the route are:

- First Great Western (FGW), the principal operator within the RUS area, operates a mix of long distance high speed, interurban and semi-fast outer and inner suburban, regional and local branch line services. These services are operated across the entire geographic scope of the RUS
- CrossCountry operate main line services from the North and Midlands to the South Coast via Oxford and Reading and to the South West and South Wales via Cheltenham
- Arriva Trains Wales operate services between Swansea, Cardiff and Cheltenham impacting on the Great Western RUS area particularly with the Cardiff to Cheltenham service
- Stagecoach South Western Trains (trading as South West Trains) operates services fringeing on the RUS area with the London Waterloo to Exeter St Davids and London Waterloo to Bristol Temple Meads services
- Heathrow Express operates non-stop express services, and the Heathrow Connect stopping service jointly operated with FGW, between London Paddington and Heathrow Airport
- Chiltern Railways operates one service each day to London Paddington from Gerrards Cross and from London Paddington to Princes Risborough
- London Midland operates services which adjoin the RUS area from the West Midlands to Gloucester via Worcester.

3.2.2

Although the scope area of the RUS specifies the boundaries of the infrastructure, any passenger services that spend all or part of their journey within the RUS geography are included within the scope of the Great Western RUS. The following cross boundary services are therefore included:

- London Paddington to Cardiff/Swansea
- Cardiff to Nottingham
- Cardiff to Portsmouth
- Reading to Gatwick Airport
- CrossCountry services between the South West and South Coast to the Midlands and the North
- London Waterloo to Exeter St Davids.

3.2.3

A number of Community Rail Partnerships operate within the Great Western RUS area; those which are members of the Association of Community Rail Partnerships (ACORP) are listed below:

- Cotswold Line Promotion Group (Oxford – Worcester – Hereford)
- Severnside Community Rail Partnership (Lines around Bristol)
- Wessex Rail Partnership (Bristol – Weymouth)
- Devon and Cornwall Rail Partnership (Exeter – Barnstaple/Exmouth; Par – Newquay; Truro – Falmouth; Plymouth – Gunnislake; St Erth – St Ives).

3.3 Current passenger market profile

3.3.1
Within the Great Western RUS area, the main markets for rail are identified as long, medium and short distance commuting into London and to a lesser extent Reading and Bristol; interurban travel between main centres such as Bristol, Exeter and Plymouth towards London, the Midlands, the North East and Scotland; inter-regional and interurban travel; leisure and tourism; access to airports and the social dimension of local branch lines and rural locations.

3.3.2
The passenger service structure can be broken down into distinct groups, which integrate at varying locations throughout the route and reflect the different markets served.

3.3.3
FGW operates interurban services between London Paddington and South Wales and London Paddington and the greater Bristol area and to Oxford and the Cotswold line, to Cheltenham, and to the far West of England. CrossCountry's longer distance intercity services from the North and Midlands provide direct links to the South Coast via Oxford and Reading and to the South West and South Wales via Cheltenham.

3.3.4
FGW also operate inner suburban services from London Paddington to as far as Slough, outer suburban services to Oxford and the Cotswolds, to Newbury/Bedwyn, and between Reading and Basingstoke, branch line services throughout the Thames Valley and the joint operation with Heathrow Express of Heathrow Connect services to Heathrow Airport. Services between Swindon and Cheltenham and Swindon and Westbury also operate.

3.3.5
Between Plymouth and Penzance passenger train services are mostly operated by FGW. CrossCountry has a limited presence west of Plymouth, although this is stronger in the summer months. A limited number of services from London Waterloo to Exeter St Davids (via Salisbury) operated by South West Trains run westwards beyond Exeter St Davids to Paignton and Plymouth, although these will cease from December 2009.

3.3.6
FGW operates a structured cross Bristol local network incorporating services between Worcester/Cheltenham and Westbury/ Southampton/Weymouth and between Cardiff and Taunton and Bristol Parkway and Weston-super-Mare. FGW's hourly semi-fast service between Cardiff and Portsmouth via Bristol and Bath, and the Severn Beach branch line service add to the cross Bristol network.

3.3.7
CrossCountry operates main line services from Cardiff to Nottingham via Birmingham, providing further journey opportunities to the North and Scotland. Arriva Trains Wales

operates services between Swansea, Cardiff and Cheltenham providing a connection to the long distance services at Cheltenham for travel further north.

3.3.8
The most intensively used Devon and Cornwall branches, to Exmouth, Falmouth and St Ives, enjoy half hourly frequencies whilst the other West of England branches have hourly or less frequent interval services.

3.4 Current passenger service provision

3.4.1
The following diagrams depict a standard hour service provision, representing the busiest hour, divided into the following geographic segments:

- Great Western Main Line (Figure 3.1)
- Thames Valley (Figure 3.2)
- Wiltshire, Somerset and South Gloucestershire (Figure 3.3)
- Worcestershire, Oxfordshire, Gloucestershire and North Wiltshire (Figure 3.4)
- Somerset, Devon and Cornwall (Figure 3.5).

3.5 Track capacity

3.5.1
The Capacity Utilisation Index (CUI) is a measure of how much of the planning capacity of a section of railway is being utilised by the current timetable. In terms of capacity utilisation, the majority of the rail network in the Great Western RUS area, over 1,000 route miles in total, can be classified as medium to low use. However, main line capacity on the Great Western Main Line (GWML) from London Paddington to Reading, through to Oxford and Reading to Cogload Jn near Taunton (commonly known as the Berks and Hants route) reaches over 80 percent capacity for the majority of the day.

3.5.2
Capacity on the GWML is constrained by the mix of 125mph high speed services and slower 90mph outer suburban services and freight. Through services from the Thames Valley branches and the High Speed Trains (HST) calling at Slough, reduce the main line capacity due to the weaving movements required between the main lines and the relief lines. Relief line capacity is constrained by a number of factors including the close proximity of some stations, the variable stopping patterns of local passenger trains and the mix of freight trains. Nearly all freight through the inner London area of the route requires access to and from Acton Yard via a single lead connection crossing the relief lines.

3.5.3
Paddington station operates to near capacity throughout the day and to full capacity at peak times with accessibility for long interurban style trains restricted by a number of shorter platforms on the north side of the station and the dedication of two platforms for the electric Heathrow Express. Platforms 3 to 12 are electrified.

3.5.4
Between Reading and London Paddington the route is operating at or near capacity for large parts of the day with a CUI of about 80 percent, particularly increasing in the peak and shoulder peak periods. The Reading station area is a critical “crossroads” on the east-west and north-south axes for both passenger and freight flows and the lack of available platforms and through-capacity, allied with the aforementioned Paddington constraints, prevent train service growth. The area is further restricted at Reading West Jn where long north – south axis freight services have to cross the GWML at grade. The current Reading Station Area Redevelopment programme will assist in providing additional platforms and through-capacity in addition to grade separation at Reading West, helping to address these constraints.

Figure 3.1 – Great Western Main Line standard hour service provision

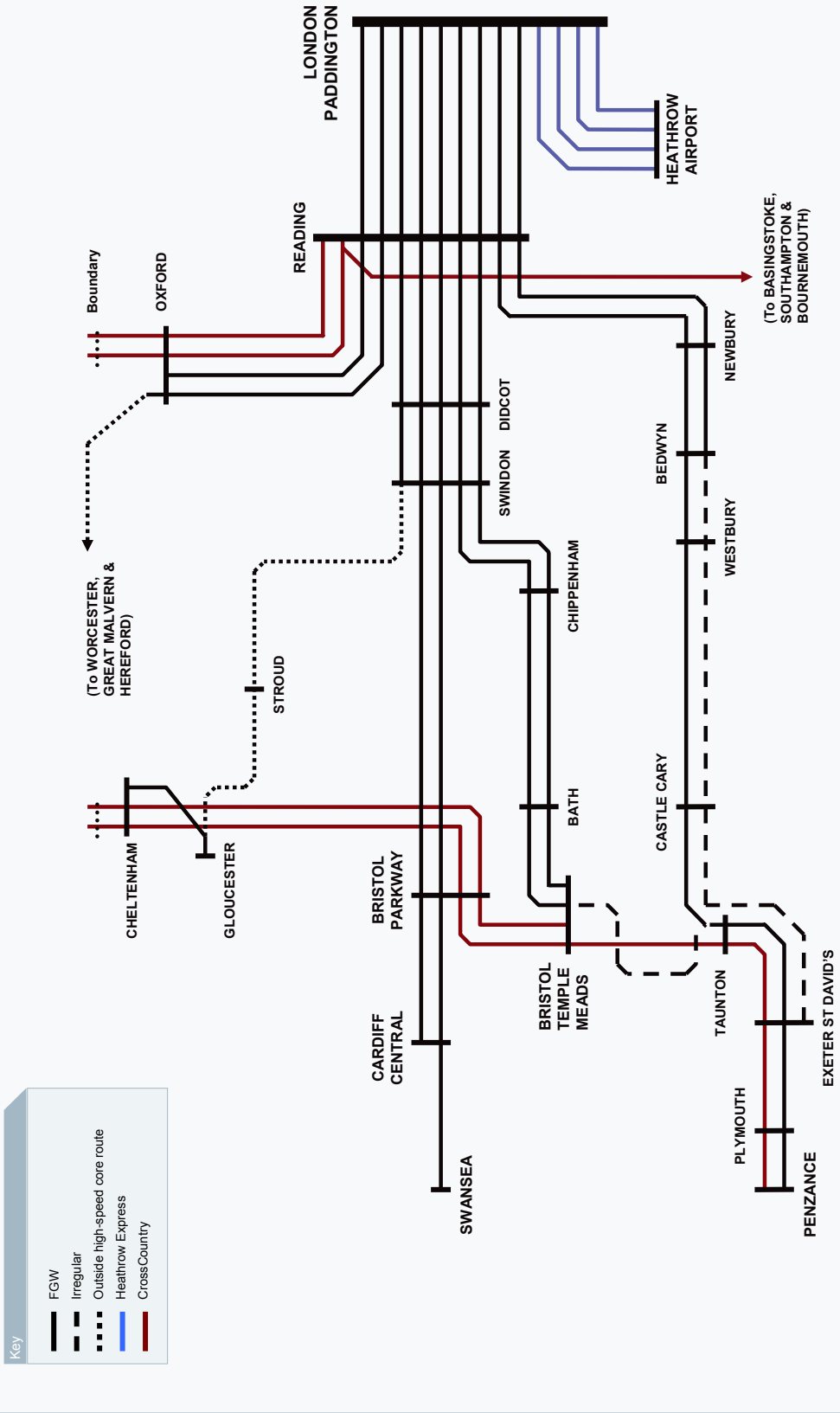


Figure 3.2 – Thames Valley (Relief Line/Stopping Services) standard hour service provision

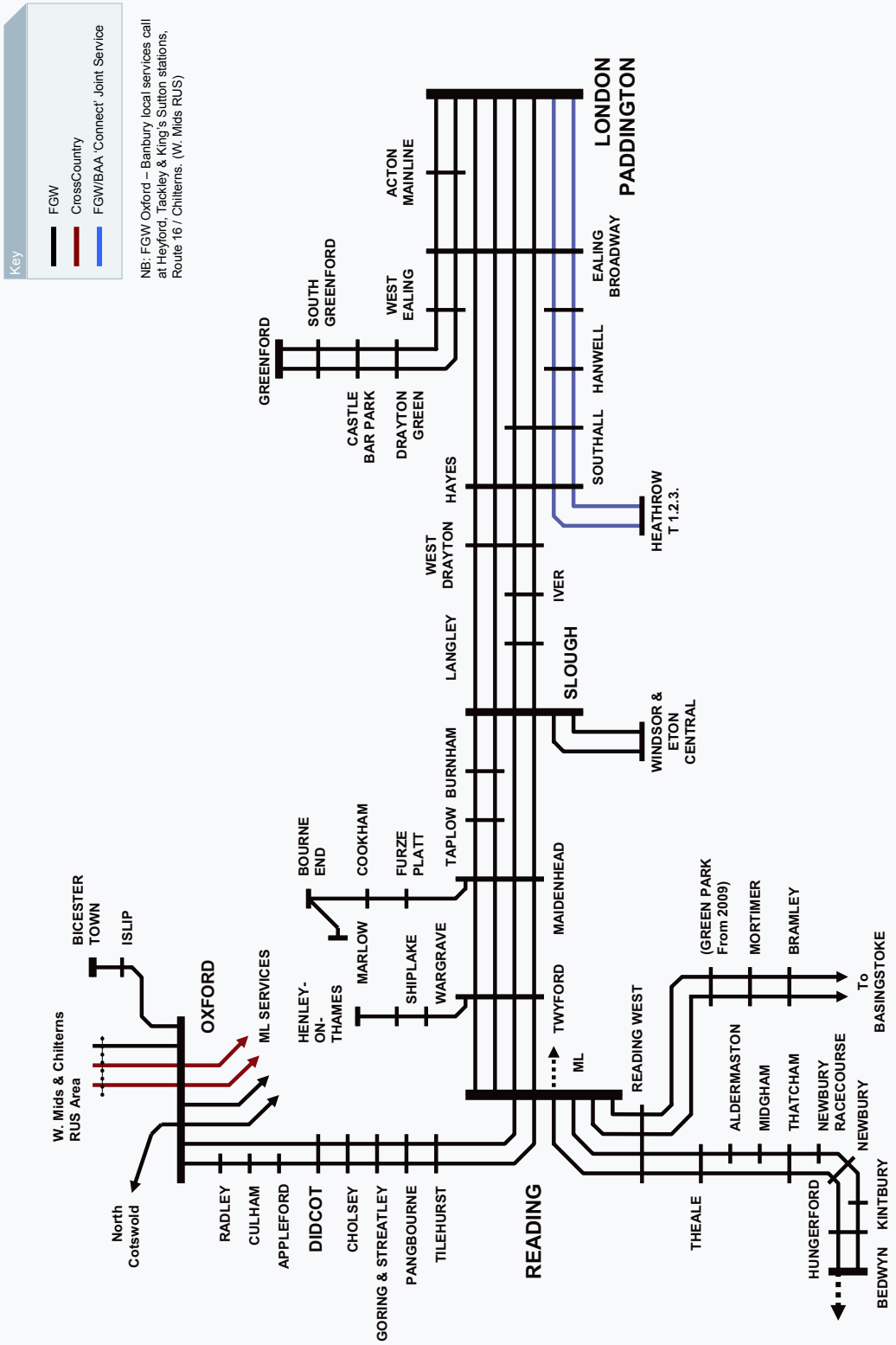


Figure 3.3 – Wiltshire, Somerset and South Gloucestershire standard hour service provision

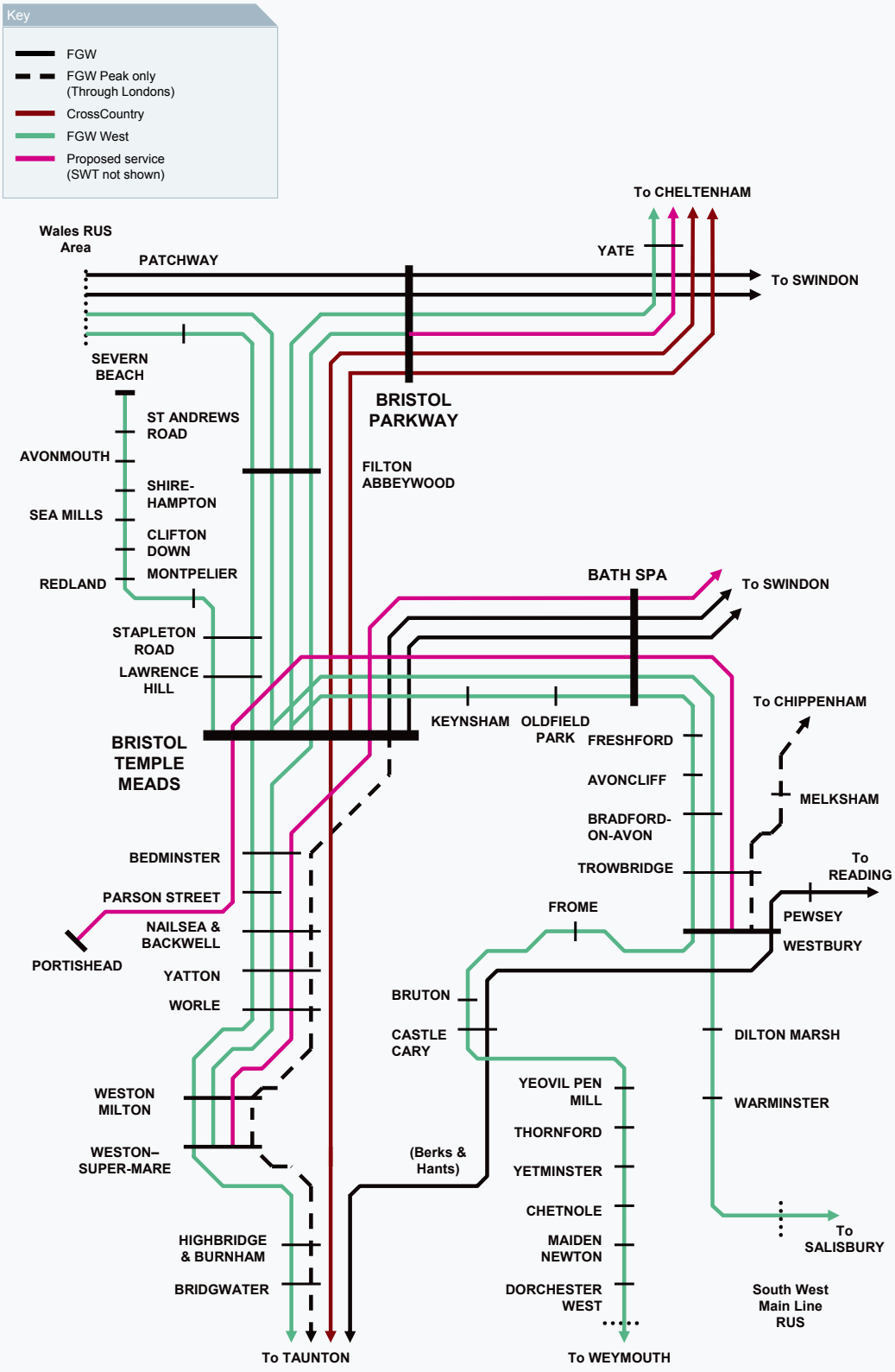


Figure 3.4 – Worcestershire, Oxfordshire, Gloucestershire and North Wiltshire standard hour service provision

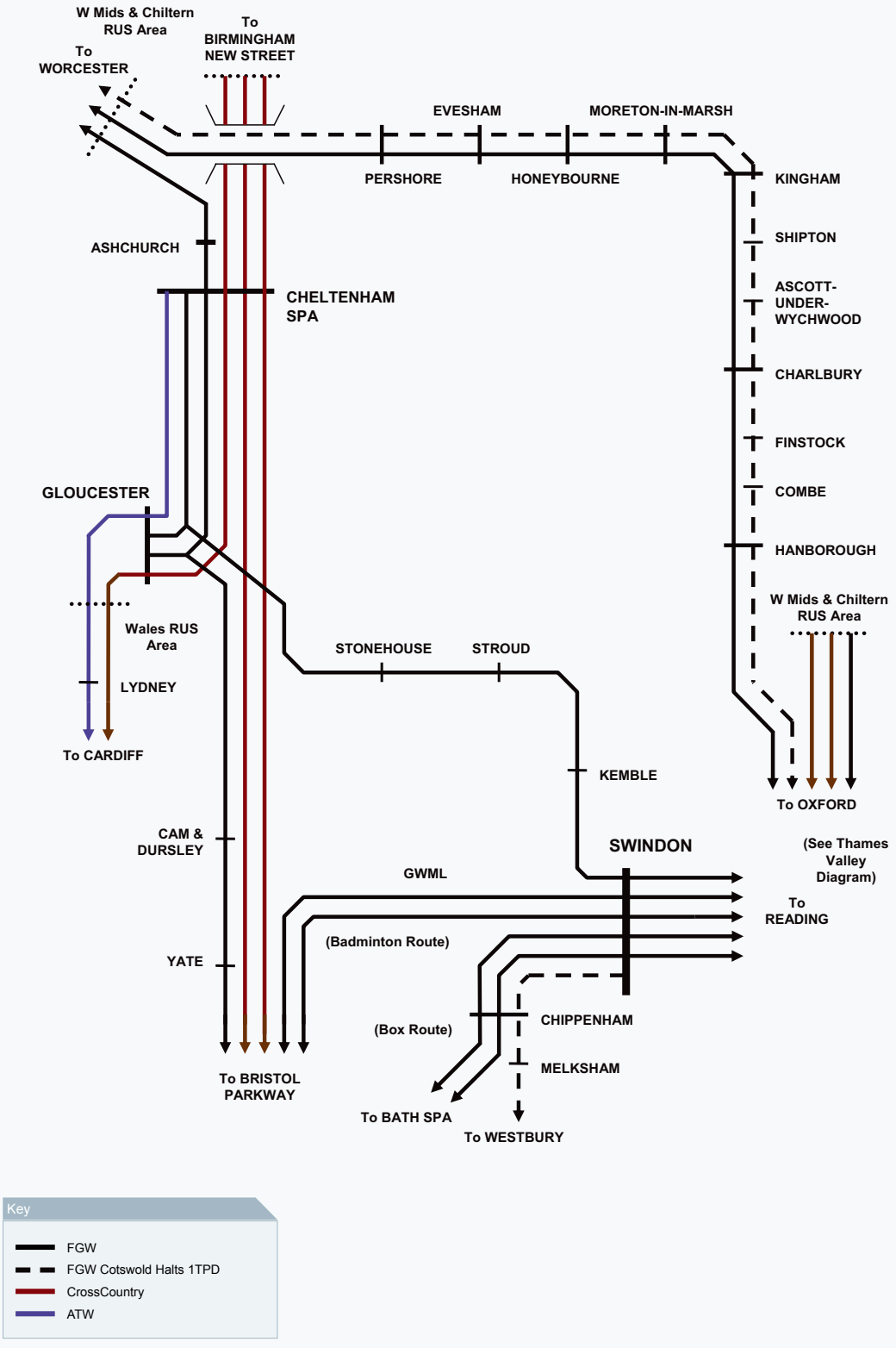
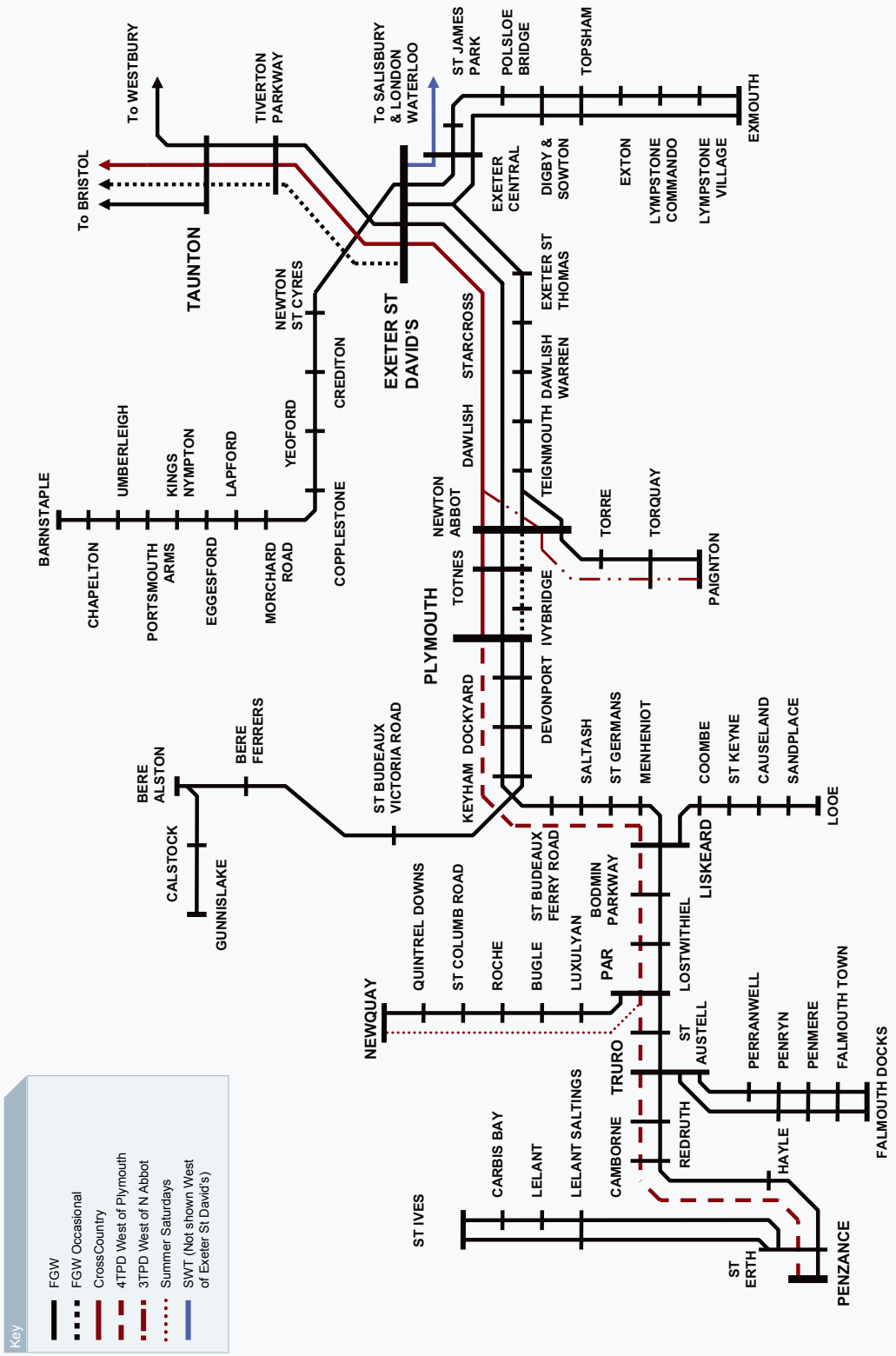


Figure 3.5 – Somerset, Devon and Cornwall standard hour service provision



3.5.5
There is a high take-up of paths between Reading and Newbury, where services from the West of England have to fit between intensive passenger and freight movements (between Reading and Southcote Jn) on the immediately adjacent Basingstoke section of the GWML. This also influences how capacity is shared westwards along the route towards Taunton.

3.5.6
Between Didcot and Oxford the mix of non-stop passenger and freight services with local services calling at lightly used stations reduces the ability to maximise capacity (CUI is about 87 percent). The current layout at Oxford station necessitates empty stock movements having to cross at the north end of the station between arrival and departure, which restricts flexibility of operation. The intermittent four tracking between Didcot and Swindon further restricts the forecast mix and volume of passenger and freight traffic over the route.

3.5.7
Capacity is constrained within the area by a number of lengthy single line sections, notably the Cotswold line and between Swindon and Kemble and the Weston-super-Mare loop. The Swindon to Gloucester line is also a main diversionary route to and from South Wales if the normal route via the Severn Tunnel is closed.

3.5.8
With the increasing number of freight services emanating from the Avonmouth terminal complex the route between Stoke Gifford towards Westerleigh Jn can become severely congested due to the track sharing of two distinct main line passenger flows with the east-west South Wales to London and north-south cross country services. This also impacts on the route further east towards Didcot and is subject to further congestion following the introduction of the Intercity Express Programme (IEP). The impact of which will be significantly greater on this section with the proposed IEP depot at Stoke Gifford.

3.5.9
The lack of spare capacity on the route, particularly in the Severn Tunnel/Bristol Parkway, Filton Bank and Thames Valley corridors, is evident at times of perturbation making service recovery difficult and resulting in greatly extended journey times over restrictive diversionary routes. This results in a number of identifiable pinch-point locations that are significant in terms of capacity constraints and performance delays through restricting operational flexibility and tending to cause performance problems in terms of out of course running. They also cause sub-optimisation of pathing opportunities and occasionally extended journey times where single line conflicts occur.

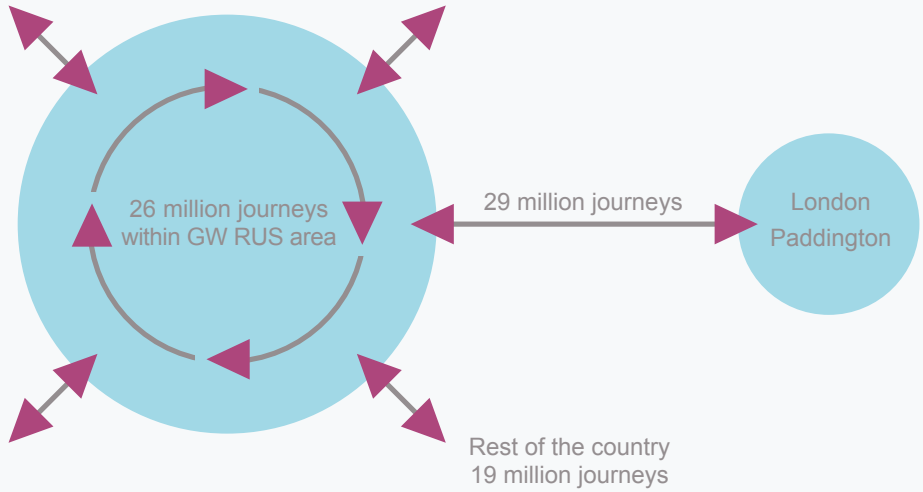
3.5.10
The single track Devon branches run at, or close to capacity, as dictated by passing loop provision, whilst the Cornish branches except those to St. Ives and Falmouth operate less intensely. In the case of the St. Ives and Falmouth branches, utilisation has been increased to the maximum possible level as a result of the Community Rail initiatives. Holiday traffic is a significant element of the passenger market in the coastal resorts.

3.6 Current passenger demand

3.6.1
The total number of rail journeys made to, from and within the Great Western RUS area has increased from 52 million in 1998 to approximately 74 million in 2007, equating to an average growth rate of four percent per annum.

3.6.2
Around 40 percent of rail journeys made in 2007/08 were between London Paddington and the Great Western RUS area. Journeys made within the RUS area have grown the most rapidly, averaging 4.6 percent per annum. Figures 3.6 and 3.7 show the split of these journeys by year and their growth rates over the nine year period.

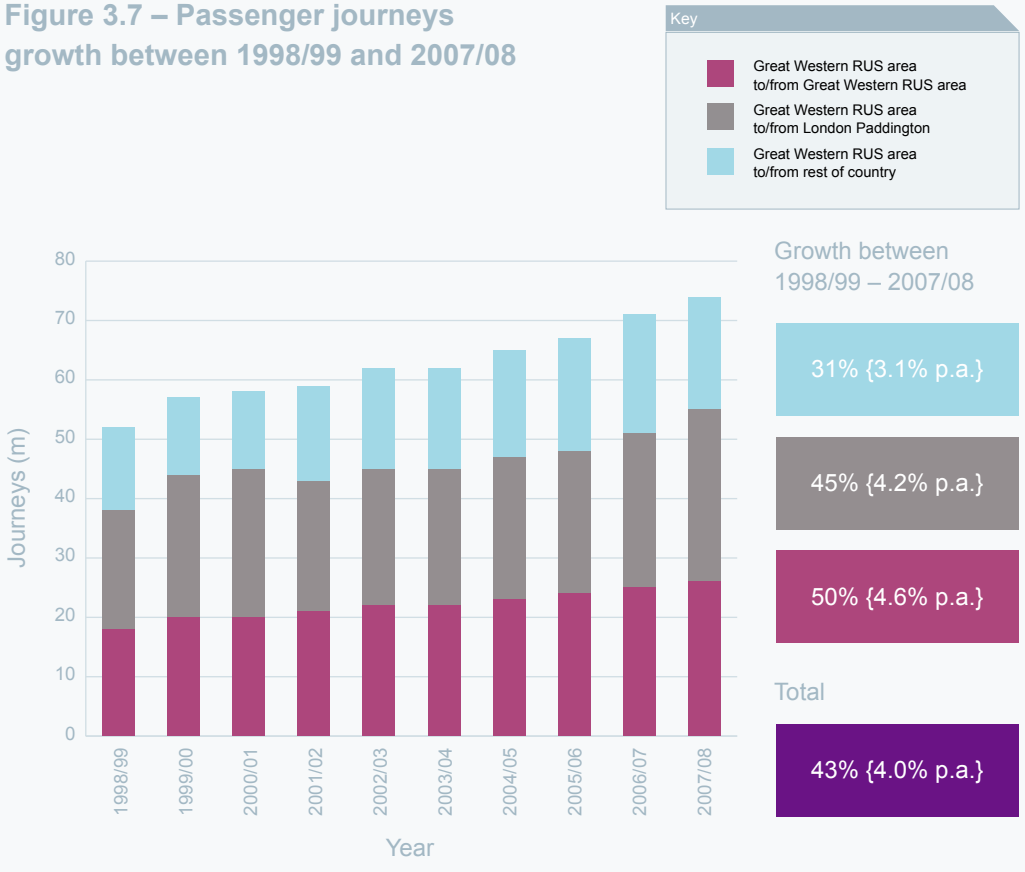
Figure 3.6 – Rail journeys to, from and within the RUS area (2007/08)



Source: RIFF 1.4 and MOIRA OR17 (Western) database

Note: Rover tickets and travelcards sold at outlets other than National Rail stations are not included

Figure 3.7 – Passenger journeys growth between 1998/99 and 2007/08



Source: RIFF 1.4 and MOIRA OR17 (Western) database

Note: Rover tickets and travelcards sold at outlets other than National Rail stations are not included

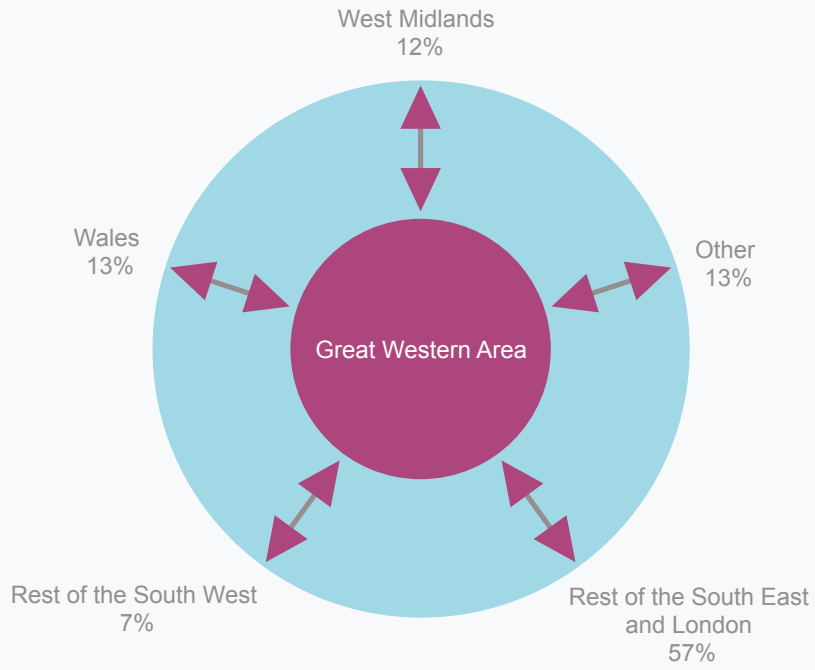
3.6.3

Figure 3.8 shows the breakdown of passenger demand between the RUS area and other regions outside the scope of the RUS. Approximately 57 percent of external demand was to the South East and greater London outside the RUS area with a further 12 percent of journeys to or from the West Midlands.

3.6.4

Within the Great Western RUS area, the main markets for rail are identified as long, medium and short distance commuting into London and to a lesser extent Reading and Bristol and the interurban flows between main centres within and outside the RUS area. The level of rail demand in the RUS area varies considerably by time of day, journey purpose and route. The busiest days for long distance services is Fridays followed by Sundays. Demand is greatest when commuters travel and thus the RUS has focussed on the train loading on weekdays in the morning and evening peaks. For the long distance services, it is recognised that the evening peak period is as busy and sometimes busier, than the morning.

Figure 3.8 – External demand to or from the RUS area, split by region (2007/08)



Source: RIFF 1.4 and MOIRA OR17 (Western) database

3.6.5

In 2007/08, 29 million rail passengers travelled between London Paddington and the RUS area for business, commuting and leisure purposes. Figure 3.9 shows the top ten flows between London Paddington and those areas served by the Long Distance High Speed services (LDHS).

3.6.6

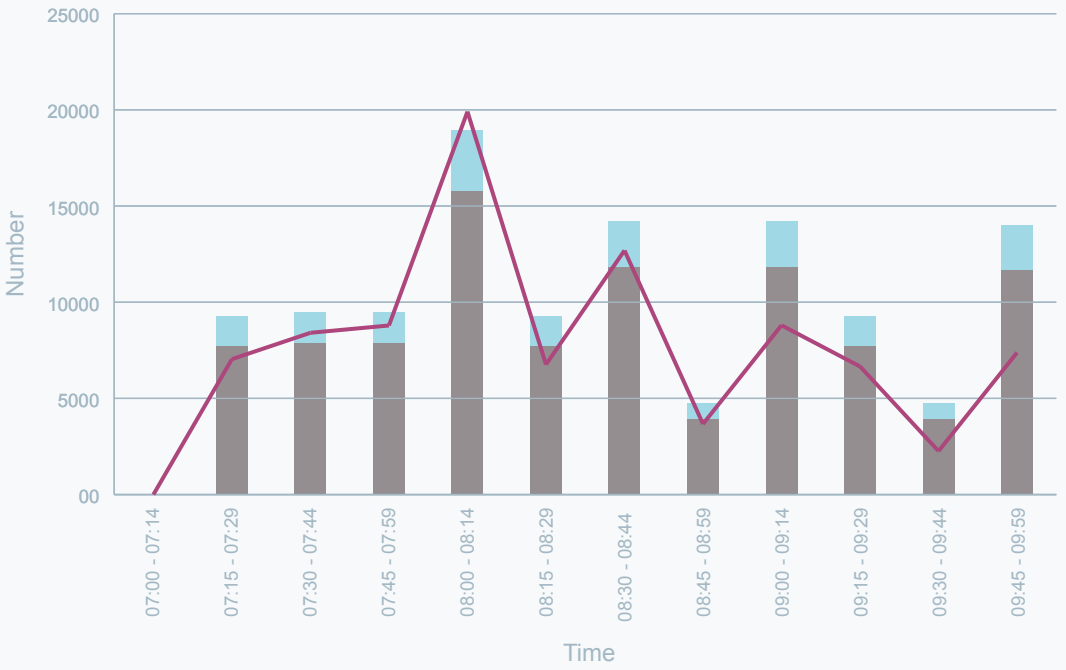
Demand into London on the LDHS services varies by time of day and day of the week. The busiest time period is the weekday morning three hour peak (between 07:00 and 09:59) with arrivals at London Paddington, reflecting the significance of the longer distance commuting market into London.

Figure 3.9 – Top 10 LDHS journeys to or from London Paddington (2007/08)

Flows	Journeys (million)
Reading	4.6
Didcot Parkway	1.1
Swindon	1.0
Bristol Temple Meads	0.9
Bath Spa	0.8
Cardiff Central	0.7
Bristol Parkway	0.6
Newbury	0.6
Exeter St Davids	0.4
Chippenham	0.4

Source: LENNON ticket sales and data extracted from MOIRA OR17 (Western version)

Figure 3.10 – Morning peak arrivals of LDHS passengers at London Paddington, weekday average 2008/09



Source: Passengers in excess of capacity (PIXC) count conducted in autumn 2008 (supplied by FGW)

3.6.7

Figure 3.10 illustrates the ratio of passengers to seats and between passengers and total capacity (which includes seating and standing allowance[1]) for LDHS services arriving at London Paddington in 15 minute segments as per the current service pattern during the three-hour morning peak period on a typical weekday in 2008/09. These include standard class seats and passengers with standard class tickets only.

3.6.8

The busiest time period is between 08:00 and 08:15 where the number of passengers exceeds both seating and standing capacity. In 2008/09, the average passenger to seat ratio for LDHS services arriving in the morning three-hour peak is 94 percent. The average passenger to seat ratio in the high peak hour (between 08:00 and 08:59) is 109 percent and this implies that the busiest services experience overcrowding with many passengers standing for more than 20 minutes.

1 On the LDHS services, standing allowance has been estimated at a ratio of 1.2 times the number of standard class seats, as per the HLOS definition.

Figure 3.11 – Top 10 rail journeys to or from London Paddington in 2007/08 (suburban services)	
Flows	Journeys (million)
Slough	2.0
Maidenhead	1.6
Oxford	1.5
Ealing Broadway	1.0
Hayes and Harlington	1.0
Newbury	0.6
West Drayton	0.6
West Ealing	0.6
Twyford	0.5
Windsor and Eton Central	0.4

Source: MOIRA OR17 (Western version)
Note: Transport for London (TfL) travelcards sold at outlets other than national rail stations are not included[2].

3.6.9
London Paddington is the focal point of demand in the RUS area, with the top five suburban flows to and from London Paddington being Slough, Maidenhead, Oxford, Ealing Broadway and Hayes and Harlington highlighting the concentration of demand within the Thames Valley area. Figure 3.11 illustrates the significance of the inner and outer suburban services supporting the shorter commuter journeys into London from the Thames Valley.

3.6.10
The average passengers to seating ratio for suburban services arriving at London Paddington in the three-hour peak is 104 percent, increasing to 127 percent during the high peak hour. Total passengers to total capacity (includes seating and standing allowance) ratio during the three-hour peak is 78 percent and 95 percent in the high peak hour. Figure 3.12 visually illustrates the passenger to seats and capacity ratios for the suburban services into London Paddington.

2 TfL estimate that approximately three million journeys in the RUS area to London are made using TfL travelcards

Figure 3.12 – Morning peak arrivals of suburban services at London Paddington, weekday average 2008/09

Source: Passengers in excess of capacity (PIXC) count conducted in autumn 2008 (supplied by FGW)
Note: Passenger loadings were recorded on train arrival at the station with the highest loadings on route to Paddington. Count includes Heathrow Connect and excludes Heathrow Express.

3.6.11
Between 08:00 and 08:30, the number of passengers exceeds both the seating and standing capacity. Count data proves that a number of services have more than 20 percent of passengers in excess of seating and standing capacity. In the shoulder peaks, there is sufficient seating and standing capacity to meet current demand.

3.6.12
The top five non-London flows within the Great Western RUS area also reflects the significance of the Thames Valley as shown in Figure 3.13. Figure 3.14 shows the top five non-London flows (greater than 20 miles) to or from outside the RUS area in 2007/08. This indicates considerable demand for rail journeys to and from locations such as Bristol and South Wales.

Figure 3.13 – Top five non-London flows within the RUS area (2007/08)		
	Flows	**Journeys**
1	Bristol Temple Meads – Bath Spa	968000
2	Slough – Windsor and Eton Central	597000
3	Reading – Maidenhead	510000
4	Reading – Slough	465000
5	Reading – Oxford	433000

Source: LENNON ticket sales and data extracted from MOIRA OR17 (Western version)

Figure 3.14 – Top five non-London flows to outside the RUS area (2007/08)		
	Flows	**Journeys**
1	Bristol Temple Meads – Cardiff Central	416000
2	Oxford – Banbury	313000
3	Bristol Temple Meads – Newport Gwent	176000
4	Bristol Parkway – Cardiff Central	147000
5	Reading – Guildford	129000

Source: LENNON ticket sales and data extracted from MOIRA OR17 (Western version)

3.6.13
The RUS has also considered other key urban interchanges outside the London area. The most significant stations are Reading, Bristol Temple Meads, Exeter and Plymouth. These are discussed in turn below;

3.6.14
Reading is both a major attractor and generator of rail demand in the RUS area. Many passengers commute from Reading to London each morning due to its close proximity to the capital and the mix of services available with both Long Distance High Speed services and suburban services. It is estimated that 95 percent of passengers travelling from Reading to London Paddington use the LDHS services which offer fast, non-stop journeys. The suburban services, while slower, provide access to intermediate stations on the relief lines providing opportunities for commuting, business and leisure purposes and for interchanges to the London Underground at stations such as Ealing Broadway.

3.6.15

Figure 3.15 illustrates the average passenger to seat ratios and the average passenger to total capacity ratios (includes both seating and standard allowances) for services arriving at Reading in the morning three-hour peak period. Figure 3.16 presents these ratios for the morning high peak hour. This shows sufficient capacity on all corridors (except Basingstoke) to meet current demand in both the one-hour and three-hour peak periods for services arriving at Reading. On the Basingstoke to Reading services in the high peak hour, the passenger to seat ratio on arrival at Reading reaches 105 percent therefore some passengers will stand within the available standing capacity. However, the ratio between passengers and total capacity is 84 percent thereby proving sufficient total capacity is available to accommodate current demand on the Basingstoke to Reading corridor in the high peak.

Figure 3.15 – Average load factors on weekday arrivals at Reading in 2007, morning three-hour peak (07:00 – 09:59)

Key

Average load factor on arrival at Reading

Load factor (relative to seats)	Load factor (relative to total capacity)
Over 130%	Over 100%
100% - 130%	70% - 100%
80% - 99%	50% - 69%
less than 80%	less than 50%

Note: Total capacity includes seats and standing allowance

Figure 3.16 – Average load factors on weekday arrivals at Reading in 2007, morning high peak hour (08:00-08:59)

Key

Average load factor on arrival at Reading

	Load factor (relative to seats)	Load factor (relative to total capacity)
	Over 130%	Over 100%
	100% - 130%	70% - 100%
	80% - 99%	50% - 69%
	less than 80%	less than 50%

Note: Total capacity includes seats and standing allowance

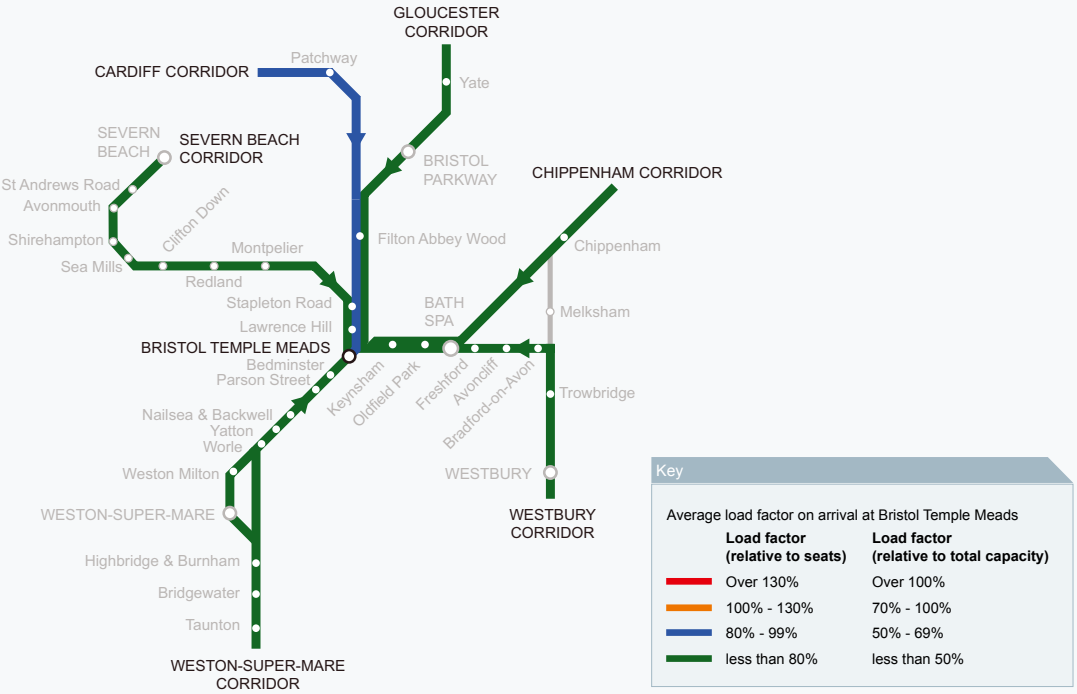
3.6.16

Bristol is the largest urban centre in the South West Government region providing employment, education opportunities and leisure activities. In 2007, approximately seven million passenger rail journeys started or ended at Bristol Temple Meads, a 75 percent increase from four million in 1998. Trips to Bristol by rail, particularly for commuting purposes, have become increasingly more attractive in recent years as a result of an improved train service and increased road congestion into and around the city centre.

3.6.17

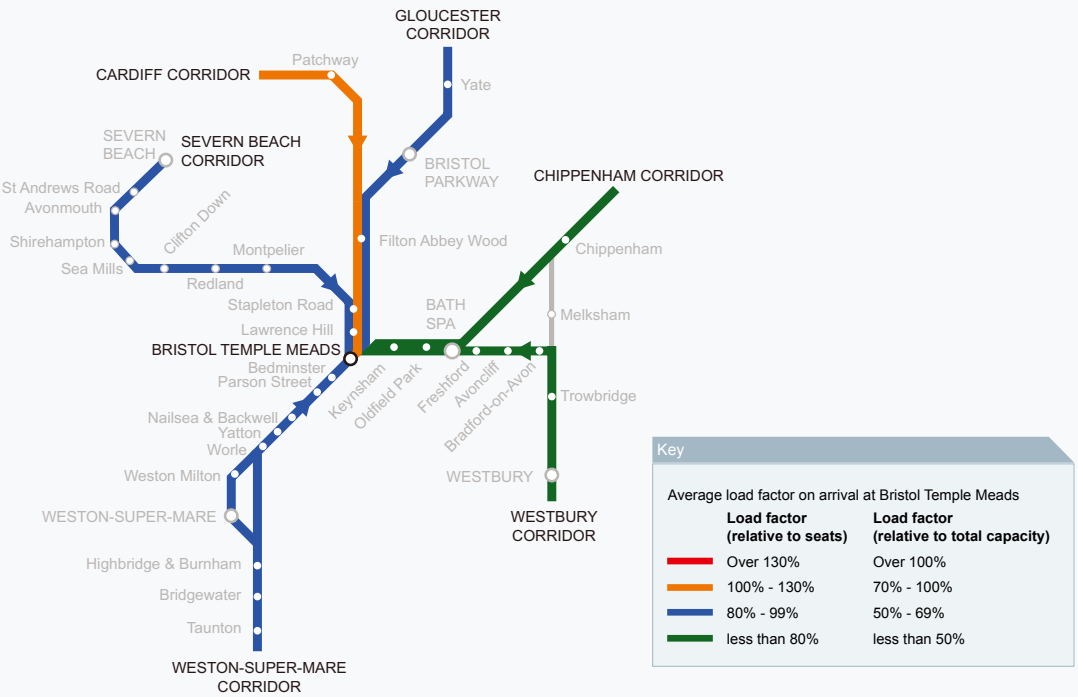
The level of rail demand varies considerably by time of day with demand at its highest level in the high peak hour. Figure 3.17 illustrates the ratios of passengers to seats and to total capacity (includes both seating and standard allowances) at Bristol Temple Meads for trains arriving in the three-hour peak period. This shows that total capacity provided across the three-hour peak period is sufficient to meet demand as of 2007/08.

Figure 3.17 – Average load factors on weekday arrivals at Bristol Temple Meads in 2007, morning three-hour peak (07:00-09:59)



Note: Total capacity includes seats and standing allowance

Figure 3.18 – Average load factors on weekday arrivals at Bristol Temple Meads in 2007, morning high peak hour (08:00-08:59)



Note: Total capacity includes seats and standing allowance

3.6.18

Figure 3.18 shows that all corridors except the Cardiff to Bristol corridor have both a passenger to seat and total capacity ratio of less than 100 percent. However, it should be noted that this is a level of average loadings and within this average a number of services would have passengers standing in the high peak hour. The Cardiff to Bristol corridor has a 95 percent passenger to total capacity ratio during the high peak hour and there is evidence that on the busiest services, some services are in excess of the available capacity.

3.6.19

Exeter and Plymouth are the key regional centres in Devon and play an important role in supporting regional economic growth. Total rail demand to Exeter and Plymouth has increased rapidly in the last decade. Demand for rail at Exeter St Davids was approximately 2 million per year in 2007, which represents an increase of 30 percent from 1998. Plymouth experienced a higher level of growth with rail journeys increasing by 50 percent from 1.3 million in 1998 to around 2 million in 2007.

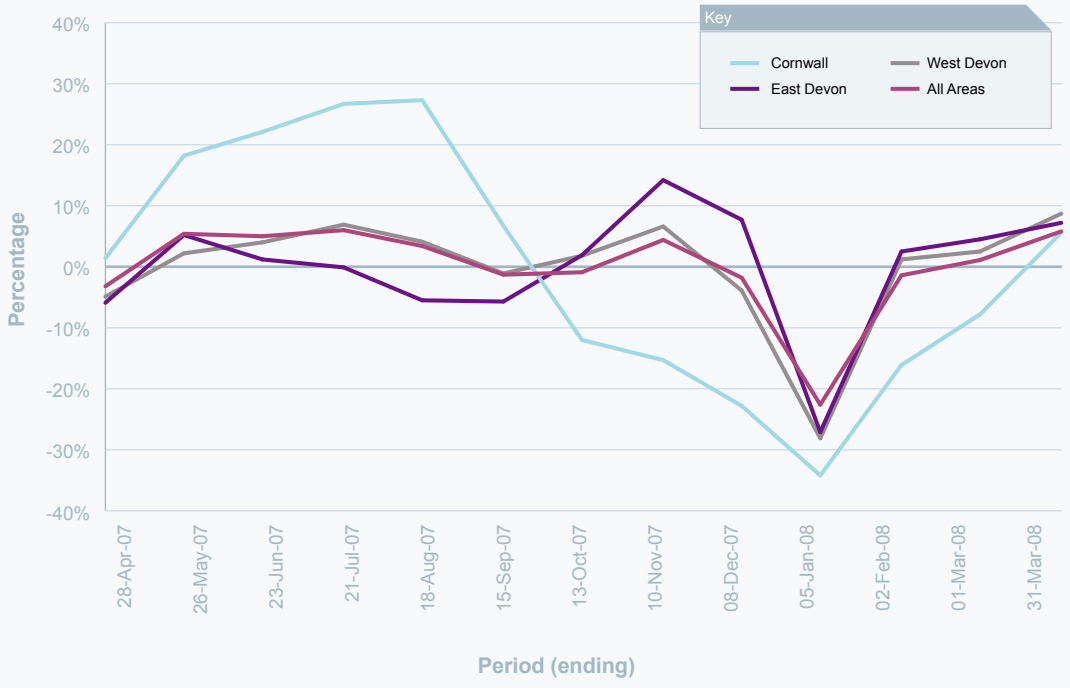
3.6.20

In Devon and Cornwall, holiday traffic is a significant element of the overall rail passenger market. Tourism produces seasonal variations in rail demand to popular tourist destinations. Figure 3.19 shows how the demand to Devon and Cornwall fluctuates during the year with the four-weekly demand for each period compared against the annual average ranging from eight percent to -30 percent over the course of 2007/08. The high peak summer months (July and August) generate up to 38 percent more demand than the four-weekly annual average and falling to below -30 per cent over Christmas and the New Year.

3.6.21

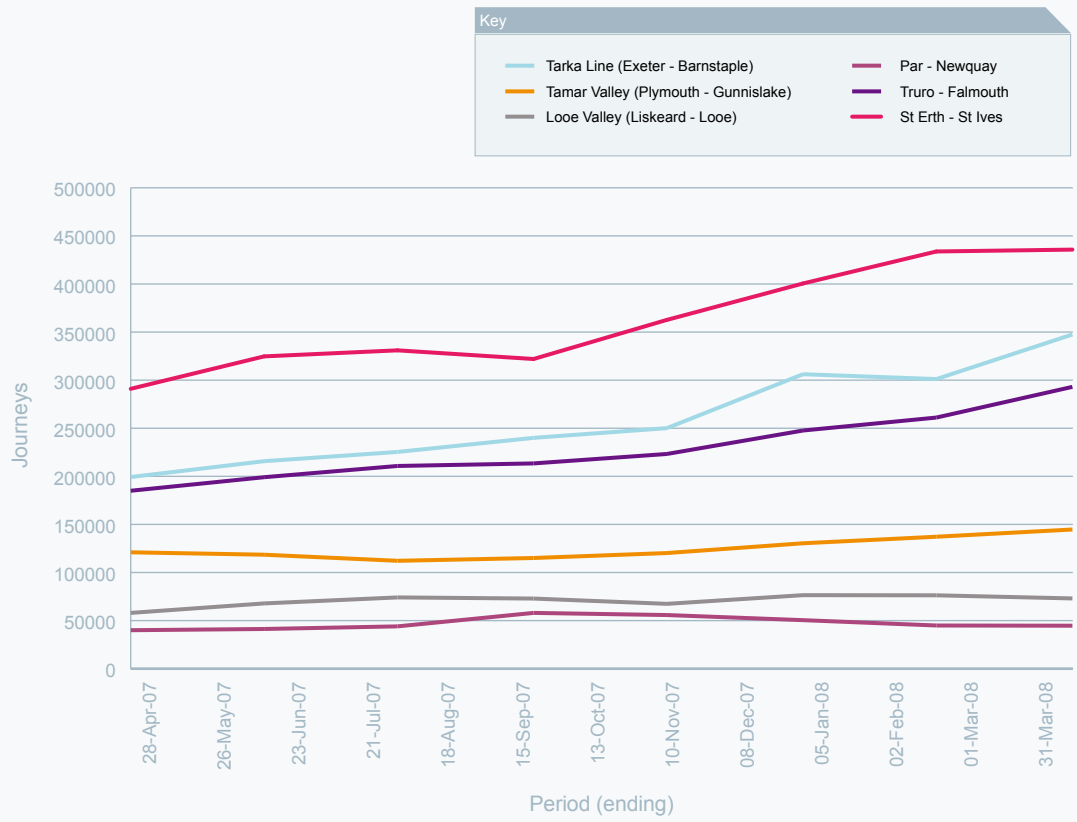
Demand for local services (excluding the Long Distance High Speed services) on the Devon and Cornwall branch lines has also increased substantially from 1.7 million journeys in 2001 to 2.5 million journeys in 2008, an increase of 50 percent. Figure 3.20 shows the total rail journeys (excluding the Long Distance High Speed services) made on the branch lines between 2001 and 2008.

Figure 3.19 – Seasonal variations in rail demand to/from Devon and Cornwall (2007/08)



Source: LENNON ticket sales (2007/08)

Figure 3.20 – Demand for rail on the branch lines in Devon and Cornwall



Source: LENNON (rail) ticket sales data, excluding long distance high speed services
Figures contain Carnets and Lelant Salting P&R

3.6.22

Exeter to Barnstaple has experienced the most growth with a 74 percent increase in passengers since 2001. Of all the branches, it is still experiencing the highest growth per year with an eight percent increase during the year to 2008. The reduction in journeys on the Par to Newquay branch shown in Figure 3.20 is due to the introduction of through high speed train services and figures for travel on these are not included.

3.6.23

London Heathrow is the largest airport in the country with around 70 million passengers per annum and is included within the Great Western RUS area. With the opening of Terminal 5 in 2008, the airport's capacity grew to accommodate a further 30 million passengers per year and it is predicted that passenger growth will increase by a further 15 percent by 2013.

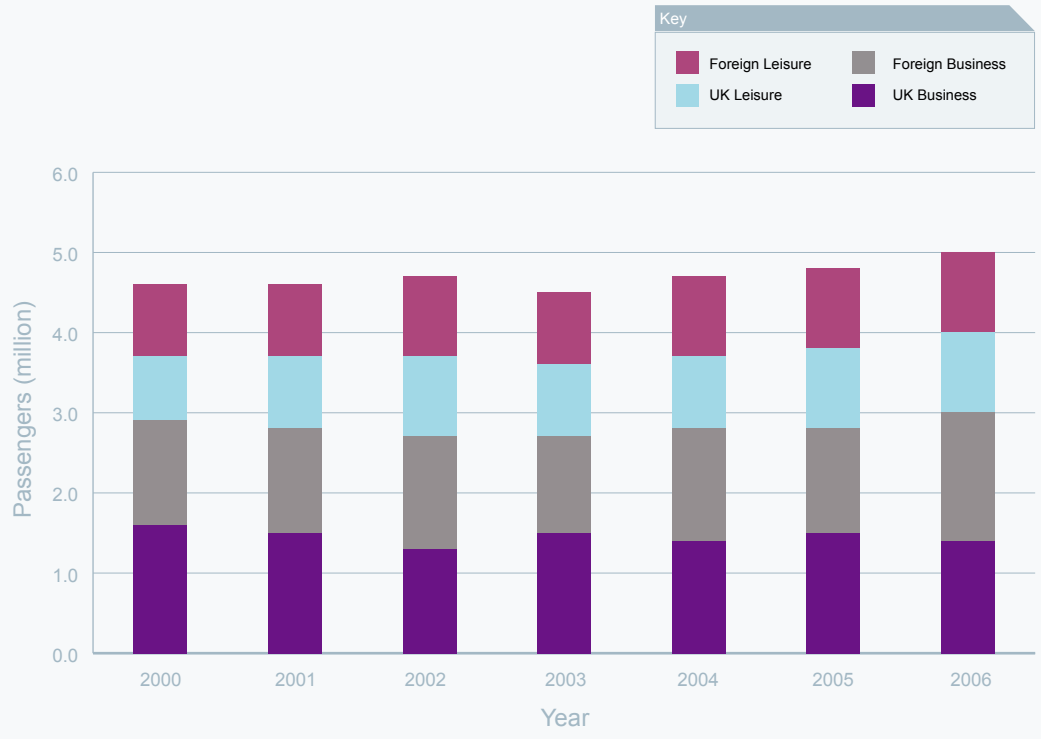
3.6.24

Around 83 percent of passengers travelling to Heathrow Airport travel from London and the wider South East region. Various means of transport serve the airport with rail access available through London Underground and through Heathrow Express and the Heathrow Connect service. Heathrow Airport is the biggest employment site within the United Kingdom with more than 315 organisations employing 74,000 staff. Staff are encouraged to use public transport with the airport aiming to improve travel choices for staff with initiatives such as free buses around the airport campus and a staff travel card with up to 50 percent discounts on some routes. Whilst Heathrow Express provides a faster premium fare shuttle service from London Paddington, the Heathrow Connect services offer a local stopping service to stations along the route attracting the commuter market and airport employees.

3.6.25

Figure 3.21 illustrates demand for Heathrow Express services by journey purpose. In 2006, 5 million passengers travelled on Heathrow Express representing a nine percent increase from 2000.

Figure 3.21 – Total journeys on Heathrow Express by journey purpose



Source: Data supplied by Heathrow Express

3.6.26

Evidence suggests that the busiest days for Heathrow Express are Tuesdays and Fridays supporting the predominant use of the service for business purposes. For services arriving into London Paddington, the morning high peak hour between 08:00 and 08:59 is the busiest and for those services departing London Paddington for Heathrow Airport the three hour evening peak between 16:00 and 18:59 is the busiest.

3.7 Freight Operating Companies

3.7.1

There are currently 10 licensed freight operators who have access contracts across the whole of the rail network. These are;

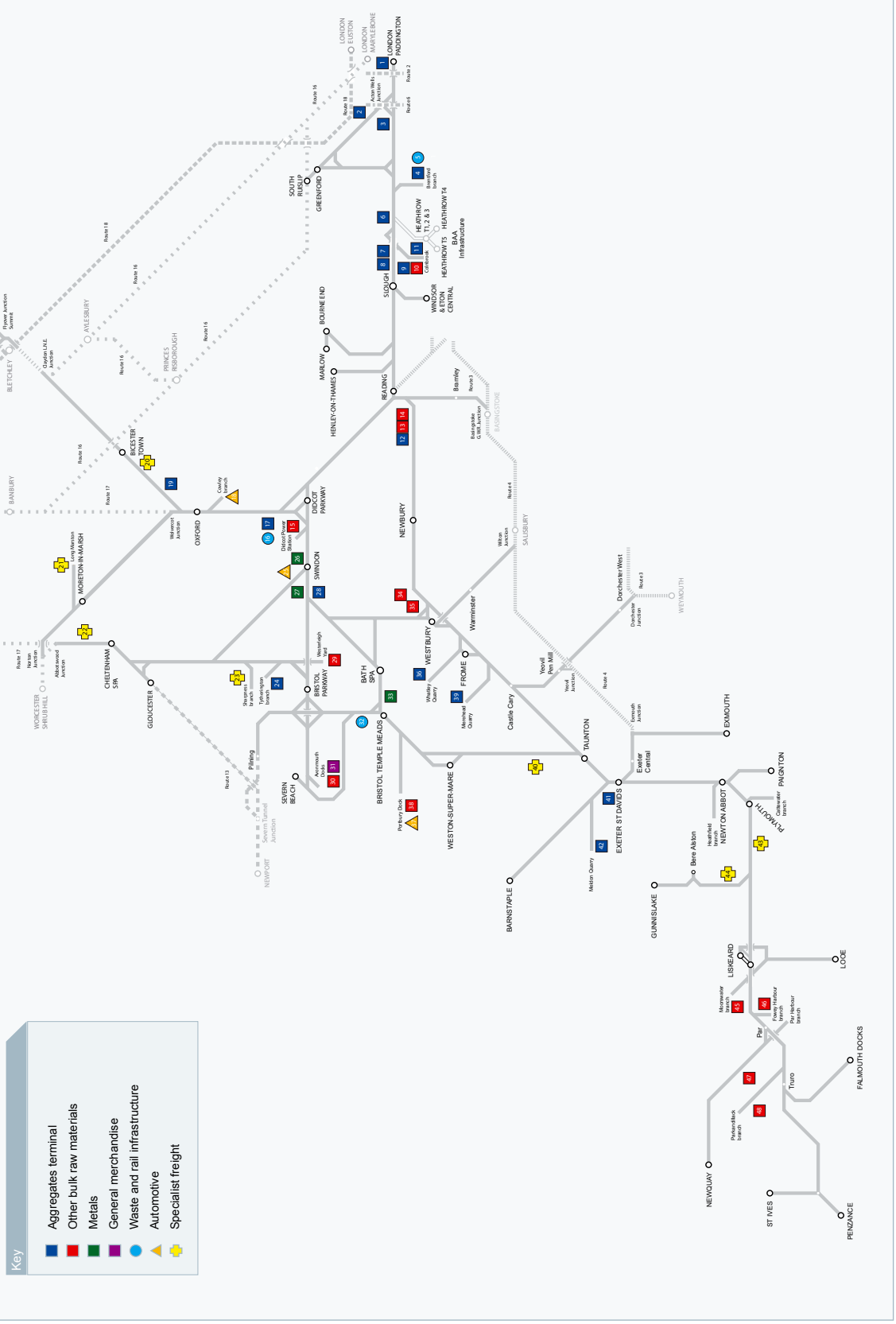
- DB Schenker Rail (UK) Limited (formerly English Welsh and Scottish Railways), the largest rail freight operator in Great Britain, with a licence to operate European services. DB Schenker run trains for a wide range of markets and are structured into four market-based groups: Energy (includes coal), Construction (which includes domestic waste), Industrial (which includes metals and petroleum) and Network (which includes international, automotive, express parcels services and rail infrastructure services)
- Freightliner Group has two divisions: Freightliner Limited and Freightliner Heavy Haul. Freightliner Limited is the largest haulier of containerised traffic, predominantly in the deep sea market; whilst Freightliner Heavy Haul is a significant conveyor of bulk goods, predominantly coal, construction materials and petroleum. It also operates rail infrastructure services
- First GBRf, formerly GB Railfreight, is also a significant operator of deep sea container trains and rail infrastructure services. They also run a number of services for bulk market customers including coal and gypsum
- Direct Rail Services operates traffic for the nuclear power industry in Great Britain. In the last few years the company has expanded into running services for the domestic intermodal and short sea intermodal markets
- Fastline Freight, an established provider of rail infrastructure services, has recently operated into the intermodal market
- Advenza Freight Limited offers intermodal high speed and precision logistics distribution throughout the United Kingdom
- Colas Rail provides rail freight haulage for all market sectors throughout the UK and Europe
- Freight Europe offers rail freight services including train haulage in the UK and Europe
- West Coast Railway specialise in operating charter trains, both in its own right and on behalf of tour operators throughout the UK and has a licence for freight operations
- Serco Rail predominantly provides engineering services to Network Rail with the national measurement train and Omnicom (the national survey train).

3.8 Current freight market profile

3.8.1

Significant volumes of freight are carried over the RUS area, with an estimated 7,000 million tonnes transported per annum. The Great Western Main Line is the second busiest corridor for freight into London after the West Coast Main Line. In the Great Western RUS area there are around 45 freight terminals handling over 12 different commodities as shown in Figure 3.22. In addition to these flows, which have origins or destinations within the RUS area, other freight traffic traverses the area to destinations in South Wales and to the North of England and Scotland.

Figure 3.22 – Freight terminals



3.8.2
The major commodities transported within the Great Western RUS area are aggregates, coal and steel. Figure 3.23 illustrates the principal freight flows and includes the locations of the quarries on the route; the main quarries being Merehead, Whatley and Meldon.

3.8.3
The main markets served within the RUS area are presented below:

3.8.4
Aggregates for the construction industry mainly originate in the Mendips, with others originating from outside the RUS area, and account for much of the freight traffic between the West Country and London with terminals at Paddington, Acton, Brentford, Hayes, West Drayton, Thorney Mill, Colnbrook and others to the south and east of London. The aggregate flows between the Mendips and London are the heaviest freight flows nationally and can reach six million tonnes each year, equating to 4,400 tonnes per train. Other terminals served are at Theale, Wootton Bassett, Appleford and Oxford Banbury Road.

3.8.5
The route between the South Coast Port of Southampton and the West Coast Main Line via Basingstoke, Reading and Oxford is the key route for deep sea container services, generating significant volumes of container traffic for the West Midlands, the North and Scotland. The Freight RUS, published in March 2007, highlighted a specific “gap” with the gauge clearance requirements on this route. This is discussed further in **Chapter 4** with the committed scheme to enhance the gauge on this route. Avonmouth has limited container movements, however the proposal by the Bristol Port Company to construct a new container terminal development at Avonmouth is discussed further in **Chapter 5** under future freight growth.

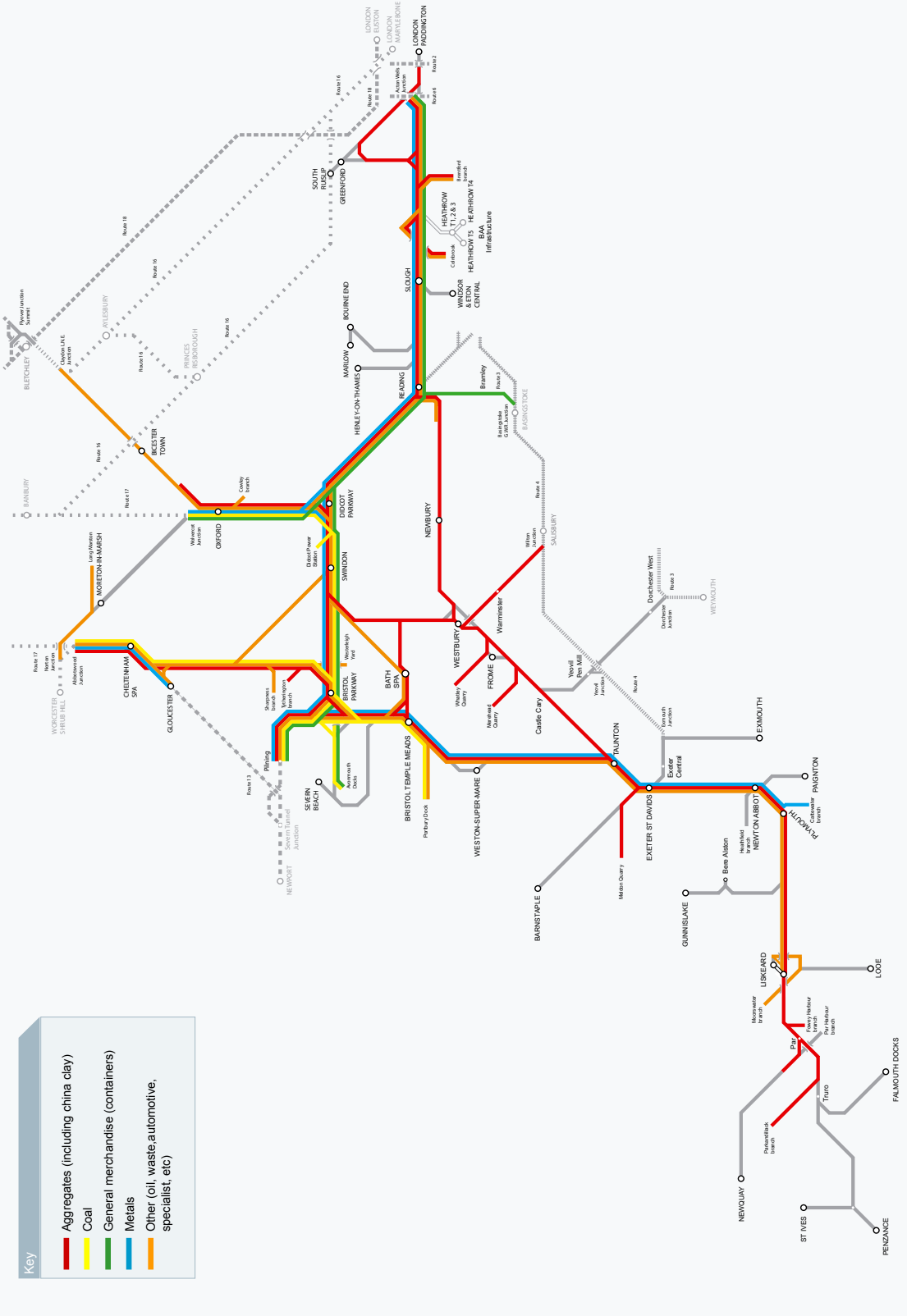
3.8.6
The metals market includes large volumes of steel transported from South Wales to a variety of terminals throughout the UK. Steel production facilities at Llanwern and Port Talbot generate significant numbers of trains each day.

3.8.7
Automotive manufacturing is centred on Swindon (Honda) and Oxford Cowley (BMW). Train loads of export cars run via the Channel Tunnel and Purfleet Docks respectively. The automotive import market is mainly based on the Port of Bristol’s Portbury and Avonmouth terminals. Daily trains between Dagenham in east London and Bridgend cater for Ford traffic. A rail terminal at Swindon Hawksworth handles imported steel for car manufacture.

3.8.8
Didcot Power station is the only rail served power station within the RUS area. At present, the plant is non-EU compliant as it is not fitted with Flue Gas Desulphurisation (FGD) equipment. Unless a dispensation is granted it is likely that this station will cease coal burning operations by 2015. Whilst Aberthaw Power station lies within the scope of the Wales RUS, it will continue to be served from Avonmouth and Portbury. The influence of South Wales on freight traffic is significant on this route due to the many impacts that through traffic has on the area. It is therefore important not to consider these flows in isolation. The coal fired Uskmouth power station in South Wales is mainly supplied locally from Newport docks, with some flows from Bristol.

3.8.9
Petroleum traffic generates up to five trains per week crossing the route from Milford Haven to either Westerleigh or Theale. A flow operates between Lindsey Oil Refinery (Immingham) and Westerleigh five times a week and between Lindsey Oil Refinery and Theale three times a week. There is also a planned train once a week from Port Clarence to Westerleigh and other irregular movements between Lindsey Oil Refinery and Didcot Power station. There is one oil train per day from Lindsey Oil Refinery to Colnbrook.

Figure 3.23 – Freight flows by commodity



3.8.10
Daily train loads of containerised waste to landfill sites at Appleford and Calvert originate from Brentford and Bristol.

3.8.11
Didcot is a key hub for Ministry of Defence (MOD) traffic feeding terminals at Bicester, Ashchurch, Keyham, Ernesettle and Warminster and other terminals outside the RUS area.

3.8.12
Freight traffic generated in Cornwall is predominantly china clay, mostly exported locally through the Port of Fowey, but with some longer distance traffic also. Cement traffic from Hope (Peak District) runs to Moorswater on the Looe Branch. Aggregates traffic runs from Burngullow to East London.

3.8.13
Network Rail infrastructure traffic operates across the RUS area, mainly serviced from the Westbury Local Distribution Centre (LDC).

3.9 Freight capacity and capability

3.9.1
The busiest part of the network is between Reading and Acton as can be seen in Figure 3.24 which illustrates the daily number of scheduled freight paths in the Great Western RUS area by route section. The diagram shows all Working Timetable (WTT) paths, as at May 2009, of which only a percentage are actually used every day. The diagram does not illustrate trains which are short-term plan special movements, and therefore illustrates an average capacity utilisation position.

3.9.2
The Freight RUS presents a view of the freight growth and alterations in existing traffic flows that could reasonably be expected to occur on the network by 2014 and presents a strategy to address the key issues that arise in accommodating these changes. These predictions form part of the baseline and are used as a basis for future demand and are therefore considered further in **Chapter 5** along with the recently extrapolated freight forecasts to 2019 and 2030.

3.9.3
The Freight RUS recommends a proactive strategy for the development of priority core and diversionary routes to accommodate W10 gauge. This will facilitate the growth of rail's share of the market for haulage of 9ft 6in containers on conventional deck height wagons. Loading gauge defines the maximum height and width of vehicles that can be safely accommodated without fouling structures such as bridges and platforms. Within the RUS area loading gauge predominantly ranges from W6 to W8, as shown in Figure 3.25.

3.9.4
Route Availability (RA) is a system for determining which types of locomotive and rolling stock can travel over any given section of route and is normally determined by the strength of underline bridges in relation to axle load and speed. The RA of a specific route is determined by the carrying capability of both its structure and track. As shown in Figure 3.25, most of the RUS area is classified as RA8 which permits axle loads up to 22 tonnes per axle. Only in certain specially controlled circumstances, can trains receive derogation to operate heavier axle loads over lower categorised routes.

3.9.5
The range of loop lengths within the RUS area varies from 186 metres at Eggesford (although rarely used for freight) to 1447 metres at Milton. Ten percent of the loops in the RUS scope area are long enough to accommodate the longest freight trains of 775 metres, with the majority of loops between 500 metres and 775 metres. Freight operators have aspirations for loops to be at least 775 metres, to accommodate 121 SLUs (Standard Length Units). FOCs are engaged in a number of initiatives to improve path take-up and the efficiency of operations. All operators are seeking to maximise the use of each path on the network by running trains which are longer, heavier and in some cases potentially bigger (both in weight and height).

Figure 3.24 – Scheduled freight paths

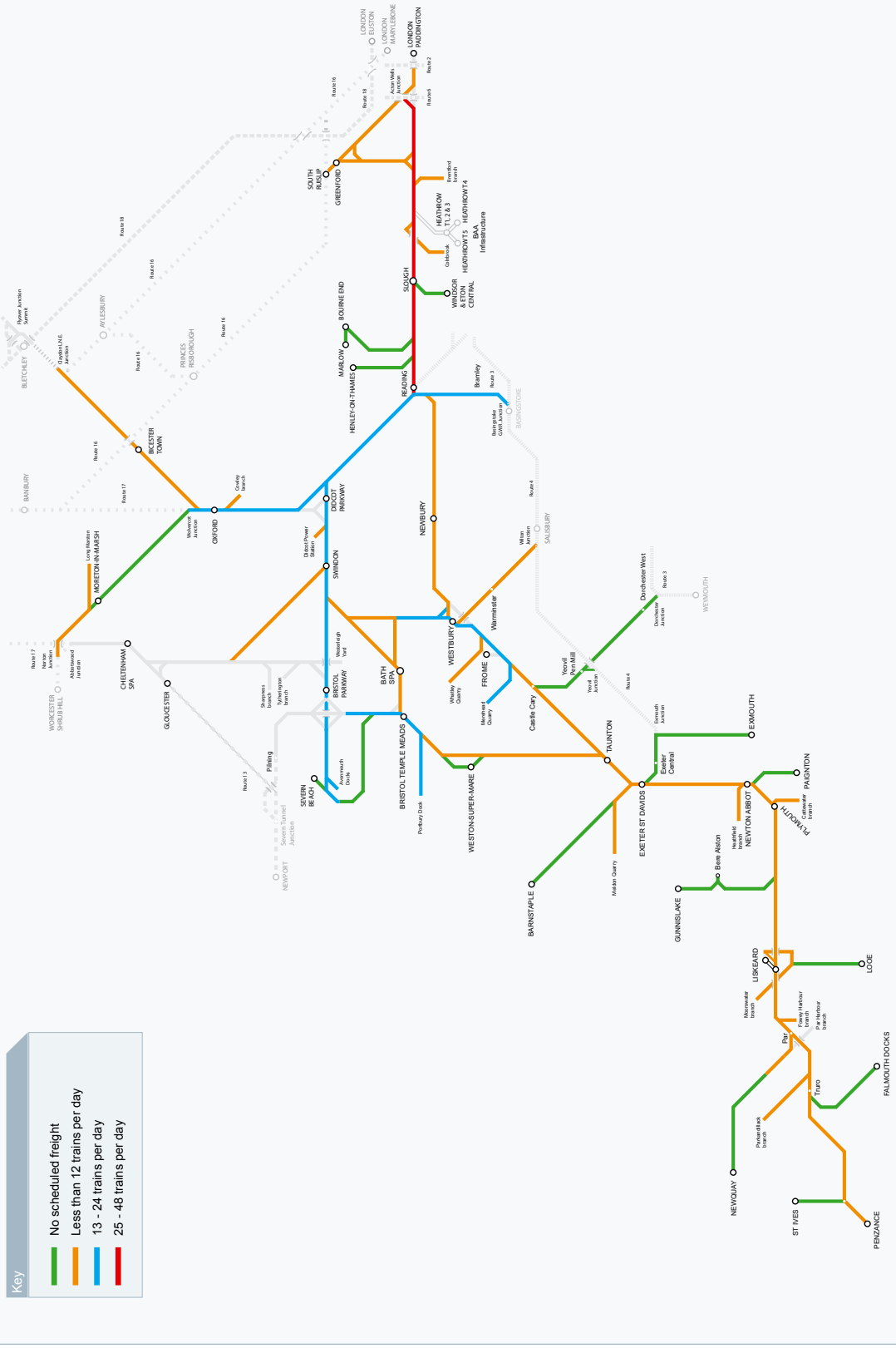
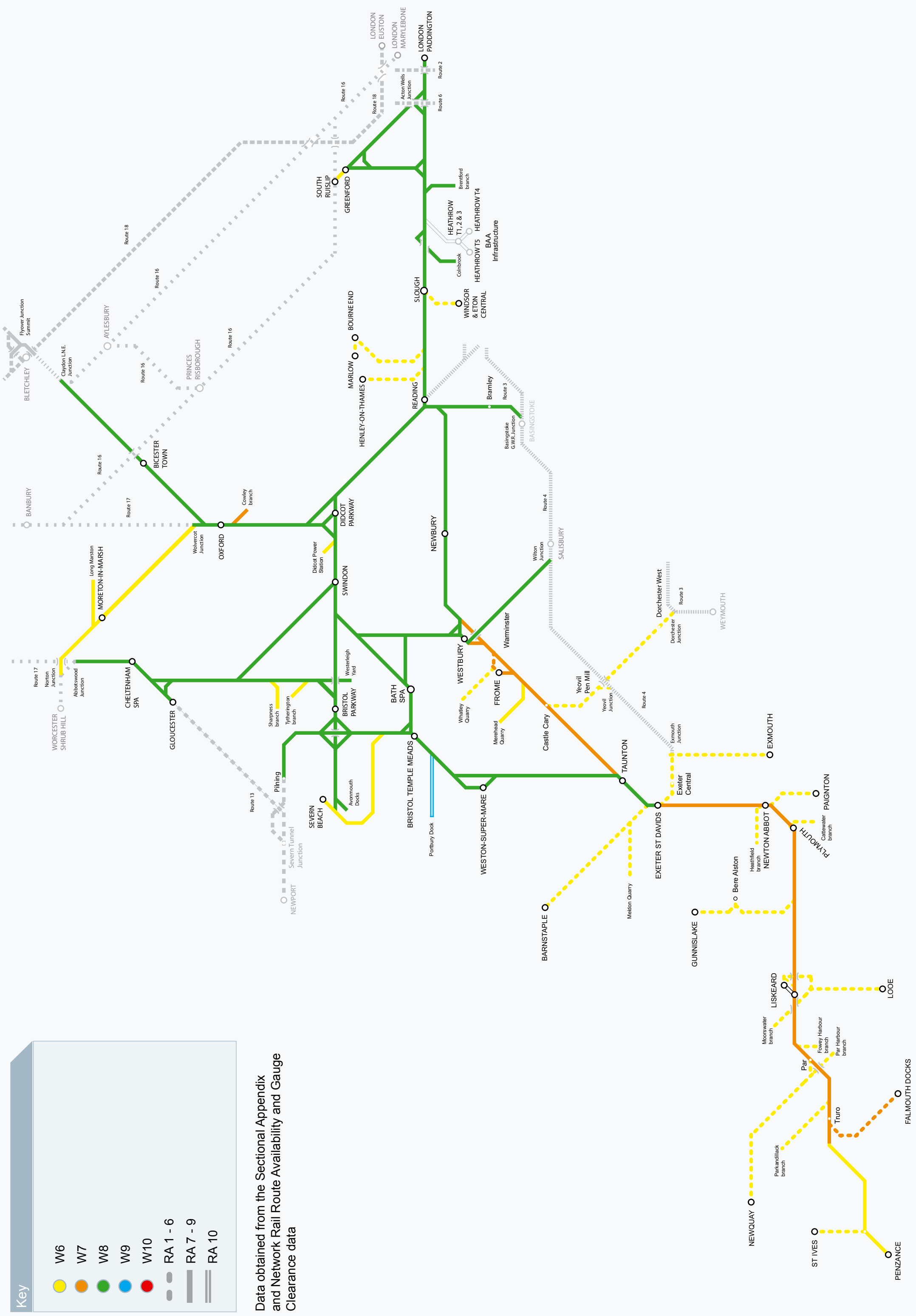


Figure 3.25 – Gauge and route availability



Data obtained from the Sectional Appendix and Network Rail Route Availability and Gauge Clearance data

3.10 Current RUS Infrastructure

3.10.1

The infrastructure characteristics in the scope area of the Great Western RUS varies widely, depending on the location, historical service demands and recent developments. This has resulted in different levels of route capability, represented across the area by the track configuration of the network from east to west as it changes from four tracks to two tracks and then to a single line. 70 percent of the route is two tracks with only 12 percent comprising four track sections. This is shown in **Chapter 2**, Figure 2.1.

3.10.2

The principal infrastructure characteristics analysed as part of the baseline exercise includes Linespeeds, Signalling headways, Electrification, Platform lengths, Station facilities (including car parking) and rolling stock depots and stabling.

3.10.3

Linespeeds vary greatly, from the high speed sections of 100 – 125mph to the rural branch lines where the majority of speeds are within the 40 – 75mph band with some areas falling below 35mph. Figure 3.26 illustrates the differing linespeeds across the RUS area.

3.10.4

A variety of signalling systems also feature across the Great Western RUS area, which again, reflects the historical differences in demand and service levels for each area. Signalling headways is a measure of how closely (in time) one train can follow another with the range reaching from two minutes to over 10 minutes across the RUS scope area as shown in Figure 3.27.

3.10.5

Currently, there is a limited amount of electrification within the RUS area, with the line between London Paddington and Airport Jn being the only electrified section. The lines between Airport Jn and Heathrow Airport are also electrified but these are owned by BAA. With Crossrail, the limit of electrification will extend to Maidenhead and with the recent commitment to the electrification of the Great Western Main Line the route from London Paddington to Oxford, Newbury and Bristol (via Bath and Bristol Parkway) will be electrified by 2016. This will be extended to Swansea by 2017. These developments are discussed further in **Chapter 4** under committed schemes and with recent developments in **Chapter 8**.

3.10.6

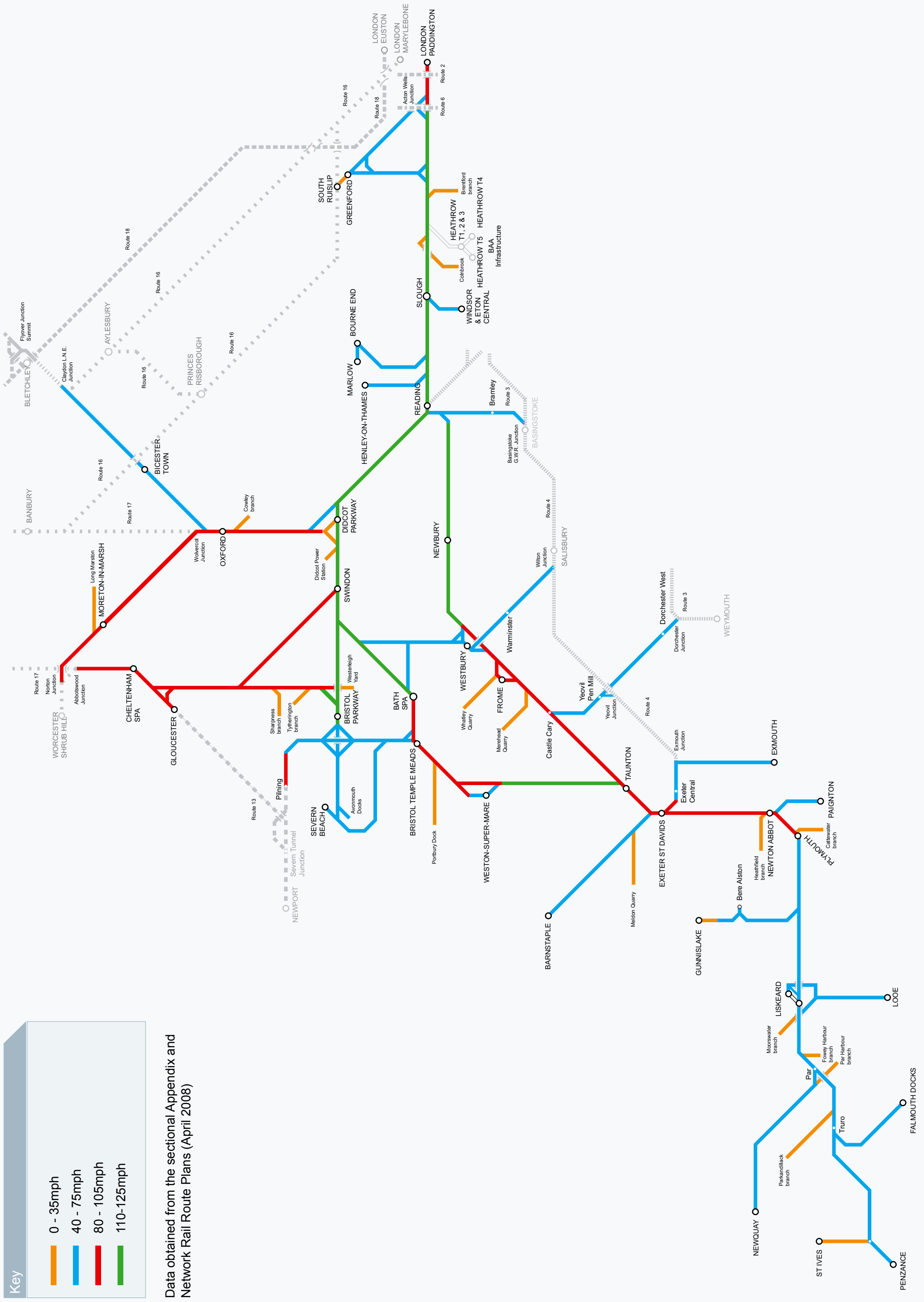
The length of platforms also vary along a line of route, this means the train length and service provided can be constrained by the shortest platform, or Selective Door Operation (SDO) has to be deployed. The shortest and longest platform lengths across the RUS scope area are indicated in Figure 3.28. Platforms lengths across the RUS area vary and can accommodate a mixture of two-, three-, and four-car train configurations and longer two plus eight-car High Speed Train formations. The constraint of short platforms is particularly evident in the Thames Valley making it difficult to deliver much needed passenger capacity through train lengthening.

3.11 Stations

3.11.1

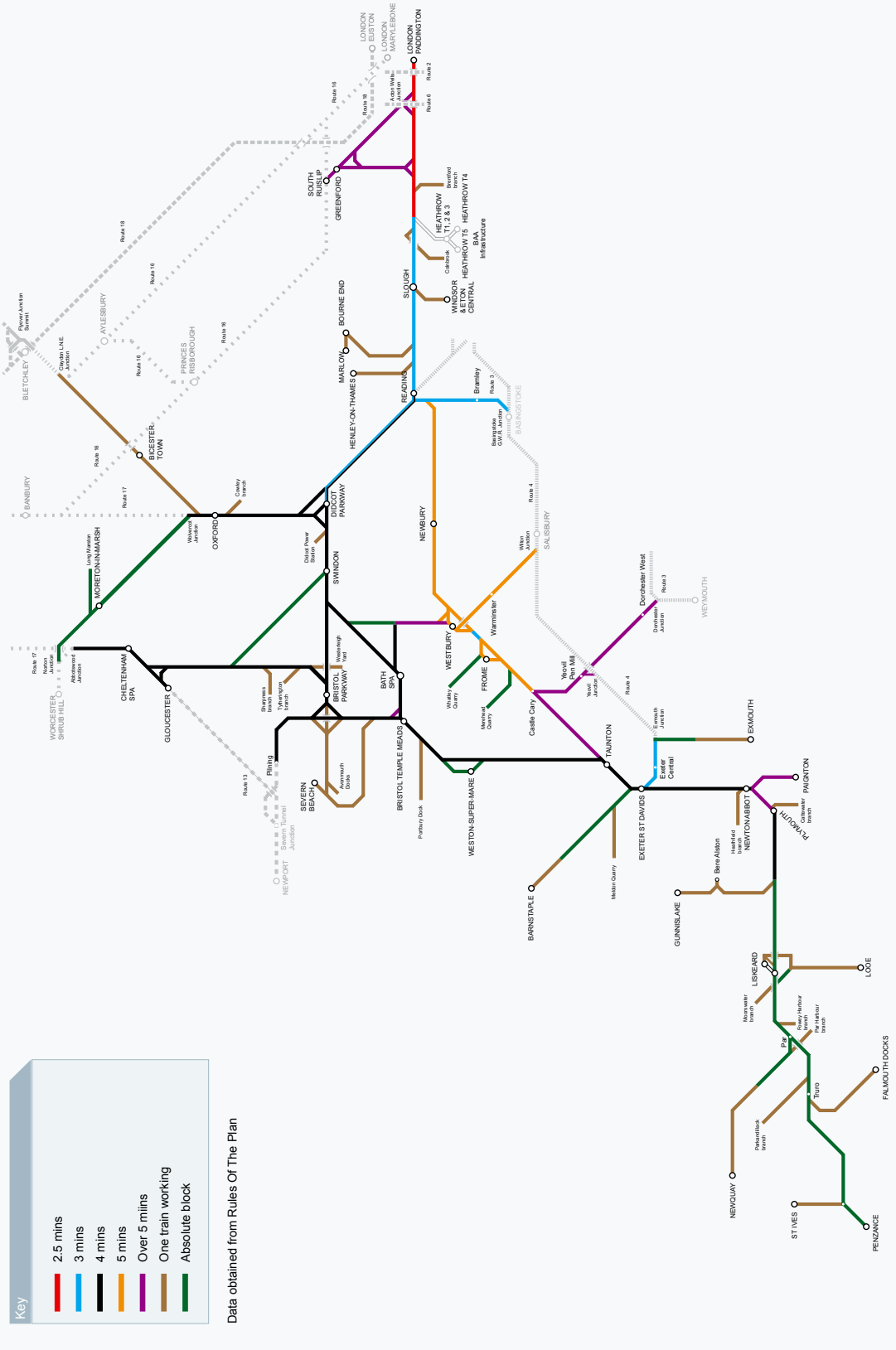
Appendix A provides a detailed list of station facilities at the 192 stations located within the Great Western RUS area (including the station classification) and the integration with other modes of transport. Most locations intersect with the railway or run close to other modes of public transport and this all forms part of the passenger's journey. The ease with which passengers can get to stations determines the attractiveness of rail travel relative to other modes. Car parking availability and utilisation is also presented in Appendix A along with accessibility to the station and interchange opportunities with other modes of transport.

Figure 3.26 – Linespeeds



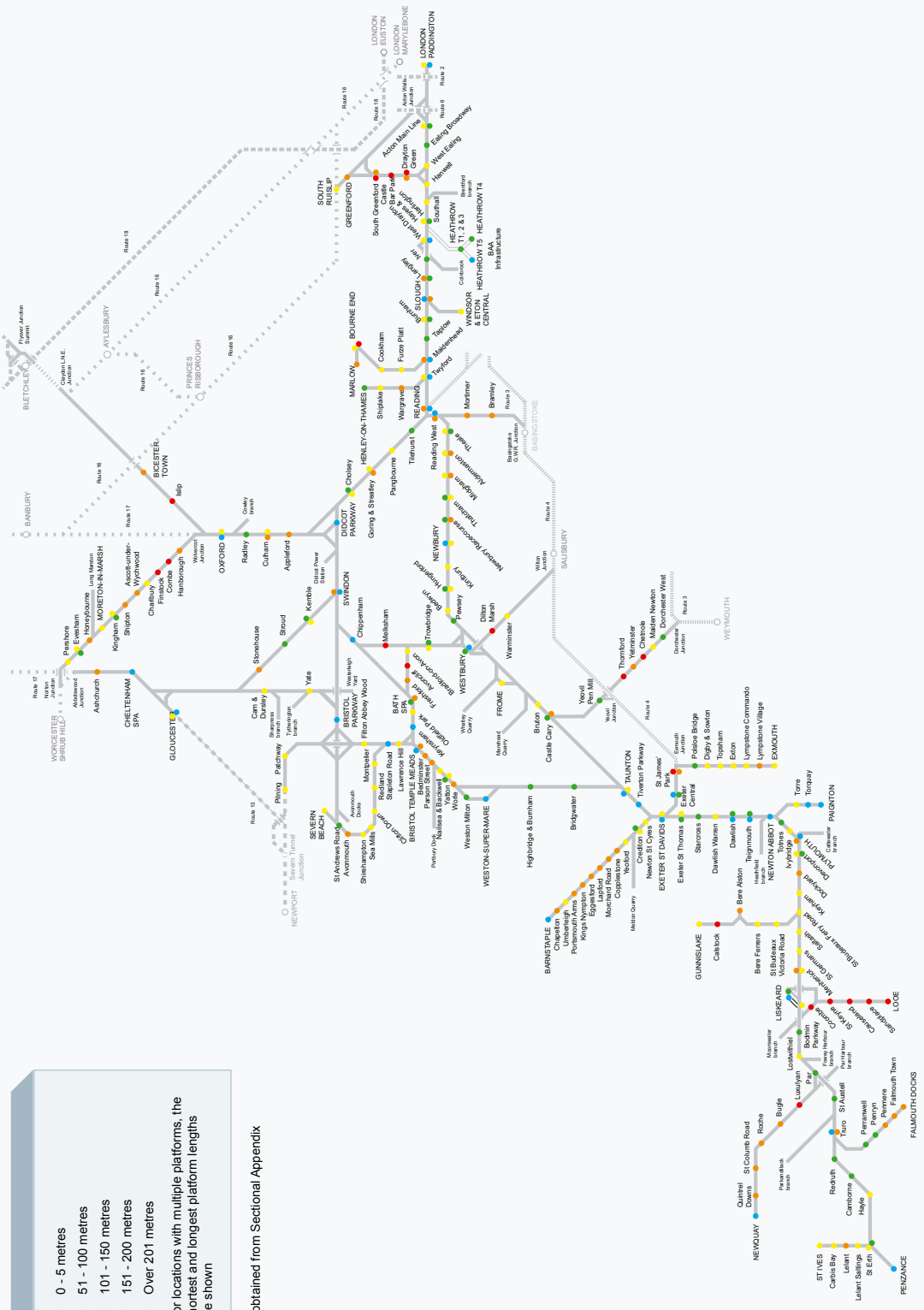
Data obtained from the sectional Appendix and Network Rail Route Plans (April 2008)

Figure 3.27 – Signalling headways



Data obtained from Rules Of The Plan

Figure 3.28 – Platform lengths



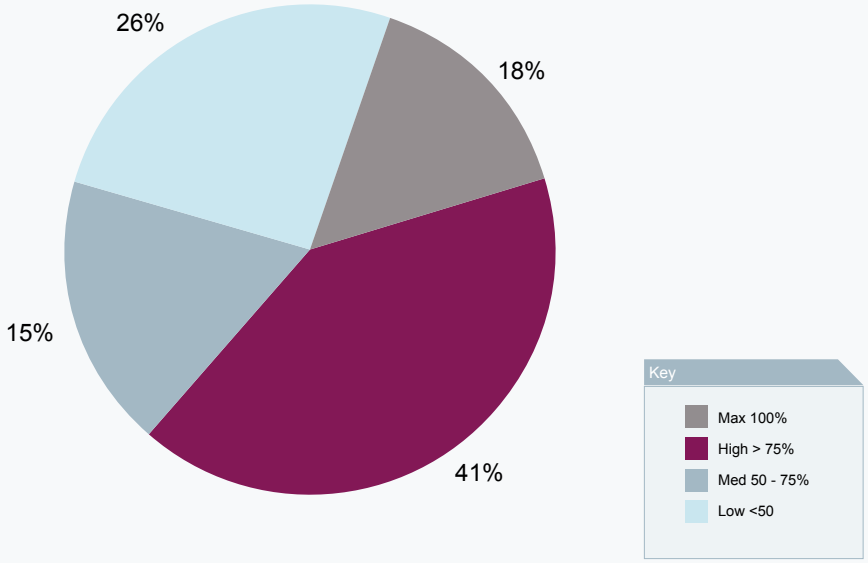
3.11.2

It is noted that lack of station car parking capacity is a widespread issue which occurs at many of the main regional centres. Car park occupancy data identifies 18 percent of car parks within the RUS area as being at 100 percent utilisation, with a further 41 percent of car parks with utilisation of over 75 percent. It is thus a key issue if access to the network is not to be deterred suppressing future passenger demand.

3.11.3

There are many station enhancement projects in development sponsored by the train operating companies, third parties, through the National Station Improvement Programme or Access for All which aim to address station facilities including expansions to car parks. These are discussed further in **Chapter 4**.

Figure 3.29 – Car park occupancy analysis (2008/09)



Source: First Great Western

Figure 3.30 – Top ten most used stations in 2007/08	
	Passenger (millions) per annum
London Paddington	29.1
Reading	17.0
Bristol Temple Meads	7.4
Slough	5.5
Oxford	4.7
Bath	4.3
Maidenhead	3.9
Ealing Broadway	3.5
Swindon	2.6
Didcot Parkway	2.6

Source: LENNON (rail) ticket sales (excluding interchange)
Note: Transport for London (TfL) travelcards sold at outlets other than National Rail stations are not included.

3.11.4
Figure 3.30 highlights the top 10 most used stations within the RUS area during 2007/08.

3.11.5
The least used stations within the RUS area with less than 1000 passengers per annum during 2007/08 include Chapelton, Coombe, Pilning and Lelant; however this analysis excludes journeys made on Rover tickets which may have an impact on the actual level of footfall at some of the stations.

3.12 Train maintenance depots and stabling

3.12.1
The principal maintenance depots in the Great Western RUS area are at Old Oak Common (London), Reading, St Phillips Marsh (Bristol), Exeter, Laira (Plymouth) and Long Rock (Penzance). These depots are operated by FGW. There is an additional depot at Landore (Swansea) but this is outside the scope of the Great Western RUS area.

3.12.2
Each of the depots is different and performs a specific role, based on its location, facilities, processes and assigned rolling stock. Each depot has been developed to operate on a variety of activities which include overnight servicing, maintenance, modifications, repairs, tyre turning and cleaning. Each depot has a different layout, with variables such as track layout, berths and stabling roads which dictate the workflow through the site.

3.12.3
The other major depot in the RUS area is that of Heathrow Express at Old Oak Common (London) adjacent to FGW's HST depot.

3.12.4
In addition to the depots, the stabling of FGW vehicles occurs at station areas in Paddington, Oxford, Cheltenham, Gloucester, Westbury, Bristol Temple Meads, Exeter and Plymouth. South West Trains use the network sidings at Exeter New Yard, Exeter St Davids and CrossCountry stable at Barton Hill (Bristol), Laira (Plymouth) and Long Rock (Penzance).

3.12.5
As part of the Reading Station Area Redevelopment works, the existing maintenance depots at Reading Triangle will be demolished and a new depot built on the Reading West Jn sidings. A new depot at Reading will need to be constructed to accommodate the proposed new fleets, additional vehicles to deliver the extra capacity to meet the High Level Output Specification (HLOS) targets and the Intercity Express Programme (IEP).

3.12.6
Adjacent to the Great Western Main Line is the currently disused North Pole depot, vacated following the move of Eurostar from London Waterloo to St Pancras. North Pole has been identified for stabling and possible maintenance of the IEP trains in the London area. Crossrail will concentrate its maintenance activities at Old Oak Common.

3.12.7
There are also a number of freight maintenance depots and sites within the Great Western RUS area where freight operators conduct servicing and light maintenance. These include Acton, Avonmouth, Barton Hill, Stoke Gifford, Westbury, Merehead Quarry, Taunton Fairwater, Newton Abbot and Fowey.

3.12.8
Figure 3.31 illustrates the current locations for depots, stabling and maintenance in the RUS area for both passenger and freight operators and also includes the proposed Track Renewals Recycling Centre at Westbury.

3.13 Engineering access

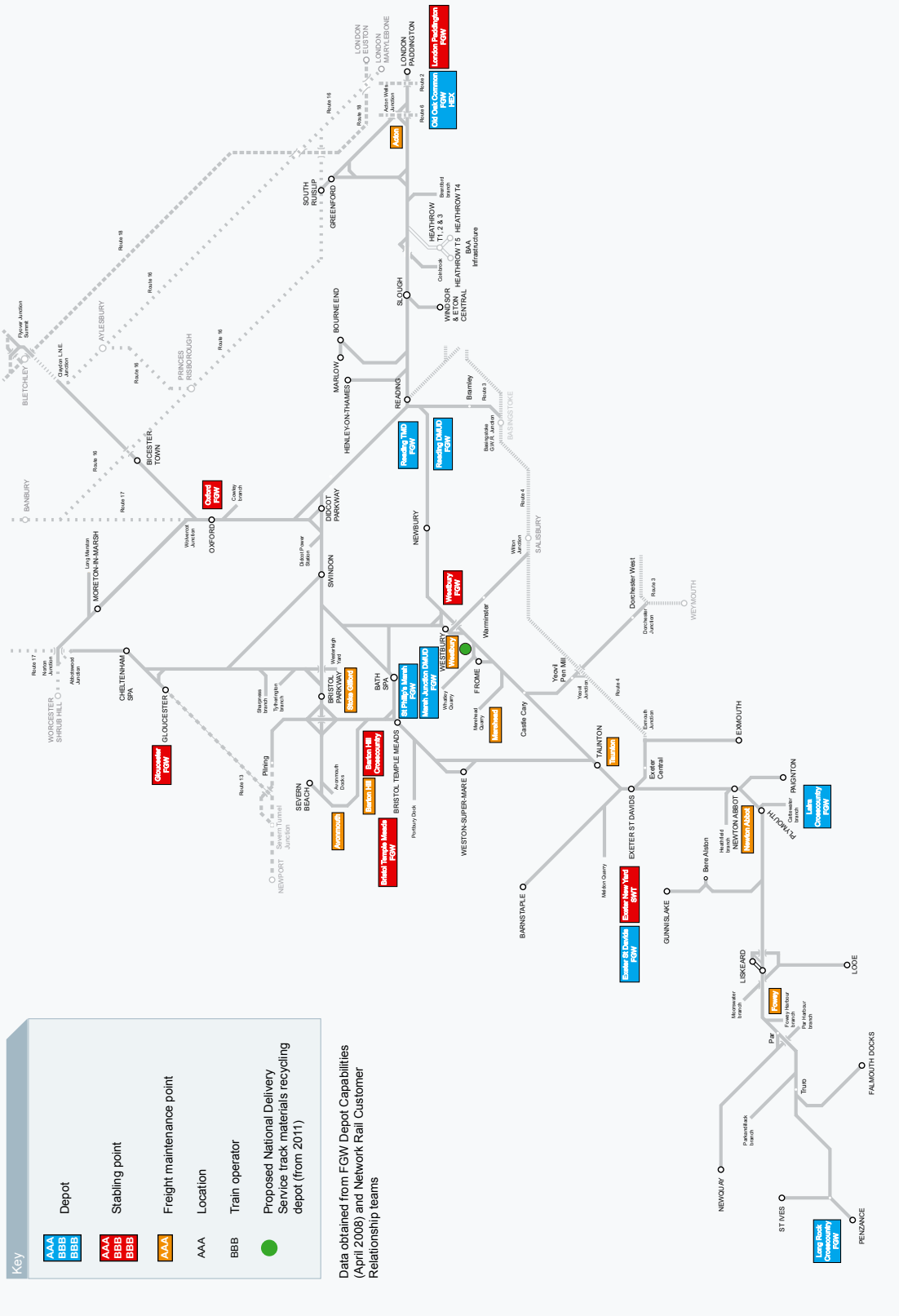
3.13.1
Currently there are three types of possessions for engineering access within the RUS area: normal possessions taken overnight during “white periods” when no trains are scheduled to run; cyclical possessions, which are taken for maintenance on a route section generally on a four, eight or 12-week cycle; and abnormal possessions, which are generally taken as required over a weekend in order to carry out renewal and enhancement works. Both the cyclical and the abnormal possessions often require diversions of passenger and freight services on some of the key routes.

3.13.2
With the mixture of traffic and routes within the RUS area, engineering access varies from heavily restricted on the Great Western Main Line (as a result of franchise commitments and Heathrow Express contract requirements), to a reasonable match to requirements on the branches lines. The current access arrangements around the various route sections are briefly described below.

3.13.3
The vast majority of renewals and enhancement work is undertaken at weekends and the track possession plan is constructed on a route wide basis to ensure that on all weekends at least one route is available from London to Bristol and South Wales, and north – south coast CrossCountry and freight services can continue to operate. The main considerations include no concurrent possessions from Southcote Jn to Exeter, or Bristol to Cogload Jn and Bathampton Jn to Bristol, or Bathampton Jn to Westbury. In addition there are restrictions on Friday night possessions throughout the summer to cater for the holiday market. This possession strategy also needs to intertwine with other key routes throughout the rest of the country, particularly Didcot North to the Midlands and Reading to Basingstoke.

3.13.4
On the four track section between Didcot and London Paddington a permanent two track timetable solution is established whereby access to two track sections is provided overnight for up to eight hours with standardised weave patterns between main and relief lines. Access at Airport Jn, at Slough and at Reading is reduced to five hours only and weekend access is essential for the maintenance of these heavily used junctions.

Figure 3.31 – Depot and stabling points



3.13.5
The section from Didcot to Swindon requires extended journey times (predominantly through rail replacement bus services) when the line is closed for maintenance or renewal activity. For this reason, work is concentrated into non-summer periods when critical maintenance and renewals work takes place.

3.13.6
Although outside the scope of the RUS a key asset in the area is the Severn Tunnel, where the extreme and aggressive environment necessitates a specific cyclical renewal programme to maintain performance and safety. A six-year cycle requires that a full renewal of the track and a detailed civil engineering inspection takes place. This puts additional strain on the diversionary route via Gloucester which adds at least one hour to the journey time. The Severn Tunnel is maintained on a recurring midweek night frequency with reversible working over one line. In 2009/10 there will be additional and continuous engineering work taking place in the Severn Tunnel area as part of the Newport Area Signalling Renewal (NASR). This will require diversions of freight and passenger services on either side of the tunnel as a feature of the timetable.

3.13.7
On the rest of the route, access for maintenance is available on overnight possessions with consent from affected operators and with an alternative route for services made available. For example when both lines are blocked between Wootton Bassett Jn and North Somerset Jn, trains will run via Bristol Parkway.

3.13.8
Weekend double line blockades are employed for any major significant renewals or maintenance works. Track renewals will continue on the Bristol to Exeter route, primarily to the south of Taunton, and on the Berks and Hants route to 2010. This will be achieved through a combination of weekend and midweek possessions and continuous use of the High Output Track Renewals system in order to achieve the outputs required for renewal of the ballast and track. The system will require overnight single line working of sections of route with retimings and limited diversions of overnight services and stock moves. Conventional renewal will apply where operational restrictions (e.g. level crossings, stations and junctions) prevent the use of High Output Track Renewals. Network Rail's High Output equipment is currently based at Taunton Fairwater Yard to allow rapid and frequent transit to the renewal sites on the route.

3.13.9
For some parts of the area, only one line may be blocked at a time and therefore single line working will be operated, for example weeknights between Cogload Jn and Plymouth, on Filton Bank and between Gloucester and Abbotswood Jn.

3.13.10
All possessions are organised to ensure that access to freight terminals is normally available, for example Southcote Jn to Westbury and between Westbury and East Somerset one line is available for access to the quarries.

3.13.11
A different approach to heavy maintenance on the numerous West of England branches has been developed where workload requirements are such as to warrant extended midweek blockades and bus substitution by agreement with the operator. This current policy will continue in Devon and Cornwall where necessary but on a reducing basis. On the Torbay line, work is mainly carried out during school half term holidays.

3.13.12
Works have commenced in 2009 for the remodelling and rebuilding of Reading station area. This is likely to involve weekend and bank holiday journey disruption and diversions during the construction period. However, every effort will be made to reduce disruptions to passengers to a minimum.

3.13.13

Across the Great Western RUS area, a number of generic issues affecting engineering access at present have been identified – many of which are being reviewed as part of the Seven Day Railway initiative:

- growing demand for more services at weekends and particularly on Sundays
- whilst there are often diversionary routes available when lines are closed for maintenance, diversion of freight services is usually more restricted due to the limitations of gauge and route availability
- the potential for growth in freight traffic in both existing and new flows could put pressure on maintenance regimes as presently conducted
- the diversion of services to an alternative route has a knock-on impact on services that normally use that route
- the diversion of services extends passenger journey times and also reduces the quantity of passenger carrying capacity.

3.14 Seven Day Railway

3.14.1

The Seven Day Railway initiative seeks to balance the need for improved late night and weekend services with the need for engineering access by providing a consistent and reiterated timetable. The concept is being developed by Network Rail with industry stakeholders by examining appropriate route sections.

3.14.2

A coordinated approach has been developed to ensure consistency between the Western Seven Day Railway work packages and the identified gaps and options under the RUS – the results of this are discussed further in **Chapter 6**. Further details on the objective of the Seven Day Railway initiative is presented in **Chapter 4** under committed schemes.

3.15 Performance

3.15.1

In order to establish the performance baseline for the Great Western RUS area, the current level of performance and the historical trend for both Public Performance Measure (PPM) and delay minutes was assessed using data from 2006/07 and 2007/08 extracted from the data warehouse 'Performance Systems Strategy' (PSS).

3.15.2

Sub areas were defined through the geographic split of the RUS scope area into 10 summary areas, aligned with strategic route sections to aid analysis. A representation of overall performance and level of delay per sub area was provided. The summary sections are presented in Figure 3.32.

Figure 3.32 – Geographical split of Great Western RUS area

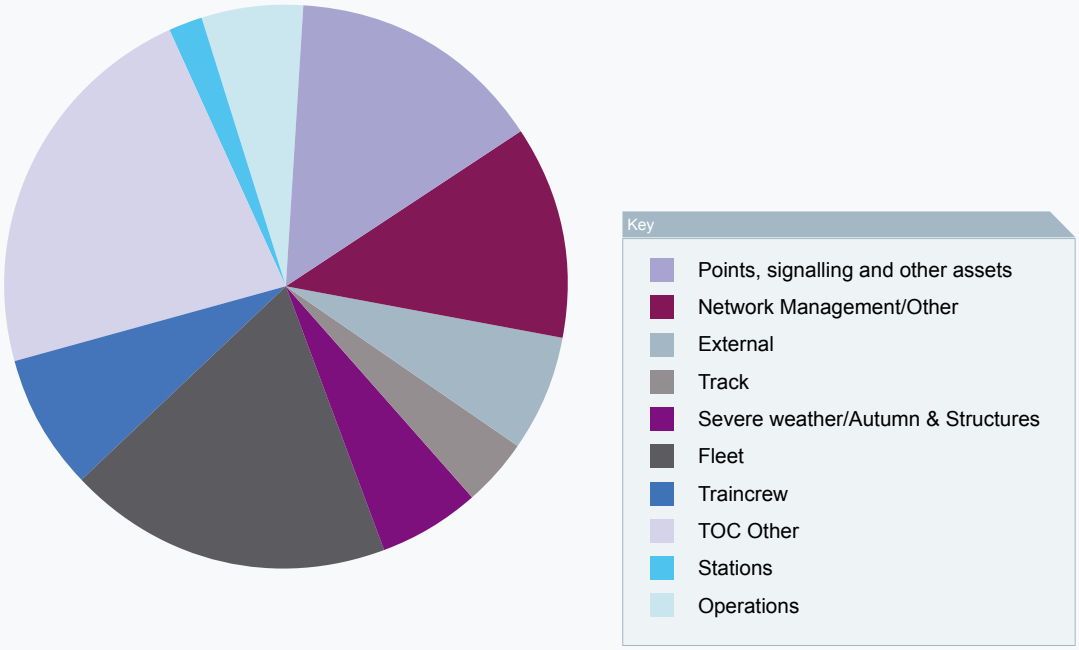
Summary area reference	Summary area name	Strategic Route Sections
GW01	Paddington – Didcot	13.01, 13.02, 13.03
GW02	Didcot – Pilning (via Badminton)	13.04
GW03	Greater Bristol and Westbury	4.02, 4.04, 4.05, 4.06, 13.06, 13.12, 13.15, 13.22
GW04	Reading – Cogload Jn	12.01, 13.11
GW05	Bristol – Birmingham Line	13.08
GW06	Cogload Jn – Penzance	12.02, 12.03, 12.04
GW07	Oxfordshire and North Cotswolds	13.07, 13.13, 13.21, 16.05
GW08	Thames Valley branches	13.09, 13.10, 13.18, 13.19, 13.20
GW09	Devon and Cornwall branches	12.05, 12.06, 12.07, 12.08, 12.09, 12.10, 12.11, 12.12, 12.13
GW10	Wales	13.05, 13.14, 13.16, 13.24

Note: freight locations in sub-sections 4.06, 12.14, 13.23, 13.24 and 16.05 are aligned with their nearest geographic summary area

3.15.3
Delay is categorised into two types: primary delay and reactionary delay. Primary delay is delay caused directly to a train by an incident; reactionary delay is delay which is indirectly caused to other trains as a result of such an incident. The RUS does not consider primary delays (those that occur due to a problem with the infrastructure or the train itself e.g. point's failure, vandalism or shortage of train crew) and focuses on reactionary delay. This is because primary delays are addressed through other industry processes which focus on reducing these incidents at source.

3.15.4
Reactionary delay minutes to passenger and freight operators by location were extracted with mean delay per train; the results of the top 15 locations of each were tabled and are presented in Appendix B. Total delay was further categorised by JPIP category (these are broad categories of incident causation used in the Joint Performance Improvement Plans between Network Rail and the Train Operators). Each JPIP category was assessed for the Great Western RUS area and by each summary area. The results of the Great Western RUS area are presented in Figure 3.33. Details of the delay per summary area are available on Network Rail's website under the baseline analysis.

Figure 3.33 – Total delay for the Great Western RUS area by JPIP category



3.15.5
Analysis of the main delays showed the top three causes of delay in the scope area are due to Train Operating Companies (TOC) Other (external causes, freight terminal/yard delays, low adhesion includes autumn impact and non-technical fleet delays), fleet issues and infrastructure faults.

3.15.6
More detailed analysis on the main sources of delay per route section was undertaken. The total delay for 2006/07 and 2007/08 was combined, split by primary and reactionary delay, and presented by line of route for the following key routes within the Great Western RUS area:

- Bristol Temple Meads to London
- South Wales to London
- Cotswolds to London
- Penzance to London (via Berks and Hants)
- Birmingham to Taunton
- South Wales to South Coast.

3.15.7
This analysis identified performance pinch-points at London Paddington, Reading, Didcot, Westbury and Bristol Temple Meads as evident in the following graphs.

Figure 3.34 – Bristol Temple Meads to London Paddington

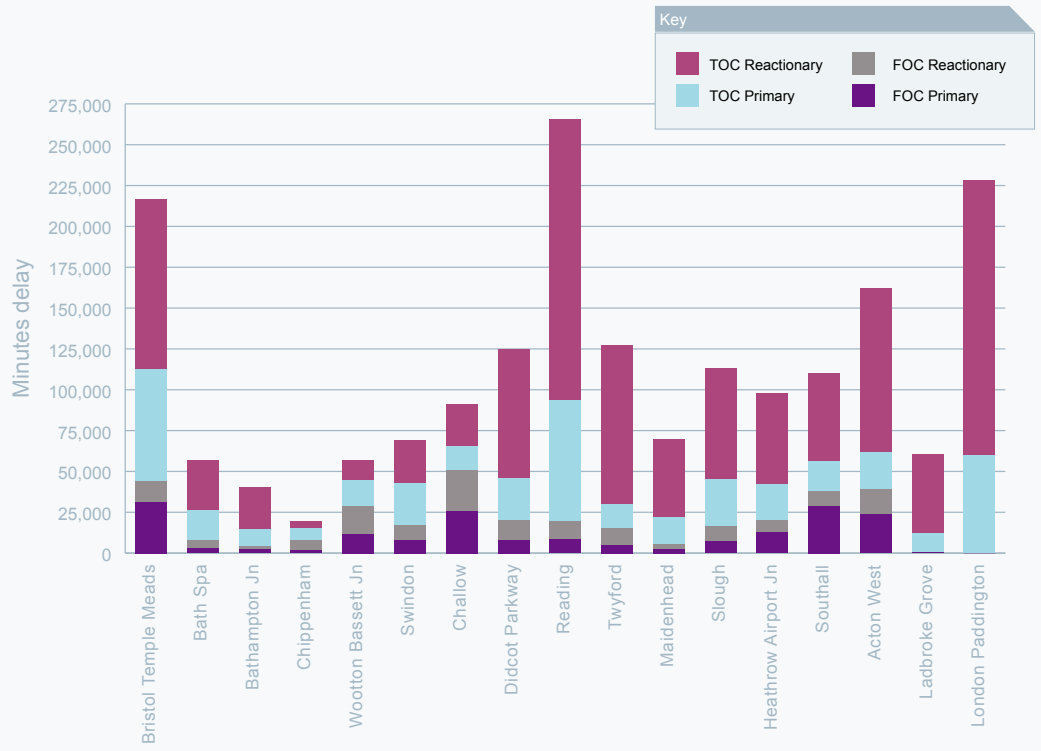


Figure 3.35 – South Wales to South Coast

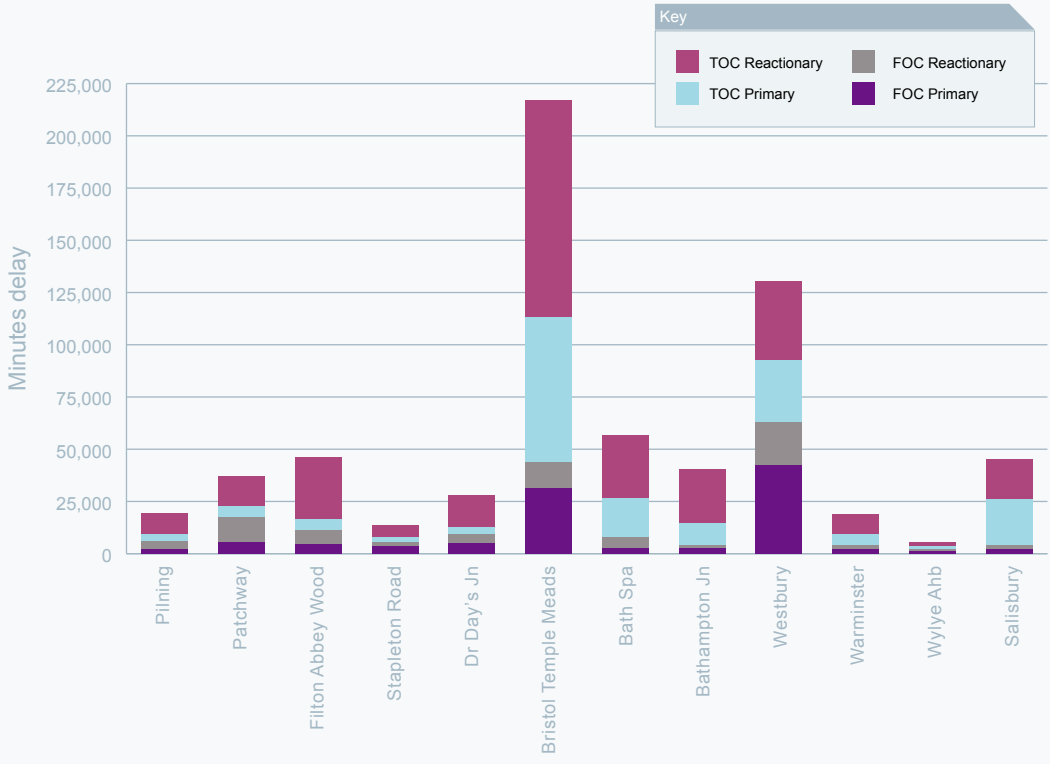
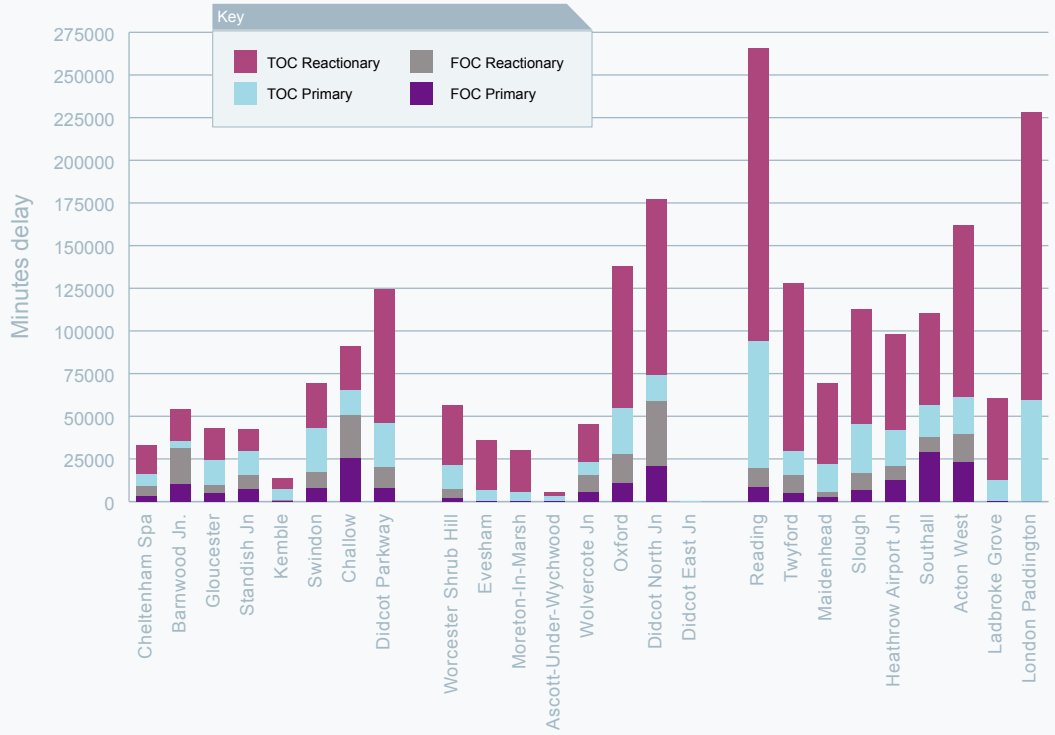


Figure 3.36 – Cotswolds to London Paddington



3.15.8
The reasons for these performance pinch-points are discussed further in **Chapter 6** "Gaps and Options" where the gaps are quantified and the causes of the delays investigated. Interventions are then proposed for development and appraisal to mitigate these delays.

3.16 Future performance targets

3.16.1
The High Level Output Specification (HLOS) performance targets set the aspirations from 2009 to 2014; the forward projection from 2014 needs to be determined. Nationally, the Public Performance Measure (PPM) trajectory is targeted for 92.6 percent by 2014 with an overall 25 percent Network Rail reduction in delay minutes.

3.16.2
The Office of Rail Regulation (ORR) Periodic Review determination stated that Crossrail should be deemed as performance neutral with the effects of the Reading Station Area Redevelopment included in the forward projections of performance to 2014. The RUS has included these assumptions within the baseline.

3.16.3
From the start of Control Period 4, a Freight Performance Measure has been introduced which is equivalent to the Passenger Performance Measure and which, will provide quantifiable performance data to be used to identify and recommend mitigations and improvements for performance of freight services. The ORR determination states that there must be a reduction in delays of 25 percent to freight services by 31 March 2014.

3.17 Performance and timetables

3.17.1
The December 2008 timetable was confirmed by the Stakeholder Management Group (SMG) as the base timetable for RUS analysis. A joint working group between Network Rail and First Great Western was established to focus on the timetable developments for the

Western route, reviewing problem areas and developing recommendations for timetable and performance improvements that can be undertaken up to 2014. The timetable working group and SMG agreed, that timetable changes would be managed through the Network Rail team and added to the RUS baseline with any further future timetable initiatives from 2014 onwards managed through the Great Western RUS process.

3.17.2
Further details of the purpose, results and proposals for future timetable developments are provided in **Chapter 4** “Planned service changes”.

3.18 Summary

The assessment of the current situation has illustrated a number of gaps. These are developed further in **Chapter 6** whereby the process of gap identification, quantification and option appraisal are presented.

4. Planned changes to infrastructure and services

4.1 Introduction

4.1.1

This chapter outlines the major railway enhancement and renewal schemes which are either planned (committed schemes) or proposed (uncommitted schemes) within the forecasting horizon of the Great Western Route Utilisation Strategy (RUS) specifically over the next five to 10 years. It also reviews current and proposed changes to service provision.

4.1.2

Where schemes are committed, these are included within the RUS baseline. The baseline therefore equates to today's railway (as described in **Chapter 3**) plus committed schemes to 2014; this is defined as the "do minimum". In this context, a committed scheme is that which is either included in the High Level Output Specification (HLOS), has confirmed funding or is at GRIP stage 3 (Option Selection) or above (GRIP being Network Rail's "Guide to Railway Investment Projects" and the process by which investment schemes are managed). Any interventions proposed by the RUS are assessed against this "do-minimum" scenario rather than the present situation.

4.1.3

If schemes are currently uncommitted, the RUS cannot assume they will go ahead so will only consider the effect implementation of such projects may have on the strategic recommendations the RUS makes. However, once the RUS is established, it remains a live document and will be reviewed and if necessary updated whenever significant change in policy or circumstances arise.

4.2 Planned changes to infrastructure

4.2.1

This section presents committed enhancement schemes firstly by those specified in the HLOS, then by other committed schemes followed by uncommitted schemes that have also been taken into consideration.

4.2.2 Committed enhancement schemes – High Level Output Specification

The 2008 Periodic Review set Network Rail's outputs, revenue requirement and access charges for the period 1 April 2009 to 31 March 2014 (this is referred to as Control Period 4 (CP4)). This is the first review since the passing of the Railways Act 2005 and introduces the new process whereby the Secretary of State issues a High Level Output Specification (HLOS) and a Statement of Funds Available (SoFA).

4.2.2.1

The HLOS states what the Government wants to buy from the rail industry in terms of reliability, capacity and safety and the projects it will fund over the five years of the control period, the key elements of which are presented here before being discussed in more detail:

- Reliability and punctuality (performance improvement)
- Capacity (by strategic route)
- Safety
- Intercity Express Programme (IEP)
- European Rail Traffic Management System (ERTMS)
- Maidenhead and Twyford platform extensions (relief lines)

- Reading Station area redevelopment
- Cotswold Line redoubling
- Westerleigh Jn to Barnt Green linespeed improvements
- National Stations Improvement Programme (NSIP)
- Network Rail Discretionary Fund (NRDF)
- Strategic Freight Network (SFN)
- Seven Day Railway
- Rolling stock.

The HLOS specifies national targets for Reliability, Capacity and Safety to be achieved by the end of CP4:

Reliability

– 92 – 93 percent Public Performance Measure (PPM) for services split into the sectors of Long distance; London and South East and Regional

– a 25 percent reduction on services arriving at their final destination 30 minutes or more late, or cancelled; with

– £160 million allocated for a performance improvement fund to ensure the industry performance meets the PPM and cancellation and significant lateness outputs

Capacity

– an increase of 22.5 percent capacity to relieve overcrowding

– a target in additional passenger kilometres to be accommodated on each of the strategic routes

– major stations and other urban areas have target numbers of arriving passengers to be accommodated. Figure 4.1 indicates the volume for the areas within the Great Western RUS

– the peak three hours are between 07:00-09:59 and 16:00-18:59 with the high peak hours being 08:00-08:59 and 17:00-17:59

– load factors are defined as the ratio of passengers actually carried on a train compared to the design capacity of the train (including seats and standing allowances)

Figure 4.1 – High Level Output Specification total demand to be accommodated

	Peak three hours			High-peak hours		
	Forecast demand in 2008/09	Extra demand to be met by 2013/14	Maximum average load factor by 2014	Forecast demand in 2008/09	Extra demand to be met by 2013/14	Maximum average load factor by 2014
Paddington	24100	2900	67%	11500	1400	76%
Other urban areas	27700	3600	41%	12300	2000	46%

Safety

– a three percent reduction in the risk of death or injury from accidents on the railway for passengers and rail workers

– the network passenger safety index reduced to 0.240. (A forecast measure of the risk of fatalities and weighted injuries normalised per billion passenger kilometres)

4.2.2.2

The committed enhancement schemes to deliver these CP4 HLOS targets are further described below:

4.2.2.3 Intercity Express Programme (IEP)

The Intercity Express Programme (IEP) provides a new generation of trains catering for longer distance travel and services on interurban and outer suburban routes, replacing the existing High Speed Trains. The introduction of the modern designed units on an increased service level will provide a significant increase in capacity which will make a major contribution towards meeting the increasing demand for rail travel over the next 30 years.

The Great Western IEP fleet is expected to be delivered from 2016 onwards and comprises electric trains up to 260 metres in length. The fleet will also include a significant number of bi-mode trains with five-car formations of around 128 metres in length; capable of being self-powered through the generator car and able to take advantage of overhead electrification. The basis of the new fleet is 10-car sets on interurban services and five-car sets on the outer suburban services which will predominantly operate as standard 10-car sets but with five-car capability for off peak services.

Although the procurement of these new trains is committed, development work is underway on the proposed timetable and calling patterns for these new services. The train type (electric or bi-mode) and configuration (full length ten-car or half length five-cars) depends on the service. A draft service specification was devised for the purpose of the IEP tender documentation to manufacturers and this has been used for the purpose of RUS analysis as a guide to the expected provision of services.

The trains will initially be allocated to the Long Distance High Speed services London Paddington to South Wales, Bristol and West of England and the Thames Valley outer suburban services to Oxford and Newbury as illustrated in Figure 4.2. The deployment of the IEP services further in the West of England will form phase two which is expected to begin in 2019.

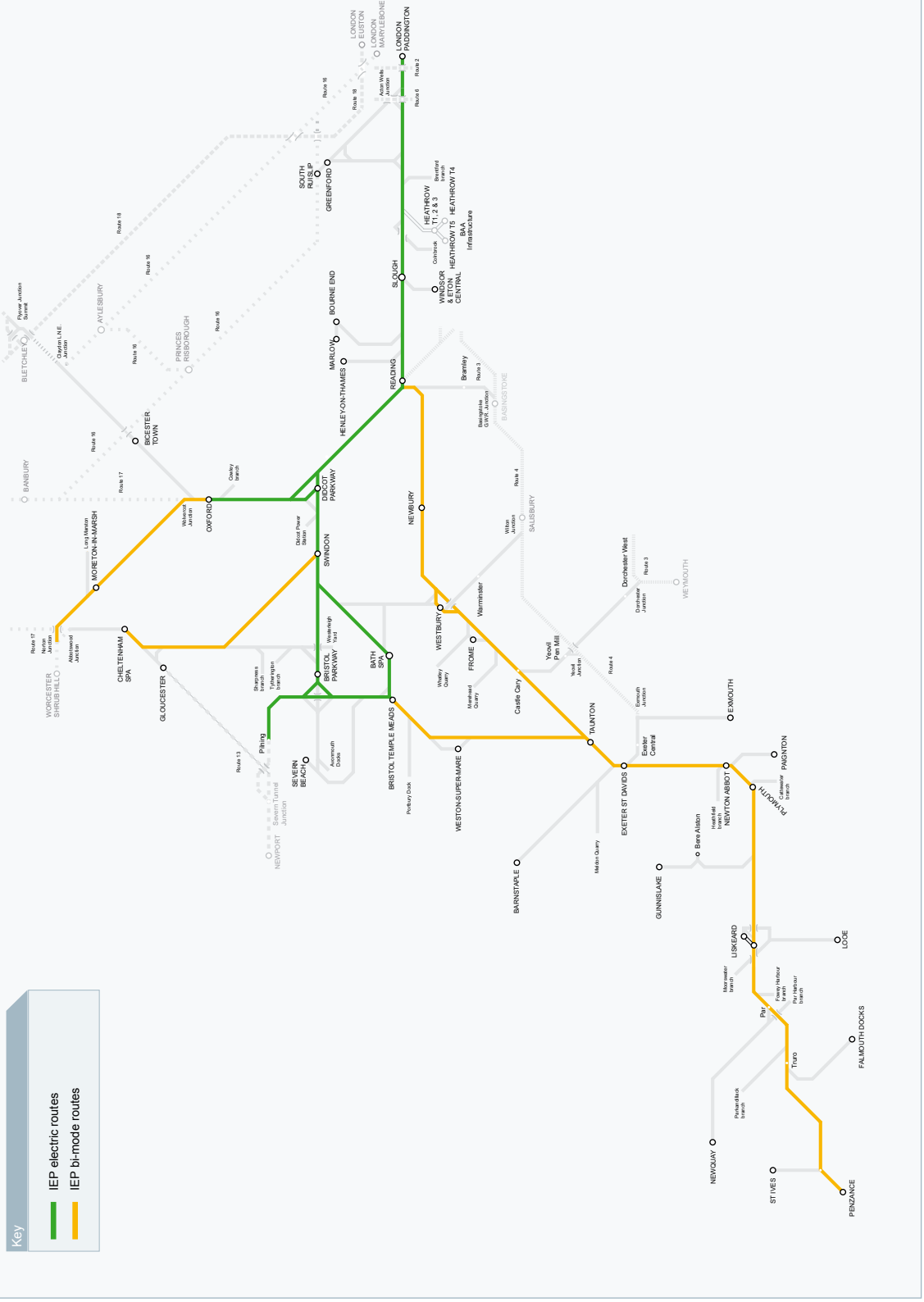
Following the recent commitment in July 2009 to electrify the Great Western Main Line (GWML), IEP fleet deployment will maximise the opportunities this presents.

4.2.2.4 European Rail Traffic Management System (ERTMS)

European Rail Traffic Management System (ERTMS) is a cab-based signalling and train control system which combines the European Train Control System (ETCS) and Global System for Mobile communications – Railways (GSM-R). ERTMS enables the signalling control centres to transmit movement authorities via the GSM-R directly to the train.

The on-board computer knows the braking characteristics of the individual train and is able to calculate and enforce the maximum safe speed at any time preventing the train from exceeding its movement authority. All required information, such as speed, and situation on a forthcoming section of track is communicated directly and continuously to the train driver via a monitor mounted in the driver's cab. With the data being computed on-board, the system can calculate different braking profiles for different train types. This enables movement authorities to be provided and the distance between trains to be reduced thus enabling for a more efficient movement of trains on the network.

Figure 4.2 – Initial deployment of IEP



The introduction of radio-based cab signalling will be a key enabler in the development of the future railway. It will underpin enhancements to railway operations and support capacity improvements beginning in Control Period 5 (CP5) and Control Period 6 (CP6). ERTMS will be applied to all major resignalling schemes from approximately 2014 onwards with the Great Western Main Line expected in 2016.

4.2.2.5 Maidenhead and Twyford platform extensions

The enhancement of the up and down relief line platforms at Maidenhead and Twyford to cater for longer suburban trains in advance of Crossrail will contribute to the delivery of increased capacity into London Paddington to achieve the HLOS capacity metric and support the operational plans. However, the scheme will only be implemented should the HLOS vehicle programme fail to deliver the specified metric.

4.2.2.6 Reading Station area redevelopment

The redevelopment of Reading station is a circa £425 million scheme to relieve the bottleneck currently experienced on the GWML from the West to London and North to South. The programme of works delivers a major capacity, capability and performance enhancement of the station area and its approaches. Based around a core of new platforms; north entrance, transfer bridge and track work within the main station area, the scheme involves a major capacity enhancement through grade separation at Reading West Jn and reinstatement of the east end diveunder. A new train maintenance depot will be constructed to the west of the station replacing the existing depot, which will be demolished to accommodate the new track layout. Preliminary works commenced during 2009 with full implementation currently programmed for 2016.

4.2.2.7 Cotswold Line redoubling

The scheme redoubles around 20 miles of single track on the Cotswolds Line from west of Evesham through to Moreton-in-Marsh and from Ascott-under-Wychwood to Charlbury, with significant signalling modifications, three new station platforms and associated facilities. The current single line sections significantly constrain route performance and capacity and prevent the introduction of a regular, operationally robust hourly clock-face service. It also makes it difficult for the timetable to recover from operational problems elsewhere on the network, especially in the London area and this regularly leads to further late running. The scheme will deliver improved performance on the route for the existing service pattern, and enable the introduction of an hourly service increasing capacity. The scheme further allows through running for freight and diversionary operations. Implementation is planned for 2011.

4.2.2.8 Westerleigh Jn to Barnt Green linespeed improvements

The scheme to raise the linespeeds up to 110mph will deliver a significant reduction in journey times along the Bristol to Birmingham corridor and South Wales to Birmingham corridor which merge north of Gloucester, with associated benefits to the wider cross boundary services. This enhancement will also deliver significant performance improvements as well as providing an increase in both passenger and freight capacity. Implementation is currently programmed for 2013.

4.2.2.9 National Stations Improvement Programme (NSIP)

£150 million will be spent nationally on a National Stations Improvement Programme (NSIP) to develop an informed programme for the enhancement and improvement of stations during CP4. The primary driver for this is the improvement of the service environment including passenger facilities, security and overall visual quality.

The current NSIP tranche 1 stations in the Great Western RUS scope area are presented in Figure 4.3, with a brief description of the scope, current status and estimated completion date, however these are subject to change:

Figure 4.3 – Tranche 1 National Stations Improvement Programme		
Slough	enhance ticket hall, new seating and customer waiting accommodation, toilets, customer information signage, fencing, bicycle parking and redefined north side road access.	2009
Newbury	access improvement works to the station entrance; enhancement works to footbridge; new fences and new totems creating additional drop-off car parking. Additional passenger seating.	2009
Didcot Parkway	upgrade of ticket hall; new waiting accommodation on platforms; additional cycle storage provision and possible increase in retail availability	2009
Swindon	waiting accommodation on platforms, bike storage and forecourt works	2010
Cheltenham	forecourt and access works; customer signage, customer seating and bike storage	2011
Gloucester	forecourt works; customer signage, customer seating, bike storage	2011
Chippenham	waiting accommodation, bike storage, canopies	2011
Exeter St Davids	waiting accommodation on platforms, bike storage, forecourt works and ticket hall upgrades	2011
Truro	waiting accommodation on platforms, bike storage, forecourt works, ticket hall upgrades and car park works	2011
Castle Cary	waiting accommodation, bike storage, fencing, customer shelters and customer seating	2012
St Austell	car park works, customer seating and waiting area	2012
Penzance	new toilets, seating, ticket area upgrades, waiting rooms	2012

Stations currently identified for Tranche 2 (from 2012 onwards) are Westbury, Weston-super-Mare, Exeter Central, Newton Abbot and Plymouth with the decision made on their inclusion and scope expected in 2011.

4.2.2.10 Network Rail Discretionary Fund (NRDF)

The Network Rail Discretionary Fund (NRDF) is a mechanism for funding minor schemes (nominally under £5 million) which are either linked to renewals or are stand alone schemes which have a positive whole-industry business case. A stand alone scheme is an enhancement undertaken as a separate scheme independent of any planned renewal works whilst an enhancement undertaken with a renewal is an enhancement implemented as part of a planned renewal. This specific funding stream reflects the importance to enhance the capacity and capability of the rail network where this will deliver value for money, and meet identified requirements.

Schemes that have been funded by the NRDF and completed to date include the Paddington to Reading relief line linespeed improvements; the Taunton relief line linespeed improvements, the enhancement to Airport Jn and the additional third platform at Bristol Parkway. Network Rail also part funded the Falmouth Branch line upgrade discussed in paragraph 4.2.3.8. Future schemes currently in development with committed funding from the NRDF include the conversion to passenger use of the up and down goods loop at Oxford; the south facing bay platform at Oxford station and the Bath Spa Capacity upgrade which increases capacity through the station area reducing platform reoccupation times.

4.2.2.11 The Strategic Freight Network (SFN)

£200 million has been allocated nationally for the development of the Strategic Freight Network (SFN) during CP4. The SFN seeks to create a network of core and diversionary routes on the heaviest used lines, with capability of gauge and train length available to allow for expected growth in traffic. An optimised pattern of freight trunk routeing will minimise conflicts between freight and passenger traffic, benefiting both forms of traffic.

For the Great Western RUS area the diversionary route between Southampton and Basingstoke via Laverstock and Andover has been identified and approved as a committed scheme to enable W12 gauge. It will be the first step in a strategy to provide both additional capacity and diversionary capability on the route from Southampton to the West Midlands and West Coast Main Line. The gauge enhancement to the main line route forms the initial Transport Innovation Fund (TIF) enhancement scheme (see 4.2.3.5 for further details).

Train lengthening opportunities are also being assessed under the SFN, with the Southampton to West Midlands route a candidate scheme currently being progressed to GRIP stage 3 (Option Selection), permitting growth without increasing capacity utilisation. However, in order to facilitate this infrastructure changes may be necessary.

The Channel Tunnel route to the south of London has funding of £10 million allocated for its delivery. There are two potential components of this; the first is an enhancement of the route between Tonbridge and the West London Line via Redhill to allow Class 92 locomotives to operate. The second is to look at creating a south of London orbital route between Tonbridge and Reading via Redhill and Guildford and is currently uncommitted.

Also included in the SFN is a specific fund for infill gauge schemes to progress towards the SFN vision of extensive W12 gauge clearance and funding provision of £5 million for studies to develop identified schemes for delivery in CP5 – these are currently being defined and agreed with stakeholders.

4.2.2.12 Seven Day Railway

The Office of Rail Regulation (ORR) has allocated £160 million nationally to assist in the development of the Seven Day Railway initiative. The Seven Day Railway programme of change will increase current levels of network availability by keeping passengers on trains rather than rail replacement buses during engineering works.

The funding for the Seven Day Railway initiative will be spent on both infrastructure enhancements to facilitate the increase in rail operations such as crossovers and bi-directional signalling, plant and equipment to facilitate working under the new access patterns and protection systems for staff as well as changing Network Rail's work methods.

The overall vision for the Seven Day Railway initiative on the Great Western is to build a railway that reduces disruption to all customers (passenger and freight) and better meets their needs, whilst delivering efficient and effective maintenance, renewals and enhancements. Within the Great Western RUS area, the routes identified in the HLOS for Seven Day Railway are:

- London Paddington to Cardiff
- London Paddington to Bristol
- London Paddington to Exeter
- Bristol to Birmingham.

Following discussions with operators, the following extensions to this programme are proposed which include the main lines from Cardiff to Swansea; Exeter to Plymouth and Reading to Birmingham. A back to basics review of both the train timetable and maintenance methods and requirements will lead to further improvements initially proposed within Wales.

4.2.2.13 Rolling stock

The Department for Transport's (DfT) White Paper "Delivering a Sustainable Railway" (2007), stated that a rolling stock plan would be published, setting out in greater detail how rolling stock would be used to deliver increased capacity. While the primary focus of this rolling stock plan is on delivering the additional capacity in CP4 it also sets out the steps that the Government is taking to achieve the longer-term aspirations set out in the Rail Technical Strategy.

In terms of the HLOS, the additional capacity will be secured either through the procurement of new rolling stock; or through redeploying existing rolling stock which is displaced by new. The replacement, whether new or redeployed from elsewhere, will derive opportunities for journey time improvements and increase operational flexibility.

First Great Western has submitted their Request for Proposal for the HLOS rolling stock to the DfT for 40 additional vehicles for the Thames Valley area and 12 additional vehicles for the West of England (including Devon and Cornwall). This has been assumed for the purposes of the Great Western RUS baseline as a committed scheme.

With the recent commitment to the electrification of the GWML, the requirements for rolling stock radically changes as there becomes less need for diesel trains and a greater requirement for electric trains. The previously planned procurement of new diesel trains has now been superseded with a new rolling stock plan to be published by the DfT in autumn 2009. Until this information is available, the current assumptions remain. The RUS will revise any analysis accordingly following publication of the rolling stock plan later in the year. An update will therefore be provided in the final Great Western RUS.

4.2.3 Other committed enhancement schemes (2009 – 2019)

The following schemes are other committed enhancements within the Great Western RUS area. These schemes, in addition to the capacity specified schemes above, have formed part of the baseline and as such have been taken into consideration during the appraisal work.

4.2.3.1 Electrification

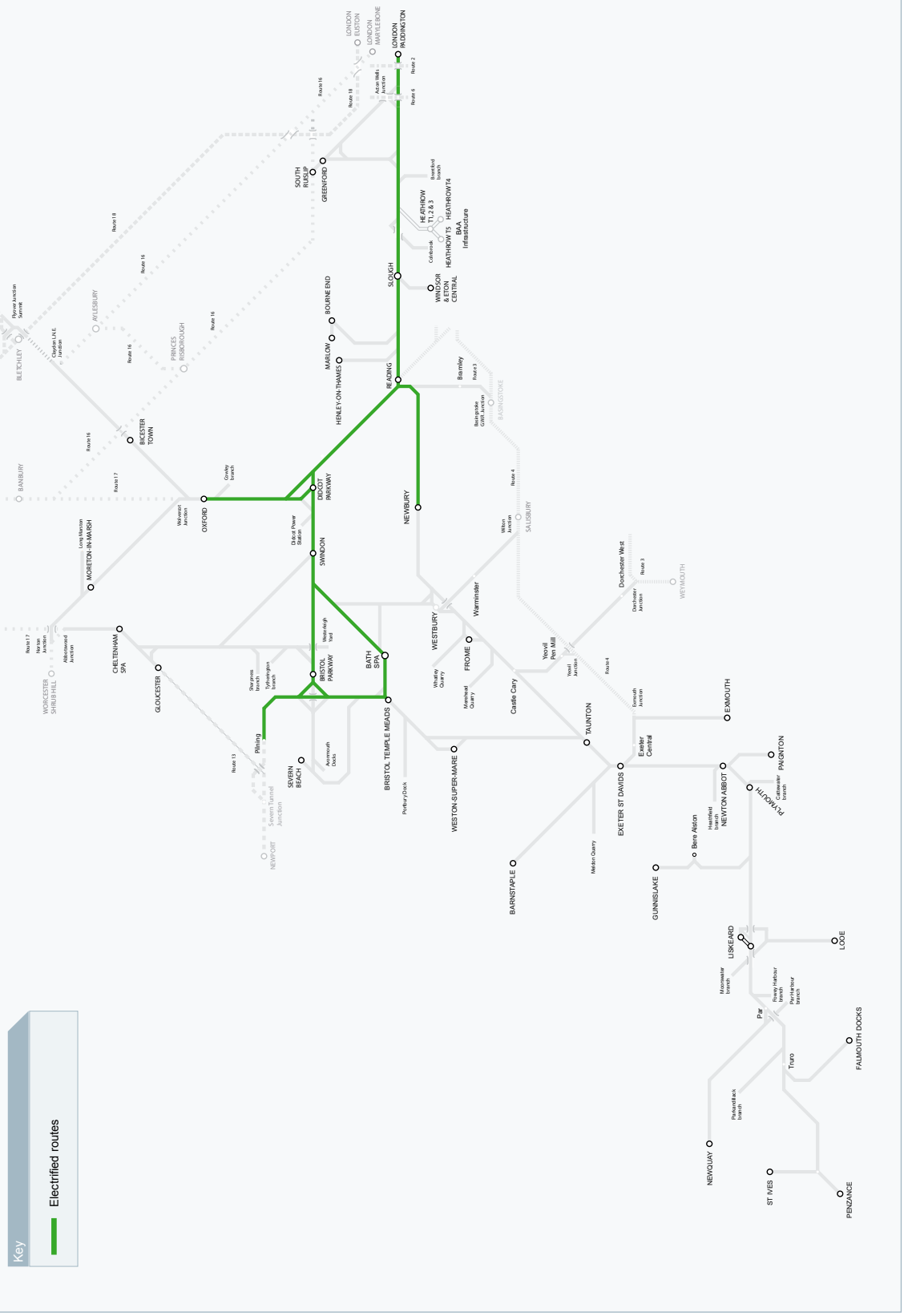
In July 2009, the commitment to electrification of the GWML beyond the scope of Crossrail to Maidenhead, in accordance with the position set out in the Network RUS (May 2009) was announced. The route from London Paddington to Bristol/Swansea, and to Oxford/Newbury, will be electrified as shown in Figure 4.4. Development works will commence immediately, with the majority of construction work between 2014 and 2016. Subject to detailed planning work, electric services will be introduced progressively: London Paddington to Oxford, Newbury and Bristol by the end of 2016 and London Paddington to Swansea by the end of 2017.

4.2.3.2 Crossrail

Crossrail is a new railway proposal for London and the South East. The route utilises the current network of lines and will run from Maidenhead and Heathrow in the west across London into Essex and Greater London in the east, travelling underground through new twin-bore tunnels between London Paddington and East London. It will initially operate with 10-car electric trains, capable of carrying more than 1500 passengers in each train delivering substantial economic benefits in London and the South East and across the UK. Crossrail will make travelling in the area easier and quicker whilst reducing crowding on London's existing transport network.

Royal Assent was given to the Crossrail Bill in July 2008 and the new Crossrail Act 2008 gave authority for the railway to be built. Main construction works are scheduled to commence in 2010 with the service operational from 2017. Further details on the scope and developments for Crossrail are presented in **Chapter 8**.

Figure 4.4 – Electrification of Great Western Main Line



4.2.3.3 West Ealing bay platform

As featured in the Thames Valley Regional Planning Assessment (2007) this scheme will provide additional capacity into London Paddington for other services. Greenford services will terminate at a new west facing bay platform at West Ealing and could be increased in frequency. The scheme is included within the Crossrail proposals and as such implementation forms part of the Crossrail programme and is currently scheduled for 2013.

4.2.3.4 Reading Green Park

A third party funded new station between Reading and Basingstoke adjacent to the M4 motorway at Junction 11, is being developed to serve the business community at Green Park. The station is proposed to be completed by 2011.

4.2.3.5 Southampton to West Coast gauge enhancement

This scheme to construct a W10 gauge cleared route from Southampton to the West Coast Main line via Basingstoke, Reading, Didcot and Leamington is a Transport Innovation Fund (TIF) scheme which will enable the movement of 9ft 6in containers on standard height wagons on this core route. Preliminary works are underway with completion programmed for 2011.

4.2.3.6 Swindon to Kemble redoubling

To improve capacity and performance on the Swindon to Kemble route this scheme proposes to redouble a 12 mile section of single line. This will enable an improvement in reliability and the use of this section of the railway as a key diversionary route for South Wales when the main line route via the Severn Tunnel is closed. In its current role, the single line section severely restricts service development, diversionary capacity and performance. The scheme is currently being developed to GRIP stage 4 (Single Option Development); however, there is currently no commitment to fund implementation. The South West Regional Development Agency (SWRDA) has however submitted a bid for £20 million as a contribution to the scheme as part of their short-term commitments in the South West Regional Funding advice for 2009 to 2019.

4.2.3.7 Clifton turnback

As part of the Severnside Community Rail Partnership, Bristol City Council and Network Rail have jointly funded the provision of a turnback facility at Clifton Down station on the Severn Beach branch line. This enhancement permits the turning of trains back towards Bristol Temple Meads during times of perturbation and introduces the operational flexibility to allow the operation of a more frequent service between these stations. The scheme was completed in April 2009.

4.2.3.8 Falmouth branch line upgrade

This project was the aspiration of Cornwall County Council to enhance the service on the Falmouth Branch line to two services an hour throughout the day. The provision of a new passing loop and platform improvement works at Penryn were undertaken as part of the scheme, which was completed in April 2009. The route has recently been designated a Community Rail Line and this enhancement is promoted by the DfT as a way forward for the Community Rail initiative.

4.2.3.9 Access for All

In 2005, the DfT agreed a funding pattern for the next ten years to provide an ‘accessible route’ at selected stations as part of an Access for All Programme. The Access for All Programme is part of the Railways for All Strategy, launched in 2006 to address the issues faced by mobility impaired passengers using railway stations in Great Britain. Central to the strategy is the commitment of £35 million nationally per year, until 2015, for provision of an obstacle free, accessible route to and between platforms at priority stations. This generally includes the provision of lifts or ramps, as well as associated works and refurbishment along the defined route.

The current stations, scope and programme for those stations in the Great Western RUS area is as follows:

Figure 4.5 – Access for All programme of works

Station	Scope	Completion
Exeter Central	Lifts	Completed
Taunton	Lifts	Completed
Westbury	Lifts	Completed
Twyford	New footbridge, lifts, tactiles	2009
Chippenham	Lifts and footbridge	2011
Gloucester	Lifts and footbridge	2011
St Erth	Lifts, footbridge	2012
Burnham	scope to be confirmed	2014

4.2.4 Uncommitted enhancement schemes (2009 – 2019)

There are a number of schemes and initiatives for improving future capacity, capability and/or performance, which have been considered, even though they are currently unfunded. As there is no firm funding commitment, they are taken as uncommitted (so do not form part of the RUS baseline) but due to their significance and the effect that can be achieved through their implementation, we have, where necessary, considered there impact through our analysis.

4.2.4.1 High speed lines

HS2 is a new company established to review the development of potential high-speed lines improving connectivity between London and the North West – HS2 is mainly focusing on the route from London to the West Midlands, with potential links to Heathrow Airport.

Network Rail has commissioned a New Lines Programme to investigate the case for building one or more new lines as additions to the national network. The focus of the New Lines Programme is to test the hypothesis that in the future, the existing rail lines from London to the north and west will be operating at full capacity and the conventional and next generation tools for increasing capacity will be exhausted. There will be the need for additional intervention, including the building of a new high speed line. The current phase of the work programme is aimed at developing a business case for a new high speed line for an exemplar corridor.

4.2.4.2 Paddington station remodelling

With the introduction of IEP trains, the platform area at Paddington station will need remodelling with potential signal relocations, additional electrification and platform lengthening in order to accommodate the volume of growth – the current IEP service specification is likely to require up to 14 long platforms. In addition to these station works, due to the predicted increasing volumes of traffic in each direction (with the introduction of IEP and Crossrail), grade separation of the throat into Paddington is also a likely requirement.

4.2.4.3 London Heathrow – western access

There are longer-term aspirations for accessing Heathrow Airport by rail via a western access (ie. on to the Great Western Main Line, west of West Drayton) beyond the objectives of Crossrail. This would enable

trains to run directly between Reading and Heathrow Terminal 5 (T5) (for which passive provision has been provided at T5). The scheme is in the early stages of development.

4.2.4.4 AirTrack

AirTrack is a BAA proposal to connect Heathrow Airport directly to the national rail network south of the airport through the provision of three new services to T5 via Staines: from London Waterloo via Richmond; from Guildford via Woking; and from Reading via Bracknell. The scheme will require four kilometres of new railway to connect the new station at T5 to the existing Windsor line near Staines with the rebuilding of 400 metres of railway in Staines.

The redevelopment work at Reading station (under the Reading Station Area Redevelopment scheme) provides for additional capacity to be introduced at the southern side of the station with a new third platform and platform extensions to enable longer 12-car trains to be accommodated. The new Reading station will enable the terminus of the AirTrack proposal to offer a new rail link into Heathrow Airport from the west. Implementation of AirTrack is currently programmed for 2014 (subject to funding) and would provide the opportunity for more rail service options in the future. The scheme is currently funded to complete the required Transport and Works Order (TWO).

4.2.4.5 East West Rail

The primary objective of this initiative is to improve east-west connectivity in the Oxford to Cambridge arc. The East West Rail (EWR) Consortium wish to reintroduce passenger services from Oxford and Aylesbury to Bletchley and Milton Keynes. The primary purpose of the reopened railway is as a local transport link supporting growth and development, and as a means of easing traffic congestion problems in Oxford, Bletchley and Milton Keynes. Further development of the route would deliver significant capacity headspace on the Cherwell Valley and other existing routes and is seen as a long-term strategic route, supporting inter-regional passenger services and creating an alternative freight route between the South of England and the Midlands, the North and Scotland.

4.2.4.6 Evergreen III – Bicester Chord

This forms part of Chiltern Railways secondary franchise commitment to provide a London Marylebone to Oxford service through the construction of a new south-west chord line connecting the Chiltern main line and the former Oxford to Cambridge line where they cross south of Bicester. The scheme will rebuild the Bicester to Oxford section of the route for 100mph capability, with five minute planning headways and involves the construction of a new Park and Ride station at Water Eaton, to the north of Oxford. The scheme aims to be operational by 2012.

4.2.4.7 Reopening of the Portishead line

A scheme to reopen six kilometres of disused railway between the current limit of the line adjacent to the Portbury Dock boundary (Portbury Jn) and Portishead town centre with the conversion of the current freight only line to passenger status is undergoing evaluation.

The reopened line would support both a passenger service to operate between Portishead and Bristol Temple Meads and freight services for Portbury Docks. Passenger service frequency is yet to be confirmed and is subject to a range of optioneering decisions. Promoted by North Somerset Council (NSC), the scheme is part of a wider West of England Partnership promoted Bristol area bid under the Transport Innovation Fund (TIF) and is currently being developed to GRIP stage 3 (Option Selection). The South West Regional Development Agency (SWRDA) has also submitted a bid for £25 million as a contribution to the scheme as part of their medium term commitments (2014 – 2019) in the South West Regional Funding advice for 2009 to 2019.

4.2.5 Planned major renewal schemes

Figure 4.6 lists the major planned renewal schemes within the RUS area for CP4:

Figure 4.6 – Major planned renewal schemes for CP4

Implementation	Scheme
2009/10	Switch and Crossing (S&C) track renewals – Ableton Lane, Bathampton Jn, Oxford North Jn and Thingley Jn, Heywood Road Jn, Long Rock and St Budeaux Jn
2009/10	Earthworks renewals – Chipping Sodbury, Cleeve, Kemble and Tredington, Heywood Road Jn and Dawlish
2009/10	Building Renewals at Exeter St Davids station
2010/11	S&C renewals – Southall West Jn, Barnwood Jn, Berkeley Road Jn, Lawrence Hill, Stoke Gifford Jn, Thingley Jn and Whitehill, Keyham, Saltash and Tiverton
2010/11	Earthworks renewals – Bourton, Rodbourne and Uffington
2010/11	Didcot Parkway, Taunton, Exeter St Davids and Plymouth – CCTV, Customer Information Systems and Public Announcement
2011/12	S&C renewals – Acton East Jn, Greenford, Didcot North Jn, Dr Days Jn, Grange Court, Yatton, Taunton and Topsham
2011/12	Telecoms renewals - Swindon and Bristol Temple Meads - CCTV, Customer Information Systems and Public Announcement
2012/13	S&C renewals – Didcot East, Newbury West, Woodborough, Swindon East, Aish, Hermerdon and Saltash

4.2.5.1

The major planned renewal schemes currently programmed for CP5 include the resignalling of Reading, Oxford, Swindon, Bristol, Exeter and Plymouth. However, with the proposed introduction of ERTMS on the Great Western Main Line between London Paddington and Bristol due to commence towards the latter stages of CP4, with estimated completion during CP5, it is anticipated that this will supersede the existing signalling system and in effect replace the need for conventional resignalling.

4.2.5.2

The resignalling of Exeter and Plymouth will continue based on current asset condition and is currently programmed for implementation during 2016 –– 2018, with Cornwall resignalling programmed within CP6.

4.3 Planned service changes

4.3.1 December 2009 timetable changes

During the production of the Great Western RUS, there have been two timetable changes (December 2008 and May 2009). Some of the earlier analysis resulted in identifying proposals which have since been implemented as part of these timetable changes and latterly will be introduced in December 2009. The specific elements of this are addressed further in **Chapter 6**; however, the following amendments are expected to be undertaken in the December 2009 timetable (subject to the normal timetabling process and franchise Service Level Commitment consultation where applicable):

4.3.2 First Great Western

4.3.2.1 High speed services

- To provide faster journey times between South Wales and London for peak business flows it is proposed that the 05:59 Monday – Friday Swansea to

London Paddington ceases to call at Didcot Parkway and Reading arriving London Paddington at 08:55

- To provide a faster evening service to South Wales it is proposed that the Monday-Friday 16:45 from London Paddington should cease to call at Didcot Parkway
- To reflect patronage levels the 10:35/10:54 Plymouth to London Paddington will start from Bristol Temple Meads. This service is paralleled in Devon by the 08:37 Penzance to London Paddington (via the Berks and Hants line)
- To reflect patronage levels it is proposed that on Saturdays the 19:00 London Paddington to Taunton service terminates at Bristol Temple Meads but is replaced by an extension of the 19:50 Cardiff Central to Bristol Temple Meads to Taunton, which will provide additional calls at Bedminster and Parson Street. The last London Paddington to Weston-super-Mare/Taunton through trains will remain at 18:30 and 20:30
- Sunday morning services between Bristol and London Paddington run at a core hourly basis but the service commences with a non-standard pattern of departures at 07:40, 08:10 and 09:00 from Bristol Temple Meads

4.3.2.2 London Thames Valley services

- To provide an enhanced service at Radley it is proposed that off peak Monday–Friday departures from London Paddington at XX57 and Oxford at XX37 call additionally at Radley

4.3.2.3 West services

- An additional service Monday–Friday will be provided from Bristol Temple Meads (16:54) to Westbury (17:14)

4.3.3 CrossCountry

- CrossCountry propose no changes and the timetable will remain as per May 2009.

4.3.4 Removal of South West Trains services west of Exeter

From December 2009, South West Trains (SWT) will terminate their London Waterloo to South Devon services at Exeter St Davids, ceasing operations west of Exeter to Paignton and Plymouth. The London Waterloo to Exeter St Davids service will increase to one train per hour as opposed to the current two-hourly service facilitated by the provision of a new passing loop at Axminster implemented during 2009. This fulfils the company's franchise commitment to provide an hourly service between Exeter St Davids and London Waterloo via Honiton, Axminster and Crewkerne.

The new infrastructure enables this increased service level but in order to facilitate additional resources for the increased hourly service, the termination point becomes Exeter St Davids. The DfT has requested First Great Western to provide similar services west of Exeter once the SWT services are withdrawn. This will be facilitated in the short term by locomotive and coaches in the Bristol area. Discussions on the longer-term rolling stock solution are ongoing.

4.3.5 Future service provision with IEP and Crossrail

4.3.5.1

With the introduction of IEP (2016) and Crossrail (2017) there will be significant changes to the service provision across the route. With the absence of confirmed timetables for both IEP and Crossrail, the current service specifications have been used to assess capacity and service provision. Detailed below are the anticipated changes presented by the current service structure as per the current draft service specifications. It is recognised that when final specifications for these schemes are available, further, more detailed analysis will be required to ensure that IEP, Crossrail and freight services can all be accommodated.

4.3.5.2 Main line services (Great Western Main Line)

IEP trains will begin to replace the current eight-car High Speed Trains across much of the GWML network including the Oxford/ Cotswold corridor. Projected growth in demand is expected to be catered for by a substantial increase in capacity of the new 10-car train formations (formed of two five-coach units) which will be capable of working in electric or diesel mode.

In addition to the higher capacity of the new trains themselves, an increase in frequency from two trains per hour to three trains per hour is currently proposed for the Oxford corridor, with through working to the Cotswold Line (from Oxford to Worcester, Great Malvern and Hereford) at standard hourly intervals. This is as per the current service specification.

4.3.5.3 Main line services (interurban)

On the core London Paddington/Bristol/South Wales corridor IEP trains will continue to provide half hourly services, with some South Wales services accelerated to run non-stop between Reading and Bristol Parkway. A fifth train per hour is currently proposed between London Paddington and Bristol Temple Meads via Bristol Parkway to cater for projected growth more generally. Swindon and Didcot will be served by alternative high speed services which will include some services starting from these stations. The existing two-hourly through service from London Paddington to Cheltenham will potentially increase to an hourly frequency.

4.3.5.4 Outer suburban (beyond Slough to Oxford and Newbury)

In order to cater for Twyford an outer suburban service will be operated on the relief lines, integrated with Crossrail Maidenhead services, which will run between London Paddington and Oxford, calling at the local Thames Valley stations between Reading, Didcot and Oxford. With electrification of the GWML, it is envisaged that these services will be four-car electric trains (redeployed from the Thameslink programme) replacing the existing two and three-car diesel trains.

All Henley branch trains will operate to Twyford only in connection with these services and all Marlow/Bourne End services will operate to Maidenhead only, both will remain as existing diesel trains.

On the Kennet Valley section between Reading and Newbury, services will be provided by an hourly semi-fast service between London Paddington and Exeter St Davids, with extra peak hour services between London Paddington and Newbury. In conjunction with this arrangement longer distance services (to Plymouth and Cornwall) will run faster to Exeter St Davids than at present.

4.3.5.5 Inner suburban (services east of Slough)

Crossrail services will operate at a similar frequency to today with four trains per hour all day Maidenhead to West Drayton (inclusive) and on to London Paddington and the Crossrail core. Projected growth in demand will be catered for by a substantial increase in the capacity of the new, standard 10-car electric train formations. The new trains will feature a greater proportion of standee capacity to reflect the higher level of demand for short commuter journeys to inner and central London.

Between Hayes and Acton (inclusive), the Heathrow Terminal 4 service will provide a minimum level of four trains per hour. In the peak hours, eight trains per hour, all day Crossrail services will be supplemented by a further two additional trains per hour east of West Drayton. The normal linkage of these services across London will be between Maidenhead and Shenfield and between Heathrow Terminal 4 and Abbey Wood.

Further details of the introduction of IEP and Crossrail and the impact on the Great Western RUS area are provided in **Chapter 8**.

4.4 Definition of "do-minimum" case

4.4.1 Generic assumptions (for non-London services)

Options developed later in this document (**Chapter 6**) are compared against a do-minimum case that assumes the interventions in 4.2 as committed schemes will happen as planned. Any interventions that are proposed in the RUS are therefore assessed against this "do-minimum" rather than the present day situation.

4.4.2 Four scenarios for London services

4.4.2.1

As there were a large number of known developments (committed and uncommitted) already programmed for the Thames Valley area over the time period of the RUS, four different scenarios were developed for the "do-minimum" case for London services. This is due not only to the mix of interventions but also due to the high level of uncertainty in the actual timeframes, scope and service specifications of these proposals at this time.

4.4.2.2

The introduction of IEP on the Long Distance High Speed services is a generic assumption for this RUS as a commitment under the HLOS. However, in developing the RUS, it was uncertain whether diesel or electric IEP trains would be procured which gave rise to two alternative do minimum cases – diesel and electric.

4.4.2.3

Furthermore, until July 2008 when the parliamentary order gave Crossrail Royal Assent, it was uncertain whether Crossrail would be delivered as scheduled for 2017. This also gave rise to two different do minimum cases – with and without Crossrail.

4.4.2.4

The other variable within this scenario matrix was electrification. When work on the Great Western RUS commenced in March 2008, electrification was still an uncommitted desirable. This has since progressed with the recent commitment to electrification of the Great Western Main Line. However, due to the uncertainty of this during the process of RUS analysis two different do minimum cases were considered – with and without electrification.

4.4.2.5

Since Crossrail, IEP and electrification interventions interact, it was necessary to develop four different scenarios to manage the different possibilities that could exist. This enabled the RUS to progress with analysis and proposals for potential interventions to assist with the issues of capacity and performance that were identified through the gaps process (detailed in **Chapter 6**).

4.4.2.6

The table below describes the four scenarios used for the London services:

Figure 4.7 – Scenario matrix for London services

Scenario	IEP	Electrification	Crossrail (to Maidenhead)
A	Y	N (IEP-Diesel)	N
B	Y	Y (IEP-Electric)	N
C	Y	N (IEP-Diesel)	Y
D	Y	Y (IEP-Electric)	Y

Electrification refers to London Paddington to Bristol/Swansea and Oxford/Newbury

IEP refers to London Paddington to South Wales, Bristol and some West of England services

Scenario A

- Electrification as now (Heathrow)
- No Crossrail
- Current suburban services
- IEP diesel

Scenario B

- Electrification
- No Crossrail
- Current suburban services
- IEP electric

Scenario C

- Crossrail plus electrification to Maidenhead
- Residual suburban service to Paddington High level
- IEP diesel

Scenario D

- Crossrail to Maidenhead
- Electrification
- Residual suburban service to Paddington High level
- IEP electric

4.4.2.7
The interventions that have been assessed against these scenarios, as part of this RUS, are detailed in **Chapter 6** Gaps and Options.

4.5 Rolling stock

4.5.1
The proposed rolling stock replacement programme creates an opportunity which potentially will not reoccur for another 30 years. This involves the choice of new rolling stock which could provide a significant opportunity to address a number of gaps that exist in this RUS. These benefits are magnified with the incremental extension of electrification. The replacement, whether new or redeployed from elsewhere can unlock additional journey opportunities; increase operational flexibility and potentially improve capacity.

4.5.2
The electrification programme for the GWML radically affects the requirements for rolling stock over the next decade. There will be less need for diesel trains and a greater requirement for electric trains. The current proposals under the HLOS rolling stock plan have been used to date as part of the RUS baseline. However, it is recognised that with the commitment to electrification, the previous plan for new diesel trains has been superseded. As such a new rolling stock plan is expected to be published, of which the RUS will take cognisance of and adjust analysis accordingly.

4.5.3
Introducing additional capacity during the peak, whether as longer trains or more frequent short trains, will generally require additional rolling stock to be sourced. The standard approach when assessing these options in a RUS is to include the full lease cost of the extra rolling stock unit(s), giving due consideration to the types that might be available from leasing companies or manufacturers if new build is required.

4.5.4
The RUS therefore seeks to identify principles for future rolling stock provision, as a contribution to a wider rolling stock strategy to be developed by or on behalf of the Government. The aims should be to enable:

- additional rolling stock to be introduced incrementally on routes in the Great Western RUS area
- appropriate rolling stock to be deployed on each service group.

4.6 Depots and stabling

4.6.1

Nationally a strategy is being developed in order to accommodate the additional vehicles procured as part of the HLOS. This will affect depots across the RUS area which may need to be enhanced or have additional facilities provided as it is recognised that the current capacity and facilities available at the depots may not be able to accommodate the new vehicles procured as part of the fleet replacement due around 2014.

4.6.2

It is also recognised that there is limited capacity at the existing depots for the stabling of any more units. Therefore, depending on the specification of the new units, facilities at current depots may need to be reviewed as an integral part of the fleet replacement programme. The Network RUS is examining the rolling stock and maintenance depot strategies for the whole of the UK network and is due to commence consultation in 2009.

4.6.3

Chapter 3 presented the current situation with regards to depots and stabling capabilities within the RUS area and it is expected that this will be sufficient for the expected number of vehicles under the HLOS within the Thames Valley region. A review of the requirements in the West of England is underway with a number of locations being considered.

4.6.4

In addition to the HLOS vehicles, IEP will also bring about its own requirements for depots, stabling and maintenance facilities with the current proposal to use the North Pole Depot in London and new facilities to be built in Reading and Bristol. **Chapter 8** expands on these requirements with the development work being undertaken.

5. Planning context and future demand

5.1 Introduction

5.1.1

This chapter considers the planning context for the Great Western Route Utilisation Strategy (RUS). The Great Western RUS is related to a number of other strategies and policies covering rail and other transport modes; a synopsis of the key documents that have influenced the analysis is presented. This is followed by the predicted changes in demand for both the passenger and freight markets within the area of the Great Western RUS, outlining the process undertaken and the resultant predictions.

5.1.2

The following key documents represent the planning context and have been influential in the RUS process:

- Regional Spatial Strategy (RSS) for the South West (draft)
- Regional Economic Strategy (RES) for the South West
- Regional Planning Assessments (RPA) for the Thames Valley and South West
- The South West Rail Prospectus
- The Future of Air Transport
- The Strategic Rail Authority Great Western Main Line RUS
- Network RUS: Scenarios and Long Distance Forecasts and Electrification
- Freight Route Utilisation Strategy (FRUS)
- Delivering a Sustainable Transport System (DaSTS).

5.2 Regional planning documents

5.2.1 Regional Planning Assessments

5.2.1.1

The Department for Transport's (DfT) Thames Valley and South West Regional Planning Assessments for the railway published in May 2007 and June 2007 respectively considered the impact of future levels of growth across the rail network and the capacity issues that may emerge from this over the short, medium and long term to 2026.

5.2.1.2

The RPAs identify the role of rail as supporting London's role as a world city and the local economies of other key urban centres, by enabling rail commuting linking employers to sources of skilled labour; supporting the growth and integration of London and South East, and the South West economies. The South West Rail Prospectus also notes that rail has a key role to play in facilitating longer distance movements connecting the South West to London, the South East and West Midlands as well as supporting tourism and providing access to ports and airports.

5.2.1.3

The DfT's Thames Valley RPA forecasts growth for morning peak arrivals into Reading to increase by 15 percent between 2006 and 2016 and by 31 percent to 2026. The South West RPA forecasts that demand for rail journeys towards London in the morning peak will be met throughout the route by increased service provision up to 2016. However, by 2026 seating demand is forecast to be in excess of capacity from as far as Castle Cary by up to 14 percent. The RPAs also indicate that interurban growth on the Bristol to London Paddington route is forecast to be in excess of seating capacity by as much as 18 percent, from as far west as Chippenham by 2026[1]. Demand for

holiday traffic to Devon and Cornwall is set to grow, with significant growth forecast for local services to Exeter, mainly on the Exmouth branch and from the south Devon area.

5.2.1.4
Demand for travel from the South West to London and to the Midlands and the North is also on the increase and is expected to continue. Between Bristol and Birmingham 36 percent growth in demand is forecast between 2006 and 2016 with 63 percent growth to 2026. There is a key business need for connectivity to London and the South East, including Heathrow Airport with journey times from key centres such as Taunton in under two hours, Exeter under two and a half hours and Plymouth in under three hours. Demand has been particularly strong in the evening peak, on Fridays and throughout the weekend, with Sundays being CrossCountry's second busiest day of the week.

5.2.1.5
The Government's "Delivering a Sustainable Railway" White Paper (2007) also proposes a continuation of the Community Rail Development Strategy. This aims to improve long-term sustainability on local and rural lines by encouraging demand growth and managing costs down. With the exception of the Exmouth and Paignton branch, all branch lines in Devon and Cornwall have either a Community Rail line or service designation, therefore demand on these lines will be strongly influenced by their respective local rail partnerships.

5.2.2 Regional Spatial Strategy for the South West 2006 – 2026

5.2.2.1
The draft Regional Spatial Strategy for the South West sets the spatial framework for the future development of the region from 2006 to 2026. It seeks to tackle the major challenges that the region faces over this period, including accommodating a substantial increase in population and a growing economy, tackling climate change and reducing the region's ecological footprint as defined by the consumption of natural resources and energy.

5.2.2.2
Transport links, business, social requirements and environmental concerns, as well as the way different areas and places function, all have a significant influence. An important spatial context for the South West is provided by the relations it has with adjacent regions namely the South East, West Midlands and Wales. Evidence demonstrates that the most significant linkages between the South West and the wider United Kingdom are those with London and the South East, particularly for the business community.

5.2.2.3
By 2026, the RSS estimates that the region could have a population of around six million. Regional housing requirements plan for economic growth at 2.8 percent per annum with an increase in the total number of jobs by 2026 of between 365,000 and 465,000.

5.2.2.4
The RSS identifies 21 Strategically Significant Cities and Towns (SSCTs) across the region which form the basis for the extensive growth in dwellings and jobs anticipated over the period to 2026. Table 5.1 summarises the projected increases in jobs, dwellings and population in the SSCTs by 2026.

1 As quoted in the South West RPA, 6.2.1 the "seating capacity is based on the December 2006 timetable allowing for further resources changes planned by FGW for the 2007 timetable change and the additional seating arising from the refurbishment and recognition of the FGW HST formations."

Figure 5.1 – Projected increases in the 21 SSCTs by 2026			
SSCT	**Jobs**	**Dwellings**	**Population**
Barnstaple	6300	4800	9600
Bath	16000 – 20000	7500	15000
Bournemouth	18100 – 23000	15600	31200
Bridgwater	18500	6200	12400
Bristol	73000 – 93000	64000	128000
Cheltenham	8000 – 10800	12500	25000
Chippenham	6300	4500	9000
Cornwall Towns	16500	13800	27600
Dorchester	7300 – 9500	4000	8000
Exeter	22300 – 28500	18500	37000
Gloucester	9300 – 12700	17500	35000
Plymouth	42000	31500	63000
Poole	14700 – 18,900	10000	20000
Salisbury	10800 – 13600	5000	10000
Swindon	26000 – 32000	35000	70000
Taunton	18500	14000	28000
Torbay	11700	10000	20000
Trowbridge	11700	5000	10000
Weston-super-Mare	8500 – 10000	12000	24000
Weymouth	7300 – 9500	5000	10000
Yeovil	9100	6400	12800
Total	**336100 – 394100**	**302800**	**605600**

Cornwall Towns includes Camborne, Pool, Redruth, Falmouth, Penryn and Truro Torbay includes Torquay, Paignton and Brixham

5.2.2.5
The RSS includes the Regional Transport Strategy and a set of transport policies to deliver this strategy. This states that the most important transport factor affecting the performance of the regional economy is reliable connections to London and the South East (and international markets beyond). Much of the region lies within the two-hour rail journey time to London which is characteristic of locations having the best economic prospects. Further development of the heavy rail network in Greater Bristol, Exeter and Plymouth to provide for local and commuter journeys is also proposed to deliver spatial growth and congestion targets.

5.2.2.6
The growth shown in Figure 5.1 emphasises the large increases in jobs, and hence both commuting and business travel, which is anticipated in Swindon, Bristol, Exeter and Plymouth and hence the potential for rail to have a major role in both these markets in each of the areas. As a result, there is an emphasis on these key locations in the development of commuter rail operations in the region.

5.2.2.7
The draft Regional Spatial Strategy is aligned with the Regional Economic Strategy which seeks to sustain regional economic performance, improve the quality of skills across the region, encourage regeneration of deprived areas and address inequalities within the region.

5.2.3 Regional Economic Strategy for the South West 2006 – 2015

5.2.3.1
The aim of the Regional Economic Strategy is to address the particular economic needs of the region. It achieves this whilst also supporting, enhancing and delivering European, national and regional strategies and policies. The RES states that Bristol has a lead role as a city-region of international, national and regional significance and can use its status as a national science city to strengthen the West of England's regional economic base. Plymouth has the potential for a more significant role in the region as have Exeter, Swindon and Gloucester/Cheltenham.

5.2.3.2
Regionally, it is important that the RES reinforces the aims set out in the Integrated Regional Strategy (IRS), and complements the Regional Spatial Strategy to ensure that the region is working in an integrated way to agreed goals. The Integrated Regional Strategy for the South West is an important mechanism for better integrated working in the region as it provides a set of broad objectives and priorities relevant across sectors. Just Connect is an Integrated Regional Strategy for the South West for the period 2004 to 2026.

5.2.4 Delivering a Sustainable Transport System (DaSTS)

5.2.4.1
Delivering a Sustainable Transport System (DaSTS) is the DfT's new approach to long-term transport planning and will be used in determining funding decisions for the five-year period from 2014 to 2019. DaSTS sets out the process for determining priorities with the establishment of goals and the identification of challenges. Options are then generated, sifted and prioritised before decisions are made on the future transport programme.

5.2.4.2
DaSTS outlines five goals for transport, focusing on the challenge of delivering strong economic growth while at the same time reducing greenhouse gas emissions. It outlines the key components of the national infrastructure and discusses the difficulties of planning over the long-term in the context of uncertain future demand.

5.2.4.3
DaSTS draws together the recommendations in both the draft Regional Spatial Strategy and the Regional Economic Strategy presenting nine main growth areas identified by the region as per the RSS and the priorities for delivering sustainable economic growth in the RES. These areas require the largest quantum of sustainable growth (84 percent of growth in dwellings and 86 percent of growth in employment). The nine growth areas are:

- Cheltenham and Gloucester
- Swindon
- West of England (Bath, Bristol and Weston-super-Mare)
- Taunton
- Exeter
- Torbay (Torquay, Paignton and Brixham)
- Plymouth
- Key Cornish towns (Camborne, Redruth, Truro, Falmouth and Penryn)
- South East Dorset (Bournemouth and Poole (outside the RUS scope)).

5.2.4.4
With the RSS and the RES the challenges across economic development, housing and transport and the issues faced in different parts of the region are well known. The South West Regional Development Agency and the South West Councils have formed a four-stage programme to develop the evidence base

necessary to support the principle objectives of their Regional Funding Allocation (RFA) 2 bid whilst adopting the DaSTS process.

5.2.5 The Future of Air Transport

5.2.5.1

The Government's White Paper "The Future of Air Transport" published in 2003 set out a national strategic framework for the development of airport capacity until 2033. Developments at Heathrow Airport, such as the new Terminal 5, which opened in March 2008 and the modernising of other terminals has and will continue to have a major impact on the RUS area. Forecast growth in passengers using Heathrow Airport has identified the need for further airport expansion leading to the proposal for a third runway and sixth terminal. The challenge for rail will be how it can contribute to providing national links to key centres as a potential alternative to domestic flights.

5.2.5.2

The national policy framework established in the White Paper supports the development of Bristol as the main regional airport in the South West but also supports improved access and development to the other airports within the area namely Exeter, Plymouth and Newquay. These airports are forecast to grow from 4.5 million passengers per annum in 2000 to almost 20 million passengers per annum by 2030. Developing the role of the South West airports to support the growth of tourist visits to the region will be key.

5.2.5.3

In the context of national policy, the aim of the region's air strategy as presented in the Regional Spatial Strategy is to meet more of the South West's demand for air services within the region with reduced journeys to airports outside the region, particularly in the form of road traffic to London Heathrow and Gatwick. This will be achieved through the development of existing airports through improved access and investment at Bristol and Exeter airports. To improve access to Bristol Airport there is a proposal to develop Worle station as a Parkway station and interchange for the city and the airport to enable through links.

5.2.5.4

Despite wishing to contain travel and demand to airports within the South West, the development of a western rail link to London Heathrow is favoured by the region as there continues to be strong demand particularly from the business community for improved rail access to Heathrow Airport. The recent commitment to electrification between London, Bristol and South Wales will have an impact on the case for western rail access.

5.3 Eco-towns

5.3.1

Eco-towns are a proposed programme of exemplar sustainable new towns to be built in England. They will be new towns of at least 5,000 – 20,000 homes intended to create new settlements to achieve zero carbon emissions and more sustainable living, using the best new design and architecture. The developments are intended to encourage a modal shift from road to rail and promote a car free community, with reduced emissions and traffic congestion being the key measures.

5.3.2

In November 2008, a shortlist of 12 sites was announced for public consultation of which, three impacted on the Great Western RUS area: Weston Otmoor, Middle Quinton and St Austell. In July 2009, the DfT announced four confirmed sites to be progressed to the next phases of planning, public consultation and local planning approval. The four sites are St Austell (China Clay) in Cornwall, North West Bicester in Oxfordshire, Whitehill-Bordon in Hampshire and Rackheath in Norfolk. Of these, the site at St Austell is within the scope of this RUS with the site at Bicester bordering the area with the West Midlands and Chilterns RUS. It is currently expected that this first wave of eco-towns will be established by 2016. The progression of these sites will increase levels of rail demand in the surrounding areas; however the options for rail have yet to be evaluated. In 2010, the identification of the

second wave of eco-towns will commence through local and regional plans.

5.4 Passenger demand: Drivers of change

5.4.1

Beyond the early years of the strategy, forecasts become increasingly less certain. In considering demand beyond 2019, the RUS notes the Government's aspiration in the "Delivering a Sustainable Railway" White Paper, to provide a reliable network capable of handling double the number of passengers over the next 30 years. This aspiration sets an overall context for the future development of the railway but is not intended to be a forecast for any specific route or area.

5.4.2

Current economic conditions will affect passenger numbers and freight volumes, although to what extent is somewhat unclear. There remains considerable uncertainty regarding the severity of the recession and the timescale for recovery. As the Freight RUS was published in March 2007, it provides a pre-recession view of freight demand and growth. Much of the passenger demand forecasts used in the Network RUS and the Great Western RUS were formulated using 2007/08 data with some more recent counts undertaken.

5.4.3

The RUS assumes that recovery does happen, even if the timescale is uncertain, and on that basis the forecasts are a reasonable view of growth in the medium to long term. For example, it could be that the level of demand forecast for 2019 may be achieved slightly later (or indeed earlier). Early indications show that the effect of the recession on passenger demand has been minimal with the demand for rail still increasing although at a lower rate than the rapid growth experienced in the last few years, however, there has been a greater impact on freight.

5.4.4

The following sections present the forecasts of passenger demand to 2019 for the Great Western RUS area within the markets of Long Distance High Speed services; suburban services and key interurban centres. A review of the long-term, long distance forecasts as presented by the Network RUS specifically for the Great Western RUS area is included followed by a review of the future freight forecasts and market scenarios.

5.4.5

It is important to note that the forecasts for passenger demand do not include any effect from electrification. It is recognised that there are quantitative and qualitative benefits evident from electrifying the railway which will impact and increase passenger demand.

5.5 Forecast passenger demand

5.5.1 Forecasting approach

5.5.1.1

The Passenger Demand Forecasting Handbook (PDFH) is the industry standard framework for modelling growth, using demand drivers, such as UK demographics, economic growth and the characteristics of competing modes to predict the change in passenger demand. A number of data sources regarding these external drivers were used in compiling the forecasts:

- gross domestic product (GDP) and central London employment forecasts were obtained from Oxford Economic Forecasting
- forecasts of local population and employment were obtained from version 5.4 of the Department for Transport's TEMPRO model
- elasticity assumptions were drawn from PDFH version 4.1, except for elasticity to fare increases, for which PDFH 4.0 guidance was used
- assumptions about the real cost of fuel and levels of car ownership were derived from TEMPRO version 5.4.

5.5.1.2
The PDFH has been used to predict future growth in rail journeys, except where this has been shown to be an under or over prediction of historic growth in the RUS area. In these cases, an alternative methodology (or overlay) based on historic evidence has been used. Evidence suggests that the PDFH framework can underestimate the recent acceleration in passenger growth experienced in some urban and interurban rail markets outside of London. An extensive validation exercise was therefore undertaken to assess how well the PDFH methodology would have explained historic growth on key flows in the Great Western RUS area.

5.5.1.3
For London flows, the RUS found that the PDFH was able to reasonably predict the historic growth that occurred between 1998 and 2006 once various changes that had occurred over this time period had been included eg. timetable changes, the impact of performance improvement and the effect of installing ticket barriers at London Paddington. Similarly demand into Reading could be explained by PDFH methodology. These forecasts were therefore agreed by the Stakeholder Management Group and used for the RUS analysis.

5.5.1.4
However, it was evident that the PDFH under predicted historic growth on the urban and interurban flows in the RUS area. This under prediction was particularly significant for flows into Bristol and flows between the RUS area and other regions, particularly the West Midlands and South Wales. An alternative approach to forecasting was therefore developed using a combination of historic growth and PDFH estimates, in line with the methodology used in other RUSs. This approach assumes that the current short-term rate of high growth continues in the first two years; this is then followed by four years of standard PDFH growth with an additional "overlay" to capture the unexplained historic growth; the growth rate then returns to the rate predicted using the standard PDFH methodology. These forecasts were agreed by the Stakeholder Management Group and used for the RUS analysis.

5.5.1.5
In developing the demand forecasts for the Great Western RUS, Reading and the surrounding area to the west have been grouped together to form the forecasts for Long Distance High Speed services while the shorter commuter market comprising of the stations located to the east of Reading are grouped as suburban services. Each of these markets and their forecasts are discussed in turn below.

5.5.2 Passenger forecasts – Long Distance High Speed

5.5.2.1
The growth forecast for passenger flows from within the Great Western RUS area to London Paddington on the Long Distance High Speed (LDHS) services is predicted to increase between 2008 and 2019 by 31 percent in the peak and 42 percent for all day services. This is equivalent to a 2.5 percent increase in the peak and a 3.2 percent increase all day per annum. These growth forecasts include exogenous factors, such as economic and employment projections as well as the cost of travel with rail fares and fuel prices.

5.5.2.2
These forecasts do not include the full impact of the Intercity Express Programme (IEP) and electrification of the Great Western Main Line (GWML) on service provision, capacity and demand. This is due to the service specification for IEP services still being developed and therefore the impact that these schemes may have on demand has not been explicitly modelled.

5.5.2.3

However, with the current IEP service specification the proposed quantum of services has been used as a basis to undertake initial capacity analysis to ascertain how the increase in service provision (as presented in **Chapter 4**) can assist with accommodating predicted growth. With the draft design for the new diesel and electric trains, an indication of the number of seats and standing allowance has enabled high level load factor analysis to be undertaken.

5.5.2.4

This analysis has demonstrated that the extra capacity provided by IEP (in either bi-mode or electric form) is sufficient to accommodate predicted demand into London Paddington to 2019 during the three-hour peak period (07:00 and 09:59). This additional capacity is provided through the increased capability of the rolling stock and through the proposed increase in service frequency on a number of routes.

5.5.3 Passenger forecasts – suburban services

5.5.3.1

Demand from the short to medium commuter market in the Great Western RUS area to London is predicted to increase by 21 percent in the peak and by 25 percent all day between 2008 and 2019. This is equivalent to an annual growth of 1.8 percent for peak services and 2.1 percent for all day services. These forecasts predominantly represent demand from stations to the east of Reading to central London such as Maidenhead, Slough and West Drayton. It is recognised that following the introduction of electrification on these services by the end of 2016, additional capacity will be provided through the introduction of four-car electric trains (proposed to be redeployed from the Thameslink programme) replacing the existing two and three-car diesel trains. This change may also positively impact on the attractiveness of rail and therefore level of passenger demand for these services, however the potential impact of this has not been included in the forecasts.

5.5.3.2

These forecasts do not include the potential impact of the Crossrail scheme on passenger demand as the Crossrail timetable is still under development (now at Iteration 2), therefore the RUS has not explicitly analysed the impact on demand of the Crossrail scheme. However, capacity analysis has been undertaken at a high level using the capacity assumptions for the proposed 10-car Crossrail service with the Crossrail Iteration 1 timetable which demonstrates that sufficient capacity will be available on the suburban services. It is anticipated, that following the implementation of Crossrail in 2017, passenger demand and travel patterns in the Thames Valley area will begin to be affected towards the end of the 10-year RUS forecast period following an introductory period of the new services. Looking ahead, it is predicted that on-train capacity on Crossrail services into London Paddington will be sufficient until at least 2026.

5.5.4 Passenger forecasts – key urban centres

5.5.4.1 Reading

Peak arrivals into Reading are predicted to increase by 28 percent between 2008 and 2019, this equates to a rate of 2.3 percent per annum. All day demand is predicted to increase at a higher rate of 31 percent in the same forecast period, equating to an annual increase of 2.5 percent.

5.5.4.2 Bristol

Peak demand to Bristol is predicted to grow by 41 percent between 2008 and 2019 which is equivalent to an annual growth rate of 3.2 percent. Off peak demand is predicted to grow by 37 percent over the same time period, which is principally assumed to be for leisure purposes. This forecast is aligned with the recent high growth experienced in the Bristol conurbation area as a result of a number of demand drivers; these include an increase in road congestion during peak hours and changes in commuting patterns favouring rail travel. This growth forecast is also consistent with the forecast in the South West Regional Planning Assessment, which predicts an

average growth rate of 3.5 percent per annum (all day) between 2006 and 2026 under the "High Growth Scenario".

5.5.4.3 Exeter and Plymouth

It has been shown that the PDFH tends to under predict rail passenger growth experienced in urban and interurban rail markets outside of London. As shown in **Chapter 3**, urban centres in the South West region such as Exeter and Plymouth have experienced strong growth in rail demand over the last decade. Therefore, for the purpose of option appraisal as detailed in **Chapter 6**, the passenger growth forecast, established for Bristol has been adopted and used for Exeter and Plymouth. A bespoke forecast has not been explicitly developed. It is anticipated that in the short to medium term, rail demand at these urban centres will continue to grow at a rate higher than PDFH forecasts and the magnitude of growth is likely to be similar to Bristol.

5.5.5 Predicted loadings – key urban centres

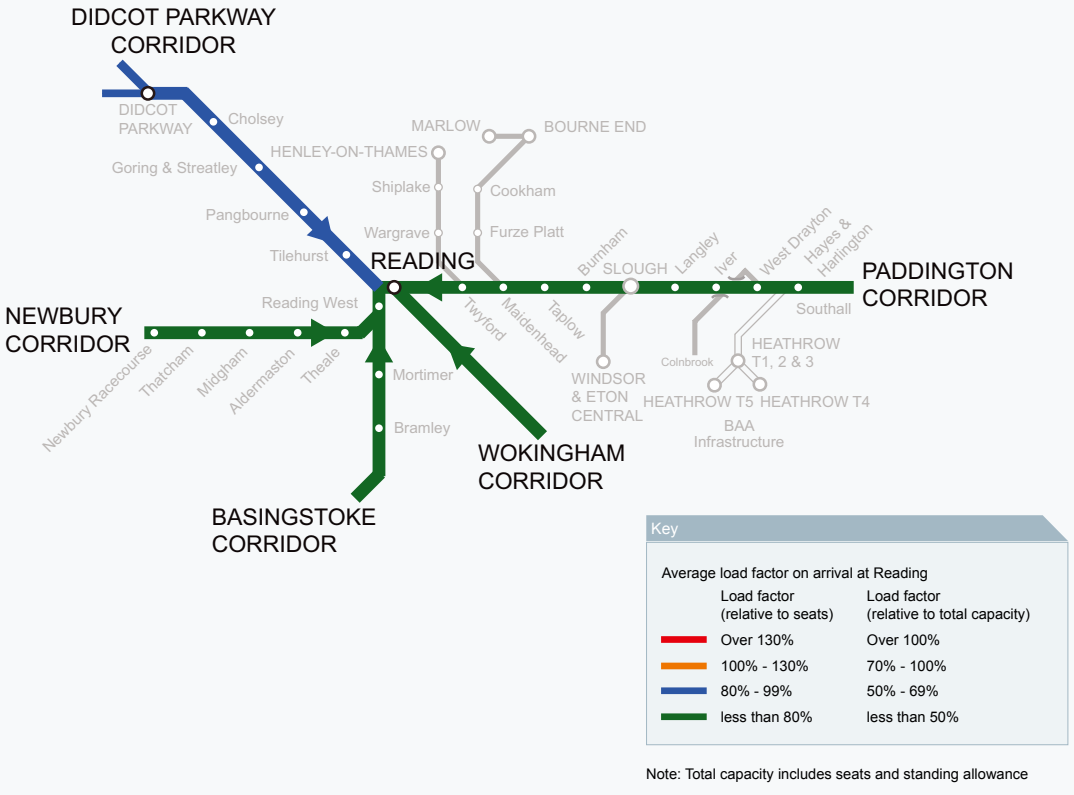
5.5.5.1 Reading

Figure 5.2 shows the estimated load factors (relative to seats) on arrival at Reading in 2019.This is a ratio of passengers to seats expressed as a percentage. This is presented by corridor in the three-hour morning peak period followed by the high peak hour in Figure 5.3.

5.5.5.2

All corridors, except Wokingham and Basingstoke, will have sufficient seats available to meet expected demand across the high peak hour and three-hour peak period.

Figure 5.2 – Average weekday load factors on arrival at Reading in 2019, three-hour peak (07:00-09:59)



Note: Total capacity includes seats and standing allowance

Figure 5.3 – Average weekday load factors on arrival at Reading in 2019, high peak hour (08:00-08:59)

These estimated load factors take into account the additional capacity expected to be provided through the High Level Output Specification (HLOS) with the rolling stock proposals and the Intercity Express Programme. These interventions have been included within the analysis as they form committed schemes as discussed in **Chapter 4**.

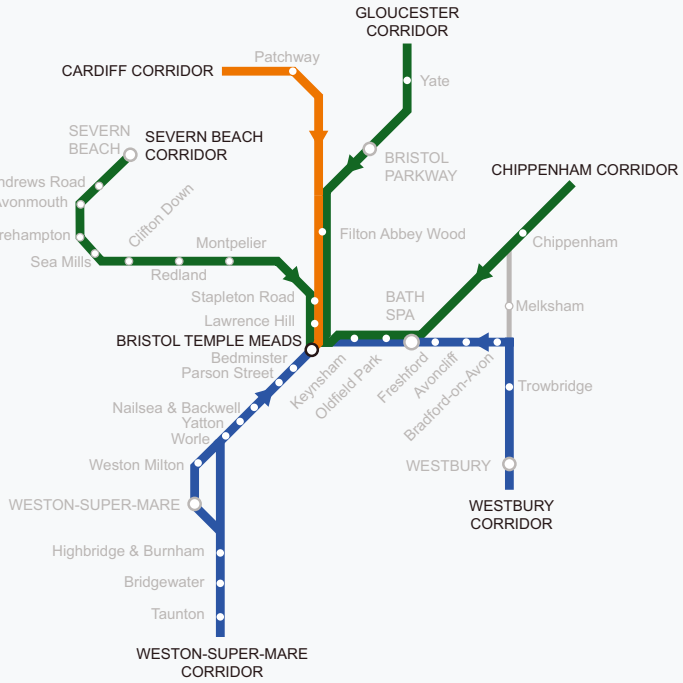
5.5.5.3

The HLOS response submitted by First Great Western (FGW) to a Request for Proposal by the DfT includes provision for train lengthening on the Wokingham and Basingstoke corridors. For the Basingstoke corridor, these additional vehicles resolve the expected crowding in 2019 on the suburban services – the resultant crowding as shown in Figure 5.3 remains on the long distance CrossCountry services into Reading. On the Wokingham corridor, after the introduction of the HLOS additional vehicles, it is still expected that the Gatwick Airport to Reading services will continue to have more passengers than seats available on arrival in the morning peak period at Reading in 2019, with the stations at Guildford and Gatwick Airport also experiencing on-train crowding. However, both of these corridors will have sufficient total capacity (includes seats and standing allowance) to meet predicted growth in the morning peak.

5.5.5.4 Bristol

The level of crowding on services into Bristol during the morning three-hour peak period is forecast to increase by 2019. Figure 5.4 shows estimated load factors by corridor in the morning three-hour peak period followed by the high peak hour in Figure 5.5.

Figure 5.4 – Average weekday load factors on arrival at Bristol Temple Meads in 2019, three-hour peak (07:00-09:59)



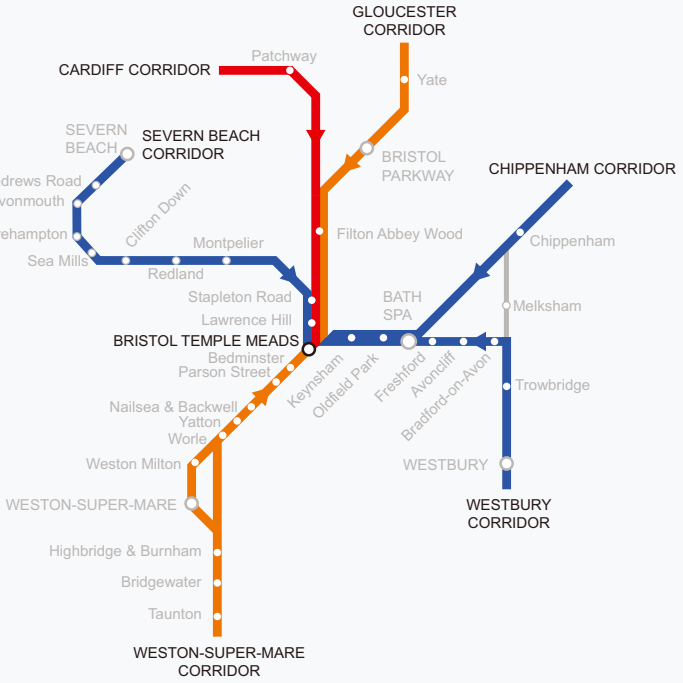
Key

Average load factor on arrival at Bristol Temple Meads

	Load factor (relative to seats)	Load factor (relative to total capacity)
	Over 130%	Over 100%
	100% - 130%	70% - 100%
	80% - 99%	50% - 69%
	less than 80%	less than 50%

Note: Total capacity includes seats and standing allowance

Figure 5.5 – Average weekday load factors on arrival at Bristol Temple Meads in 2019 high peak hour (08:00 – 08:59)



Key

Average load factor on arrival at Bristol Temple Meads

	Load factor (relative to seats)	Load factor (relative to total capacity)
	Over 130%	Over 100%
	100% - 130%	70% - 100%
	80% - 99%	50% - 69%
	less than 80%	less than 50%

Note: Total capacity includes seats and standing allowance

5.5.5.5

As part of their HLOS Request for Proposal response, FGW propose 12 additional vehicles to enable train lengthening on a number of routes in the West of England and the predicted load factors presented in Figure 5.4 and Figure 5.5 have taken this into account. The Cardiff to Bristol corridor is still predicted to experience a high level of crowding in 2019 with some passengers standing across the high peak hour above the total capacity provision (this includes both seating and standing allowances). It is recognised that additional capacity will need to be sought and this is discussed further in **Chapter 6**. Although Gloucester and Weston-super-Mare corridors are predicted to experience a passenger to seat ratio of 100 percent or above in the high peak hour, there remains sufficient total capacity to accommodate predicted demand in the peak to 2019.

5.5.6 Passenger forecasts – cross RUS flows

5.5.6.1

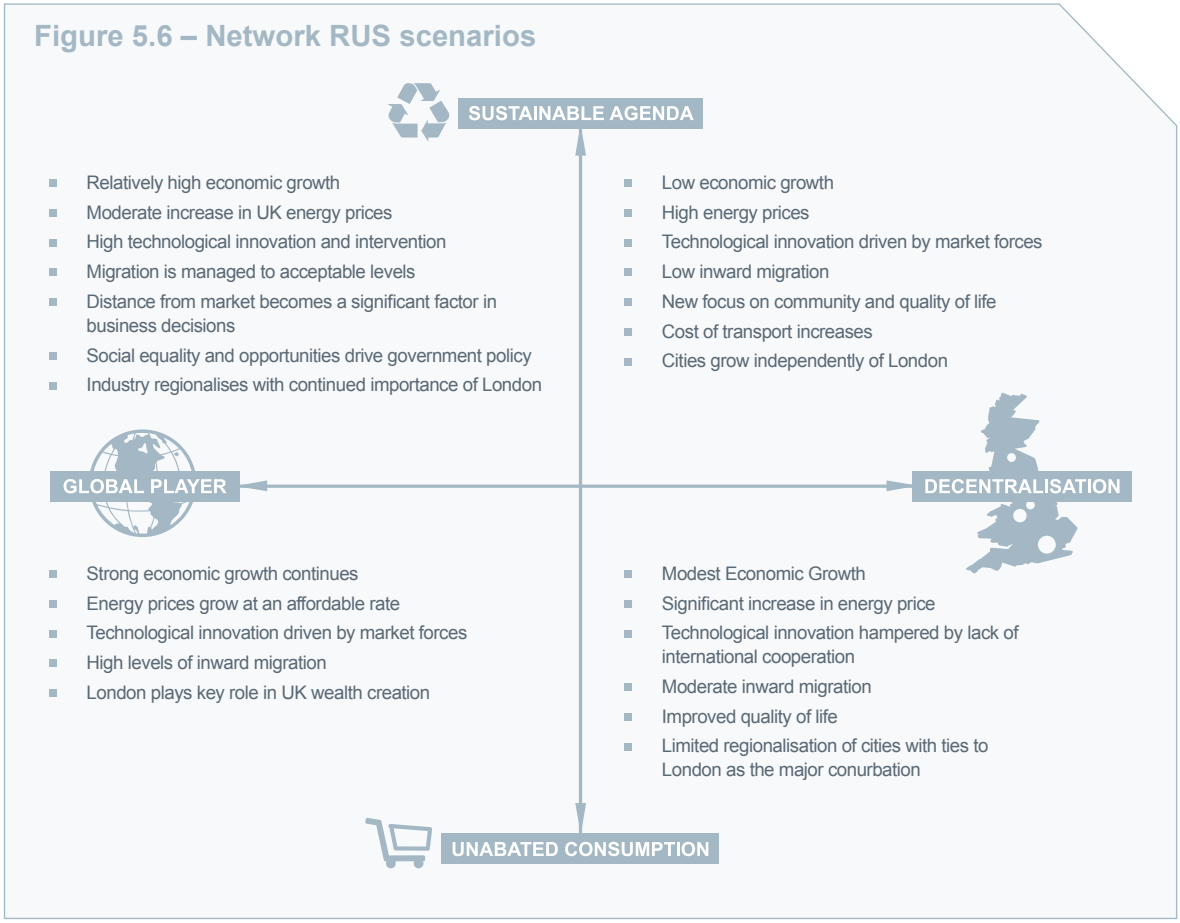
Significant growth is predicted to 2019 on flows between the Great Western RUS area and South Wales and between the Great Western RUS area and the West Midlands. All day passenger demand in this market is predicted to grow by over 30 percent between 2008 and 2019. The greatest growth is expected between Bristol and South Wales at 35 percent, followed by Reading and the West Midlands at 34 percent with a 32 percent growth predicted between Bristol and the West Midlands.

5.5.7 Network RUS: Long distance passenger demand forecasts

5.5.7.1

The Network RUS "Scenarios and long distance forecasts" published in June 2009 presented the growth in rail demand over a 30-year horizon for conurbation flows on the western route by four scenarios, these are shown in Figure 5.6.

Figure 5.6 – Network RUS scenarios



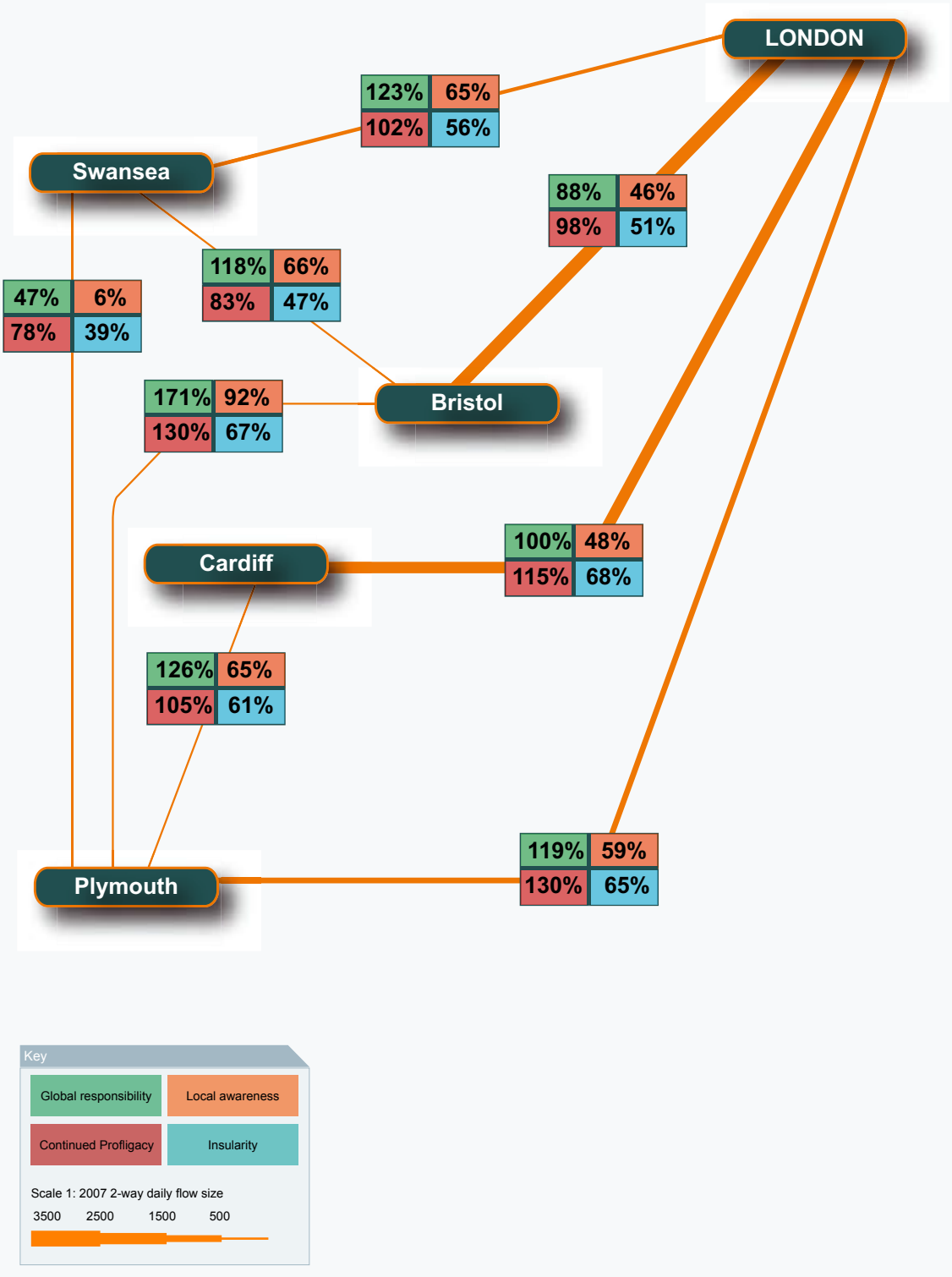
5.5.7.2

The Network RUS demand forecast is developed using an alternative approach to PDFH as it recognises that PDFH is not always appropriate for longer-term forecasts. The forecasts are based on a detailed consideration of factors affecting long distance market size and market share and represent a longer-term view to 2036. The strategic national corridor for the western route includes the key conurbations on London to Bristol and Plymouth; London to South Wales and from South Wales to the South West routes. Figure 5.7 illustrates the forecast growth in long distance rail trips to cities on this corridor. The long distance passenger corridor in the Network RUS also includes the cross country route from Leeds to Bristol, although not shown in Figure 5.7; it will impact on the Great Western.

5.5.7.3

The effect of increasing the attractiveness of rail compared to road is strongest for flows such as Bristol to Swansea and Plymouth where rail has a relatively low market share but where small changes in rail's competitive position can lead to large changes in market share. It is recognised that future changes to rail patterns positively impacts on the role of rail, strengthening its position and increasing demand. However, the potential changes in the economy, as reflected in the various scenarios, will impact to differing extents on the level of growth forecast.

Figure 5.7 – Network RUS: Western corridor demand forecasts to 2036



5.6 Forecast freight demand

5.6.1

Freight demand forecasts were developed nationally in the Freight Route Utilisation Strategy (FRUS) published in March 2007; this presented a strategy for accommodating the forecast freight traffic across the national network over the 10-year period from 2004/05 to 2014/15 and estimated approximately 25 percent growth in the number of freight trains per day.

5.6.2

In compiling these forecasts, two methods were used. Firstly, a "bottom up" approach using current flows and known changes projected forward to 2014. This was undertaken by the Freight Operating Companies and predicted a 26 percent growth. The other method referred to as the "top down" approach used a more scientific approach using the "Great Britain Freight Model" (GBFM), a calibrated model based on evidence of actual rail market shares. This estimated a 28 percent growth to 2014.

Since the publication of the FRUS, these forecasts have been supplemented by aspirations by the DfT and other stakeholders to increase the proportion of freight carried by rail throughout the United Kingdom. The DfT's "Delivering a Sustainable Transport System" White Paper provides support for transferring freight from road to rail in order to reduce road congestion and carbon emissions, with the Ports Policy Review interim report (2007) forecasting that by 2030 half of all rail freight will be port related.

5.6.3

In August 2008, the Rail Freight Group (RFG) and Freight Transport Association (FTA) published forecasts for demand for rail up to 2015 and 2030. These forecasts present a 30 percent increase in tonne km from 2006 to 2015 and more than doubling by 2030. However, the growth in intermodal traffic is forecast to be much higher, more than doubling by 2015 and a five-fold increase by 2030 reflecting a continuing expansion of trade from continental Europe and further afield, plus a significant use of rail to and from rail-connected warehouses.

5.6.4

Figure 5.8 presents the national rail freight forecasts to 2030:

Figure 5.8 – National rail freight forecasts

	2006	2015	2030
Tonnes (millions)	123.7	130.3	197.8
Tonne km (billions)	23.5	31.0	50.4
Trains ('000s)	409	434	634
Percent tonne by rail (km)	12.6	15.0	20.7

5.6.5
The Strategic Freight Network (SFN) has produced a current indication of the order of growth to 2019 and 2030 for specific corridors. These forecasts are an approximation and are currently being refined and agreed with key stakeholders. Once agreed, these forecasts will be presented on a route by route basis across the national rail network with capacity assessments undertaken to review if this growth can be accommodated on the current network – where it can't, the SFN will propose and appraise interventions.

5.6.6
Initial assessments for the indicative level of freight growth on the Reading to London Paddington corridor, Didcot to Leamington and across Bristol have been included in the Great Western RUS option appraisal work (see **Chapter 6**). These forecasts are subject to confirmation of the actual growth that is expected to occur over the next ten to twenty years. They represent the incremental increase in the number of trains per day in each direction at 2019 and 2030. The breakdown of the forecasts used for each route is presented in Figure 5.9.

5.6.7 Current market scenarios
The potential for freight growth exists in all market sectors but the current economic fluctuations make accurate forecasting difficult. However, it is not unreasonable to assume that following a period of static or negative growth freight will return to, or exceed, previously attained levels of traffic. The following scenarios describe the main opportunities in each sector:

5.6.7.1 Intermodal
Strong deep sea container growth is forecast to continue with the W10 gauge clearance scheme underway between the Port of Southampton and the West Coast Main Line. Once the enhancement scheme is delivered in 2011, the forecasts identify growth of six to eight trains per day in each direction to and from the port by 2014/15. It is further predicted that by 2030, there will be a shortfall in capacity by up to 50 trains per day on this route. Growth in container traffic is also expected with the proposed aspirations of the Bristol Port Company as discussed in paragraph 5.6.8.

5.6.7.2 Aggregates
Growth in aggregates freight traffic is also expected to occur to meet the house building programme demands in the South East of England, the construction of the Olympic Games sites and Crossrail. The construction of Crossrail will generate significant volumes of freight movements both for aggregates and cement traffic to site, and extracted materials from the tunnelling works from site. The FRUS indicates up to three additional trains per day will be required to meet the predicted growth in construction traffic, with a substantial increase under the SFN forecasts to 2019.

Figure 5.9 – Strategic Freight Network – forecast growth

Location	2019	2030
Paddington to Reading	25	36
Didcot to Oxford	29	43
Bristol	7	13

5.6.7.3 Coal

The most significant driver of change in demand patterns is the Energy Supply Industry (ESI) coal market. This is due to ongoing shifts towards importing coal supplies and volume shifts between competing import facilities. The future of the UK energy policy and carbon emission levels will affect the demand for coal. It is currently unclear how this will affect the demand for rail transport. Biofuel alternatives being considered require substantial volumes of coal, and any growth in this type of fuel at the expense of coal (for conventional coal-fired power generation) is likely to increase the demand for train paths rather than lead to a reduction.

The future of Didcot Power station is currently unclear. At present, the plant is non-EU compliant as it is not fitted with Flue Gas Desulphurisation (FGD) and unless a dispensation is granted it is likely that the station will cease operations from 2015. This would release additional capacity on the route between Avonmouth and Didcot should the power station cease coal burning operations. However, if it remains operational, future freight capacity on this section would need to be reviewed to assess whether the current infrastructure can accommodate such growth along with the other enhancements proposed for the area specifically with the introduction of the Intercity Express Programme.

5.6.7.4 Other materials

The FRUS estimates two additional metal product trains per day and one additional petroleum train per day will be needed across the RUS area.

5.6.8 Terminal developments

The Regional Spatial Strategy for the South West supports opportunities for developing freight markets in the region particularly for Bristol which is the largest port in the South West. Opportunities to develop the markets of these ports are supported, especially where measures include improved rail access to enable more sustainable distribution. The Bristol Port Company has high level proposals for increased rail volumes from a proposed container terminal development at Avonmouth. Further growth driven by the development of this new terminal could drive new capacity gaps.

5.7 Summary

The above analysis has enabled a number of “gaps” to be identified between the current levels of supply and demand and that which will be required over the next 10-year period to 2019 in order to accommodate predicted growth. The gaps identified and the interventions assessed are discussed further in the following chapter “Gaps and options”.

6. Gaps and options

6.1 Introduction

6.1.1

Previous chapters have presented baseline data (the current capability and requirements of the network), committed schemes, forecasts of future demand and other drivers of change. This chapter builds on this by detailing the process of gap identification, the options to address these gaps and the process of their appraisal.

6.2 Gaps

6.2.1

A Route Utilisation Strategy (RUS) gap is defined as the difference between what the system can currently supply, in terms of infrastructure and train services, and what is likely to be demanded of the system, in terms of what it needs to do going forward for passenger and freight at suitable levels of performance.

6.2.2

RUS gaps can be broadly classified into four types:

- capacity and capability – where the size, number and mix of services (passenger and/or freight) does not meet current or future needs
- performance – where the performance outputs of the railway system fall short of requirements
- journey times – where location to location journey times (passenger or freight) do not meet current or future needs
- connectivity – where journeys between locations (passenger or freight) do not meet current or future needs.

6.3 Process

6.3.1

The process adopted during the Great Western RUS was to identify and catalogue where issues exist on the current railway and where they are expected to exist going forward. This was undertaken through the baseline study (with stakeholder input) and through an analysis and comparison of current (**Chapter 3**) and predicted changes in demand (**Chapter 5**) as well as a review of strategic documentation for the geographical area. This provided identification of potential “gaps” between what the railway system delivers now and what it is required to deliver going forward over the timeframe of the RUS.

6.3.2

A list of 128 issues were assembled from this process, which were then subjected to detailed analysis by the Great Western RUS Stakeholder Management Group (SMG). Each issue was meticulously reviewed and categorised as a gap, an option, a constraint or a stakeholder aspiration. This finalised the gaps which were considered to need further, more detailed analysis.

6.4 Identification of gaps

6.4.1

From the list of 128, the SMG determined there were 21 gaps to be pursued under the Great Western RUS. A summary table of the identified gaps is as follows:

Figure 6.1 – Table of gaps

No.	Nature of gap	Key issues
1.	Paddington peak capacity	existing and predicted crowding and ability to meet forecast growth to 2014, 2019 and beyond on services at London Paddington during the peak
2.	Inner suburban service pattern	existing and predicted crowding and ability to meet forecasted growth and service provision following proposed interventions with Crossrail and Intercity Express Programme
3.	Paddington to Reading all day capacity	existing and predicted crowding and ability to meet forecast growth to 2014, 2019 and beyond on all day services between London Paddington and Reading
4.	Paddington to Reading performance	existing performance issues and requirement to meet the High Level Output Specification targets to 2014 and beyond
5.	Slough to Windsor all day capacity	existing crowding and ability to meet forecast growth to 2019
6.	Freight capacity and capability in/ around London and freight capacity North/South	freight paths, loading gauge and train lengthening with current schemes under the Freight RUS, Strategic Freight Network, Crossrail and East West Rail
7.	Reading peak capacity	existing and predicted crowding and ability to meet forecast growth to 2019 and beyond on services during the peak at Reading
8.	Didcot to Wolvercot Jn performance	existing performance issues at Didcot East Jn, Didcot North Jn and Oxford
9.	West Midlands to South Coast: a) connectivity b) all day capacity	a) lack of direct services from the North East, Yorkshire and Derbyshire to the South Coast b) existing and predicted crowding and inability to meet forecast growth to 2019 and beyond on all day services between the North and the South Coast
10.	Swindon to Gloucester performance	existing performance problems and service levels for normal service provision and under diversionary working
11.	South Wales to South Coast all day capacity	existing and predicted crowding and ability to meet forecast growth to 2019 and beyond on all day services between South Wales and the South Coast
12.	West Midlands to South West a) connectivity b) all day capacity	a) lack of direct services from Greater Manchester and the South West beyond Bristol b) existing and predicted crowding and inability to meet forecast growth to 2019 and beyond on all day services between the North and the South West

13.	Bristol peak capacity	existing and predicted crowding and inability to meet forecast growth to 2019 and beyond on services during the peak at Bristol Temple Meads
14.	Bristol performance	existing performance issues on the approaches to Bristol Temple Meads, specifically due to conflicting moves at Bristol East Jn
15.	Westbury area performance	existing performance issues in the Westbury station area
16.	Exeter and Plymouth area service pattern	existing connectivity issues between and across Exeter and Plymouth
17.	Interurban journey times	opportunities for improving journey times on services through either linespeed improvements and/or changing calling patterns
18.	Early morning arrivals to key regional centres	limited early morning journey opportunities from London Paddington to Plymouth and from Birmingham to Cardiff
19.	Station crowding	existing and predicted capacity problems identified at London Paddington; Ealing Broadway; Windsor and Eton Central; Reading, Oxford and Bristol Temple Meads stations
20.	Seasonal fluctuations	existing and predicted fluctuations in supply and demand to, from and within Devon and Cornwall
21.	Impact of Heathrow Airport including western access	impact of Crossrail and Heathrow Express on London demand to Heathrow Airport; local demand and services to Heathrow Airport from Reading including current and expected demand to Heathrow Airport from the South West

Figure 6.2 visually demonstrates these gaps across the Great Western RUS area.

6.5 Generic gaps

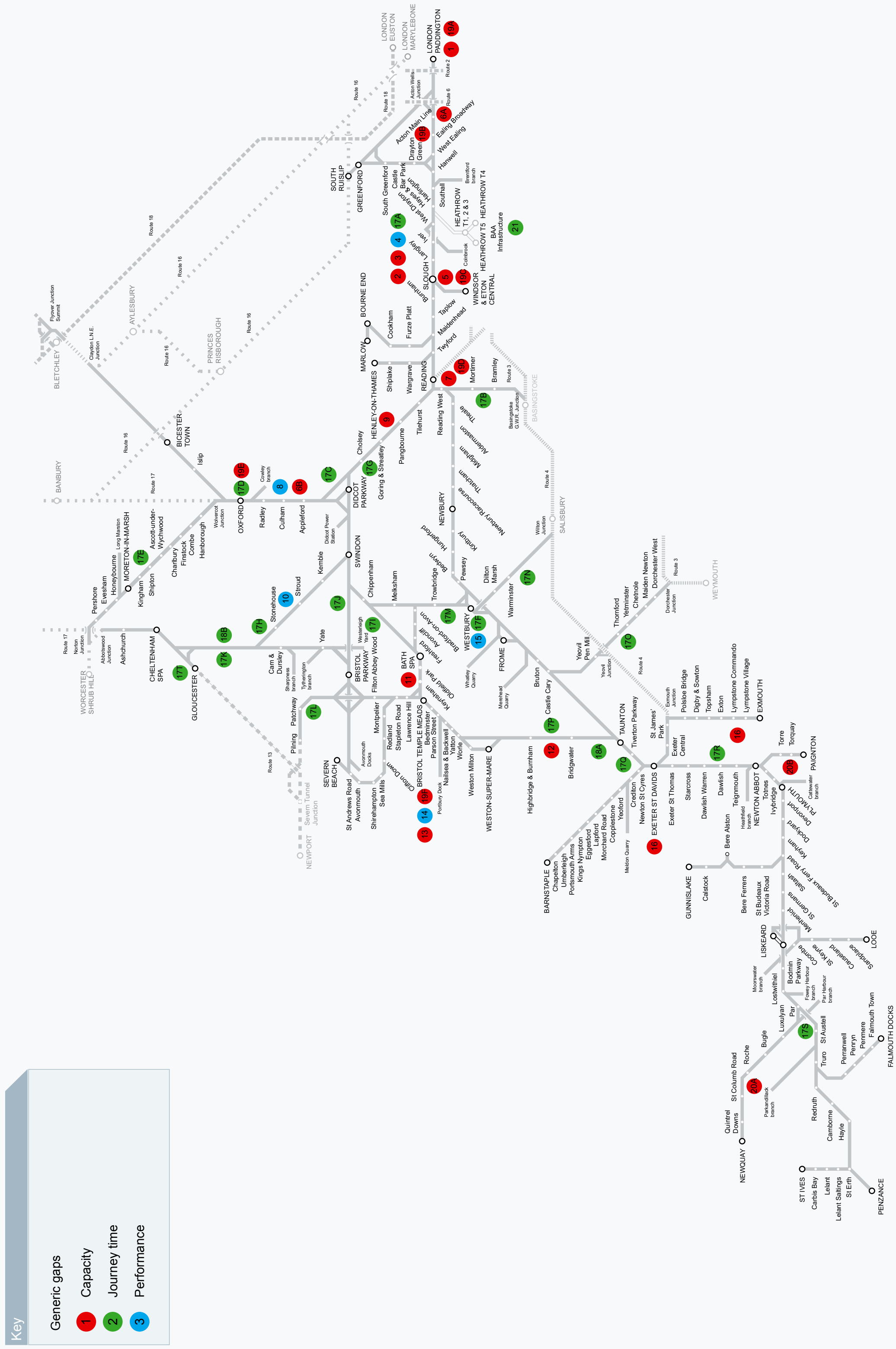
6.5.1

A number of generic strategic gaps, relevant to the overall rail network, were identified by the SMG as part of the gaps process. The majority of which have been discussed in **Chapter 4** as committed schemes with the Intercity Express Programme (IEP), electrification and Seven Day Railway initiative. The Strategic Freight Network and the Freight RUS captures the generic gap of freight train length and network capability whilst depot capacity for new rolling stock, predominantly as a result of the additional vehicles expected to be provided through the High Level Output Specification (HLOS), but also with reference to IEP, is being addressed nationally through the Network RUS and IEP project.

6.5.2

These strategic gaps are therefore being managed through various means and as such are not intended to be duplicated by this RUS. The performance and capacity metrics from the HLOS have been incorporated in the RUS gap list and are addressed accordingly through the option analysis below.

Figure 6.2 – Great Western RUS scope area with identified gaps



6.6 Quantification of gaps

6.6.1

Once the gaps have been identified, the next stage is to quantify the gap. During the process of assessing and quantifying the RUS gaps, a number of gaps were resolved and were therefore not progressed any further, these are discussed below:

6.6.2 Gap 5: Slough to Windsor and Eton Central all day capacity

6.6.2.1

The issue of on-train crowding on services throughout the day between Slough and Windsor was raised during the gaps process. The timetable at the time of analysis (May 2008) provided three trains per hour Monday to Friday during the morning and evening peaks with two trains per hour during the inter-peak period.

6.6.2.2

However, from December 2008 the service provision increased to three trains per hour all day Monday to Friday. The current level of demand was assessed with forecast growth to 2019 to understand whether the two-car service of three trains per hour was sufficient to cater for the expected levels of demand. The results showed that the three trains per hour provided a passenger to total capacity (includes seats and standing allowance) ratio of 70 percent during the morning high peak hour, reducing to less than 20 percent in the off peak. This level of service provision is therefore sufficient to accommodate predicted growth until at least 2019.

6.6.2.3

A review of the existing service provision and forecast growth to 2019 on weekend services was also undertaken. From July 2009, the Saturday service has been increased from two cars to three cars for the summer months. First Great Western (FGW) are currently reviewing the continuation of this extension as well as evaluating the operation of three trains per hour on Saturdays as an alternative.

6.6.2.4

In the longer term, additional capacity could be provided on the line by either increasing the service to a four-car train and/or increasing the linespeed of the route in order to increase the frequency of the train service. Based on the current prediction of growth, it is expected that this will be required from 2020 onwards. With the introduction of the Crossrail scheme, the bay platform at Slough will remain capable of accommodating at least a four-car train.

6.6.3 Gap 6: Freight capacity and capability (in and around London and north-south)

6.6.3.1

Freight capacity and capability was raised as a gap by stakeholders across the RUS area, specifically in and around London and for flows north to south. Concerns were raised with regard to future freight growth particularly in the London area after the completion of the Crossrail scheme with freight capability noted specifically as an issue in and around the London area.

6.6.3.2

The Freight RUS identified freight capacity requirements nationally to 2014. The Strategic Freight Network (SFN) is analysing freight growth nationally beyond 2014 to both 2019 and 2030 and will consider any interventions that may be required to meet this growth. Freight capacity and capability needed to be considered in line with these existing strategies and as such no specific options to address these gaps were analysed in the Great Western RUS. However, the SFN forecasts for freight growth to 2019 and 2030 have been included, where applicable, in the analysis of other options to address other gaps.

6.6.3.3

The proposed and committed schemes for development and implementation under the SFN are listed below along with an update on the infrastructure enhancements provided by the Crossrail scheme which provide improvements for freight.

6.6.3.4
The Freight RUS divided gaps into capacity and capability. For the Great Western RUS area, the capacity gap identified related to the predicted growth to 2014 (of up to six additional trains per day) in intermodal traffic on the Southampton to West Midlands route. This is driven by the gauge clearance enhancement scheme addressing the capability gap for traffic from the Port of Southampton to the West Coast Main Line (WCML) via Winchester, Reading West, Coventry and Nuneaton. The increase in capacity, and the potential gap arising, is assessed later in the chapter in Option C under 6.9.3.

6.6.3.5
As stated in **Chapter 4** under committed schemes, the gauge enhancement of this route to W10 is currently underway. As a result of this enhancement, it was evident that diversionary routes would also be required to accommodate W10 traffic. Two diversionary routes were identified and assessed, via Laverstock and Andover or via Melksham, with the route via Laverstock and Andover approved under the SFN as a committed scheme. This again, forms part of the RUS base. The route via Melksham is currently uncommitted but remains an aspiration under the SFN for future development.

6.6.3.6
Although the base case in the Freight RUS did not identify the Southampton to WCML route as a capacity constraint, it was noted that with the predicted demand generated by the gauge enhancement, a future capacity gap could arise. The Freight RUS presented a number of options to address this for the short and long term, many of which are being addressed through other schemes:

- train lengthening opportunities are being assessed through the SFN
- the Reading Station Area Redevelopment scheme provides grade separation at Reading West Jn
- Oxford Resignalling will review signalling headways between Didcot and Aynho Jn when undertaken in Control Period 5
- the Cherwell Valley resignalling scheme addressed issues between Aynho Jn and Leamington
- signalling headways will be improved as part of the Banbury signalling renewals during Control Period 4. The resignalling scheme also includes modernisation of the station layout at Banbury.

6.6.3.7
A timetable assessment completed for the Freight RUS indicated that four paths per day, in each direction, were available without any subsequent enhancement work between Southampton and the WCML. The Great Western RUS has completed a revised capacity study for the Didcot to Leamington area under Gap 8 (Didcot to Wolvercot Jn performance), incorporating the latest freight forecasts from the SFN for expected growth to 2019 and 2030 along with predictions in the increase of passenger services through the introduction of IEP. The characteristics of the additional freight trains were 75 mph intermodal trains at 1400 tonnes. The results of the study proved that the predicted growth is compatible with the existing infrastructure subject to the provision of a third bi-directional line from Didcot North Jn towards Appleford (see 6.9.3 for further details).

6.6.3.8
In the longer term, the potential reopening of the Oxford to Bletchley line could offer a preferable routeing option for this freight flow. This is being reviewed further under the West Midlands and Chilterns RUS with a common strategy being developed with the West Coast Main Line RUS. Building on the East West Rail scheme, the consortium is reviewing a new north-south routeing strategy between the WCML and the South Coast via Reading which could be developed, for both passenger and freight services. If freight services are further extended to Bedford, this could provide a north-south freight route from the Midland Main Line to the South Coast (subject to gauge capability for W10 traffic).

6.6.3.9
The SFN is reviewing gauge enhancements from the West Midlands to Doncaster which could potentially further enhance and enable extension of the route from Southampton to West Midlands further north. The increase in network capability that this could provide would assist in addressing the north – south capacity gap as identified under the Great Western RUS.

6.6.3.10
For the London area, as part of the SFN there is a GRIP (Guide to Railway Investment Projects) stage 3 study reviewing the options for a London orbital route from the Channel Tunnel to the north and west of London via Redhill and Reading which can also link into north–south movements as well as those around London.

6.6.3.11
Crossrail provides W10 gauge from Acton to Maidenhead with passive provision for W12. The proposed infrastructure works listed below will assist with freight flows and improve access to terminals:

- grade separation at Acton with a passenger 'diveunder' improving access/egress to/ from Acton Yard
- improved grade separation at Airport Jn
- a repositioned loop at Hanwell Bridge to ease access to/from the Brentford Branch
- a repositioned fifth line between West Drayton and Iver.

6.6.3.12
The latest Crossrail service specification (Iteration 2) incorporates the specified provision of freight paths per day, in and around London, which accommodates the SFN growth forecasts of 25 paths per day to 2019 and 36 paths per day to 2030.

6.6.3.13
From the work streams currently in progress, there is evidence that the freight capacity and capability gaps into and around London and north to south are being reviewed and addressed and as such, no further interventions were proposed. An update on the development of these schemes will be provided in the Fnal Great Western RUS.

6.6.4 Gap 18: Earlier arrivals at key regional centres

6.6.4.1
Earlier morning arrivals for services at Plymouth (from London Paddington) and Cardiff (from Birmingham) was raised as a gap. A high-level economic appraisal on the option of a new service from London Paddington to Plymouth indicated that the scheme offered a poor value for money business case.

6.6.4.2
With the Birmingham to Cardiff journey opportunity it was further clarified that the gap related to direct journeys from Birmingham New Street to Cardiff Central between 05:30 and 07:30. If the 05:42 service could be retimed to depart Birmingham New Street later and achieve a faster running time, the identified gap could be filled. It was therefore agreed that this was a timetabling issue to be reviewed and that the Great Western RUS should not consider it further.

6.6.4.3
With the London to Plymouth journey opportunities, a review of the travelling pattern of users was completed on the first morning services between London Paddington and Plymouth to understand who was travelling, where they were heading and what the purpose of their travel was. The results of this highlighted the focus of demand was more on local journeys specifically between Swindon and Bristol and between Exeter St Davids and Plymouth rather than end to end long distance London to Plymouth journeys. This confirmed the high levels of demand for the inter-regional connections which are further assessed under options H and L. Due to the results of the passenger survey and the limitations of the business case, the Great Western RUS did not consider this gap any further.

6.7 Option definition

6.7.1

After each gap has been quantified and the issues assessed, they are then considered using a standard “toolkit” of possible solutions. The option toolkit includes a range of interventions, from the operation of longer trains within current infrastructure, re-timetabling to improve capacity, to platform extensions and the construction of additional tracks. Using the toolkit, interventions are defined and developed into proposed options to identify the next steps in the analysis.

6.7.2

A number of gaps with a degree of commonality were grouped together to form an option thus allowing the 21 gaps to be addressed by 15 defined options. The proposed options were reviewed and agreed by the SMG before further assessment commenced.

6.7.3

Figure 6.3 presents the Gap and Options matrix which provides a brief description of each of the options and includes which gaps are addressed through each option:

Figure 6.3 – Gaps and option matrix

Option	Gap addressed:
Option A: Increase capacity and improve performance on the Paddington to Reading corridor including connectivity to Heathrow Airport and also including a potential western access This option tested the requirements for lengthening services during the peak into Paddington; all day capacity and performance with and without Crossrail and Intercity Express Programme in addition to proposals for improved access from the west to Heathrow Airport	1, 2, 3, 4, 6a and 21
Option B: Lengthen services on the Reading to Gatwick Airport corridor This option tested the requirements for lengthening services during the peak into Reading specifically on the Wokingham corridor	7
Option C: Improve capacity and performance through infrastructure enhancements; Didcot – Wolvercot Jn This option tested various infrastructure enhancements to increase capacity and alleviate performance delays between Didcot and Wolvercot Jn	8
Option D: Improve connectivity and increase capacity on the West Midlands to South Coast corridor This option tests the requirements for lengthening services on the Newcastle to Reading and Manchester to Bournemouth services with alternative service provisions modelled to improve connectivity from the North to the South Coast	9
Option E: Improve capacity and performance through infrastructure enhancements; Swindon and Gloucester This option assumes double tracking between Swindon to Kemble and reviews reducing headways from Kemble to Standish Jn to improve performance and increase capacity, particularly when the route is used for diversionary purposes	10

Option F: Review service provision on the Cardiff to Portsmouth corridor This option tested the requirements for lengthening services during the peak on the Cardiff to Portsmouth route and reviewed an alternative service proposition for additional capacity and an improvement in journey times	11
Option G: Improve connectivity and increase capacity on the West Midlands to South West corridor This option tests the requirements for lengthening services on the Manchester to Bristol Temple Meads and Edinburgh to Plymouth services with alternative service propositions modelled to improve connectivity from the North to the South West	12
Option H: Lengthen services into Bristol Temple Meads and review service proposition This option tested lengthening a number of services that operate to/from Bristol Temple Meads to alleviate on-train crowding and contribute towards the management of predicted demand	11 and 13
Option I: Improve capacity and performance through infrastructure enhancements at Bristol This option tested various infrastructure enhancements for the north, south and east approaches to Bristol Temple Meads in order to improve the performance of the station layout particularly at Bristol East Jn and increase capacity across Bristol	14
Option J: Review service proposition across Bristol to provide additional capacity and improve performance This option reviewed an alternative service proposition for cross Bristol services as a longer-term improvement to capacity, performance and connectivity	11, 13 and 14
Option K: Improve capacity and performance through infrastructure enhancements at Westbury This option tested the provision of an additional platform face at Westbury to increase capacity and improve performance around the station area	15
Option L: Increase connectivity between Exeter and Plymouth This option tested various timetable alterations for local services across Exeter and through extensions of long distance services from Bristol Temple Meads to Exeter and Plymouth	16
Option M: Improve linespeeds and change calling patterns on interurban journeys This option tested increasing linespeeds and/or changing calling patterns on a number of interurban routes in order to improve journey times	17
Option N: Improve passenger throughput at known constrained stations This option reviewed stations where passenger capacity was near to, or exceeding, the capability of the station	19
Option O: Seasonal fluctuations This option assessed supply and demand for the long distance services and for those branch lines where services are affected during the summer timetable. Capacity and operational interventions were also reviewed	20

6.8 Assessment of options

6.8.1

Each of the options has been assessed for operational and/or economic impact where applicable. Timetable and performance analysis is used to determine whether or not an option is practicable, i.e. the proposed service can actually be timetabled reliably on the network. Economic appraisals compare the revenue implications and socio-economic benefits of changes to infrastructure and/or service specifications (frequency, journey time, stopping pattern) against operating cost (Opex) changes and any capital costs (Capex) necessary to enhance infrastructure to permit such service alterations.

6.8.2

Options that have been developed to address gaps to 2019 have been subject to an appraisal which is compliant with the Department for Transport's (DfT) Transport Analysis Guidance (webTAG). Where appropriate, Benefit Cost Ratios (BCRs) are reported, which indicate the value for money of any particular scheme. The DfT funding criteria permits recommendation of funding through the RUS process if the BCR is at least 1.5, which is indicative of medium value for money. However, schemes involving infrastructure investment are required to offer high value for money indicated by a BCR of at least 2. However, all schemes are subject to funding being available.

6.8.3

The figures presented in this chapter result from high-level feasibility work (equivalent to GRIP 0), and represent the most likely value for money based on a range of key sensitivities. Each option is presented below, detailing the scope, the process undertaken and the recommendations of the analysis. Where an option is recommended, the relevant Transport Economic Efficiency (TEE) table or BCR is provided.

6.9 Option appraisal

6.9.1 Option A: Increase capacity and improve performance on the Paddington to Reading corridor including connectivity to Heathrow Airport and western access

The gaps identified relate to capacity, performance and connectivity on the Paddington to Reading corridor including service provision and western access to London Heathrow. Using the four scenarios, as presented in Figure 6.4, for the Intercity Express Programme (IEP), electrification and Crossrail, various options for capacity and service provision were reviewed.

Figure 6.4 – Scenario matrix for London services

Scenario	IEP	Electrification	Crossrail (to Maidenhead)
A	Y	N (IEP-Diesel)	N
B	Y	Y (IEP-Electric)	N
C	Y	N (IEP-Diesel)	Y
D	Y	Y (IEP-Electric)	Y

Electrification from London Paddington to Bristol/Swansea and Oxford/Newbury

IEP from London Paddington to South Wales, Bristol and some Exeter/Plymouth services

No specific options were devised to address performance as this work is being undertaken as part of the Reading Area Station Redevelopment scheme which addresses current issues on the main line substantially improving performance (predicted output is a 37 percent improvement in train delay minutes) and capacity (125 percent improvement on through line platform capacity). Any recommendations made to capacity and service provision should also, in effect, improve the performance of the services.

As part of the analysis a number of assumptions were made on schemes with which the Great Western RUS interfaces. The RUS assumes that the Paddington Station Remodelling scheme will deliver the necessary infrastructure changes to accommodate IEP and that London Underground Limited's (LUL) proposals will address station capacity issues for their proposed service revision.

With regards to timetables, the RUS analysis used the IEP service specification (January 2008) as per the DfT's Invitation to Tender (ITT) documentation with the Crossrail Iteration 1 timetable. The following assumptions were made:

- prior to Crossrail: all non-IEP services continue as now
- post Crossrail: two outer suburban trains per hour to London Paddington
- Heathrow Express continues as now (four fast trains per hour).

Although, the service specification of IEP is uncommitted, the proposal has been used for the purpose of analysis under the RUS. It is recognised that this is subject to change, and further detailed assessments will be completed in line with the predicted freight forecasts to ensure all services can be accommodated.

The RUS analysis focused on what the capacity provision of these proposed services would be and how this fitted with predicted demand and, where possible, reviewed the timetable structure to understand how this affected both capacity and connectivity. Scenario A and B focused upon the pre-Crossrail world, with the main difference being electrification under scenario B as this will affect whether bi-mode or electric IEP trains would be used (electric trains provide significant additional seating capacity). Scenario C and D included Crossrail but was with and without electrification beyond Maidenhead. The results and analysis for each scenario are summarised below.

6.9.1.1 Scenario A and B

Analysis shows there is sufficient on-train capacity to meet passenger demand and forecast growth to 2019 on Long Distance High Speed services (LDHS) with IEP (either diesel or electric). However, on-train crowding on the inner suburban services (Oxford to London Paddington (stopping), Greenford to London Paddington and Heathrow to London Paddington) is predicted to get worse by 2019. Analysis showed that to maintain the current load factor in 2019 on these services, a total of approximately 1200 extra seats would be required across the morning peak period. In total, this equates to three additional vehicles for both the Oxford to London Paddington and Greenford to London Paddington services and 10 additional vehicles for the Heathrow Connect to London Paddington services across the peak period.

A sensitivity test to change the service provision on the inner suburban services was undertaken to see whether this addressed on-train crowding. This considered replacing the current Greenford to London Paddington services with two-car Greenford to West Ealing shuttles plus an additional two trains per hour from West Drayton to London Paddington (five cars) with current Heathrow Connect (two trains per hour) continuing as now. The results showed an average ratio of passengers to seats of less than 90 percent across the three-hour peak which would address identified capacity problems.

The IEP timetable was reviewed with various propositions modelled. This included operating IEP trains on the December 2008 timetable with the inclusion of Twyford and Maidenhead relief line stops on the outer suburban services. The IEP specification (January 2008), had shown a reduction in calls at Twyford and Maidenhead.

Following the commitment to both Crossrail (July 2008) and electrification (July 2009), scenarios A and B become obsolete and therefore the options were closed. The RUS therefore focused on scenarios C and D.

6.9.1.2 Scenario C and D

Analysis shows there is sufficient on-train capacity to meet passenger demand and forecasted growth to 2019 on both Long Distance High Speed services, outer and inner suburban services with the implementation of IEP (electric) and Crossrail.

The IEP and Crossrail service propositions were reviewed with a number of revisions modelled. Under the IEP specification (January 2008), there was a reduction in calls at Twyford and Maidenhead. The RUS reviewed the option of operating Didcot Parkway to London Paddington shuttles to improve connectivity and provide a relief line stopping service as far as Maidenhead; which then ran on the fast lines to London Paddington.

A further sensitivity was undertaken on the level of demand at Twyford and Maidenhead to assess whether this change in supply under the IEP specification would meet future requirements. The results showed sufficient on-train capacity at Maidenhead to meet demand in the morning peak provided by the current level of service. In the future, demand will be catered for by the proposed four trains per hour Crossrail service. Connectivity from Twyford proved sufficient for demand to at least 2019 under the current IEP specification.

The RUS completed a high-level review of the Crossrail proposition which included extending Crossrail from Maidenhead to Reading and operating additional through peak hour trains from Bourne End and Henley to London Paddington. The recent commitment to the electrification of the Great Western Main Line (GWML), west of Maidenhead, provides the opportunity for the extension of Crossrail services to Reading which will bring significant benefits, by giving the wider Thames Valley direct rail access to central London and the city while also creating extra capacity at London Paddington for longer distance services. This is achieved through the removal of the residual diesel services which provided the service between Reading and intermediate stations. The extension of Crossrail would also reduce the infrastructure requirements for the scheme at Maidenhead and Slough. The DfT and Crossrail will be reviewing the costs and benefits of this option. The possible electrification of the branch lines in the Thames Valley will also be reviewed in addition to some short sections of the route in West London to provide connectivity between freight lines.

Electrification will enable the current Thames Valley suburban services into London Paddington to be operated by electric trains instead of the existing diesel trains. It is proposed that existing Thameslink four-car electric trains will be transferred onto the GWML, replacing the current two and three-car diesel trains, when the new Thameslink fleet is introduced. These vehicles can operate up to 100mph and provide additional capacity. It is planned that suburban services between Oxford, Reading and London Paddington will be operated with these vehicles by the end of 2016.

Heathrow Airport already benefits from an electrified rail link to London but passengers from the west are required to change trains or use coach links to the airport. A recent study commissioned by local authorities in the Thames Valley identified a potential case for direct rail access to the airport from the west, particularly from Slough, Maidenhead and Reading. One of the constraints identified was the lack of electrification on the GWML to support services from Heathrow Airport.

The commitment to electrification will have a positive impact on the case for western rail access to Heathrow Airport and will continue to be assessed.

A comparison of the SFN forecasts with the provision of freight paths in the Crossrail timetable proved sufficient to accommodate predicted growth to at least 2030. The SFN forecasts 25 paths per day to 2019 and 36 paths per day to 2030. The Crossrail Access Option requires that there should be 69 westbound and 73 eastbound freight paths per day; with the current Crossrail timetable (Iteration 2) meeting this requirement.

Further to the RUS analysis of capacity and service provision with IEP and Crossrail, the capacity at Paddington station emerged as an issue with regards to track and platform capacity in the station area. This occurs from the potential mix of services which will operate post 2016 with Heathrow Express, IEP, Crossrail and residual diesel services. An earlier timetable study completed in 2008 determined insufficient capacity within the existing layout at Paddington station to accommodate future growth. A more detailed study is currently underway to specifically determine the number, and length, of platforms that will be required, the results of which will be available in autumn 2009. This will be aligned with any necessary infrastructure enhancements of the approaches into the station area to accommodate the increase in services and depot connections with the proposed IEP depot at North Pole. An update will be provided in the Final Great Western RUS.

During the course of analysis under this RUS, further timetable specifications were produced revising both the IEP and Crossrail timetables. These were being developed simultaneously by the established project teams for each of these schemes. As such, many of the recommendations that would have been proposed in the RUS have been accommodated in the revised service propositions.

With the uncertainty, fluidity and changing base of the RUS (particularly for the Thames Valley area) the SMG agreed that no further work should be undertaken by the Great Western RUS for this option and that it should be remitted to the individual project teams established to manage and coordinate these schemes. Further details on the developments of IEP, Crossrail and connections to airports are provided in **Chapter 8**; a longer-term view.

6.9.2 Option B: Lengthen services on the Reading to Gatwick Airport corridor

On-train crowding for services into Reading station was identified as a gap through the baseline analysis. Load factor forecasts to 2019 (as presented in **Chapter 5)** identified that the Wokingham and Basingstoke corridors would still experience passenger to seat ratios of over 100 percent on arrival at Reading during the high peak hour (08:00-08:59). As part of the HLOS response to the Request for Proposal by the DfT, First Great Western (FGW) has proposed additional vehicles on the Basingstoke corridor which will address issues of on-train crowding on the suburban service. Crowding will remain on the long distance services and this will be addressed through option D (see 6.9.4).

On the Wokingham corridor, under FGW's HLOS proposal, the two-car service currently operating between Redhill and Reading will be lengthened to three cars. A sensitivity test which included the proposed AirTrack service was completed to see whether the implementation of AirTrack would resolve the predicted crowding in 2019 on this corridor. This analysis confirmed that there would still be a capacity issue in particular with regard to three morning peak hour services from Guildford.

The option for providing additional capacity into Reading through train lengthening was considered. Appraisal work was undertaken on the proposal to lengthen the three morning peak hour services from the Guildford line into Reading, by one extra vehicle, with two services providing a sufficient BCR of greater

than 1.5. However, this proposal relied upon the attaching and detaching of an additional vehicle to form a four-car unit for the peak period only. This was deemed an unrealistic assumption and would in practice be inoperable. A sensitivity test of operating the additional unit throughout the day was appraised, however due to the increase in operational cost, it produced poor value for money and the option was discounted.

Taken with the knowledge that other stations on the North Downs line experience overcrowding, a review of the entire route from Reading to Gatwick Airport was undertaken. From this, it was evident that four Reading to Gatwick Airport services could benefit from train lengthening, two in each direction.

The option reviewed lengthening these three-car services by two cars each. This was considered operationally viable due to the ability to be able to detach and reattach a two-car unit. The additional units would then only operate during the peak periods, addressing the capacity gap, and could be stabled or deployed elsewhere during the off peak. Other potential uses for the rolling stock are also available during the inter-peak but these have not been included in the analysis. The revised appraisal for this option provides a medium value for money scheme and can therefore be recommended as a way to relieve crowding on the service. Figure 6.5 presents the Transport Economic Efficiency (TEE) table for this option.

A number of the platforms on the route are only capable of accommodating three or four-car trains and therefore Selective Door Opening (SDO) would need to be deployed to make the service operationally practical. It is recognised that the operation of the four additional vehicles, should they be fitted with SDO, would not be compliant with the rest of the fleet and therefore an operational solution would need to be found.

Figure 6.5 – Transport economic efficiency table for lengthening the Reading to Gatwick Airport service

30-year appraisal	**£million (2002 PV)**
Costs (present value)	
Investment cost	0.0
Operating cost	8.7
Revenue	-2.8
Other government impacts	0.6
Total costs	**6.5**
Benefits (present value)	
Rail users' benefits	9.6
Non-users' benefits	1.1
Total quantified benefits	**10.7**
NPV	**4.2**
Quantified BCR	**1.7**

The Sussex RUS has analysed peak arrivals into Gatwick Airport. The Great Western analysis has since reviewed every service on the North Downs route and incorporates the analysis and recommendations from the Sussex RUS of lengthening one peak service into Gatwick Airport. The analysis concludes that in total there is a business case to lengthen four Reading to Gatwick Airport services (two in each direction).

During the Sussex RUS Draft for Consultation further analysis is being undertaken to review the extension of services from Redhill to Gatwick Airport which is a requirement of the Greater Western Franchise. The potential remodelling at Redhill in CP5 would enable through services to operate to Gatwick Airport on a more ordered pattern of service, facilitating the existing franchise commitment of providing two trains per hour to Gatwick Airport. A positive business case to extend these services would facilitate an improvement to service frequency on the route between Reading and Gatwick Airport.

6.9.3 Option C: Improve capacity and performance through infrastructure enhancements; Didcot to Wolvercot Jn.
The process started with a review of the baseline analysis whereby performance between Didcot and Wolvercot Jn was identified as a pinch-point for reactionary delays (**Chapter 3**) and classified as a gap. Through quantification of this gap, the main cause of delay was identified as being due to lost paths following late running trains. Specifically at Oxford, the analysis showed delays occur due to lost paths when regulated for other late running trains and awaiting platform allocation and station congestion.

As options to improve the performance gap between Didcot and Wolvercot Jn, the following five infrastructure enhancements were proposed:

1. Four tracking between Radley and Oxford
2. Four tracking between Oxford and Wolvercot Jn, redoubling Wolvercot Jn, and the route to Charlbury
3. Grade separation at Didcot East and construction of an Up Avoider platform
4. Extend and convert to passenger status the up goods loop at Didcot Parkway
5. Extend Didcot North Jn towards Appleford creating a four track section.

These schemes were modelled in Railsys (a simulation model utilising proposed infrastructure with service provisions) to understand and quantify the reliability benefits that could be achieved by the enhancements.

Option 1 provides additional tracks between Oxford and Radley. This is achieved through extending the down relief line to connect with the down goods loop and through to reception no.1, and through the extension of the up loop from Hinksey North to Hinksey South and onto Radley. Option 2 constructs a four track section north of Oxford station by extending the down goods loop to Wolvercot Jn, redoubling the junction and double tracking between Wolvercot Jn and Charlbury.

Through the Railsys model, both options 1 and 2 highlighted constraints at Oxford station due to the capacity constraint and routing limitations available with the current layout and number of platforms. Both schemes improved performance into, and out of, Oxford but any benefit derived was eradicated by the capacity constraints at the station. As such, a theoretical future layout revising Oxford station was produced (see Appendix C). The revised layout was designed to accommodate IEP and future growth as well as taking cognisance of other known initiatives for the area with the south facing bay platform, East West Rail and Chiltern Railways aspiration for an hourly Oxford to London Marylebone service. The proposal for the IEP services currently involves the splitting of two five-car sets (joined to make a 10-car train) at Oxford to create five-car sets to serve specific routes, e.g. one five-car set would go forward to the Cotswolds line whilst the other five-car set may return to London.

Options 1 and 2 were re-modelled in Railsys against this new Oxford station layout to

assess any potential benefits. The scheme was appraised which demonstrated that the combined option of options 1 and 2, against the new station layout, provided greater benefits when undertaken as a package. This appraisal did not however include the further benefits available from the additional capacity for passenger and freight, opportunities for journey time improvements or any changes in operational expenditure all of which can enhance the business case. The RUS would therefore recommend that the current Oxford Station Area Redevelopment scheme, in conjunction with the proposed Oxford resignalling, consider the wider strategic benefits of capacity, journey time enhancements, Seven Day Railway initiatives and performance that can be achieved through wider ranging improvements at Oxford station.

Option 3 proposed a new flyover at Didcot East Jn with a new platform on the Up Avoiding line. This would eliminate conflicting moves at Didcot East Jn through grade separation of the junction. However, the Railsys output showed minor improvements to performance due to the grade separation being undertaken at Reading West Jn as part of the Reading Station Area Redevelopment scheme. As a committed scheme, this forms part of the RUS baseline and is included in the model layout in Railsys. The grade separation between Oxford Road Jn and Reading West Jn will enable freight services to cross onto the relief lines avoiding any conflict with the main lines. This removes further conflicting moves at Didcot East Jn. As such, the implementation of another flyover at Didcot East Jn would produce marginal benefits. The scheme offers poor value for money with a BCR of less than 1 and is therefore not recommended.

Option 4 reviewed extending the up goods loop from east of Steventon to connect with the up relief line. The line would be converted to passenger status and would enable slower services to be removed from the main lines. The operational impact of the scheme offered a small improvement to reliability. Due to the minimal performance benefits, this option was not taken any further.

Option 5 extends Didcot North Jn towards Appleford creating a four track section. This presented a performance improvement through the separation of non-stopping services via the Didcot Avoiding lines with services running more slowly to and from Didcot West curve. These benefits were captured in the business case and with the cost of the renewal (scheduled for Control Period 4) of Didcot North Jn included in the appraisal, the enhanced scheme generated a sufficient benefit cost ratio for the SMG to recommend further development work to understand the incremental scope and cost of this enhanced option.

From the appraisals of the aforementioned schemes, it became apparent that given the improvements in performance over the last year, the options produced marginal benefits. The baseline analysis undertaken for the RUS used performance data from 2006/07 and 2007/08 and it was from here that the pinch-point of Didcot was evident and quantified as a gap. However, since this analysis was undertaken, there has been a substantial improvement in performance in the Great Western RUS area and this is predicted to continue with the metrics to be delivered during CP4. The Railsys model also included the committed schemes that form the Great Western RUS base and with the Reading Station Area Redevelopment scheme and the Cotswold line redoubling scheme significantly improving the performance of the area, any further benefits are minimal.

Performance is, and always will be a moveable target, which has recently considerably improved. It is therefore considered that performance around the area of Didcot is no longer a key concern for the route and will remain under control. To quantify this, the baseline analysis was rerun using the 2008/09 data and presented a 27 percent improvement in performance specifically in this area compared with the baseline analysis from

2006 – 2008. Issues that now arise result from secondary delays, and the inability to recover performance by train regulation due to the lack of infrastructure capacity in the area.

The gap was therefore further analysed for capacity purposes, and with the introduction of IEP and expected growth in freight traffic, a capacity analysis was undertaken for the area to assess how the current infrastructure could accommodate such growth.

The current forecasts from the Strategic Freight Network for the Didcot to Oxford route present substantial growth to 2019 and 2030, primarily in intermodal traffic from the Port of Southampton to the West Coast Main Line which is predominantly due to the current gauge enhancement scheme underway. The number of trains predicted per day in each direction is 29 to 2019 and 43 to 2030. These are incremental to today's figures.

With the proposed freight forecasts, equating to one additional freight train per hour in each direction to 2019 and two additional freight trains per hour to 2030, the 2019 and 2030 scenarios were modelled to include the additional freight with the proposed IEP service specification. This involved the replacement of the current December 2008 Class 1 services between London Paddington, Oxford and the north Cotswold line with the proposed IEP timetable with all other services timetabled around this.

The results of the capacity study proved that the additional freight forecasted with the increase in services following the introduction of IEP could be facilitated on the current infrastructure subject to the following enhancements:

- Didcot North Jn to Oxford: a bi-directional line between the junction and Appleford crossing
- Oxford station: revised layout sufficient to accommodate IEP and freight growth
- a review of freight regulation points at Leamington Spa (in line with the SFN and West Midlands and Chiltern RUS).

With the infrastructure at Didcot North Jn raised again through the capacity study (further to option 5 identified for performance improvements), options for the layout were reviewed in order to achieve the most optimum solution for both capacity and performance improvements along with the Seven Day Railway initiative. The preferred option was to incorporate an enhancement to the junction with the planned track renewal in 2012. However, following an engineering review it became evident that it is not feasible to provide an additional line bypassing the junction due to the limited land available and the curvature of the junction. It would also be difficult to relocate the junction, again because of land issues and the close proximity of a footbridge.

Alternative options were therefore reviewed with the most practical solution being the provision of a passing loop on either side of the main lines between the junction and Appleford, to be used by passenger or freight services whilst retaining the access to Appleford sidings. Both loops would have 775 metres capability. However, this option would be completed independently of the planned renewal of the junction which will continue in CP4 and the benefits from this would not be able to be captured in the business case.

This option will be further evaluated during the consultation period of the RUS, to quantify the capacity, performance and Seven Day Railway benefits through timetable and performance modelling. The business case for this enhancement will therefore be revised accordingly and assessed as a stand alone scheme to see whether it provides value for money. The results of this analysis will be presented in the Final Great Western RUS.

6.9.4 Option D: Improve connectivity and increase capacity on the West Midlands to South Coast corridor

On-train crowding has been highlighted as an issue on the Manchester to Bournemouth and Newcastle to Reading services. CrossCountry has undertaken recent passenger counts (May 2009) which will be assessed and appraised for any train lengthening opportunities. This will be completed during the consultation period of the Great Western RUS with analysis and recommendations presented in the Final RUS document.

Following this analysis, further sensitivities will be tested on the Newcastle to Reading service to assess whether a change in the service proposition will assist issues of capacity and improve connectivity. The sensitivities below will be modelled against the current service routing (Newcastle – Doncaster – Solihull – Reading) and against a proposed extension of this service to Southampton and/or Bournemouth.

The following sensitivities will then be applied to both the current and extended service proposition:

1. Newcastle to Reading via Leeds (instead of Doncaster)
2. Newcastle to Reading via Birmingham International (instead of Solihull)
3. Newcastle to Reading via Leeds and Birmingham International.

The analysis for sensitivity 1 has been undertaken as part of the Yorkshire and Humber RUS. This work suggested that the re-routeing via Leeds has a high value for money business case based on the assessment carried out, and demonstrated no unusual practicality or funding issues. On this basis it would normally have been recommended for inclusion in the strategy. However, the option was found to be heavily dependent on other industry processes including HLOS, the development of the East Coast Main Line regular interval timetable, and the wider socio-economic impacts that are not assessed under the RUS process. It was therefore concluded that the re-routeing option would need to be developed in more detail through other industry processes, and it is not anticipated that any of the geographical RUSs will consider this issue in any further detail.

Sensitivity 2 will be undertaken during the Great Western RUS consultation process with initial results based on the revenue effects of this option presented in the Final Great Western RUS. However, the full appraisal will be presented in the West Midlands and Chiltern RUS and will include any infrastructure intervention costs which may be required to accommodate all services (including this potential re-routeing) on the Leamington – Coventry – Birmingham New Street corridor.

Sensitivity 3 will be considered in the Great Western RUS, although as with sensitivity 2, the full appraisal of possible infrastructure costs in the Birmingham area will be reported in the West Midlands and Chiltern RUS.

6.9.5 Option E: Increase capacity and improve performance through infrastructure enhancements; Swindon to Gloucester

Performance issues between Swindon and Gloucester were acknowledged through the baseline analysis. The Swindon to Kemble redoubling scheme (as discussed in **Chapter 4**) is a scheme currently being progressed to GRIP stage 4 (Single Option Development) which could assist in addressing this performance issue and is included in the RUS baseline. Although there is currently no funding commitment for its implementation, the RUS is aware of the South West Regional Development Agency's (SWRDA) bid for £20 million as a contribution to the scheme as part of their short-term commitments for regional funding.

Swindon to South Wales via Gloucester is also a key diversionary route when the Severn Tunnel is closed; this not only contributes to poor performance on the route but also constrains current and future capacity. This was further acknowledged by the train and freight operators as part of the western route consultation on the Seven Day Railway initiative.

The Great Western RUS built on the proposed redoubling scheme and reviewed what infrastructure requirements would be necessary to increase the capacity of the route to enable the operation of four trains per hour to accommodate future growth and for diversionary purposes. These consist of:

- an hourly passenger train (either local or high speed service) between Swindon and Cheltenham Spa calling at Kemble, Stroud, Stonehouse and Gloucester. (From 2016 this will be replaced by IEP with a proposed hourly London Paddington to Cheltenham service);
- an hourly freight service operating between Swindon (Loco Yard) and Gloucester Yard Jn (assumed a Class 6 with 2000 tonnes trailing load); and
- two London Paddington to South Wales high speed services diverted when the Severn Tunnel is closed.

A timetable model to accommodate this level of service was completed and concluded that with the resignalling works under the Swindon to Kemble scheme, two additional signals would be required (one in each direction) between Stonehouse and Standish Jn to provide improved headways along this route and allow the four services to operate. This would deliver both capacity and performance gains. The potential for a new North Swindon station and a turn back facility at Kemble were also included in this analysis.

Funding is expected to be secured for the development of the scheme and the business case for the incremental enhancement for the signalling improvements between Kemble and Standish Jn from the Seven Day Railway initiative. The feasibility of the scheme will therefore be developed with GRIP 4 expected to be completed by summer 2010, at which point a decision will be made as to whether this scheme provides sufficient value for money.

The RUS supports the development of the business case for the incremental enhancement and recognises that should the scheme achieve the necessary BCR, it is beneficial to combine it with the Swindon to Kemble redoubling.

6.9.6 Option F: Review service proposition on the Cardiff to Portsmouth corridor

On-train crowding on the South Wales to South Coast services was identified as a gap, with two affected service groups: Cardiff to Portsmouth and Bristol to Weymouth. Capacity was assessed on these service groups throughout the day with a comparison of winter and summer months to understand any impact of seasonality.

For the Cardiff to Portsmouth service, using counts from November 2008 and predicting growth forward to 2019, three services in each direction during the morning and evening peak will have more passengers than available seats. For the Bristol to Weymouth service, one service in each direction in each peak was identified with on-train crowding.

The first stage of the option appraisal reviewed train lengthening as a short-term solution to meet the current and expected levels of demand. The results of this analysis are presented under option H: Bristol capacity (see 6.9.8). In summary, there is a case to lengthen five morning and evening peak hour services on the Cardiff to Portsmouth corridor.

As a longer-term option for the Cardiff to Portsmouth service, a change in the service proposition was reviewed to address on-train crowding and improve journey times which was identified as an interurban route under Gap 17 (see option M under 6.9.13). A service proposition was developed which involved removing several stops from the existing service and introducing an additional local stopping service. This therefore provided a means of addressing the capacity issues and also enabled the principal service to achieve improved journey times. Economic appraisal showed that this option provides high value for money, as presented in Figure 6.6, when taken with the potential train lengthening business case (option H under 6.9.8). The RUS recommends that this proposal is implemented.

Network Rail has also established a joint Cardiff to Portsmouth Route Improvement Project Group with FGW to focus on this service group and derive initiatives to help improve performance. The group will review possible changes to the service proposition towards Portsmouth with a view to possible journey time savings across the route as a whole.

Figure 6.6 – Transport economic efficiency table for revised service proposition of the Cardiff to Portsmouth service

30-year appraisal	**£million (2002 PV)**
Costs (present value)	
Investment cost	0.0
Operating cost	2.5
Revenue	-1.3
Other government impacts	0.3
Total costs	**1.5**
Benefits (present value)	
Rail users' benefits	2.4
Non-users' benefits	0.6
Total quantified benefits	**3.0**
NPV	**1.5**
Quantified BCR	**2.0**

6.9.7 Option G: Improve connectivity and increase capacity on the West Midlands to South West corridor

On-train crowding has been highlighted as an issue on the Edinburgh to Plymouth and Manchester to Bristol Temple Meads services. CrossCountry has undertaken recent passenger counts (May 2009) which will be assessed and appraised for any train lengthening opportunities. This will be completed during the consultation period for the draft Great Western RUS with analysis and recommendations presented in the Final RUS document.

A change to the service proposition of the Manchester to Bristol Temple Meads service was assessed, through extending this service to Exeter St Davids and/or Plymouth to improve connectivity (identified under gap 16 Exeter to Plymouth) and to potentially assist in crowding relief for the Edinburgh to Plymouth service. The results of this are presented later in this chapter under 6.9.12 option L.

6.9.8 Option H: Lengthen services into Bristol Temple Meads

The option to increase peak capacity into Bristol Temple Meads (BTM) by train lengthening was devised from the baseline analysis and load factor predictions to 2019 (with predicted growth at Bristol Temple Meads as presented in **Chapter 5**). More peak services will have passengers standing either close to, or above, total capacity (this includes seat and standing allowances). A business case for providing additional vehicles has been developed using 2007/08 passenger counts and the RUS passenger forecasts to 2019. Train lengthening is considered as a short-term solution to address crowding issues with a longer-term solution of changing the service frequency examined and presented under option J in 6.9.10.

As part of their response to the Request for Proposal for HLOS, the DfT requested FGW to propose deployment of 12 additional vehicles as one of the options to enable train lengthening on a number of routes in the West of England. This proposal has been included in the RUS analysis as the HLOS forms part of the RUS base as a committed scheme. The assessment has therefore reviewed train lengthening over and above the HLOS proposal, to identify the number of additional vehicles that would be required to accommodate demand on each corridor.

Analysis shows that there is a business case to lengthen 11 trains in total across the morning and evening peaks (07:00 to 09:59 BTM arrivals and 16:00 to 18:59 BTM departures) which in total adds 17 additional vehicles in both peak periods. As a number of the additional vehicles will operate in both the morning and evening peaks, the business case supports the procurement of nine additional vehicles in order to strengthen these services.

Figure 6.7 presents the number of additional vehicles recommended per corridor combined for the morning and evening three-hour peak periods with the expected ratio of passengers to total capacity before and after the enhancement. This shows that train lengthening on the Cardiff to Portsmouth and Cardiff to Taunton corridor provides high value for money. For the Gloucester to Westbury corridor, demand is concentrated in the morning high peak hour with a predicted passenger to seats ratio of 120 percent and a total capacity ratio of 95 percent in 2019 before the enhancement. Train lengthening is recommended for the Gloucester to Westbury corridor subject to a review of the expected growth as a result of the relocation of Ministry of Defence employees to Filton Abbey Wood in 2011.

Figure 6.7 – Additional vehicles by corridor across the morning and evening peak (07:00 to 09:59 Bristol Temple Meads arrival and 16:00 to 18:59 Bristol Temple Meads departure)

Corridor	Number of lengthened services	Number of additional vehicles 2019/20	BCR	Ratio of passengers to total capacity without enhancement	Ratio of passengers to total capacity with enhancement
Cardiff to Portsmouth	5	9	2.8	100%	85%
Cardiff to Taunton	4	6	2.5	110%	80%
Gloucester to Westbury	2	2	1.9	70%	50%
Total	**11**	**17**			

The Great Western RUS therefore recommends the lengthening of 11 peak trains which will add 17 additional vehicles to the morning and evening peak periods on the above corridors.

With the recommended procurement of nine additional vehicles, there may be requirements to either lengthen platforms at some of the stations to physically enable the longer trains to operate or provide Selective Door Opening (SDO). The business case analysis for all of the corridors has been completed assessing both scenarios of either platform lengthening or SDO with the capital cost of this. The value for money for each corridor remains the same for either option and therefore the recommendation does not change under these scenarios.

It is however recognised that should SDO be fitted only to the nine additional vehicles, they would not be compliant with the rest of the fleet and therefore an operational solution would need to be found. The TEE tables are presented in Figures 6.8 and 6.9 for each of the corridors for both the scenarios of platform lengthening and Selective Door Opening.

The analysis also included the services into Bristol Temple Meads from both Severn Beach and Chippenham; however the option of train lengthening on these corridors provided poor value for money and is therefore not recommended. With the recent completion of the turnback at Clifton Down the proposal to operate a more frequent service will address issues when it is implemented.

Figure 6.8 – Transport economic efficiency table for train lengthening: Platform lengthening scenario

	£million (2002 market prices)		
30-year appraisal	**Cardiff – Portsmouth**	**Cardiff – Taunton**	**Gloucester – Westbury**
Costs (present value)			
Investment cost	0.4	0.3	0.0
Operating cost	23.1	9.9	4.6
Revenue	-14.2	-5.0	-2.3
Other Government Impacts	2.8	1.0	0.5
Total costs	**12.2**	**6.2**	**2.7**
Benefits (present value)			
Rail users' benefits	19.5	9.7	2.9
Non-users' benefits	13.5	5.0	2.2
Total quantified benefits	**33.0**	**14.7**	**5.1**
NPV	**20.8**	**8.5**	**2.4**
Quantified BCR	**2.7**	**2.4**	**1.9**

Figure 6.9 – Transport economic efficiency table for train lengthening: Selective Door Opening scenario

	£million (2002 market prices)		
30-year appraisal	**Cardiff – Portsmouth**	**Cardiff – Taunton**	**Gloucester – Westbury**
Costs (Present value)			
Investment cost	0.0	0.0	0.0
Operating cost	23.2	9.9	4.6
Revenue	-14.2	-5.0	-2.3
Other Government Impacts	2.8	1.0	0.5
Total costs	**11.9**	**6.0**	**2.7**
Benefits (Present Value)			
Rail users' benefits	19.5	9.7	2.9
Non-users' benefits	13.5	5.0	2.2
Total quantified benefits	**33.0**	**14.7**	**5.1**
NPV	**21.1**	**8.7**	**2.4**
Quantified BCR	**2.8**	**2.5**	**1.9**

6.9.9 Option I: Increase capacity and improve performance through infrastructure enhancements at Bristol

The performance analysis as part of the baseline identified a high degree of reactionary delays occurring around Bristol, specifically at Bristol East Jn, due to the number of crossing and reversible moves required into and out of Bristol Temple Meads. Three infrastructure interventions were proposed in response to the identified performance issues in this area:

1. Three or four tracking from Dr Days Jn to Filton
2. A new passing loop (on the up line) at St Anne's between North Somerset Jn and St Anne's Tunnel
3. Extension and conversion to passenger status of the carriage line from Bristol West to Parson Street creating a four track railway.

The scope, analysis and results for each are discussed further below:

6.9.9.1 Three or four tracking from Dr Days Jn to Filton

Filton Abbey Wood and Dr Days Jn have become bottlenecks in the Bristol area as a result of the high number of passenger and freight flows traversing the junctions where the infrastructure at these locations reduces from four tracks to two. The introduction of a four track section from the existing four tracks at Dr Days Jn up to and including Filton Abbey Wood (known as Filton Bank) was modelled in Railsys. The junction speeds were increased to 40mph and the layout at Dr Days Jn converted into a larger junction in order to achieve the separation of passenger and freight flows as far as possible. In order to support the scheme, a new junction would also be required at Horfield to facilitate freight and stopping services originating in the eastern direction accessing the relief lines and an additional platform created at Filton Abbey Wood.

Railsys analysis demonstrated performance improvements due to the ability of services to overtake on the additional lines and the potential to segregate non-stop and stopping services. This presented a high level all-encompassing option, increasing line speeds and revising junction layouts, which came at a high cost. As such, the option offered poor value for money.

A revised layout for the area, with options for three or four tracks, utilising the existing layout at Dr Days Jn and simplifying the requirements at Filton was developed and modelled in Railsys. This revision generates performance and journey time improvements at a reduced cost due to the simplification of the layout. The business case for the scheme with an option for either three or four tracks has been completed on the revised reliability benefits but still generates poor value for money.

With the committed growth in train movements in the area with the introduction of the proposed IEP specification, it is evident from the initial timetable review that the current infrastructure cannot accommodate the additional services. The issue therefore becomes that of insufficient infrastructure capacity. A capacity study will be undertaken to review the current and predicted growth in both passenger and freight traffic. This will identify what infrastructure is required to accommodate such growth. The results of this study will be presented in the Final RUS.

The scheme to enhance Filton Bank has also been identified as a key requirement for the Seven Day Railway initiative, as currently all lines have to be closed when engineering work takes place and no diversionary routes are available. With this and the proposed growth in the area, with an additional hourly IEP service, the proposed IEP depot in the Bristol area and the freight forecasts for the Bristol area from the Strategic Freight Network, the SMG have agreed that the business case be further developed during the consultation period of the RUS. This will enable all benefits to be defined and quantified in the business case – capacity, Seven Day Railway, journey time and performance improvements. A revised business case for this scheme, and any subsequent recommendations, will therefore be completed.

An additional option reviewed as part of the above scheme, was the extension of the down goods loop from Platform 2 at Bristol Parkway to the Down Filton line. This provided an improvement for services towards Wales and Bristol Temple Meads minimising the interaction by allowing services towards Bristol to bypass the main lines at Stoke Gifford Jn. The Railsys results highlighted the removal of waiting time at Bristol Parkway for late running services towards Wales and vice versa and therefore proved beneficial to develop the business case. Due to the high costs for the signalling alterations necessary, the scheme offers poor value for money and is not recommended to be taken any further at this stage. It may become more valuable in the future when IEP is introduced particularly when the location of the new depot is taken into account.

6.9.9.2 A new passing loop at St Anne's

A new up goods passing loop between North Somerset Jn and St Anne's Tunnel, to mirror the existing down goods loop was proposed as an option to improve performance particularly around Bristol East Jn. Performance analysis showed that the actual position of the loop provided minimal performance benefits due to its close proximity to Bristol Temple Meads and the Rhubarb curve. As such, the loop was not used at all during the perturbation simulation in Railsys.

As an alternative, new passing loops on the up and down main line at Keynsham were modelled to see the effect of these on performance. The new loops would be positioned on the 12 mile stretch between Bath and Bristol Temple Meads and could assist train service regulation. Performance analysis confirmed a marginal performance benefit, particularly for the non-stopping services. However, with the proposed infrastructure cost, the appraisal results showed that the level of benefits was not sufficient. The scheme is therefore not recommended.

6.9.9.3 Extension and conversion of the carriage line from Bristol Temple Meads to Parson Street

To improve performance at Bristol Temple Meads to and from the west (Taunton/Weston-super-Mare), an option to extend and convert to passenger status the carriage line from Bedminster to just beyond Parson Street was considered. This would create a four track section between Bristol Temple Meads and just beyond Parson Street with the existing platforms at both stations modified to create island platforms. The scheme is also considered essential to provide sufficient capacity to deliver the half-hourly service for the proposed reopening of the Portishead branch for passenger services and further cross Bristol opportunities.

The additional capacity created through the additional track reduces congestion at Bristol West Jn through the segregation of stopping and non-stopping traffic (local and long distance) across the four lines and delivers journey time improvements. It has been identified that long distance southbound services from Bristol Temple Meads will benefit most from this scheme. Economic analysis based on performance benefits alone shows that the option provides high value for money, as presented in Figure 6.10, when 26 minutes of reactionary delays per day are recovered at Bristol West Jn. Analysis on current performance confirms that this is achievable and the scheme would therefore normally be recommended.

However, with the delivery of improved performance under the HLOS CP4 targets, the business case will need re-evaluating using the latest performance figures at the time in CP5. With the resignalling for Bristol also due in CP5, the scheme should be reviewed as an incremental enhancement to the resignalling scheme where the opportunity will also arise to redesignate the four tracks into pairs of main line and relief lines.

This scheme is also highly favourable due to the number of economic and housing developments around Bedminster which are projected for the next five to ten years and with the proposed reopening of the Portishead branch line for passenger services. Bedminster could also become a cross Bristol interchange for certain services relieving pressure on the station capacity at Bristol Temple Meads. The scheme to create the four tracks will enhance the transport links from these areas into Bristol and therefore further reviews of the timetable and calling patterns of services should be undertaken. The creation of the four track section provides the capacity necessary to deliver those services.

The results of the three infrastructure options considered for performance improvements also highlights that should the timetable structure be revisited, to take account of the new infrastructure provided, then there is also the potential to realise capacity and journey time improvements. These improvements result from the segregation of stopping and non-stopping services within the Bristol area. An initial assessment of this has been undertaken at a high level and is presented next in option J.

Figure 6.10 – Transport economic efficiency table for extending the carriage line from Bristol Temple Meads to Parson Street

60-year appraisal	**£million (2002 PV)**
Costs (Present value)	
Investment cost	6.0
Operating cost	0.0
Revenue	-4.3
Other government impacts	0.9
Total costs	**2.6**
Benefits (Present value)	
Rail users' benefits	4.0
Non-users' benefits	1.1
Total quantified benefits	**5.1**
NPV	**2.5**
Quantified BCR	**2.0**

6.9.10 Option J: Review service proposition across Bristol to provide additional capacity and improve performance

As a longer-term approach to address capacity and performance issues around Bristol, a revised service proposition was assessed to understand the potential impact of this, its operation and any further infrastructure that would be required to accommodate it. The objectives of the proposal were to reduce the reversing moves at Bristol East Jn as identified in the performance baseline, improve capacity and accessibility for cross Bristol services and improve journey times.

The service proposition creates a pattern on top of what is there today using the December 2008 timetable as a base. It assumes the proposed IEP service specification and includes all known enhancements (committed, uncommitted and aspirational), the requirements for the Portishead passenger service and the aspirations for a “Bristol Metro” based upon the West of England Partnership’s aspirations. This acknowledges the medium term bid for funding by the South West Regional Development Agency (SWRDA) for both the Portishead and Bristol Metro schemes for the period 2014/15 – 2018/19.

The revised service proposal would deliver an enhanced local rail network of services across the greater Bristol area. It is envisaged by the scheme promoters, the West of England Partnership, that with new infrastructure and rolling stock, the revised service pattern would support sustainable growth along the key corridors of Weston-super-Mare to Yate and Cardiff to Bath Spa via Bristol Parkway, Filton Abbey Wood and Bristol Temple Meads. This would increase patronage, reduce car use and road congestion and improve reliability whilst also providing additional capacity.

The service specification includes the following trains per hour (tph) visually presented in Figure 6.11:

- 1tph Weston-super-Mare to Yate
- 1tph Weston-super-Mare to Chippenham
- 1tph Taunton to Cardiff via Weston-super-Mare
- 1tph Portishead to Gloucester
- 1tph Portishead to Clifton Down (peak only)
- 1tph Bristol Temple Meads to Severn Beach
- 1tph Bristol Temple Meads to Westbury (with extensions to Weymouth)
- 1tph Chippenham to Salisbury.

With the exception of the extensions to Gloucester (due to a lack of available paths under the current timetable), the study proved that operationally the specification is achievable. A business case for each proposal was prepared by corridor for each of the proposed changes to service provision, assessing the proposed timetable and any infrastructure requirements against predicted demand. The specification of the option and economic results, with BCRs, are presented below by corridor. Potentially, there are greater benefits available should the specification be reviewed as a whole cross Bristol metro.

6.9.10.1 Bristol Temple Meads to Gloucester corridor

Due to the unavailability of train paths for an additional service to Gloucester the option of providing a Bristol to Yate service was considered. This reviewed extending the hourly Weston-super-Mare to Bristol Parkway service to Yate, increasing service frequency at Yate from one train per hour to two, helping to reduce crowding on the Gloucester to Bristol services as well as providing additional direct services between Yate and stations south of Bristol. The timetable study showed that it would also be operationally possible to retimetable the proposed service to operate at half-hourly intervals and this pattern is assumed in the appraisal.

Figure 6.11 – Proposed Bristol Metro, standard hour

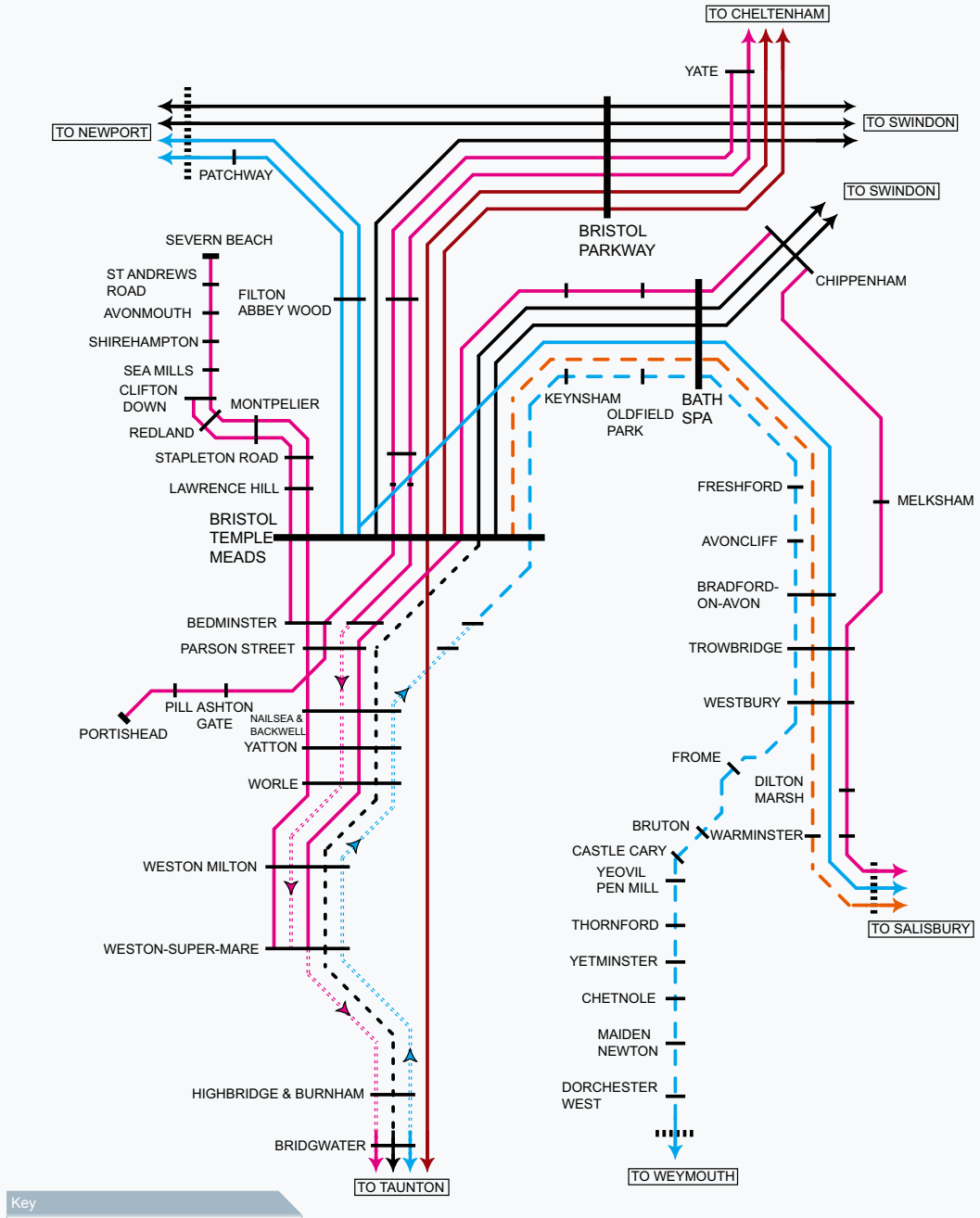


Figure 6.12 – Economic appraisal of service extension to Yate

Option	Infrastructure requirements	All Costs	Sensitivity 1: No capital expenditure	*Sensitivity 2: No capital expenditure or leasing cost
Weston-super-Mare to Bristol Parkway extension	Turnback at Yate	BCR 0.6 NPV £-8.5m	BCR 1.0 NPV £0.3m	BCR 2.5 NPV £4.2m

**sensitivity 2 devised due to potential developer funding as part of the commercial development at Yate*

When all costs are considered, the scheme represents poor value for money, however, the extension of the service to Yate when taken with third party funding (for both infrastructure and additional leasing costs) as per sensitivity 2 provides high value for money with a BCR of 2.5. The RUS therefore recommends this option subject to the provision of third party funding. The results of the economic appraisal are presented in Figure 6.12.

6.9.10.2 Bristol Temple Meads to Chippenham corridor

The option reviewed an additional hourly service between Bristol Temple Meads and Chippenham calling at all stations. This service would improve train frequency and reduce on-train crowding and would require the construction of a bay platform at Chippenham station and two additional rolling stock units.

Based on the economic appraisal, the additional Bristol to Chippenham service offers a poor value for money scheme and was not recommended. Due to this, an alternative option of a Bristol Temple Meads to Bath Spa shuttle was reviewed. This option would provide an additional hourly service between Bristol Temple Meads and Bath Spa calling at all stations, improving train frequency and reducing on-train crowding. This service does not require any additional infrastructure so no capital costs would be incurred. The scheme offers high value for money and therefore the RUS recommends its implementation.

Sensitivity tests show that if the cost of the bay platform at Chippenham could be met by another funding source, the Chippenham to Bristol Temple Meads service would provide medium value for money and meet the funding criteria with a BCR of 1.5 as shown in Figure 6.13 sensitivity 1. However, further analysis demonstrates that the incremental BCR for extending the recommended Bristol Temple Meads to Bath Spa service to Chippenham is 1.4 (sensitivity 2) and is therefore below the funding threshold. Analysis of the incremental BCR determines whether the additional operating cost of extending the service to Chippenham is justified. It compares the additional cost and the additional benefits of the Chippenham extension over and above the alternative option of the extension to Bath Spa.

Figure 6.13 – Economic appraisals of Bristol Temple Meads to Chippenham options

Option	Infrastructure requirements	All Costs	Sensitivity 1: No capital expenditure	Sensitivity 2: No capital expenditure
Chippenham to Bristol Temple Meads	Bay Platform (Chippenham)	BCR 1.1 NPV £4.2m	BCR 1.5 NPV £9.5m	Incremental BCR (Bath vs. Chippenham) 1.4 NPV £3.7m
Bath Spa to Bristol Temple Meads Shuttle	None	BCR 1.8 NPV £7.0m	N/A	

6.9.10.3 Bristol Temple Meads to Weston-super-Mare corridor

This option provides an additional hourly service calling at all stations on the route between Weston-super-Mare and Bristol Temple Meads. The option would require substantial infrastructure works with the redoubling of Worle Jn, redoubling of the single line track from Worle Jn to Weston Milton and the reinstatement of the bay platform at Weston-super-Mare station. The option would also require additional rolling stock to operate the new services. The service would increase the frequency of services operating on the corridor improving the opportunity to travel and providing some crowding relief. The infrastructure could also allow additional stops to be made at Weston Milton.

Initial economic modelling indicated that greater benefits could be achieved by extending the services to Bristol Parkway and this was included in the analysis. A further option of an additional off peak hourly service from Bristol Temple Meads terminating at Yatton was investigated as an alternative to the Weston-super-Mare to Bristol service. This option would require additional infrastructure to enable the turn back of services at Yatton and would therefore incur capital costs. Even though the infrastructure alterations at Yatton have yet to be quantified, the option of operating additional services to Yatton provides poor value for money. The results of the appraisals are presented in Figure 6.14.

Figure 6.14 – Economic appraisals of Bristol Temple Meads to Weston-super-Mare options

Option	Infrastructure requirements	Results
Weston-super-Mare to Bristol Temple Meads	Worle Jn, redouble line to Weston-super-Mare and bay platform at Weston-super-Mare	BCR 0.4 NPV £-29.0m
Weston-super-Mare to Bristol Parkway	Worle Jn, redouble line to Weston-super-Mare and bay platform at Weston-super-Mare	BCR 0.5 NPV £-25.9m
Yatton to Bristol Temple Meads off peak	Signalling amendments	BCR 0.7 NPV £-0.5m

Figure 6.15 – Economic appraisal of Cross Bristol options		
Option	**Infrastructure requirements**	**All Costs**
Bath Spa to Clifton Down	None	BCR 2.4 NPV £11.0m

The results show that the options for operating additional services to Weston-super-Mare and Yatton would be poor value for money due to the high level of infrastructure costs that would be required. The RUS does not therefore support any of the options.

Cross Bristol opportunities were reviewed following the analysis and results of the appraisal per corridor. This involved either the extension of the proposed Bristol to Bath Spa shuttle through Bristol Temple Meads to Clifton Down or by extending the Bath Spa shuttle through Bristol Temple Meads to Yatton.

As presented in the Weston-super-Mare corridor analysis, the option for extending a service to Yatton is poor value for money even without the inclusion of the infrastructure costs. The review of the Bath Spa to Bristol Temple Meads shuttle extended to Clifton Down does however show that the scheme would generate a high value for money ratio and as such the RUS would recommend the review of this option subject to its operational viability. The economic appraisal results are presented in Figure 6.15.

6.9.10.4 West Wiltshire Corridor: Salisbury to Chippenham

A number of options were considered for the West Wiltshire corridor to meet demand for travel from Melksham to other urban centres such as Bristol, Bath Spa, Chippenham and Swindon. The options reviewed an hourly Westbury service operating to either Chippenham or Swindon and an hourly Salisbury to Chippenham service. These options would significantly enhance the service provision on the route and offer faster journey times to London through an interchange at Chippenham. Should the service terminate at Chippenham, the construction of a bay platform at Chippenham would be required. Should the service be extended to Swindon, no additional infrastructure would be necessary. The economic appraisal results for the options are presented in Figure 6.16.

Figure 6.16 – Economic appraisal of West Wiltshire Corridor			
Option	**Infrastructure requirements**	**2-car service**	**Sensitivity 1: 1-car service**
Salisbury – Chippenham	Bay Platform (Chippenham)	BCR 1.3 NPV £14.8m	BCR 1.9 NPV £30.8m
Westbury – Chippenham	Bay Platform (Chippenham)	BCR 2.0 NPV £27.5m	BCR 2.6 NPV £34.1m
Westbury – Swindon	None	BCR 1.7 NPV £28.0m	BCR 2.8 NPV £43.0m

The RUS recommends the further development of the proposals by the scheme promoter (Wiltshire Council) to include a detailed timetable study to assess the operational viability of the proposals with predicted future growth. The RUS recommends that any further work is undertaken in conjunction with the West of England Partnership as scheme promoter for the Bristol Metro. The proposals will need more detailed modelling and operational verification to understand the timetable viability with the mix of passenger and freight services and any performance implications.

The proposed service proposition for the enhanced cross Bristol services maintains a freight path every hour in each direction (as per the current timetable) and has been compared with the predicted freight growth using the Strategic Freight Network forecasts for the Bristol area. Further timetable work will be required by the scheme promoter particularly for the West Wiltshire options to ensure current and future freight is viable within the service proposals.

There are potential capacity issues for the Bristol area as a result of the introduction of IEP and the impact the potential increase in services will have on the current network. An initial review has been completed as part of the RUS analysis, with Filton Bank identified as a constraint, and this will be further assessed as part of the timetable analysis for IEP.

6.9.11 Option K: Improve capacity and performance through infrastructure enhancements at Westbury

Westbury was identified as a pinch-point for performance issues through the baseline analysis. A review of the reactionary delay data identified the loss of train paths when regulated for another late running train and awaiting platform as being the main causes for delays. Using this data, a review of the station area, its infrastructure and operability was undertaken in order to assess what interventions could be proposed to improve performance. Following discussions with the local operations staff, FGW and freight operators the option emerged for the creation of an island platform utilising the existing Platform 1 and constructing a new platform face on the down reception line. The analysis included the withdrawal of freight services from the station area by routing them around the avoiding lines as recommended in the development of the Strategic Freight Network.

The area around Westbury is the subject of various future proposals which all impact on the capacity and ultimately performance of the station and the surrounding area. Over the next five years, the Network Rail National Delivery Service will develop their current facilities at Westbury, to become one of three national Track Materials Recycling Centres. The scheme will be developed further to accommodate the scrap and long-welded rail currently stored at Thingley Jn and the residual land will be developed for a Network Rail fleet maintenance facility. Freight traffic is also expected to grow particularly with construction traffic to service the Olympics infrastructure.

The business case for the scheme was constructed using the performance data from the baseline analysis with a review of the percentage reduction in reactionary delay minutes that could be achieved through the new platform. With an estimated recovery of 70 percent of reactionary delay minutes, equating to 27 minutes per day, the scheme offers high value for money with a BCR of 2.2.

Based on this analysis using current performance from the baseline analysis (2006 – 2008), the RUS recommends the implementation of this scheme. However, as performance is a moveable target and with the delivery of improvements to meet the HLOS targets in CP4, it is imperative that the business case is re-evaluated using the latest performance data at the time in CP5.

Figure 6.17 – Transport economic efficiency table for Westbury Platform

60-year appraisal	£million (2002 PV)
Costs (Present value)	
Investment cost	9.9
Operating cost	0.0
Revenue	-7.7
Other government impacts	1.7
Total costs	**3.9**
Benefits (Present value)	
Rail users' benefits	6.8
Non-users' benefits	1.8
Total quantified benefits	**8.6**
NPV	**4.7**
Quantified BCR	**2.2**

However, an additional platform at Westbury also forms part of the mitigation plan for the Reading Station Area Redevelopment and Crossrail works to facilitate diversionary services during the construction period. This scheme could therefore be an earlier requirement than CP5 due to the need for its construction to facilitate the works at Reading. The Reading Station Area Redevelopment and Crossrail mitigation team are currently reviewing this with a view to developing the scheme to GRIP stage 4 (Single Option Development).

6.9.12 Option L: Increase connectivity between Exeter and Plymouth

Issues at Exeter and Plymouth were raised during the process of identifying gaps, these needed to be further defined to understand whether the gap related to station congestion, train capacity, performance or connectivity. Station managers confirmed that although there were busy times at both stations, there was not a congestion problem. In terms of train capacity, FGW commissioned a report in September 2008 in respect of the HLOS capacity metric which identified that total capacity was sufficient into and out of Exeter St Davids during the morning and evening peak period with the current deployment of rolling stock and the HLOS capacity parameters.

However, aware that some services across Exeter are overcrowded, a passenger survey at Exeter Central was undertaken to review the services from Exmouth. A train count from Exeter St Davids to Plymouth was also completed, both of which showed on-train crowding in the morning peak periods. The RUS therefore recommends that such services (Barnstaple to Exmouth and Exeter to Plymouth) could benefit from train lengthening in peak periods and recognises that this will be reviewed as part of the FGW HLOS work. A decision as to the number of additional vehicles and the services that will benefit from them is awaited.

Figure 6.18a – Current service provision, standard hour

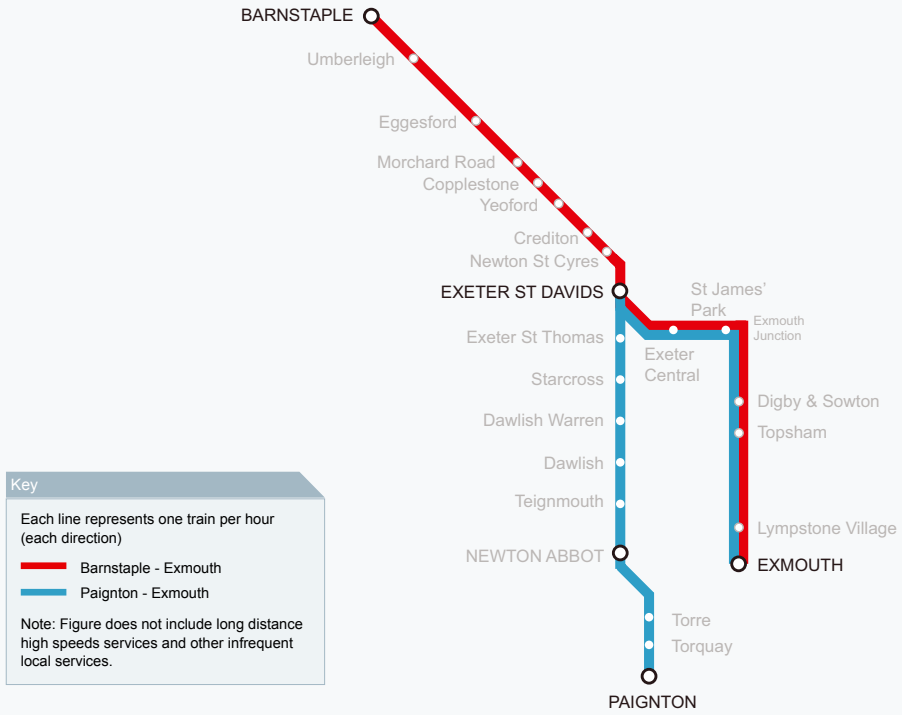


Figure 6.18b – Proposed service provision, standard hour

The focus therefore remained on connectivity between Exeter and Plymouth, a long standing issue remaining from the Strategic Rail Authority's Great Western Main Line RUS (June 2005). Following a review of previous studies and timetable outputs, a service proposition was developed to improve connectivity. A timetable study was completed using the December 2008 timetable (incorporating May 2009 changes) with the following additions:

- current local service pattern as May 2009 with the following proposed changes to local services - half hourly all stations Exmouth to Paignton and an hourly St James Park to Barnstaple;
- an hourly London Waterloo to Exeter St Davids service (as per December 2009)
- proposed replacement services west of Exeter
- aspirational half hourly service from Axminster to Exeter St Davids.

This became the base timetable. With the exception of the "aspirational" half hourly Axminster to Exeter St Davids service, the other proposals are operationally compatible and can be accommodated on the current infrastructure.

In order to facilitate the additional Axminster service, a significant amount of infrastructure would be required either at Exeter St Davids (with a new bay platform) or throughout the route with passing loops, sidings and an element of double track. The appraisal included the impact of the new Cranbrook station. As a detailed infrastructure solution was not produced, the option was appraised without the capital cost of the infrastructure to see if there was a case for further development. The results of the economic appraisal showed that without any capital expenditure, the benefit cost ratio is 0.8 and therefore this option for an additional Axminster to Exeter St Davids service was not further developed and is not recommended.

The option to change the current service provision by terminating the existing Barnstaple to Exmouth services at St James Park and operating a new half-hourly Paignton to Exmouth service enhances the services on the Paignton branch. The service can be provided on the current infrastructure, although four trains per day during the inter-peak would need to terminate at Newton Abbot rather than Paignton to allow the long distance services to continue to operate to Paignton. Figures 6.18 A and B illustrate today's service against the proposed service.

The business case for this option with the increased service frequency, doesn't achieve a BCR of 1.5 until 2018. The RUS therefore recommends the implementation of this scheme in 2018. However, the appraisal has not taken into account any potential crowding on weekend services. Should passenger counts, to be conducted over summer 2009, reflect on-train crowding issues, the business case can be amended to reflect this with the potential benefit of crowding relief achieved through the additional service. The Final RUS will present any change to this recommendation.

Figure 6.19 – Transport economic efficiency table for Exeter local services	
30-year appraisal	**£million (2002 PV)**
Costs (Present value)	
Investment cost	0.0
Operating cost	14.2
Revenue	-4.4
Other government impacts	1.1
Total costs	**10.9**
Benefits (Present value)	
Rail users' benefits	14.6
Non-users' benefits	1.8
Total quantified benefits	**16.4**
NPV	**5.5**
Quantified BCR	**1.5**

Three further options for extending long distance services to Exeter St Davids and/or Plymouth as a method for improving connectivity across the area were modelled on the above base timetable:

- Option 1: extend the proposed London Paddington to Bristol Temple Meads via Bristol Parkway IEP service to Exeter St Davids / Plymouth
- Option 2: extend the Manchester Piccadilly to Bristol Temple Meads service to Exeter St Davids / Plymouth
- Option 3: extend the Cardiff to Taunton service to Exeter St Davids / Plymouth.

Option 1 proved problematic due to the incompatibility of the current IEP service specification and the December 2008 timetable. With the improved journey times for IEP, the services did not fit into the current paths. A high-level economic appraisal proved the option to be unviable due to the high operational costs that would be required with the expected level of demand. This option has therefore been discounted at the present time but recommended for review when the proposed IEP timetable has been further defined and agreed. It is recognised that the IEP proposal could introduce a standard pattern throughout the day between Bristol, Exeter, Plymouth and Penzance. This may enable the extension of a further IEP service to be accommodated should future demand require it.

With option 2, the Manchester Piccadilly to Bristol Temple Meads service is perceived to be less crowded than the Edinburgh to Plymouth service, therefore an extension to Plymouth could assist in effectively managing demand whilst also providing an additional service from Bristol to Plymouth.

The results of the timetable study for the potential extensions of the Manchester Piccadilly to Bristol Temple Meads (option 2) and the Cardiff to Taunton service (option 3) proved that either of these extensions could be accommodated on the current infrastructure subject to minor amendments to the timetable and calling patterns. However, the economic appraisal of the options reviewed scenarios for extending some or all of the services to Exeter St Davids and/or Plymouth and all generated poor value for money due to the additional operating costs. The level of benefits are therefore not sufficient to justify the high expenditure cost and on this basis, the RUS does not recommend the extensions of these two services.

6.9.13 Option M: Improve linespeeds and changed calling patterns on interurban journeys

This option tested increasing linespeeds and / or changing calling patterns on a number of interurban routes in order to improve journey times. The RUS scope area was divided into 20 route subsections and a high level assessment of the benefits associated with a one minute journey time improvement was estimated (see Appendix D). From this, the maximum level of capital expenditure that could be supported to achieve a good value for money business case (a benefit cost ratio greater than 2) was quantified and is presented in Figure 6.20.

The various route sections were then ranked in order of probability as to whether a linespeed or change in calling pattern was deemed achievable taking account of known renewal and enhancement schemes. The subsections were then modelled in "Route Runner" (an Excel-based model using infrastructure and train characteristics to calculate potential journey time benefits or disbenefits across a route section) and the estimated minutes that could be saved were calculated. This analysis concluded that the route sections with the most achievable benefits that were worthy of further review were:

- **linespeed increases:** Bristol to Taunton and Gloucester to Severn Tunnel Jn
- **change in calling patterns:** Reading to Swindon, Oxford to Worcester, Bristol to Westbury and Plymouth to Penzance.

6.9.13.1 Linespeed increases

- Bristol to Taunton
  Following an initial review by Network Rail engineers, the scope for this linespeed improvement was reduced to Bristol to Bridgwater due to the embankment formations across the Somerset levels. The potential speed increase of the Bristol to Bridgwater section to 125mph would provide a notional saving of three minutes. Based on a three-minute journey time improvement analysis showed that a maximum of £50 million of capital expenditure could be spent. The RUS recommends this scheme is progressed.
- Gloucester to Severn Tunnel Jn
  The current linespeed on the route between Gloucester and Severn Tunnel Jn is a mix of speeds due to the high number of level crossings and the existing track curvature of the route. Network Rail engineers are currently reviewing the route to see if any increases can be made.

6.9.13.2 Change in calling patterns

- Reading to Swindon
  On the Reading to Swindon section of the GWML, analysis into the removal of stops at Didcot Parkway on certain services found that short-term and long-term options were achievable. FGW's proposed December 2009 timetable includes this change with further work underway to improve journey times between South Wales and London Paddington.

  As a longer-term recommendation, the proposed IEP specification (January 2008) removes the stop at Didcot Parkway from alternative services from South Wales, notionally improving the journey time between London and Swansea by up to 10 minutes. A further journey time improvement may be possible with the electrification of the GWML of up to 19 minutes, the earliest opportunity for this is anticipated from 2018. These benefits are achieved through the change in calling pattern and through the acceleration and braking capabilities of the IEP trains. The proposed level of service at Didcot Parkway under the IEP specification matches the level of service offered today. The RUS therefore recommends that this element is retained in the IEP proposition.
- Oxford to Worcester
  Following a review of this service and its current calling pattern, it was agreed that due to the minimal benefits that could be achieved from removing stops, the service should remain as it currently is.

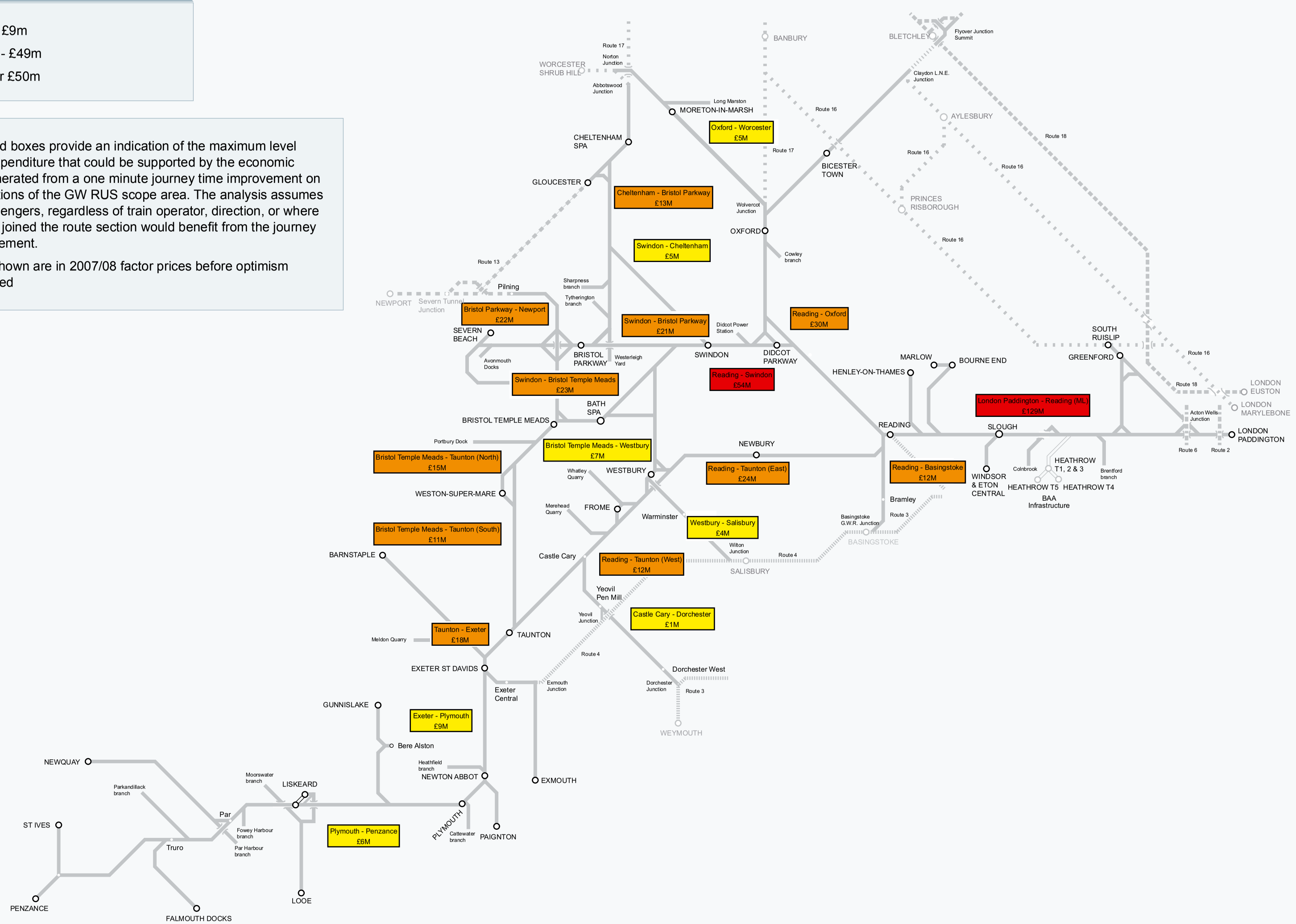
Figure 6.20 – Interurban journeys

Key

- £0 - £9m
- £10 - £49m
- Over £50m

The coloured boxes provide an indication of the maximum level of capital expenditure that could be supported by the economic benefits generated from a one minute journey time improvement on various sections of the GW RUS scope area. The analysis assumes that all passengers, regardless of train operator, direction, or where passengers joined the route section would benefit from the journey time improvement.

All figures shown are in 2007/08 factor prices before optimism bias is applied



The RUS recommends a frequent review of the requirements and usage, particularly following the completion of the redoubling of the Cotswold line and any impact from this in line with IEP service developments.

- Bristol to Westbury
  As part of the revised service proposition for the Cardiff to Portsmouth service as presented in 6.9.6, there will be a journey time improvement of up to nine minutes for a morning Portsmouth to Cardiff service between Westbury and Bristol Temple Meads and a two-minute journey time saving on one return evening service between Bristol and Westbury.

- Plymouth to Penzance
  Initial analysis focused on local service provision, removing various stops (with a proposal for an additional local stopping service implemented) to improve end to end journey times by circa 15 minutes. Various tests were also completed on revising the main line calling pattern with the journey time savings ranging from nine minutes to 18.

  However, it became evident that there were potential benefits that could be gained through a review of the strategy of local services between Plymouth and Penzance. Due to the complexities that needed to be considered with the single line sections, park and ride opportunities and main line and branch line connections it was proposed that a greater timetable study should be developed to review this. After discussing this with FGW, it transpired that such timetable work had been undertaken and a number of service changes were being introduced from May 2009. This option was therefore closed with the recommendation to continually review requirements and the calling patterns for journey time improvements as an ongoing timetabling activity with the joint timetable improvement group established between Network Rail and FGW.

6.9.14 Option N: Improve passenger throughput at known constrained stations

A number of stations were identified as experiencing station congestion as part of the gaps process – London Paddington, Ealing Broadway, Windsor and Eton Central, Reading, Oxford and Bristol Temple Meads. The majority of these are subject to major station enhancement schemes which will rectify existing overcrowding as well as cater for expected levels of growth:

- London Paddington – The proposed remodelling scheme will address congestion issues and future proof the area for growth. Proposed for 2015

- Reading – A pedestrian flow study confirms the new station layout is sufficient to cater for estimated future growth. Programmed for 2016

- Oxford – Oxfordshire Council's station enhancement scheme addresses the station area, footbridge and interchange currently programmed for 2010

- Bristol Temple Meads – station enhancement scheme underway to address station congestion, improve access/egress and station facilities, estimated 2011.

It was therefore agreed that these gaps could be closed as far as the RUS is concerned; the remaining stations of Ealing Broadway and Windsor and Eton Central are discussed further below:

6.9.14.1 Ealing Broadway

The station at Ealing Broadway is due to be rebuilt as part of the Crossrail scheme. Analysis by Crossrail Limited, Network Rail and Transport for London of ticket gate data assumes that the new station to be built will rectify the current issues of congestion and passenger flow. However, with the rebuild programmed for 2014 it was questionable whether current levels of overcrowding could be allowed to continue until then. In addition to a recommendation that the station rebuild

is brought forward, the RUS reviewed a short-term option of an additional entry and exit point.

The proposal to reroute passengers and provide an additional entry and exit point is not new and has been campaigned for by local transport and passenger user groups, other operators and supported by Network Rail for several years. However, due to the physical works (and cost) required to facilitate this (relocation of food outlets, retail units and demolition of a wall) the proposal fails to achieve a business case as a stand alone scheme. The Crossrail programme team will continue to review the programme of works for the station rebuild and ensure delivery is completed as early as feasibly possible.

6.9.14.2 Windsor and Eton Central

Overcrowding on the platform at Windsor and Eton Central station was identified through the process of gap quantification – a station count was completed in January 2009 with a number of issues identified. Over 1.4 million passengers used the station during 2007/08, with further pedestrians using the area as a through walkway from the coach park to the town centre. A fence divides the platform into two routes, one for the passengers alighting and boarding the trains and the other for the through pedestrians. This severely limits the space available for those using the train.

Although the through walkway has not acquired public footpath status, the footway was first leased from British Rail to the Royal Borough of Windsor and Maidenhead in 1984. The fence dividing the platform is erected as a duty of care in order to prevent non-railway passengers from entering the main platform area; as such it would require a formal risk assessment and review between all the parties to consider whether the removal of the fence would result in a greater risk.

As part of the RUS option assessment a number of interventions were proposed; the installation of ticket gates, widening the existing platform or constructing a second platform face. The option of constructing a second platform face was discounted due to the ownership of the station area and land available. The other two options provide short-term and longer-term improvements; the first being the installation of ticket gates as a means to manage and direct the flow of passengers alighting and boarding the train, the second being to widen the existing platform face by up to 1 metre to extend the surface area available.

Due to the number of ticket gates that would be required to appropriately route passengers through the area and the additional operational costs of this, this option proved not to be economically viable. The longer-term option of widening the platform face by slewing the track has been appraised. Analysis shows that the benefits associated with walk time improvements to passengers were not sufficient to justify the cost of construction. Therefore this option is not recommended in the RUS. The recent introduction of three-car trains on Saturdays will assist to reduce overcrowding and conflicts between alighting and boarding passengers on the platform area by spreading passengers across the platform space available. FGW are also evaluating the business case to operate three trains per hour on Saturdays as a alternative.

6.9.15 Option O: Seasonal Fluctuations

Seasonal fluctuations in supply and demand were identified through the baseline analysis. As shown in **Chapter 3**, the demand variations to, from and within Devon and Cornwall during the summer and winter months are significant with up to 30 percent variations.

It was proposed to review those branch lines where the service offered through the summer differed to that provided through the winter in particular assessing those branch lines where Long Distance High Speed (LDHS) services also operated, namely Newquay and Paignton. With the focus on the mix of long distance and local services on the Newquay and Paignton lines, load factor analysis on these areas for summer Saturdays was completed, the results of which are presented below.

6.9.15.1 Newquay

The capacity analysis showed that there was sufficient capacity on the Long Distance High Speed services on summer Saturdays from 2009 to 2019 with an estimated 35 percent passenger growth. A review of the operability of both the local service and the LDHS to see what would be required to accommodate this should it be a feature in the future was undertaken. At present, during the summer timetable only the LDHS service operates non-stop from Par to Newquay on Saturdays, the local stopping service is withdrawn, and there is no service available for the intermediate stations between Par and Newquay.

Timetable analysis has identified that three additional local stopping services could be operated on a Saturday in each direction based around the summer (May 2009) High Speed Train timetable. In order to facilitate this, a new passing loop (potentially at St Columb Road) and additional rolling stock would be required. The economic appraisal of this option (without the capital costs of the new passing loop) showed the scheme offered poor value for money with a BCR of less than 1. Based on this, the RUS is not able to recommend the additional services.

However, Cornwall Council has recently raised an aspiration to review the service provision for Newquay relating to the confirmation of the eco-town at St Austell. The above analysis is a first step in recognising what additional provision (service and infrastructure) could be provided.

6.9.15.2 Paignton

Capacity analysis on the local and long distance services into, and out of Paignton will be completed during the RUS consultation period. This is due to insufficient data currently available to undertake any assessment and with passenger counts programmed in August 2009 by both CrossCountry and FGW, up-to-date information will be available. This data will be used to assess the current levels of demand, projected to 2019 and will be reviewed in line with the proposed service under Option L (6.9.12). The results, along with any recommendations, will be provided in the Final RUS document.

With the remaining branch lines, those with self contained services, assessments will be undertaken and addressed through the Community Rail Route Plans. This has already been completed for St Ives with the Barnstaple branch currently underway.

Furthermore, there are a number of initiatives which will enhance the local area which Network Rail will continue to support and assist the local council and the Community Rail team with. The completion of the new passing loop and station facilities at Penryn is an example of this, with the Falmouth Branch line providing the improved service of two trains per hour to meet Cornwall Council's specifications.

A Park and Ride facility at St Erth station is being developed by Community Rail and Cornwall Council (CC) as a means to reduce demand on parking and road infrastructure within St Ives, encouraging a modal shift to rail. The scheme will include station enhancements such as a new booking office, tourist information facility, café and display areas. FGW have been engaging with CC with the view of enhancing the service on the St Erth to St Ives branch to accommodate anticipated demand and will review lengthening the service potentially up to five cars for a longer period than just the summer months.

6.10 Summary

There are a number of key outputs from the gaps and option appraisal process which are drawn together and presented into an emerging strategy for the short, medium and longer term. This strategy is presented in the following chapter.

7. Emerging strategy

7.1 Introduction

7.1.1

This chapter draws together the initial conclusions from the Great Western Route Utilisation Strategy (RUS) analysis into an emerging strategy to 2019. This will be refined over the course of the coming months in the light of consultation responses, together with further analysis and option appraisal, to form a concluding strategy for recommendation in the final Great Western RUS.

7.1.2

The strategy for Control Period 4 (CP4) is presented along with specific options from the RUS which can potentially be included within this timeframe. The remainder of the chapter focuses on the recommendations to be taken forward into Control Period 5 (CP5).

7.2 Strategy for Control Period 4 (2009 – 2014)

7.2.1

The committed strategy for CP4 encompasses the following elements from the High Level Output Specification (HLOS) with other committed schemes as presented in **Chapter 4** which are summarised below;

- delivery of the HLOS capacity metrics specifically for London and Bristol by means of the HLOS rolling stock allocation determined in the Department for Transport (DfT) Rolling Stock plan (expected autumn 2009)
- delivery of the HLOS capacity programme for the RUS area by means of the:
  - Reading Station Area Redevelopment
  - Twyford and Maidenhead relief line platform enhancements[1]
  - Cotswold line redoubling
  - Westerleigh Jn to Barnt Green linespeed improvements
- delivery of the HLOS performance metrics
- development of electrification proposals
- delivery of all other committed schemes
  - Southampton to West Coast gauge enhancement and the diversionary route via Andover and Lavistock
  - Reading Green Park station
  - Up and Down goods loops at Oxford
  - Bath Spa Capacity upgrade.

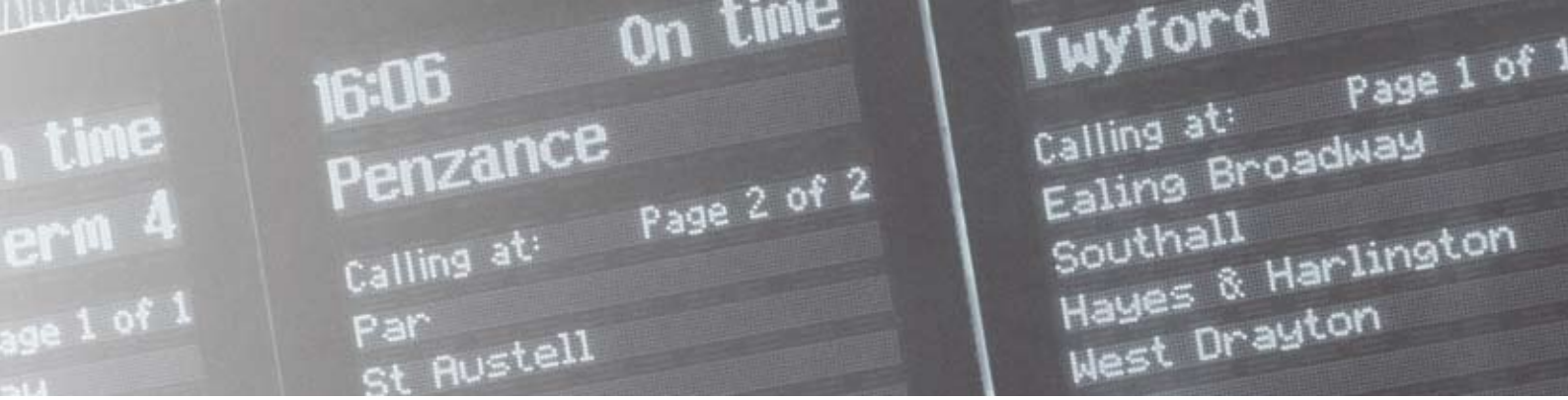
7.2.2

The completion of this investment programme will develop the existing rail network providing the necessary infrastructure to operate an increased service level and longer trains whilst also improving journey times, reliability and performance. The CP4 strategy also enhances the capability of the railway for freight services with the Southampton to West Coast gauge enhancement scheme and the development of the Strategic Freight Network.

7.2.3

It is also recognised that many of the uncommitted third party enhancement schemes discussed in **Chapter 4**, can assist in addressing the gaps identified by the RUS bringing network and service capacity and capability that can benefit the area. Several of these schemes provide significant interfaces with the HLOS capacity programme, specifically with the Cotswold line redoubling and the Westerleigh Jn to Barnt Green linespeed improvements as presented below:

1 Should the HLOS capacity metric for London be met by the rolling stock plan this project would not be required for HLOS purposes.



- Cotswold line redoubling:
  - the Didcot to Oxford capacity enhancement redeveloping the station area and providing a four track section between Radley and Wolvercot Jn
  - Oxford to Bletchley strategic route development for passenger and freight
  - East West Rail upgrading the line between Oxford and Milton Keynes
  - Evergreen III infrastructure works to facilitate a new Oxford to London Marylebone service via High Wycombe
- Westerleigh Jn to Barnt Green Linespeed improvements:
  - interaction with the Bromsgrove station relocation project
  - interaction with Bromsgrove electrification and Redditch branch improvement
  - interaction with Birmingham Gateway
  - cross Bristol service increases with the proposed 'Bristol Metro'

7.2.4 Station enhancements

In the initial period to 2014, there are also a number of programmes and initiatives proposed to address and improve the general station environment at various locations across the RUS area:

- the National Stations Improvement Programme (NSIP) seeks to improve station facilities. In addition, the continuation of the Access for All programme aims to improve the accessibility of stations by providing step-free access to platforms. A number of stations in the RUS area benefit from these programmes as discussed in **Chapter 4**
- there are also third party enhancement proposals for a number of stations as presented in **Chapter 6** which include London Paddington, Ealing Broadway (as part of the Crossrail programme), Reading, Oxford and Bristol Temple Meads. These schemes will address current pedestrian congestion as well as provide sufficient capacity and capability to accommodate future growth.

7.2.5

A number of options identified through the Great Western RUS are recommended, where possible, to be completed during CP4. This is due to their ability to be combined with current schemes during this timeframe aiding the development and potential implementation of the options.

Infrastructure schemes

- Construction of an additional platform face at Westbury station for capacity and performance benefits. Although the RUS recommends this as a stand alone scheme from CP5 onwards (subject to business case evaluation), there are benefits from implementing this scheme as part of the mitigation plan for Crossrail and the Reading Station Area Redevelopment works as it provides a viable diversionary route. Under this proposal, the platform needs to be operational by early 2011. The business case for the scheme would be enhanced to include performance, capacity and diversionary benefits but is subject to funding
- to improve capacity and performance on the Swindon to Gloucester route, the RUS

supports the development of the Swindon to Kemble redoubling scheme recommending the inclusion of the incremental enhancement to signalling headways between Kemble and Standish Jn (subject to business case evaluation).

Timetable changes

- The RUS recommends a continual review of existing timetables as an ongoing measure. This forms part of the Joint Timetable Improvement Group with Network Rail and First Great Western. This should include a review of the timetable for the Oxford to Worcester services following the implementation of the Cotswold line redoubling scheme during CP4, in view of the emerging changes to the service provision expected to be introduced with the Intercity Express Programme (IEP)
- The RUS recommends a continual review of existing timetables as an ongoing measure with CrossCountry.

7.2.6
When drawn together, these initiatives will result in significant changes to the capacity, capability and operation of the railway, substantially improving the current network over the next five years. The predominant focus of this strategy is capacity improvements through infrastructure, station change and rolling stock. This strategy is the first step to achieving the transformation of today's railway, when combined with the strategic elements for CP5 the transformation will be significantly greater.

7.3 Strategy for Control Period 5 (2014 – 2019)

7.3.1
To accommodate the predicted levels of growth, the RUS strategy identifies changes to service provision, including train lengthening, along with infrastructure enhancements required to facilitate such growth for both the passenger and freight markets.

7.3.2
Such capacity improvements can also create improvements in connectivity and journey times. Options to improve performance at the known pinch-points are also recommended along with a view on their ability to further enhance the capacity and capability of the network, which may be required over the longer term. The options can also offer greater benefit when incorporated with future timetable changes.

7.3.3
The proposals, where applicable, also align with the Seven Day Railway initiative to improve network availability for both passenger and freight.

7.3.4
The recommendations for the emerging strategy for CP5 are presented below; firstly by committed schemes followed by recommendations from the Great Western RUS.

7.3.5
The committed strategy for CP5 encompasses the following elements as part of the CP4 HLOS along with other commitments:

- delivery of electrification on the Great Western Main Line
- delivery of the Intercity Express Programme
- delivery of the European Rail Traffic Management System
- Crossrail (to Heathrow Airport and Maidenhead).

7.3.6
IEP and Crossrail are both expected to introduce a significant increase in capacity, through longer trains and an increase in service provision benefiting passengers travelling into London as well as those travelling throughout the RUS area. The implementation of both electrification and the European Rail Traffic Management System will modify the existing railway system and generate significant advances in track capacity

and enhanced capabilities. Together, these can also deliver considerable improvements to journey times and connectivity.

7.3.7

The emerging strategy as recommended by the Great Western RUS is presented below by the generic RUS gaps of Capacity, Connectivity, Journey times and Performance. A number of schemes offer combined interventions when brought together; this is particularly significant for capacity and performance where many of the options will provide opportunities to address both gaps, which in turn, can assist in journey time savings and support the Seven Day Railway initiative.

7.3.8 Capacity and connectivity

Recommendations to address capacity are:

- four additional vehicles to deliver capacity improvements on the Reading to Gatwick Airport service for two morning and two evening peak services
- nine additional vehicles (over and above the HLOS proposal of 12 vehicles) for services into and out of Bristol Temple Meads in particular to address crowding on the following corridors:
  - Cardiff to Portsmouth: five additional vehicles to enhance two morning peak services and three evening peak services
  - Cardiff to Taunton: three additional vehicles to enhance two morning and two evening peak services; and
  - Gloucester to Weymouth: one additional vehicle to enhance one morning and one evening peak service.
- an enhanced cross Bristol service improving connectivity as well as supplying additional capacity through the provision of the following additional services throughout the day:
  - hourly Bristol Temple Meads to Yate (subject to third party funding);
  - hourly Bristol Temple Meads to Bath calling all stations
  - hourly Westbury to Chippenham or Swindon
- a revised local service pattern from 2018 for cross Exeter services improving connectivity and providing additional capacity:
  - half hourly Paignton to Exmouth
  - hourly Barnstaple to St James Park

7.3.9 Performance

The following options are recommended to address performance (subject to business case evaluation in CP5) and also deliver extra capacity:

- an additional platform at Westbury station (subject to inclusion within the Crossrail and Reading Station Area Redevelopment mitigation plan in CP4)
- an extension of the carriage line from Bristol Temple Meads to Bedminster and onto Parson Street to provide a four track section.

7.3.10 Journey times

Options recommended to improve journey times are:

- revised calling patterns at principal stations for one morning and one evening Cardiff to Portsmouth service which reduces journey times by up to nine minutes. Intermediate station calls are catered for by an additional stopping service between Westbury and Bristol Temple Meads
- linespeed improvements between Bristol Temple Meads and Bridgwater.

7.3.11
When brought together, the elements of the draft strategy will deliver substantial improvements to capacity, connectivity, performance and journey times whilst supporting the Seven Day Railway initiative across the entire RUS area. The delivery of this strategy can enhance the capability of rail, increasing the attractiveness and potentially increasing rail's market share. When combined with the electrification of the Great Western Main Line, the benefits from these initiatives will be extensive.

7.3.12
It is recognised that substantial freight growth is forecast and in order to accommodate this additional infrastructure will be required. The RUS analysis has included the growth forecasts from the Strategic Freight Network and presents the infrastructure schemes in the draft emerging strategy as a means to address this growth whilst maintaining performance.

7.3.13
Recommendations for additional vehicles for train lengthening are dependent on the availability of rolling stock. The revised rolling stock plan is expected to be published in the autumn. An update will therefore be provided in the Final RUS.

7.3.14
The following options are proposed for development during the consultation period of the Great Western RUS to enable greater definition and confirmation of the business case:

- enhancements to Didcot North Jn
- three or four tracking between Dr Days Jn and Filton Abbey Wood (Filton Bank)
- linespeed improvements between Gloucester and Severn Tunnel Jn

the results of which will be presented in the final Great Western RUS, and where feasible included in the recommendations for the future strategy. Consultation respondees are welcome to comment on these options.

7.3.15
Figure 7.1 provides a visual representation of the emerging strategy from the Great Western RUS.

7.3.16
The RUS strategy may include emerging recommendations regarding the gaps below following the consultation period:

- Gap 9: West Midlands to South Coast connectivity from the North and all day capacity
- Gap 12: West Midlands to South West connectivity from the North and all day capacity
- Gap 20: Seasonal Fluctuations at Paignton

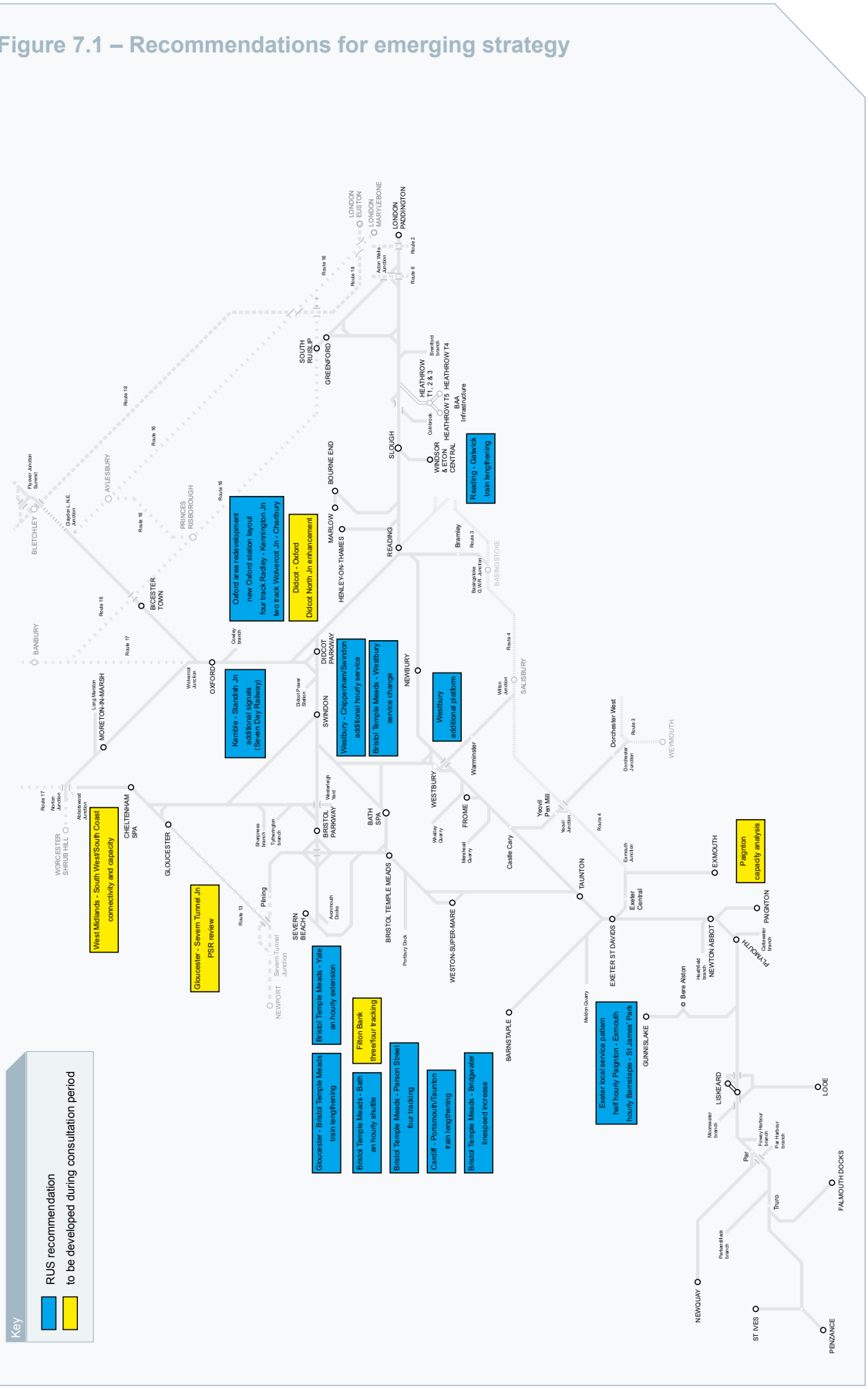
These will be presented in the final Great Western RUS, and where feasible included in the recommendations for the future strategy. Consultation respondees are welcome to comment on these gaps.

7.4 Future strategy

7.4.1
In addition to the above RUS recommendations, the current HLOS and third party schemes underway will significantly contribute to the future CP5 strategy and beyond. Predominantly within the Thames Valley region, these schemes will fundamentally change the current capacity and capability of the railway. When brought together, and completed, such schemes will transform the railway, addressing current issues whilst providing a railway that meets the requirements of the 21st century.

7.4.2
The completion of the Reading Station Area Redevelopment in 2016 and the implementation of electrification and Crossrail from 2017 will deliver major enhancements providing essential capacity and connectivity improvements into and across London and throughout the route. Crossrail, together with the Thameslink programme, will enable passengers to use services across and through the capital – north, south, east and west.

Figure 7.1 – Recommendations for emerging strategy

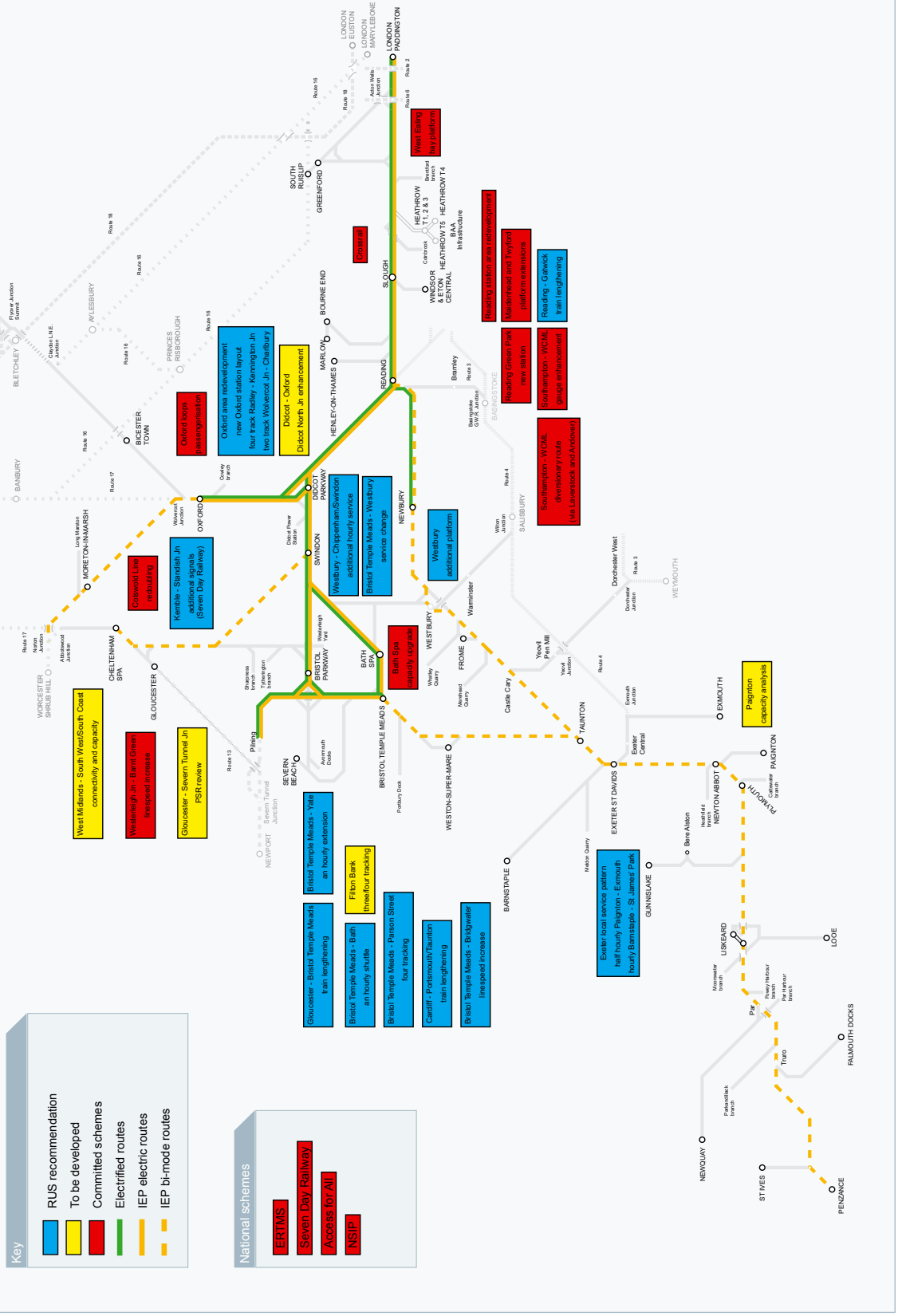


7.4.3
When these schemes are combined with the introduction of the Intercity Express Programme, further benefits are achieved through additional capacity, connectivity and journey time improvements from London to South Wales, the Thames Valley and the West of England. With the addition of electrification, these benefits are amplified. The opportunity to implement these schemes together provides further benefits and enables a complete package of developments to be delivered cohesively.

7.4.4
The following chapter expands on this, with the delivery and implications of these major schemes incorporated with a longer-term view looking at a 30-year planning horizon.

7.4.5
Figure 7.2 below presents the current picture of committed schemes for the RUS area along with the draft recommendations from the emerging strategy of the Great Western RUS to provide a view of what the future will potentially look like.

Figure 7.2 – Recommendations for emerging strategy plus committed schemes



8. A longer-term view

8.1 Introduction

8.1.1

The previous sections have provided the results of initial analysis regarding potential options for implementation within the first 10 years of the Great Western Route Utilisation Strategy (RUS) up to 2019. This chapter provides further detail on a number of the major developments proposed within this time period, predominantly in the Thames Valley, which will significantly impact on the current capacity and capability of the network influencing the future strategy of the route.

8.1.2

This is followed by a longer-term view of how the proposed developments up to 2019 can help shape the future. Also presented are other potential enhancements that could be required over the next 20 years, which would contribute to the development of the Great Western RUS area over the 30-year planning horizon.

8.1.3

The Great Western Main Line (GWML) has experienced sustained compound growth over the last 15 years which is expected to continue, despite the recent recession. Although the focus to date has mostly been on the London and Thames Valley areas, which continues with the major investments programmed over the next 10 years, it is recognised that in the longer term the radial routes from London and those in the regional locations will need significant investment to develop the network to make it consistent with the GWML.

8.2 Developments up to 2019

The greatest concentration of traffic on the GWML is on the initial 36-mile section between London Paddington and Reading, after which flows diverge to the South Midlands, Bristol, the South West and South Wales. The strategic direction for this section of the RUS area has been established for the next 10 years with the funding allocation for the delivery of major enhancement works, principally under the High Level Output Specification (HLOS) with other third party funding commitments. This includes the remodelling of the Reading station area to address performance and provide necessary capacity for current and future growth; electrification and the Intercity Express Programme (IEP) which could provide further increases in capacity, service frequency and improved journey time opportunities along with the installation of in-cab signalling through the European Rail Traffic Management System (ERTMS). When taken together this programme of enhancements significantly changes the dimensions of the railway and meets projected increases in demand and promotes a modal shift from other modes of transport.

The GWML is the longest non-electrified intercity route in Britain, of vital strategic importance to both England and Wales. Electrification has a central role in the modernisation of the railway and can significantly improve rail's product offering to its customers. The Great Western electrification project will be complemented by the £16 billion construction of Crossrail, which will extend electric train services from

Essex and the new east-west tunnel through central London to Slough, Heathrow and Maidenhead by 2017. With electrification now to be extended beyond Maidenhead, it would be possible for Crossrail to operate to Reading and beyond rather than Maidenhead from the outset. Electrification could also facilitate improvements for rail access to Heathrow Airport from the west.

Major changes to the overall pattern of operation at London Paddington will be triggered by the construction, below street-level, of two new low level platforms for Crossrail. Additional works below ground will enable passengers to interchange between these new platforms and the London Underground lines. In this way, passenger circulation will be improved, and platform capacity will be released at London Paddington surface level for main line use, in line with projected improvements as IEP trains are progressively introduced.

Figure 8.1 illustrates the volume of growth in the medium term on the main lines, where additional frequencies are expected to be provided on certain of the interurban and long distance routes following the introduction of IEP.

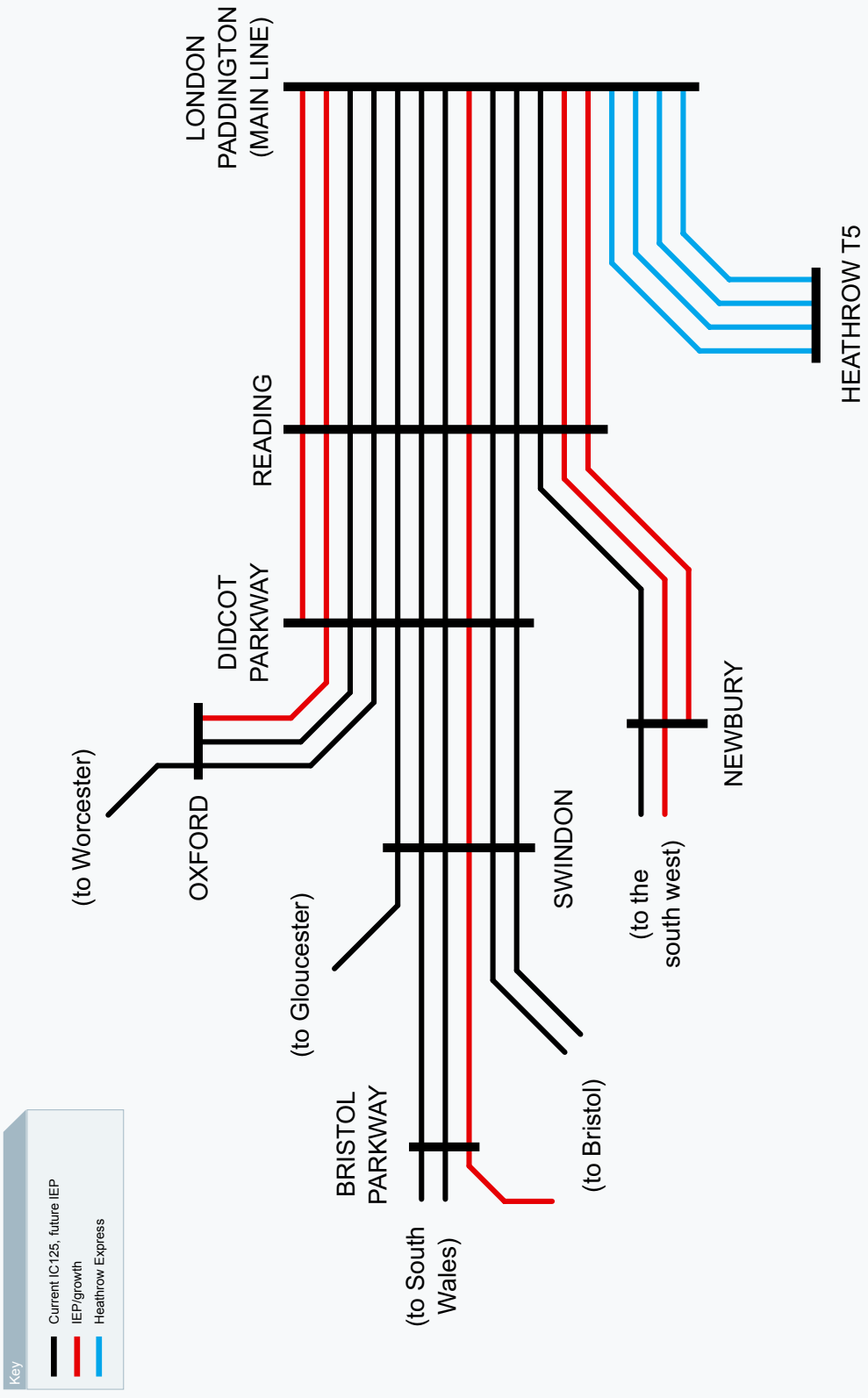
Between London Paddington and Reading, the more intense utilisation of the relief lines as a result of the increased suburban frequencies from Crossrail will be achieved through infrastructure enhancements, which include platform lengthening at most stations in order to accommodate the longer 10-car trains. The extra passenger movements generated by the increase in Crossrail services will place added pressure on freight capacity particularly between Reading and Acton. Acton Yard offers a dual role for local aggregate deliveries as well as being a staging point for multi-portion aggregates trains across London (via the North London Line) to the East and the South East.

The Crossrail enhancements to the current four track railway assist with addressing these continuing freight requirements as well as the expected growth in both freight and passenger services. Some sections of five tracks will be provided, with reversible signalling capability on the additional track to enable fluidity of movements. The two most significant enhancements will be completed at Acton (West) and Airport/Stockley Jns. Enhancements to Acton West Jn will permit westbound freight services to depart from Acton Yard without conflicting with eastbound Crossrail services. The upgrade of Airport/ Stockley Jns will permit more frequent Heathrow stopping services to operate directly between the airport and the relief lines without being in conflict with Heathrow Express and the Long Distance High Speed (LDHS) services on the main lines. This will also secure robust freight train paths on the relief lines.

Electrification will enable the current outer suburban services between Oxford, Reading and London Paddington to be operated with vehicles redeployed from the Thameslink programme by the end of 2016. From 2017, inner suburban services currently operating into and out of London Paddington will operate through the new Crossrail tunnel to central London and destinations to the east of London. This change will release much needed capacity at Paddington station for long distance services to meet forecast demand.

Figure 8.2 illustrates the volume of growth in the medium term on the relief lines, where additional suburban services will be provided

Figure 8.1 – GWML London Paddington to Reading and beyond (tph): proposed IEP (cross country not shown)



in the peak hours following the opening of the east-west Crossrail tunnel and with the introduction of standard 10-car formations. Freight traffic will normally share the relief lines with electrified Crossrail services and utilise additional, reversibly-signalled sections of the new five track railway.

The redevelopment of Reading, as presented in Figure 8.3, and the adjacent complex of junctions will enable significantly greater volumes to be carried on the east-west section of the GWML between London Paddington and Reading. This will benefit both the main lines, following the introduction of IEP, and the relief lines, in order to address a combination of increased services as a result of Crossrail and continuing freight growth to and from London and the South East. Electrification proposals for the GWML, would result in these Crossrail services (originally proposed to operate from the east and South East of London to Maidenhead) being able to be extended to Reading and beyond. There will also be major capacity benefits on the north to south cross-country route, which crosses the GWML at Reading, as a result of grade separation for freight movements and for long distance services to the South West via Castle Cary. This will continue to provide performance benefits throughout the route by reducing the need for any further conflicting movements.

Figure 8.2 – GWML London Paddington to Reading (tph): relief lines

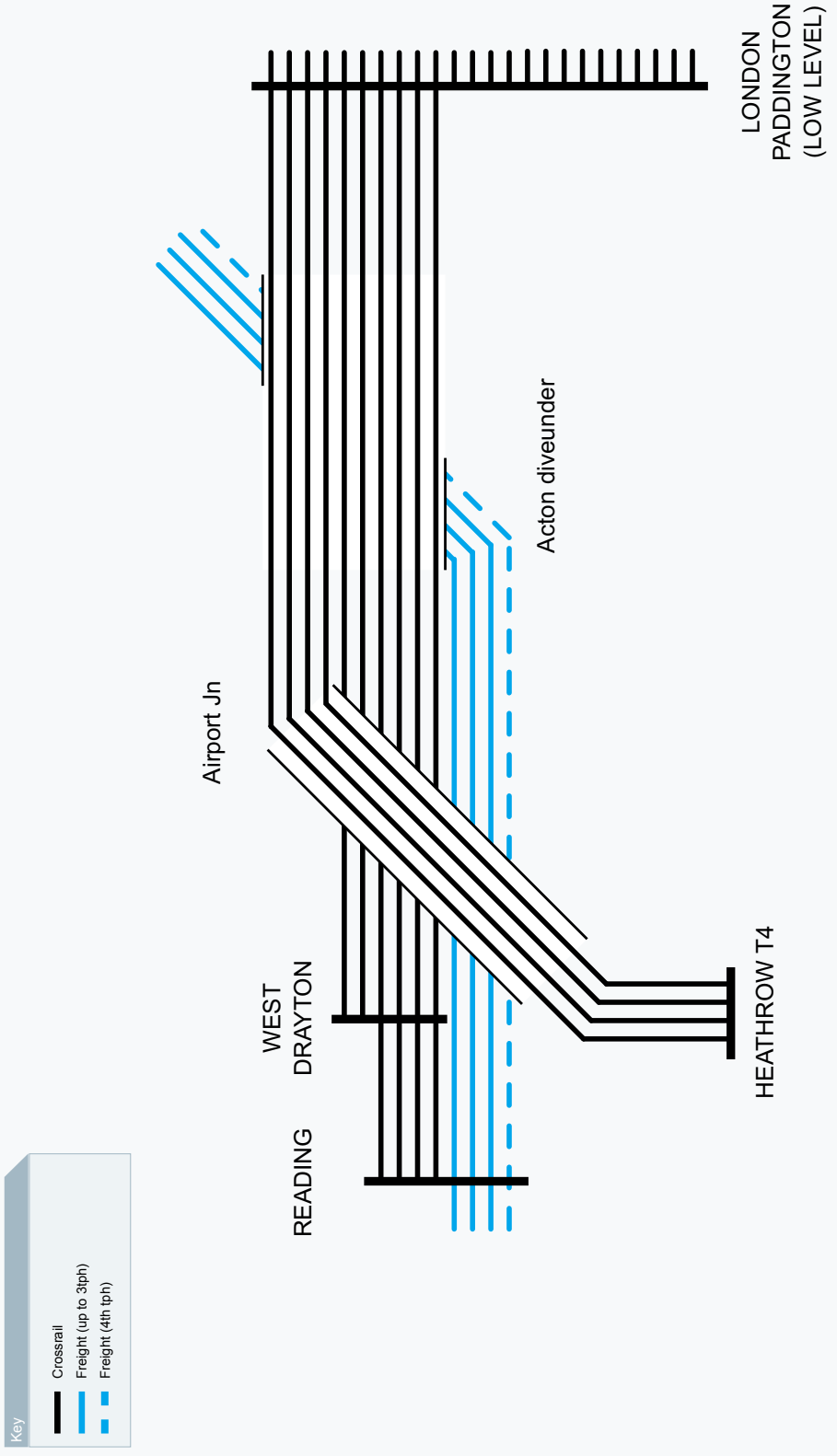
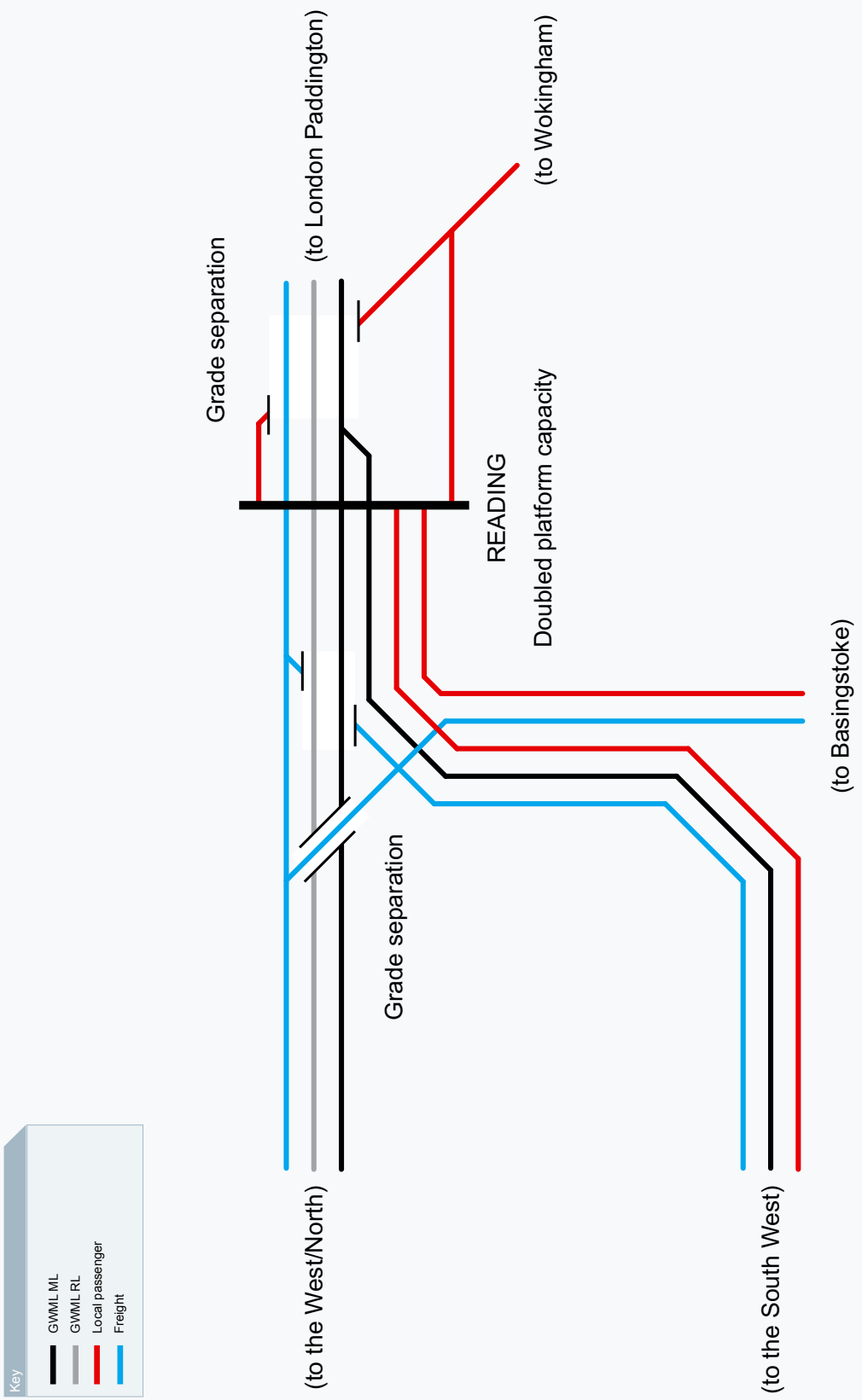


Figure 8.3 – Reading remodelling – proposed layout



8.3 Heathrow Airport

Whilst Heathrow Airport primarily serves the South East of England, with rail links to and from London by Heathrow Express, Heathrow Connect services and London Underground services, rail access to the airport from the west is presently by means of road services from Reading, or by interchange from Thames Valley stopping services at Hayes and Harlington and then via the Heathrow Connect services to Heathrow Terminal 4.

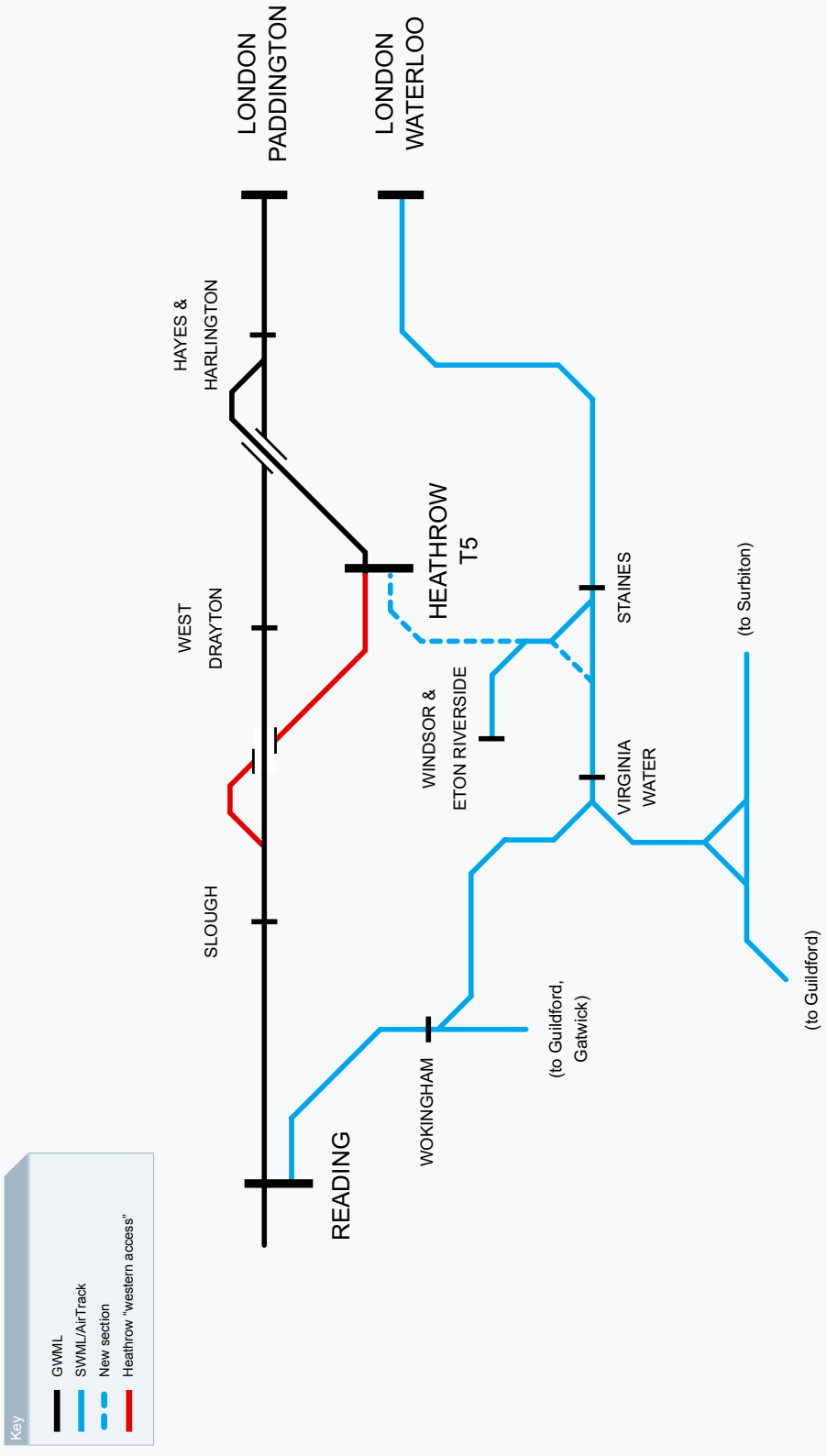
The proposed AirTrack scheme would improve this through the construction of a new section of railway line from Heathrow Terminal 5 to the South Western “inner” lines at Staines, over which it is intended, in the medium term, that a new train service could link Heathrow and Reading via Ascot and Wokingham. The Reading Station Area Redevelopment incorporates additional platform capacity for this future service, and thus improved additional interchange potential with all GWML services. There is also the potential for other AirTrack services to link Heathrow Terminal 5 to the inner South Western lines for Staines and London Waterloo, plus Guildford, subject to further capacity and operational evaluation.

In addition to the AirTrack scheme, the alternative of a more direct link to Heathrow Airport via Slough on the GWML has been identified as a longer-term option. This envisages a south to west chord from the existing Colnbrook freight-only line (which runs to the west of Heathrow Terminal 5, intertwined with the M25 motorway) joining the GWML west of West Drayton. Fast electric services (calling Slough and Maidenhead) could link Heathrow Terminal 5 with Reading, and share the relief lines with Crossrail stopping services.

This proposal would necessitate substantial upgrading of a central section of the relief lines between London Paddington and Reading. It potentially has a good strategic fit with the Crossrail works to the west of West Drayton, which allow for GWML five tracking to Iver, by utilising railway land towards Langley and Slough without significant further land take, although some bridge reconstruction would be necessary. An opportunity to progress this further could possibly be linked with the development of a third runway at Heathrow Airport.

Figure 8.4 illustrates the overall linkages between the GWML between London Paddington and Reading, the AirTrack scheme, and a possible western access to the airport.

Figure 8.4 – GWML: proposed London Paddington to Reading linkages



8.4 Gatwick Airport

Like Heathrow, Gatwick Airport primarily serves the South East of England. Direct rail links to and from Reading via Guildford (and principal intermediate stations) are well-established and provide interchange with all GWML services from the West of England. In addition, connections with CrossCountry services from the Midlands and North are also possible. Reading to Gatwick services utilise the South Western inner route platforms 4a/4b at Reading without directly running on the GWML tracks. The future remodelling of Redhill station, and infrastructure enhancements at Gatwick, which are currently being appraised would enable the achievement of a more standard order of service, operating two through trains per hour from Reading to Gatwick Airport.

The completion of the Reading Station Area Redevelopment will also incorporate a new, grade-separated underpass to the east of Reading station. This will permit the linkage of train services from west of Reading (on the relief lines) with the Gatwick route. One such linkage might be to connect the Oxford to Reading local services with those between Reading with Gatwick, providing greater opportunities to improve connectivity. The new underpass would also permit through operation of (additional) long distance services.

8.5 Oxford

As well as being an important route for long distance services linking the South with the Midlands and North, the completion of gauge enhancement works on the Southampton to West Coast Main Line during Control Period 4 (CP4) is expected to stimulate significant growth in freight, particularly for deep sea intermodal traffic. This will increase the pressure on route capacity at Oxford, (as discussed in **Chapter 6**) and it is anticipated that the signalling renewal (early in Control Period 5 (CP5)) will provide the potential to integrate enhancements in order to create additional platform capacity, consistent with planned frequency improvements linked to the introduction of IEP later in CP5.

Restoration of a substantially four track railway from the south of Oxford (at Kennington Jn) through Oxford station towards the north of Oxford (at Wolvercot Jn where the Cotswold Line diverges) could achieve greater capacity for passenger trains, whilst opening up more long distance freight paths, by addressing the pinch-point that the current Oxford layout represents. The inadequate capacity here is exacerbated by the substantial number of passenger train turnback movements which are necessary. As presented in **Chapter 6**, the combination of these enhancements with a redevelopment of the Oxford station area can generate significant improvements for the future capacity and performance for both passenger and freight services. The commitment of electrification could offer a significant change to the current operation of the station.

8.6 Bristol

Development of the proposed ‘Bristol Metro’ services, as presented in **Chapter 6,** on the cross Bristol axis of Bristol Parkway/Filton Abbey Wood through Bristol Temple Meads, and with the proposed restoration of four track capability from Bristol Temple Meads through to Parson Street (on the route to Weston-super-Mare and Taunton), could enable the segregation of faster LDHS services from more frequent stopping services, such as those linking Severn Beach and Avonmouth with Bristol on Filton Bank, north of Bristol Temple Meads. The introduction of these schemes will deliver additional capacity to support the exceptional growth experienced in Bristol.

With the proposed increase of services under the current IEP service specification, along with projected growth in freight, the already constrained section between Bristol Temple Meads and Bristol Parkway is expected to exceed its capacity utilisation. The impact will be significantly greater with the proposed IEP depot at Stoke Gifford Yard which may determine the requirement, and support the business case, for the fourth platform at Bristol Parkway.

An additional local passenger service between Bristol and Portishead (on the existing Portbury freight only line) would share the Taunton route with the faster, long distance services and would likely necessitate the enhancements south of Bristol with the additional fourth track from Bristol Temple Meads to Parson Street to accommodate the increase in services. Such local service upgrades in the greater Bristol area are dependent on a successful outcome of business case evaluation and regional funding bids for rail enhancements in CP4 with construction anticipated for CP5. The proposed Portishead and Bristol Metro schemes form part of the recent bid by the South West Regional Development Agency (SWRDA) for medium-term funding commitments for the period 2014 to 2019. The land adjacent to the existing Bristol Parkway to Parson Street two track corridor (north and south of Bristol Temple Meads) would be required and is designated accordingly.

Other regional housing and economic developments around the surrounding area, with aspirations for potential new stations, will also contribute to the necessity of increasing the capacity and capability of the area south of Bristol Temple Meads. With the area due for resignalling in CP5, opportunities exist to combine these interventions to produce an all-encompassing development of the area maximising capacity, reducing journey times and improving performance. This could include the potential redesignation of the main and relief lines for long distance and stopping services to match that provided on the route towards London Paddington. Furthermore, with the implementation of electrification and ERTMS, the benefits of an area review are magnified.

8.7 Beyond 2019

The combination of the major works outlined above is expected to cater for predicted growth in the medium to long term, through a combination of higher capacity trains and, on certain routes, increased frequencies. This is presented within the context of the Government's target in the "Delivering a Sustainable Railway" White Paper (2007) to provide a reliable network capable of handling double the number of passengers over the next 30 years as an overall framework for the future development of the railway.

The Network RUS: Electrification strategy published in May 2009 for consultation identified a number of gaps between today's railway and a future railway which could exploit the benefits of electrification. In addition to the electrification of the GWML, the strategy provided a "Western" package of schemes for which business cases should be developed further to review the benefits of electrification which could be achieved following completion of the main line electrification. The key areas identified are:

- Swindon to Cheltenham enabling electric operation from London Paddington to Cheltenham
- cross country routes south of Birmingham
  - via Coventry to Reading and Basingstoke (enabling Bournemouth to Birmingham and Manchester services to be operated by electric traction)
  - the Birmingham Camp Hill line, Bromsgrove to Cheltenham and Westerleigh Jn (Bristol Parkway) and Bristol to Plymouth and Paignton
- Severn Tunnel Jn to Gloucester enabling Cardiff to Birmingham and Nottingham services to run on electric traction and providing a diversionary route from Swindon to South Wales avoiding Severn Tunnel
- the Berks and Hants line (from Reading to Taunton)

- Basingstoke to Exeter enabling electric traction on services from London Waterloo to Salisbury and Exeter
- West London infill schemes (bridging a gap between the GWML, the Midland Main Line and the West London Line) for traffic to the south of London and the Channel Tunnel.

These schemes will be further developed from the initial review undertaken as part of the Network RUS: Electrification strategy to assess the business case and value for money.

With the commitment of electrification on the GWML, the opportunity arises in the longer-term to complete a major service recast across the Great Western RUS area. This would enable improvements in capacity, connectivity and journey times to be recognised and achieved to their full potential. When integrated with the other programme of enhancements across the area, and potential electrification on other routes, there could be a revolutionary change in the entire service provision of the rail network within the Great Western area which could positively impact on adjoining areas.

The enhancements programmed result in the capacity utilisation on both the main and relief lines, specifically on the London Paddington to Reading corridor, being pushed towards its practical limit. Whereas on the main lines trains typically operate non-stop between London Paddington and Reading, the comparatively large number of intermediate stations on the relief lines dictates that the number of paths that can be made available is lower.

HS2 is a new company established to review the development of potential high-speed lines and Network Rail has commissioned a New Lines Programme to investigate the provision of new lines as additions to the network to provide such additional capacity. Various options for new lines are being reviewed.

In the longer term a number of further measures are likely to be needed. These could involve timetable alterations, or more physical upgrade works to further increase capacity. In the former case, Crossrail tunnel construction together with provision for very high service frequencies (ie. close headway capability) and the Westbourne Park turnback facility means there will be some potential east of London Paddington (at Low Level) for running more trains through the tunnel and on to the GWML instead of as turnback services at Westbourne Park from Shenfield/Abbey Wood. One possibility would be to switch the Heathrow Express services from terminating at London Paddington to become “fast Crossrail” services instead, which would in turn release more platform capacity at Paddington. Such a switch would exploit more systematic use of the six track section east of Ladbroke Grove, together with some comparatively minor alterations to track and signalling.

Electrification of the Thames Valley branch lines (Greenford, Windsor, Bourne End and Henley-on-Thames) could also provide additional benefits with through services to London Paddington. Under Crossrail proposals, these services operate only as branch line shuttles.

The electrification of some short sections of route in West London could also provide connectivity for freight routes. This would include Willesden Acton Branch and SW sidings to Acton Wells Jn and Acton Wells Jn to Acton West Jn.

Further west, development of the relief lines between London Paddington and Reading could enable greater utilisation to be achieved for a mix of stopping and semi-fast passenger trains alongside freight. Construction of a longer section of five track railway, between Slough and West Drayton, suitably fitted with reversible signalling, would enable peak hour semi-fast passenger services to overtake stopping services (whilst these called at Langley, Iver and West Drayton stations) and then remain on the relief lines, thus avoiding

the necessity to switch the semi-fasts onto the main lines. At present this causes performance risks and uses scarce main line paths sub-optimally. In the off-peak hours the additional relief line capacity provided could then be used to handle the expected freight growth once the Crossrail service pattern has been fully established.

In this manner, such semi-fast services (for example Reading/Maidenhead/Slough) running through the Crossrail tunnel direct to the west end, city, and Canary Wharf would offer an attractive alternative to an underground interchange at London Paddington. The slightly longer relief line journey time between Reading and London Paddington, with the potential two intermediate calls, would be offset by the fact that passengers would no longer incur an interchange time penalty from a main line journey. It would also reduce the risk of the main lines becoming overloaded and reduce crowding on other London Underground services.

8.7.1 Beyond the Thames Valley (east to west)

The GWML west of Reading is essentially a flat and reasonably straight route to Bristol running at 125mph. The route is a mixed-traffic railway in that the mostly two track section west of Didcot used by existing interurban and long distance services is shared with freight trains of lower speed capability. The absence of intermediate stations (apart from Didcot and Swindon) gives faster journey time potential, which is of benefit to through trains to Wales via the Severn Tunnel. This can be further enhanced through the completion of electrification on the GWML.

Higher speed potential over the western portion of the main line through Swindon could be achieved through a combination of additional tracks to enable improved segregation of high speed passenger and other, slower-moving traffic, and grade separation at Wootton Bassett Jn, to the west of Swindon where the Box line (to Chippenham, Bath and Bristol) diverges from the Badminton line (to Bristol Parkway and South Wales). Depending on the exact mix of station calls specified on the three service groups west of Didcot (to Bath and Bristol, to Bristol Parkway and South Wales, and the Stroud Valley from Swindon to Gloucester) additional platforms at Didcot and Swindon could create further journey time improvements, by permitting better segregation of non-stop high speed services from those requiring to call at intermediate stations.

On the Berks and Hants route to the South West, significant journey time reductions could be achieved for the Plymouth and Cornwall services through the provision of faster services calling only at principal stations between Reading and Taunton. The principal intermediate stations in Wiltshire and Somerset can be catered for by another group of trains, duly flighted to enable exploitation of the maximum linespeeds (between 100 – 110mph) which are expected to remain on this more curved route.

Routes with diversionary capability for electric traction also need to be considered following the commitment to the electrification of the GWML. In some cases the availability of an electrified diversionary route may ease the provision of access for maintenance, enabling further benefits to be achieved through the Seven Day Railway initiative.

8.7.2 Beyond the Thames Valley (north to south)

On the long distance corridor linking the North and Midlands with Bristol and the South West via Cheltenham Spa, and South Wales via Chepstow, linespeed improvements are envisaged between Bromsgrove and Westerleigh Jn (where the cross country route joins the GWML to the east of Bristol Parkway). This forms part of the HLOS commitment for the current control period as discussed in **Chapter 4**. In the period up to 2014, Network Rail is also funded to deliver electrification from Barnt Green to Bromsgrove in the West Midlands. Further benefits

could be delivered through the extension of electrification through to Bristol.

With the increased number of trains anticipated through Standish Jn, to the south of Gloucester, there are potential future conflicts which may only be resolved through further enhancements at Standish Jn with grade separation or a double junction. As a longer-term proposal the review of Standish Jn and its potential developments would be required to facilitate potential service increases between Swindon and Gloucester.

As the route moves towards the west, increases in capacity and capability will be achieved with the introduction of IEP and resignalling, (either conventional or in-cab signalling (ERTMS)), scheduled for the latter part of CP5 and early CP6. This will present opportunities to reduce headways on several of the longer route sections particularly between Newton Abbot and Plymouth, significantly increasing capacity and reducing journey times on key interurban routes. Opportunities also arise for extending electrification through to Plymouth.

For services on the Devon and Cornwall branch lines it is envisaged that train lengthening opportunities will cater for future growth in the longer term. It is recognised that the area has physical and capacity constraints which may need a further review with infrastructure improvements for increasing capacity, connectivity and journey times.


First
First
40

9. Stakeholder consultation

9.1 Purpose

9.1.1

Consultation with stakeholders within and outside the rail industry is essential to the successful development of a Route Utilisation Strategy (RUS). Close involvement of stakeholders helps to ensure that:

- knowledge and experience is maximised and shared
- the correct gaps are identified
- the widest range of options is considered and the most appropriate solutions recommended
- it is an industry approach to a long term strategy.

9.1.2

According to the Office of Rail Regulation (ORR) guidelines on RUSs:

> Network Rail should develop a first draft RUS in conjunction with relevant stakeholders. It should then publish this draft RUS, specifying a reasonable consultation period within which representations can be made.
>
> Network Rail should also establish governance arrangements for individual RUSs to include stakeholders affected by any particular RUS.

Extract from ORR guidelines on Route Utilisation Strategies (April 2009)

9.2 Process

9.2.1

In order to fulfil Network Rail's obligation in an effective and consistent manner, two consultative groups were established for the Great Western RUS:

- Industry Stakeholder Management Group (SMG)
- Wider Stakeholder Group (WSG).

9.2.2

The SMG consists of representatives from passenger and freight train operators, Association of Train Operators (ATOC), Department for Transport (DfT), Transport for London (TfL), The Welsh Assembly Government, Passenger Focus and London Travelwatch and the Office of Rail Regulation (as an observer).

9.2.3

This group acts as a steering group for the RUS, meeting on a regular basis throughout the process as required. The group reviews progress and discusses the way forward. Detailed analysis is completed through subgroups which are established to focus and discuss specific issues such as passenger demand and option generation and appraisal with the relevant representatives, presenting back the findings to the SMG.

9.2.4
The SMG has formally agreed the gaps, options and strategy presented within this document, and SMG members have been involved in its drafting.

9.2.5
The WSG is a larger group containing representatives from:

- Regional Transport Partnerships
- Regional Development Agencies
- Local Authorities
- Rail User Groups.

9.2.6
This group exists to ensure that stakeholders beyond the rail industry have the opportunity to contribute to the RUS and ensure they are briefed and prepared to make best use of the formal consultation period.

9.2.7
A WSG briefing will take place in conjunction with the publication of this draft document where the draft strategy, recommendations and other findings will be briefed enabling wider stakeholders to contribute to the final document. A further WSG briefing will be convened for the final publication of the Great Western RUS.

9.3 How you can contribute

9.3.1
On behalf of the Great Western RUS SMG, Network Rail welcomes contributions to assist us in developing this RUS. Specific consultation questions have not been set as we would appreciate comments on the content of the document as a whole.

9.3.2
This RUS will have a formal consultation period of 12 weeks. The deadline for receiving responses is therefore 27 November 2009. However, earlier responses would be appreciated in order to maximise the time available to consider and respond in the final RUS.

9.3.3
Consultation responses can be submitted either electronically or by post to the addresses below:

greatwesternrus@networkrail.co.uk
Great Western RUS Consultation Response
RUS Programme Manager
Network Rail
Floor 4
Kings Place
90 York Way
London
N1 9AG

Please note that all consultation responses will be published on our website.

Key	Category	Total in GW RUS area
National hub	A	2
National hub (major station)	A(MS)	1
Regional hub	B	3
Important feeder	C	20
Medium, staffed	D	19
Small, staffed	E	35
Small, unstaffed	F	112
Facilities exist in part only	P	0
Facility exists	Y	0

Station	Operator	Cat	No of car park spaces	Disabled car park spaces	Utilisation (%)			Disabled access to platforms	Transport interchange				
					Fee charging	Non-chargeable	LA owned /operated		Taxi	Bus	Cycle	Metro	Airport
Aldermaston	FGW	F	29	Y	Free	60	N/A	Y	N	Y	Y	N	N
Appleford	FGW	F	N	N	N/A	N/A	N/A	N	N	N	N	N	N
Ascott-under-Wychwood	FGW	F	N	N	N/A	N/A	N/A	Partial	N	Y	N	N	N
Ashchurch	FGW	F	60	Y	N/A	N/A	50	Y	N	Y	Y	N	N
Avoncliff	FGW	F	N	N	N/A	N/A	N/A	N	N	Y	N	N	N
Avonmouth	FGW	F	6	N	Free	N/A	N/A	Partial	N	Y	Y	N	N
Barnstaple	FGW	E	87	Y	40	N/A	N/A	Y	Y	Y	Y	N	N

Station	Operator	Cat	No of Car Park Spaces	Disabled Car Park Spaces	Utilisation (%)			Disabled Access to Platforms	Transport Interchange				
					Fee Charging	Non-Chargeable	LA Owned /Operated		Taxi	Bus	Cycle	Metro	Airport
Bath Spa	FGW	C	359	Y	100	N/A	N/A	Y	Y	Y	Y	N	N
Bedminster	FGW	F	N	N	N/A	N/A	N/A	Partial	N	Y	N	N	N
Bedwyn	FGW	F	11	Y	Free	80	N/A	Partial	N	Y	Y	N	N
Bere Alston	FGW	F	13	Y	Free	Y	N/A	Y	N	Y	N	N	N
Bere Ferrers	FGW	F	9	Y	Free	Y	N/A	Partial	N	Y	Y	N	N
Bicester Town	FGW	F	29	N	Free	75	N/A	Y	N	Y	Y	N	N
Bodmin Parkway	FGW	D	70	N	Free	N/A	N/A	Partial	Y	Y	Y	N	N
Bourne End	FGW	E	61	Y	40	N/A	N/A	Y	Y	Y	Y	N	N
Bradford-on-Avon	FGW	E	200	Y	N/A	N/A	90	Y	N	Y	Y	N	N
Bridgwater	FGW	E	50	N	Free	75	N/A	Partial	Y	Y	Y	N	N
Bristol Parkway	FGW	B	1140	Y	100	N/A	N/A	Y	Y	Y	Y	N	N
Bristol Temple Meads	FGW	A	446	Y	100	N/A	N/A	Y	Y	Y	Y	N	Y
Bruton	FGW	F	18	Y	Free	50	N/A	Partial	N	N	Y	N	N
Bugle	FGW	F	N	N	N/A	N/A	N/A	N	N	N	Y	N	N
Burnham	FGW	E	61	Y	80	N/A	N/A	N	Y	N	Y	N	N
Calstock	FGW	F	22	Y	Free	N/A	Y	Y	N	N	Y	N	N
Cam Dursley	FGW	F	120	Y	N/A	N/A	95	Y	N	N	Y	N	N
Camborne	FGW	E	10	Y	Free	N/A	N/A	Y	N	N	Y	N	N

Station	Operator	Cat	No of Car Park Spaces	Disabled Car Park Spaces	Utilisation (%)			Disabled Access to Platforms	Transport Interchange				
					Fee Charging	Non-Chargeable	LA Owned /Operated		Taxi	Bus	Cycle	Metro	Airport
Cardis Bay	FGW	E	20	N	Free	75	N/A	Partial	N	N	N	N	N
Castle Bar Park	FGW	E	N	N	N/A	N/A	N/A	Partial	N	N	N	N	N
Castle Cary	FGW	D	120	Y	90	N/A	N/A	Partial	Y	N	Y	N	N
Causeland	FGW	F	N	N	N/A	N/A	N/A	Partial	N	N	Y	N	N
Chapelton	FGW	F	4	N	Free	N/A	N/A	Partial	N	N	N	N	N
Charlbury	FGW	E	158	Y	90	N/A	N/A	Y	N	N	Y	N	N
Cheltenham Spa	FGW	C	200	Y	100	N/A	N/A	Y	Y	N	Y	N	N
Chetnole	FGW	F	N	N	N/A	N/A	N/A	N	N	N	N	N	N
Chippenham	FGW	C	663	Y	95	N/A	N/A	Partial	Y	Y	Y	N	N
Cholsey	FGW	E	60	Y	80	N/A	N/A	N	N	N	Y	N	N
Clifton Down	FGW	F	35	N	Free	85	N/A	Y	N	N	N	N	N
Cookham	FGW	E	76	N	N/A	90	N/A	Y	N	N	N	N	N
Coombe	FGW	F	N	N	N/A	N/A	N/A	Y	N	N	N	N	N
Copplestone	FGW	F	4	N	Free	N/A	N/A	Partial	N	N	N	N	N
Credition	FGW	F	13	Y	Free	N/A	N/A	Y	N	N	N	N	N
Culham	FGW	F	8	Y	Free	N/A	N/A	Partial	N	N	Y	N	N
Dawlish	FGW	F	98	Y	90	N/A	N/A	Partial	Y	N	N	N	N
Dawlish Warren	FGW	D	5	Y	Free	N/A	N/A	Y	N	N	Y	N	N

Station	Operator	Cat	No of Car Park Spaces	Disabled Car Park Spaces	Utilisation (%)			Disabled Access to Platforms	Transport Interchange				
					Fee Charging	Non-Chargeable	LA Owned /Operated		Taxi	Bus	Cycle	Metro	Airport
Devonport	FGW	E	10	Y	Free	N/A	N/A	Y	N	N	N	N	N
Didcot Parkway	FGW	B	1088	Y	85	N/A	N/A	Partial	Y	N	Y	N	N
Digby & Sowton	FGW	F	250	Y	Free	N/A	N/A	Y	N	N	N	N	N
Dilton Marsh	FGW	F	N	N	N/A	N/A	N/A	Y	N	N	N	N	N
Dockyard	FGW	F	N	N	N/A	N/A	N/A	N	N	N	N	N	N
Dorchester West	FGW	F	N	N	N/A	N/A	N/A	Partial	N	N	Y	N	N
Drayton Green	FGW	F	N	N	N/A	N/A	N/A	N	N	N	N	N	N
Ealing Broadway	FGW	C	N	N	N/A	N/A	N/A	N	N	N	N	Y	Y
Eggesford	FGW	F	5	N	Free	N/A	N/A	Y	N	N	N	N	N
Evesham	FGW	E	84	Y	50	N/A	N/A	Partial	Y	N	Y	N	N
Exeter Central	FGW	C	70	Y	75	N/A	N/A	Partial	N	N	Y	N	N
Exeter St Davids	FGW	C	399	Y	88	N/A	N/A	Y	Y	Y	Y	N	N
Exeter St Thomas	FGW	F	N	N	N/A	N/A	N/A	N	N	N	N	N	N
Exmouth	FGW	D	200	Y	N/A	N/A	75	Y	N	N	Y	N	N
Exton	FGW	F	8	Y	Free	N/A	N/A	Partial	N	N	Y	N	N
Falmouth Docks	FGW	F	40	Y	Free	70	N/A	Y	N	N	Y	N	N
Falmouth Town	FGW	F	60	N	N/A	N/A	Y	Y	N	N	N	N	N

Station	Operator	Cat	No of Car Park Spaces	Disabled Car Park Spaces	Utilisation (%)			Disabled Access to Platforms	Transport Interchange				
					Fee Charging	Non-Chargeable	LA Owned /Operated		Taxi	Bus	Cycle	Metro	Airport
Filton Abbey Wood	FGW	F	30	Y	Free	N/A	N/A	Y	N	N	Y	N	N
Finstock	FGW	F	N	N	N/A	N/A	N/A	N	N	Y	N	N	N
Freshford	FGW	F	9	N	N/A	N/A	N/A	N	N	N	N	N	N
Frome	FGW	D	11	Y	Free	80	N/A	Y	N	N	Y	N	N
Furze Platt	FGW	E	N	N	N/A	N/A	N/A	Y	N	Y	N	N	N
Gloucester	FGW	C	231	Y	100	N/A	N/A	Partial	Y	N	Y	N	N
Goring & Streatley	FGW	E	152	Y	80	N/A	N/A	Partial	N	Y	Y	N	N
Greenford	LUL	E	36	N	NCP	N/A	N/A	N	N	Y	Y	Y	N
Gunnislake	FGW	F	22	Y	Free	N/A	N/A	Y	N	N	Y	N	N
Hanborough	FGW	F	37	Y	Free	85	N/A	Y	N	Y	Y	N	N
Hanwell	FGW	E	N	N	N/A	N/A	N/A	N	N	Y	Y	N	Y
Hayes & Harlington	FGW	D	122	Y	70	N/A	N/A	N	N	N	Y	N	Y
Hayle	FGW	F	25	N	Free	70	N/A	Y	N	N	N	N	N
Henley-on-Thames	FGW	E	267	Y	45	N/A	N/A	Y	N	Y	Y	N	N
Highbridge & Burnham	FGW	F	20	Y	Free	N/A	85	Partial	N	Y	Y	N	N
Honeybourne	FGW	F	26	Y	Free	70	N/A	Y	N	Y	N	N	N
Hungerford	FGW	F	68	N	N/A	80	N/A	Partial	N	N	Y	N	N
Islip	FGW	F	32	N	N/A	60	N/A	Y	N	Y	Y	N	N

Station	Operator	Cat	No of Car Park Spaces	Disabled Car Park Spaces	Utilisation (%)			Disabled Access to Platforms	Transport Interchange				
					Fee Charging	Non-Chargeable	LA Owned /Operated		Taxi	Bus	Cycle	Metro	Airport
Iver	FGW	E	N	N	N/A	N/A	N/A	N	N	Y	Y	N	Y
Ivybridge	FGW	F	206	Y	Free	N/A	75	Y	N	N	N	N	N
Kemble	FGW	D	336	Y	95	N/A	N/A	Y	Y	N	Y	N	N
Keyham	FGW	F	N	N	N/A	N/A	N/A	N	N	N	N	N	N
Keynsham	FGW	F	53	Y	50	N/A	N/A	N	N	N	Y	N	N
Kingham	FGW	E	134	Y	85	N/A	N/A	Partial	N	Y	Y	N	N
Kings Nympton	FGW	F	5	Y	Free	N/A	N/A	Y	N	N	Y	N	N
Kintbury	FGW	F	10	N	Free	N/A	N/A	Y	N	Y	Y	N	N
Langley	FGW	E	62	Y	90	N/A	N/A	Partial	Y	Y	Y	N	N
Lapford	FGW	F	2	N	N/A	N/A	N/A	Partial	N	N	N	N	N
Lawrence Hill	FGW	F	N	N	N/A	N/A	N/A	Partial	N	N	N	N	N
Lelant Saltings	FGW	F	130	Yes	N/A	N/A	Y	Y	N	N	N	N	N
Liskeard	FGW	D	60	N	N/A	65	N/A	Partial	N	N	Y	N	N
London Paddington	NR	A (MS)	152	Y	NCP	N/A	N/A	Y	Y	Y	Y	Y	Y
Looe	FGW	F	14	Y	75	N/A	N/A	Y	N	N	Y	N	N
Lostwithiel	FGW	F	20	Y	Free	N/A	N/A	Y	N	N	N	N	N
Luxulyan	FGW	F	10	Y	Free	N/A	N/A	Partial	N	N	Y	N	N
Lympstone Commando	FGW	F	N	N	N/A	N/A	N/A	Partial	N	N	N	N	N

Station	Operator	Cat	No of Car Park Spaces	Disabled Car Park Spaces	Utilisation (%)			Disabled Access to Platforms	Transport Interchange				
					Fee Charging	Non-Chargeable	LA Owned /Operated		Taxi	Bus	Cycle	Metro	Airport
Lympstone Village	FGW	F	15	Y	Free	N/A	N/A	Y	N	N	Y	N	N
Maiden Newton	FGW	F	12	Y	Free	N/A	N/A	Partial	N	N	N	N	N
Maidenhead	FGW	C	389	Y	90	N/A	N/A	Y	Y	Y	Y	N	Y
Marlow	FGW	F	N	N	N/A	N/A	N/A	Y	N	Y	N	N	N
Melksham	FGW	F	10	Y	Free	N/A	N/A	Y	N	N	Y	N	N
Menheniot	FGW	F	20	N	Free	N/A	N/A	Partial	N	N	N	N	N
Midgham	FGW	F	11	Y	Y	N/A	N/A	Partial	N	Y	Y	N	N
Montpelier	FGW	F	N	N	N/A	N/A	N/A	Partial	N	N	Y	N	N
Morchard Road	FGW	F	5	N	Free	N/A	N/A	Y	N	N	N	N	N
Moreton-in-Marsh	FGW	E	153	Y	50	N/A	N/A	Partial	N	Y	Y	N	N
Mortimer	FGW	E	51	N	90	N/A	N/A	Partial	N	Y	Y	N	N
Nailsea & Backwell	FGW	F	105	Y	N/A	N/A	100	N	N	N	Y	N	N
Newbury	FGW	C	222	Y	100	N/A	N/A	Partial	Y	Y	Y	N	N
Newbury Racecourse	FGW	F	N	N	N/A	N/A	N/A	N	N	Y	N	N	N
Newquay	FGW	F	49	Y	75	N/A	N/A	Y	Y	N	Y	N	N
Newton Abbot	FGW	C	261	Y	50	N/A	N/A	Y	Y	Y	Y	N	N
Newton St Cyres	FGW	F	5	Y	Free	N/A	N/A	Partial	N	N	N	N	N

Station	Operator	Cat	No of Car Park Spaces	Disabled Car Park Spaces	Utilisation (%)			Disabled Access to Platforms	Transport Interchange				
					Fee Charging	Non-Chargeable	LA Owned /Operated		Taxi	Bus	Cycle	Metro	Airport
Oldfield Park	FGW	F	N	N	N/A	N/A	N/A	Partial	N	N	N	N	N
Oxford	FGW	B	518	Y	60	N/A	N/A	Y	Y	Y	Y	N	N
Paignton	FGW	C	87	Y	75	N/A	N/A	Y	Y	N	Y	N	N
Pangbourne	FGW	E	92	Y	80	N/A	N/A	Partial	N	Y	Y	N	N
Par	FGW	E	25	Y	Free	90	N/A	Partial	N	N	N	N	N
Parson Street	FGW	F	N	N	N/A	N/A	N/A	N	N	N	N	N	N
Patchway	FGW	F	15	Y	Free	N/A	N/A	Partial	N	N	N	N	N
Penmere	FGW	F	5	N	Free	N/A	N/A	Y	N	N	Y	N	N
Penryn	FGW	F	N	N	Free	N/A	N/A	Y	N	N	Y	N	N
Penzance	FGW	C	129	Y	75	N/A	N/A	Y	Y	N	Y	N	N
Perranwell	FGW	F	20	Y	Free	65	N/A	Y	N	N	Y	N	N
Pershore	FGW	F	40	N	N/A	50	N/A	Y	N	Y	Y	N	N
Pewsey	FGW	D	79	Y	90	N/A	N/A	Partial	N	Y	Y	N	N
Pilning	FGW	F	10	Y	Free	N/A	N/A	Partial	N	N	N	N	N
Plymouth	FGW	C	352	Y	80	N/A	N/A	Y	Y	Y	Y	N	N
Polsloe Bridge	FGW	F	N	N	N/A	N/A	N/A	N	N	N	N	N	N
Portsmouth Arms	FGW	F	3	Y	Free	N/A	N/A	Partial	N	N	N	N	N
Quintrel Downs	FGW	F	N	N	N/A	N/A	N/A	Partial	N	N	N	N	N

Station	Operator	Cat	No of Car Park Spaces	Disabled Car Park Spaces	Utilisation (%)			Disabled Access to Platforms	Transport Interchange				
					Fee Charging	Non-Chargeable	LA Owned /Operated		Taxi	Bus	Cycle	Metro	Airport
Radley	FGW	F	35	N	N/A	45	N/A	Partial	N	Y	Y	N	N
Reading	FGW	A	1650	Y	60	N/A	N/A	Y	Y	Y	Y	N	Y
Reading West	FGW	F	N	N	N/A	N/A	N/A	Partial	N	N	Y	N	N
Redland	FGW	F	N	N	N/A	N/A	N/A	Y	N	N	Y	N	N
Redruth	FGW	D	38	Y	80	N/A	N/A	Y	Y	N	Y	N	N
Roche	FGW	F	N	N	N/A	N/A	N/A	Partial	N	N	N	N	N
Saltash	FGW	F	20	Y	Free	N/A	N/A	Y	N	N	N	N	N
Sandplace	FGW	F	N	N	N/A	N/A	N/A	Y	N	N	N	N	N
Sea Mills	FGW	F	N	N	N/A	N/A	N/A	Partial	N	N	Y	N	N
Shiplake	FGW	F	50	Y	N/A	95	N/A	Y	N	Y	Y	N	N
Shipton	FGW	F	20	N	Y	N/A	N/A	Partial	N	Y	N	N	N
Shirehampton	FGW	F	8	Y	Free	N/A	N/A	Y	N	N	Y	N	N
Slough	FGW	C	626	Y	90	N/A	N/A	Partial	Y	Y	Y	N	N
South Greenford	FGW	F	N	N	N/A	N/A	N/A	Partial	N	Y	N	N	N
South Ruislip	Chiltern	F	N	N	N/A	N/A	N/A	N	Y	Y	Y	Y	N
Southall	FGW	D	N	N	N/A	N/A	N/A	N	N	Y	N	N	Y
St Andrews Road	FGW	F	8	N	Free	N/A	N/A	N	N	N	Y	N	N
St Austell	FGW	C	157	Y	70	N/A	N/A	Y	Y	N	Y	N	N

Station	Operator	Cat	No of Car Park Spaces	Disabled Car Park Spaces	Utilisation (%)			Disabled Access to Platforms	Transport Interchange				
					Fee Charging	Non-Chargeable	LA Owned /Operated		Taxi	Bus	Cycle	Metro	Airport
St Budeaux Ferry Road	FGW	F	N	N	N/A	N/A	N/A	Partial	N	N	N	N	N
St Budeaux Victoria Road	FGW	F	N	N	N/A	N/A	N/A	Partial	N	N	N	N	N
St Columb Road	FGW	F	10	N	Free	N/A	N/A	Y	N	N	N	N	N
St Erth	FGW	E	60	Y	30	N/A	N/A	Partial	N	N	N	N	N
St Germans	FGW	F	N	N	N/A	N/A	N/A	Y	N	N	N	N	N
St Ives	FGW	F	200	Y	N/A	N/A	Y	Y	N	N	N	N	N
St James Park	FGW	F	N	N	N/A	N/A	N/A	Partial	N	N	N	N	N
St Keyne	FGW	F	N	N	N/A	N/A	N/A	Y	N	N	N	N	N
Stapleton Road	FGW	F	N	N	N/A	N/A	N/A	Partial	N	N	Y	N	N
Starcross	FGW	F	N	N	N/A	N/A	N/A	N	N	N	Y	N	N
Stonehouse	FGW	E	25	Y	Free	90	N/A	Y	N	N	N	N	N
Stroud	FGW	D	181	Y	80	N/A	N/A	Y	Y	N	Y	N	N
Swindon	FGW	C	607	Y	90	N/A	N/A	Y	Y	Y	Y	N	N
Taplow	FGW	E	51	Y	40	N/A	N/A	Partial	N	Y	Y	N	N
Taunton	FGW	C	309	Y	95	N/A	N/A	Partial	Y	Y	Y	N	N
Teignmouth	FGW	D	92	Y	75	N/A	N/A	Partial	N	N	Y	N	N
Thatcham	FGW	E	61	Y	60	N/A	N/A	Partial	N	Y	Y	N	N
Theale	FGW	E	219	Y	60	N/A	N/A	N	N	Y	Y	N	N

Station	Operator	Cat	No of Car Park Spaces	Disabled Car Park Spaces	Utilisation (%)			Disabled Access to Platforms	Transport Interchange				
					Fee Charging	Non-Chargeable	LA Owned /Operated		Taxi	Bus	Cycle	Metro	Airport
Thornford	FGW	F	N	N	N/A	N/A	N/A	N	N	N	N	N	N
Tilehurst	FGW	E	111	Y	80	N/A	N/A	N	N	Y	Y	N	N
Tiverton Parkway	FGW	D	193	Y	100	N/A	N/A	Y	Y	Y	Y	N	N
Topsham	FGW	F	4	Y	N/A	N/A	Y	Y	N	N	Y	N	N
Torquay	FGW	C	91	Y	75	N/A	N/A	Partial	Y	N	Y	N	N
Torre	FGW	F	5	Y	Free	N/A	N/A	Partial	N	N	N	N	N
Totnes	FGW	D	122	Y	100	N/A	N/A	Partial	Y	Y	Y	N	N
Trowbridge	FGW	D	258	Y	100	N/A	N/A	Y	Y	N	Y	N	N
Truro	FGW	C	144	Y	60	N/A	N/A	Y	Y	N	Y	N	N
Twyford	FGW	D	426	Y	82	N/A	N/A	Partial	Y	Y	Y	N	N
Umberleigh	FGW	F	11	Y	Free	N/A	N/A	Y	N	N	N	N	N
Wargrave	FGW	F	30	N	N/A	45	N/A	Y	N	Y	Y	N	N
Warminster	FGW	F	98	Y	80	N/A	N/A	Y	N	N	Y	N	N
West Drayton	FGW	E	15	Y	90	N/A	N/A	N	Y	Y	Y	N	Y
West Ealing	FGW	E	N	N	N/A	N/A	N/A	N	N	Y	N	N	Y
Westbury	FGW	D	207	Y	85	N/A	N/A	N	Y	N	Y	N	N
Weston Milton	FGW	F	36	Y	Free	75	N/A	Y	N	N	Y	N	N
Weston-super-Mare	FGW	C	158	Y	95	N/A	N/A	Y	Y	Y	Y	N	N
Windsor & Eton Central	FGW	D	N	N	N/A	N/A	N/A	Y	N	N	Y	N	N
Worle	FGW	F	150	Y	N/A	90	N/A	Y	N	N	Y	N	N

Station	Operator	Cat	No of Car Park Spaces	Disabled Car Park Spaces	Utilisation (%)			Disabled Access to Platforms	Transport Interchange				
					Fee Charging	Non-Chargeable	LA Owned /Operated		Taxi	Bus	Cycle	Metro	Airport
Yate	FGW	F	77	Y	90	N/A	N/A	Partial	N	N	Y	N	N
Yatton	FGW	E	99	Y	60	N/A	N/A	Y	N	N	Y	N	N
Yeoford	FGW	F	N	N	N/A	N/A	N/A	Y	N	N	N	N	N
Yeovil Pen Mill	FGW	E	37	Y	Free	80	N/A	Partial	N	N	Y	N	N
Yetminster	FGW	F	7	Y	Free	75	N/A	Y	N	N	N	N	N

Data Source: National Rail Enquiries and FGW

Appendix B

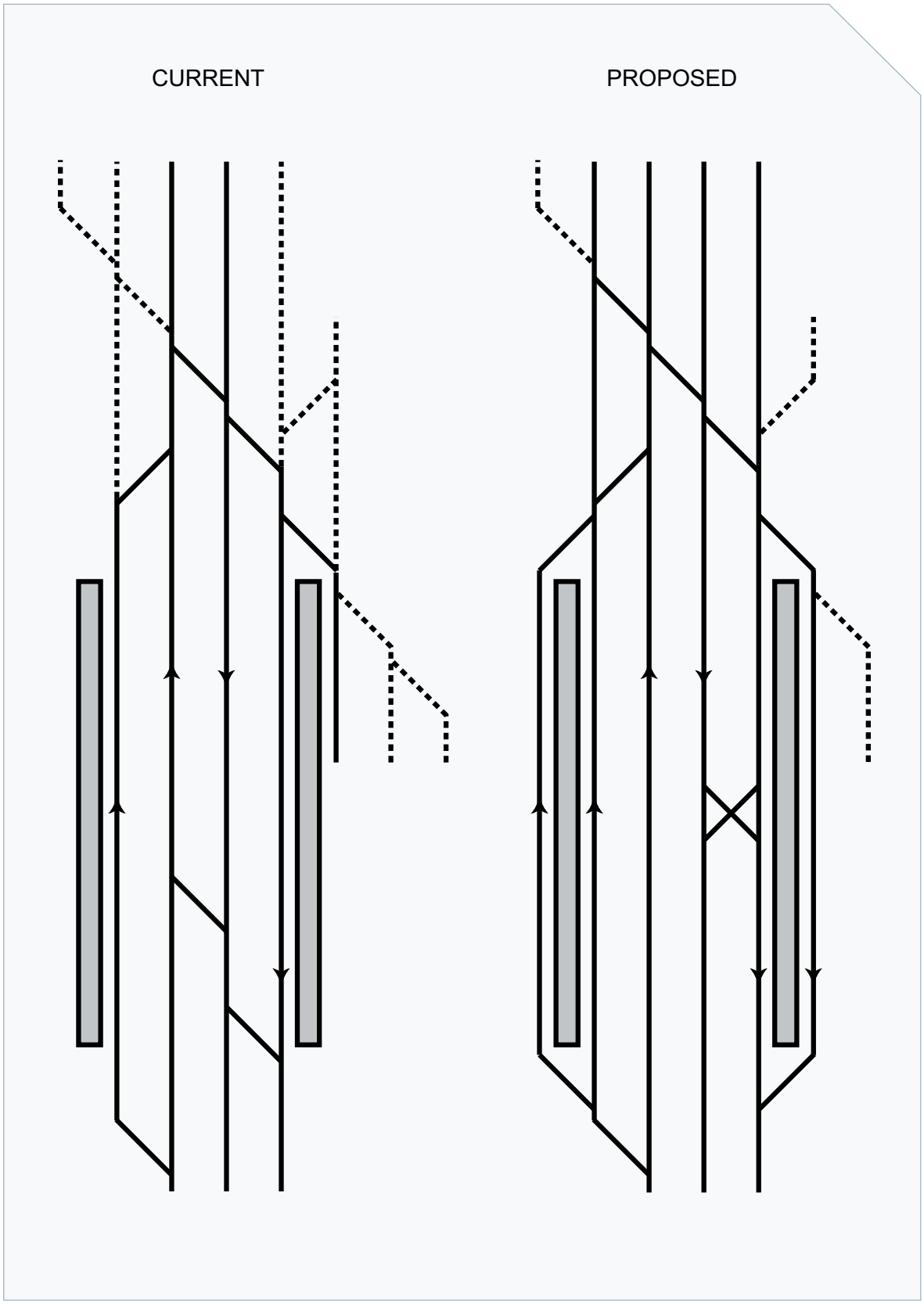
Reactionary delay minutes – top 15 locations

Passenger					
	Section	**Summary area**	**Minutes delay**	**Trains affected**	**Delay per train affected**
1	Moreton-in-Marsh	Oxfordshire and North Cotswolds	10380	1094	9.49
2	Ascott-under-Wychwood	Oxfordshire and North Cotswolds	27264	3006	9.30
3	Bristol Temple Meads	Greater Bristol and Westbury	49757	6050	8.22
4	Plymouth	Cogload Jn – Penzance	13902	1694	8.21
5	Gloucester	Bristol – Birmingham line	13481	1656	8.14
6	Bedwyn	Reading – Cogload Jn	12273	1644	7.47
7	London Paddington	Paddington – Didcot	150084	20604	7.28
8	Westbury	Greater Bristol and Westbury	23534	3249	7.24
9	Evesham	Oxfordshire and North Cotswolds	24536	3397	7.22
10	Taunton	Cogload Jn – Penzance	12858	1873	6.86
11	Oxford	Oxfordshire and North Cotswolds	62469	9120	6.85
12	Swindon – Challow	Didcot – Pilning (via Badminton)	31526	4668	6.75
13	Eggesford	Devon and Cornwall Branches	7498	1118	6.71
14	Swindon	Didcot – Pilning (via Badminton)	16228	2423	6.70
15	Swindon – Kemble	Greater Bristol and Westbury	9972	1522	6.55

Freight					
	Section	**Summary area**	**Minutes delay**	**Trains affected**	**Delay per train affected**
1	Newport Docks	Wales	38717	387	100.04
2	Westerleigh Murco	Bristol – Birmingham line	12305	139	88.53
3	Portbury Coal terminal	Greater Bristol and Westbury	29391	399	73.66
4	Theale	Reading – Cogload Jn	12397	180	68.87
5	Didcot Power Station	Didcot – Pilning (via Badminton)	46402	702	66.10
6	Avonmouth	Greater Bristol and Westbury	12111	220	55.05
7	Llanwern Sidings	Wales	28938	572	50.59
8	Wentloog	Wales	14238	304	46.84
9	East Usk Jn	Wales	9460	204	46.37
10	Alexandra Dock Jn	Wales	14670	331	44.32
11	Acton	Paddington – Didcot	49671	1193	41.64
12	Merehead Quarry	Reading – Cogload Jn	14353	361	39.76
13	Cardiff Tidal	Wales	6956	226	30.78
14	Whatley Quarry	Reading – Cogload Jn	8380	316	26.52
15	Westbury Down	Greater Bristol and Westbury	11497	446	25.78

Appendix C

Oxford station – theoretical layout



Appendix D

Interurban route sections

These figures are indicative of the overall maximum levels of capital expenditure that could be spent if all passengers benefit from the journey time improvement over the described sections.

Route Section	Benefits calculated between:	Infrastructure cost which could be supported for each minute of journey time saving – BCR of 2
Paddington – Reading	Paddington – Acton, mainline only	£129m
Reading – Swindon	Swindon – Didcot	£54m
Reading – Oxford	Oxford – Radley	£30m
Reading – Taunton (Westbury)	Reading West – Theale	£24m
Swindon – Bristol Temple Meads	Swindon – Chippenham	£23m
Bristol Parkway – Newport	Pilning – Patchway	£22m
Swindon – Bristol Parkway	Swindon – Bristol Parkway	£21m
Taunton – Exeter	Taunton – Tiverton Parkway	£18m
Bristol Temple Meads – Taunton	Nailsea & Blackwell – Yatton	£15m
Cheltenham – Bristol Parkway	Yate and Cam & Dursley	£13m
Reading – Basingstoke	Reading West – Mortimer	£12m
Westbury – Taunton	Castle Cary – Taunton	£12m
Bristol Temple Meads – Taunton	Bridgwater – Highbridge & Burnham	£11m
Exeter – Plymouth	Totnes – Ivybridge	£9m
Bristol Temple Meads – Westbury	Avoncliff – Freshford	£7m
Plymouth – Penzance	St Germans – Menheniot	£6m
Cardiff Central – Birmingham New Street	Cardiff Central – Newport	£6m
Swindon – Cheltenham	Swindon – Kemble	£5m
Oxford – Worcester	Oxford – Hanborough	£5m
Westbury – Salisbury	Dilton Marsh – Warminster	£4m
Castle Cary – Dorchester	Castle Cary – Yeovil Pen Mill	£1m

Glossary

Term	Meaning
ATOC	Association of Train Operating Companies
BCR	Benefit Cost Ratio
Capacity (of rolling stock)	Capacity is deemed to be the number of standard class seats and standing spaces available on a train.
Capacity (of infrastructure)	The capacity of a given piece of railway infrastructure is an assessment of the maximum number or mix of trains which could operate over it. This is quantified more formally through a Capacity Utilisation Index
Capacity (of stations)	The pedestrian capacity of a station is an assessment of the maximum number of passengers it can acceptably handle, given the station layout at the site concerned
Connectivity	The ability to travel between two stations or conurbations within an acceptable journey time or frequency options compared to other modes of transport
Control Period 4 (CP4)	The five-year period between 2009 and 2014
Control Period 5 (CP5)	The five-year period between 2014 and 2019
CUI	Capacity Utilisation Index
DfT	Department for Transport
DOO	Driver-Only Operation, i.e. trains which operate without carrying a guard
Down	Where referred to as a direction, ie. Down direction, Down peak, Down line, Down train, this generally refers to the direction that leads away from London
Dwell time	The time a train is stationary at a station
ERTMS	European Rail Traffic Management System. A future railway signalling system, with equipment located in the driver's cab, rather than at the lineside
FOC	Freight Operating Company
Gap	Where the network does not meet the specification or demand required of it, now or in the future
GRIP	Guide to Railway Investment Projects – Network Rail's process for project management of schemes through development and implementation
Headway	The minimum interval possible between trains on a particular section of track

Term	Meaning
HLOS	High Level Output Specification – the DfT's High Level Output Specification, which has specified to Network Rail the outputs that need to be delivered within a Control Period.
HST	High Speed Train
Intermodal Trains	freight trains which convey traffic which could be conveyed by road, rail or sea (eg. containerised traffic)
IEP	Intercity Express Programme, the name given to the project to replace the existing High Speed Train fleet
JPIP	Joint Performance Improvement Plans
Junction margin	The minimum interval possible between trains operating over the same junction in conflicting directions
LDHS	Long Distance High Speed
LENNON	An industry database recording ticket sales: Latest Earnings Networked Nationally Over Night
Load Factor (relative to seats)	Load factor (relative to seats) is calculated as the passenger demand divided by the number of standard class seats, expressed as a percentage.
Load Factor (relative to total capacity)	Total capacity includes both standard class seats and standing allowance. For intercity-rolling stock, total capacity has been estimated at a ratio of 1.2 times the number of standard class seats as per HLOS, unless specific information is available. For the commuter rolling stock, it has generally been calculated on the basis of the total number of passengers that can be accommodated, allowing 0.45 square metre of space per person. When this information is not available for some of the commuter rolling stocks, total capacity has been estimated at a ratio of 1.4 times the number of standard class seats. Load factor (relative to total capacity) is calculated as the passenger demand divided by total capacity as defined above, expressed as a percentage.
Loading Gauge	The loading gauge is the profile for a particular route within which all vehicles or loads must remain to ensure that sufficient clearance is available at all structures
MOIRA	Industry standard demand forecasting model
NPV	Net Present Value
Option	The options as identified in this document are aimed at addressing the highlighted gaps
ORR	Office of Rail Regulation
PDFH	Passenger Demand Forecasting Handbook. An industry document that summarises the effects of service quality, fares and external factors on rail demand

Term	Meaning
Perturbation	Describes disruption to the planned train service pattern
PIXC	Passengers in excess of Capacity – This only applies to weekday commuter trains arriving in London between 07:00 and 09:59 and those departing between 16:00 and 18:59. The PIXC measure for a Train Operating Company (TOC) as a whole is derived from the number of passengers travelling in excess of capacity on all services divided by the total number of people travelling, expressed as a percentage. PIXC counts are carried out in autumn each year, either by means of a manual count on a typical weekday, or (increasingly commonly) by the calculation of average loads derived from automatic passenger counting equipment fitted on trains The DfT has set limits on the level of acceptable PIXC at 4.5 percent on one peak (morning or afternoon) and three percent across both peaks. The DfT monitors the level of PIXC across peaks (both individually and combined)
Possession	Where part of the infrastructure is closed to services to carry out maintenance, renewal or enhancement works
PPM	Public Performance Measure, expressed as a percentage of trains running on time compared to those scheduled to run
Railsys	A simulation modelling tool utilising proposed infrastructure with service provisions used to measure performance/reliability benefits
RES	Regional Economic Strategy
RIFF	Rail Industry Forecasting Framework
RPA	Regional Planning Assessment
Route Availability	the system which determines which types of locomotive and rolling stock can travel over any particular route. The main criteria for establishing RA usually concerns the strength of underline bridges in relation to axle loads and speed, although certain routes have abnormal clearance problems (eg. very tight tunnels). A locomotive of RA8 is not permitted on a route of RA6 for example
RSS	Regional Spatial Strategy
RUS	Route Utilisation Strategy
S&C	Switch and Crossings
SDO	Selective Door Opening – a means of ensuring that only selected doors open when a train is stopped at a station, leaving closed any doors which overhang short platforms. Not all rolling stock is fitted with this facility; those types of rolling stock which are so fitted vary in the permutations of doors which can be kept closed in this way
Seven Day Railway	Network Rail initiative implementing techniques which will minimise the impact on passengers and freight of engineering work for maintenance, renewal and enhancements

Term	Meaning
SMG	Stakeholder Management Group
TEE	Transport Economic Efficiency
TfL	Transport for London
TEMPRO	Trip End Model Presentation Program. Software application used by the DfT to provide detailed analysis of trip end, journey mileage, car ownership and population/ workforce planning data throughout the country
TOC	Train Operating Company
tph	trains per hour
Train path	A slot in a timetable for running an individual train
TWA	Transport and Works Act
Up	Where referred to as a direction, ie. Up direction, Up peak, Up line, Up train, this generally but not always refers to the direction that leads towards London
W10	The loading gauge which enables 9" 6"containers to be conveyed on conventional wagons
WCML	West Coast Main Line
WSG	Wider Stakeholder Group
WTT	Working Timetable

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