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Network RUS
Stations

Contents

3 *Foreword*
4 *Executive Summary*
10 *Chapter 1 – Background*
12 *Chapter 2 – Scope and policy context*
16 *Chapter 3 – Baseline*
43 *Chapter 4 – Drivers of change*
47 *Chapter 5 – Gaps and options*
82 *Chapter 6 – Consultation process*
86 *Chapter 7 – Strategy and next steps*
92 *Appendix A – Case studies*
148 *Appendix B – References*
150 *Glossary*

Foreword

A successful railway station will add to the passenger experience as well as support the economic, social and environmental benefits of rail. Integration with other modes and the surrounding area can provide for an end-to-end journey experience that makes sustainable transport an attractive alternative to private vehicle usage.

Increasingly, however, stations risk becoming victims of their own success. Many of them are over 100 years old, designed for very different types and numbers of users from those which now prevail in the 21st century. People's needs and expectations have also changed significantly over time.

Stations are key to the success of the passenger rail network. They are the railway's shop window, and should enable users to gain safe, easy and comfortable access to the services they require.

In 2010-11, some 1.353 billion passenger journeys were made on Britain's rail network, a 7.6 per cent increase over the previous year and a 38.7 per cent increase over 2002-03. Growth in footfall at stations is happening and needs to be planned for.

The 2007 Rail White Paper, 'Delivering a Sustainable Railway', envisaged passenger numbers doubling in the subsequent 30 years. In response to this, significant investment is now being made across the network: new trains, longer trains, new and reopened lines, the relief of capacity bottlenecks, and major enhancements at key stations such as London King's Cross, Birmingham New Street and Reading.

Excessive pedestrian congestion at stations can, if not tackled, choke off demand. Not only can it be an unpleasant experience which many people would choose to avoid, but it can add to overall journey times and so undermine rail's competitiveness with other modes.

Relieving congestion need not involve large capital investment. This RUS identifies a range of less expensive options which can be deployed to assist in the reduction of crowding. The RUS focuses on the question of the utilisation of station capacity, and not how the rail industry should be organised to deliver this capacity.

But this RUS is not prescriptive. It does not seek to impose solutions at those stations which it forecasts as facing future congestion problems. Rather, because each station has its own unique set of circumstances, with opportunities to involve a range of local stakeholders in developing (and funding) improvements, it advocates that the industry should work in partnership to address problems at a local level.

As with each RUS, this strategy has been developed with the full input of the wider rail industry including train operators, as well as government and passenger representatives. It underwent a 60-day public consultation and I thank all of those organisations and individuals who responded. Network Rail looks forward to working with the rail industry and its stakeholders in implementing the recommendations of this strategy.

Paul Plummer
Group Strategy Director

Executive summary

Introduction

The Network Route Utilisation Strategy (Network RUS) considers planning issues which require a network-wide perspective. It consists of four separate workstreams in addition to the Network RUS: Stations. Two of these (Electrification, and Scenarios and Long Distance Forecasts) have already been established. The Passenger Rolling Stock strategy has been consulted upon and a final document is being developed for publication. The final workstream (Alternative Solutions to Delivering Passenger Demand Efficiently) commenced in September 2010, with a view to publishing a draft for consultation later in the current financial year.

The RUS is developed in conjunction with a range of stakeholders who also have a network-wide perspective. It is overseen by a Stakeholder Management Group consisting of representatives from:

- Association of Train Operating Companies (ATOC)
- Department for Transport (DfT)
- Freight Operating Companies (FOCs)
- Freight Transport Association (FTA)
- London TravelWatch
- Office of Rail Regulation (ORR) – in the capacity of observer
- Passenger Focus
- Passenger Transport Executive Group (PTEG)
- Rail Freight Group (RFG)
- Rolling Stock Companies (ROSCOs)
- Transport for London (TfL)
- Transport Scotland (TS)
- Welsh Government (WG).

A sub-set of these organisations is represented on the Stations Working Group for the RUS, in order to supply more detailed input and expertise for the document.

Scope and purpose

All of the geographically-based RUSs (see **www.networkrail.co.uk**) have identified that there will be significant growth in passenger demand across Great Britain, albeit with regional variations. For the most part, these RUSs have investigated options for dealing with this growth as it affects on-track capacity – for example by recommending longer or more frequent trains. A few of them have also highlighted the effect of growth on the capability of stations to accommodate increased passenger numbers.

It is clear that many stations across the network already suffer from varying degrees of passenger congestion. However, it needs to be emphasised that such congestion is not solely a function of absolute numbers of passengers. Small stations with comparatively fewer numbers of rail travellers can experience just as much congestion, if not more so, as the major stations in large conurbations. Congestion is caused by a constraint on the free flow of people through a system, and it is therefore important to consider the system as a whole rather than individual elements of it in isolation. Solving the problem at one point in the system may do no more than push the problem further downstream.

Why is tackling congestion important? There are several reasons, including:

- there comes a point where volumes of people cause a safety and security concern, and passenger comfort and satisfaction can be compromised
- congested platforms and concourses can make it more difficult for people who have a variety of impairments to access and enjoy rail travel
- congestion at stations can risk choking off the demand for rail travel, because it adds to the overall journey time and thus makes rail less competitive
- for many people it is an unpleasant experience which they would prefer to avoid, again potentially choking off demand
- there is an economic and social cost to the nation if time is wasted as a result of congestion.

This RUS therefore examines congestion in and around stations to identify where the problem already exists, and where it is likely to manifest itself in the future.

It then considers a range of possible solutions, or a toolkit of interventions, which may be deployed to relieve congestion. The toolkit includes a hierarchy of possible solutions, ranging from those with little or no capital cost, to those which may require more significant interventions. In all cases, the value-for-money of any proposed solution should be taken into account.

However, the RUS does not seek to recommend or impose specific solutions for individual stations, because each location has its own unique set specific characteristics. Nor does it consider how the rail industry should be structured to deliver these improvements. The RUS focuses instead on the potential means to address congestion at stations. It is far more appropriate that bespoke solutions are found and developed at local level, involving all stakeholders in the process, but making use of some or all of the interventions suggested by this RUS.

Defining the baseline

The RUS commences by analysing exactly who uses the stations on the network and for what purpose. Apart from rail travellers, typical users might include:

- those meeting people off trains
- those bidding farewell to passengers
- those seeking information about rail services
- railway staff
- other public transport staff
- taxi-drivers
- employees of retail or catering outlets
- customers of retail or catering outlets
- contractors providing goods or services to the station
- emergency services
- railway enthusiasts.

Sadly, (but it is pleasing to report decreasingly so with the spread of CCTV and other security measures[1]), some stations can attract people participating in antisocial behaviour or gathering without any purpose related to the rail network or the station and its facilities.

The station environment can be divided into three distinct zones:

The Access Zone – this is the area of (and surrounding) the station where departing rail travellers arrive at the station, or where people who have just arrived by train commence the next leg of their journey.

The Facilities Zone – this is the area of the station (typically, but not exclusively, the concourse or booking hall) where users gather information, make purchases, or otherwise avail themselves of the facilities on offer. In many stations the Facilities Zone may also include a waiting area.

The Platform Zone – in this area, users alight from trains, wait for and board trains, or interchange between trains.

At many stations there may be overlaps between the three zones. For example, the facilities zone may actually be on the platform in many cases.

The various categories of users described above will not necessarily need to use all of the zones whilst undertaking their activities at the station, but may nevertheless contribute to the total footfall and potentially come into conflict with other users.

The RUS then considers how to assess the numbers of the different types of users at stations. For passengers, the main source of data is that based on ticket sales, supplemented by a range of passenger-counting surveys. Each data source has certain strengths and weaknesses which are discussed further in **Chapter 3**. What is clear, however, is that these data sources do not provide a complete, comprehensive and up-to-date picture of exactly how many passengers are at a station at any given time of day, day of the week, or time of the year.

The industry does not routinely or systematically count the numbers of non-travellers at its stations. Counts tend to be done on a one-off basis, often because a significant redevelopment is planned to take place. In such circumstances, data on all station users are collected and input into both static and dynamic models of passenger movements in order to predict how certain changes to the physical space in the station will impact on the flow of people around the building. Only a small number of stations have had such models constructed, so again, therefore, there is a gap in the information available.

As mentioned above, there is not a direct correlation between the number of station users and the level of congestion observed. So merely analysing which stations have the greatest number of users will not of itself highlight where crowding is a particular difficulty.

1 See the British Transport Police Statistical Bulletin 2009/10

Therefore to understand where congestion at stations is deemed to be an issue, the RUS drew on two main data sources. First, it compiled a list of stations which several of the geographically-based RUSs had cited as already having, or likely in the future to have, significant congestion. Secondly, our industry partners were asked to nominate their own stations at which they considered congestion to be a current or future problem.

The next question to consider was the definition of congestion, as it is apparent that there are regional variations in what people consider to be a congested station. It seems, for example, that rail users in London and the South East are more tolerant of levels of crowding than those elsewhere in the country.

A measure of the degrees of pedestrian congestion has been used, known as Fruin Levels of Service (named after its inventor). It seeks to ascribe one of six 'levels of service' to crowding situations depending on space per passenger and rates of flow. These 'levels of service' range from free and unconstrained movement through to almost complete standstill.

Each TOC was then asked to complete a simple questionnaire in order to identify what 'levels of service' were encountered at their nominated stations (both peak and off-peak) and in what area of the station this congestion occurred.

In total, some 118 stations across the network were nominated as having issues with passenger congestion. However, it is clear from the questionnaire responses that there is considerable variance within the sample, with some of the stations having no discernible congestion at all.

Drivers of change

In its 2007 White Paper 'Delivering a Sustainable Railway', the previous UK Government set out its vision for the future of the railway in England and Wales. It sought a railway which over the following 30 years:

- will handle double today's level of freight and passenger traffic
- will be even safer, more reliable and more efficient than now
- will be able to cater for a more diverse, affluent and demanding population
- will have reduced its own carbon footprint and improved its broader environmental performance.

Ministers in Scotland published 'Scotland's National Transport Strategy' in 2006, which had the following strategic objectives covering the subsequent 20 years:

- improving journey times and connections
- reducing emissions
- improving quality, accessibility and affordability.

A theme for both Governments during the current Control Period (CP4, 2009-14) has been increases in capacity, as laid down in their respective High Level Output Statements. In England, this also included specific station improvement schemes such as at Reading and Birmingham New Street.

As stated earlier, going forward to CP5 and beyond, all the geographic RUSs have indicated that passenger growth will continue, albeit at different rates across regions and market sectors.

All of these macro-level factors will result in increased passenger numbers at stations across the network. However it is not only macro-level factors which influence the numbers of people using stations, and levels of congestion. Changes to train service patterns, local housing or employment developments, modernisation of stations, installation of automatic ticket gates – all of these local factors, and more besides, are potential causes of increased congestion.

The rail industry is seeking to accommodate growth in a cost effective manner. Since the publication of the Draft for Consultation, the 'Rail Value for Money Study' led by Sir Roy McNulty, has published its findings. The Government is now considering its response to the recommendations and developing a White Paper. The RUS is consistent with the key elements of the McNulty review as its recommendations seeks to promote solutions to manage demand rather than incur capital expenditure unless it is absolutely necessary. The RUS recognises that the rail industry as a whole has a substantial challenge to reduce the cost of running the railway while catering for growth and maintaining quality.

Gaps and options

Two different categories of gap were identified: information gaps, and congestion gaps ie locations where congestion is, or will become, a critical issue unless interventions are made.

The RUS considers how the industry might gain a better understanding of the actual numbers of people using its stations. Clearly, to obtain comprehensive and meaningful data on station usage at all 2,520 stations would be an expensive exercise, and in many cases the cost of obtaining the data would far outweigh any value to which such information could usefully be put. However, and especially at the larger stations, such information will be helpful in:

- ensuring that congestion levels remain within safety tolerances
- improving customer experience by easing congestion
- identifying congestion hot spots
- providing evidence to support the setting of station rents
- identifying trends over time
- predicting what levels of growth will cause the station progressively to 'fail'
- supporting investment decisions.

One mechanism for collecting this data would be through the concept of Station Master Planning, whereby stakeholders aim to achieve a clearly articulated and agreed vision for the station concerned, describing what the station is now and what it needs to be in the future. Such an approach would require a clear understanding of the capacity and demand for rail (and other modes) at or near to the station.

A further initiative would be to extend the scope of Station Travel Plans beyond the present 24 pilot stations (together with those on the Southern franchise). The RSSB is currently reviewing the outcome of these 24 pilot stations. Station Travel Plans articulate a strategy for managing the demand for travel to and from a station, with the aim of reducing its environmental impact; typically this would involve support for walking, cycling, public transport and car-sharing. For the process to be effective, it is necessary to collect accurate and up-to-date information on station usage.

Automatic counting systems can be used to count individuals moving through open spaces, and Network Rail is currently considering the potential for this technology. Such systems would enable a far more comprehensive picture of station usage to be obtained, with the ability to monitor and measure daily, weekly and seasonal peaks. The information can also be used as input into both static and dynamic modelling tools without the need for labour-intensive and error-prone manual counts.

On-train counting systems already exist, but with varying degrees of sophistication. Ideally all rolling stock would be fitted with equipment which could count alighters, boarders, and those on the train automatically, thereby providing useful information about both train and station usage.

From the assessment of crowding levels at the stations nominated by stakeholders, it was possible to apply background growth rates in order to predict what levels of crowding would occur in 2019 and 2031 if no interventions were made.

Supported by a set of case studies, the RUS then presents a generic toolkit of interventions which could be considered as a means of relieving congestion. These range from 'soft' options such as encouraging more use of print-at-home ticketing, or relocating information points, to the more expensive options involving provision of additional physical space. The options are presented in order of degree of intervention for each type of gap.

Consultation process and responses

The consultation period commenced with the publication of the Draft RUS for Consultation on 6 May 2011 and ran for a period of 60 days until 8 July 2011. A wide range of responses was received from interested parties ranging from Train Operating Companies, to a property developer and individual station users. This reflects some of the diverse array of interests in stations on the network. The responses received recognised the importance of congestion at stations as a potential barrier to growth.

The overall response to the RUS was positive. Support was expressed for the key gaps that have been identified in terms of the congested stations and information on station usage. Respondents welcomed the partnership approach using tools such as station travel plans. A number of respondents gave further useful information about specific stations such as Chelmsford, Cardiff Central and Cardiff Queen Street.

The formal consultation responses that have been received are published on Network Rail's website **www.networkrail.co.uk** and **Chapter 6** summarises the key themes along with actions taken as a result of the consultation.

Strategy and next steps

The RUS recommends interventions at specific stations in the medium term (Control Period 5 2014-2019). However, the list of stations considered by the RUS is not intended to be exhaustive. For those stations that have not been included, a process is proposed which will enable the situation to be re-assessed in the light of changing circumstances.

This proposed process builds upon the toolkit which has been developed to provide guidance to those considering potential means to address congestion at stations. It is also intended that the process will provide a focus for the collection of information on station usage.

Many of the stations that were nominated as congested by TOCs and stakeholders already have committed schemes in hand, or planned, which will resolve the issue. For example, the Thameslink Programme and Crossrail will address congestion at Farringdon, and IEP, TfL investment and Crossrail will address congestion at London Paddington. The RUS therefore only makes recommendations for investigating interventions at stations which have no committed plans to tackle congestion. As a result stations like London King's Cross, Reading and Birmingham New Street do not appear in the recommendations.

At a total of 11 stations, therefore, it is recommended that interventions are investigated to understand and address crowding by the end of Control Period 5 (CP5) in 2019. The stations are as follows:

- Basingstoke
- Bristol Parkway
- Clapham Junction
- Liverpool Lime Street
- London Charing Cross
- London Fenchurch Street
- London Victoria
- Preston
- Surbiton
- Watford Junction
- Wimbledon.

It is important to note that the scale of intervention to be considered at these stations may vary considerably. 'Softer' measures (measures that need little or no capital expenditure) from the toolkit may be appropriate at some locations.

During the consultation process a number of the recommendations for specific stations were changed in the light of further information received. This has resulted in the inclusion of Watford Junction in the list of those stations recommended for intervention in CP5, and the moving of Liverpool Central to the 'continued development' category. Current works at Earlsfield are likely to address the congestion problems and as a result the station has been removed from the recommendations.

There are a number of stations with long term plans which would address existing congestion issues but which may not be fully committed or developed. The RUS recommends the continued development of existing plans at the following 12 stations:

- Barking
- Bristol Temple Meads
- Chelmsford
- Derby
- Finsbury Park
- Glasgow Queen Street (High Level)
- Leeds
- Liverpool Central
- London Euston
- Manchester Piccadilly (west side platforms)
- Manchester Victoria
- Tottenham Hale.

At eight stations, there is some uncertainty whether current improvement plans will fully address congestion issues in the future, and it is therefore recommended that the situation at these locations be kept under review. They are:

- Birmingham Snow Hill
- Bromley South
- Herne Hill
- Lewisham
- London St Pancras International (Midland Main Line areas)
- London Waterloo East
- Orpington
- Seven Sisters.

The RUS recommends that the need for interventions in the medium to long term should be kept under review for a further 23 stations. The recommendation for these stations is that any future planning work should include investigation of the congestion at these stations in greater detail and appraise options for addressing the congestion gaps. As with the list of stations above, the RUS only makes recommendations for investigating interventions at stations which have no current plans to tackle congestion. So, for example, where the impact of major schemes such as Crossrail, or the Thameslink Programme, are likely to affect congestion, these stations have not been included. It is also important to note that 'softer' measures from the toolkit in **Chapter 5** to address station congestion may be appropriate at some of these locations. The stations are as follows:

- Balham
- Birmingham Moor Street
- Bradford Forster Square
- Bradford Interchange
- Cardiff Central
- Cardiff Queen Street
- Coventry
- Glasgow Central (Low Level)
- Guiseley
- Halifax
- Huddersfield
- Lichfield City
- Lincoln Central
- Liverpool James Street
- London Marylebone
- Nuneaton
- Princes Risborough
- Salford Central
- Shipley
- Solihull
- Tamworth
- Walsall
- Woking.

The RUS emphasises that these lists of stations are the current picture of congestion. However, circumstances might mean that the priority for addressing congestion may change over time. Factors at some stations will increase congestion, whereas others may see a decline. In order for recommendations to remain relevant a process has been suggested in **Chapter 7** to review congestion in future years.

The RUS makes no recommendation about who should undertake or fund the congestion relief works required at these stations, nor about what specific works are needed. However it is recommended that a combination of measures described in the toolkit in the Gaps and Options chapter will prove helpful in formulating plans.

Similarly, where lack of car parking capacity has been highlighted as an issue, the RUS recommends the adoption of Station Travel Plans, and acknowledges that there exists a wide range of policy choices for generating parking capacity which are determined by local circumstances. It is, therefore, appropriate that local solutions are developed and applied as befits the local environment.

Next steps

This RUS will become established 60 days after publication unless the Office of Rail Regulation (ORR) issues a notice of objection in this period. The recommendations of the RUS will be kept under review and (if it is merited) revisited in the future. The RUS has sought to outline a process by which the recommendations of the strategy can be taken forward by the industry. It provides a flexible approach which will be appropriate irrespective of any changes in responsibility for stations within the industry.

1. Background

1.1 Context

1.1.1 Following the Rail Review in 2004 and the Railways Act 2005, the Office of Rail Regulation (ORR) modified Network Rail's Licence in June 2005 (as further amended, in April 2009) to require the establishment of Route Utilisation Strategies (RUSs) across the network. Simultaneously, the ORR published guidelines on RUSs. A RUS is defined in Condition 1 of the revised licence, in respect of the network or part of the network, as a strategy which will promote the route utilisation objective.

1.1.2 The route utilisation objective is defined as:

> **'the efficient and effective use and development of the capacity available, consistent with funding that is, or is likely to become, available.'**
>
> Extract from ORR Guidelines on Route Utilisation Strategies, April 2009

1.1.3 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:

> **'enable Network Rail and persons providing services relating to railways to better plan their businesses, and funders better plan their activities.'**
>
> Extract from ORR Guidelines on Route Utilisation Strategies, April 2009

1.1.4 The process is designed to be inclusive. Joint work is encouraged between industry parties, who share ownership of each RUS through its industry Stakeholder Management Group.

1.1.5 RUSs occupy a particular place in the planning activity for the rail industry. They use available input from Government Policy documents such as the DfT's Rail White Papers and Rail Technical Strategy, the Wales Rail Planning Assessment, and Transport Scotland's Scottish Planning Assessment. The recommendations of a RUS, and the evidence 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 Specifications (HLOS). HLOS set strategic outputs that Governments want the railway to deliver for the public funds they have made available.

1.1.6 Network Rail will take account of the recommendations from RUSs when carrying out its activities and the ORR will take account of established RUSs when exercising its functions.

1.2 Document structure

1.2.1 This document starts by describing, in **Chapter 2**, the role of the Network RUS in the RUS programme. It describes the scope of the Network RUS Stations workstream including the key issues which it will consider and the time horizon which it addresses. It outlines the policy context and the relationship between the RUS and related policy issues which are being considered concurrently by our funders.

1.2.2 **Chapter 3** presents the baseline for this strategy. It describes the station users and the activities they undertake which are in the scope of the RUS. It also presents data on current usage of stations.

1.2.3 In **Chapter 4** the drivers of change are set out.

1.2.4 Whilst the nature of the stations on the network means that each one presents a unique capacity challenge, we have nonetheless identified generic gaps and options relating to congestion at stations. These are presented in **Chapter 5**.

1.2.5 **Chapter 6** details the responses that were received to the Draft for Consultation and sets out the changes that were made to the final RUS as a result of these responses.

1.2.6 In **Chapter 7** the strategy is outlined and the next steps for the recommendations made in the RUS are discussed.

1.2.7 The **Appendix A** contains case studies of stations affected by congestion.

1.3 Other relevant documents

1.3.1 A number of documents have either extensively informed the RUS or are relevant for consideration of capacity at stations:

- Network Rail Guide to Station Planning and Design, Network Rail, 2011
- Station Planning Standards and Guidelines, London Underground, 2008
- Getting to the Station – Findings of research conducted in the East of England, Passenger Focus, 2007
- Station Travel Plan Research Toolkit, ATOC, Passenger Focus and RSSB, 2009
- Quantifying the Benefits of Applying Best Practice at Stations, RSSB, 2011
- Station Capacity Assessment Guidance, Network Rail, 2011
- Interchange Best Practice Guidelines, TfL, 2009
- Geographic RUSs.

1.3.2 **Appendix B** provides a complete list, of reference documents which are relevant to the issues considered by this RUS.

2. Scope and policy context

2.1 The role of the Network Route Utilisation Strategy

2.1.1 Other than the Freight Route Utilisation Strategy (RUS) which was established in May 2007, the Network RUS is the only RUS which covers the entire network. Its network wide perspective is supported by a stakeholder group with network wide expertise which enables the development of a consistent approach on a number of key strategic issues which underpin the future development of the network.

2.1.2 The unique nature of the Network RUS, the broad range of its stakeholders and its inevitable interface with other key strategic workstreams make it somewhat different from the geographic RUSs. Geographic RUSs have produced strategies for defined geographic routes whereas the Network RUS considers network wide issues. As a result, the Network RUS team has developed a meeting structure, industry consultation and programme to ensure that it too produces key, timely and thoroughly consulted deliverables.

2.1.3 There are currently four Network RUS working groups, in addition to the Network RUS: Stations, some of which have already been published and been established with the Office of Rail Regulation (ORR):

- Scenarios and Long Distance Forecasts (published and established June 2009)
- Electrification (published and established October 2009)
- Passenger Rolling Stock (consultation draft published June 2011)
- Alternative Solutions to Delivering Passenger Demand Efficiently (work commenced 2010).

Network wide perspective

2.1.4 The Network RUS enables strategies to be developed by the industry, its funders, users and suppliers which are underpinned by a network wide perspective of rail planning. The development of such strategies ensures that key issues are dealt with consistently throughout the RUS programme.

2.1.5 It enables strategies to be developed which by their very nature cut across geographic RUS boundaries (for example the development of future rolling stock families and electrification) and draw on best practice for different sectors of the railway.

Organisation: Stakeholder Management Group and Working Groups

2.1.6 In common with all other RUSs, the Network RUS is overseen by a Stakeholder Management Group (SMG). The SMG is chaired by Network Rail. It draws its members from:

- Association of Train Operating Companies (ATOC)
- Department for Transport (DfT)
- Freight Operating Companies (FOCs)
- Freight Transport Association (FTA)
- London TravelWatch
- Office of Rail Regulation (ORR) – in the capacity of observer
- Passenger Focus
- Passenger Transport Executive Group (PTEG)
- Rail Freight Group (RFG)
- Rolling Stock Companies (ROSCOs)
- Transport for London (TfL)
- Transport Scotland (TS)
- Welsh Government.

2.1.7 The majority of the work and detailed stakeholder consultation, however, is carried out within Working Groups which have been formed to steer each of the Network RUS workstreams. The Working Groups manage each workstream as if it were a 'mini' RUS. The groups vary in size but are all small enough to ensure effective levels of engagement between the participants. However, given that each is composed of individuals with relevant expertise or strategic locus for the specific 'mini RUS' subject matter, they play an important role in recommending a strategy for endorsement by the SMG.

2.1.8 The SMG is the endorsement body for the outputs of the individual workstreams. Its agenda concentrates on key decisions – from endorsement of the Working Group remits to approval of key documents and ultimately the resulting strategy. If the SMG has comments or questions on papers these would be referred back to the Working Group which contains each of the SMG organisations' specialist representatives.

2.1.9 The strategies recommended by the Network RUS will be adopted within route based strategies.

2.1.10 The first meeting of the SMG identified those elements of strategy which it wished to include in the Network RUS. A Working Group was formed to take forward each chosen element of strategy. The Stations Working Group consists of members of the following organisations:

- ATOC
- DfT
- London Travel Watch
- Network Rail
- ORR (in the capacity of observer)
- Passenger Focus
- PTEG
- TfL
- Transport Scotland
- Welsh Government.

2.2 Time horizon

2.2.1 The Network RUS takes a perspective of up to 30 years to be consistent with the long term views of transport planning taken by UK Governments in their strategy documents, notably the DfT's Rail White Paper (2007) and Transport Scotland's Strategic Transport Project Review (2008).

2.3 Scope

2.3.1 This RUS considers the issues of accommodating growth and dealing with the congestion that it can generate at stations. As such it complements the geographic RUS documents which have largely considered how to accommodate growth in the usage of the trains themselves.

2.3.2 Originally, it worked to a remit which covered three broad areas:

- to produce an updated version of the 'New Stations: A Guide for Promoters' document. The previous document dated from 2004 and was produced by the Strategic Rail Authority (SRA). It was intended that the new document would reflect the industry structure then in place, provide improved guidance on alternatives to new station investment and a clearer specification of the operational analysis required to be produced at the various stages of the process by third parties
- to produce a high level analysis, conforming to the standard RUS approach of Baselining, Gap analysis and Option recommendations, assessing the ability of key stations on the network to handle present and predicted future demand
- to produce a high level analysis, conforming to the standard RUS approach of Baselining, Gap analysis and Option recommendations, of facilities which affect utilisation of station capacity. Case studies would be used where appropriate.

2.3.3 In June 2008 the first output from the Network RUS Stations workstream was delivered with the publication of the document 'Investment in Stations: A Guide for Promoters and Developers'. This document provides information for parties who wish to invest in stations and has been updated in 2011 and republished as part of the work of this RUS. It is available at **www.networkrail.co.uk**.

2.3.4 In June 2009, the 'Better Rail Stations' work led by two 'station champions', Chris Green and Sir Peter Hall, commenced. It had a remit from the DfT to advise the Government on ways to improve stations, focusing on getting the basic facilities right as well as considering the broader role of stations in the future, and its scope covered stations in England and Wales. The 'station champions' reported in November 2009, and in March 2010 the DfT published the results of its stakeholder consultation on the report. It was agreed by the SMG in September 2009 that the Network RUS stations working group should be put on hold pending the outcome of the 'Better Rail Stations' work.

2.3.5 The RUS recommenced work after the publication of the 'Better Rail Stations' report and at the March 2010 SMG a slightly revised final remit was agreed. This remaining work focused on the last elements of the remit, namely, station capacity and factors which affect utilisation of station capacity. The RUS considers different categories of station users, and considers how the activities they undertake during the different stages of their passage through the station affect the usage of capacity.

2.3.6 The RUS identifies those stations which should be examined in more detail for the potential need for intervention to address congestion, and sets out a toolkit of generic interventions to be considered at these and other stations.

2.3.7 The RUS does not endeavour to recommend principles for the physical layout of new or rebuilt stations. This guidance is contained in a separate document 'Network Rail's Guide to Station Planning and Design' which is an overview of planning and design requirements for those stations that Network Rail manages.

2.3.8 There exists a wide range of standards, safety regulations and guidance notes relating to the design of stations which cover the management of crowding and congestion, as well as safety requirements at stations. These should also be referred to as appropriate.

2.4 Policy context

England and Wales

2.4.1 In January 2011 the DfT published 'Reforming Rail Franchising: Government Response to Consultation and Policy Statement'. This document sets out a range of options for reform of the current system of passenger rail service franchising, as well as a summary of responses, and the Government's policy position in each area. Some of the elements presented in the consultation have the potential to increase the role of Train Operating Companies (TOCs) in investing in and managing stations.

2.4.2 Prior to the current Government taking office in May 2010, the DfT published its White Paper 'Delivering a Sustainable Railway' in July 2007. It provided a vision for the next thirty years. Over this period, it envisaged a doubling of passenger numbers and of freight transported by rail. It saw a railway which would expand to meet the increased demand, reduce its environmental impact, and meet increasing customer expectations, whilst at the same time continuing to improve its cost efficiency.

2.4.3 The White Paper explored the development of a 'Passenger Strategy'. The strategy included factors such as better access to stations, easier purchase of tickets, provision of fast and accurate information, meeting the specific needs of disabled passengers and improved station conditions. The value of improvements at station car parks was also included in the assessment of value to passengers of station improvements, as were elements of station security, cleanliness and the general station environment.

2.4.4 In March 2010 the Welsh Government published the 'National Transport Plan'. This document provides a transport strategy for Wales of which rail is one important element. This strategy identifies areas for potential service improvements and station enhancements, as well as initiatives for better integrated interchanges at stations as part of making the transport system more sustainable.

Scotland

2.4.5 In December 2008, Transport Scotland published its 'Strategic Transport Projects Review' (STPR). The document outlines the role of a safe, efficient and effective transport system as a key enabler of the development of a successful and dynamic nation. It reinforces the importance of linking the major Scottish cities (and areas of greatest population growth) and international gateways with fast effective links.

2.4.6 A key theme of the STPR is the promotion of mode transfer to public transport. It identifies how limited car parking facilities at some stations along with physical constraints on increasing rail capacity will, if not addressed, lead to overcrowding and a deterioration of performance. These in turn would limit the attractiveness of rail and other public transport modes in the absence of targeted investment.

2.4.7 During 2009, Transport Scotland consulted on the provision of parking at Scottish rail stations. The responses were published in February 2010.

High Level Output Specifications

2.4.8 The RUS's strategy will inform the Initial Industry Plan (IIP) which is a cross industry document to be submitted to the Governments in September 2011. Following on from the IIP, this RUS, in conjunction with other documents produced in the RUS programme, will help inform the Department for Transport (DfT) and Transport Scotland's High Level Output Specifications (HLOS) for the forthcoming planning control periods commencing with Control Period 5 which runs from 2014 to 2019.

Consistency with McNulty Rail Value for Money Study

2.4.9 Linked to the review of franchising in England and Wales, a study jointly sponsored by the DfT and ORR was commissioned to examine the overall cost structure of all elements of the railway sector and to identify options for improving value for money to passengers and the taxpayer. This study, the 'Rail Value for Money' study, was led by Sir Roy McNulty. It published its final report in May 2011. The Government is considering the report and it is planned that a White Paper will be published in Autumn 2011 in response to the study's findings.

Funding arrangements for investment in stations

2.4.10 There are a variety of funding arrangements for investment in stations in England, Wales and Scotland from schemes administered by the DfT, Transport Scotland, or Welsh Government. However, in addition to these funding sources there is also funding from a number of more local sources including:

- Local government – local authorities have been involved in funding improvement to stations
- investment by TOCs – train operators make investment in their stations, either as franchise commitments or commercial schemes
- third parties and property developers – either as part of making developments more attractive or to mitigate their impact on the transport network, developers may fund improvements to station or invest in new ones.

3. Baseline

3.1 Introduction

3.1.1 In this chapter, a background to station congestion in Britain is presented. The chapter reviews the available data on station usage, and describes the major committed schemes affecting stations across the country. Those stations that have been nominated as congested by the Working Group and Train Operating Companies (TOCs) are listed. Lastly, issues of station visit purpose, dwell time, interchange, and car parking, are explored.

3.2 Background

3.2.1 The national rail network of England, Scotland and Wales caters for approximately 4 million journeys every working day (2009-10). It is important to recognise that there has been considerable growth in the number of passenger journeys per year. For example between 2002-03 and 2010-11 there was a 38.7 per cent increase in annual passenger journeys. Stations have therefore already had to absorb considerable growth in footfall.

3.2.2 Over 24,000 daily passenger services run on approximately 9,000 passenger route miles. Each passenger accesses these services by one of 2,520 railway stations situated on the network. At present, the vast majority of these stations are owned by Network Rail and leased to Train Operating Companies (TOCs) for the duration of their franchises. The TOCs act as 'Station Facility Owner' (SFO) and are generally responsible for train dispatch, general upkeep, cleaning, security and maintenance of station and car park areas. They also operate ticket sales facilities and gatelines, as well as providing advice and assistance to passengers.

3.2.3 Eighteen of the largest stations on the network are directly operated by Network Rail as Managed Stations. Many of these are the larger termini in central London and the UK's major cities. Half of all rail journeys made in the UK either start or finish at a Network Rail Managed Station. Around 950 million people pass through Network Rail Managed Stations every year.

3.2.4 Stations are at the heart of the operation of a safe and efficient railway. They are the first point of entry onto the network for the travelling public. As well as providing access to rail services, many provide a focus for local transport interchanges, and some stations have retail and catering facilities which make them a destination in their own right. As such many provide a social amenity or focus for a community; they are economic entities in their own right; and they can be a catalyst for growth in the local economy.

3.2.5 Many of today's stations were built during the early development of the railway in the mid-19th century and are over 150 years old, whilst others have been added to the network more recently. Historically, some towns have had two or three stations in close proximity, originally built by competing companies. For example Norwich had three stations (City, Thorpe and Victoria) whereas it now has one only. While many stations are conveniently located for journey origins and destinations, other stations may now be remote from the communities they serve owing to shifting land use patterns over time.

3.2.6 The extent to which the size and layout of stations are suitable for their current level and type of use varies by station. Some stations on the network have experienced considerable growth in recent years, and are experiencing crowding at peak times, while others have large imposing spaces with empty or obsolete Victorian buildings.

3.3 Station categorisation

3.3.1 In the mid-1990s, stations on the national network were classified into six categories (A-F) based on a combination of passenger footfall and annual income from ticket sales. These are described in **Tables 3.1** and **3.2**.

Table 3.1 – Definitions of Station Categorisation	
Category	**Definition**
A – National Hub	Major station providing a gateway to the rail network from a large area, and acts as a significant interchange hub
B – Regional Hub	Large station providing a gateway to the rail network from a large area. Often served by more than one TOC with a mix of service types. May be a terminus for some services
C – Important Feeder	Significant 'feeder' station, on a busy trunk route or as a subsidiary hub station. Often with services from more than one TOC and a regular long-distance service
D – Medium Staffed	Medium-sized, staffed station, with a core inter-urban business or high-volume inner-suburban business
E – Small Staffed	Small, staffed station often with just one member of staff at any one time, or for only part of the day
F – Small Unstaffed	Small, unstaffed station

Table 3.2 – Station Category and the numbers in each category	
Station Category	**Number of stations in each category**
A	28
B	67
C	248
D	298
E	679
F	1200
Total	**2520**

3.3.2 The categorisation was developed to aid planning. For example it was used in the setting of minimum standards in a consistent manner, prioritising enhancements, and managing asset condition and maintenance.

3.3.3 It would be wrong to conclude that pedestrian congestion issues only affect the larger and busier stations in Categories A, B and C. Even stations in Category F can theoretically experience congestion problems, especially if they serve mass entertainment venues with large peaks of activity, such as Wembley Stadium.

3.4 Defining and measuring station congestion

3.4.1 In simple terms, congestion occurs when too many people are occupying too small or constricted a space, in such a way as to prevent free movement. Easing congestion will therefore be a function of reducing the concentration of people, and/or increasing the amount of usable space.

3.4.2 Usable space can be very different from actual space. For example at Preston station (see case study in **Appendix A**) the station buildings are of Victorian origins with the platform lengths longer than many services using the platforms, which, with the exception of sleeper services, are currently nine-car Class 390 sets (to be lengthened to 11-car) or two five-car Class 221 sets at around 230 metres in length. The longest platform is 359 metres. The usable space for passengers is therefore far less than the total surface area of the station platforms.

3.4.3 The areas of congestion at a station tend to be at key pinch points through which large numbers of users must pass. Examples include platform or station entrances where users are funnelled towards a single point. This may be exacerbated by cross-flows of other users or the intrusion of facilities such as ticket retailing into the concourse or platform space. It is important to see congestion in the wider context of the station and train service. Addressing congestion in one area may have the unintended consequence of simply moving the problem to a different area of the station.

3.4.4 Beyond a certain level of congestion, the flow of passengers is impeded and will add to the total travelling time of a journey. Congestion at locations such as terminal stations may pose an upper limit on the numbers of passengers which can be carried on a route. In extremis, congestion can be an issue of safety and, progressively above a certain level, station closures as a result of crowding can become a frequent event. Congestion at stations must therefore be considered when investing in the network, or in the case of this RUS when planning for future levels of forecast passenger demand.

3.4.5 Planners use a variety of methods to measure crowding in and around stations. The most regularly used in rail planning is Fruin 'levels of service'. This is a measure of passenger or customer density developed by Prof. John J Fruin in 1971. This measure, which had previously been used successfully in the planning of airports, gives the number of passengers within a square metre of space, or the flow rate of pedestrians per minute per metre space of footway. Six levels of crowding are used to distinguish between free movement of people and congested areas on a sliding scale, Fruin 'Level of Service' A being total free movement and Fruin 'Level of Service' F representing a standstill situation. These levels of service are illustrated in **Figure 3.1** and their values shown in **Table 3.3.** There are different service level values for different areas of the station to reflect the differing impacts of congestion while queueing, using stairs, or walkways.

Figure 3.1 – Diagram of Fruin Levels of Service A to F[1]

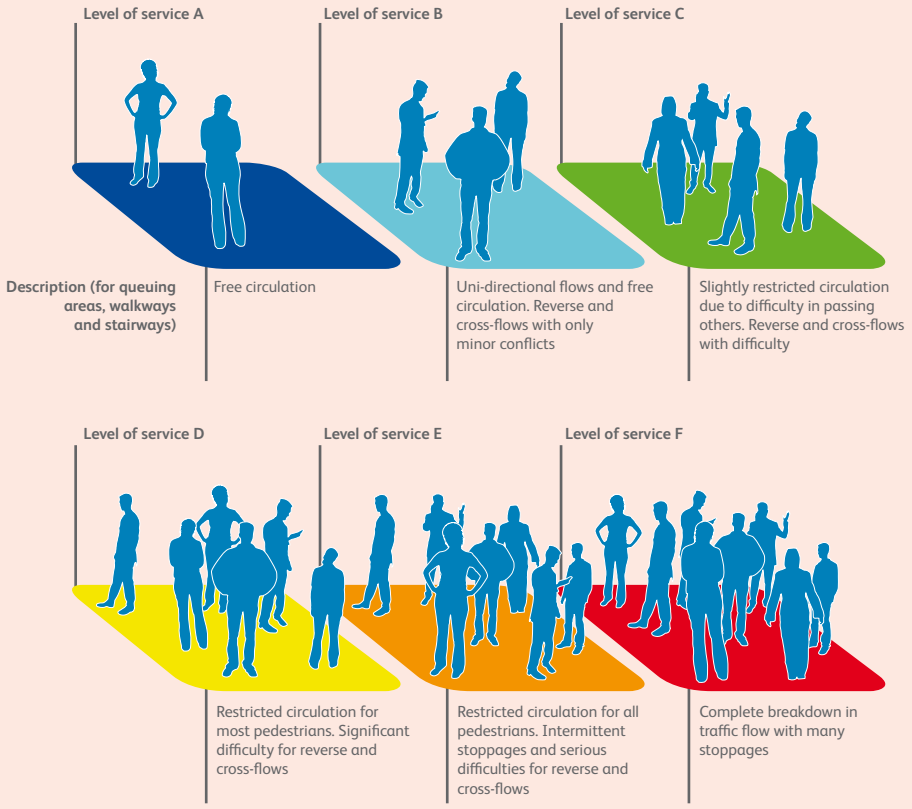


Table 3.3 – Values of Fruin Levels of Service A to F

Level of Service	Density	Flow rate
A	>3.25m² per person	<23 (pedestrians/min/m)
B	2.32-3.25m² per person	23-33 (pedestrians/min/m)
C	1.39-2.32m² per person	33-49 (pedestrians/min/m)
D	0.93-1.39m² per person	49-66 (pedestrians/min/m)
E	0.46-0.93m² per person	66-82 (pedestrians/min/m)
F	<0.46m² per person	>82 (pedestrians/min/m)

1 Source: London Underground Station Planning Standards and Guidelines, 2008

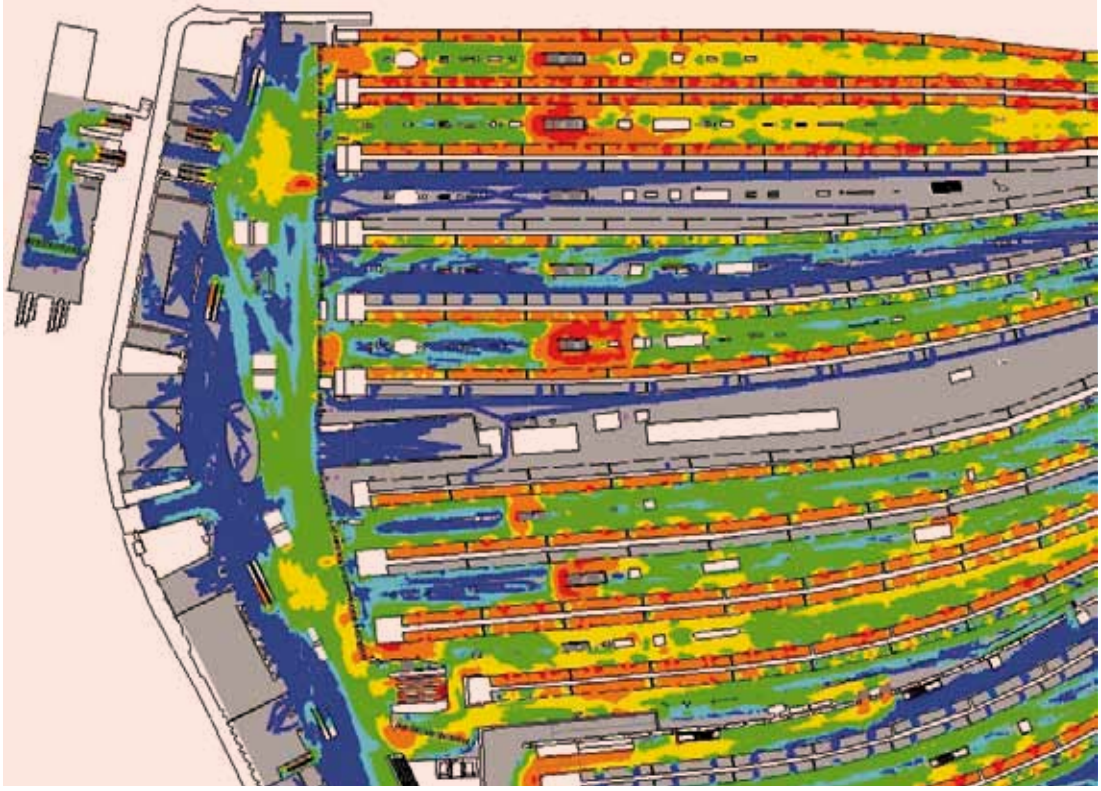
3.4.6 These levels of service are used by pedestrian capacity models to understand where crowding occurs on stations and to what degree. The varied design of stations means that Fruin 'levels of service' can vary greatly even within a small distance, as congestion is more likely to occur in constrained areas.

3.4.7 Historically rail planners have tended to plan to accommodate crowding at a level no higher than Fruin Level C, although there will be exceptions where this is neither practical nor possible (high peak times, event days etc). For more information on the current acceptable parameters please refer to the Network Rail 'Station Capacity Assessment Guidance'.

3.4.8 Passenger perceptions of crowding and its impact can vary between market sectors. It has been previously observed that in some larger cities, passengers are more accepting of a higher pedestrian flow or crowding than in other parts of the country.

3.4.9 A range of static (spreadsheet based) and dynamic models (software simulation tools) are available to simulate how pedestrians ambulate around structures such as stations. Dynamic models generally provide a more detailed level of analysis, even down to the level of interaction between individual pedestrians. **Figure 3.2** illustrates how such a model can assess Fruin levels in a predictive scenario from modelling recently undertaken at London Waterloo.

Figure 3.2 – Pedestrian Flow Model of London Waterloo[2]



3.4.10 Constructing such models is a complex and time-consuming task. As a result, models have only been constructed for a relatively small number of stations nationwide, and usually in response to a proposed significant investment in order to understand how any change to the station design would impact on pedestrian flows.

2 Source: Waterloo Station Redevelopment LEGION Passenger Modelling for Network Rail, 2009

3.5 Valuing the cost of congestion

3.5.1 When considering the cost of congestion, and the benefits of its alleviation, most of the impact that is taken into account by economic appraisal relates to the cost per person of time lost to congestion at a station (depending on the type of passenger and on the kind of activity they are undertaking) by considering the value of their time. This is an established procedure, used for valuing time savings when journey times are reduced. These values are derived from the rail industry's latest Passenger Demand Forecasting Handbook (PDFH), which is currently in its 5th edition, and the DfT WebTAG and Transport Scotland STAG appraisal procedures.

3.5.2 For schemes such as the Birmingham Gateway project, substantial savings in both rail and non-rail users' time as a result of the scheme form a major element of the benefits of the intervention. The outputs from pedestrian modelling were used to forecast journey time savings which were given a value of time in the appraisal. From this analysis a business case was constructed and a benefit-to-cost ratio (BCR) was calculated in order to indicate the value for money of an option. In England and Wales, a BCR over 2.0 is considered 'high value for money', a BCR over 1.5 is considered 'medium value for money' and a BCR less than 1.0 is considered 'poor value for money'. Scottish appraisal guidance does not use the same hurdle values.

3.5.3 The way in which congestion is valued does not generally consider those factors which make congestion unpleasant for the station user. More complex valuation of the benefit of alleviating congestion could also consider the impact of the congestion and apply a penalty for the disutility of spending time in that environment. The benefits to the economy or socio-economic factors could also be taken into account.

3.6 Station usage statistics

3.6.1 There are various sources of data available within the rail industry on station usage. Some of this information is publicly available (such as the ORR station usage statistics) whereas other information (such as disaggregated train counts) is commercially confidential. There are five basic ways to collect station usage information:

Information derived from ticket sales

3.6.2 Ticket sales data is the most available form of information which can be used to derive passenger usage of stations, and indeed of the wider railway network. It provides an indication of the numbers of passengers entering and exiting at each station. The main form in which this information is published is the ORR station usage statistics.

3.6.3 However tickets sold do not directly equate to usage of stations as they do not include non-travellers at stations, and they provide only a partial view of the pattern of journeys. There are particular challenges in establishing journey patterns for interchanging passengers, and certain tickets such as Travelcards and season tickets do not relate to a single route or journey.

Information about ticket usage

3.6.4 The data from automatic ticket gates and smartcards, such as Oyster, provides information about the actual usage of tickets and patterns of journeys undertaken. In both instances the volumes of data are very large, potentially providing problems for analysis and data storage. The coverage of ticket gates is limited and this means that both sets of information may not capture all legs of a rail journey.

Manual counting

3.6.5 Manual counts can either be done at the station recording numbers of station users, or by indirectly measuring station usage by counting the number of passengers on trains. Counts can be used at various points around the station to establish flows of passengers and also the routes taken within the station. Station counts are typically undertaken as part of a specific project, although there are some regular counts. Regular counts include cordon counts in the London & South East and in PTE areas.

Automatic footfall counting

3.6.6 Automatic systems which count footfall can either measure station usage directly at stations, or (with on-train systems) by indirectly measuring the numbers of passengers boarding and alighting at a station. The latter only provides information about those who are actually travelling.

Passenger survey information

3.6.7 Passenger survey information provides data about the activities of passengers, origins and destinations of their journeys, movement within the station, their levels of satisfaction with attributes of the station, and their demographic profiles. This information is required to understand more about station users' needs and, in the case of station counts, to establish the ratio of travellers to non-travellers. In addition, different market sectors of passengers may have different needs at the station. For example, long distance high speed travellers typically may have more luggage and are likely to be spending a longer time at the station in advance of their train. A number of surveys are regularly carried out including the Travelcard Survey and National Passenger Survey (NPS).

3.6.8 The various data sources are described below along with their main strengths and weaknesses which are summarised in the **Tables 3.4** to **3.13**.

Office of Rail Regulation station usage data

3.6.9 The Office of Rail Regulation station usage data estimates the annual number of National Rail passengers arriving, departing, and interchanging (between National Rail services) at all stations on the network. The information is published annually on the ORR's website **www.rail-reg.gov.uk.**

3.6.10 Station usage is disaggregated by three categories of ticket; Full, Reduced and Season. **Table 3.4** discusses the strengths and weaknesses of this data set.

Table 3.4 – ORR station usage data strengths and weaknesses

Strengths	Weaknesses
Data provides a reasonably accurate reflection of annual National Rail passengers for a large number of stations on the network. This data is likely to be most accurate for stations outside large conurbations.	Factors need to be applied to estimate peak, or daily station usage from the annual totals. This data only includes passengers using National Rail services. Other station users (eg retail users, meeters and greeters, or Underground users in London) are not included. The data has some known weaknesses for stations in large conurbations. In London, the stations used by Travelcard passengers are estimated from the London Travelcard Survey and the 2001 London Area Travel Survey (LATS). TfL has provided evidence of substantial variations between passenger counts at inner London stations and the ORR data. Passengers travelling on multi-modal tickets in PTE areas are not included in the data, therefore usage will be underestimated. Station users travelling on certain rail operators (including Heathrow Express and Eurostar) are not included in the data. Interchange data is derived from ticket sales origin and destination information with a prediction of the most likely journey routeing. This potentially excludes some interchanges because the type of ticket does not necessarily provide the information on origin and destination, for example travelcard type products and where passengers have two separate tickets. Season tickets are also problematic and therefore there has to be an assumption made about the level of usage of each ticket. There are issues about allocating data between stations when tickets are to/from groups of stations (Birmingham Stns or Worcester Stns, for example). The data excludes London Underground users even where the station facilities may be shared, for example at Ealing Broadway.
Frequency of production	Annually published and publicly available
Owner	Office of Rail Regulation

3.6.11 The ORR station usage data is appropriate to use when a national sample of data is required. This is because it is the most comprehensive single measure of station usage. However, when using the data set in this way it is important to understand that the known weaknesses highlighted above are present. The ORR publishes a guidance document along with the spreadsheet which explains the methodology used and the limitations of the data set (available at: **www.rail-reg.gov.uk**). The data is only presented as an annual figure in each ticket category so where greater detail is required it may need to be augmented either by MOIRA (see section on MOIRA) or from bespoke surveys and the other sources of detailed usage data.

MOIRA

3.6.12 MOIRA is a demand allocation modelling tool which allocates an origin – destination matrix of rail passengers to trains.

3.6.13 The origin – destination matrix of rail passengers is derived from ticket sales recorded by LENNON (an industry database recording ticket sales). Therefore, annual station usage will be similar to ORR Station Usage data because MOIRA is used to populate the ORR data set. Because MOIRA allocates passengers to trains, it can be used to estimate station usage by time of day. **Table 3.5** summarises the strengths and weakness of using MOIRA as source data on station usage.

Table 3.5 – MOIRA data strengths and weaknesses

Strengths	Weaknesses
The same as for the ORR data but MOIRA can provide more disaggregated results.	As MOIRA relies on the same inputs most weaknesses are similar to that of the ORR data. While MOIRA has advantages over the high-level ORR data, it is still only a model and the allocation of passengers to trains in MOIRA is done on the basis of an algorithm, demand profiles and deannualisation factors which may not reflect true travel behaviour. The allocation to train services does not take into account factors such as train capacity.
Frequency of production	Twice yearly versions for rail industry usage
Owner	Whole rail industry model

3.6.14 MOIRA is an appropriate tool for high level estimates of patronage at stations, particularly those outside conurbations, where a source of information is required to be broken down to times of day or particular trains. If more specific information is required counts may be needed of numbers of boarders and alighters on train services or counts at specific areas around the station.

Automatic ticket gates (ATGs)

3.6.15 The data from ticket gates provides information about ticket usage. ATGs have been installed for the purpose of revenue protection, as well as security and safety at 270 stations on the network. These gates can digitally record the volume of passengers passing through them. **Table 3.6** contains a discussion of the strengths and weaknesses of using data from automatic ticket gates to determine station usage.

Table 3.6 – Automatic ticket gates data strengths and weaknesses

Strengths	Weaknesses
Ticket gates record National Rail passenger volumes on a daily basis. Data can be disaggregated by time of day (in timebands as small as five minutes) and direction of travel (arriving or departing). Ticket gates also have the potential to capture other information encoded on tickets, including price, origin, destination, Railcard and type of ticket. Ticket gates in continuous operation can be used to analyse peaks in rail travel – for example daily peaks, Friday evenings, bank holiday travel, seasonal commuting, etc.	Ticket gates are not always in continuous operation. No data is captured when they are left open. At some stations, gates may be opened on safety grounds during times of peak passenger flow. In some places there is a combination of open and closed gates to help passengers whose tickets are not readable by the ATG. Data volumes can present problems for both storage and analysis. Some ticket formats are incompatible with gates, hence some passengers have to use 'side-gates' which do not always record throughput (although data can be scaled up to reflect this). Station coverage of gatelines varies and there are currently 270 National Rail stations which are either fully or partially gated. Several large stations are not fully gated, including London Waterloo East, London Paddington, and London Victoria. Ticket gate data usually only covers passengers using National Rail services. Other station users (eg retail users, meeters and greeters, or Underground users in London) are not included.
Frequency of production	Not publicly available and infrequently shared widely within the rail industry
Owner	Station facility owners

3.6.16 Automatic ticket gates can provide detailed information about the volumes of passengers at particular times of day and by origin, destination as well as ticket type. This can provide very accurate information about the passengers at the gateline. However, it may well need to be augmented with other information to provide data about non-travellers, other areas of the station, those times when the ticket barriers may be left open and any ungated entrances.

Smartcard ticketing data

3.6.17 Smartcard ticketing provides information about ticket usage which is recorded either at ticket gates or when users touch in or out at card readers. The most comprehensive information about ticket usage of smartcards comes where there is a high percentage of ticket gates and a high penetration of smartcard ticketing, of which London Underground is an example of both features. The strengths and weaknesses of Smartcard ticketing are therefore similar to those of ATGs.

3.6.18 Smartcard ticketing has the potential to provide significant information about passenger journey patterns including usage of stations. The main smartcard in established usage is the Oystercard in London.

3.6.19 Smartcard ticketing is expanding with the extension of ITSO compliant smartcards being considered in a number of locations across the network. **Table 3.7** relates specifically to Oystercard data as this is the largest smartcard in current operation but the factors identified are likely to be common to other smartcard systems.

3.6.20 **Table 3.7** provides strengths and weaknesses of the Oystercard data. All National Rail stations in London are equipped with Oyster validators and the data is much more widespread than automatic ticket gate data, which is only available for some stations.

Table 3.7 – Oyster smart card data strengths and weaknesses

Strengths	Weaknesses
Data is very detailed – origin and destination, route taken, other modes used, journey times. Very comprehensive, covering all modes where Oyster is valid (National Rail, Underground, DLR, Tramlink, buses). Information on origins, destinations, route and journey times for individual passengers. Data captured at all stations and en route (using validators) rather than only at stations with ticket gates. Ability to identify different types of user (under 16s, over-60s, students, staff, etc.).	Quantity and detail of data means analysis is not simple. Data only available for four-week period due to sheer quantity of data and storage restrictions. Only Oyster users are captured so data needs to be extrapolated. This can be problematic as Oyster users tend to have similar journey types and profiles (ie frequent travellers making local journeys involving other modes of public transport). The users who are not captured by Oyster information therefore cannot be easily estimated by scaling up the data. Data has to be requested for specific locations and purposes. Passengers not using Oyster are not captured, but assumptions can be made to gross up the data to the full station demand. However, this will be influenced by local factors which can be hard to replicate using general scaling factors.
Frequency of production	Continuous
Owner	TfL

3.6.21 The information from smartcard ticketing about passenger usage of the transport system is likely to increase as systems are progressively introduced around the network. Currently the Oystercard data in London illustrates how this information can be effectively used. However, the scale of the information generated poses a challenge in both storage and analytical terms.

Manual station counts

3.6.22 Bespoke manual counts can potentially be conducted at any station. The data collected is used to build pedestrian models or to do static assessments to support investment cases (for example, ticket gate installation, or station remodelling). **Table 3.8** describes the strengths and weaknesses of a bespoke approach.

Table 3.8 – Manual station counts data strengths and weaknesses

Strengths	Weaknesses
Bespoke station surveys normally include a count of peak footfall, including station visitors who are not using National Rail services. Sometimes, these surveys record information on the movement of passengers through stations (for example, "from platform x to street exit y").	Up to date bespoke surveys exist only for a small proportion of stations on the network. However, where they do exist they tend to relate to larger stations. These surveys are usually conducted on an ad-hoc basis and for specific purposes, and the data collected may become outdated quite quickly. Manual counting can have inaccuracies based on the ability of the people undertaking the count either to maintain concentration or to count passengers accurately. Counts represent a snapshot of shifts when counts are undertaken. They do not therefore provide a full picture of station usage.
Frequency of production	Dependent on specific projects
Owners	Various parties – eg TOCs, Network Rail, funders or developers

3.6.23 Bespoke surveys are likely to be appropriate where there are specific investment schemes at stations. The bespoke information can be developed for the purpose of the project to establish at the appropriate level of detail the usage patterns for the station. Bespoke surveys tend to be undertaken in advance of major changes to the station or services and therefore may become out of date once the project has been implemented.

Network Rail managed station manual counts

3.6.24 Station footfall counts are undertaken at the 18 Network Rail Managed Stations periodically. **Table 3.9** discusses the strengths and weaknesses of the data resulting from Network Rail managed stations counts.

Table 3.9 – Network Rail managed stations counts data strengths and weaknesses

Strengths	Weaknesses
Network Rail's Managed Station Counts provide an estimate of total daily and annual footfall. The counts cover all station users, including visitors who are not using National Rail services (for example, retail footfall). Some counts are disaggregated by time of day (AM peak, interpeak and PM peak).	Shares many of the same weaknesses listed in **Table 3.8**. The counts do not necessarily distinguish between National Rail passengers and other station users. However, surveys are also carried out of the journey purpose which does indicate a percentage of non-travellers, but this does not directly relate to the counts.
Frequency of production	Last undertaken in 2008
Owner	Network Rail

3.6.25 In recognition of the weaknesses of manual counts, Network Rail is currently developing proposals to install automatic footfall counters at the stations that it manages. These CCTV based counters could potentially provide year round information about footfall at exits, retail units and key locations around the station. This information would address many of the weaknesses of the manual counts and provide a valuable resource for planning and managing stations.

Manual counts on trains

3.6.26 On-train counts are collected every autumn and the survey covers most peak suburban services to and from central London on those service groups where automatic passenger counting is not installed. The purpose of the counts is to determine the number of passengers on each train, at its most heavily loaded point.

3.6.27 'Cordon Counts' are undertaken each autumn and these record the volume of National Rail passengers passing cordon points into and out of central London. **Table 3.10** shows the strengths and weaknesses of this data in relation to its usage to determine station footfall. Counts are also undertaken in some PTE areas and in Scotland.

Table 3.10 – Autumn census data strengths and weaknesses

Strengths	Weaknesses
This data can be used to build up a picture of station usage by National Rail passengers. Both PIXC and Cordon counts can be disaggregated into small time periods. PIXC and Cordon counts cover a significant proportion of peak trains in central London, across a large number of stations.	The purpose of PIXC counts (Passengers In eXcess of Capacity) is to provide a picture of passenger volumes on trains, not at stations. In general, these counts are limited to trains approaching central London. For each train, a single count is collected at its 'critical load point' (the station with the highest arrival load). This location may vary by train along a route. For example, the critical load point can be either Clapham Junction/Vauxhall or Waterloo. This data only reflects passengers using National Rail services. Other station users (eg retail users, meeters and greeters, or Underground users in London) are not included. Neither the PIXC counts nor the Cordon Counts cover off-peak periods, or contra-peak services. Trains in the Long Distance sector are usually excluded from the counts. Station users travelling on some rail operators (including Heathrow Express and Eurostar) are not included in the counts. PIXC counts are for standard class passengers only (where there is first class it is not included) – this affects the south of London TOCs where first class on some service groups is still significant.
Frequency of production	Annual – the headline figures are published but disaggregated data is confidential
Owner	DfT

3.6.28 Where PIXC and Cordon Count data exists it can be used to augment other information about station usage. However, the coverage of the information is limited and it only records those passengers on the trains, not usage of the station.

Guards counts

3.6.29 Passenger loading information on long distance train services are collected by train managers and revenue protection staff. **Table 3.11** shows the strengths and weakness of this data source.

Table 3.11 – Guard counts data strengths and weaknesses

Strengths	Weaknesses
This data can contribute to the estimation of station usage by providing a relatively accurate picture of long distance train loads along line of route. This data is usually routinely collected by long distance train operators. Trains are normally counted several times over the duration of a timetable, allowing weekly and seasonal peaks to be identified.	The purpose of train count data is to provide an indication of passenger volumes on trains, not at stations and generally on-train counts do not record numbers of boarders and alighters. This data is generally limited to long distance train operators. The data would not identify other station users. Coverage of the data may be partial. For example at times of perturbation it may not be possible (or of the highest priority) for counts to be undertaken by on-train staff.
Frequency of production	Undertaken by individual TOCs on an ongoing basis and confidential
Owner	Individual TOCs

3.6.30 Where such counts are used to give an indication of the numbers of boarders and alighters at a particular station, this data will be incomplete if other operators who do not undertake similar counts also serve the station concerned.

On-train automatic passenger counting

3.6.31 Train loading data can be captured digitally by on-train automatic passenger counting systems, such as train weighing equipment. Other systems may use infrared sensors, video and/or CCTV technology which can automatically count numbers of people passing by.

3.6.32 There are two basic families of systems:

- load weighing – these systems weigh the train and record the net difference in weight at each stop as a proxy for the volume of passengers
- door counting systems – these systems use a variety of electronic counting systems to record the numbers of passengers getting in and out at each stop. There are a variety of levels of sophistication of these systems with CCTV systems generally providing greatest level of detail and accuracy.

3.6.33 The APC systems are installed on around 39 per cent of passenger rolling stock[3]. Such passenger counting systems have typically been mandated as part of franchise agreements for the past five to seven years. Accuracy of systems claimed by manufacturers varies, but can be within + or - 10 per cent.

3.6.34 TOCs use this information extensively to plan timetables and rolling stock resource allocation on the basis of loadings. As part of franchise commitments, TOCs also supply the data to the DfT.

3.6.35 **Table 3.12** describes the strengths and weaknesses of the APC data source.

Table 3.12 – APC data strengths and weaknesses

Strengths	Weaknesses
This data can contribute to the estimation of station usage by providing a relatively accurate picture of peak and off-peak train loads along line of route. Data for individual services are normally captured many times over the duration of a timetable, allowing weekly and seasonal peaks to be investigated and trends to be monitored.	The purpose of train counts is to provide a picture of passenger volumes on trains, not at stations. At present, APC systems do not cover all of the national fleet (only approximately 39 per cent), although this is improving and the deployment of APC probably covers a greater percentage of journeys. The data does not identify other station users. Systems that use train weighing cannot identify boarding and alighting passengers, and only measure numbers on board. For example, if 100 passengers alight and 100 passengers board the system would record no change. The difference between systems mean that data collected may not be directly comparable with each other except for the net difference at each location. The volumes of information produced by APC systems are potentially large requiring very substantial IT processing power.
Frequency of production	Continuous, and annually provided to the DfT by TOCs but not in the public domain
Owner	Individual TOCs and supplied to DfT

3.6.36 APC like other train borne systems only provides data on train usage and not directly on station usage. However, some systems may only be able to show the net numbers of passengers on a train service at each station and not the numbers boarding and alighting.

3 Source: Page 8, House of Commons Committee of Public Accounts, Increasing Passenger Rail Capacity, Fifth Report of Session 2010–11

National Passenger Survey

3.6.37 The NPS provides a network-wide picture of customers' satisfaction with rail travel. As a data source on stations, it provides passenger opinions of train services collected twice a year from a representative sample of passenger journeys. The NPS seeks passenger feedback about the following aspects of stations:

- overall satisfaction with the station
- ticket buying facilities
- provision of information about train times/platforms
- the upkeep/repair of the station buildings/platforms
- cleanliness
- the facilities and services
- the attitudes and helpfulness of the staff
- connections with other forms of public transport
- facilities for car parking
- overall environment
- personal security whilst using the station
- the availability of staff
- how request to station staff was handled.

3.6.38 This information provides a data set on passenger satisfaction with stations which has been collected since Autumn 1999. **Table 3.13** describes the strengths and weaknesses of the NPS data source.

Table 3.13 – NPS data strengths and weaknesses

Strengths	Weaknesses
NPS provides an overview of passenger satisfaction with various aspects of stations across all passenger train operators. It enables analysis at a TOC, or regional level of differing passenger satisfaction with stations. Can be used to see the profile of users, journey purpose, ticket types, and whether they consider themselves to have a disability.	The NPS often does not have statistically significant series of data for individual stations. Large stations may have such data series but for many stations there may be relatively small sample sizes or there may only be data from survey waves. The NPS only relates to those users of stations who are travelling on the railway. The survey does not cover non-travellers. The NPS does not have as many specific questions relating to congestion on the station as for the on-train environment.
Frequency of production	Twice yearly survey
Owner	Passenger Focus

3.6.39 The NPS provides an overview at a TOC level of customer satisfaction with various aspects of stations. The information about the profile of rail travellers is also potentially useful data in relation to the needs of station users. However, the data is often not detailed enough to allow analysis at the level of individual railway stations. For this level of analysis, for example to support National Stations Improvement Programme (NSIP) investment in stations, Passenger Focus has conducted more in depth market research at the level of individual stations.

3.6.40 From the Autumn 2010 wave of the National Passenger Survey specific questions were included about passenger satisfaction at all 18 Network Rail managed stations. The sample size was also increased at these stations to allow them to be analysed with a large enough sample of data to be able to draw statistically significant findings. This will provide a comparable data set with other industry data series.

3.7 Current committed plans affecting stations

3.7.1 During Network Rail's Control Period 4 (2009-14) there are committed infrastructure enhancement schemes which will deliver capacity improvements and have significant impacts on stations. These include specific investment in redeveloping major stations, and large projects like Thameslink and Crossrail which will transform whole routes. There is also individual investment at stations through NSIP and the DfT's Access for All Programme (AFA).

Major Station Redevelopments

3.7.2 Birmingham New Street is undergoing substantial redevelopment which is due to be completed by 2015. This investment will increase platform, concourse and entrance capacity. The environment of the station will also be substantially enhanced.

3.7.3 London King's Cross is undergoing redevelopment which is due to be completed in 2013. The redevelopment will provide a new enlarged western concourse and a public square in front of the station where the current concourse is located.

3.7.4 Reading station area is currently the subject of substantial redevelopment to increase capacity of the railway and improve performance which is to be completed by 2016. Reading station is undergoing radical change to provide new platforms, a new footbridge and step-free access.

National Stations Improvement Programme

3.7.5 NSIP is a DfT-funded cross-industry programme designed to enhance approximately 150 medium sized stations across routes in England and Wales. It is a committed spending requirement in Network Rail's CP4 Delivery Plan to deliver station improvements for passengers. The primary objective of the programme is to make noticeable and lasting improvements to the environment at selected stations. The programme is being developed through local delivery groups which enable the NSIP money to be invested in the most effective way by leveraging in third party funding. Local delivery groups include train operators and representatives from Network Rail.

Access for All

3.7.6 The Access for All (AfA) Programme is part of the Railways for All Strategy, launched in 2006 to address the issues faced by disabled passengers using railway stations in Great Britain. Central to the strategy is the ring-fencing of £35m funding 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.

Thameslink Programme

3.7.7 The Thameslink Programme incorporates enhancements on the Thameslink routes in the London and South East area. The Thameslink programme has phased delivery over three key outputs, one was completed in March 2009, and the other two are due for completion in December 2011 and December 2018 respectively. A number of stations will be subject to platform extensions and London Bridge, London Blackfriars and London Farringdon will be substantially enhanced. London St Pancras International Thameslink platforms are already operational as part of the wider investment at London St Pancras International station.

Crossrail

3.7.8 The Crossrail project aims to deliver infrastructure enhancements to enable operation of 24 trains per hour from central London to destinations such as Heathrow Airport, West Drayton and Maidenhead in the west and Abbey Wood and Shenfield in the East. The works will involve major changes at London Liverpool Street and London Paddington to accommodate the new services and passenger volumes.

London Underground Upgrade Programme

3.7.9 The London Underground Upgrade Programme is increasing the capacity of Underground lines. This will have an effect on the ability to disperse passengers from a number of major railway terminals in London. The upgrades also have the potential to change the journey patterns of passengers transferring from National Rail services to the Underground. The upgrades have funding in the TfL Business Plan up until 2018. The Underground Victoria Station Upgrade will make specific difference to onward travel from London Victoria rail station.

Intercity Express Programme

3.7.10 On 1 March 2011, the Government announced that it had decided to resume the Intercity Express Programme procurement. The first of the new trains are expected to be in service by 2016 on the Great Western and East Coast Main Lines. To accommodate the increased capacity of train services, it is likely that enhancement work will be undertaken at stations such as London Paddington.

Electrification

3.7.11 Following the electrification programme in the North West and on the Great Western Main Line to Oxford, Newbury, Bristol and Cardiff, the cascade of electric rolling stock might result in train and platform lengthening and changes to service patterns in these areas. This in turn is likely to generate increased patronage at the stations served.

South East England train lengthening programme

3.7.12 The train lengthening programme in the South East of England will allow the operation of longer trains on key routes. This programme will see investment in platform lengthening at a number of stations, but will also influence the future footfall at stations along the routes. The programme of enhancements will provide the following capability:

- 10-car capability on certain suburban services on the Wessex route into London Waterloo
- 10-car capability on certain suburban services on the Sussex route into London Victoria
- 10-car capability on certain suburban services on the Sussex route into London Bridge
- 12-car capability on the Sussex route from East Grinstead into London Victoria and London Bridge
- 12-car capability on certain Kent route suburban services into London Charing Cross and London Cannon Street
- 12-car capability on the Tilbury Loop and Ockendon Branch into London Fenchurch Street
- 12-car capability on certain West Anglia services on the Anglia route into London Liverpool Street
- 12-car London King's Cross to Cambridge train lengthening.

3.7.13 The capability changes will be delivered to different timescales across CP4. Longer services will be possible on or before the December 2013 timetable change date.

Edinburgh – Glasgow Improvement Programme

3.7.14 The Edinburgh - Glasgow Improvement Programme consists of a series of improvements, including electrification, between Scotland's two largest cities and the wider central Scotland corridor. Work is scheduled to be completed by 2016. The project plans to deliver a faster and more frequent service between Edinburgh Waverley and Glasgow along with new or increased service opportunities. Investment is planned at Haymarket station to improve the current facilities and concourse, as well as providing an interchange with the Edinburgh tram network.

Other train lengthening programmes

3.7.15 As part of HLOS, peak capacity enhancements are planned in CP4 to lengthen Northern and Trans Pennine Express services into Liverpool Lime Street, Manchester Piccadilly, Leeds and Sheffield.

3.7.16 The DfT sponsored enhancement scheme to lengthen Class 390 vehicles on the West Coast Main Line (WCML) is progressing, and, whilst none of the existing nine-car trains have yet been extended, the first four additional 11-car trains are already undergoing route testing. The overall aim is to increase capacity on the WCML to accommodate growth forecasts on this route. In order for the lengthened sets to operate, platform work is required at a number of stations.

3.8 Uncommitted schemes potentially affecting stations

HS2

3.8.1 The High Speed 2 scheme is being developed to provide high speed rail links from London to the Midlands and the North. Potentially it will have a substantial impact upon those stations it serves. London Euston for example might be expected to undergo substantial redesign. HS2 services will generate significantly increased footfall and therefore are likely to compel a redesign of existing facilities particularly for onward travel and dispersal, as well as concourse space.

3.8.2 HS2 is likely to abstract passengers from some stations on the classic network as the journey time and service opportunities offered by HS2 result in changes in passenger journey patterns. At this stage in its development the precise impact is hard to quantify.

3.8.3 Completion of the first phase from London to Birmingham is planned for Control Period 7 (CP7, 2024-29)

Crossrail 2

3.8.4 Crossrail 2 (or the Chelsea to Hackney line) is a potential but uncommitted scheme to provide a link across London on a north-east to south-west corridor. It has been included in the Mayor's Transport Strategy and the London Plan and a route has been safeguarded. If the scheme incorporates suburban services into London Terminals then it could be expected to relieve congestion at certain key stations by providing a direct connection into central London, bypassing termini as well as relieving congestion on certain London Underground lines.

3.8.5 The London and South East RUS envisages that Crossrail 2 could potentially be delivered in CP7.

3.9 Current congestion at stations

3.9.1 When crowding occurs for relatively short periods of time during each day, or before or after a planned event (as can occur at stations near sports stadia or event venues), station crowds may need to be actively managed (for example at Cardiff Central when events are held at the Millennium Stadium). Active management refers to measures which require specific intervention such as temporary queueing systems, as opposed to passive management, which might involve permanent one-way systems, automatic ticket gates or boarding zones with hatched marking. With regularly-practiced plans in place, effective active management, such as queueing, barrier control or temporary station closures can be effective in dealing with large numbers of people.

3.9.2 The following features can all act as bottlenecks at some stations:

- bridges
- doorways
- stairways
- lifts and escalators
- tunnels
- gatelines
- platforms
- ticket office queues
- queues for retail or other services
- queues and waiting to access real time information
- access to interchange areas.

3.9.3 Crowding can become uncomfortable (or in extreme circumstances, present a risk to passenger safety) in these areas and may need to be managed appropriately. As soon as a risk is identified, management measures are put in place to mitigate it. Examples include 'tidal-flow' measures where crowds are directed around a station in one direction only, or where certain points become entrance or exit only for parts of the day. Others include temporary measures such as at Falmer on event days where a queueing system is implemented to control access to the platforms.

3.9.4 Congestion during perturbation is also an important factor in considering congestion at stations. The impact of perturbation can potentially impact on stations of all sizes. When passenger numbers build beyond a certain level on platforms safety concerns can result in station closures. Small stations where trains terminate short of their destination during perturbation can suffer from particularly high levels of congestion.

3.9.5 In order to identify those stations which have pedestrian capacity issues and which have not been highlighted in previous RUSs, the Working Group and TOCs were asked to nominate congested stations across England, Wales and Scotland. For those stations which were nominated, SFOs were asked in a questionnaire to apply local knowledge to assess various aspects of station crowding. These aspects were:

- whether, and when queues for tickets form, and whether the queues impede flow of passengers not buying tickets
- typical Fruin congestion level in concourse area in the peak
- typical Fruin congestion level in concourse area in the off peak
- typical Fruin congestion level on any footbridge/ in the subway (as applicable) in the peak
- typical Fruin congestion level on any footbridge/ in the subway (as applicable) in the off peak
- typical Fruin congestion level on the busiest platform(s) in the peak
- typical Fruin congestion level on the busiest platform(s) in the off peak
- whether crowding regularly prevents passengers who change trains at the station from catching connections.

3.9.6 The main outcome of this survey was an assessment of the Fruin levels of congestion on the station concourse, platforms, and footbridge and subways for both the peak and off-peak. This information was presented in the Draft RUS for Consultation which is available on Network Rail's website – **www.networkrail.co.uk**. It is important to note that the evaluation of Fruin levels has been based on a subjective assessment of usage and not on strictly controlled measurement of passenger density or flows. This approach was selected because a relatively high level assessment of congestion is appropriate for a national strategy.

3.9.7 Not all of the stations nominated by the Working Group and train operators were found to be congested in the questionnaire responses. Of those stations which did demonstrate congestion, many showed a wide range in reported levels. A number of stations were reported as having high Fruin levels in all areas of the station. However, it is important to note that congestion in just one area of the station may form a pinch point which limits the overall capacity of the station, and can cause equally severe problems as those which have congestion in more areas.

3.9.8 For most stations the peak periods were the times at which the greatest levels of congestion were experienced. There are however some stations where off-peak congestion was said by TOCs to be higher than the peak period. The frequency at which congestion occurs is also important to consider when assessing congestion. Stations such as Birmingham New Street experience congestion on a daily basis during the week. Other stations may experience congestion less frequently. There was a specific group of stations where the greatest levels of congestion related to special planned events such as football matches.

3.9.9 The questionnaire asked about congestion during typical operation and did not focus on periods of perturbation. It is, however, acknowledged that congestion at times of disruption can be a significant issue at stations.

3.9.10 Many of the stations that have been nominated as congested are the subject of enhancements listed in **Section 3.7**. Therefore while there are current congestion issues at stations like Birmingham New Street or London King's Cross, investment currently being delivered will address the congestion issues.

3.9.11 The list below shows all of the stations which were nominated. The results of the questionnaire were provided in the Draft for Consultation. The list is not intended to be exhaustive and it should be noted that a process is suggested for consideration of station congestion in the future which can be found in **Chapter 7**.

- Ascot
- Ashburys
- Balham
- Banbury
- Barking
- Basingstoke
- Billericay
- Birmingham International
- Birmingham Moor Street
- Birmingham New Street
- Birmingham Snow Hill
- Bradford Forster Square
- Bradford Interchange
- Brentwood
- Brighton
- Bristol Parkway
- Bristol Temple Meads
- Bromley South
- Cambridge
- Cardiff Central
- Cardiff Queen Street
- Chafford Hundred
- Chelmsford
- Chesterfield
- Clapham Junction
- Colchester North
- Coventry
- Derby
- Dore
- Ealing Broadway
- Earlsfield
- East Croydon
- Farnborough Main
- Farringdon
- Finsbury Park
- Forest Gate
- Gatwick Airport
- Gidea Park
- Glasgow Central (Low Level)
- Glasgow Queen Street (High Level)
- Guildford
- Guiseley
- Halifax
- Haymarket
- Herne Hill
- Horsforth
- Huddersfield
- Kings Norton
- Kirk Sandall
- Leeds
- Leicester
- Lewisham
- Lichfield City
- Lincoln Central
- Liverpool Central
- Liverpool James Street
- Liverpool Lime Street
- London Blackfriars
- London Bridge

- London Cannon Street
- London Charing Cross
- London Euston
- London Fenchurch Street
- London Kings Cross
- London Liverpool Street
- London Marylebone
- London Paddington
- London St Pancras (Upper Levels Midland Main Line platforms)
- London Victoria
- London Waterloo
- London Waterloo East
- Manchester Deansgate
- Manchester Oxford Road
- Manchester Piccadilly (Platforms 13/14)
- Manchester Victoria
- Milton Keynes Central
- Nuneaton
- Orpington
- Peterborough
- Preston
- Princes Risborough
- Putney
- Reading
- Redhill
- Richmond
- St Albans City
- Salford Central
- Salford Crescent
- Saltaire
- Seven Sisters
- Sheffield
- Shipley
- Slough
- Solihull
- South Gyle
- Staines
- Stourbridge Junction
- Stratford
- Stratford upon Avon
- Surbiton
- Tamworth
- Telford Central
- Tottenham Hale
- Twickenham
- Vauxhall
- Wakefield Westgate
- Walsall
- Walthamstow Central
- Watford Junction
- Wembley Stadium
- West Ham
- West Hampstead (Thameslink)
- Wimbledon
- Windsor & Eton Central
- Witham
- Woking
- Wolverhampton
- Worcester Foregate Street.

3.10 Use of a station

3.10.1 As has been illustrated in the discussion of station categorisation above, there is a wide variety of types of railway station in Britain. The users of stations also vary considerably in their needs. In order to try and conceptualise the use of a station this section of the chapter considers broad categories of users to encapsulate the basic needs of station users. Where a station is identified as having congestion issues, then knowledge of where the congestion is located and what type of passenger uses the station is important to establishing any solutions. These general categories of users are as follows:

Traveller:

- business
- leisure
- commuter.

Non-traveller:

- dropping off
- meeting
- using station facilities
- other eg staff, or using the station as a thoroughfare.

3.10.2 To address the variety of stations it is not proposed to consider each station in turn. To do so would result in a large amount of repetition. This is because, whilst there is a wide variety of stations, there are common activities to all stations. In order to reduce overlap this document seeks therefore to break down the station into common activity zones, as follows:

- **Access Zone** – area through which the station user enters or exits the station to onward transport
- **Facilities Zone** – where the needs of passengers for services and facilities on the station are met
- **Platform Zone** – area for waiting for train services, find information about train services, and access and egress to and from the train itself.

3.10.3 In some stations these areas will not be distinct zones and may be shared. For example there may not be a clear distinction between facilities and platform zones at many stations. This may be because they are smaller stations, or because retailing facilities are provided on the platforms. While these zones may overlap they are present within all stations and the needs of station users can be represented within them. The extent and the quantity of facilities will vary according to the station and the usage of these facilities will depend on the user.

3.10.4 **Figure 3.3** summaries the basic activities and facilities found in the three key zones.

Figure 3.3 – Activity Zones

3.10.5 The zones that have been used in this document follow a similar structure to those used by the Association of Train Operating Companies (ATOC) in the NSIP station zoning project, which will be undertaken at all stations in England by 2012, with the exception of Network Rail Managed Stations. The project seeks to zone information at stations in the following areas to provide a logical and consistent presentation of the information that the passenger needs:

- Welcome Zone – station facility information and information about the local area
- Ticket Zone – ticket retailing and passenger real time information
- Train Zone – timetable and penalty fare information
- Onward Journey Zone – information about multimodal onward travel.

3.10.6 The zones used in the RUS build on this concept but are slightly simplified for the purposes of the RUS. This is because the NSIP zones specifically relate to the information required by the passenger at each point through the station and less to the physical layout of the station and causes of congestion.

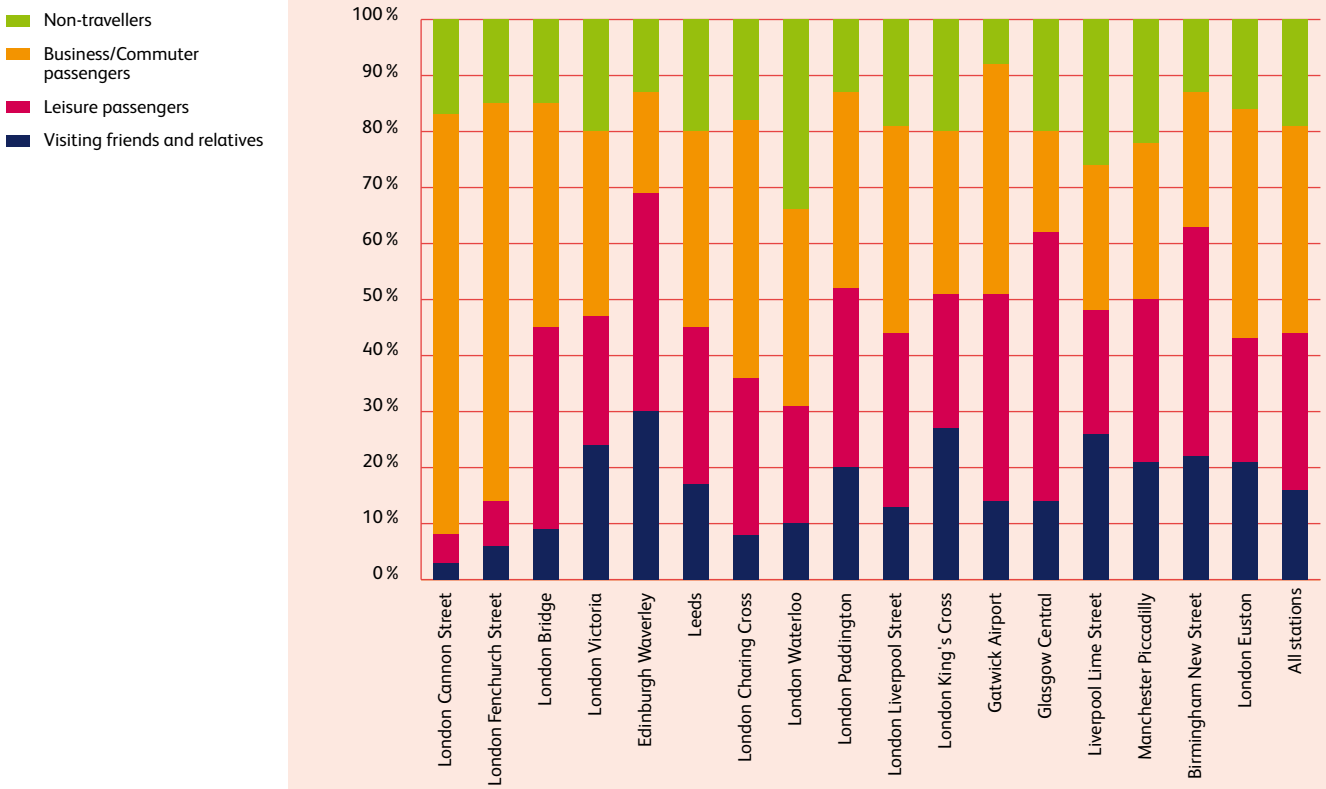
3.10.7 Station users will undertake one or more activities depending on the nature of their use of the station. These activities will be within one of the three key station zones.

Station visit purpose and dwell time

3.10.8 There is limited information about the footfall of non-travellers at stations as a whole. For 17 of the 18 Network Rail managed stations (London St Pancras International excluded) a survey of all users was last conducted in 2008. The National Passenger Survey (NPS) provides twice yearly data about the journey purpose but only of actual rail travellers and not non-travellers.

3.10.9 Across those 17 managed stations, 18 per cent of visitors, on average, were non-travellers, 37 per cent were commuters or business travellers, 28 per cent were leisure travellers and 16 per cent were visiting friends and relatives. The results for the individual stations are shown in **Figure 3.4.**

Figure 3.4 – Station visit purpose for Network Rail Managed Stations 2008

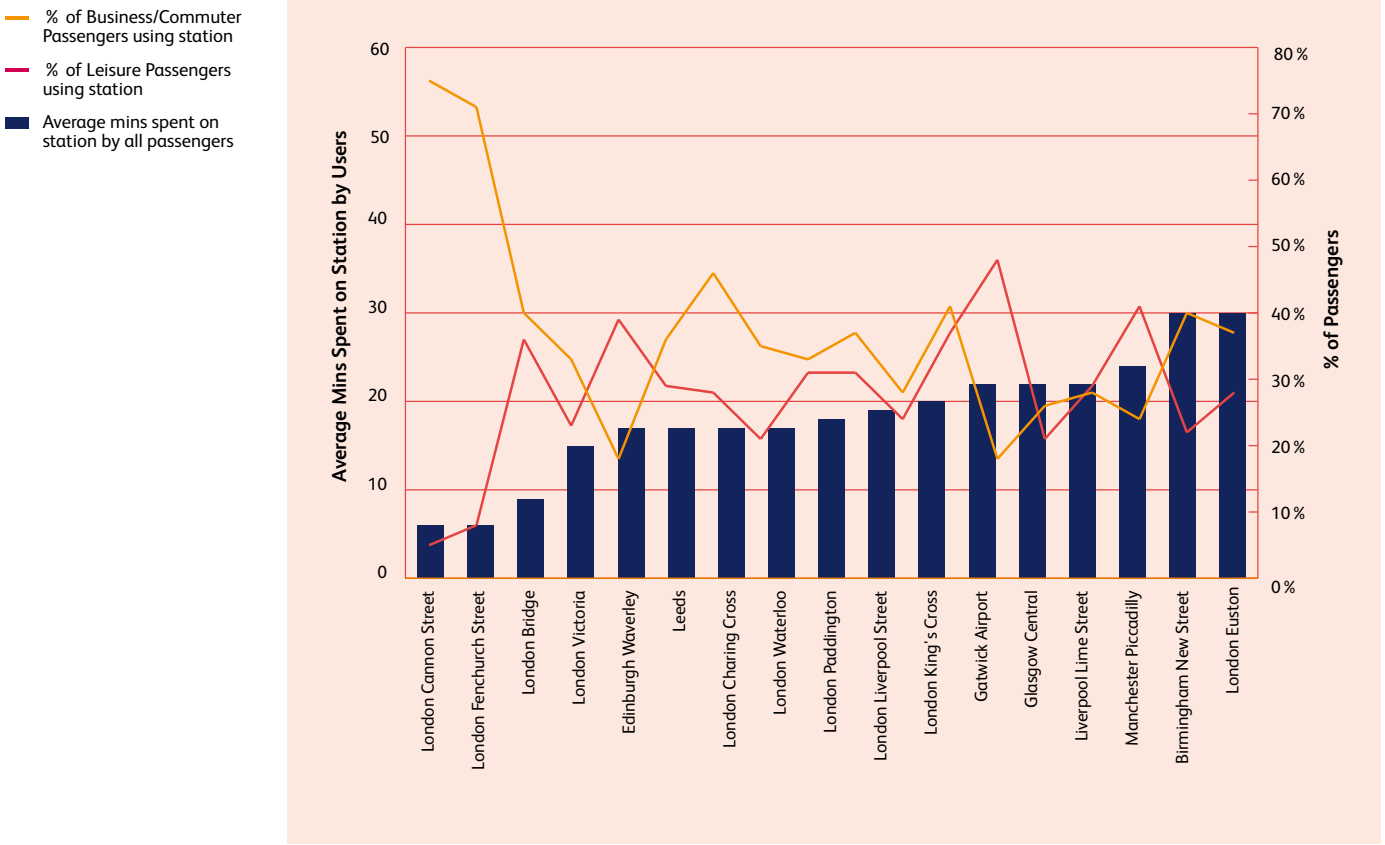


3.10.10 The number of people in a station at any given time will clearly impact on the use of station capacity. This number will be a function of the time that users spend in the station, and not just the number of users. Survey results for the time spent by users on a station are available for Network Rail Managed Stations, and are shown in **Figure 3.5**. The length of time that passengers spend on the station has a big impact on the facilities required and also the space dedicated to waiting on the concourse.

3.10.11 The nature of large stations is that some passengers, particularly those using long distance high speed services, may dwell at the station for some time before their service. At stations where dwell time of passengers is significant, it is important that a balance is achieved between encouraging productive dwell time but ensuring that it does not impact upon the operation of the station, and instead contributes to the experience of the passenger. The trend to advanced purchase ticketing requiring passengers to travel on specific trains has resulted in passengers often arriving earlier for their train in order to be sure that they catch the specific service they are booked upon. TOCs suggest this is increasing the dwell time on stations where advanced purchase tickets represent a high percentage of passengers.

3.10.12 The time that a user spends on a station will be influenced by a number of factors, one of which is the journey purpose. **Figure 3.5** also shows the average time spent plotted against journey purpose. This suggests that there is correlation between the length of time spent at the station and the type of passenger. In general the graph suggests that commuters and business passengers spend less time at the station than leisure passengers. The contrast can be most clearly seen at those London stations with the highest proportions of commuters or business travellers such as London Cannon Street and London Fenchurch Street. By contrast, Birmingham New Street has one of the highest proportions of leisure passengers and also has one of the longest average passenger time spent on stations.

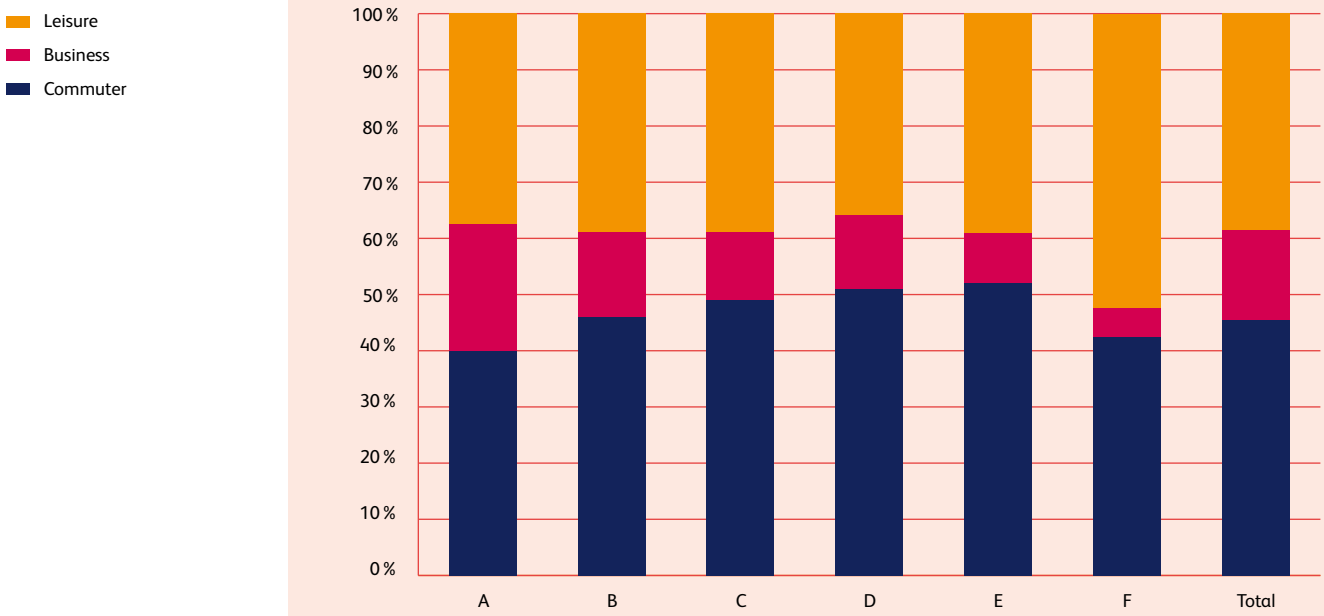
Figure 3.5 – Graph of time spent at stations and the percentage of business and commuter travellers at Network Rail managed stations



3.10.13 The importance of the mix of users is that their usage of the station and its facilities is related to their journey purpose. The length of time spent on a station is linked to the type of journey that is being undertaken. The level of familiarity with the train system is related to both journey frequency and purpose. These factors can influence the speed at which passengers transit the station. This in turn has an impact on the potential for congestion at the station.

3.10.14 The NPS shows the breakdown of journey purposes for each category of station on the network. This is illustrated in **Figure 3.6.** Broadly the highest percentages of business travellers are found at the larger stations. At category A stations the percentage of business travellers is highest at 23 per cent. The percentage of leisure passengers is highest at the category F stations (53 per cent). Commuters form the highest percentage of travellers at category E stations (52 per cent).

Figure 3.6 – Percentage of passengers by journey purpose at each category of station



Accessing the station

3.10.15 There are a number of modes by which station users may arrive at, and depart, from the station. These users will make use of the station forecourt, and the station entrance. In some cases there will be dedicated areas according to the mode of access or egress, such as cycle racks, bus stands, a station car park, a drop off point or a taxi rank.

3.10.16 In the case of arrival or departure by Underground, the entrance to the Underground station will often be in the main station concourse. It is important therefore to consider the footfall generated within the national rail station by such activities particularly where the only entrance to the Underground is via the national rail station, such as at London Euston and Ealing Broadway.

3.10.17 At a handful of stations serving ports or airports, passengers will access the station by ship or aeroplane. In these instances passengers may have significant quantities of luggage which may result in congestion, and which might be addressed, for example, by having step-free access to platforms.

3.10.18 The DfT 'National Rail Travel Survey Research' found that nationally most rail travellers accessed the station by walking (54 per cent). The next largest mode was private motor vehicles and taxis (20 per cent), metro and light rail (14 per cent), bus and coach (10 per cent), and lastly cycling (2 per cent). This excludes those travellers arriving at a station by national rail services to change trains.

3.10.19 As **Figure 3.7** shows there is considerable variation in the modal choice to access the station between the three major markets of commuting, business and leisure travellers. In particular, commuters are more likely to access the station by walking and business travellers are more likely to use either the car or metro and light rail (LRT). The mixture of mode of access to the station has important implications for congestion in that it will dictate the volumes of usage for facilities connected to each mode, for example utilisation of car parking provision.

Figure 3.7 – Distribution of access mode of transport by different types of passengers nationally (2008)[4]

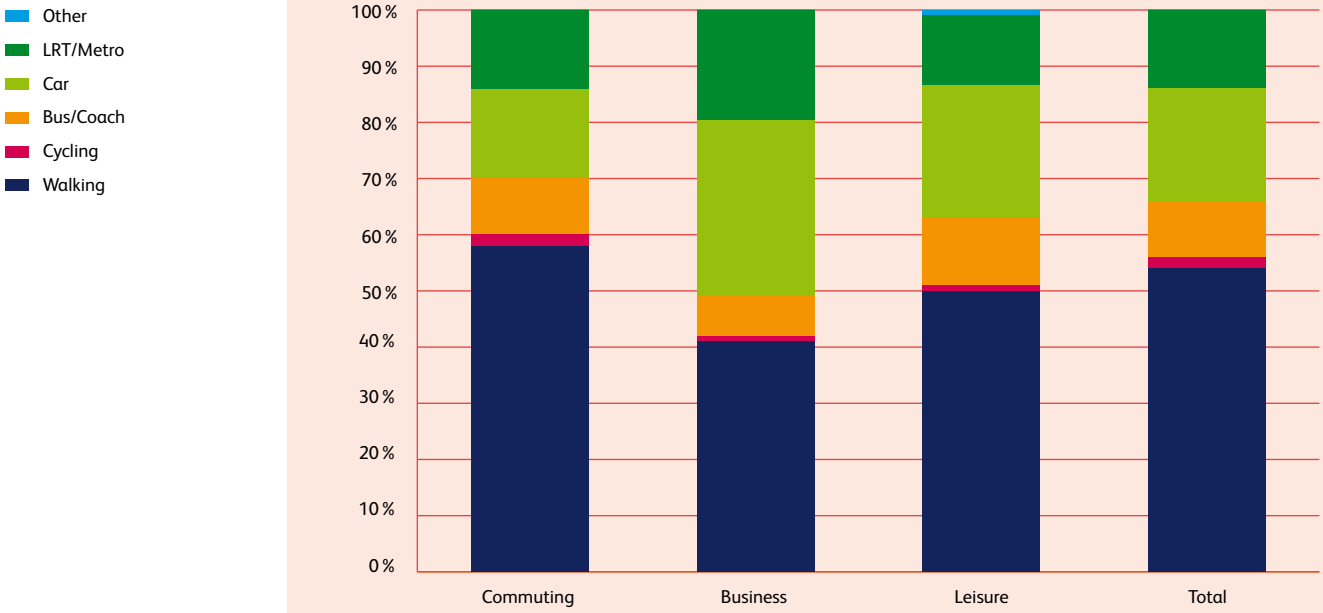
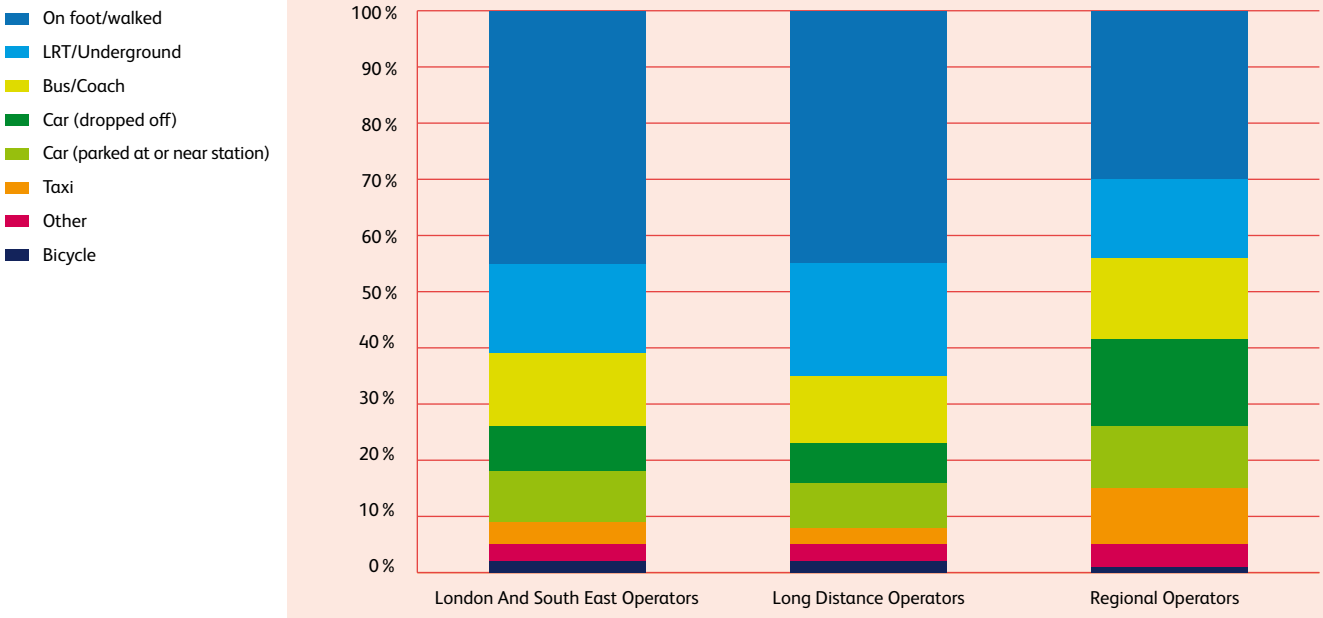


Figure 3.8 – Mode of access to the station from the National Passenger Survey (2010 – spring and autumn combined) by operator type



4 Source: DfT 'National Rail Travel Survey Research' 2008

3.10.20 **Figure 3.8** shows the mode of access to the station based on the NPS questionnaires for the three types of rail operator. This shows, in particular, the difference in the use of private motor vehicles to access the train station. The proportion of passengers assessing the station by car is greatest for regional operators reflecting in part the lower levels of public transport provision and the potentially more dispersed population making walking a less viable option.

Station car parking

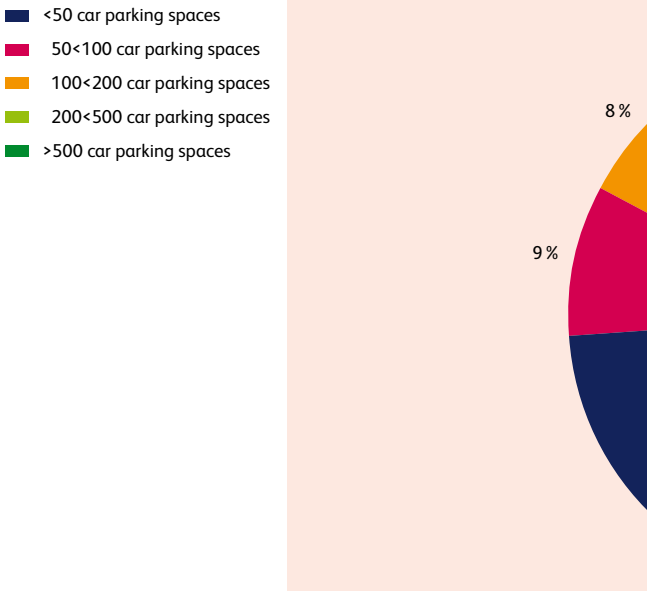
3.10.21 The remit tasked the RUS to look specifically at the appropriate approach for establishing the requirement for car park provision. As can be seen from both **Figure 3.7** and **3.8** car usage is a significant means of accessing the station but even for regional operators it is only one of a number of ways to access the station. In establishing the requirement for car park provision it is necessary to consider the full spectrum of modes by which passengers and other station users access the station.

3.10.22 The geographic RUSs have addressed car parking, and indeed accessing the station in general, in varying degrees of detail. The East Midlands and Greater Anglia RUSs, for example, considered car parking utilisation in some detail. The draft London and South East RUS looked at bus services in the Hampshire and Solent area. This RUS focuses on the general factors influencing car parking provision.

3.10.23 The RUS has used the 'Car-Parking at Railway Stations – Report for the Passenger Demand Forecasting Council' (2010) as a source of baseline information about car parking provision at rail stations. Based on the information available this document showed the provision of car parking spaces across the network. **Figure 3.9** shows that for the majority of stations, less than 50 car parking spaces are provided.

3.10.24 Car parking provision varies with the market served and the geographic location. Suburban locations such as Wimbledon serve a dense catchment area with high penetration of public transport. In addition the space is not available, nor the road network able, to handle very large volumes of car travel to the station. The largest car parks are often (not surprisingly) associated with parkway locations designed specifically with car access in mind.

Figure 3.9 – Pie chart of the provision of car park spaces at stations (2007-08)



3.10.25 Car parking charges are important to consider in the context of car parking provision because they can be used as a tool to manage demand. Car parking charges are levied, or indeed not levied, for a variety of reasons. Car parking pricing policies may be designed to:

- earn a commercial rate of return
- manage demand or discourage non-rail parking
- promote the usage of rail services particularly in the off-peak
- incentivise efficient usage of car parking space, for example by providing discounts for those who car-share.

3.10.26 It is clear from the Passenger Focus' report 'Getting to the Station - Summary of research conducted in the East of England' (2007) that the availability of parking had a significant impact on users if it was perceived to be difficult at a particular station:

- 38 per cent of car park users would drive to another station
- 24 per cent of car park users passengers would travel earlier to secure a space
- 18 per cent of car park users said they would get a lift to/or from the station instead
- 17 per cent of car park users would make the complete journey by car.

3.10.27 The research suggested that suppressed parking demand is difficult to calculate. Each station has a different level based on factors such as catchment area, (in the instance of the Passenger Focus research, in East Anglia) distance from London, journey time and service frequencies. Suppressed parking demand may also have a consequent impact on suppressed demand for rail travel.

3.10.28 The RUS has reviewed the car parking policies of the Passenger Transport Executives in order to illustrate the range of policy considerations and the local decisions that have been made about car parking in those areas. While these areas may share similar transport market features, and free or discounted parking is a common mechanism for encouraging rail usage, the policies on charging and car park expansion illustrate a wide range of approaches. Some like West Yorkshire PTE are considering a demand management approach along with using charging as a means to fund enhancement. Others, like Transport for Greater Manchester (TfGM) use specific criteria to assess the case for prioritising particular car park sites for expansion. The current PTE policies on car parking are as follows:

Strathclyde Partnership for Transport (SPT) – Strathclyde Partnership for Transport has a policy of free car parking at stations. This covers stations and car parks operated by First ScotRail. Some car parks are provided in partnership with the local councils. This policy is seen as a means of promoting modal shift in terms of SPT's Regional Transport Strategy and Park and Ride Action Plan **(www.spt.co.uk).** SPT has been working in conjunction with the local councils to increase capacity by ground level extension (where land opportunity exists).

Nexus – at the Tyne and Wear Metro stations, under the terms of the Metro concession, DB Regio makes a commercial judgment on whether to charge for

parking. The result of this is that most stations where there are more than 100 spaces, or specific facilities such as a multi storey or a staff presence, there is a £1.60 daily charge. At present, parking at smaller stations remains free. There is no specific policy as to whether parking should be free or not, it depends on whether adjacent non-rail parking is charged for and the quality of the facilities provided.

Metro – West Yorkshire Metro's current car parking charging policy at stations in West Yorkshire is generally free for all, with a number of exceptions such as Keighley, Castleford and Bradford Forster Square where there are particular issues with demand management and a tie-in with the town centre charging scheme. The other exceptions will be at locations controlled by TOCs where the PTE does not have co-signatory status. The rationale behind this policy is to encourage modal shift to public transport and encourage park-and-ride.

The PTE is, however, looking at developing a charging scheme in LTP3 (Local Transport Plan) as a means of better managing demand and funding station enhancements such as car park extensions. This, however, will be subject to the approvals of the ITA (Integrated Transport Authority) and the PTE members.

South Yorkshire (SYPTE) – In 2009 the then South Yorkshire PTA reaffirmed its stance to offer a free-parking policy at all urban rail stations in South Yorkshire. This policy covers all stations operated by Northern Rail within the area. However, this will continue to be reviewed in light of the economic environment.

The process SYPTE uses for evaluation of new or extended park-and-ride sites involves considerations such as assessment of potential or existing demand, and these are considered amongst other criteria in a 'scored' selection process before any scheme is deemed feasible. Any new proposal would be added to a prioritised list of other potential sites ranked in an effectively value for money basis. Trigger mechanisms are in place should issues arise that could affect demand at each site such as future developments and service changes.

Transport for Greater Manchester (TfGM) – there are approximately 2,600 car parking spaces at stations across Greater Manchester with the size of individual car parks ranging from 200+ spaces to fewer than 10 spaces. Most car parks are directly managed and maintained by the TOCs (primarily Northern Rail) although Horwich Parkway station and car park is owned and managed by TfGM. Local Authority car parks also exist in some locations; although these may serve a wider purpose, they are also used by rail passengers. TfGM's current policy is to provide parking free of charge at stations and Metrolink stops. Passengers are charged to park at stations managed by Virgin Trains (including Stockport and Wigan North Western).

According to TfGM, the majority of station car parks are used to capacity and are full after the morning peak period. Where demand for car parking exceeds supply, there is evidence of 'fly-parking' on streets around stations which can cause conflict with local residents and businesses.

The primary objective for providing park-and-ride spaces is to reduce the number of car trips made into Manchester City Centre which is the main market for park-and-ride although some locations may also be suitable for intercepting trips to the district centres. In broad terms, TfGM has a preference for developing park-and-ride at stations beyond the M60 so that car traffic can be intercepted before it enters the areas closer to the city centre where congestion is greatest. Other key criteria used to inform the selection and prioritisation of sites include:

- frequency of train service (minimum of two trains per hour)
- land availability
- access to key highway routes
- impact upon residential areas.

Merseytravel – has a policy of providing free car parking at stations on the Merseyrail network. This covers stations and car parks operated by three TOCs, Merseyrail Electrics, Northern Rail and two unstaffed stations operated by Arriva Trains Wales. Some car parks are provided in partnership with the local councils. This policy is seen as a means of promoting sustainable transport.

Consideration has been given to increasing capacity by ground level extension (where land opportunity exists) or by decking (a more expensive option per space which has been discussed but not yet implemented).

Centro – in the West Midlands Centro provides free parking at stations on the network (excluding Coventry, Birmingham International, Birmingham New Street and Wolverhampton stations which are managed by Network Rail and other TOCs). This

policy is aimed at attracting users to the rail network in order to reduce road congestion and pollution, especially in the peak. In Centro's view, charging for parking would also encourage on street parking around stations leading to problems for local residents. Centro's policy is to encourage people to access the rail network by environmentally friendly modes where possible and to that end Centro invests in cycle storage facilities and works with highway authorities to improve walking access. However, recognising the distance some people need to travel to a station, Centro has a policy of providing and continuing to expand car park provision where the economic and environmental benefits outweigh the cost of provision.

3.11 Conclusion

3.11.1 This chapter has presented a background to stations including their categorisation and defining the nature of pedestrian congestion at stations. The available statistics on station usage and their strengths and weaknesses have been discussed. Information on large scale committed schemes that will affect stations in CP4 has been described, along with major uncommitted schemes that would have a substantial effect on the capacity required at stations on the classic network.

3.11.2 Stations which are regarded by the railway industry as congested have had their current congestion assessed in terms of its location and Fruin level of service.

3.11.3 A picture of the usage of stations was then described in terms of the types of users of the station and which areas of the station that they use.

3.11.4 **Chapter 4** discusses the drivers of change for station congestion and **Chapter 5** (based on those drivers of change) identifies gaps and proposes options for resolving the gaps.

4. Drivers of change

4.1 Introduction

4.1.1 This chapter discusses the drivers of change affecting congestion at stations. Whilst the strategic expectation is that the numbers of people using the railway will increase significantly over the next 20-30 years, this does not of itself imply that congestion at stations will necessarily get worse. Congestion can be affected by a wide range of factors such as changes in the train service, rolling stock, means of ticket purchase, physical layout of the station, and not just by increased footfall. The interaction of these factors may have both positive and negative consequences on congestion at different locations either around a station or between different stations.

4.2 High level policy context

4.2.1 In its 2007 White Paper 'Delivering a Sustainable Railway', the then UK Government set out its vision for the future of the railway in England and Wales. It sought a railway which over the following 30 years:

- will handle double today's level of freight and passenger traffic
- will be even safer, more reliable and more efficient than now
- will be able to cater for a more diverse, affluent and demanding population
- will have reduced its own carbon footprint and improved its broader environmental performance.

Further details can be found on the Department for Transport's website **www.dft.gov.uk**

4.2.2 In Scotland, ministers published 'Scotland's National Transport Strategy' in 2006, which laid down the following strategic objectives covering the subsequent 20 years:

- improving journey times and connections
- reducing emissions
- improving quality, accessibility and affordability.

Further details are contained in the supporting document 'Scotland's Railways', and in the subsequent publication 'Strategic Transport Projects Review' which states that background rail demand (exclusive of any growth generated by improvements and route reinstatement) will increase by 47 per cent from 2005 to 2022. All of these documents are available at: **www.transportscotland.gov.uk**

4.2.3 The expectation of both Governments, therefore, is that there will be an increase in the numbers of people using the railway, and hence in the numbers of people needing to access and use stations.

4.2.4 For Control Period 4 (2009-2014), each government issued a High Level Output Specification (HLOS).

4.2.5 In England and Wales, included within the metrics which the HLOS required the railway industry to deliver, were levels of passenger growth into the main London termini, and other major cities across the nations. Although not stated directly, the implicit nature of the requirements means that station and terminal capacity will have to be at such a level as to be able to accommodate the additional growth stated for each corridor by 2014. Station investment funding was directed to the National Stations Improvement Programme (NSIP) fund and through major projects such as Reading and Birmingham New Street redevelopment. NSIP invests at medium sized stations to improve the station environment.

4.2.6 Access for All (AfA) funding is used to provide an obstacle free, accessible route to and between platforms at priority stations. The DfT is responsible for these schemes in England and Wales and Transport Scotland undertakes this role in Scotland. Depending on the precise nature of the investment AfA schemes can have an affect on reducing congestion at a station.

4.2.7 Scottish Ministers also produced their own HLOS for Scotland, which similarly listed outputs required of the railway industry in Scotland. A number of interventions have been delivered which will increase capacity on Scotland's railways (such as the reopening of the Airdrie to Bathgate line in December 2010). No specific mention is made of station capacity improvements to cater for increased demand, these being implicit rather than explicit.

4.2.8 A common aspiration for stakeholders concerns improvements in journey times. Traditionally there has been an emphasis on line speed increases, sometimes in conjunction with the introduction of new rolling stock, as a means of delivering journey time reduction. However, it is important to recognise that the time spent on the train is only a part of the overall journey time. Time spent accessing the station, and at the station, often constitutes a significant proportion of the total end to end journey time, and addressing these at a local level, in partnership with stakeholders, can provide opportunities to reduce overall journey times.

4.2.9 A recent legislative initiative by the new Coalition Government was the introduction to Parliament in December 2010 of the Localism Bill. Should it pass through the parliamentary process without significant amendment, one of its key objectives is to devolve more power to local authorities and to give statutory undertakers such as Network Rail a duty to co-operate with local authorities. This has the potential of unlocking mechanisms to ease congestion which occurs outside the railway curtilage but still affect rail travellers – such as access difficulties.

4.2.10 Finally, the current UK Government continued to progress the 'Rail Value for Money Study', led by Sir Roy McNulty, to examine how the industry as a whole can be run more efficiently and offer significantly better value for money, but without cutting services or lowering quality. In the final report, published in May 2011, the study makes recommendations which are currently being considered by the Government. It is anticipated that the Government will publish a consequential White Paper in Autumn 2011. The key conclusions of the Study were:

- devolve decision-making
- move away from 'predict and provide' to 'predict manage and provide'
- encourage cost-effective whole-system solutions
- improve incentives on Network Rail and TOCs.

4.3 Growth in station footfall

4.3.1 Overall growth in rail journeys and passenger kilometres is driven largely by major macro-economic factors such as Gross Domestic Product or employment in large commuting centres such as London or Glasgow. But actual growth in the numbers of people using a particular station is not simply a factor of normal economic or population growth. Growth can also occur through the release of suppressed demand following the provision of extra capacity, and by means of modal shift. Suppressed demand can be released by a number of factors such as:

- train lengthening
- increased train frequency
- addressing station congestion
- increased car parking spaces at a station
- improved access by public transport to the station.

4.3.2 Modal shift is triggered by a number of factors including:

- the relative cost of rail against competitor modes
- new through journey opportunities
- the relative overall journey time of rail against competitor modes
- the relative quality, convenience and ease of use of rail against competitor modes
- the relative safety and security (and perceptions thereof) of rail against competitor modes

- the extent to which rail is perceived by passengers as more environmentally friendly than competitor modes.

4.3.3 With the large amount of investment made by all parties in the industry to improve each of these aspects, growth from modal shift is likely to be significant where rail offers a competitive alternative to other means of transport.

4.3.4 In practice, the actual rate of growth will vary significantly from station to station, not just because of macro-level drivers and how they affect different types of traveller, but also because of local issues specific to individual stations. These could vary from regeneration projects in the vicinity, through improvements to access, to crime reduction initiatives. There are therefore general factors which may grow the number of journeys but there may also be local factors or indeed limits to wider railway capacity which may constrain growth at particular stations.

4.3.5 The Scenarios and Long Distance Services element of the Network RUS was established in May 2009. This stated how growth in the long distance rail market was likely to affect the traditional 'inter city' or Long Distance High Speed (LDHS) market on journeys over 50 miles. It also explored how potential changes in economic, demographic and social factors could affect the levels of passenger and freight growth over the long-term.

4.3.6 As forecasting up to 30 years in advance cannot be wholly accurate owing to the length of time involved, a set of four scenarios was considered to understand how passenger growth could change, depending on factors such as government and environmental policy, the economy, migration, regional development and other social factors. In some scenarios, the growth in passenger numbers between Britain's major cities could be almost 150 per cent on the heaviest flows (such as the West Coast Main Line). Even in the lower growth scenarios, passenger numbers are likely to increase by almost 50 per cent.

4.3.7 This clearly has implications for the capacity of the network infrastructure and also that of trains. Of course, terminal capacity is also an important factor and the stations that accommodate the travelling public will need to be able to cope with the increased passengers using their facilities.

4.3.8 As far as commuting and business travel is concerned, research has shown that the levels of rail patronage and growth in demand broadly follow the economic success of the wider economy[1]. Long distance demand is affected by this, but growth in commuter traffic is heavily affected by economic performance and by the number of job opportunities in city centres.

4.3.9 Commuter passengers, however, have quite different needs from those of long distance travellers and the business market, and this is reflected in the facilities required at stations in commuter areas. Passengers who make a journey every day are familiar with their station, route and the facilities available to them. They often know the timetable, platforms from which their train departs, and where to access connections if necessary. Commuters also tend to be more used to large crowds of people in a busy station environment and are often more experienced in dealing with disruption if it occurs.

4.3.10 The geographical RUSs also publish route-based growth forecasts based on the specific factors affecting usage in each RUS area. Several of them have also identified stations where growth is likely to cause congestion in the future.

4.3.11 Finally, the footfall of a station includes all users, and not just those who are travelling on train services. Many stations are a destination in their own right, for example for those who are attracted by the retail or catering facilities on offer. Again, whilst growth in this demand will depend to a large extent on wider economic factors, there will also be significant local influences such as the range and quality of competitive facilities in the near vicinity.

4.4 Forecasting methodology

4.4.1 A qualitative assessment of Fruin Level of Service was provided by the relevant Station Facility Owner. A background growth forecast for the dominant market sector at the station was applied to the range of values that form the highest reported Fruin Level of Service. This resulted in a range of forecast Fruin levels which were used in conjunction with information about future interventions at the station to prioritise further intervention. The forecasting of the demand at stations is explained in more detail in **Section 5.3**.

4.4.2 It is important to note that these Fruin levels have only been used to prioritise further more detailed investigation. The forecasting is aimed therefore at identifying locations where congestion is expected and where no scheme is currently committed to address the issue. Every station has unique circumstances of both layout and demand which means that more detailed investigation is required to develop gaps and options for each station. However, with 2,520 stations on the network an element of prioritisation is required to filter those stations where more detailed investigation is perceived to be justified.

1 Source: PDFH, Passenger Demand Forecasting Handbook

4.5 Train service patterns

4.5.1 Changes to the train service at a station can have significant impacts on the footfall of a station, and on the way in which passengers flow around the station.

4.5.2 For example, an increase in train frequency is likely (initially at least) to reduce crowding on the station as the platforms and waiting areas clear of passengers more often. This, of course, assumes that there is an even distribution of the service frequency round the clockface. On the other hand, an increase in service frequency is also likely to generate increased demand, so that the actual numbers of passengers may in practice increase.

4.5.3 Similarly, alterations to the destinations of trains travelling through a station may either reduce or increase the numbers of passengers interchanging, which may then impact on levels of congestion.

4.6 Rolling stock interface

4.6.1 The station-rolling stock interface has a number of potential impacts on station congestion. Factors such as the length of train, and interior and exterior layout have an affect on the boarding and alighting time of passengers. In addition, a longer train has the capacity to carry more passengers, and when passengers disembark they do so in a greater surge of numbers which can result in congestion around the station. Changes in rolling stock may therefore have a direct impact on station congestion. At Clapham Junction, for example, on Platform 9, an issue occurs because on some rolling stock the Selective Door Opening (SDO) system cannot be selected by vehicle or door, but only by unit. As a result while some vehicles in the rearmost unit may be in the platform, the doors cannot be opened. This forces passengers to use a smaller area of the platform and a smaller number of doors to board and alight. The consequence is congestion on both train and platform, and increased dwell times.

4.6.2 The speed of boarding and alighting can also be affected by significant stepping distances between rolling stock and platform. Large steps both vertically and horizontally are likely to slow passenger flows boarding and alighting. The provision of a reduced stepping distance from train to platform has the potential to improve the speed of passengers boarding and alighting, quite apart from the clear benefits to those with reduced mobility or carrying luggage.

4.7 Accessing the station and onward travel

4.7.1 The means by which passengers arrive at or depart from the station can influence congestion at a station. The railway is usually only one part of a journey and therefore changes or capacity constraints in onward travel or the means of arrival at the station can affect congestion and factors such as the utilisation of car parks.

4.7.2 Investment in other modes can also impact on demand at a particular station. Such circumstances were identified by the South London RUS, which reported that extension of the Docklands Light Railway to Greenwich and Lewisham attracted significant levels of interchange from Southeastern services, but this, conversely, eased pressure at the London terminals.

4.8 The physical layout of the station and facilities

4.8.1 Stations have a long asset life, and many of the stations on the network were originally built in the nineteenth or early twentieth centuries. This means that they may not be configured for modern-day facilities, expectations or usage. An example of this is the installation of automatic ticket gatelines within the footprint of existing stations which can create an impediment to free passenger flows around the station, leading to congestion. More generally gatelines typically change the flows of passengers around the station and this impact needs to be taken account of when installing Automatic Ticket Gates. Congestion can also be influenced by 'softer' factors such as changes in the way in which the station is managed, or by provision of information around the station. The impact of perturbation also needs to be considered as the station may have to cater for substantial changes in passenger numbers, dwell times and flows.

4.8.2 The user needs for the station are not static, and these needs will continue to evolve over time. Societal changes towards more usage of technology, for example smartcards and mobile internet devices, have already changed (and are likely to continue to change) requirements for ticket retailing facilities and customer information systems at stations.

4.9 Conclusion

4.9.1 This chapter has described some of the policy and other factors which can influence the levels of congestion at stations. The following chapter now considers what the generic gaps and options are for addressing the problem.

5. Gaps and options

5.1 Introduction

5.1.1 This chapter sets out the gaps in capacity at stations and options which are proposed to address them. These gaps and options are confined to capacity utilisation and do not consider capability or quality attributes of stations. The gaps and options have been divided into two types:

Type 1 – Information on station usage. Gaps have been identified in the current data provision for station usage and options are presented to address these

Type 2 – Congestion at stations. The chapter forecasts growth in congestion at those stations which have been identified as congested either in previous Route Utilisation Strategies (RUSs) or by train operating companies and the working group. A toolkit of options for use in addressing gaps relating to station congestion is presented as a potential means of tackling these gaps. In addressing gaps at stations it is important to see congestion not in discrete areas but in the context of the station and train service as a whole. Otherwise addressing a gap in one area may simply move the congestion to a different location at the station, from one station to another, or from the station to the train.

5.2 Type 1 gaps and options: information on station usage

5.2.1 It is clear, from **Chapter 3**, that there exist large differences in the range, the amount, and the quality of empirical information available about station usage.

5.2.2 At one end of the spectrum, a few (typically larger) stations have had comprehensive surveys and analysis undertaken, enabling a full picture of pedestrian flows and densities to be created over a range of time periods. This, in turn, allows dynamic models to be built which can predict the effects of proposed interventions on how passengers use the stations and the congestion that is expected to result.

5.2.3 At the other end of the spectrum, many stations have only limited data on usage, and much is commonly extrapolated by planners using data with known weaknesses such as ticket sales (which by definition excludes non-travellers or travellers without tickets) – see the discussion in **Chapter 3**.

5.2.4 There would, of course, be a cost to gathering accurate usage data at every station on the network. In addition, there is little value in gathering such data unless some clear, specific and value-giving use will be made of it. Therefore the cost of obtaining the information must not exceed the value of any decision or output resulting from it.

5.2.5 Nevertheless, and particularly at locations where there is forecast to be severe congestion, there is likely to be benefit from obtaining and regularly updating usage information in order to:

- ensure that congestion levels remain within tolerances
- assist in improving customer experience by easing congestion or people movement
- identify congestion hot spots
- provide evidence to support the commercial setting of station rents and development opportunities
- predict what levels of growth will progressively cause the station to 'fail' and when that might be expected
- support investment decisions.

5.2.6 The gaps that have been identified from the presentation of strengths and weaknesses of data sets, in **Chapter 3** are shown in **Table 5.1**.

Table 5.1 – Type 1 gaps: information on station usage		
Type 1 Gap Number	**Gap Description**	**Comments**
1	Known weaknesses of methodology	Many of the data sets detailed in **Chapter 3** are not actually collected for the purpose of determining station usage. Instead they indirectly relate to station usage, for example ticket sales, or counts of passengers on trains
2	Lack of data coverage	There are some aspects of station usage for which there is either no information collected or only partial information. This is particularly the case with information about non-travellers' usage of stations
3	Difficulty of comparing data sets and lack of a process of coordination	A number of data sets collect information about the same area, but may not be directly comparable. For example, manual counts of station users may not align to ticket based data

5.2.7 The options that have been considered to address the gaps that have been identified are as follows:

Option 1: a data collection process that is universal but that can be adapted for the individual nature of stations

Option 1(a) Station master planning

5.2.8 Gap 1 could be addressed by collecting data specifically for the purpose of understanding the key planning issues at a specific station. For example Network Rail, in conjunction with a number of train operators, is currently developing the concept of station masterplanning. A masterplan can be defined as:

> ***'A jointly prepared planning framework and context for investment decisions at an individual station that allow the station's evolution to meet the needs of the railway and its stakeholders'***

5.2.9 This approach provides a framework to coordinate the process of data gathering about station usage for a defined purpose. This addresses both Gap 3 and also Gap 2 in the sense that it increases data coverage to support investment decisions. The objective of the masterplanning approach is to achieve:

- a clearly articulated and agreed vision for the station describing what the station is now and what it needs to be in the future
- a shared understanding of the relative priorities, constraints and opportunities for the station
- a decision-making framework for investment opportunities that might arise at the station
- a strong and supportive network of active station stakeholders.

5.2.10 The station masterplanning process can therefore provide a framework for collecting station usage information at larger stations. It is more appropriate for larger stations because it provides a detailed framework for an individual station and therefore the cost involved might not be suitable for the scale of investment at smaller stations.

Option 1(b) Station travel planning

5.2.11 The station travel plan process could provide a vehicle for improving data coverage about station usage (see **Section 5.4** of this chapter and Case Study 13 in **Appendix A**). Station travel plans are strategies implemented by a range of stakeholders for reducing the negative environmental impacts which travel to and from a station can generate. These are usually accompanied by surveys of station usage and in particular the means by which station users access the station. The Department for Transport (DfT) definition of a Travel Plan is as follows:

> ***'A strategy for managing the travel generated by your organisation, with the aim of reducing its environmental impact, typically involving support for walking, cycling, public transport and car sharing'***

> ***'A long term management strategy for an occupier or site that seeks to deliver sustainable transport objectives through positive action and is articulated in a document that is regularly reviewed'.***[1]

5.2.12 The station travel planning approach potentially provides a framework for information gathering at all station categories A to F. As the DfT definition states, the travel plan is meant to be a document which is regularly reviewed and therefore it provides a framework to ensure that information about a station is regularly updated. Station travel plans can be undertaken for groups of stations and

1 DfT (2008) The Essential Guide to Travel Planning

they can be used flexibly to encompass all levels of station category. This approach of undertaking clusters of station travel plans has been used by Southern as part of its franchise commitment to deliver station travel plans. The ATOC Station Travel Plans: National Pilot (see link to website **www.stationtravelplans.com**) undertook 24 pilot Station Travel Plans in England and Wales. A range of types of stations were covered including some groups of stations.

5.2.13 Station travel planning can be linked to local policy initiatives and needs, and its aims can therefore be tailored to suit the community which the station, or group of stations, serves. This is particularly important as station travel plans involve a partnership approach both in their development and implementation. The Railway Safety and Standards Board (RSSB) is currently assessing the effectiveness of the pilot schemes which have been undertaken.

5.2.14 The station travel planning process can therefore provide a framework for collecting station usage information at the full range of stations on the network. For smaller stations travel plans may be undertaken in groups, whereas larger stations might typically have standalone plans. Station travel planning concepts should only be employed where they are cost effective.

Option 2: means of increasing coverage or accuracy of current means of data collection

Option 2(a) Automatic passenger counting (APC) on train

5.2.15 As has been described in **Chapter 3**, franchise agreements for the past five to seven years have typically mandated the installation of APC systems on board rolling stock and the supply of the resulting information to the DfT. APC systems are currently installed on approximately 39 per cent of rolling stock. The option exists for these systems to be potentially extended in the future to encompass a progressively larger percentage of the rolling stock fleet.

5.2.16 A subset of this option is to harmonise the outputs of these systems installed in the future to ensure that installations provide fully compatible data. It is for the railway industry to select the most appropriate technology when procuring APC systems, but in general the accuracy of these systems should conform to certain thresholds in order that the data set as a whole can be coherent.

5.2.17 This has the potential to address all three gaps. Increased data coverage could be provided by installing these systems more widely, whilst common specifications would address some of the data weaknesses and make the information collected more comparable and coherent.

5.2.18 The data from APC systems is provided to the DfT as part of the terms of franchise agreements. This information forms a very substantial volume of data and requires substantial computer processing power.

5.2.19 It is recognised in this option that the APC information is not collected for the purpose of monitoring station usage and is only able to give a partial picture of station usage as it does not include non-travellers. Moreover, not all APC systems are capable of counting boarders and alighters. It is primarily used for monitoring capacity utilisation on train services in order to optimise resource allocation and timetable development. If this option were to be taken forward, the gathering of information about station usage would have to be commensurate with the primary purpose of APC systems which relates to other usages of the statistics by train operators.

Option 2(b) Automatic footfall counting on stations

5.2.20 Manual collection of station footfall information requires considerable resources and can typically only be used to provide snapshots of information. In addition, manual methods of counting may be affected by perturbation or external factors such as the weather. Automatic footfall counting systems on the other hand potentially address Gaps 1, 2 and 3 by providing greater volumes of higher quality and comparable data.

5.2.21 Network Rail is developing a proposal to install automatic counting systems at some of its managed stations. The counting systems currently being considered would potentially provide benefits such as:

- a detailed understanding of footfall at stations entrances and exits
- a detailed understanding of footfall for all retail units
- improved data for station management and longer term planning of stations.

5.2.22 The feasibility and cost of mobile counting systems (which could be deployed as required around the network) are also being considered. Such systems could be used to monitor stations where congestion issues are highlighted around the network and to establish quantitative data about usage and congestion. This could allow more cost effective data collection and provide detailed information on which to base decisions about any interventions.

5.2.23 At other stations on the network it could also be possible to install similar technology to record footfall more accurately. This information could be used in conjunction with survey data and information about the number of train journeys, to build detailed pictures of the usage of stations. The benefit of this approach would be that a sample of data could be collected which would record the actual usage of the station, time of day of that usage, and this could be combined with information about the train service. It might not be cost effective to install this level of technology at all stations. However, it could be considered for:

- larger stations where this level of information would be appropriate for business planning
- those stations with a perceived high level of crowding, to establish objectively where and when it occurs in order to inform and prioritise investment.

5.2.24 The advantage of this approach is that it is a direct measurement of usage of the station as opposed to an indirect measurement derived from usage of the train service. This could be complemented by increased use of on-train automatic passenger counting.

5.2.25 Alternative approaches to establishing footfall by one-off counts may be appropriate in general, but they only provide a single snapshot. Installation of automated counting systems allows very detailed information to be collected which can accurately span the daily, monthly and seasonal variations, and thereby assist to identify trends.

5.2.26 Accurate information about station footfall could potentially have a range of secondary usages, not least to augment information about fare evasion.

Option 2(c) National Passenger Survey (NPS)

5.2.27 The current NPS questionnaire has questions in the train facilities sections which relate to whether passengers have sufficient room to sit and stand, and ease of getting on and off the train. There are no equivalent questions about the specific issues which affect station congestion. An option to increase the information coverage on station usage is for the NPS questionnaire to include an equivalent level of questions about station congestion as is currently found for the on train environment. This option increases data coverage and therefore addresses Gap 2.

Option 2(d) Cordon Counts

5.2.28 At the same time as the counts relating to train services, counts could also be conducted at stations expand the data coverage. This could be linked to the development of a station capacity metric.

Option 2(e) Greater coordination of data sets

5.2.29 There are a number of parties within the railway industry for whom information about station usage is important including train operators, Network Rail, DfT, local authorities and property developers. The range of users reflects the extent of involvement of parties in maintenance, investment and operation of stations. The Office of Rail Regulation (ORR) is currently developing a data warehouse for industry statistics. Such a data warehouse will have several levels of access depending on the needs and roles of the parties accessing the information. Station usage data could be coordinated and indeed made available to the interested parties allowing a greater coordination of data about station usage addressing Gap 3.

Option 2(f) undertake a qualitative survey of Fruin levels at all stations

5.2.30 The qualitative questionnaire on Fruin levels at stations conducted at 118 stations on the network could be refined and extended to all stations on the network and linked to an ongoing process of review of stations. This could provide a view on nationwide station congestion and could be repeated at intervals to establish trends.

5.2.31 There would be a significant cost to undertaking this exercise and it is important to note that as a qualitative survey there are weaknesses in this approach. This option would, however, provide greater information about the levels of congestion at station addressing Gap 2.

Option 2(g) develop pedestrian models at larger stations

5.2.32 Pedestrian models, both dynamic and static, exist for a number of stations on the network. While these are not direct data sources, they take information about station usage and model pedestrian flows and levels of congestion. These models have generally been created for specific investment proposals, so, for example, many of the recently gated franchised stations have had pedestrian models constructed to assess the impact of automatic ticket gatelines being introduced. For Network Rail managed stations, models have been constructed often in association with investment proposals. These models may only be of part of a station and have not been produced for more general application, nor are they necessarily up to date.

5.2.33 Given the size of the Network Rail managed stations and larger franchisee managed stations it would be a potentially useful resource to support investment decisions to maintain pedestrian models of stations where congestion issues are identified. These models could then be used in conjunction with the data from the automatic footfall counters to be able to identify congestion issues in the future, as well as to assist in the development and appraisal of options to address congestion.

5.2.34 Currently there are pedestrian models of some of the Network Rail managed stations. Seven stations do not have models currently and these would need to be developed. The cost for a dynamic model depends on the size and complexity of the station and numbers of options considered. There would also be a cost for updating existing models and maintaining the models once created. The cost for producing and maintaining a static model would be substantially lower and for simpler station layouts would be more cost effective. The business case would need to consider the cost of the production and maintenance of models (either static or dynamic) versus the benefits of this approach, which may include:

- improved data quality to prioritise investment resources by determining when intervention would be required to address congestion
- improved data quality on which to appraise intervention options and therefore potential cost savings
- the ability to assess the impact of changes in the wider railway system, for example timetable changes, on congestion at the station. This could be used for example to avoid unintended congestion at stations as a consequence of other interventions
- assessing the impact of, and planning for, unique significant special events.

5.2.35 The option to develop pedestrian models would address Gap 1, known weaknesses of methodology, and Gap 2, lack of data coverage. For stations that are not managed by Network Rail, SFOs could also consider this approach where appropriate, as TOCs undertake significant modelling relating particularly to automatic ticket gate installation.

5.2.36 The cost of this option is potentially substantial and it would have to be subject to a value for money assessment to be recommended. If this option were progressed it would be likely that it would be targeted at stations with known issues rather than resulting in modelling across all large stations.

Type 1 summary of gaps and options

5.2.37 **Table 5.2** shows a summary of the gaps and options and a matrix of how they relate to each other. Ticks indicate that the option addresses the gap and a cross means the option is not relevant to the gap.

Table 5.2 – Type 1 Matrix of gaps and options

		Type 1 option number								
		1(a)	1(b)	2(a)	2(b)	2(c)	2(d)	2(e)	2(f)	2(g)
Type 1 gap number	Gap and option description	Station master planning	Station travel planning	Automatic passenger counting on train	Automatic footfall counting on stations	National Passenger Survey	Cordon counts	Greater coordination of data sets	Undertake a qualitative survey of Fruin Levels at all stations	Develop pedestrian models for all larger stations
1	Known weaknesses of methodology	✔	✔	✔	✔	✘	✘	✘	✘	✘
2	Lack of data coverage	✔	✔	✔	✔	✔	✔	✘	✔	✔
3	Difficulty of comparing data sets and lack of a process of coordination	✘	✘	✔	✔	✘	✘	✔	✘	✘

5.3 Type 2 gaps: stations with capacity gaps

5.3.1 **Chapter 3** presented a list of stations that had been nominated by train operators and stakeholders as being currently congested. Train operators completed a qualitative assessment of the Fruin levels of congestion on the station concourse, platforms, and footbridges and subways for both the peak and off-peak at these stations. Using the growth rates in **Table 5.3**, forecasts of future congestion were made for each station by applying the relevant rate to the highest reported Fruin Level at that station. This does not therefore mean that the whole station will be at this level of congestion; rather it may only relate to a specific part of the station.

5.3.2 The growth forecasts that have been used are of a high level and are not specific to any one station. This is in order that the growth forecast is of commensurate level of accuracy to the qualitative assessment of congestion in **Chapter 3**. Background rates of growth for dominant market sectors at each station have been used.

Table 5.3 – Long term passenger growth forecast by market sector[2]

Market	% growth per year
London Commuter	1.30 %
Long Distance	2.00 %
Regional Urban Commuter	2.75 %
London Other	2.50 %
Regional Urban Other	3.00 %
Rural	2.50 %

2 'Planning Ahead – the Long Term Planning Framework' RFOA, ATOC & Network Rail 2010

5.3.3 Many of the stations that have been nominated as congested are the subject of enhancements. Therefore while there are current congestion issues at stations like Birmingham New Street or London King's Cross, investment currently being delivered will address them. The future growth scenarios in **Table 5.4** explicitly do not include the impact of any committed investment. Where committed investment will address congestion it is not recommended that further intervention is carried out because it is assumed committed interventions will address the gap.

5.3.4 Other changes such as train lengthening may have impacts on the levels of crowding experienced at a station because larger numbers of passengers can potentially alight at a station from a single train. The committed schemes and major future schemes in development are described in **Table 5.4** for each of the nominated stations.

5.3.5 All forecasts have been standardised to start in 2010 and finish in 2019 or 2031 for the short and long term growth forecasts respectively. The growth rates have been applied to the range of each Fruin level of density of metres squared per person for the highest reported Fruin level at the station. As a result once growth rates have been applied to the Fruin levels up to 2019 or 2031 the Fruin level is described as being, for example, between level D and E rather than a single Fruin level. This reflects the fact that each Fruin level itself incorporates a range of values.

5.3.6 It is important to note that the information on which the table is based is only a high level assessment of congestion by the rail industry. Different train operators have contributed individual station survey results and this means in some instances there are variations in the relative assessed levels of congestion. The usage that this information has been put to is to identify where further more detailed investigation is justified. This data has not been used to identify specific gaps and options, and has only been used to decide where further investigation of congestion is warranted.

5.3.7 There are other factors which may affect how the rate of passenger growth impacts on station congestion. This is particularly the case where plans alter the nature of the train service, or investment changes the physical layout and facilities present in a station. There is considerable variation between station layouts and the nature of the congestion that they experience. The conclusion of this analysis gives an indication of which stations require more detailed investigation of crowding. The RUS conclusions for each station fall into the following categories:

Investigation of intervention recommended in CP5 for stations that are forecast to be at Fruin levels E or F by 2019 and where there are no current plans to address these levels of congestion. It is important to note that the scale of intervention to be considered at these stations may vary considerably and the costs may vary accordingly. 'Softer' measures (measures that need little or no capital expenditure) from the toolkit may be appropriate at some locations. As a result of consultation Watford Junction has been added to this list in the consultation period. However, Liverpool Central has been moved to the 'continued development of existing plans' category. Earlsfield has been removed from this category because current works at the station are likely to address the congestion problem.

Continue development of existing plans which would address existing congestion issues but which may not be fully committed or developed.

Keep under review for 2019 where the impact of investment and future growth are uncertain.

Keep under review in the medium to long term for those stations forecast to be at Fruin levels E or F by 2031 where there are no current plans to address these levels of congestion. The recommendation for these stations is that any future planning work should include investigation of the congestion at these stations in greater detail and to appraise options for addressing the congestion gaps.

No intervention proposed beyond current plans in the foreseeable future where either current congestion or growth is not sufficient to recommend intervention, or planned investment will address capacity constraints. However, changes in circumstances or very long term growth may mean that these conclusions will need to be reviewed in due course. Stations that fall into this category have not been included in the table for the sake of conciseness of the document. For those who are interested in the questionnaire responses for these stations they can be found in the Draft for Consultation of this document which is available on Network Rail's website: **www.networkrail.co.uk**.

5.3.8 The list of stations considered is not an exhaustive list and changes in circumstances in the future may mean that other stations need to be considered, and equally it is possible that congestion may reduce at some stations meaning that intervention is no longer required. In **Chapter 7** the RUS sets out a process for considering congestion at stations in order to ensure that there is flexibility to accommodate changes to the recommendations of the RUS.

Table 5.4 – List of congested stations for which recommendations have been made

Station	2010 Reported congestion			Dominant market at time of greatest crowding	Highest predicted range of Fruin Levels				Committed scheme description and qualitative factors influencing specific growth	Due	Further schemes in development	RUS conclusion
	Concourse	Accessing platforms	On platform		2019		2031					
Balham	D	D	D	London Commuter	D	E	D	E	Balham has work funded to open up the entrance to the west of the tracks that leads onto Balham High Road. The planned works will assist flow issues from the bottom of stairwell to the ticket gates. It is believed these will be sufficient to handle demand. Train lengthening on some services in CP4.	2011	In the long term there may be the need for a scheme to provide a Bedford Road entrance to divert some passengers away from the only stairwell that currently gives access to the platforms - but this would be a CP6 and beyond intervention.	Keep under review in the medium to long term
Barking	C	D	C	London Commuter	D	E	D	E			Barking is on TfL's severely crowded list in the Mayor's Transport Plan. Plans were initiated to improve the station forecourt area, to help address congestion and interchange issues whilst giving the area a facelift. However, funding has not yet been secured.	Continue development of existing plans
Basingstoke	B	E	B	London Commuter	E	F	E	F	South West Trains is shortly to implement plans to increase the booking office circulation area and introduce improved segregation of departing and arriving passengers.			Investigation of intervention recommended in CP5
Birmingham Moor Street	B	B	D	Regional Urban Commuter	D	E	F	F	Chiltern Railways investment has brought Platforms 3 and 4 back into operational usage. This reduces the immediate pressure on most areas of the station. However, as the West Midlands and Chiltern RUS identified, the narrow Southbound through platform is likely to remain a source of congestion in the future. The Evergreen 3 timetable will substantially shorten the journey times from London to Birmingham Snow Hill.	Completed 2010	The West Midlands and Chiltern RUS recommended that platform widening is the long-term solution and this needs to be considered as an integral element of the future High Speed station plans. In the meantime it will be necessary for Chiltern Railways pro-actively to manage congestion issues on the platform.	Keep under review in the medium to long term
Birmingham Snow Hill	E	C	E	Regional Urban Commuter	E	F	F	F	The West Midlands and Chiltern RUS has recommended that crowding will have to be monitored closely when the new second access to the station is opened, as this should relieve some of the pressure on the main barrier line and provide a considerable increase in the passenger handling capacity of the station.	CP4	There is a London Midland long-term aspiration for Platform 4 to be a through platform, once Centro hand back the platform to Network Rail (following reinstatement after the Tram system extends to the city centre).	Keep under review for 2019

Bradford Forster Square	B		B	Regional Urban Commuter	B	C	E	E				Keep under review in the medium to long term
Bradford Interchange	B		B	Regional Urban Commuter	B	C	E	E				Keep under review in the medium to long term
Bristol Parkway	B	E	E	Long Distance	E	F	F	F	IEP service specification, has two additional 10-car IEP services from Bristol to London every hour. Increases in the number local services are also expected. Current station congested at peak times. Scheme to build a 4th platform at the station – now on hold as no business case on performance but may be required for IEP capacity.	On hold		Investigation of intervention recommended in CP5
Bristol Temple Meads	D	C	B	Long Distance	D	E	E	F	IEP and electrification will affect the service offering at this station.	CP4	A GRIP 2 third-party funded study into proposed station enhancement.	Continue development of existing plans
Bromley South	E	D	E	London Commuter	E	F	E	F	No intervention is proposed at Bromley South beyond the existing Access for All and NSIP proposals, which will enlarge the gateline and reconfigure the booking-hall area to improve flows. The Thameslink Programme will affect service patterns at the station which may have an impact on demand.	CP4		Keep under review for 2019
Cardiff Central	B	A	B	Long Distance	B	C	C	D	2010-13 Additional platforms as part of wider Cardiff Area Signalling Renewal, IEP and electrification will alter services to this station potentially influencing demand.	CP4		Keep under review in the medium to long term
Cardiff Queen Street	B	C	B		C	D	E	F	2010-13 Additional platforms as part of wider Cardiff Area Signalling Renewal.	CP4		Keep under review in the medium to long term
Chelmsford	C	B	B	London Commuter	C	D	C	D	As part of NSIP works there are proposals, for which the Borough Council is seeking funding, to widen the existing passenger staircases (upper level) and remodel the customer entrances. Also refurbishment of passenger lifts and station buildings.	CP4	Beaulieu Park – new station is currently proposed north east of Chelmsford to service the growing Beaulieu Park development.	Continue development of existing plans

Station	2010 Reported congestion			Dominant market at time of greatest crowding	Highest predicted range of Fruin Levels				Committed scheme description and qualitative factors influencing specific growth	Due	Further schemes in development	RUS Conclusion
	Concourse	Accessing platforms	On platform		2019		2031					
Coventry	D	B	C	Regional Urban Commuter	D	E	F	F	Platform 4 is having SDO applied during 2011 for 11-car Pendolino services to stop there if necessary, Platforms 2 and 3 are already long enough.	CP4	A third party scheme (Coventry City Council) providing a second access to the station (in the Warwick Road area) is currently on hold but would look to ease access problems at the front of Coventry station and relocate bus stops and ease road congestion.	Keep under review in the medium to long term
Derby	E	D	D	Long Distance	E	F	E	F	Enhancements to the transport interchange facilities as part of a third party funded station master plan.	CP4		Continue development of existing plans
Finsbury Park	D	D	D	London Commuter	D	E	D	E	CP4 Delivery Plan to extend the platforms to 12-car length and to bring back into use the disused up platform located between the Up Slow and Up Goods, in connection with which the Up Goods becomes the Up Slow 2 and available for use by passenger trains. The Thameslink Programme will affect the service pattern at this station.	CP4	There had been plans by TfL/LUL, but these are understood now to be in abeyance owing to lack of funds.	Continue development of existing plans
Glasgow Central (Low Level)	D	D	D	Regional Urban Commuter	D	E	F	F	No schemes currently in development for the low level station.			Keep under review in the medium to long term
Glasgow Queen Street (High Level)	C		C	Regional Urban Commuter	C	D	E	F			Proposals being reviewed under the EGIP programme of works, no delivery date at present.	Continue development of existing plans

Guiseley	B	B	B	Regional Urban Commuter	B	C	E	E			Planned platform extensions currently on hold.	Keep under review in the medium to long term
Halifax	C	C	C	Regional Urban Commuter	C	D	E	F	A new entrance from the waiting room directly onto the Leeds bound platform that may reduce congestion around the stairs, particularly at morning peak times.	CP4		Keep under review in the medium to long term
Herne Hill	C	A	D	London Commuter	D	E	D	E	The Thameslink Programme will affect the service pattern at this station.	CP4		Keep under review for 2019
Huddersfield	D	D	D	Regional Urban Commuter	D	E	F	F	The station operator is installing lifts to help with access and Equality Act issues.	CP4	Additional platform being considered for CP5.	Keep under review in the medium to long term
Leeds	C	B	B	Regional Urban Commuter	C	D	E	F	2010-14 – Leeds station Redevelopment of the station and new southern entrance and 2013-14 a new bay platform.	CP4		Continue development of existing plans
Lewisham	E		F	London Commuter	F	F	F	F	Access for All and NSIP scheme recently completed at this station. No further intervention is proposed. The Thameslink Programme will change some service patterns.	CP4/5	The Bakerloo Line extension suggested in the Mayor's Transport Strategy may have an effect on passenger volumes at the station if it is implemented.	Keep under review for 2019
Lincoln Central	C	C	B	Rural	C	D	E	F				Keep under review in the medium to long term

Station	2010 Reported congestion			Dominant market at time of greatest crowding	Highest predicted range of Fruin Levels				Committed scheme description and qualitative factors influencing specific growth	Due	Further schemes in development	RUS Conclusion
	Concourse	Accessing platforms	On platform		2019		2031					
Liverpool Central	E	D	F	Regional Urban Commuter	F	F	F	F	Liverpool Central Development Plan: phased between 2010-12.	CP4	Further aspirations detailed in the case study of the station in **Appendix A**.	Continue development of existing plans
Liverpool James Street	B	C	D	Regional Urban Commuter	D	E	F	F				Keep under review in the medium to long term
Liverpool Lime Street	D		E	Long Distance	E	F	F	F	11-car Pendolinos are planned to operate from the station.	CP4		Investigation of intervention recommended in CP5
London Charing Cross	F	D	F	London Commuter	F	F	F	F	The Thameslink Programme will substantially change service patterns to the station. Train lengthening is planned for some routes serving the station.	CP5	The case for longer-term congestion relief for CP5 and beyond is being developed. 12-car capability in platform 4 considered within this scheme.	Investigation of intervention recommended in CP5
London Euston	F		E	Long Distance	F	F	F	F			A new high speed line is part of the recommended strategy to deal with capacity shortages on the West Coast Main Line. This would include redevelopment of London Euston by 2026. HS2 is forecast to cause significant dispersal problems at Euston which will also need consideration. Network Rail is developing a commercially financed scheme in order to help mitigate issues at the station until HS2 and to mitigate the impact of the latter's construction.	Continue development of existing plans
London Fenchurch Street	D	E	D	London Commuter	E	F	E	F		CP5	Potential CP5 scheme – 2015 onwards – Work presently underway costing various options for improving passenger flow and capacity.	Investigation of intervention recommended in CP5

London Marylebone	E		E	London Commuter	E	F	E	F	No committed interventions to tackle the station capacity, but the impact of the Evergreen 3 investment project increasing the station footfall is being considered.			Keep under review in the medium to long term
London St Pancras (Upper Levels Midland Main Line Platforms)	E	D		Long Distance	E	F	F	F			Potential impact of HS2 transferring passengers from the MML.	Keep under review for 2019
London Victoria	F		F	London Commuter	F	F	F	F	Train lengthening in CP4 will affect some routes into the station.	CP5	2013-18 – Victoria station redevelopment and London Underground Victoria Station Upgrade. Work presently underway costing various options for improving passenger flow around concourse and ticket line.	Investigation of intervention recommended in CP5
London Waterloo East		E	E	London Commuter	E	F	E	F	The Waterloo balcony scheme will improve access to the station, but will only address one area of congestion in the station. Thameslink will have a knock-on effect on the service pattern at the station.	CP4	A scheme exists to provide an additional street exit/entrance at the country end of the station, using the steps currently giving access to/from the Jubilee Line.	Keep under review for 2019
Manchester Oxford Road	E	D	E	Regional Urban Commuter	E	F	F	F	Works to make the station Equality Act compliant with lifts and access improvements and platform renewals.	CP4	Plans to remodel the layout and extend Platforms 1-4 are being examined by the Northern Hub Project.	Continue development of existing plans
Manchester Piccadilly (Platforms 13/14)	B	C	D	Regional Urban Commuter	D	E	F	F	2010-11 – Scheme to de-clutter Platforms 13 and 14.	CP4	The Northern Hub recommended option would create two new through platforms (15 and 16). This would spread passenger flows across four platforms rather than two.	Continue development of existing plans
Manchester Victoria	D	D	C	Regional Urban Commuter	D	E	F	F	Redevelopment project is expected to resolve issues, so no further intervention is recommended. An NSIP scheme is also planned. The North-West electrification and Northern Hub projects have the potential to result in changes at this station.	CP4/5		Continue development of existing plans
Nuneaton	C	B	C	Regional Urban Commuter	C	D	E	F				Keep under review in the medium to long term

Station	2010 Reported congestion			Dominant market at time of greatest crowding	Highest predicted range of Fruin Levels				Committed scheme description and qualitative factors influencing specific growth	Due	Further schemes in development	RUS Conclusion
	Concourse	Accessing platforms	On platform		2019		2031					
Preston	C	E	D	Long Distance	E	F	F	F	De-cluttering of Platform 1 and 2 planned for 2012-3 to increase platform area available to passengers to alleviate congestion. 11-car Pendolinos. North Western electrification will affect some services at this station.	CP4		Investigation of intervention recommended in CP5
Princes Risborough	D	A	B	London Commuter	D	E	D	E	NSIP scheme in CP4 to increase seating in new extended waiting room. New paving being provided. Evergreen 3 investment will see a changed service pattern at this station and reduced journey times.	CP4		Keep under review in the medium to long term
Salford Central	C	C	B	Regional Urban Commuter	C	D	E	F				Keep under review in the medium to long term
Seven Sisters	A	C	D	London Commuter	D	E	D	E	Minor station works to improve capacity to be delivered by 2014.	CP4		Keep under review for 2019
Shipley	B	B	B	Regional Urban Commuter	B	C	E	E			Additional peak services rather than longer trains may ease congestion but both these options are on hold.	Keep under review in the medium to long term

Solihull	C	C	C	Regional Urban Commuter	C	D	E	F				Keep under review in the medium to long term
Surbiton	C	F	F	London Commuter	F	F	F	F	Train lengthening to 10-car.	CP4		Investigation of intervention recommended in CP5
Tamworth	C	C	D	Regional Urban Commuter	D	E	F	F	NSIP Scheme is being planned to build a new waiting room (Platform 1), install glazing to the stairwells for weather protection (Platforms 1 & 2), and on Platforms 3 & 4 install full height glazing to the existing rooms.	CP4		Keep under review in the medium to long term
Tottenham Hale	C	D	B	London Commuter	D	E	D	E	Class 379 trains being introduced on the West Anglia route leading to a significant timetable change.	CP5	Tottenham Hale station improvements to the station circulation as part of the Tottenham Hale development programme. L&SE RUS recommended action short of 4-tracking (though it remains a future aspiration).	Continue development of existing plans
Walsall	B		C	Regional Urban Commuter	C	D	E	F				Keep under review in the medium to long term
Watford Junction	F	E	E	London Commuter	F	F	F	F	NSIP scheme may relieve concourse area. There are also platform extensions to accommodate 11-car Pendolinos.	CP4	The Croxley Link could bring more passengers to the station impacting on congestion – this is currently uncommitted.	Investigation of intervention recommended in CP5
Wimbledon	C	E	E	London Commuter	E	F	E	F	Train lengthening to 10-Car.	CP4	Potential CP5 scheme – 2015 onwards – Work presently underway costing various options for improving passenger flow and capacity.	Investigation of intervention recommended in CP5
Woking	D	B	C	London Commuter	D	E	D	E	There has been a very recent scheme to install a second flight of stairs from the overbridge to the island platform which will have helped congestion.	CP4		Keep under review in the medium to long term

5.4 Type 2 gaps and options: toolkit of options to address generic station capacity gaps

5.4.1 As has been described in **Chapter 4** there are a range of drivers of change which impact upon congestion. Growth in passenger numbers on the railway is forecast to increase within the timescales of the RUS. This suggests that if congestion at stations is not tackled it may lead to increased time spent by passengers at stations extending their total travelling time. If congestion at stations reaches sufficient levels it might also act as a barrier to further growth, which means that it is therefore a challenge that the railway industry as a whole needs to address in partnership.

5.4.2 This section sets out capacity gaps, with respect to the activities described in **Chapter 3**, and a toolkit of options to address them. Given the wide variety of bespoke station designs on the network, it was felt to be most useful to identify generic issues along with a range of options applicable to different circumstances to address the gap.

5.4.3 The toolkit is also intended to reflect the position that there are several parties who might potentially be involved in addressing congestion at stations. The list of gaps and options has been drawn up in conjunction with the Working Group which represents a wide range of stakeholders in the railway industry. The list of gaps and options is not intended to be exhaustive and is instead intended to provide a resource for those looking at addressing issues of congestion.

5.4.4 The capacity gaps and options are organised according to the three zones of the station identified in **Chapter 3**:

Access Zone – area through which the station user enters or exits the station to onward transport. Gaps relating to this area of the station have been labelled AZ in the toolkit. An example of a gap in this zone is conflict between people arriving or leaving the station and other users or modes of transport

Facilities Zone – where the needs of passengers for services and facilities on the station are met. Gaps relating to this area of the station have been labelled FZ in the toolkit. An example of a gap in this zone is long queues forming at the ticket office

Platform Zone – area for waiting for train services, information about train services, and access and egress to and from the train itself. Gaps relating to this area of the station have been labelled PZ in the toolkit. An example of a gap in this zone is congestion at platform entrances and exits.

5.4.5 Options to address congestion have been listed in order of scale of intervention. It is intended therefore that users of the toolkit should consider addressing congestion gaps starting firstly with lower cost options, and only considering higher cost options if they are the only way in which to address the congestion gap, and the benefits of intervention can be justified in a business case. All of the options have been listed by order of level of intervention. Given the bespoke design of many stations, the cost will vary depending upon the station in question but, in general, lower cost options are presented first for consideration to address gaps. Options are labelled in the toolkit, or depending on their level of intervention, as follows:

A **Options which affect the level of demand at stations**. An example of such an option is encouraging passengers to use print-at-home tickets for advanced internet purchases. Print-at-home tickets do not need the passenger to fulfil their purchase by entering card details and a booking code into a ticket vending machine thereby reducing the demand for these facilities. These kinds of options should be considered first because they may remove the requirement for capital investment or delay the point at which it becomes necessary.

B **Options which affect the way in which the demand uses available capacity**. An example of such an option is using directional signage on stairs and entrance ways or variable signage or other means of separating flows of passengers to avoid congestion (see Bristol Temple Meads case study). This does not alter the existing space but by separating flows to avoid conflict there is the potential for the existing station to be operated with less congestion without providing additional capacity. Options of this kind may have costs associated with them, but they allow the existing facilities to function without investment in additional capacity or by temporarily delaying the need for such investment until a higher demand threshold has been reached.

C **Options which increase available capacity**. An example of such an option is the provision of an additional overbridge to increase the capacity available for passengers to either interchange or access different parts of the station. This option is illustrated in the Southampton Airport Parkway case study where an additional footbridge was installed which increased capacity, provided step-free access and was also covered from the elements. This type of option is clearly higher cost than the first two levels of intervention and is only appropriate for consideration where options to manage demand, or improve the usage of the existing space have either not been practically possible or will not provide sufficient levels of congestion relief to address the gap. Options to increase the capacity of a station are likely to have the highest costs associated with them. They should

only be considered once lower cost alternatives have been implemented or are not able to deliver the desired reduction in congestion. A value for money business case would be required to justify such investment.

5.4.6 A fourth set of gaps and options has been produced for congestion relating to planned special events. Examples of the impact of events on congestion at a station include the Cardiff Central case study which illustrates the impact of events at the Millennium Stadium on the station. The reason for considering these gaps and options separately is that they can affect all areas of a station but do not occur on a daily basis. Special management measures may well be put in place and they may involve third parties such as the police to manage the crowds.

5.4.7 The process by which the toolkit of gaps and options has been developed has followed two strands. First, workshops with the Working Group were used to generate gaps and options. Secondly, case studies of stations were undertaken to illustrate the range of congestion issues experienced across a geographic spread of the network, and in terms of a range of size and types of stations. The case studies were therefore selected in order to represent the range of regional issues and station categories. The list of case studies is shown in **Table 5.5**. The last case study is of station travel plans and is not specific to one single station, but illustrates an option for potentially addressing Access Zone gaps. The details of each case study can be found in **Appendix A**.

Table 5.5 – List of case studies in Appendix A

Case study	2009-10 annual footfall (ORR station Usage) (millions)	Station category	UK Region	Issues illustrated
Bristol Temple Meads	8.9	A	South West England	Congestion at a major regional interchange
London Waterloo	91.9	A	Greater London	Major London Terminal congestion
Cardiff Central	11.9	B	Wales	Event day congestion and commuter congestion
Clapham Junction	38.3	B	Greater London	Congestion at a major train-to-train interchange
Liverpool Central	19.0	B	North West England	An underground island platform with considerable congestion
Preston	4.9	B	North West England	A large station but nevertheless subject to congestion
Cardiff Queen Street	3.0	C	Wales	Event day congestion and commuter congestion
Farnborough Main	2.7	C	South East England	Intervention to improve multimodal interchange facilities
Southampton Airport Parkway	1.5	C	South East England	Interventions to increase car parking and decrease footbridge congestion
Haymarket	2.2	D	Scotland	Planned interventions to address congestion across the station and improve multimodal interchange
Littlehaven	0.3	E	South East England	Congestion experienced at a small commuter station
Farnborough North	0.4	F	South East England	Congestion exiting a small unstaffed station via a level crossing
Station Travel Plans	n/a	n/a	England and Wales	n/a

5.4.8 The range of case studies in **Appendix A** provides specific examples of the gaps. In some instances they also provide possible options to address the generic gaps that have been identified. It is important to note that the RUS in highlighting options in the case studies and the toolkit is not recommending specific intervention at any station and is using the case studies for example purposes only. Any intervention would have to be subject to an appraisal and in the case of investment requirements a business case would have to be developed.

Station congestion toolkit – Access Zone Gaps and options

5.4.9 Gaps and options are presented in **Table 5.6** which illustrates those found in the Access Zone. The Access Zone, described in **Chapter 3**, relates to those activities undertaken by station users in accessing the station by the full range of modes of transport available. The only station users who would not pass through this area of the station are those who interchange between two national rail services. Otherwise all passengers, and non-travellers, pass through this area of the station. The gaps and options in **Table 5.6** therefore relate to these activities and areas of congestion. Where possible the options have been illustrated with examples from the case studies in **Appendix A**, or from examples where these options have been implemented elsewhere on the network. Options are labelled in the toolkit A, B or C depending on their level of intervention.

5.4.10 Gaps have been placed in the following order according to the proportions of passengers using each mode of transport to access the station as a national average for 2010 (waves 22 and 23) of the National Passenger Survey:

- walking (30 %)
- car (dropped off) (15 %)
- light rail or underground (14 %)
- bus or coach (14 %)
- car (parked and ride) (11 %)
- taxi (10 %)
- other (motorbike, air and sea…) (4 %)
- bicycle (1 %).

Table 5.6 Access Zone Gaps and Options

Access Zone - toolkit				
Gap number	Toolkit gap	Option number	Toolkit option	Comments
AZ1	Conflicts may exist between people arriving or leaving the station and other users or modes of transport. This increases congestion potentially delaying station users.	B AZ1.1	Separate conflicting flows of people by clear directional signage.	At Bristol Temple Meads signage is used in the subway and on the stairs to indicate the direction of passenger flows to avoid congestion from conflicting directions of passenger flows. See Bristol Temple Meads case study in **Appendix A.**
		B AZ1.2	Separate conflicting flows of people by erecting physical barriers.	In the morning peak at London Euston, barriers are put in place to segregate those coming up the escalator off the London Underground concourse, from those going in the opposite direction separating the conflicting flows of people.
		C AZ1.3	Investigate whether conflicts can be resolved by relocation of facilities.	See Farnborough Main case study in **Appendix A** – a new interchange in the station forecourt separated out different activities reducing conflict between users exiting the station.
		C AZ1.4	Consider the need for physical changes to the station layout or structure, such as the provision of additional entrances or exits.	Witham station in its redevelopment plans will have an additional entrance to the overbridge allowing the moving of the pick up and drop off point into the existing car park which is currently only accessible by a circuitous route. This will address congestion associated with the entrance to the overbridge.
AZ2	Where entrance or exit is by means of a level crossing, delay and congestion can be caused whilst people wait for the crossing to be clear of trains. This gap is more likely to be an issue at smaller stations where the provision of other means of crossing rail lines is not provided.	A AZ2.1	Consider minor alterations to the timetable to expedite crossing clearance.	See Farnborough North case study – Platform entrance/exit to Platform 1 (towards Guildford and Redhill) is a narrow footpath and caters for up to 200 passengers alighting from one service in the morning peak.
		B AZ2.2	If ticket-issuing facilities are provided, consider locating them on the side of the crossing which sees the peak flow of rail traffic (in order to prevent access across the crossing being prevented by delay in issuing tickets).	See Littlehaven case study in **Appendix A** – ticket issuing facilities are only on one side of the station and as a level crossing needs to be used to access the other platform this can form a constraint.
		C AZ2.3	Evaluate provision of a footbridge or subway.	See Farnborough North case study in **Appendix A.**
		C AZ2.4	On double-track railways, examine the feasibility of staggering the platforms such that the crossing is always in rear of a stopped train.	Examples of staggered platforms include Mitcham Eastfields station. However, to modify an existing station would be costly and in many cases unlikely to have a value for money business case.
AZ3	Manually operated entrance doors to station buildings may constrain flows of people, especially those with luggage, prams or restricted mobility.	B AZ3.1	Leave doors open.	The ability to open the doors at all times may be dependent on weather conditions.
		C AZ3.2	Investigate whether automatic doors would ease the problem.	As part of an NSIP scheme automatic doors are to be installed at Tamworth Station. Automatic doors have the potential to stop the manual opening of doors being a cause of congestion.

Table 5.6 Access Zone Gaps and Options

Access Zone - toolkit				
Gap number	Toolkit gap	Option number	Toolkit option	Comments
AZ4	Infrequent, or unintegrated, onward public transport provision may cause people to remain at the station longer than is necessary.	B AZ4.1	Improve the information provision on the station about onward travel by public transport. This might include posters providing timetable information, improved wayfinding signage to nearest bus stops, or real time information about bus, tram or Underground services within the station.	The station zoning programme is currently looking at the passenger information provision at all stations in England (with the exception of those managed by Arriva Trains Wales and Network Rail). The aim of the project is to have a consistent approach to the placement of key passenger information at rail stations in England. One aspect of information provision that is being reviewed is that of onward travel information for public transport. The scheme is part of NSIP, is costing £2.7 million and is due to be completed by 2012. The project is being coordinated by the Association of Train Operating Companies (ATOC).
		C AZ4.2	Discuss and implement improvements with transport operators in partnership with other stakeholders, adopt a Station Travel Plan.	See the Farnborough Main case study in **Appendix A** – Hampshire County Council worked with a range of stakeholders to improve the interchange facilities and enhance the bus services at the station.
		C AZ4.3	Improve the interchange facilities for example by providing or improving the bus stop facilities.	See the Farnborough Main case study in **Appendix A** – one of the key elements of the case study was the installation of a new bus stop with improved waiting facilities.
AZ5	Where buses or coaches are being used to replace train services, the forecourt can become congested with both people and vehicles, conflicting with other users, and causing delays.	A AZ5.1	Build further on the principles of the 7 Day Railway (policy to maximise the availability of the network to passengers and freight customers), and avoid the use of replacement buses.	For example the diversion of trains rather than bus replacement as part of the blockade of Reading Station over the Christmas and New Year period 2010-11.
		B AZ5.2	Where the use of buses is unavoidable, ensure that the proposed interchange station is capable of handling the type and quantum of replacement road vehicles.	It is also important that the signage and staffing at the bus replacement interchange are sufficient to handle the level of service.
AZ6	Lack of covered waiting area for taxis, buses or other pick-up areas may cause users to wait in the station building during inclement weather.	C AZ6.1	Consider the provision of additional canopies and/or shelters.	See Farnborough Main case study in **Appendix A** – new waiting facilities improve the provision of shelters for passengers. This means that passengers have higher quality shelters to wait for bus services and do not have to walk so far to access the buses.
AZ7	Car parks which require the issue of a ticket on entry may cause queues.	A AZ7.1	Consider usage of different technology, such as mobile phone, RingGo or e-ticketing payment for car parking.	At Brighton station Southern have implemented pay-by-mobile. Southeastern has e-tickets available for daily and weekly parking tickets at its stations. Other operators such as First Great Western have a RingGo system whereby users can pay over the telephone for parking.
		B AZ7.2	Consider whether pay-and-display, with no entrance/exit control, is more suitable.	
		C AZ7.3	Consider the provision of an additional entry lane for ticket issue.	

Table 5.6 Access Zone Gaps and Options

Access Zone - toolkit

Gap number	Toolkit gap	Option number	Toolkit option	Comments
AZ8	Car parks may fill up early in the day and may prevent people using the station.	A AZ8.1	Investigate whether pricing is set at the optimum level, especially in relation to other parking facilities in the locality.	Local factors will determine the correct level of car park pricing and part of this consideration relates to the pricing of other local parking. Pricing might be used to manage demand at the station car park, or equally no charge may be levied in order to encourage rail usage. However, the overall approach to car parking needs to consider how users access the station in the totality. Station Travel Planning provides a tool to assess how people are accessing the station and what the barriers to using alternative modes of transport might be.
		A AZ8.2	Examine whether the car park is used by those other than station users.	Consider offering discounts to rail travellers or charging a premium to non-rail users.
		A AZ8.3	Pricing to incentivise car sharing and therefore more efficient usage of car parking spaces.	Chiltern Railways gives discounts with a car sharing voucher for those with more than one occupant parking at peak times.
		A AZ8.4	Consider incentives to encourage users to use another nearby station where capacity exists particularly if there are reasons why users are 'rail-heading' to a particular station in favour of alternatives.	Needs to take account of any loss in fare revenue if this involves a shorter train journey and also the impact on the road system.
		A AZ8.5	Stakeholders could work together to implement measures to encourage other modes of accessing the station, such as the adoption of a Station Travel Plan, the extending reach of Plusbus ticketing etc.	See the Station Travel Plan case study in **Appendix A** – given that there may well be space constraints on car parking expansion, and that Station Travel Plan seeks to reduce the impact of passengers travelling to and from the station, the Station Travel Plan represents a means of changing the modal choice of passengers, relieving the pressure on car parking.
		B AZ8.6	Investigate whether real-time parking space availability information can be provided electronically.	It might be possible to provide real time information about car parking available to the passenger who can then make a decision about the means of transport they choose to travel to the station if they have alternatives available.
		B AZ8.7	Consider whether the bay marking is optimised, both in terms of bay size and the general layout of the bays.	See Farnborough Main case study **Appendix A** where the station forecourt was revised to give a more optimal layout for station users.
		C AZ8.8	Consider vertical or horizontal expansion of car park.	See Southampton Airport Parkway case study **Appendix A** where there are plans to expand the rail station car parking. Chiltern Railways at Bicester North and at a number of other sites has double decked car parks to increase capacity. London Midland has done similarly at sites such as Bletchley and Tring.

Table 5.6 Access Zone Gaps and Options

Access Zone - toolkit				
Gap number	Toolkit gap	Option number	Toolkit option	Comments
AZ9	The demand for secure cycle parking is greater than the available spaces.	B AZ9.1	As part of a Station Travel Plan consider whether appropriate space has been devoted to cycle parking based on the level of demand traded off against other use of the station footprint, for example the car park.	See Station Travel Plans case study in **Appendix A.**
		B AZ9.2	If certain racks are underused owing to security concerns of users, consider improving lighting, CCTV coverage, or the type of cycle rack to encourage users to park cycles at that location to relieve pressure elsewhere around the station.	At Colchester North, as part of an NSIP investment at the station, a secure cycle facility is being provided. This is part of the Station Travel Plan to encourage cycling as a means of accessing the station. Colchester was one of the ATOC pilot Station Travel Plans.
		C AZ9.3	Use of spare space within the station, where available, for cycle storage facilities.	For example – the investment in cycle facilities at London Euston includes double-decked cycle racks in a previously relatively unused area in front of the station.
		C AZ9.4	Consider high capacity cycle racks.	The cycle racks installed at London Euston were double-decked increasing the density of parking and therefore minimised the space required.
		C AZ9.5	Consider installing cycle lockers or secure cycle parking accessible only by key or entry pass.	While this is secure it may put off casual users. An example of this type of secure cycle parking can be found at Finsbury Park.

Station congestion toolkit - Facilities Zone gaps and options

5.4.11 Gaps and options are presented in **Table 5.7** which illustrates those found in the Facilities Zone. The Facilities Zone, as has been described in **Chapter 3**, relates to the facilities used by station users. These might typically include ticket retailing, information, waiting facilities, and information provision, as well as retailing. As is illustrated in **Chapter 3** all users of the station may potentially use the Facilities Zone. The gaps and options in **Table 5.7** therefore relate to these activities and areas of congestion. Where possible the options have been illustrated with examples from the case studies in **Appendix A**, or from examples where these options have been implemented elsewhere on the network. Options are labelled in the toolkit A, B or C depending on their level of intervention.

5.4.12 The gaps are organised as follows:

- ticket retailing facilities
- congestion between different users.

Table 5.7 Facilities Zone Gaps and Options

Facilities Zone - toolkit				
Gap number	Toolkit gap	Option number	Toolkit option	Comments and examples
FZ1	Long queues forming at the ticket office.	A FZ1.1	Promote a higher take-up of purchase of season tickets, or multi-journey cards.	Reduces the frequency of usage of ticket purchase facilities at the station thereby reducing the associated congestion.
		A FZ1.2	Promote a higher take-up of on-line purchase of tickets, with no requirement for collection at the station.	Removes the need to use station ticket vending and purchasing facilities thereby reducing the demand and the associated congestion. However, print at home tickets can create delays at automatic ticket gates that cannot read bar codes on printed tickets.
		A FZ1.3	Implement smart ticketing options such as pre-pay cards.	An example is the Oystercard system, which from January 2010 has been implemented for use on services within the London Travelcard Zones. The effect has been a reduction in ticket sales transactions at ticket offices within the area in which Oystercard is valid. Other ITSO compliant systems are being considered elsewhere.
		A FZ1.4	Consider whether the demand can be attracted to an alternative station either by pricing initiatives, or by service quality improvements.	Examples might include changes to ticketing or car parking pricing, or improvements to service frequency, journey time or train capacity to encourage passengers to change to a different station.
		B FZ1.5	Organise occasional familiarisation sessions where staff encourage travellers to use vending equipment where it already exists.	Research has indicated that some users are deterred from using machines because of perceived complexity, or lack of confidence they will issue the best or cheapest ticket for the journey being made 'Passenger Focus, Ticket Vending Machine Usability Qualitative Research' (July 2010). Helping passengers to feel confident in using ticket vending machines would maximise their utilisation and potentially reduce queueing at the ticket office if vending machines are underused.
		B FZ1.6	Consider a single-queueing system to ensure equity for customers and to manage the space taken up by queueing passengers.	Note that such systems can take up more concourse space, and can increase average transaction times as there is a longer time between transactions.
		B FZ1.7	Consider whether transaction types can be segregated eg advance travel purchase segregated from immediate travel purchase.	At London King's Cross the ticket queues are divided into tickets for travel today, and those for advanced purchase. This has the potential to separate out those customers with longer and more complex purchases reducing queues for those with more straightforward day of travel purchases.
		C FZ1.8	Open additional ticket windows to cater for peak demand.	See Liverpool Central case study in **Appendix A** which has options for investment to increase the number of ticket windows thereby increasing capacity and reducing queueing times. As with any investment in staff and facilities a positive business case would be needed to justify such investment.
		C FZ1.9	Supplement ticket office facilities with roving ticket-issuing staff at peak times.	An example of this practice is Virgin Trains at London Euston station concourse, which has the potential to reduce demand and therefore queues at the ticket office and vending machines.

Table 5.7 Facilities Zone Gaps and Options

Facilities Zone - toolkit				
Gap number	Toolkit gap	Option number	Toolkit option	Comments and examples
FZ1	Long queues forming at the ticket office. (continued)	C FZ1.10	Supplement ticket office facilities with ticket vending equipment.	The Liverpool Central case study (See **Appendix A**) also exemplifies increasing ticket vending machine provision to provide enhanced capacity and reducing queueing times. The cost of ticket vending machines needs to be justified with a positive business case.
		C FZ1.11	Establish if passengers are travelling to the station because of capacity problems at other stations, for example lack of car park space, and if investment in facilities elsewhere would relieve congestion at the station in question.	Rail heading to particular stations may result from the ability to access the station by car, or because of the price of train fares. Station Travel Planning provides an opportunity to consider how this trend could be addressed if the passenger numbers could be spread between other stations. Investing elsewhere might be a more cost effective way of reducing congestion by spreading demand between stations more effectively.
		C FZ1.12	Establish the catchment area of the customer base to ascertain whether the demand is symptomatic of the need to open a new station.	This is potentially the highest cost option to addressing congestion issues at a station. In some instances it may be possible to justify the construction of a new station on the basis of the level of demand within the catchment area of an existing station. However, this would only be an option for consideration in specific circumstances (eg change in housing distribution) and if there was a positive business case. For further information see ' Investing in Stations – A Guide to Promoters and Developers'.
		C FZ1.13	Increased ticketing capacity at origin stations in order to avoid queues at excess fares windows at destinations.	Queues at excess fares windows at destination stations may be reduced by greater provision of ticket retailing facilities either on train or at origin stations. This option has potential cost implications in terms of facilities and station or on-train staff.
FZ2	Queues forming at the ticket office/machines which, whilst meeting waiting time standards, obstruct other users.	A B C FZ2.1	Any of the Options in Gap FZ1 above.	See above.
		B FZ2.2	Investigate whether non-travellers and other users can be routed differently or otherwise segregated from ticket queues.	At Coventry station barriers are used for managing queues both at the ticket windows and the ticket vending machines, to ensure that the concourse is available for other station users not requiring these facilities and so reducing pedestrian flow conflicts.
		B FZ2.3	Investigate whether ticket facilities can be relocated.	The Bristol Temple Meads case study (see **Appendix A**) considers the possibility of relocating ticket facilities from their current location to provide more concourse and access space as the current concourse area is constrained leading to congestion at peak times.

Table 5.7 Facilities Zone Gaps and Options

Facilities Zone - toolkit				
Gap number	Toolkit gap	Option number	Toolkit option	Comments and examples
FZ3	Long queues forming at ticket vending equipment.	A FZ3.1	Encourage purchase of season tickets, or multi-journey cards, smart cards.	Oystercard Pay as You Go full introduction on the national rail network in London in 2010 has reduced the number of transactions at ticket offices because passengers have stored value on the smart card which avoids the need to use ticket purchasing facilities for every journey.
		A FZ3.2	Encourage on-line purchase of tickets, with no requirement for fulfilment at the station.	Virgin Trains print-at-home tickets do not require passengers to use ticket vending or purchasing facilities at the station potentially reducing queues. Chiltern Railways at London Marylebone have automatic ticket gates which can read print-at-home tickets. However, there may be issues with gatelines as print-at-home tickets are not generally readable by current automatic gatelines.
		B FZ3.3	Implement a queueing system to ensure efficient access to the ticket machines.	At Coventry station a queueing system is in place to access the ticket vending machines on the station concourse, this ensures that queues for the ticket vending machines do not conflict with other pedestrian flows across the concourse.
		B FZ3.4	Consider whether the transaction time could be reduced by speeding up the operating system, improving the user interface or simplifying the ticketing options.	See Passenger Focus research on 'Ticket Vending Machines Usability' (July 2010) which provides a passenger perspective on the screen layout, programme sequence and information. The conclusions of the research provide suggestions on how the interface could be improved which have benefits in both transaction time and assisting passengers to purchase the best value ticket for their journey.
		C FZ3.5	Supplement ticket vending facilities with roving ticket-issuing staff at peak times or staff to assist passengers at ticket vending machines.	At busy supermarket and other retail outlets staff are provided to assist customers with purchases from self-service checkout facilities. In a similar way railway customer service staff can be on hand at banks of ticket machines to help customers find the best value ticket and also to reduce the individual transaction time. Virgin Trains at London Euston, for example, have provided roving staff to assist at busy times.
		C FZ3.6	Provide additional ticket vending machines.	Many TOCs have installed separate vending machines for the sole purpose of ticket collection, thereby reducing queues by separating out ticket purchase and ticket collection. This is particularly relevant for long distance high speed operators where there are large numbers of advanced internet purchases which are collected at the station. The cost of providing additional ticket vending machines must be considered and a value for money business case would be required to justify such investment.

Table 5.7 Facilities Zone Gaps and Options

Facilities Zone - toolkit				
Gap number	Toolkit gap	Option number	Toolkit option	Comments and examples
FZ4	Congestion between different types of station users eg between retail users and passengers.	C FZ4.1	Concourse space may need to be created by the relocation of retail units to de-clutter the station, removing obstacles to passenger circulation.	See case study of the London Waterloo balcony scheme to relocate retail units from the main concourse to a mezzanine floor. This will enable the relocation of some existing retail units from the main concourse to improve passenger flow and remove various congestion pinch points.
FZ5	Limited space for users to dwell and/or congestion at key points such as in front of Customer Information System (CIS).	B FZ5.1	Relocation of CIS or increased real time information provision.	The Cardiff Queen Street case study illustrates the congestion that can occur in front of CIS screens. However, unless there are obvious alternative locations for the CIS or for additional CIS to be provided it can be difficult to solve within the existing footprint of a station. Increase availability and awareness of information available to passengers using personal mobile phone devices.
		C FZ5.2	Revise the layout of the station, for example by providing additional concourse space or extra entrances and exits to reduce congestion.	See Bristol Temple Meads case study in **Appendix A** which has options for investment to increase the concourse space and provide additional entrances to reduce congestion.

Station congestion toolkit - Platform Zone gaps and options

5.4.13 Gaps and options are presented in **Table 5.8** which illustrate those found in the Platform Zone. The Platform Zone, as has been described in **Chapter 3**, relates to the platform area of the station used by station users to board and alight from train services and to wait for train services.

As is illustrated in **Chapter 3** all passengers use the Platform Zone. The gaps and options in **Table 5.8** therefore relate to these activities and areas of congestion. Where possible the options have been illustrated with examples from the case studies in **Appendix A**, or from examples where these options have been implemented elsewhere on the network. Options are labelled in the toolkit A, B or C depending on their level of intervention.

Table 5.8 Platform Zone Gaps and Options Toolkit

Platform Zone - Toolkit

Gap number	Toolkit gap	Option number	Toolkit option	Comments
PZ1	In inclement weather, passengers congregate under the canopy, causing congestion and increased station dwell time if all the train doors are not used.	C PZ1.1	Extend the canopy further along the length of the platform, or provide shelters.	Current works at Clapham Junction are extending the platform canopies in order to encourage passengers to use the full length of the platform during inclement weather. Passengers currently congregate under the canopy and do not make full use of the platform length. This leads to bunching of passengers and slower boarding times potentially increasing train dwell times.
PZ2	Passengers may assemble near departure screens, especially during times of disruption.	B PZ2.1	Consider implementing a queueing system for specific services to manage passengers during disruption.	At London Charing Cross owing to the limited concourse space a queueing system is implemented in disruption.
		B PZ2.2	Consider increasing the font size of displays so they can be seen from further away.	Newer style CIS systems are more legible, particularly in strong sun light, than older cathode ray tube type CIS screens. This has the potential to make the CIS screen more easily legible and therefore reduce the time taken for passengers to assimilate the information along with minimising the potential for associated congestion. It is important to link such management of congestion to industry initiatives to provide improved passenger information during disruption.
		B PZ2.3	Consider 'Station Zoning' of the station to make the signage and information easier and more logical for passengers to find.	Station Zoning has been implemented by Southern as part of their franchise commitment. In England at non-Network Rail stations Information Zoning is currently being undertaken as a NSIP project due to be complete by the end of March 2012. Station Zoning involves each station being surveyed for the current information provision. Following this survey the station is conceptually divided into zones in which information is presented to passengers at stations. This is designed to provide a more logical and consistent presentation of the information that the passenger needs, so that the passenger knows where to expect information to be found and also aims to de-clutter the information provision at the station. The Information Zones are: ● Welcome Zone - information about facilities and local area ● Ticket Zone - ticket retailing and passenger real time information ● Train Zone - timetable and penalty fare information ● Onward Journey Zone - information about multimodal onward travel.

Table 5.8 Platform Zone Gaps and Options Toolkit

Platform Zone - Toolkit				
Gap number	Toolkit gap	Option number	Toolkit option	Comments
PZ2	Passengers may assemble near departure screens, especially during times of disruption. (continued)	B PZ2.4	Provide real time information at other locations within the station along the line of route passengers take thereby stopping the need for them to congregate in one particular area.	CIS screens may be installed in locations such as car parks, or in the case of larger stations inside retail facilities such as cafes. CIS screens have been installed in the retail and seating area outside London Euston. This means that passengers do not have to congregate in the concourse area to access information about the departure time of their train service. This has the potential to reduce congestion on the concourse particularly during periods of disruption.
		B PZ2.5	Consider installing further displays along the length of the platform.	The positioning of a CIS screen may cause passengers to congregate in one small area of a platform, as illustrated by the Littlehaven case study in **Appendix A**. The impact of this can be crowding in one area slowing boarding time and affecting train performance. Spreading passengers out along the platform has the potential to give more efficient boarding and reduce the impact on the train service by reducing dwell time.
		B PZ2.6	Consider de-cluttering the platform or concourse to improve passenger circulation and allow the screens to be seen from further away.	In some instances other structures, equipment or signage may obscure the sight lines to the CIS. By decluttering the station CIS can be seen from further away reducing congestion.
PZ3	If unsure how many carriages are on the train, passengers may not use the appropriate length of the platform, causing bunching and potentially extending dwell times.	B PZ3.1	Information on train lengths can be provided by CIS systems.	This information may not be useful if there is no indication about exactly what extent of the platform the train will occupy. Southern CIS announces train length because a number of train services split and join on route so it is important for passengers to know which coaches to board for their destination. This could also be used more widely to alert passengers to the length of the train service and where they should therefore wait on the platform, spreading passengers and reducing congestion.
		C PZ3.2	Consider placing door markings with carriage numbers on the platform.	This is only likely to be feasible if identical rolling stock types are used on all services, and if the stop boards are positioned in such a way that different length trains will always have the doors in the same position. It also requires high levels of braking accuracy on the part of train drivers.
		C PZ3.3	Consider platform doors.	Only likely to be achievable on a discrete network using homogenous rolling stock in fixed formations such as on the future Crossrail stations and on the London Underground Jubilee line extension.
PZ4	Passengers requiring a specific part of the train (eg first class carriage, carriage with reserved seat, carriage with cycle space, carriage with disabled access) may not know where to position themselves.	B PZ4.1	Deploy platform staff to assist such passengers.	Long distance high speed services often have staff deployed on the station to assist in this way. For example at York station for East Coast services platform staff are deployed in part to assist boarding.
		B PZ4.2	Signage on the platform to indicate where each carriage will stop.	While this information can be helpful, the signage can be misleading if the train is not in its usual formation.
		B PZ4.3	Use CIS to convey appropriate information.	There may be challenges in implementing this option as, for example, if the CIS system is not aware of trains being in reverse formation then the information may be misleading.

Table 5.8 Platform Zone Gaps and Options Toolkit

Platform Zone - Toolkit

Gap number	Toolkit gap	Option number	Toolkit option	Comments
PZ5	Arriving trains may already be crowded making it difficult for passengers to board.	A PZ5.1	Consider whether the calling pattern of trains on the route and at the station is optimal for matching demand.	Where the train service is frequent but unevenly spread across the hour, congestion can result on both the first train to arrive and also the train immediately following a long gap. Making the stopping pattern 'clock-face' ie a 30 minute interval for a 2 trains per hour service, or 15 minute interval for a 4 trains per hour service spreads loadings most efficiently across all services. This has the potential to minimise congestion both on the train and at the station.
		B PZ5.2	Use CIS to inform passengers where the less crowded part of the train is likely to be.	As information systems become more sophisticated it might be possible to provide real-time information from the on-train Automatic Passenger Counting system about where the busiest part of the train is.
		C PZ5.3	Consider whether higher capacity rolling stock needs to be diagrammed.	Train lengthening has the potential to increase the speed of boarding by providing more doors for passengers to board through. However, longer trains may have the effect of increasing the volumes of passengers also alighting from the train service, particularly at terminal stations, leading to congestion exiting the platforms.
		C PZ5.4	Consider whether additional trains should be timetabled.	More trains increase the number of passengers that can travel away from the station and may reduce congestion by reducing passenger dwell time at the station.
		C PZ5.5	Reduce stepping distance if a wide and/or high gap between the train and the platform is slowing boarding and alighting and forming a barrier to accessibility for people with mobility impairments.	London Underground has used humps on platforms to provide step-free access on parts of the platform. High stepping distances or wide gaps between the train and the platform have the potential to slow boarding and therefore increase congestion.
		C PZ5.6	Consider whether the train internal layout can be reconfigured to remove crowding from around the doors, by, for example, making it easier for passengers to stand in the body of the vehicle, or by widening the doors, or by increasing the vestibule area.	An example of modifications to rolling stock to increase its capacity without increasing its length is South West Trains refurbishment of Class 455s to augment the standing capacity, remove seating from around the doors and providing grab rails. These kinds of adaptations have the potential to reduce the time taken for passengers to board the train thereby reducing congestion on the platform.

Table 5.8 Platform Zone Gaps and Options Toolkit

Platform Zone - Toolkit

Gap number	Toolkit gap	Option number	Toolkit option	Comments
PZ6	Congestion at automatic ticket gatelines.	B PZ6.1	Opening of gates at times of perturbation.	Gatelines should have sufficient capacity when installed to cater for peak demand without needing to be opened. However, at times of disruption exceptional volumes of passengers may need to pass through a gateline and in these circumstances it may be necessary and appropriate to open the gates in order not to impede passenger flow. However this needs to be weighed against the adverse impacts on revenue protection.
		B PZ6.2	Directional signage above the automatic gateline indicating which gates are operating in which direction.	An example of this approach can be seen at London Marylebone where variable signs above the gates indicate which ones are open in the direction of travel. This means that passengers can get into the right queue in advance of the gateline thereby increasing the efficiency of throughput.
		B PZ6.3	Implementation of a fastboarding system whereby passengers going straight to the platform can bypass the queues of passengers waiting in front of the gateline, as trialled at London Victoria.	This system of queueing has recently been implemented at the gateline for platforms 15-19 at London Victoria. An area is segregated using a roped off barrier and floor markings to allow passengers going straight to their platform to avoid those waiting in front of the CIS screen for their platforms to be announced.
		C PZ6.4	Relocate or expand the gateline to give either more gates or greater run-off space.	This solution involves an increase in capacity and any investment would have to be justified by a value for money business case.
PZ7	Congestion at platform exit/entrances.	B PZ7.1	Directional signage on stairs and entrance ways or variable signage or other means of separating flows of passengers.	Bristol Temple Meads case study (see **Appendix A**), directional arrows to segregate the flows on stairways. Note – where escalators are provided the separation of pedestrian flows by, say, having a one-way tidal flow from a specific entrance is more practical. With stairs it is hard to persuade passengers to use the one-way system.
		C PZ7.2	If the width of the platform exacerbates crowding seek to widen the platform in absolute terms or by removing obstacles.	At Seven Sisters a structure on the platform may be removed from Platform 2 to increase the width of platform space in the area of the entrance to the London Underground station which is currently a pinch point at peak times.
		C PZ7.3	Provide new exit/entrance or enlarge existing entrance.	The Preston case study (see **Appendix A**) is an example where extra capacity is proposed at a platform entrance/exit in order to address congestion at this location in the station.
		C PZ7.4	Provide new platform to relieve congestion.	The Cardiff Central case study (see **Appendix A**) describes plans to construct a new platform in part to relieve congestion at existing platforms.

Table 5.8 Platform Zone Gaps and Options Toolkit

Platform Zone - Toolkit

Gap number	Toolkit gap	Option number	Toolkit option	Comments
PZ8	Congestion on subways and overbridges.	A PZ8.1	Consider revising the service pattern by restructuring the timetable to remove the need to interchange or by making the interchange easier for the passenger. Simpler interchange might be cross platform interchange preventing the need for passengers to use the subway or overbridges.	A theoretical example is the possibility of creating an Oxford, Didcot, Reading, Gatwick Airport service which would in theory (provided the train service was sufficiently attractive to passengers) allow the current 141,000 passengers per annum to avoid the need to interchange at Reading station. This theoretical reduction in footfall represents 4.5 % of the total interchanging passengers at Reading, but only 0.8 % of the total numbers of passengers using the station. If it were possible this would mean that passengers from stations between Reading and Oxford would not have to interchange at Reading station for the Gatwick Airport services.
		B PZ8.2	Provide improved wayfinding signage either to help passengers to find their way quickly to onward platforms, or to promote alternative routes.	At Stratford station as part of the Olympics preparation, signage has been improved to make it a more simple station to navigate. This means that passengers potentially can transit the station faster and without having to stop to work out which way to go.
		B PZ8.3	Provide improved real time information to help passengers find their onward connection and reducing congestion at points of information.	If there are several platform choices for onward connections, or passengers are not familiar with the station, real time information can help passengers quickly establish which platform they need to go to, avoiding congestion at points of information.
		B PZ8.4	Variable signage and/or one way flows particularly at peak times.	Variable signage has the potential to be used to vary the message to passengers about the direction of travel in a subway. Current examples on the network are mainly of fixed signs, but variable signage can vary the message depending on the level of demand.
		C PZ8.5	Expand overbridge or subway.	The expansion of an overbridge or subway increases the capacity for passengers to transit between platforms and has the potential to reduce congestion. To do so requires investment and would have to be justified by a value for money business case.
		C PZ8.6	Creation of additional entrances to the overbridge or subway.	Witham station where a new footbridge entrance is planned in 2011 which has the potential to reduce congestion at this location in the station.
		C PZ8.7	Provide a new overbridge or subway.	See Southampton Airport Parkway case study in **Appendix A** where an additional footbridge was provided at the station.
		C PZ8.8	Provide escalators in order to increase the flow rate of passengers.	Increased flow rate of passengers may relieve congestion in one location. However, it is important to ensure that congestion is not thereby moved to a different location within the station instead.
		C PZ8.9	Where escalators are already in place, provision of additional escalators.	Increased flow rate of passengers may relieve congestion in one location. However, it is important to ensure that congestion is not thereby moved to a different location within the station instead.

Table 5.8 Platform Zone Gaps and Options Toolkit

Platform Zone - Toolkit				
Gap number	Toolkit gap	Option number	Toolkit option	Comments
PZ9	Passengers interchanging between trains may result in congestion.	B PZ9.1	Optimise connectional margins to ensure travellers remaining on the station no longer than expedient.	This reduces the time a passenger needs to spend on the station potentially reducing congestion.
		B PZ9.2	Maximise opportunities for cross-platform or same platform interchange.	Same platform interchanges may have operational risks as it may result in crowding on the platform slowing boarding and potentially affecting train service performance.
		B PZ9.3	Consider whether rerouteing of trains may reduce demand for interchange.	For example as has already been mentioned, extending the Gatwick Airport-Reading services to Didcot and Oxford could in theory reduce the number of passengers interchanging at Reading. This service change is not actively being considered and only appears as an illustrative example.
		B PZ9.4	Ensure signage directs people efficiently to the right connecting platform.	Limited information about onward connections at Clapham Junction is a factor in causing congestion in the subway because passengers are not certain about which platform their next train will leave from.
		C PZ9.5	Use of travelators to increase and manage the flow of passengers.	Airports make use of travelators in order to move passengers long distances within stations. London Underground uses travelators for this purpose at London Waterloo and at Bank.

Table 5.8 Platform Zone Gaps and Options Toolkit

Platform Zone - Toolkit

Gap number	Toolkit gap	Option number	Toolkit option	Comments
PZ10	Platform overcrowding.	A PZ10.1	Platform allocation of services could be reviewed in order to reduce congestion.	If alternative platforms are available trains could be moved to more appropriate locations or to spread the pattern of arrivals or departures.
		A PZ10.2	Review rolling stock provision to see if it is possible to reassign rolling stock with greater door capacity for locations and times where particular delays are experienced.	This issue was raised by Worcestershire County Council relating to Class 158 end-door position delaying boarding and alighting when used on commuter services.
		B PZ10.3	Modify selective door opening (SDO) to allow control down to the individual door or vehicle and not just by unit thereby maximising the numbers of vehicles and doors that passengers can use to board and alight.	This would be an option for Class 444/450 trains on Platforms 7, 8 and 9 at Clapham Junction where at the moment SDO is only able to isolate the whole last unit on trains formed of 10/12 cars. It does not allow individual doors or vehicles in the last unit to be selectively opened. Passengers must therefore crowd into a smaller area of the platform slowing boarding and alighting times.
		B PZ10.4	De-clutter the platform by moving, for example, structures or retail units.	At Seven Sisters a structure is to be removed from Platform 2 to increase space to access the entrance to the London Underground station which is a location of peak time congestion.
		C PZ10.5	More frequent or lengthened train to take passengers off the platform onto train services more rapidly therefore reducing platform dwell time.	Timetable and rolling stock interventions have the potential to increase the capacity of the train service which increases the numbers of passengers per hour which can travel from a given station. At the same time increasing the capacity of the train service may also increase the volumes of passengers alighting from the train service particularly at terminal stations. This may result in crowding due to the volumes of passengers exiting platforms.
		C PZ10.6	Extend the platforms to accommodate longer services.	Platforms are being extended to accommodate 10-car services on suburban services into London Waterloo.
PZ11	Lift of insufficient capacity causing congestion.	A PZ11.1	Sign users to alternative facilities.	If alternative facilities exist, sign users to these locations to reduce congestion.
		B PZ11.2	De-clutter/increase the waiting space for the lift provided.	This option has the potential to increase the waiting space to reduce the density of passengers waiting for lifts.
		C PZ11.3	Replace with higher speed lift or bigger lift.	Higher speed or bigger lifts give greater capacity to move passengers thereby potentially reducing congestion.
		C PZ11.4	Install additional lifts or alternatives such as escalators.	Additional facilities increase the capacity to move passengers potentially reducing congestion, but may only move the problem elsewhere.

5.4.14 It is important in addressing congestion that the needs of people with audio, visual, learning and physical impairments are considered. For example a consultation response from the National Association of Deafened People pointed out that often at times of disruption the CIS will at times tell passengers to 'please listen for further announcements' which presents difficulties for those with hearing impairments. This issue has particular relevance to those elements of the toolkit relating to information provision.

5.4.15 For people with physical impairments their needs in terms of level access should also be borne in mind when trying to resolve congestion gaps relating to access to areas of a station. The RUS has not looked at specific issues of accessibility, this is not to diminish its significance, but reflects the remit of the RUS to look at the capacity of stations. That said investment at stations often relates in a range of benefits not just congestion relief and it may be possible to improve provision for people with a range of disabilities.

Station congestion toolkit – special events

5.4.16 Gaps and options are presented in Table 5.9 and illustrate the issues resulting from large volumes of passengers attending special events such as football matches or music concerts. The specific nature of the congestion will vary depending on the physical layout of the station, volumes of passengers and the train service, but in general the congestion resulting from special events primarily relates to large volumes of passengers arriving or departing from the station in a short period of time. Passengers travelling to the start of an event or leaving from an event generally do so within narrow time slots. The station must therefore cater for very large numbers of passengers in a compressed period of time.

5.4.17 For large events, special measures may have to be put into place to manage the flows of people and in some cases to hold passengers away from the platforms until their train is ready. Modifications may be made to the train service, special queueing arrangements may be activated, or platforms put into use that are not normally used in day-to-day operation. In some instances the sheer scale of congestion may mean that investment in additional capacity is required to cater for such volumes. As an example Stratford domestic station has undergone substantial investment, largely funded by the Olympic Development Authority to expand the capacity of the station to cater for the volumes of passengers using it during the 2012 Olympics and Paralympics Games period. The station is the main access point for the Olympic Park and while there will be significant investment in capacity at the station, temporary measures will also be implemented to manage the flows of passengers including:

- increased frequency of trains
- later night trains
- stand-by trains
- one-day Travelcard included with the Games Ticket.

5.4.18 While the 2012 Olympic Games are unique in scale the basic options that have been used are common to other events. The options that have been considered fall within the following groups and are common to other events:

A Options which affect the level of demand at stations

B Options which affect the way in which the demand uses available capacity

C Options which increase available capacity.

5.4.19 At other stations the volumes, while large, may be sufficiently infrequent that the congestion may be managed by special operational measures such as queueing systems or modified levels of train service. It may be in the interests of an event organiser to fund the capacity in order to serve their event if the railway industry does not have a value for money business case to invest in the provision of capacity for only periodic demand. To illustrate the periodic demand, in the six months from March 2011 to August 2011 there are nine events shown (at the time of writing) on the website of the Millennium Stadium in Cardiff, which is an average of 1.5 per month.

Table 5.9 Special Events Gaps and Options

Special Events – Toolkit				
Gap number	Toolkit gap	Option number	Toolkit option	Comments
SE1	Queueing to access the station.	A SE1.1	Working with the event organisers and the police to manage the flows of passengers to the station.	This may be particularly relevant for football matches separating home and away fans.
		A SE1.2	Divert passengers to alternative stations or transport.	Alternative travel may be possible, for example by bus to appropriate stations and event organisers could encourage these options for travel.
		C SE1.3	Increasing the number of staff on duty.	Additional staff may be required to cater for the increased volumes of passengers.
		C SE1.4	Increase the space available outside the station for queueing.	The expansion of capacity to access the station to cater for events would have to have a positive business case to be considered for implementation.
SE2	Congestion on the concourse.	A SE2.1	Queueing systems to hold passengers away from platforms until their train is ready.	Queueing systems are employed at Cardiff Central to cope with volumes of passengers leaving Millennium Stadium events.
		A SE2.2	Reducing the need for ticket purchase on the day of travel.	For the Olympics a Games Ticket will also include a One-Day Travelcard thereby removing the need for spectators to purchase tickets on the day of travel.
SE3	Congestion accessing the platforms.	C SE3.1	Using additional infrastructure such as extra platforms or entrances which are not normally required.	Additional infrastructure for infrequent usage may need to be funded by the event organiser.
SE4	Congestion on the platform.	A SE4.1	Only allowing exit and interchange passengers to use the station.	At Cardiff Queen Street on Millennium Stadium event days the station is open only for exit one hour after the event at the stadium has commenced. Passengers arriving from Cardiff Bay are unable to join northbound Valley Lines services owing to train services already being full and standing. Instead they are required to travel to Cardiff Central to join a queueing system.
SE5	Congestion boarding the train service.	C SE5.1	Consider modifying the train service to provide additional capacity.	A number of stations serving frequent event sites are served by additional trains on event days, for example, Newbury Racecourse Station.

5.5 Conclusion

5.5.1 This chapter has detailed gaps for both information on station usage and also for generic congestion gaps. Options have been proposed to address both of these two types of gaps.

5.5.2 Based on the growth forecasts for 2019 and 2031 gaps in capacity are quantified for those stations which have been identified as congested. A range of Fruin levels of service are presented for both the short and long term footfall growth.

5.5.3 **Chapter 6** details the consultation process, responses and the actions that have been undertaken to address comments received during the consultation period.

5.**5.4** **Chapter 7** will now go on to make recommendations based upon the analysis of gaps and options, as well as setting out the next steps.

6. Consultation process

6.1 The Draft for Consultation

6.3.1 A Draft for Consultation of the Network RUS (Stations) was produced in conjunction with the cross industry Working Group and approved for publication by the Stakeholder Management Group. The Draft for Consultation was published on 6 May 2011 along with a press release announcing its publication. A 60 day period of consultation followed for stakeholders and other interested parties to respond formally to the proposals in the Draft RUS. The consultation closed on 8 July 2011 and the consultation responses are published on Network Rail's website **www.networkrail.co.uk.**

6.2 Consultation responses

6.2.1 48 responses to the consultation document were received. Those who responded fell broadly into seven categories as listed below:

The RUS Stakeholder Management Group and the RUS Working Group

- ATOC
- DfT
- London TravelWatch
- ORR
- Passenger Focus
- PTEG
- TfL
- Transport Scotland
- Welsh Government

Train Operating Companies and Owning Groups

- Arriva Trains Wales
- East Coast Main Line Company Limited
- FirstGroup

Local and regional authorities

- Association of Transport Coordinating Officers
- Birmingham City Council
- Blackpool Council
- Cambridgeshire County Council
- Chelmsford Borough Council
- City of York Council
- Colchester Borough Council
- East Sussex County Council
- Essex County Council
- Hampshire County Council
- Hertfordshire County Council
- Lancashire County Council
- Luton Borough Council
- Norfolk County Council
- Peterborough City Council
- Plymouth City Council
- Rochdale Metropolitan Borough Council
- Rother District Council
- Royal Borough of Windsor & Maidenhead
- South Gloucestershire Council
- Suffolk County Council
- TACTRAN
- Tandridge District Council
- West Sussex County Council
- Worcester County Council

Passenger Transport Executives

- South Yorkshire Passenger Transport Executive
- Strathclyde Passenger Transport

Rail user groups and interest groups

- GATCOM
- Huddersfield Penistone and Sheffield Rail Users Association
- Marylebone Travellers Association
- National Association of Deafened People
- Railfuture
- TravelWatch East Midlands

Property developers

- GWPlanning

Individuals

- Two individuals responded to the RUS

6.2.2 The responses received were all well considered and provided useful contributions about individual congested stations as well as the wider toolkit of options to address generic congestion gaps at stations. All respondents recognised the significance of station congestion as an issue affecting passengers and station users. The overall response to the RUS was positive. Support was expressed for the key gaps that have been identified ie congested stations and information on station usage. Respondents welcomed the approach of local solutions using tools such as station travel plans and partnership. A number of respondents gave further useful information about specific stations such as Chelmsford, Cardiff Central and Cardiff Queen Street.

6.2.3 The formal consultation responses that have been received are published on Network Rail's website **www.networkrail.co.uk**. The next section of this Chapter summarises the key themes.

6.3 Key themes in the consultation responses

Comments on the scope

6.3.1 The importance of developing a strategy for the capacity of stations was acknowledged by all respondents. The significance of congestion at stations as a potential barrier to growth was recognised. To emphasise this point, a number of responses highlighted the importance of particular stations to the surrounding regional economy. East Coast, for example, pointed out that the changes to their timetable introduced in May 2011 will potentially have an effect on demand at stations by increasing the numbers of services.

6.3.2 A minority of respondents commented on the scope of the RUS. Facilities, accessibility, and service standards at stations were not included in the scope of the RUS except where they impact upon capacity. A number of respondents ranging from TfL, Hertfordshire County Council to rail user groups, expressed the view that the RUS should have considered these factors either at specific stations or in general. This has not been pursued further because it is outside the agreed remit which focuses on station capacity issues. This is not to diminish the importance of these issues which are being considered outwith the RUS.

6.3.3 Station categorisation was also not part of the scope of the RUS but it is being considered by Network Rail as part of wider initiatives in relation to stations. A number of respondents raised the question of the appropriateness of station categorisation at certain individual stations and the system structure itself. The RUS does not propose to address these questions further as the wider system of categorisation of stations is being considered separately.

Comments on the baseline

6.3.4 A large number of responses supported the approach of identifying stations for further investigation of congestion. There were some concerns raised notably by TfL and PTEG about the robustness of the methodology. It was recognised that the methodology was presented with caveats in the Draft RUS. Given the numbers of stations on the network the RUS sought to use a qualitative methodology to identify stations which merited in-depth future investigation. The final RUS further emphasises these points and puts the methodology in context as a result of the comments raised.

6.3.5 Interestingly a number of respondents recognised that, while there were no congestion issues in their particular area, passengers from their locality were affected by congestion at other stations such as terminal stations, and also demand from their area was affected by and contributed to that congestion.

6.3.6 There was support for the approach of considering stations using the three activity zones in order to conceptualise the usage of capacity at stations. However, some respondents suggested that the specific needs of certain travellers needed to be considered, such as those travelling to access education.

6.3.7 A number of respondents suggested that further explanation was required of the impact of future uncommitted projects. HS2 is one project that was referenced in a number of places in the Draft RUS. TfL also suggested that other uncommitted major schemes such as the Chelsea – Hackney Crossrail 2 also should be included in terms of their impact on stations. A section has therefore been added to **Chapter 3** which details the general potential impact of major uncommitted schemes on stations on the network.

Comments on the drivers of change

6.3.8 A number of the comments that were received on the drivers of change section of the Draft RUS suggested that further explanation was needed of the demand forecasting methodology as applied to the Fruin Levels. The final version of the RUS therefore includes a further explanation of the forecasting methodology in **Chapter 4**.

6.3.9 Impact of local demand factors on the specifics of station congestion growth were raised in a number of instances. The final RUS addresses these comments in the further explanation of the forecasting methodology.

6.3.10 It was suggested that the RUS could include consideration of changing arrangements for the leasing of stations. **Chapter 7** in the final RUS includes a discussion of the potential impact of these changes on addressing congestion at stations.

Comments on the gaps and options

6.3.11 There was widespread acknowledgment of the current weaknesses of data sets on station usage and support for the idea of addressing this gap. Many respondents welcomed the suggestions around station travel plans and master plans. A number raised the question of master plans for TOC managed stations. Many local authority respondents, while welcoming the ideas on travel plans, raised the question of resources. On the subject of car parking, there was general approval for the RUS approach of suggesting that car parking decisions are best addressed at a local level.

6.3.12 East Coast along with other respondents requested further explanation of how automatic counting systems would be deployed in the management of stations. They also recognised that on-train counters are not an adequate means of assessing passenger volumes at stations.

6.3.13 The list of individual congested stations was, not surprisingly, the subject of several consultation responses. Of those responses further consideration has been given to Chelmsford which was raised by both Essex County and Chelmsford Borough Councils. In discussion with London Midland the congestion issue that they raised on certain platforms at Watford Junction has also led to reconsideration of the recommendation.

6.3.14 A number of respondents raised the question of special events affecting stations which were not mentioned in the Draft RUS. SPT pointed out the impact of the 2014 Glasgow Commonwealth Games on stations in and around Glasgow.

6.3.15 Whilst the final RUS has made some individual changes to gaps at stations either because of changed circumstances or further information, the main means by which the RUS has addressed these comments is by setting out a process by which station congestion can be assessed. This ensures that, for stations both on and off the list, interventions can be prioritised as circumstances change. This may mean some stations no longer require interventions while others become more of a priority. Above all the list of 118 stations is not intended to be definitive as circumstances will change over the 30 year time horizon of the RUS. Importantly, the strategy is able to cope flexibly with these events.

6.3.16 The Toolkit of generic gaps and options at congested stations generated a number of useful comments from respondents. The omission of the needs of people with hearing impairments was raised by the National Association of Deafened People and this point has been addressed in the final RUS along with the needs of people with other impairments.

6.3.17 The management of demand by pricing strategies at stations as an option to address congestion was one that raised some concern from respondents. However, this has remained in the Toolkit as a potential tool available to manage congestion at stations and more generally on the rail network.

6.3.18 A response from East Coast suggested that the impact on congestion of disruption was an area which should be addressed by the final RUS. Accordingly the RUS has given some additional thought in the toolkit of gaps and options to this issue affecting station capacity.

Comments on the recommendations

6.3.19 The key concern raised by a number of respondents was the implementation of recommendations at congested stations. The final RUS has sought to provide more definitive recommendations on those stations where the congestion issue is identified as requiring intervention in CP5. The process by which these recommendations will be taken forward is the Initial Industry Plan which will in turn inform the High Level Output Specification of what the Governments wish to fund in CP5 (2014 to 2019).

6.3.20 More widely the RUS has sought to set out a clear and simple process by which station congestion can be assessed. This process aims to draw together recommendations on collection of information with assessing congestion. This is intended to address both those concerns about implementation and also those stations either not on the list of 118 stations or those not recommended for intervention.

6.3.21 In the context of implementation, a number of respondents noted the possible impact of franchising policy. A discussion has been included in **Chapter 7** of both the potential funding sources and the impact of policy changes in the railway industry on addressing congestion at stations.

6.3.22 Importantly, support was expressed for the partnership approach which cuts across a number of the recommendations made by the RUS.

Comments on the case studies

6.3.23 Specific comments were received on a number of case studies. Comments in some instances provided additional information or suggested changes. The case studies which were mentioned in responses were:

- Cardiff Central
- Cardiff Queen Street
- Clapham Junction
- Littlehaven
- Liverpool Central
- London Waterloo
- Preston.

6.3.24 Changes have been made to reflect these comments.

6.4 Conclusion

6.4.1 The responses that were received have helped to inform the strategy and next steps for the RUS which are presented in **Chapter 7**. The responses have strengthened the information on specific stations and added to the range of the Toolkit of gaps and options at congested stations. Specific changes have been made to the recommendations to tie together the strategy on station usage information, congestion at specific stations and the toolkit of gaps and options. This also identified those parties responsible for taking forward the recommendations.

7. Strategy and next steps

7.1 Introduction

7.1.1 This chapter sets out the recommendations of the RUS and a potential strategy for its implementation. It draws together the conclusions from the analysis that has been conducted to develop the RUS and reflects the consultation responses that have been received. Recommendations are presented based on medium term growth forecasts to 2019 and in the long term forecasts to 2031. The chapter is divided into the short, medium and long term which relate to Network Rail's Control Periods.

7.1.2 The chapter also sets out the next steps for the RUS, which will become established 60 days after publication unless the Office of Rail Regulation (ORR) issues a notice of objection in this period.

7.1.3 The recommendations of a RUS – and the evidence of relationships and dependencies revealed in the work to meet them – form an input into the strategic decisions made by the industry's funders and suppliers. The RUS has informed the development of the Initial Industry Plan which forms the railway industry's vision for the railway in the period between 2014 and 2019 and beyond.

7.2 Short term – (Network Rail Control Period 4 to March 2014)

7.2.1 Network Rail's funding for CP4 does not include further funds for intervention in congestion relief beyond committed schemes described in the baseline of this RUS. The funding of investment for relief of congestion at stations can come from a variety of sources which broadly fall into the following areas:

- TOC investment
- Local Government
- Property developers
- Network Rail's own funds.

7.2.2 The key recommendations that relate specifically to CP4 concern information on station usage. Analysis of the current data sets on passenger throughput at stations has been presented in **Chapter 3**, followed by gaps and options in **Chapter 5**. In this chapter, recommendations are made about the collection of information about station usage in order to assess station capacity requirements in the future.

7.2.3 **Option 1 (a) and (b)** – Station Master Planning and Station Travel Planning are being undertaken by Network Rail at managed stations and in the case of Travel Plans have been incorporated in the most recent South Central franchise award, as well as having been undertaken separately at a number of trial stations. The Rail Safety Standards Board (RSSB) is currently reviewing the effectiveness of a pilot study into Station Travel Plans. The RUS recommends that where cost effective these initiatives are continued by the rail industry and that they are used as a framework for the collection of information on station usage.

7.2.4 Many consultees, including Local Authorities, support Station Travel and Station Master Plans. However, a number of Local Authorities noted the lack of funding commitments to implement Station Travel Plans more widely.

7.2.5 **Option 2 (a) and (b)** Automatic footfall counting installation:

- **2 (a) At stations** – Network Rail is currently developing proposals to invest in automatic footfall counting systems for the stations it manages. This approach could also be considered more widely where congestion issues are identified. Portable systems are also being investigated which may have further potential in this respect. The installation of counters provides extensive information about passenger usage of stations which can be analysed and used in either static or dynamic models of pedestrian flows. There are also other advantages to station operators in that such systems provide information about retail footfall which can be used to maximise rental incomes, or to provide information about the day-to-day management of the station. They allow the identification and prioritisation of areas of congestion that need to be addressed, and give information which allows options to be appraised.
- **2 (b) On trains** – automatic passenger counters are now installed on 39 per cent of the national train fleet. It is recommended that the approach of installing passenger counting systems on new or refurbished vehicles is continued. It is also recommended that consideration be given to whether the outputs of these systems can be harmonised when procuring these systems in the future in order to provide a dataset which can be fully compatible to maximise its value to

the rail industry. Counters on trains also allow congestion to be identified and addressed to benefit passengers by improving both on-train and station environments. It is recommended that Automatic Passenger Counters be used more widely for monitoring station usage, where there is a business case to do so (given that their primary purpose remains the development of timetables and efficient deployment of TOC resources).

7.2.6 Option 2 (c) – an option considered was the potential to include more questions in the National Passenger Survey about congestion on stations. This option would increase the data available about congestion on stations in terms of passenger attitudes and perceptions. It is recommended that this option is considered by Passenger Focus, whose decision would need to take account of the existing size and content of questionnaire.

7.2.7 Option 2 (d) – conducting counts on stations at the same time as the Autumn Passenger Census could provide additional information about the usage of the station in relation to its capacity.

7.2.8 Option 2 (e) – greater coordination – it is recommended that opportunities are taken to maximise the value of information already collected to ensure that datasets are coordinated so as to extract the greatest value and benefit from the information already available to the railway industry on station usage. For Option 2(g), developing pedestrian models at larger stations, it is also recommended that the models within the industry are shared where the opportunity exists.

7.2.9 Option 2 (f) – undertaking a qualitative survey of Fruin levels at stations across a wider section of the network would have an associated cost. It might provide a wider view of the congestion levels on the network in order to prioritise intervention. However, it is concluded that the process undertaken by the RUS is likely to have considered a sufficient breadth of stations in creating a list of stations for more detailed investigation. It is not therefore recommended that this is undertaken beyond the work that the RUS has already conducted. However, the qualitative process that has been undertaken by the RUS forms a possible framework for any future wide scale investigation of congestion at stations.

7.3 Process for assessment of station capacity and toolkit of generic gaps and options for congested stations

7.3.1 Given the variety of circumstances of station congestion the RUS has sought not to be prescriptive. Instead, the RUS has developed a toolkit of generic station congestion gaps and options. The aim of this toolkit is to provide a resource in addressing congestion issues at stations and to ensure that decision makers consider the range of options first to ensure capital investment is deployed as efficiently as possible.
The toolkit can be found in **Chapter 5.**

7.3.2 In addition the RUS has sought to set out a simple process for consideration of station congestion. This process aligns the station usage information recommendations with a process to consider congestion issues that arise in the future. The list of congested stations considered by the RUS is not definitive and should not be perceived as fixed. Instead changes in circumstances at individual stations may result in congestion either increasing or decreasing. The framework for the RUS's recommendations needs to be sufficiently flexible to take account of these changes to remain relevant.

7.3.3 The RUS recommends a process for approaching assessment of congestion at stations. This process is set out in **Figure 7.1**. Along side this process the Network Rail 'Station Capacity Assessment Guidance' **www.networkrail.co.uk**, provides advice on the technicalities of assessing station capacity. The process provides a framework for considering stations that have not been assessed by the RUS or reprioritising those referenced in the RUS in the future. The structure of the process matches that of the toolkit in that it suggests the consideration of different levels of interventions, starting with those of little or no cost, to resolve the gap.

7.4 Medium term (Control Period 5 April 2014 to March 2019)

74.1 Investigation of intervention is recommended in CP5 for stations that are forecast to be at Fruin levels E or F by 2019 and where there are no current plans to address these levels of congestion. The stations which have been identified as being in this category in **Table 5.4** in **Chapter 5** are:

- Basingstoke
- Bristol Parkway
- Clapham Junction
- Liverpool Lime Street
- London Charing Cross
- London Fenchurch Street
- London Victoria
- Preston
- Surbiton
- Watford Junction
- Wimbledon.

7.4.2 It is important to note that the scale of intervention to be considered at these stations may vary considerably. 'Softer' measures (measures that need little or no capital expenditure) from the toolkit may be appropriate at some locations.

7.4.3 It is recommended that these stations are considered for inclusion in the Government's HLOS for England and Wales.

7.4.4 There are a number of stations with long term plans which would address existing congestion issues but which may not be fully committed or developed. The RUS recommends the continued development of existing plans at the following stations which have been identified as being in this category in **Table 5.4** in **Chapter 5**:

- Barking
- Bristol Temple Meads
- Chelmsford
- Derby
- Finsbury Park
- Glasgow Queen Street (High Level)
- Leeds
- Liverpool Central
- London Euston
- Manchester Piccadilly (west side Platforms)
- Manchester Victoria
- Tottenham Hale.

7.4.5 Where the impact of investment and future growth is uncertain it is recommended that those stations are kept under review in the period up to 2019. The stations which have been identified as being in this category in **Table 5.4** in **Chapter 5** are:

- Birmingham Snow Hill
- Bromley South
- Herne Hill
- Lewisham
- London St Pancras International (Upper Levels Midland Main Line Platforms)
- London Waterloo East
- Orpington
- Seven Sisters.

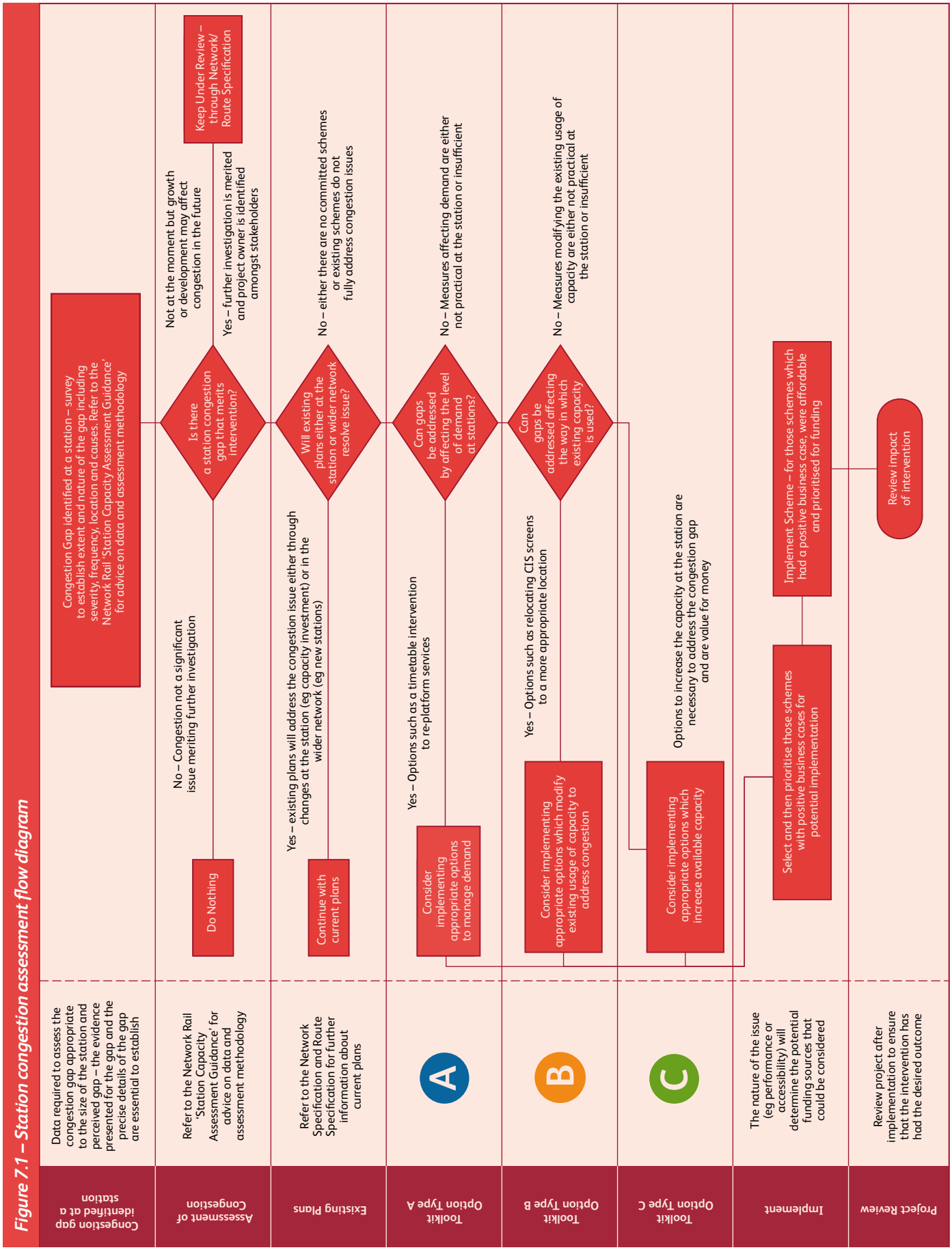


Figure 7.1 – Station congestion assessment flow diagram
Congestion gap identified at a station
Assessment of Congestion
Existing Plans
Toolkit Option Type A
Toolkit Option Type B
Toolkit Option Type C
Implement
Project Review
Data required to assess the congestion gap appropriate to the size of the station and perceived gap – the evidence presented for the gap and the precise details of the gap are essential to establish
Refer to the Network Rail 'Station Capacity Assessment Guidance' for advice on data and assessment methodology
Refer to the Network Specification and Route Specification for further information about current plans
A
B
C
The nature of the issue (eg performance or accessibility) will determine the potential funding sources that could be considered
Review project after implementation to ensure that the intervention has had the desired outcome
Congestion Gap identified at a station – survey to establish extent and nature of the gap including severity, frequency, location and causes. Refer to the Network Rail 'Station Capacity Assessment Guidance' for advice on data and assessment methodology
Is there a station congestion gap that merits intervention?
No – Congestion not a significant issue meriting further investigation
Do Nothing
Not at the moment but growth or development may affect congestion in the future
Keep Under Review – through Network/ Route Specification
Yes – further investigation is merited and project owner is identified amongst stakeholders
Will existing plans either at the station or wider network resolve issue?
Yes – existing plans will address the congestion issue either through changes at the station (eg capacity investment) or in the wider network (eg new stations)
Continue with current plans
No – either there are no committed schemes or existing schemes do not fully address congestion issues
Can gaps be addressed by affecting the level of demand at stations?
Yes – Options such as a timetable intervention to re-platform services
Consider implementing appropriate options to manage demand
No – Measures affecting demand are either not practical at the station or insufficient
Can gaps be addressed affecting the way in which existing capacity is used?
Yes – Options such as relocating CIS screens to a more appropriate location
Consider implementing appropriate options which modify existing usage of capacity to address congestion
No – Measures modifying the existing usage of capacity are either not practical at the station or insufficient
Options to increase the capacity at the station are necessary to address the congestion gap and are value for money
Consider implementing appropriate options which increase available capacity
Select and then prioritise those schemes with positive business cases for potential implementation
Implement Scheme – for those schemes which had a positive business case, were affordable and prioritised for funding
Review impact of intervention

7.5 Long term beyond 2019

7.5.1 The RUS recommends that the need for interventions in the medium to long term should be kept under review at those stations forecast to be at Fruin levels E or F where there are no current plans to address these levels of congestion. The recommendation for these stations is that any future planning work should include investigation of the congestion at these stations in greater detail and to appraise options for addressing the congestion gaps. The stations which have been identified as being in this category in **Table 5.4** in **Chapter 5** are:

- Balham
- Birmingham Moor Street
- Bradford Forster Square
- Bradford Interchange
- Cardiff Central
- Cardiff Queen Street
- Coventry
- Glasgow Central (Low Level)
- Guiseley
- Halifax
- Huddersfield
- Lichfield City
- Lincoln Central
- Liverpool James Street
- London Marylebone
- Nuneaton
- Princes Risborough
- Salford Central
- Shipley
- Solihull
- Tamworth
- Walsall
- Woking.

7.5.2 For the other stations in **Table 5.4** in **Chapter 5** intervention is not proposed beyond current plans. In these cases either current congestion and growth is not sufficient to recommend intervention, or, planned investment will address capacity constraints in the foreseeable future. It is important to note that this recommendation may need to be reviewed if circumstances change at the station.

7.6 Changing station management and policy environment

7.6.1 In the period that the RUS has been developed there have been changes proposed to the way in which the rail industry manages stations. The policy seeks to address the perceived complex allocation of roles and responsibilities in the contractual structure governing stations. In the context of the RUS this means that there may be changes in the roles and responsibilities of the parties currently involved in station management and investment. For the franchises that are currently in the process of being re-let the potential for Station Facility Owners to take greater responsibility for stations (including full repair leases) and rights to manage and develop stations are being considered. Other franchise policies designed to incentivise franchises to invest by giving longer franchises may also mean TOCs having a greater role in investing to address congestion.

7.6.2 It is hard to predict the precise impacts of these changes, not least because there will be a transition period. The changes are likely to affect different stations in different ways. There may well be a wide spectrum of impacts ranging from full TOC control and investment, to the continuation of the current arrangements.

7.6.3 Given the changes in responsibilities, the RUS has suggested a flexible approach using the toolkit and station capacity process. It is hoped that this will mean that the RUS's findings can remain relevant because they can be flexible to adapt to differing structures, quite apart from other changes in circumstances at specific stations.

7.6.4 The RUS is consistent with the McNulty 'Rail Value-for-Money Study' as its recommendations seek to promote an industry which is affordable and efficient. The rail industry as a whole has a substantial challenge to reduce the cost of running the railway while catering for growth and maintaining quality. Station capacity and congestion at certain stations is a symptom of the success in terms of growth in passenger numbers that has been experienced. However, the railway industry's challenge is to address such issues in an affordable manner.

7.7 Car parking provision

7.7.1 **Section 3.10** discussed some of the drivers and influencing factors relating to car park usage at stations. It is important not to see car parking in isolation from the other modal choices to access the station.

7.7.2 Car parking charges are levied, or indeed not levied, for a variety of reasons. This maybe for:

- earning a commercial rate of return
- managing demand or discouraging non-rail parking.

7.7.3 But equally:

- no charges may be levied in some areas in order to promote the usage of rail services particularly in the off-peak
- car-sharing discounts may incentivise efficient usage of car parking space.

7.7.4 The factors which affect price relate to the intended purpose of the charge and/or to the price of alternative car parking facilities. While many car parks are provided at stations, a substantial number of these are not directly operated by the railway and in some instances neither the train operator nor Network Rail has any role in setting the price of car parking.

7.7.5 As has been illustrated in **Chapter 3**, there are a wide variety of car park provision and pricing policy choices. Some areas may choose to increase car parking capacity and reduce price in order to encourage train usage in particular in the off-peak. Others may choose to increase price as a way of managing car parking demand. Local Authorities and Passenger Transport Executives may set strategic direction for these issues. The RUS cannot prescribe solutions because local factors will determine what the appropriate approach is. Instead the toolkit in **Chapter 5** suggests options to address car parking capacity gaps which range from managing demand by giving discounts to users who car share, to increasing car parking capacity by expanding the car park either vertically or horizontally. The correct solution for car parking supply needs to be considered at a local level taking into account the means by which station users access the station. The RUS therefore recommends that car parking is considered as part of a Station Travel Plan approach.

7.8 Investment in Stations Guide

7.8.1 As part of the work of producing this RUS the 'Investment in Stations – A Guide for Promoters and Developers' has been updated. This is a document which was last updated in 2008, and which provides guidance to any organisation which is interested in investing in new stations or enhanced facilities at existing stations. In order for this document to remain a useful tool it has been further revised to reflect the latest position at the time of writing. This document has been published on Network Rail's website at – **www.networkrail.co.uk**

7.9 Conclusion

7.9.1 **Chapter 7** has recommended an approach for both the gaps in information on station usage and gaps in station capacity. While there are weaknesses with some of the data sets on station usage the main recommendation is that existing data is coordinated more effectively. Further information could also potentially be collected by using automatic footfall counters more extensively at stations. This process also sets out a framework to allow the RUS's recommendations to be flexible to be able to take account of changing circumstances which influence congestion at stations on the network. Changes may result in either increases or decreases in levels of congestion and the process for considering congestion is intended to refocus priority accordingly.

7.9.2 The RUS recognises that the sources of funding for intervention to address congestion at stations and the parties who may be involved are varied. Train Operating Companies, Network Rail, Local Authorities, Local Enterprise Partnerships, Community Rail Partnerships, Developers, Department for Transport (DfT), Transport Scotland and the Welsh Government all potentially have a role to play. Other parties such as event organisers may also have a role in addressing congestion at those specific stations serving event sites. In implementing schemes to address congestion, a partnership approach is desirable because stations fall at the interface between the railway, local communities and the rest of the transport system. Indeed options such as implementing Station Travel Plans implicitly need a partnership between Local Authorities and the railway industry. Most directly those stations recommended for intervention in CP5 have informed the development of the Initial Industry Plan which is the railway industry's first submission for funding for the period between 2014 and 2019.

7.9.3 The RUS will be reviewed periodically by the Network RUS Stakeholder Management Group to ensure that circumstances have not changed that have an impact upon its recommendations.

7.9.4 The information available on station usage has had a consequence on the ability to recommend actions to address station capacity gaps. Instead a toolkit of generic station capacity gaps and options has been presented. This is intended to be a resource for the industry as a whole for use when addressing congestion at stations. It is important that each station is treated on its own merits and that a proper assessment of costs and benefits of any proposed intervention is undertaken. Those stations which are forecast as having congestion issues by the end of CP5 in 2019, and in 2031, (and where no intervention is currently proposed) are recommended for further investigation.

Appendix A – Case studies

Case studies:

1. Bristol Temple Meads
2. Cardiff Central
3. Cardiff Queen Street
4. Clapham Junction
5. Farnborough Main
6. Farnborough North
7. Haymarket
8. Littlehaven
9. Liverpool Central
10. London Waterloo
11. Preston
12. Southampton Airport Parkway
13. Station Travel Plans.

As discussed in **Chapter 5 Section 5.4** the case studies were selected because they represent a cross-section of station congestion issues and categories of station.

The case studies do not recommend options, instead they suggest possible approaches to mitigate or resolve the congestion issue(s) at the particular station. These have been used to populate the toolkit of gaps and options.

It should be recognised that no guarantee can be given as to the overall success of a particular option owing to the individual characteristics of a station. Therefore options for congestion relief at each case study station should be seen as potential solutions and do not represent committed interventions. If any of the suggested options were to be taken forward at the case study stations, a value for money business case would need to be established alongside securing of appropriate funding for the investment.

Gaps have been organised in same structure as the station congestion toolkit (**Tables 5.6** to **5.9** in **Chapter 5**):

- **Access Zone (AZ)** – area through which the station user accesses or exits the station to onward transport
- **Facilities Zone (FZ)** – where the needs of passengers for services and facilities on the station are met
- **Platform Zone (PZ)** – area for waiting for train services, information about train services, and access and egress to and from the train itself.

Potential options to address congestion have been listed in order of level of intervention:

A options which affect the level of demand at stations

B options which affect the way in which the demand uses available capacity

C options which increase available capacity.

Case Study No. 1
Bristol Temple Meads

Station Category: A

2009-10 annual exits, entries and interchanges: 8.9 million

A. Introduction

Bristol Temple Meads is the primary station for central Bristol. Currently the station has 13 platforms which are in use. The station is located approximately a mile from the city centre and is operated by First Great Western.

A station plan of Bristol Temple Meads can be seen via the following link to the National Rail Enquiries website: **http://www.nationalrail.co.uk/stations/sjp/BRI/stationOverview.xhtml**

B. Baseline

The station acts as a national hub for a mix of long distance, regional and local services within the South West. The station has half hourly services to London Paddington, Birmingham New Street and Cardiff Central and hourly services to Exeter St Davids, Edinburgh Waverley, Glasgow Central, Manchester Piccadilly, Plymouth, Southampton Central and Portsmouth Harbour. Less frequent services operate to destinations such as Aberdeen and Dundee. Local services also operate within the Greater Bristol conurbation, serving locations such as Filton Abbey Wood, Lawrence Hill and Severn Beach.

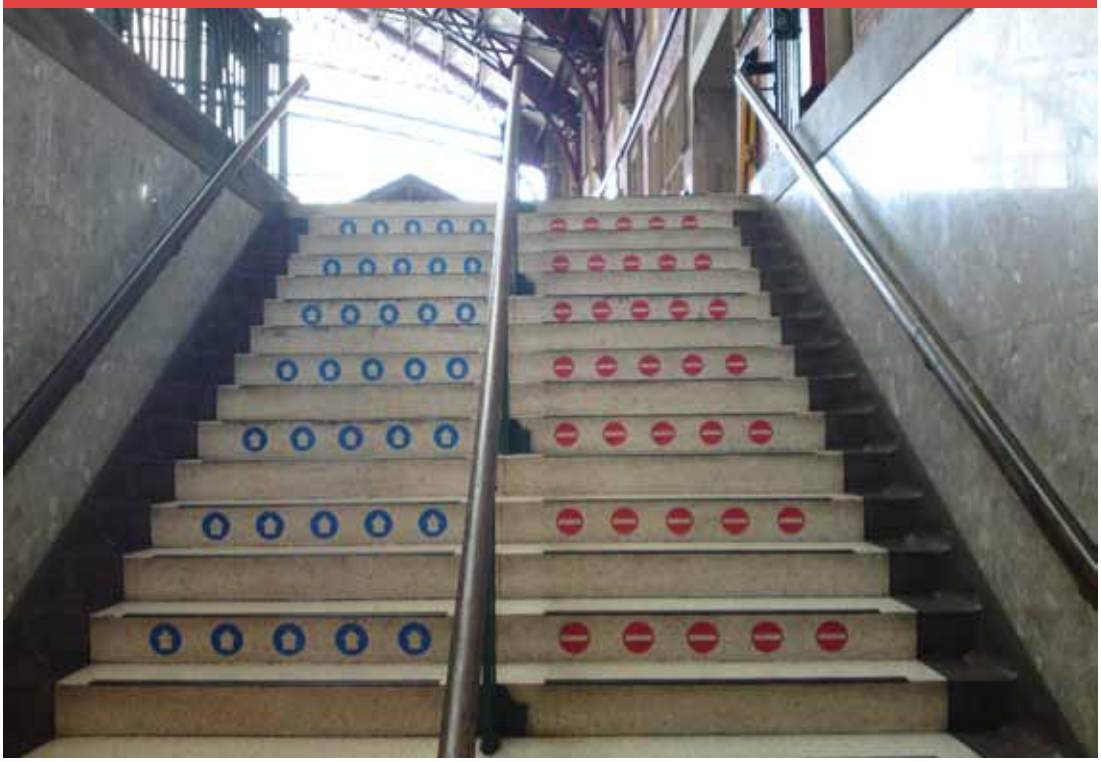
The station acts as an important interchange for train services from Scotland, Birmingham, South Wales, Wiltshire, Dorset and London, the West Country and local commuter services. Office of Rail Regulation station usage data highlights the station's importance as an interchange between national rail services. In 2009-10 a total of 0.89 million passengers interchanged between trains at the station. This figure excludes passengers interchanging between rail and other modes.

Current congestion is focused around the following areas:

- station forecourt – particularly during the morning and evening peak congestion occurs between conflicting flows of passengers arriving and leaving the station. It is the main pedestrian route out of the station and provides access to buses, taxis, pick up and drop off facilities, and car parking
- concourse – ticket purchasing facilities at both ticket windows and ticket vending machines experience considerable queueing in the morning and evening peak. Congestion also occurs on the concourse from conflicting flows and the lack of space for passengers to wait. This is particularly prevalent around the Customer Information Systems which is located immediately in front of the gateline. **Photograph 1** illustrates the concourse and conflicting users of the station
- automatic ticket gates – congestion at the ticket gates after some train arrivals, particularly in the morning peak
- platforms – during the morning and evening peaks congestion occurs at a number of staircases accessing the platforms. Particular problems occur with the volumes of arriving passengers and the conflict between those trying to gain access to the platform. Directional flow signage, as shown in **Photograph 2**, is provided on the steps.

Photograph 1 – Bristol Temple Meads concourse

Photograph 2 – Stairway directional flow signage Platform 3



C. Future plans and aspirations

During the past 10 years, the area outside the station has been substantially developed and existing proposals for future development of the immediate area surrounding the station are substantial. The growth in passenger numbers is one of the principal drivers for enhancing the station layout to improve the way in which passengers pass through the station. A Network Rail funded study into proposed station enhancement has been undertaken and options have been considered for investment in the station.

The options include making use of the Digby Wyatt Shed which was the original railway terminus. It is currently a car park, but there are proposals to relocate this function and replace it with station facilities from the existing concourse.

The options under consideration are set out in more detail in the options section of the gaps and options table.

D. Gaps and options

The gaps and options at Bristol Temple Meads are set out in the table opposite:

Access Zone			
Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
AZ1	The station forecourt experiences congestion and conflicting pedestrian flows. It is a key pedestrian route to the station. In addition, it is the main cycle route to the station, provides access to the short and long term car parks, car drop off/pick up points, service buses, airport buses and access to the British Transport Police private car park. The constraint is most noticeable during the morning and evening peaks	C AZ1.3	A potential option for mitigating or resolving this constraint could include moving the car pick-up/drop-off and car parking facilities from the front of the station to the rear of the station accessed from the Cattle Market Road
		C AZ1.4	A potential option is to open the existing staff entrance/exit adjacent to the Bonapartes Café on Platform 3 for public access. This would provide an additional entrance/exit, and could help to relieve congestion experienced at the existing gateline and in the main ticket hall/ concourse area. In order to realise such an option consideration would need to be given to the re-location of a fire-escape for the first floor offices and associated air conditioning and removal or decrease of the Panel Signal Box footprint

Facilities Zone			
Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
FZ1 & 3	Ticket purchasing facilities – at present, queues occur at ticket windows and ticket machines during the am and pm peaks. At present the level of ticket purchasing available for current day of travel consists of four ticket machines and up to five ticket windows.		Consider options in the toolkit for Gap FZ1 and 3.
FZ5	Concourse congestion - the concourse experiences congestion owing to the space available to dwell within the station building. In addition the Customer Information Screens are on the key desire line to/from the gateline.	C FZ5.2	A potential option is to open up the Queen's entrance adjacent to the disused Platform 2. This could help relieve congestion in the existing booking hall and at the gateline. However it is uncertain how much overall benefit this option could give since the location of the potential entrance/exit is distant from the main subway to Platforms 5 to 15. The entrance/exit would be useful for cyclists entering/leaving the station since it is close to the cycle stands. It would have the potential to reduce the number of cyclists entering/exiting the station via the main concourse. Additional entrances, especially if gated, incur additional staffing costs.
		C FZ5.2	A number of commercial and other developments are expected to be initiated on the southern and eastern sides of the station in the short and medium terms. An option could be to develop an additional entrance/exit connecting the new mixed-use development. This would involve opening up the existing passenger subway through to the new development. At present, the end of the subway is a First Great Western stores facility. The long term benefit of a south/east side entrance could be in providing a convenient alternative access to the high numbered platforms usually used by trains to/from London Paddington (11, 12, 13 and 15). It would help to alleviate congestion in the main booking hall, gateline and stairwells from Platform 3 to the passenger subway.
		C FZ5.2	A potential option is to refurbish the Digby Wyatt Shed. This would include the provision of retail units. Currently the Grade One listed Digby Wyatt Shed is used for car parking. Under this option it would be proposed to relocate the ticket office into the shed and provide retail unit space. This option could have the added advantage of creating greater space for passenger circulation and resolving an existing gap relating to current booking hall and concourse capacity. In addition it would be proposed to create additional entrances to the Digby Wyatt Shed from the Temple Quays office development to integrate with future mixed use developments and a proposed bus interchange. This option ideally would be most beneficial if it was combined with extending the passenger subway from Platform 3 to the shed.

Platform Zone			
Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
PZ6	Gateline capacity – queues occur at the gateline when there are a number of consecutive train arrivals, particularly during the morning peak.		Consider options in the toolkit for Gap PZ6.
PZ7	Platform exit stairwell congestion following an arrival of a train – typically following a long distance arrival on any of Platforms 9, 11, 13 and 15. The nature of the congestion centres upon passengers trying to descend via the staircases.		Consider options in the toolkit for Gap PZ7.
PZ8	Platforms 5 to 15 subway entrance from Platform 3 – Platforms 5 to 15 are accessed via two sets of stairs to the subway from Platform 3. The overwhelming majority of passengers (96 per cent) use the stairs on the north side, which results in conflicting flows between passengers heading towards Platforms 5 to 15 and passengers travelling in the reverse direction. The morning and evening peaks are the periods of greatest passenger flows.	B **PZ8.4**	A potential option would be to encourage utilisation of the stairwell furthest from the gateline on Platform 3 to access the subway to Platforms 5 to 15. At present there is very little usage of this stairwell as it involves walking slightly further to enter the subway. However, congestion occurs on the stairwell nearest to the gateline and at the exit from Platform 3. Under this option, a one way system could be developed whereby passengers entering the subway would use the stairwells nearest the gateline and those exiting the subway use the current underutilised stairwell or vice versa.
		C **PZ8.5**	A potential option would be to increase the width of the stairwell to/from Platform 3 from four metres to six metres (the subway width is eight metres) to help mitigate the gap.
		C **PZ8.6**	A potential option to extend the passenger subway beneath the forecourt to the Digby Wyatt Shed. It would require the refurbishment of the Digby Wyatt Shed to be implemented. The long term advantage of extending the subway might be to alleviate congestion associated in the existing booking hall, concourse and gateline. Pedestrian flow analysis has shown that if the subway extension were to be combined with refurbishing the Digby Wyatt Shed then forecast passenger flows could be adequately catered for up until 2037. As a result there would be no need to open up the entrance adjacent to Bonapartes Café or improve vertical circulation to Platform 3.

E. Summary

This case study has demonstrated a number of examples of congestion which are typically experienced at major stations. It is to be noted that often the congestion is concentrated in the morning and evening peaks.

Despite a number of congestion constraints having been identified at the station, there are several options to mitigate the problems. These range from simple signage encouraging station users to use less utilised stairwells, to the creation of new entrances to relieve congestion.

Case Study No. 2
Cardiff Central

Station Category: B

2009-10 annual exits, entries and interchanges: 11.9 million

A. Introduction

Cardiff Central is one of two principal stations serving the city of Cardiff (the other being Cardiff Queen Street on the Cardiff Valley Lines network). The station is on the Great Western Main Line route between London Paddington and Swansea. The station is close to the city centre and the Millennium Stadium (with a 74,500 person capacity) and consists of seven platforms. Platforms 1-4 are used by a combination of long distance and regional services. Platforms 6 and 7 are used by local Cardiff Valley Lines commuter services. Platform 0, which was opened in 2004, is used extensively on Millennium Stadium event days and for inter urban Arriva Trains Wales services between Cardiff Central and Cheltenham Spa and Ebbw Vale. The station is operated by Arriva Trains Wales.

A station plan of Cardiff Central can be seen via the following link to the National Rail Enquiries website: **http://www.nationalrail.co.uk/stations/sjp/CDF/stationOverview.xhtml**

B. Baseline

The station acts as a national hub for a mix of long distance, regional and local services within South Wales. The station has half hourly services to London Paddington and Bristol Temple Meads and hourly services to Birmingham New Street, Carmarthen, Ebbw Vale, Nottingham, Swansea, Southampton Central and Portsmouth Harbour. Local services also operate within the Cardiff Valleys area, serving locations such as Pontypridd, Aberdare, Merthyr Tydfil, Caerphilly, Rhymney to the north and, to the south, Barry, Penarth and Bridgend. Less frequent services also operate to destinations such as Fishguard Harbour, Holyhead, Milford Haven and Pembroke Dock.

The station is an important interchange for train services from South, North and West Wales, the East and West Midlands, Wiltshire, Hampshire and London, the West of England and local commuter services. Office of Rail Regulation station usage data highlights the station's importance as an interchange between national rail services. In 2009-2010 a total of 1.1 million passengers interchanged between rail services at the station. This figure excludes passengers interchanging between rail and other modes.

Current congestion is focused around the following areas:

- access to the station – the access from the southern side of the station (Penarth Road) is limited by the provision of only two standard and one wide aisle automatic ticket gates. The access is also limited to this side of the station by public transport
- Millennium Stadium events – considerable congestion occurs on event days at the Millennium Stadium requiring specific measures to be put in place to manage the congestion after events by implementing a queueing system for each destination
- platform access congestion - access to platform 0 is via a stairway which becomes congested when arriving passengers conflict with those trying to access the platform and the exit. January 2011 saw the provision of lift access to the platform. **Photograph 3** illustrates the narrow stairway entrance and exemplifies competing calls on signage. An Equality Act compliant lift has recently been installed to access Platform 0
- following arrivals of peak hour Valley Lines services on platforms 6 and 7, congestion can occur at the stairwells as passengers seek to descend to the passenger subway and exit the station
- congestion at the main gateline, particularly after arrivals. The congestion will typically occur during the peaks, particularly following arrivals from London Paddington in the evening peak. The gateline has five standard aisle gates and one wide aisle gate.

C. Future Plans and Aspirations

Considerable investment is proposed at the station as part of the Cardiff Area Signalling Renewals (CASR) to be completed by 2013. Currently several options have been developed to enhance the station. At the next stage of the design where a single option is selected pedestrian modelling of these options is likely to be undertaken to assess the impact on congestion.

The purpose of the station enhancement project is to identify possible developments that can be carried out on the Network Rail land immediately south of the station, covering the existing car parking area, so as to enable future growth in passenger numbers using the station. The project also needs to enhance the southern entrance to the station and facilitate access to the new Platform 8 being provided by the CASR. The options that have been considered as part of the station enhancement project are presented in the options section of the table in **Section D** of this case study.

Photograph 3 – Cardiff Central Platform 0

D. Gaps and options

The gaps and options at Cardiff Central are set out in the table below:

Access Zone			
Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
AZ1	At present there is limited access to the station from the southern side (Penarth Road). The station entrance has a gateline comprising two standard gates and one wide aisle gate. There are two ticket machines available, one immediately inside the station and one outside the station. Congestion can occur during peak periods and immediately after train arrivals. The southern side is an increasingly important access point to the station given the development of offices on this side of the station and also the proximity of the entrance to afford easy access to Cardiff Bay.	C AZ1.4	A potential option would be to create an enlarged/redeveloped southern entrance which could help to relieve congestion experienced when using the existing southern entrance. It may also encourage greater usage of the entrance if vehicle and pedestrian accessibility were improved alongside provision of a multi-storey car park to mitigate lost car parking spaces as a result of the redevelopment.

AZ1	Accessibility to Platform 0 – the platform was opened to provide additional capacity at Cardiff Central on Millennium Stadium match days and provide additional capacity for local services. The platform can be accessed from the station car park (step free access) or from the main concourse via a set of stairs. Congestion only occurs when passengers are alighting from a train arriving on the platform and trying to exit the station.		Consider options in the toolkit for Gap AZ1 An Equality Act compliant lift has recently been installed to access Platform 0 from the concourse.
SE1 to 5	Millennium Stadium event day congestion – It is inevitable that the station will experience some degree of congestion during Millennium Stadium event days owing to the sheer volume of passengers using the station. The nature of congestion is most prevalent after the event owing to the volumes of passengers needing to use the station.	C **SE2.1**	The current management of the station effectively addresses this congestion by means of a queueing system at the front and rear of the station. Separate queues are created for specific destinations.

Facilities Zone

Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
FZ1	Queueing occurs at the excess fare window on the southern side of the station (Penarth Road exit). This typically occurs during the morning peak as passengers alight from Valley Lines services off Platforms 6 and 7. The situation may improve as a result of more revenue protection inspectors being on services and greater provision of ticket machines at stations across the network.		Consider options in the toolkit for Gap FZ1.

Platform Zone

Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
PZ6	Gateline congestion in the passenger subway following train arrivals - Congestion can occur immediately after certain train arrivals. The congestion will typically occur during the peaks, particularly following arrivals from London Paddington in the evening peak.	C **PZ6.4**	A potential option would be to widen the existing gateline to the mainline concourse. The close proximity of retail units means that it might not be possible to widen it in its current location. However, it may be possible to widen the gateline by bringing it forward by a few metres to create space for additional gates. Care would need to be exercised in ensuring that pedestrian routes to/from the ticket office, retail units and the station entrance/exit are not impeded. Arriva Trains Wales suggest the potential for a 'half-moon' semicircular gateline to expand the capacity of the existing gates. They recognise the constraints of the listed building status of the station which any such option would have to consider.

Platform Zone			
Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
PZ7	Valley Lines Platforms 6 and 7 stairwell congestion – Following arrivals of peak hour Valley Lines services on Platforms 6 and 7, congestion can occur at the stairwells as passengers seek to descend to the passenger subway and exit the station. Although there are two sets of stairwells both stairwells are often heavily congested. This is most noticeable during the morning peaks.	B **PZ7.1**	A potential option would be to separate flows of passengers using signage on the stairways accessing the platforms which could help to reduce congestion. Signage could be provided on the stairwells and on the floor as seen in Bristol Temple Meads subway.
		C **PZ7.3**	A potential option would be to re-open the southern side subway to Platforms 6 and 7 which is currently used only on Millennium Stadium event days. This would help to reduce congestion at the main entrance. However, owing to the limited subway footprint it would be difficult to envisage the subway acting as an entrance and exit. Potentially the most feasible option would be both for it to be an exit only.
		C **PZ7.3**	Arriva Train Wales suggest that the widening of the stairway would potentially alleviate the congestion.
		C **PZ7.4**	Platform 8 is being provided as part of CASR to the south of the existing Platform 7. This could assist in providing additional capacity and help to reduce overcrowding on existing platforms.
PZ10	Platform 1 & 2 congestion.	C **PZ10.5**	Arriva Trains Wales propose the potential for Platform 0 to accommodate 6-car trains as part of the CASR. They also propose the reinstatement of former Platform 5 to similarly increase platform capacity to relieve congestion on Platforms 1 and 2.

E. Summary

This case study has demonstrated a number of examples of congestion which are typically experienced at major stations. It is to be noted that often the congestion is concentrated in the morning and evening peaks.

Despite a number of congestion constraints having been identified at the station, there a number of options to mitigate the problems. These range from simple signage to separate flows of pedestrians on stairwells and in subways, to the creation of new entrances to relieve congestion.

Cardiff Central is an example of a station which has to cope with large volumes of passengers travelling to and from major planned events. Passenger volumes from the Millennium Stadium are effectively managed at the station by implementing a queueing system to control passenger access to the station.

Case Study No. 3
Cardiff Queen Street

Station Category: C

2009-10 annual exits, entries and interchanges: 3 million

A. Introduction

Cardiff Queen Street is one of two principal stations serving the city of Cardiff (the other being Cardiff Central on the Great Western main line route between London Paddington and Swansea). Cardiff Queen Street is located on the Cardiff Valley Lines network. The station is located close to the main city centre shopping area of Queen Street and a short walk from the Millennium Stadium (74,500 capacity). The station consists of three platforms. Platform 1 serves northbound services heading to Valley Lines destinations such as Pontypridd, Aberdare, Coryton, Merthyr Tydfil, Rhymney and Treherbert. Platform 2 serves southbound services travelling towards Cardiff Central, Barry Island, Penarth and Bridgend. Platform 3 is used for the Cardiff Queen Street to Cardiff Bay shuttle service. The station is operated by Arriva Trains Wales.

A station plan of Cardiff Queen Street can be seen via the following link to the National Rail Enquiries website: **http://www.nationalrail.co.uk/stations/sjp/CDQ/stationOverview.xhtml**

B. Baseline

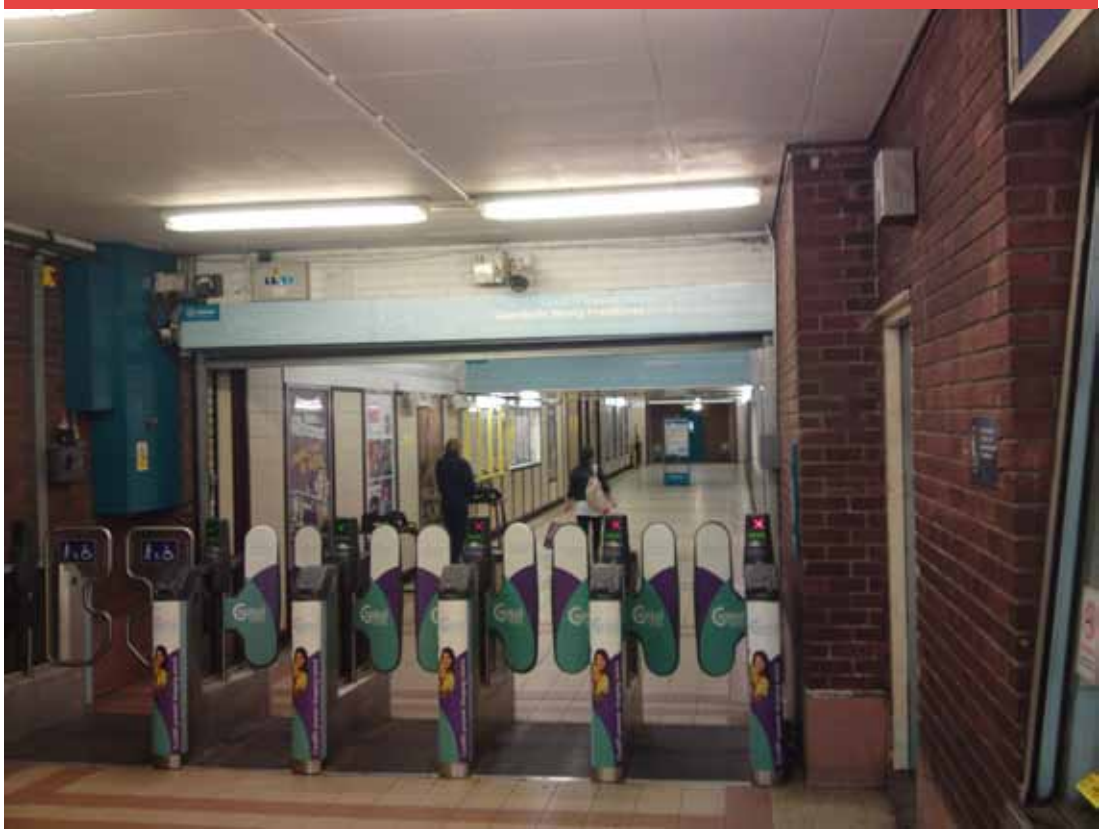
The station acts as the primary station for commuters and leisure traffic wishing to access Cardiff City centre. The western side of the station is the main shopping area of the city, Cardiff Queen Street. The eastern side of the station on Newport Road has extensive office development. The station has high frequency services (every 15-20 minutes) to Bargoed, Barry Island, Cardiff Bay, and Penarth, half hourly services to Aberdare, Coryton, Merthyr Tydfil and Treherbert and hourly services to Bridgend and Rhymney. It is also an important interchange for train services from various destinations on the Valley Lines network. Office of Rail Regulation station usage data highlights the station's importance as an interchange between national rail services. In 2009-10 a total of 0.5 million passengers interchanged between rail services at the station. This figure excludes passengers interchanging between rail and other modes.

Current congestion is focused around the following areas:

- severe overcrowding on Millennium Stadium event days which cause the station to be open only for exit one hour after the match at the stadium has commenced. Passengers arriving from Cardiff Bay are unable to join northbound Valley Lines services owing to train services already being full and standing. Instead they are required to travel by Cardiff Central and to join the queueing system, in operation there (see previous case study for further details)
- Platform 1 overcrowding in the evening peak results from the narrowness of certain of areas of the platform. This is a consequence of buildings on the island Platform 1 and 2 which constricts the waiting area towards the front of the platform in the Cathays direction. This is illustrated in **Photograph 4**
- gateline congestion following train arrivals, particularly during the high morning peak. At present there are four standard gates and a wide aisle gate. Typically during the morning peak three gates are set in the exit direction. Congestion exiting the station can occur during the morning peak following southbound arrivals. The nature of the constraint can be seen in **Photograph 5**
- the Customer Information Screen (CIS) in the main booking hall is located immediately adjacent to the gateline. This presents a potential congestion constraint as passengers consult the CIS while other passengers try to pass through the gateline to access and leave the platforms
- Arriva Trains Wales also highlighted the constrained booking office and concourse area as a source of congestion.

Photograph 4 – Cardiff Queen Street Platform 1

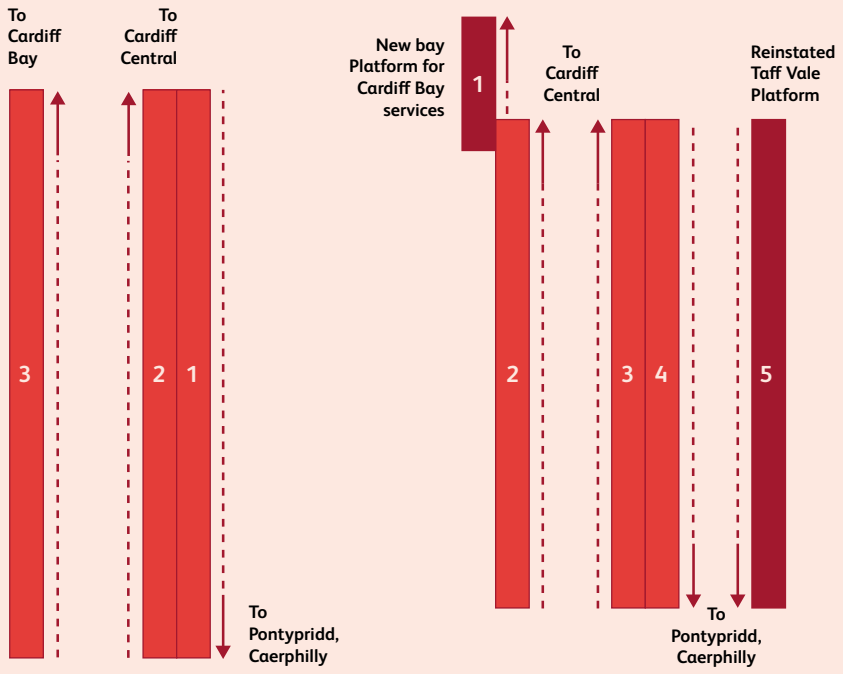
Photograph 5 – Cardiff Queen Street automatic ticket gateline



C. Future plans and aspirations

As with Cardiff Central there are plans at Cardiff Queen Street to increase station capacity as part of the Cardiff Area Signalling Renewals (CASR). The options for the provision of additional platforms are currently progressing through the Network Rail enhancement option evaluation GRIP process. Under this scheme it is proposed that a new bay service platform on the eastern side of the current Platform 3 would be created. This is in addition to the reopening of the disused Taff Vale platform. Platforms under this scheme would be renumbered from east to west. **Figure 1** shows the existing platform arrangement at the station and the proposed arrangement.

Figure 1 – Existing and proposed platform layout at Cardiff Queen Street



D.Gaps and options

Cardiff Queen Street has several congestion related 'gaps' which include:

Access Zone			
Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
SE5	Overcrowding on Millennium Stadium event days which causes the station to be open only for exit one hour after an event at the stadium has commenced. The rationale behind this is to mitigate acute overcrowding on the platforms owing to trains already having left Cardiff Central full and standing. During this period the station remains open for passengers exiting the station. Passengers arriving from Cardiff Bay are unable to join northbound Valley Lines services owing to train services already being full and standing. Instead they are required to travel via Cardiff Central and to join the queueing system there.		Consider options in the toolkit for Gap SE1-5 and take advantage of any opportunities afforded by the completion of the Cardiff Area Signalling Renewals.

Facilities Zone			
Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
FZ5	The current location of the Customer Information Screen (CIS) in the main booking hall is immediately adjacent to the gateline. This gives rise to congestion, in that passengers will be consulting the CIS, whilst other passengers try to pass through the gateline to access and leave the platforms.		Consider options in the toolkit for Gap FZ5.

Platform Zone			
Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
PZ6	Gateline congestion following train arrivals. Congestion exiting the station can occur during the morning peak following southbound arrivals. At present there are four gates and a wide aisle gate. Typically during the morning peak three gates are set in the exit direction .		Consider options in the toolkit for Gap PZ6.
PZ7	Platform 1 experiences overcrowding during the evening peak owing to the volume of passengers using the station. A particular problem is the narrow areas of Platform 1. This is a result of buildings being located on the island platform of 1 and 2. The narrow waiting area is towards the front of the platform in the Cathays direction.	C PZ7.2	A potential option would be to relocate existing staff offices to the southern end of Platforms 1 and 2. This option would relieve platform capacity congestion experienced at the northern end of Platform 1 during the evening peak owing to the narrow platform width.
		C PZ7.4	Funded option as part of Control Period 4 (CP4) to provide additional platforms through the Cardiff Area Signalling Renewals (CASR) scheme. This option is currently progressing through the Network Rail enhancement option evaluation GRIP process. Under this scheme it is proposed that a new Bay service platform on the eastern side of the current Platform 3 would be created. This is in addition to the re-opening of The Taff Vale platform.

E. Summary

Cardiff Queen Street has several general constraints typical of inner suburban stations. The gaps are orientated largely towards peak periods. Options to mitigate these gaps are complex and potentially costly. Creation of a new entrance, additional platforms and re-location of buildings would help to ease congestion but there will still be occasions when the station has to be closed to boarding traffic. It is difficult to see how congestion could be abated on Millennium Stadium event days without the provision of additional rolling stock to cater for the additional demand and this would have to be subject to a business case. On event days it is not so much a station capacity issue but more a train capacity matter.

Case Study No. 4
Clapham Junction

Station Category: B

2009-10 annual exits, entries and interchanges: 38.3 million

A. Introduction

Clapham Junction is the busiest rail interchange in the UK with 20.5 million interchanging passengers per annum in 2009-10. It is a key interchange between the Southern, South West Trains and London Overground railway networks. Services originate and terminate in a range of areas which include, London Victoria, London Waterloo, Surrey, Sussex, Hampshire, and the South West, as well as North and West London. The station comprises 17 platforms, 16 of which are operational, and is managed by South West Trains.

See link to the National Rail Enquiries website which provides a station plan of Clapham Junction – **http://www.nationalrail.co.uk/stations/sjp/CLJ/stationOverview.xhtml**

B. Baseline

The station acts as a major interchange for a mix of long distance and suburban services to and from southern England and the West Country. The station has high frequency inner suburban services to places such as Chessington, Epsom, Dorking, Hampton Court, Shepperton, Richmond, Sutton, East Croydon, and Wimbledon. The station also provides a connection to the West London Line via London Overground services to Willesden Junction and Stratford, along with Southern services to Watford Junction and Milton Keynes Central.

Mainline longer distance services, typically with 1-2 trains per hour (or more) serve destinations which include Basingstoke, Bognor Regis, Eastbourne, Exeter St Davids, Gatwick Airport, Hastings, Horsham, Littlehampton, Portsmouth Harbour, Reading, Salisbury, Southampton Central, Weymouth, Winchester, Woking and Yeovil Junction.

Research by Passenger Focus and London TravelWatch (March 2010) into passenger priorities at the station revealed that the level of congestion in the subway was the top passenger priority for improvement. Within the results, it was found that commuters, who are more likely to be using the station in the peak periods, rated the subway as a greater priority for improvement (55 %) than did business or leisure passengers (43 %). It was also noted that passengers had difficulty finding their way around the station and information about which platforms trains depart from was noted as the 3rd highest priority for business/leisure users of the station (5th highest across all users). This problem may be adding to the congestion experienced in the passenger subway, because the subway is narrow and passengers looking at the information about which platform to go to cause further congestion in the subway.

At present congestion is focused around the following areas:

- overcrowding occurs during the am and pm peaks in the main passenger subway, as seen in **Photograph 6**
- queueing during the am peak in the main ticket hall in the am peak (particularly on Monday mornings)
- congestion descending from the mainline Up Fast Southern platform (Platform 12) into the passenger subway immediately after arrival of a train service during the am peak
- congestion ascending from the mainline Up Fast Southern platform (Platform 12) onto the passenger footbridge to interchange with other services immediately after arrival of a train service at the platform
- congestion experienced by passengers trying to access Platforms 9 and 10 from the passenger overbridge immediately after the arrival of an inner suburban service travelling to London Waterloo from Platform 10
- overcrowding on Platform 17 during the am peak on Southern West London Line departures which originate from Clapham Junction. This is illustrated in **Photograph 7**
- overcrowding on Platform 2 during the am peak on London Overground departures which originate from Clapham Junction. This is illustrated in **Photograph 8**
- congestion on am peak hour departures from Platform 9 when trains formed of 10 or 12 carriage Desiro units are unable to open the doors on the rear unit despite some of the carriages being in the platform because of the constraints of the selective door opening system. Passengers must therefore use a smaller area of the platform and number of doors leading to congestion, and increasing dwell times
- ticket gateline congestion at the main concourse.

Photograph 6 – Clapham Junction main subway crowding

Photograph 7 – Clapham Junction Platform 17 congestion following the 08:43 arrival from Shepherd's Bush

Photograph 8 – Clapham Junction Platform 2 congestion prior to the 08:25 arrival from Stratford

C. Future plans and aspirations

There are currently CP4 plans to provide a new entrance at Clapham Junction via the disused 'Brighton Buildings'. This will provide direct access from street level onto the footbridge, from which lifts to all platforms have recently been installed. This will have some impact on congestion around the station but it is recognised that crowding in and access to and from the subway will continue to be an issue in some areas, so the case is being analysed for further development to relieve congestion in CP5.

Transport for London (TfL) is investing in the extension of the East London Line to Clapham Junction. Passenger services are due to commence in mid-2012 and will terminate in an extended Platform 2. Given that this RUS has identified that crowding on Platform 2 is already a problem, congestion relief measures will be implemented by the time East London Line services to Clapham Junction begin.

TfL has an aspiration for all train services to stop at Clapham Junction from the South West Main Line during the peaks. This would require significant alterations to track and signalling layouts. It is also expected to increase the level of interchange significantly; and if the solutions in the morning peak were to involve timetabling consecutive Up trains alternately in to Platforms 7 and 8 (an island platform), it may require further decongestion measures to be taken on those platforms themselves.

D. Gaps and options

Clapham Junction has a number of congestion related 'gaps' which include:

Appendix A

Access Zone

Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
AZ1	Clutter on pavements on St John's Hill, making pedestrian and bus access to the station difficult.		Consider options in the toolkit for Gap AZ1.
AZ9	Lack of cycle parking facilities leading to cycles being locked on railings causing an obstruction.		Consider options in the toolkit for Gap AZ10.

Facilities Zone

Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
FZ1	Queueing during the am peak in the main ticket hall (particularly on Monday mornings). Severe overcrowding can occur during the morning weekday peaks, particularly on Monday mornings when station users are renewing season tickets etc. The queueing can extend across the concourse and impact upon passenger flows to/from the gateline.		Consider options in the toolkit for Gap FZ1.

Platform Zone

Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
PZ6	Ticket gateline congestion to and from the main concourse and passenger subway can occur during the high peak periods due to the limited size of the gateline.		Consider options in the toolkit for Gap PZ6.
PZ8	Overcrowding occurs in the main passenger subway during both the am and pm peaks. The subway acts as a connection to the main booking hall and platforms, secondary entrance/exit in the direction of Platform 2 and as an interchange route between Southern and South West Trains services. The typical pinch points in the morning peak are centred around passengers descending into the subway from arrivals.	B PZ8.4	A potential option is the introduction of a one-way system during the high peak periods to manage congestion in the passenger subway. Passengers interchanging during the peaks are encouraged through a combination of announcements and signage to use the footbridge for interchanging between services. This is likely to be challenging to implement in practice.
		C PZ8.6	A committed scheme to reduce congestion at the station involves the reopening of the former entrance to the station in the currently disused 'Brighton Buildings'. This will provide direct access to the passenger footbridge. It is expected that this will help to relieve congestion in the passenger subway.

Platform Zone			
Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
PZ8	Congestion experienced by passengers trying to access Platforms 9 and 10 from the passenger overbridge immediately after arrival of an inner suburban service travelling to London Waterloo from Platform 10. The congestion occurs immediately after an arrival at Platform 10 which sees significant numbers of passengers alighting at the station in order to change for other services such as Southern services into London Victoria and London Overground services to Kensington Olympia and Willesden Junction.	B PZ8.4	A potential option would be to provide Variable Message Signage (VMS) around the station helping passengers to find a less congested route. However, given the limited entrance/ exits to/from the platforms this may have limited effectiveness. It may be useful in managing crowding in the subway by advising passengers not to enter the subway but to use the footbridge.
PZ8	Congestion occurs immediately after an arrival in the am peak on Platform 12 which is the arrival platform for Southern mainline services from Sussex as passengers try to descend to the passenger subway. Many of these passengers will be interchanging at the station onto services into London Waterloo. The majority of the services calling at the platform during the am peak are formed of 12 coaches. The location of the two exits to the passenger subways is towards the middle/front of services (typically coaches 5-7). In contrast, the exit to the main passenger footbridge is located at approximately coaches 10-11.	B PZ8.4	A potential option would be to create a one way system for entry/exit to Platform 12 via usage of the two stairwells to the subway. This would need to be clearly marked and managed to ensure efficiency.
PZ8	Congestion ascending to the footbridge from the mainline Up Fast Southern platform (Platform 12) onto the passenger footbridge to interchange with other services immediately after arrival of a train service at the platform. Passengers are predominantly interchanging between Southern services from Sussex Coast services on to inner suburban services for London Waterloo and to a lesser extent long distance South West Trains services in the direction of Woking, Basingstoke and Southampton, as well as London Overground services towards Kensington Olympia and Willesden Junction via the West London Line. The current congestion experienced by passengers in the morning peak is exacerbated owing to the provision of temporary stairs during Access for All works at the station. Upon completion in 2011, a new staircase will be provided at the original access point to the footbridge. This should help to alleviate some degree of overcrowding due to the larger capacity of the stairwell in contrast to the temporary structure.		

Platform Zone			
Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
PZ10	Congestion on am peak hour departures from Platform 9 which are formed of 10-car Class 444 Desiro units, and to a lesser extent 12-car Class 450s. Due to the short platform on Platform 9, Selective Door operation (SDO) is used as it is not possible to open all the doors along the full length of the train on the platform. The SDO system on the units only permits the selective opening of doors by unit, rather than by carriage or by individual door. Therefore only the front 5 cars are opened despite at least 8 carriages being in the platform. This limitation causes congestion on the platform and discourages passengers from spreading evenly along the platform. An example of such a service which experiences this problem is the 08:12 service to Bournemouth and Weymouth which has large numbers of commuters boarding in the direction of Basingstoke.	B PZ10.3	A potential option would be to modify selective door operation to allow control down to the individual door or vehicle and not just by unit.
PZ10	Overcrowding on Platform 17 during the am peak on Southern West London Line departures which start from Clapham Junction. During the morning peak there are several services which start from Clapham Junction and travel to destinations along the West London Line such as West Brompton (for Earls Court), Kensington Olympia and Shepherds Bush (for Westfield). Overcrowding can occur prior to the train's departure as passengers await the inward working to form their service. Turnround times are minimal hence the build up of passengers on the platform.	C PZ10.5	The London & South East Route Utilisation Strategy has considered options to potentially increase the frequency of Southern services between Watford Junction and Clapham Junction and to lengthen services to 8-cars at the times of greatest demand. The latter would require platform extensions at Clapham Junction but both might reasonably be expected to reduce both platform and train congestion.
PZ10	Overcrowding on Platform 2 during the am peak on London Overground departures which start from Clapham Junction. Overcrowding can occur on Platform 2 during the am peak where London Overground departures to destinations on the West London Line leave from. Similarly to Platform 17, turnround times are minimal and hence a build up of passengers can occur on the platform. The East London Line extension to Clapham Junction scheduled to be completed in 2012 will increase the numbers of services operating from the already congested Platform 2.	C PZ1.1 PZ8.6 FZ4.1	Congestion relief measures will be implemented by the time East London Line services to Clapham Junction begin. As well as changes to the layout of the platform these will include: • reopening a second disused stairway to the Grant Road ticket hall • reconfiguration of Grant Road ticket hall Provision of extra shelter on Platform 2 to spread demand along platform during wet weather.

E. Summary

This case study has illustrated a diversity of congestion related gaps associated with a major national interchange. Options are wide ranging from basic signing to encourage more efficient passenger movements, to opening up a new entrance to relieve congestion. While current investment will have positive impacts on congestion, it is recognised that congestion will remain in the main subway and a number of other locations on the station. Given the forecast growth in passengers, and the existing congestion, consideration is being given to further investment in Control Period 5.

Case Study No. 5
Farnborough Main

Station Category: C

2009-10 annual exits, entries and interchanges: 2.7 million

A. Introduction

Farnborough Main in Rushmoor, North Hampshire is located on the South Western Main Line. The station is located on the edge of the town centre with large residential areas either side of the railway line.

The station acts as an important commuter station to London for local residents. The town is a significant location for business and the aviation industry. Every two years the town holds the Farnborough International Airshow which attracts additional visitors to the town centre.

A station plan of Farnborough Main can be seen via the following link to the National Rail Enquiries website: **http://www.nationalrail.co.uk/stations/sjp/FNB/stationOverview.xhtml**

B. Baseline

Prior to September 2010 accessibility by public transport to the station was very limited with the primary Route 1 bus service (from Camberley to Aldershot via Farnborough) not calling at the station and instead calling outside the station complex. **Photograph 9** illustrates the previous bus stop facilities prior to investment.

Only a handful of peak hour buses, mainly to the airport and associated business parks such as Qinetiq called at the station. The lack of a regular bus service directly to and from the station was deemed a serious 'gap' in encouraging greater public transport usage to and from the station. Furthermore, the interchange often experienced congestion as a result of the lack of segregation of the different modes using the facility. **Figures 2 and 3** illustrate the layout before and after the investment at the station.

Research undertaken during 2008-09 by Hampshire County Council into travel patterns and user needs at the station revealed a number of transport accessibility 'gaps'.

Photograph 9 – Farnborough Main previous bus stop facilities

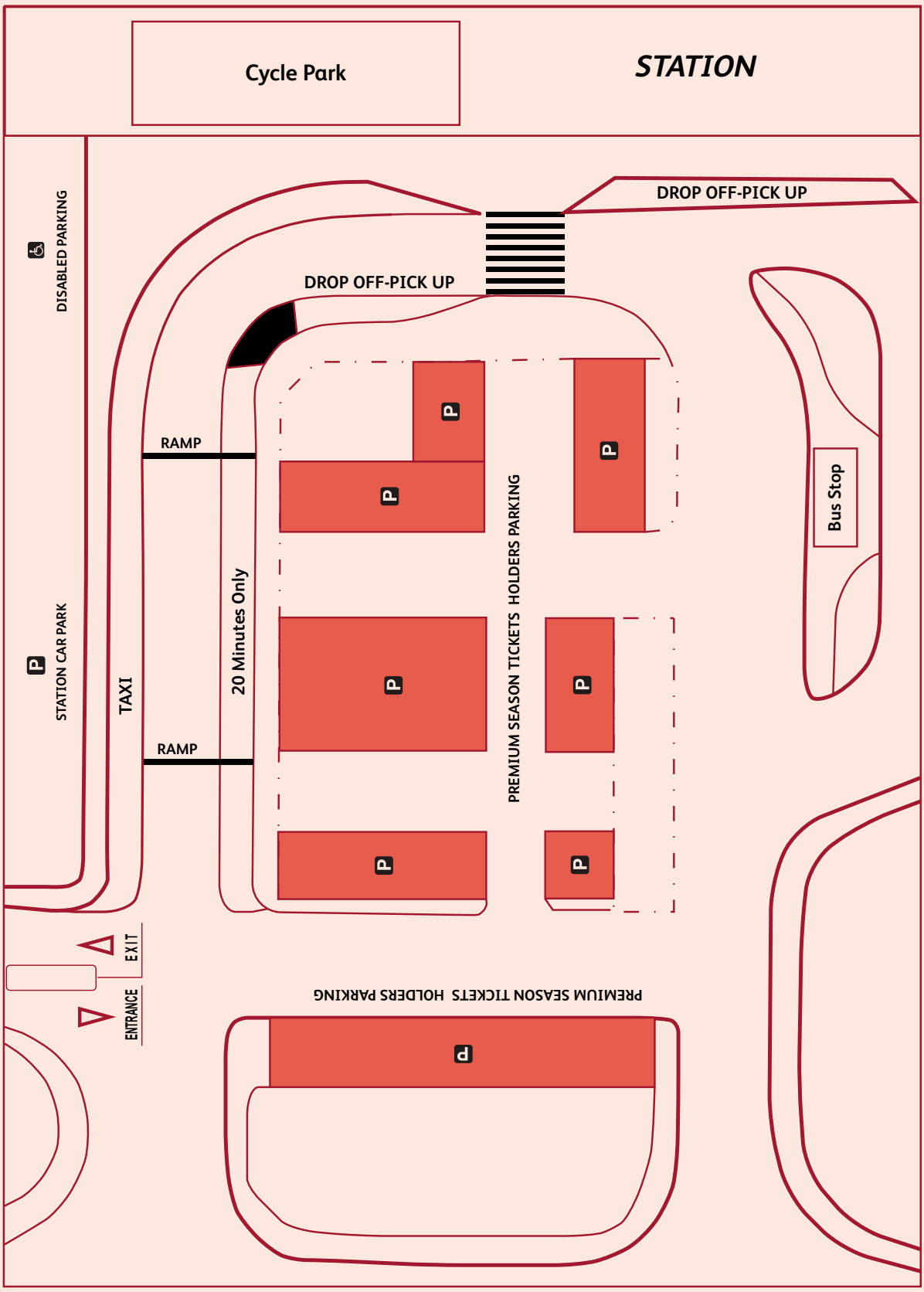


Figure 2 – The layout of Farnborough Main forecourt before investment

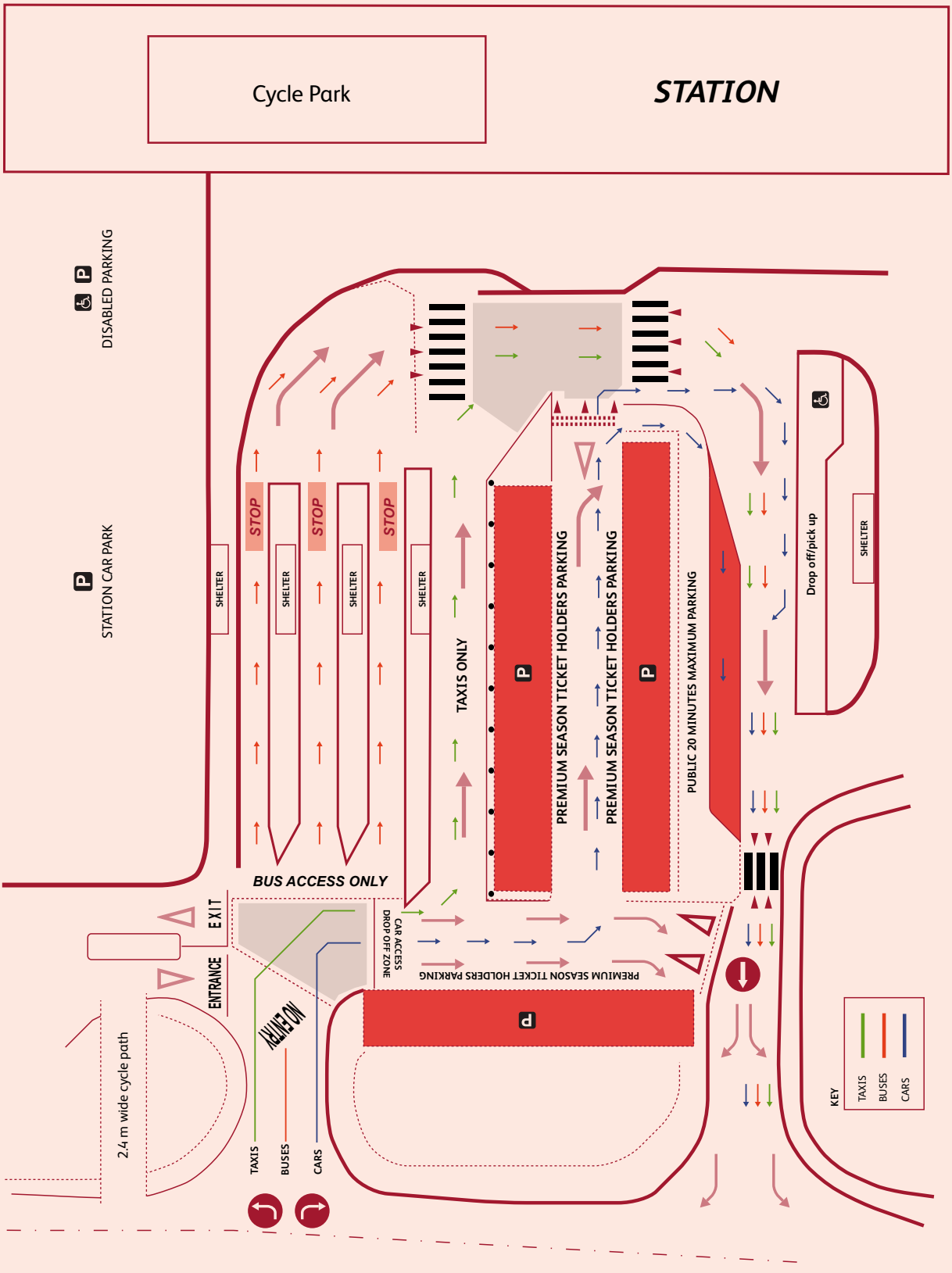


Figure 3 – The layout of Farnborough Main forecourt after investment

Photograph 10 – Farnborough Main new bus interchange

Hampshire County Council, Rushmoor Borough Council, South West Trains and Stagecoach South Buses subsequently set about attempting to enhance the interchange for all users. Specific aims of an enhanced interchange were:

- to segregate the different users of the interchange to minimise potential conflict through effective allocation of available land, as illustrated by **Photograph 10**
- encourage greater bus usage to and from the station through the provision of 3 dedicated bus bays, with high quality waiting facilities. The Aldershot/Camberley to Farnborough services started using the new interchange from September 2010
- provide a safer, more secure environment for cyclists, pedestrians accessing the station from the local highway through enhanced, clearly defined routes to/from the station
- provision of clearly marked dedicated taxi rank space to cater for public demand and satisfy the requirements of the Rushmoor Taxi Board
- development of dedicated drop-off/pick-up areas to minimise congestion experienced at the front of the forecourt.

C. Future plans and aspirations

As part of the Access for All scheme a footbridge is currently being constructed, which will provide step-free access to all platforms at the station.

D. Gaps and options

Prior to the opening of the new interchange in September 2010 a number of interchange gaps could be identified:

Access Zone

Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
AZ1	A congested station forecourt, making access to the station very difficult for buses. The original layout was an unsegregated interchange with a mix of users conflicting with one another for space, predominantly at the front of the station. Taxi ranks were located immediately alongside the pavement upon entering the interchange, drop-off facilities were on the opposite side of the taxi rank, cycle parking facilities were located across the interchange.	C AZ1.3	A dedicated taxi lane which has helped to reduce congestion by providing specific facilities for taxi drivers to use. It has had the added advantage of helping to minimise delays as the dedicated lane means they are able to exit the interchange without conflicting with other traffic.
		C AZ1.3	Creation of a dedicated pick-up and drop-off area close to the station. The new interchange has created a dedicated pickup and drop-off area close to the station entrance and the routeing through the interchange does not require the user to walk across the front of the station.
		C AZ1.3	Safer routes for cyclists and pedestrians to and from the interchange. The new interchange has brought the added benefit to both cyclists and pedestrians of safer routes to and from the interchange. Previously, the unsegregated arrangement of the interchange created conflicting flows between users. The improved interchange has clearly defined footpaths for both cyclists and pedestrians. In addition improved cycle parking facilities are provided.
AZ4	Very infrequent bus services servicing the station. Prior to introduction of the new interchange, the station was served by a handful of bus services during the morning peak. This excluded any of the high frequency services between Aldershot, Farnborough and Camberley.	C AZ4.2	Improvements to the frequency of the bus services servicing the station – as part of the introduction of the new bus interchange facilities a higher frequency of bus services was implemented.
AZ4	Lack of capacity for buses using the station (only a single bay). A lack of bus stand capacity was a particular problem prior to the opening of the new interchange. There was only a single bus bay and access to this required buses having to drive around the interchange conflicting with other users of the interchange.	C AZ4.3	Creation of a dedicated increased capacity bus stand complex. The new arrangement consisted of 3 bus bays with improved facilities which included real time information. The location of the bus bays enable services to enter the station interchange, call at the bay and exit the interchange with minimal delay. Other vehicles are barred from entering the bus bays, thus allowing continuous access to the facility for both scheduled bus services and (if ever required) rail replacement bus services.
AZ4	The majority of bus services operated from stops away from the station - as highlighted previously, owing to the lack of bus bay capacity and time penalty associated with entering the station due to the congested forecourt, many bus services called at stops away from the station. This included the service between Aldershot, Farnborough and Camberley which operated on weekdays at a 10-minute frequency. Instead of calling at the station many services (including Route 1) called at a nearby roundabout. The stop in the direction of Camberley was approximately 300m away from the station front and consisted of a basic pole and information only with no waiting shelter. The stop in the Farnborough and Aldershot direction consisted of a basic shelter approximately 500m from the station and required crossing the main road via a couple of pedestrian crossings.		
AZ6	Outdated, inadequate waiting facilities and basic information provision. The existing waiting facilities consisted of a brick built shelter with glass panelling. The inside had been heavily vandalised.		

Facilities Zone			
Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
	No gaps were identified in this area of the station.		

Platform Zone			
Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
	No gaps were identified in this area of the station.		

E. Summary

This case study has demonstrated a number of interchange gaps which caused congestion at the front of the station. However through careful redesign of the interchange it has been possible to mitigate the congestion problems and provide enhanced public transport facilities at the station.

This has only been possible through committed partnership working between Hampshire County Council, Rushmoor Borough Council, Stagecoach South Buses, South West Trains and Network Rail. The involvement of all of these parties has enabled the provision of additional public transport services by working directly with the bus companies and the Borough and County Council. The approach has also been a partnership involving the railway operator and infrastructure manager in improving station facilities. Without this partnership it would not have been possible to deliver these improvements for the passenger.

Case Study No. 6
Farnborough North

Station Category: F

2009-10 annual exits, entries and interchanges:0.4 million

A. Introduction

Farnborough North is one of two stations (the other being Farnborough Main on the South Western Main Line) serving Farnborough in Rushmoor, North Hampshire. It is located on the North Downs Line from Reading to Guildford and Redhill. The station is located on the edge of the town with sizeable residential areas nearby. It consists of two platforms and is unstaffed. The station is operated by First Great Western.

A station plan of Farnborough North can be seen via the following link to the National Rail Enquiries website: **http://www.nationalrail.co.uk/stations/sjp/FNN/stationOverview.xhtml**

B. Baseline

The current service pattern at Farnborough North consists of one train per hour in each direction between Redhill-Reading and Reading-Redhill. These are supplemented during the morning and evening peaks with additional services to and from Gatwick Airport, Shalford and Reading.

The station is located close to two schools and one college, all located on the west side of the railway (on the Farnborough town centre side). The station is heavily used by college and school children arriving on trains from the north, e.g. originating from the direction of Reading. Research by Hampshire County Council in 2008, as part of the Farnborough Town Access Plan, revealed 228 users alighting off the 08:29 arrival from Reading who need to cross the railway line. Of these, the majority of users were students at the local schools and college. The nature of the congestion experienced is pulsed, ie. concentrated numbers of users trying to exit via the crossing gate, immediately after the departure of their service on Platform 1. This is illustrated in **Photograph 11**.

Passengers using Platform 1 access it via a gated foot crossing over the railway, protected by red and green warning lights. This crossing is also a bridleway. In addition there is a locked private vehicular crossing giving the only vehicular access to a dwelling on the east side of the railway, as shown in **Photograph 12**.

C. Future plans and aspirations

There are no current plans for investment at the station.

Photograph 11 – Farnborough North long queue to get off Platform 1

Photograph 12 – Farnborough North warning lights do not cross

D. Gaps and options

Farnborough North station has several congestion related gaps and options which include:

Access Zone

Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
AZ1/2	Platform entrance/exit to Platform 1 (towards Guildford and Redhill) – capacity constraint is the exit to/from Platform 1 (Guildford direction). The exit is a narrow footpath and has to cater for typically over 200 passengers alighting from one service in the morning peak. The Farnborough North foot crossing provides access across the line and historically there has been a need for a crossing across the line to link the communities of Farnborough and Ash Vale. The crossing provides bridleway access across the railway. The nature of the crossing requires users to open a gate to cross the line. Miniature warning lights are provided to warn users of approaching trains. These were installed in 1990 as a result of fatal accidents in 1980 and 1985. Users taking an animal across the crossing are required to phone the signaller for permission before crossing the line. During the majority of the day the crossing is not a significant capacity constraint. However during the morning peak, particularly on services originating from Reading, the volume of passengers alighting and wishing to exit via the gate is high. The area in front of the foot crossing acts as a drop-off/pick up point and walking route to and from the station and bridleway. The gaps associated with this area relate to the mix of users using the station and the potential for conflict owing to the pulsed nature of movements and the constrained space in this area. The overriding conflicts are between pedestrians and motor vehicles using the station and traffic using an adjacent builders merchant.	A AZ2.1	A potential option would be to investigate the feasibility of recasting the timetable to permit greater intervals between trains calling in both directions at the station – at present it is common for trains in opposite directions to cross at Farnborough North, thus requiring passengers arriving from the Reading direction on Platform 1 to wait for both lines to clear before using the crossing. For example the 08:29 arrival from Reading (from which typically over 200 passengers alight during term time) is crossed by the 08:30 departure to Reading. One option would be to retime trains to permit the Reading train to leave earlier so that the crossing can be used sooner.
		C AZ1.4	A potential option would be to widen the existing entrance/exit to the platform – under this option the existing entrance/exit to the platform could be widened to permit a greater flow of passengers exit to the platform and therefore potentially speed up passage across the crossing. However, the crossing itself would remain a constraint.
		C AZ1.4	A potential option would be to provide a secondary exit – It is theoretically possible to provide a secondary exit from the platform as land behind the station is currently underused. Again, however, the crossing itself would remain the pinch point.
			Leave the entrance/exit as is – this is likely to be the preferred option since the nature of the congestion occurs only on a few trains each week, hence making the business case for improvements marginal. Indeed, initial assessment indicates that (based only on potential time savings from relieving congestion) a capital outlay of no more than around £50,000 could be supported. Furthermore, if access was wider and in turn pedestrian access/egress was quicker, there is potential for more congestion to be transferred to the foot crossing.
		C AZ1.4	A potential option would be to realign the existing front of station facilities – this would involve reallocation of the limited space in front of the station to provide a clearer pick up/drop-off area and offer a clear walking route along Farnborough Street for pedestrians. Under this option it may be required to remove the existing five free car parking spaces which are for the station. Consideration could also be given to providing a bus stop at the station.
			Leave as is – owing to the very limited current space, and the low pedestrian usage during most of the day, it is not likely to be feasible to undertake any access improvement measures within this area without extensive costly alteration. Such proposals are unlikely to rank highly on a priority list, especially when funds are constrained.

Access Zone

Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
AZ1/2 (cont)		C AZ2.3	A potential option would be to close the bridleway access over the railway and retaining rights only for pedestrians and cyclists over the foot crossing would be advantageous since it would remove the requirement to provide a route across the line for horses. Under present designation, a horse and rider must be able to cross the line safely.
		C AZ2.3	The alternatives to the option above of a subway or a bridge which can accommodate horses (as well as being Equality Act 2010-compliant) are unlikely to be feasible or affordable.
		C AZ2.3	A potential option would be to widen the pedestrian gate – could only realistically be done at the expense of narrowing the vehicular gates.
		C AZ2.4	As the station is on a double-track railway a potential option would be to examine the feasibility of staggering the platforms such that the crossing is always in rear of a stopped train.

Facilities Zone

Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
	No gaps were identified in this area of the station.		

Platform Zone

Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
	No gaps were identified in this area of the station.		

E. Summary

Whilst this case study demonstrates that even small, Category F stations can experience congestion problems, at Farnborough North these are confined to very specific times of the week. The congestion is experienced typically once a day when passengers alight from the weekday 08:29 arrival from Reading.

No business case is likely to be made for any scheme to ease the congestion which requires capital expenditure of more than around £50,000.

Any options to address the crowding are likely to be of a 'softer' nature, for example one means of reducing the time taken to exit the station from Platform 1 might be to make some minor retimings to allow down trains to be clear of the crossing before up trains arrive.

Case Study No. 7
Edinburgh Haymarket

Station Category: D

2009-10 annual exits, entries and interchange 2.2 m

A. Introduction

Haymarket is Scotland's fourth busiest railway station. It is situated to the west of Edinburgh Waverley Station and is close to Edinburgh's financial district, Murrayfield rugby stadium and Tynecastle football stadium. It currently serves as an interchange between rail, bus and taxi. From 2013 it will also provide an interchange with the new Edinburgh tram system.

There are four through platforms at the station. The North Lines platforms (Platforms 1 and 2) serve the Edinburgh to Fife, Dundee, Perth, Inverness and Aberdeen routes. The South Line platforms (Platforms 3 and 4) serve the Edinburgh to Dunblane, Glasgow via Falkirk, Glasgow via Bathgate, Glasgow via Shotts and Carstairs routes. An additional bay platform (Platform 0) was provided at the north side of the station, to the rear of Platform 1, in 2003.

The station is located on two main levels. The main entrance level for passengers is directly through the main entrance to the station building at street level off Haymarket Terrace. Access to the lower platform level is via access stairs from the upper level concourse and footbridge. A secondary entrance off the existing car park provides Equality Act 2010 compliant access to Platforms 0 and 1 and also direct access to platform level. This entrance is used on major match day events as a crowd control area. Equality Act 2010 compliant lifts from the existing footbridge to Platforms 2/3 and 4 were provided in 2011.

The existing station building enjoys the highest (Grade A) listed status. The site is also adjacent to the City Centre World Heritage Site and West End, Coltbridge and Wester Coates Conservation Areas.

A station plan of Edinburgh Haymarket can be seen via the following link to the National Rail Enquiries website: **http://www.nationalrail.co.uk/stations/sjp/HYM/stationOverview.xhtml**

B. Baseline

Haymarket station currently handles 2.2 million passengers each year. Patronage levels are forecast to increase further as a result of background growth, the introduction of the Edinburgh tram and planned service enhancements. It is currently forecast that there will be 9.0 million passengers using the station each year by 2030.

The current station layout is inefficient owing to the inadequate accesses to the main building and the restricted concourse and circulating areas. It is not possible to develop the existing facilities further to address these deficiencies within the limited footprint of the existing station building and footbridge. It is therefore likely that a restriction would have to be placed on passenger numbers using the station in future during peak periods if augmented facilities are not provided to handle the forecast demand growth.

C. Future plans and aspirations

The Scottish Government launched its vision to improve services on the existing Edinburgh to Glasgow rail corridors in 2007. The infrastructure enhancement projects that need to be implemented to allow this vision to be realised are collectively referred to as the Edinburgh to Glasgow Improvements Programme (EGIP). One of the projects in this programme is the Haymarket Capacity project.

The main rail industry stakeholders (Transport Scotland, First ScotRail, and Network Rail) have been working in partnership since 2004 to develop proposals for the redevelopment of the station that address the current congestion issues. These proposals initially concentrated on developing the wider Haymarket area, incorporating land owned by City of Edinburgh Council and other third parties.

However, owing to funding constraints and the legal issues arising as a result of the multiple land owners, it was identified that only a project based on utilising land that is currently in Network Rail's ownership could proceed at this stage. Development work on an optimised proposal that meets this constraint has therefore been underway since 2008.

There are three main elements to the proposal that has been developed as a result of this work. These are:

- the addition of a new station concourse
- the provision of a new wide access deck with Equality Act compliant lifts and escalators to platform level
- The making good of the existing station building and platform accommodation.

The current floor area of the existing building at street level, and the linked footbridge which provides access down to platform level, is approximately 250 square metres. The floor area of the proposed new concourse and access deck is approximately 2,250 square metres. As well as providing significantly enhanced circulation areas, this will allow a large increase in retail facilities provided at the station.

The project is currently being managed by First ScotRail to the end of GRIP Stage 4. It is proposed that future GRIP Stages will be financed and delivered by Network Rail.

The associated expenditure will be added to Network Rail's Regulated Asset Base (RAB). Transport Scotland will fund the project and make additional payments to reflect this increase in the RAB at the appropriate rate of return set by the Office of Rail Regulation (ORR). This arrangement will be formalised through a Delivery Plan under the ORR Investment Framework. The terms of this Delivery Plan have yet to be agreed with Transport Scotland prior to formal submission to ORR.

It is intended that the phasing of the implementation of these works will be integrated with the phasing of the adjacent Edinburgh tram works.

D. Gaps and options

The current station facilities have a number of gaps. These principally relate to the specific congestion capacity constraints of the site. These Gaps are summarised in the table below together with a description of how the current station redevelopment proposals will address these Gaps.

Access Zone

Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
AZ1	The main entrance/exit to the station has two relatively narrow entrance/exit points. This can cause a congestion constraint particularly at peak periods.	C AZ1.4	The redevelopment proposals will see the existing station entrance doubled in size by converting two existing window openings in the building frontage into doorways. A new station entrance will also be provided into the new concourse adjacent to the Edinburgh tram stop on Haymarket Terrace. This will provide significant relief to the existing station entrance.

Facilities Zone

Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
FZ1	The booking hall is located in the existing listed building. There are currently two ticket office windows and two ticket machines in the concourse. During the evening peak the ticket queues impede the flow of passengers trying to enter/exit the station to/from the gateline. First Scotrail have revenue protection inspectors helping to 'queue-bust' during peak periods.	C FZ1.8/10	A new booking hall will be provided in the new concourse as part of the proposed redevelopment scheme. This will have four ticket office windows. The number of ticket machines that will be provided has yet to be determined. However, space exists to provide significantly more machines than the current two.
FZ5	There is provision of a customer information screen at the entrance to the stairwell which leads to Platform 1. The screen provides real time information for all services and its close proximity to the gateline can cause congestion in the area owing to passengers stopping to look at the screen.	B FZ5.1	The proposed redevelopment scheme provides a new CIS display screen which will be provided on the southern wall of the new concourse building. This location is on the route to the platforms and is remote from the lifts, escalators and stairs that give access to them.
FZ5	The customer information screen at the stairwell to Platform 4 provides an additional information point for passengers using the station. However the location does encourage passengers to congregate on the bridge before entering the platform. This is particularly noticeable in the evening peak.	B FZ5.1	As per above, a new CIS screen to be provided in a different location in the new concourse building.

Platform Zone

Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
PZ6	Owing to the limited space, the gateline is somewhat constrained with five gates and a side access gate. Congestion occurs during peak periods at the gateline immediately after the arrival of services.	C PZ.6.4	A new ticket gateline comprising twelve gates will be provided as part of the proposed redevelopment scheme. This is considered sufficient to meet the forecast future demand levels.
PZ7	Congestion occurs on Platform 4 for services in the direction of Glasgow Central. The heaviest congestion levels tend to be in the area in close proximity to the entrance/exit stairwell to the platform. The reluctance of passengers to move down the platform is partly owing to uncertainty regarding train formations.	C PZ.7.3	The existing stairs down from the footbridge are located towards the east end of Platform 4. The new concourse deck will be located approximately in the centre of the platforms. Access down to the platforms will be provided by stairs at the west end of the deck, lifts in the centre of the deck and escalators at the east end of the deck. In combination with an amendment to the train stop board locations on each platform, this will provide the optimum arrangement for passenger transfer between the two levels.
PZ7	Congestion occurs on Platforms 2 and 3 during the evening peak. Similarly to Platform 4 the heaviest congestion levels tend to be in the area closest to the entrance/exit to the platform. The reluctance of passengers to move along the platform is partly as a result of uncertainty concerning train formations.	C PZ.7.3	See gaps above, similar solution to Platform 4 to be employed for Platform 2 & 3.
PZ8	The passenger overbridge is a main congestion pinchpoint during peak periods at the station since it is the only passenger access route to the platforms. Customer information screens are in situ on the bridge and passengers tend to stop to consult these and wait on the footbridge to seek cover/wait to see which train will depart first for Edinburgh. Congestion also occurs immediately after train arrivals as passengers exit from the platforms and exit the station.	C PZ.8.5	The existing footbridge that gives access to the platforms has an internal width of 3.5 metres. This is proposed to be replaced by a new concourse deck that will be approximately five times this width.

Special Events

Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
SE1	On match days at Murrayfield, a queueing system according to user destination is adopted. The temporary holding area is in the existing station car park.	A **SE1.1**	This queueing arrangement will be retained under the redevelopment proposal. The option of relocating the queueing system to the station forecourt was considered but this was discounted owing to the limited space availability in the forecourt and the conflicts introduced with other passengers.
		C **SE1.4**	A potential option to enhance the forecourt by providing additional public realm space is being considered. However the associated timescales and funding availability for the works are uncertain owing to the extent of third party land that would be required.

E. Conclusion

The redevelopment proposals for Haymarket station address congestion at various locations around the station, on the platforms, concourse and accessing the platforms. The station is forecast to undergo significant growth in footfall and will become an interchange with the tram system, which is due to be completed by 2013.

The case study illustrates a range of options for interventions that the current redevelopment proposal for the station considers to address the congestion gaps. These include increases in capacity by providing a new concourse, entrance, and gateline, as well as realigning stop boards to be in an optimised layout for passengers to exit both the train and the platforms.

The case study also illustrates the range of options for handling the passenger volumes resulting from matches at nearby Murrayfield.

Case Study No. 8 Littlehaven

Station Category: E

2009-10 annual exits, entries and interchanges: 0.3 million

A. Introduction

Littlehaven station serves the areas of Littlehaven, Holbrook and Roffey in the northeast area of Horsham, West Sussex. The station is on the Arun Valley Line. The off-peak Southern service frequency is two stopping trains per hour in each direction between Horsham and London Bridge. During the peak hours fast services to London Bridge and London Victoria call at the station as well as services to Bognor Regis, Portsmouth Harbour and Southampton Central.

A station plan of Littlehaven can be seen via the following link to the National Rail Enquiries website: **http://www.nationalrail.co.uk/stations/sjp/LVN/stationOverview.xhtml**

B. Baseline

The station has two platforms, each capable of accommodating four carriages. Access to both platforms is via side ramps and a ticket office is provided on the Down (Horsham bound) platform. This is included within the crossing keeper's building. Access between both platforms is via a manually controlled set of crossing gates. These are due for replacement in the foreseeable future with full length automatic barriers.

Being located in the residential areas of Littlehaven and Holbrook the station's usage profile is very much orientated towards the peak. Annual ORR data estimates usage at 0.3 million entries and exits per year based upon 2009-10 data. The station has seen increased usage over the last 5-10 years as a result of increased housing provision in the Holbrook area.

In order to understand the nature of the congestion at this station a series of passenger boarding and alighting counts, dwell time analysis and station operational observations were undertaken during May 2010. A brief summary of this is presented prior to discussion of the gaps and options associated with the station.

The passenger counts examined:

- entries and exits by five minute segments
- boarding and alighting of trains by service
- boarding and alighting via the critical door (the door nearest the entrance and exit to the platform or that provides easy access to the rest of the train, ie. coaches 5-12), as the platforms are only 4-car
- the dwell time of services calling at the station
- the length of time taken for the platform to clear.

The findings of these passenger counts were as follows:

- during the morning peak (06:00-10:10 – 25/05/10) 640 passengers entered the (to London) platform. The busiest periods were 07:45-07:50 – 62 entrants and 07:25-07:30 – 49 entrants. This corresponded with the two busiest departures from the station, 102 passengers boarding the 07:29 service to London Victoria and 77 passengers boarding the 07:49 service to London Bridge (25/05/10)
- during the evening peak, 16:00-20:30 – typically up to 150 passengers can alight from the busiest service
- analysis of the critical door revealed that the location of this door in the morning peak varied according to train length and where the train had originated. Fast services from the Sussex Coast saw the critical door to be at coach four which facilitated ease of access to the rest of the train in order to obtain a seat. On stopping services, originating from Horsham, the critical door varied from coach one door one to coach four door two. Passenger throughput via the critical door varied from five passengers to 32 passengers

- analysis of evening peak critical door trends revealed the critical door to be the second door of coach four, due to the location of the exit from the station. Passenger throughput varied from three passengers to 82 passengers
- train dwell times at the station during the morning and evening peaks varied considerably, primarily owing to fluctuating passenger numbers and varying train lengths. In the morning peak the dwell time varied from 36 to 79 seconds. The longest dwell time was seen on the 07:49 service to London Bridge at 79 seconds (26/05/10). In the evening peak the dwell time varied from 36 to 85 seconds (26/05/10 - 27/05/10). The longest dwell time was seen on the 18:08 departure to Horsham (from London Bridge) at 85 seconds, but this was because it arrived 96 seconds early
- the length of time for the Down platform to clear following an arrival of a train varied from 54 to 118 seconds, which is in excess of the timetabled dwell time. The service which took the longest time to clear the platform was the 18:35 arrival from London Bridge with 151 passengers alighting from it (27/05/10).

C. Future plans and aspirations

Information Zoning has been undertaken by Southern at the station (as per the description in **Section 5.4**).

The staffed crossing is due to be replaced in 2012 by an automatic full barrier crossing. This would be unlikely to affect passenger flows but would also involve the removal of the crossing box, meaning that the ticket office could be relocated to this area of the station.

D. Gaps and options

In light of the survey results and station observation work a number of gaps have been identified:

Photograph 13 – Congestion at the far end of Platform 1 at Littlehaven during the morning peak

Access Zone

Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
	No gaps were identified in this area of the station.		

Facilities Zone

Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
FZ2	Platform 1 (Up) – London direction has a narrow entrance to the platform with a ticket machine. The entrance and ramp to Platform 1 is very narrow and, at the end of the footpath prior to the ramp to the platform, there is a ticket machine. This constrained access can cause congestion during the morning peak when there are queues for the ticket machine and other users entering the station. There is reluctance by some users to cross the line to purchase tickets from the ticket office for fear of the crossing gates closing and resulting in them missing their intended train.	B FZ2.2	A potential option would be to widen the entrance and passageway to Platform 1 which could help alleviate problems associated with the congestion experienced with people queueing for tickets from the ticket machine and station users entering the platform. Widening of the ramp up to the platform may be unfeasible given the close proximity of the ramp to the ticket vending machine.
		B FZ2.3	After the level crossing is automated space would be created which could potentially allow for the ticket office to be relocated to the crossing box on Platform 1. This would widen the access to Platform 1 and 2, as well as providing ticket office facilities for those on Platform 1 avoiding the need to cross the railway for those users.
FZ5	On Platform 1, the passenger information boards displaying timetable information etc. are located immediately at the top of the entrance ramp to the platform. Although desirable from one perspective in ensuring that passengers have immediate information regarding timetables etc, the location presents a congestion constraint. The nature of the constraint is that any passengers standing looking at the boards immediately create an obstruction to the flow of passengers entering the station.	B FZ5.1	A potential option would be to relocate the passenger information boards from the immediate entrance to the platform in order to help reduce congestion. The information display boards could be relocated to the middle of the platform adjacent to the existing waiting shelter or on to the roadway accessing the station.

Platform Zone			
Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
PZ2	Platform 1 – London direction – location of Customer Information Screen (CIS) **see Photograph 13**. At present, passengers have to walk along the platform to look at real-time train information and then often walk back along to the middle/front of the platform. This is not a congestion related problem in the off-peak but in the peak can cause congestion as passengers are walking back along the platform as passengers are walking along the platform in the opposite direction.	B **PZ2.5**	A potential option would be to duplicate CIS screens along the platforms to distribute passengers more evenly.
PZ7	During the evening peak, Platform 2 – Horsham direction – experiences congestion immediately after arrivals of certain services. The cause of the congestion is owing to the volume of passengers alighting from services and trying to filter out of the single narrow exit past the ticket office, and associated congestion caused by the volume of passengers waiting to cross the line to access the large residential area of Holbrook. **See Photograph 14**	C **PZ7.3**	Potential options in order to alleviate peak hour congestion experienced on exiting Platform 2 could include (a) examination of the feasibility of opening up the exit on to the road, (b) widening of the exit ramp by narrowing of the ticket office/crossing keeper accommodation and (c) investigation into creation of an additional side entrance/exit from Platform 2. If an additional exit to the platform was provided it may encourage a more even dispersal.
PZ7	Platform 2 – Horsham direction – narrow entrance/exit past the ticket office/crossing keeper accommodation. It is not a particular problem during the off-peak owing to the lesser volumes of passengers using the station. The constraint can be a problem in the evening peak and also to a lesser extent when people are queueing to purchase tickets from the ticket office.		
PZ10	The platforms at the station are only 4-coaches long, and during the am peak 12-coach services originating from stations such as, Bognor Regis, Portsmouth Harbour and Southampton Central are often already heavily loaded in carriages 1 to 4. As a result passengers tend to congregate at the far end of Platform 1 in order to gain access to the rear door of coach 4 and therefore timely access less heavily loaded coaches 5-12. This results in congestion towards the end of the platform which has a knock-on impact for passengers trying to board the preceding stopping services. It also has a performance impact by potentially extending train dwell times.	C **PZ10.6**	A potential option would be to extend both platforms to accommodate eight cars. Platform extensions at this location would have a significant cost, in part because of the location of the level crossing, and would require a positive business case if it were to be pursued.

E. Summary

This case study has highlighted a number of typical congestion related problems associated with this type of station (a small edge of town commuter station). Congestion essentially occurs only at peaks with moderate sustained usage during the off-peak. There are a number of options to help mitigate congestion ranging from low cost measures such as relocation of information displays from platform entrances to high costs measures such as extension of platforms. It is likely that it will inherently be difficult to develop a compelling business case to justify the more extensive congestion relief measures at this type of station owing to the concentrated nature of the congestion and the numbers of passengers per day.

Photograph 14 – Congestion in the evening peak at the exit to Platform 2 at Littlehaven

Case Study No. 9
Liverpool Central

Station Category: B

2009-10 annual exits, entries and interchanges: 19 million

A. Introduction

Liverpool Central is a primary underground station on the Merseyrail network. It lies under the heart of the retail centre of the city and provides journey opportunities to north, south and west of the city region. Three routes to the north and one to the south are served from a Victorian island platform on the Northern Line. A deep level, single platform, on the Wirral Line serves four destinations to the west. Access to the Northern Line is via an escalator or steps. Access to the Wirral Line is via two flights of escalators from the concourse or one escalator from the Northern Line platform. A lift also serves the street level concourse, Northern Line (low level) and Wirral Line (deep level).

A station plan of Liverpool Central can be seen via the following link to the National Rail Enquiries website: **http://www.nationalrail.co.uk/stations/sjp/LVC/stationOverview.xhtml**

B. Baseline

Patronage at Liverpool Central is forecast to increase with the recent opening of Liverpool One, Europe's largest single, retail development. Further retail development in the city centre, including the Central Village development in the station airspace will significantly increase pressure on the station in the years to come. Liverpool Waters and Wirral Waters are two significant mixed use developments being promoted by the docklands area owner. Both of these will add further to the demand for rail travel.

The station has a twin facing island platform at low level. These were part of the Wirral Railway built in Victorian times under the Mersey. In the 1970s these platforms were configured into an extended Northern Line route from Southport and towns north of Liverpool. The Wirral Line services were diverted into a lower platform at deep level in a loop line serving four underground stations in the City Centre before heading back under the Mersey.

There are four trains per hour terminating in the Northern Line platforms for each of two branches, and four trains per hour in each direction on the remaining northern branch that works through to the southern branch. This equates to a total of 24 train movements per hour from the island platforms. **See Photograph 15.**

On the Wirral Line from December 2010 there are two trains an hour to the Ellsemere Port branch, and four trains an hour on the three other branches, which is a total of 14 trains an hour. There are extra trains in the peak hours on both lines.

There are occasions when the station needs to be closed off owing to the high number of people wishing to access the station who conflict with passengers leaving the site. Typically these are busy shopping Saturdays and Christmas and January shopping weeks.

C. Future plans and aspirations

A scheme has been developed which has considered a number of options in order to address the gaps at Liverpool Central called the Liverpool Development Plan. The development plan has committed funding for the following phases:

- the construction of a new travel centre, booking office and M2Go facility, which has been completed
- concourse and facility enhancements
- provision of additional passenger lift
- Wirral and Northern Line – replacement of ceiling, wall and flooring surfaces
- decluttering of the Northern Line platforms by moving escalator plant rooms
- considering installing platform screen doors to manage congestion.

The project has been funded by:

- DfT Access for All Major Schemes
- National Stations Improvement Plan
- Merseytravel LTP
- European Regional Development Fund.

The project has been delivered in partnership by the Local Delivery Group which comprises:

- Network Rail
- Merseyrail Electrics
- Merseytravel
- With collaboration from Merepark Developments.

Further phases are aspired to but do not currently have committed funding to increase train capacity and potentially widen the tunnel in which the platforms are situated.

Photograph 15 – Liverpool Central typical usage of the Northern Line island platform

D. Gaps and Options

Access Zone			
Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
AZ1	Insufficient approach infrastructure in view of future neighbouring retail developments.	C AZ1.4	A potential option would be to develop improved passenger access on the approaches to the station. This would involve working with adjacent property developers to provide commodious and appropriate accesses between these new developments and the station concourse.

Facilities Zone			
Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
FZ1	Inadequate ticket purchase opportunity leading to queueing.	C FZ1.8	An option has been implemented to increase the ticket purchase opportunity. The previous three windows and one ticket vending machine were be replaced with six ticket windows and retail unit and one ticket vending machine. This facility is now branded as an 'Mtogo' by Merseyrail.
		C FZ1.10	Increase ticket vending machine provision was also part of the 'Mtogo' concept to provide enhanced capacity and reducing queueing times. One additional Ticket Vending Machine has been installed at the station.
FZ5	Inadequate passenger waiting capacity.	C FZ5.2	Work is underway in Summer 2011 to increase passenger waiting capacity at street level on the concourse footprint. Provision of relocated automatic ticket gates and a new street level waiting room will provide holding capacity for excessive passenger flows. It will help to control access onto low and deep level platforms.

Platform Zone			
Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
PZ10	Life expired passenger facilities poorly located for current station usage	B **PZ10.4**	A potential option would be to renew platform level passenger facilities (seating etc) to contemporary designs in better locations. Provision of new passenger seating and repositioning of seating bays could assist pedestrian movements. This option is planned for implementation in CP4 and is currently being designed.
PZ10	Insufficient rail capacity in view of future neighbouring and city region developments.	C **PZ10.5**	A potential option would be to develop long term solutions to increasing train capacity of the underground station. This would involve joint working within the rail industry and with others on the development of long term capacity solutions and the associated funding packages. Working groups have been set up to develop this option further.
PZ11	Life expired escalators and obsolescent plant room equipment.	B **PZ11.2**	A potential option would be to reconfigure escalator layouts or re-engineer existing escalators to provide more space and more efficient circulation on platforms. Relocation of escalator plant rooms to new voids below platforms and opening out of existing plant rooms could create additional platform circulation space. This option is planned for implementation in CP4 and is currently being designed.
PZ11	Single lift of minimal capacity inadequate for the number of buggies and wheelchairs using the station.	C **PZ11.2**	A potential option would be to increase the number of lifts either between all three levels or between concourse and low level. Provision of widened access to the existing lift and installation of additional lift between street level and low level platforms could be considered. Working groups have been set up to develop this option further.

E. Summary

The scheme that has been developed at Liverpool Central is an example of different parties working together to deliver substantial improvements to the transport infrastructure.

Case Study No. 10
London Waterloo

Station Category: A

2009-10 annual exits, entries and interchanges: 91.9 million

A. Introduction

London Waterloo is the mainline terminus for services to and from London, Surrey, Hampshire and the South West and is a Network Rail managed station. It is a major transport hub with interchange opportunities with national rail services at Waterloo East, and with London Underground's Bakerloo, Jubilee, Northern and Waterloo and City Line services, as well as local buses. A Barclays Cycle Hire docking station has recently been installed outside the station. The station has 19 operational platforms and all train services are run by South West Trains. A further 5 platforms are located in the London Waterloo International former Eurostar station. There is a CP4 commitment to bring these back into operational service to ease platform congestion at the station, particularly on inner suburban South Western services, and to enable additional peak services from the Putney direction.

A station plan of London Waterloo can be seen via the following link to the National Rail Enquiries website: **http://www.nationalrail.co.uk/stations/sjp/WAT/stationOverview.xhtml**

B. Baseline

The station acts as a national hub for a mix of long distance and suburban services to and from south west London, the south of England and the West Country. The station has high frequency inner suburban services to destinations such as Chessington South, Dorking, Hampton Court, Shepperton, Hounslow and Windsor & Eton Riverside. Mainline longer distance services, typically with 1-2 trains per hour (or more) serve destinations which include Basingstoke, Exeter St Davids, Portsmouth Harbour, Reading, Salisbury, Southampton Central, Weymouth, Winchester, Woking and Yeovil Junction. Less frequent services run to and from destinations such as Bath Spa, Bristol Temple Meads, Warminster and Westbury.

The station currently has over 90,000 passenger movements in the morning peak (2009), with London Underground dealing with 50,000 passenger movements for the same period (not all journeys are interlinked).

It is also important to note that the footfall at a major terminus like London Waterloo is not just made up of passengers. As a result of its scale of retailing facilities the station footfall also comprises a large number of non-travellers. The Network Rail counts of footfall and passenger survey (2008) at managed stations shows that 34 per cent of users annually are non-travellers. This percentage of non-travellers is the highest of all of Network Rail's managed stations. The average passenger dwell time of 17 minutes (2008), which combined with the volumes of non-travellers, means that there is a very significant demand for concourse space and facilities.

The station acts as an important interchange with other modes of transport and between rail services such as the adjacent London Waterloo East station. Office of Rail Regulation station usage data highlights the station's importance as an interchange between national rail services. In 2009-10 a total of 5.5 million passengers interchanged between rail services at the station. This figure excludes passengers interchanging between rail and other modes.

Current congestion is focused around the following areas:

- access to the Northern, Bakerloo, Waterloo & City, and Jubilee Line London Underground entrances – congestion occurs in the morning peak from the volumes of passengers trying to access the Underground platforms. Resolving the capacity constraint accessing the Underground might simply move the congestion below ground which would not resolve the congestion as a whole. This reflects the capacity of London Underground services to carry the volumes of people arriving at Waterloo in the morning
- on the main concourse congestion occurs particularly around certain areas of the concourse that are constrained by the presence of retail units. Queues also occur at the ticket office and ticket vending machines. The Waterloo Balcony scheme to declutter the concourse and move the retail units to a mezzanine balcony level and to provide a new location for ticket retailing are planned to address these issues. **Photograph 16** shows congestion on the concourse
- during the peak hours in the morning there are queues in the subway to access the London Underground services
- automatic Ticket Gatelines are an area of congestion as passengers queue to exit the platforms after morning peak arrivals.

C. Future plans and aspirations

Given the current congestion at the station and the forecast growth a number of schemes are in development to increase the capacity of the station:

- Waterloo Balcony Scheme (construction 2011 to 2012) – in order to declutter the concourse space, which is a location of current congestion, a scheme is underway to relocate retail facilities from the main concourse to a mezzanine level of the station. A balcony will project over part of the concourse and the retail units themselves will be accommodated in what is currently office space. The works for the Waterloo Balcony scheme will be undertaken in advance of the other two schemes (detailed below) and it is due to be completed by 2012. The pedestrian modelling of congestion for the other two schemes has been undertaken without taking into account the Balcony scheme, so they have therefore taken a deliberately cautious view
- reopening Waterloo International (WIT) Platforms 20-24 (construction 2012 to 2013) – WIT has been closed since Eurostar services were transferred to London St Pancras International. Options have been developed in order to bring the former Eurostar platforms in Waterloo International in to use for domestic services from the Windsor Lines. These lines serve stations on routes to Reading, Hounslow, Richmond, and Windsor and Eton Riverside
- a number of options have been considered, some of which may have a negative impact on congestion and passenger transit times. The option to bring WIT back into usage more or less without modification results in passengers having to make a circuitous journey to the platforms. The platforms were laid out for international travel with significant security checks, and a secure waiting area before passengers were called to board their specific service. This is different from the requirements of passengers using high density suburban services
- other options therefore propose direct access from the main concourse rafting over the space where passengers formerly went down to a lower level beneath the platforms to check-in and board the Eurostar trains. This option allows a much shorter transit time and does not require use of escalators down to the lower level. The former Eurostar platforms were also accessed directly from London Underground and if suburban passengers were also able to do this it might well overwhelm the London Underground entrance area
- some options considered not having all of the Windsor Line services use the WIT platforms, thereby meaning that passengers would not know whether to head for WIT or the main station. There may therefore be the potential for some congestion resulting from passenger indecision. However, based on pedestrian modelling, the project sponsors do not believe that this will be a major issue for congestion, but would be a retrograde step in terms of customer service
- with all of the options for WIT the station CIS will have to be modified to remove the service from the screen earlier than for those trains departing from Platforms 1-4. This larger time allowance is in order to reflect the longer walking transit time required for passengers to reach their services on platforms 20-24
- there is no direct access to the peak hour subway from WIT and therefore passengers would have to use the London Underground entrance adjacent to platform 19 to access London Underground services. Options have been considered to address congestion that might result at this location by reducing the number of gates in the WIT automatic gateline and thereby controlling the flow of people towards the Underground entrance
- Waterloo 10-car (construction 2013 to 2014) – Platforms 1-4 are only able to accommodate 8-car trains. As part of wider train lengthening plans, platform lengthening is required on Platforms 1-4 to increase the length of train services. This will involve works to modify the track and layout in the station throat to accommodate longer services. The construction works will be phased to minimise the disruption to passengers. The bringing back into use of the Waterloo International platforms is central to the 10-car scheme. Waterloo International is likely to be used during the construction work on Platforms 1-4 in order to provide the extra capacity to allow the station to continue to function. Once the works are completed, Windsor Line services (a quantum that has yet to be decided) will operate from Platforms 20-24. The consequences for congestion at Waterloo have been extensively modelled using computer simulation tools.

D. Gaps and options

London Waterloo has a number of congestion related 'gaps' which include:

Photograph 16 – London Waterloo concourse evening peak congestion

Access Zone			
Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
AZ1	Congestion at the London Underground entrances (Jubilee Line entrance and Northern/ Bakerloo/W&C Lines entrance) in the am peak.		Consider options in options in the toolkit for Gap AZ1.
AZ1	Peak Hour Subway queues in the am peak in order to access London Underground services.		

Facilities Zone			
Toolkit gap no:	**Specific gap description**	**Toolkit option no:**	**Specific option description**
FZ4 & 5	Overcrowding during the am and pm peaks on the main concourse. Overcrowding typically occurs in both peaks, causing queues to impact upon key entry/exit points and flows to/ from the London Underground station at the following locations: ● around retail units in the middle of the concourse ● newspaper stands ● entrance/exit to Waterloo East adjacent to WH Smiths mid-concourse ● ticket vending machine queues impacting across key flows and into Customer Information Screen (CIS) dwelling areas thus constraining flows to/ from the entrances to the South Bank and Westminster.	B PZ8.2	A potential option would be greater utilisation of the Peak Hour Subway during the pm peak. At present, during the pm high peak period the main concourse congestion experiences periods of intense congestion. In contrast, the Peak Hour Subway is less well utilised. Consideration should be given as to how passengers could be encouraged to use the subway when waiting for their trains. Increased information displays in the subway and increased signage encouraging passengers to use the area could be considered.
		B PZ8.4	A potential option would be the introduction of a Variable Message Signage (VMS) to help direct flows of passengers in and around the vicinity of the station. VMS has seen extensive utilisation on congested road networks but to a lesser extent at railway stations. Providing information to passengers as early as possible after alighting from their train would help them to make more informed choices as to their route for their onward journey. For example if a specific entrance to the London Underground was experiencing saturation passengers could be advised of this and directed to a less congested entrance, thus helping to spread the flow across the station. Consideration would need to be given to the exact location of such information provision to ensure that their location does not cause additional congestion as a result of people stopping to look at the board(s). Further investigation into the potential usage of this alternative technology is needed to formulate an informed decision as to the costs and benefits of such an intervention.
		C FZ4.1	Relocation of existing retail facilities by creation of a 1st floor balcony for retail outlets. A scheme to relocate existing ground floor concourse retail facilities to create a new 1st floor balcony is being implemented. Access to the retail space will be via a balcony structure along the façade of the Network Rail office building. The scheme will open up the concourse by the removal of retail facilities, thus creating increased space for passenger circulation.

Facilities Zone			
Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
FZ4 & 5 (cont)		C FZ5.2	Reopening of Waterloo International Terminal (WIT) platforms and arrivals and departures areas. Assuming that WIT will be brought into operational use around 2013-2014, several possible options are available for managing congestion within the station. These include: ● linking the WIT arrivals level in with the Peak Hour Subway. This would result in those passengers arriving into WIT and needing to use London Underground not having to use the Waterloo concourse. Care would need to be exercised to ensure that congestion is not transferred to the Peak Hour Subway ● bringing back into use the arrivals and departures level at Waterloo International would have the potential for not only providing a mechanism for congestion relief of the main concourse but also provide an additional retail opportunity ● in the longer term there are aspirations for an additional entrance associated with development in the area to improve access in the Westminster direction by accessing York Road from the WIT area of the station.

Platform Zone			
Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
PZ6	Ticket gateline congestion typically occurs during the am high peak particularly upon the suburban platforms 1-4. It has been identified that platforms 1-2 are particular areas of congestion. This can be attributed to the limited amount of space and hence in turn somewhat restricted gateline. Congestion is not limited purely to the suburban platforms as this can occur on mainline services when two services arrive at adjacent platforms within a short time of each other. This is a particular problem where two adjacent arrivals are formed of 12 -car Class 450 car formations.		Consider options in options in the toolkit for Gap PZ6.

E. Summary

London Waterloo has the greatest combined number of exits, entries and interchanges of any station in the UK. A number of committed investments are planned at London Waterloo to increase terminal capacity. The recommissioning of London Waterloo International is clearly a potential resource for the station but because of the different use to which it was formerly employed substantial changes will be required to bring it back into use in a way in which benefits passengers. There are longer term aspirations to create a concourse with improved access to Westminster.

Some elements of the congestion at Waterloo relate directly to the capacity of the London Underground services to carry the volumes of passengers arriving at the station in the morning peak. Capacity to access London Underground could in theory be increased but without a corresponding increase in Underground train service capacity this would not be resolved as it would move the congestion into the below ground environment. There are currently upgrades to both the Jubilee (forecast completion 2011) and Northern (forecast completion 2014) lines which will see capacity increase by 33 per cent and 20 per cent respectively.

Case Study No. 11

Preston

Station Category: B

2009-10 annual exits, entries and interchanges: 4.9 million

A. Introduction

The city of Preston, Britain's newest city, is the commercial and administrative capital of Lancashire, and home to the University of Central Lancashire. It has an extensive motorway network, which places a population of one million within 30 minutes of the city centre.

The station sits on the West Coast Main Line with access north and south. It has diverging routes to Bolton and Manchester, Blackburn and Burnley and beyond to Leeds, Ormskirk, Blackpool, Carnforth and Barrow. The station has seven through platforms and two bay platforms at the south end. The station layout is made up of three islands, Platforms 1 and 2 which generally cater for the services to and from the Blackpool, Ormskirk and Blackburn lines; the main island 3 and 4, for through services along the West Coast Main Line and services to and from the Manchester line; and 5 and 6 which caters for long distance services between Birmingham; London to and from Scotland. Platform 7 is not in service for passenger trains but is sometimes used to pass freight services. Normal routeing for freight is via the goods lines to the west side of the Platform 1 and 2 island.

A station plan of Preston can be seen via the following link to the National Rail Enquiries website: **http://www.nationalrail.co.uk/stations/sjp/PRE/stationOverview.xhtml**

B. Baseline

Preston is the major employment centre in the region and caters for large numbers of commuters from all of the local major towns, for example Bolton, Blackburn, Warrington, Wigan, Blackpool and Lancaster. There is also a sizeable student population travelling to universities in Preston and Lancaster. There are good links to London Euston and Manchester in particular. Given the number of routes diverging form the West Coast Main Line, there is also a substantial interchange requirement at Preston.

The station is staffed 24 hours a day, seven days a week, and is operated by Virgin Trains. The other two operators using the station are Northern Trains with local services and TransPennine Express with both interurban and long distance services.

The station buildings are of Victorian origins with the platform lengths longer than the current normal day time services, which are nine-car Class 390 sets or two five-car Class 221. It should be noted that Class 390s are planned to be extended to 11-cars. **Photograph 17** shows the arrival of a Class 221 service on Platform 3a.

The station has a number of entrances, the main entrance being a slip road from the Fishergate Road which has direct level access from the roadway and drop-off point to the ticket hall. Additional entrances are situated in Butler Street. The main entrance gives level access to the overbridge from the street, but the only other access to and from the overbridge involves a stairway. There are taxi and bus facilities also available in this area. Two alternative access points to Platform 7 are available for those using the short stay or long stay car parks and for wheelchair users, which gives access to the subway via a ramp or the second subway via lift. Platform 7 is not stopped at by passenger trains but is used as a means to access other platforms.

There is an overbridge adjacent to the ticket office facility, accessed by a staircase and leading across the station to all other platforms. The normal practice is that trains stop between this area at the north end of the station and a point beyond the two subways. Customers who are able to negotiate stairs can walk to the first of the subways which is linked to the platforms via a series of ramps from the various island platforms. Customers who use a wheelchair are unlikely to use these ramps owing to the gradients involved, but can instead use the second subway, which is accessed via modern lifts further towards the south end of the station.

The two island platforms, 1 2, 3 and 4, have an information display with next platform departure and 'next departures from this station'. Similar information is available in the subways adjacent to the access to each island platform.

The narrower island Platforms 5 and 6, have screens displaying next departure from this platform but no subsequent departure listings.

Egress from all platforms except 3 and 4, is either via a steep and fairly narrow stair case to the narrow over bridge, or via a longer walk to the subway and to alternative exits.

C. Future plans and aspirations

There are a number of schemes which may affect congestion at the station described in the Northern RUS. The electrification of routes in the North West may result in train lengthening of some services which call at this station. This has the potential to change the congestion seen at the station. The impact of the electrification scheme is set out in great detail in the Northern RUS, along with the proposals for the Northern Hub Project.

Photograph 17 – Customers awaiting a Birmingham – Scotland service at Preston

D. Gaps and options

The gaps at Preston station can be grouped into crowding, lack of information displayed, mobility impaired access and are outlined below:

Access Zone			
Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
	No gaps were identified in this area of the station.		

Facilities Zone			
Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
FZ2	Crowding at peak times in the area between the two sections of overbridge with ticket office queueing impeding station access and egress at the main entrance.	C PZ8.5	A potential option would be, if the overbridge is replaced, to install a design with wider walkways and including platform departure information on the overbridge itself.

Platform Zone			
Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
PZ2	Crowding is evident on island Platform 5 and 6, specifically when long distance travellers are waiting for the arrival of one or more Long Distance services. The platform in this area is narrow and customers tend to congregate adjacent to the stairway. The level of crowding is manageable at this stage, however when the train services arrive, and these volumes try to embark whilst others disembark, there is a crowding issue with disembarking customers now looking for their next departure. Any wheelchair users disembarking in this area have to proceed forward the full length of the train to the subway lift. In these circumstances an eight minute interchange is difficult.	B PZ2.4	In the short term it is envisaged that the level of crowding is manageable in terms of those customers waiting for trains at the platforms concerned. A combination of announcing information regarding location of first and standard class, coach letter identification and a staff presence is suitable. However an aid to improve the situation would be the provision of screens showing the next and subsequent departures from the station with platforms. These screens and any other information would ideally not be located at the stairway so as not to encourage gathering in this area. As passenger growth continues and if crowding becomes more unmanageable, more sensitive planning of platforming of services could be considered, potentially even modernising and opening Platform 7 and splitting the current operation on Platforms 5 and 6, having Platform 5 as a northbound platform and Platform 7 as a southbound platform.
PZ2	Platforms 5 and 6 information display screens only show the next departure from the two platforms. There is no list of departures from the station. This results in arriving passengers for interchange looking for information which is not available, adding to confusion and lengthening the crowding period. There are announcements which are audible if there is no diesel powered train in the platforms. In these circumstances the engine noise usually drowns out the announcements. This is of added significance when the interchange between trains is near to the minimum of eight minutes or in the event of late running and alternative trains to those scheduled need to be identified.	B PZ2.4	Multi-departure screens showing subsequent departures from the station with platform numbers could reduce the level of uncertainty for disembarking customers and so ease crowding.
PZ7	There is peak time crowding during peak arrival times at Platform 1 and 2 stairway when trains disembark resulting in it taking several minutes for customers to egress via the stair ways to the main station entrance or footbridge to Butler Street.	C PZ7.3	This issue will not easily be resolved without facilities options such as escalators or additional stairways. Given the current location of the overbridge and the operational area of the platform, a second stairway accessing the overbridge would not likely be used. An alternative option could be the staggering of the area of platform used by north bound and south bound services so that the overbridge is central and a second stairway opening onto the overbridge opposite the current stairway is provided.
PZ7	The steep stairways form all platforms to the overbridge are unsuitable for customers with luggage, prams or push chairs, yet the alternatives are some distance in the opposite direction.	C PZ7.3	Solutions could be considered as part of any renewal of the overbridge as outlined in options above.

Platform Zone			
Toolkit gap no:	Specific gap description	Toolkit option no:	Specific option description
PZ8	Mobility impaired customers arriving by public or own transport will arrive in Butler Street. Wheelchair users will be required to enter in one of the two southern entrances with the overbridge entrance not having level egress to the ticket office or platforms. Instead they will need to access the subway via the lift at the southern end of the station.	B PZ8.2	Step free access is available; however there is no suitable signing to advise this. Signage at all three Butler Street entrances could be potentially improved so that unfamiliar users can use the facilities. In addition a safe crossing route over the roadway should be provided, and access to the station created from the bus interchange and car parks.
PZ8	Mobility impaired access to Platforms 1,2, 5 & 6 from the ticket office and main entrance area, or from public transport at Butler Street is via a circuitous route. This requires the least mobile people to travel the longest distances to access services.	C PZ8.5	In the short term no specific options appear to be affordable. However, the overbridge has narrow walkways, steep stairs and no mobility impaired access except at the Butler Street end. Although the lifts to the south end subway are modern and suitable, use of these compels those with least mobility and with heavy or bulky luggage to travel the longest distances to use facilities or to change trains. As investment becomes available and renewal of facilities such as the overbridge are considered, options to bring the facilities for all customers in the same location could be developed.
PZ8	The narrow overbridge creates congestion with the volumes trying to access platforms or entrances, particularly during peak hours when two-way movement is evident or when heavily loaded services arrive, specifically with customers with accompanied luggage. The numbers of customers interchanging between island platforms can easily cause crowding particularly at peak hours or when long distance travellers with cases interchange.	C PZ8.7	If a sufficiently compelling business case was found to exist, an additional overbridge could be considered based on the benefit in terms of reduced congestion to the passenger versus the cost of providing additional capacity. The current Station Operator views relocation of the ticket office to Butler Street as the main entrance, as a way of improving the whole operation and experience for the customer.
PZ10	Crowding on Platform 1 and 2 holding area is evident with the combination of the high frequency of trains scheduled, the comparatively narrow platform island and the location of the buffet area in close proximity to the stairway and centrally to the operational platform length. This island is used predominantly by local services and is busiest during the peak hours and high holiday season when many customers interchange with services on this platform.	B PZ10.4	A potential option, as described in the Lancashire and Cumbria RUS, would be for the buffet facilities in this area to be relocated towards the southern area of the platform to open out a larger holding and circulating area. **See Photograph 18.**

E. Summary

Preston station serves a variety of markets and the constraints that are present at the station are common to many stations of this nature. There are a number of constraints to access and movement around the station. There are also platforms where other station usages, such as retail, constrict the available space for passengers to wait for and board or alight from train services. The options outlined in the case study would require a full business case to be developed before they could be recommended.

Photograph 18 – Platform 2 passengers boarding a Northern service at Preston

Case Study No. 12

Southampton Airport Parkway

Station Category: C

2009-10 annual exits, entries and interchanges: 1.5 million

A. Introduction

Southampton Airport Parkway is situated on the South West Main Line between Southampton Central and Eastleigh. It lies close to Junction 5 of the M27, and in very close proximity to the terminal building of Southampton Airport. It therefore serves both as a typical parkway station, with a large station car-park, and as a convenient means of accessing the airport by rail.

A station plan of Southampton Airport Parkway can be seen via the following link to the National Rail Enquiries website: **http://www.nationalrail.co.uk/stations/sjp/SOA/stationOverview.xhtml**

B. Baseline

Rail demand at Southampton Airport Parkway is just over 1.4m journeys per annum, and, in the 10 years up to 2008, annual average growth exceeded 5 per cent. Over half of all journeys are to and from London, of which 40 per cent are made by season-ticket holders. There are plans to increase parking capacity (currently just under 400 spaces) by constructing a multi-storey car-park.

The airport sees around 2 million travellers each year, and this is expected to grow to 6m by 2030. Rail share of this market is currently 10 per cent, and there is an aspiration to grow this to 15 per cent by 2015.

There are, therefore, a number of different station users with differing needs.

The station has two platforms, linked by a footbridge. The car park is situated on the upside of the station, whereas access to the airport is from the downside. The off-peak train frequency is five trains per hour in each direction.

C. Recent developments

A project to provide a new footbridge has recently been achieved through partnership funding and a local delivery group. The project was funded by DfT Access for All Major Schemes. The project was delivered by the Local Delivery Group, in partnership with:

- South West Trains
- Hampshire County Council
- BAA plc
- Network Rail.

The outcome of the project was a new footbridge which is in addition to the current facilities. The second footbridge:

- more than doubles capacity and is wider than the existing footbridge
- the new footbridge is covered from the elements both on the steps and bridge span
- it has lifts for step free access and is Equality Act 2010 compliant
- it is on a more direct route between airport terminal and rail ticket office.

The existing footbridge was retained to allow choice for users depending on which exit they need and their chosen position in the train, see **Photograph 19** and **20**.

Southampton Airport Parkway station is having its car park enlarged by adding an additional storey, this car park is intended for rail passengers rather than airport users as there are National Car Parking (NCP) parking facilities opposite the terminal building. This will result in 378 additional spaces in the car park as a whole.

D. Gaps and options

Table of gaps and options at Southampton Airport Parkway:

Access Zone

Toolkit Gap No:	Specific Gap Description	Toolkit Option No:	Specific Option Description
AZ8	Car parking capacity.	C AZ8.8	There are plans to increase parking capacity (currently just under 400 spaces) by constructing a multi-storey car-park.

Facilities Zone

Toolkit Gap No:	Specific Gap Description	Toolkit Option No:	Specific Option Description
	No gaps were identified in this area of the station.		

Platform Zone

Toolkit Gap No:	Specific Gap Description	Toolkit Option No:	Specific Option Description
PZ8	Footbridge is the only means of crossing the line.	C PZ8.7	Replace with wider footbridge on new alignment.
	Footbridge is narrow.		
	Footbridge is open to elements.		
	Footbridge is an impediment to people with luggage and restricted mobility.		Supplement with second footbridge on new alignment.
	Footbridge causes conflicts between airport to upside station users and park-and-ride to downside station users.		

E. Summary

The planning and delivery of the second footbridge at Southampton Airport Parkway illustrate the benefits of working in partnership to provide improvements to the passenger.

Photograph 19 – Southampton Airport Parkway old footbridge

Photograph 20 – Southampton Airport Parkway new footbridge (taken from old footbridge)

Case Study No. 13
Station Travel Plans

A. Introduction

A workplace Travel Plan is defined by DfT as "a strategy for managing the travel generated by [an] organisation, with the aim of reducing its environmental impact, typically involving support for walking, cycling, public transport and car sharing."

In the 2007 White Paper, 'Delivering a Sustainable Railway', reference to Station Travel Plans (STPs) was made: "The Government welcomes Transport 2000's idea of station travel plans. Like workplace travel plans, the aim will be to provide the best possible package of environmentally friendly access options. A good station travel plan should improve access to stations and reduce impacts on the surrounding road network."

A Station Travel Plan can bring together all the stakeholders with an interest in rail stations (rail industry, local authorities, passenger groups, bus and taxi operators, cyclists and others) to develop and agree common objectives and a coordinated approach to delivering them.

B. Current Situation

In response to the White Paper, in early 2008, Association of Train Operating Companies (ATOC) invited Train Operating Companies (TOCs), Local Authorities, Passenger Transport Executives (PTEs) and Network Rail to propose a list of English and Welsh stations suitable for a pilot programme. A total of 24 pilot schemes were selected covering 31 stations, although one location appears to have subsequently withdrawn. Delivery of the individual plans commenced in August 2009.

Monitoring the success of the pilot schemes is ongoing, and a final report is due in April 2012.

Success will be measured against four criteria, which are:

- modal shift from car travel to sustainable modes for travel to/from the stations as a result of the station travel plan
- more rail passengers using stations as a result of the station travel plan
- CO_2 emissions from passenger travel to/from station reduced as a result of the station travel plan
- improved customer satisfaction with end to end journeys as a result of the station travel plan.

C. Contents of a typical Station Travel Plan

Typically a Station Travel Plan will include:

- context and need for a plan
- high level objectives
- 'SMART' objectives
- indicators for measuring achievement of objectives
- timescales for achievement of objectives
- roles and responsibilities of partner organisations
- costs and funding sources
- priorities.

D. Example of a Station Travel Plan

One example is the station travel plan which has been developed for Durham station by Durham County Council and the former National Express East Coast tram operator (now East Coast Trains).

Both Durham County Council and National Express East Coast expressed a wish to develop a Station Travel Plan to encourage greater utilisation of more sustainable modes of transport to/from the station. They also saw the plan as a tool for engaging more effectively with other city partners in improving access to/from the station by modes other than the private motor car.

Data for the travel plan evidence base was collated through a consultation phase which included face to face surveys, online surveys of different user types (including non-users), face to face meetings and discussions with members of the public and community groups.

The key objectives of the travel plan were to:

- improve the accessibility of the station for bus services and to increase bus usage to/from the station
- enhance cycle parking at the station and improve cycle and pedestrian access links
- improve 'Blue Badge' parking
- develop better working partnerships with Durham County Council, Durham City Council and other relevant organisations within the city.

The underlying targets of the plan were centred upon increasing the modal access share of sustainable modes of transport. These included:

- increase the proportion of rail users accessing the station by bus from 16 per cent to 20 per cent by December 2010
- increase the proportion of rail users accessing the station by park and ride from 1 per cent to 5 per cent by December 2010
- increase the proportion of rail users accessing the station by cycle from 0 per cent to 2 per cent by December 2010
- increase the proportion of rail users accessing the station on foot from 20 per cent to 24 per cent by December 2010

- increase the number of Blue Badge holder parking spaces from 9 to 10 by March 2010
- increase cycle parking provision from 50 to 76 spaces by March 2011.

During the development of the plan a number of policy interventions to improve access to/from the station were considered but rejected for various reasons. Examples of rejected interventions included:

- installation of dedicated car sharing bays within the station car park was considered but rejected as there would be no feasible way of enforcing the measure. It was noted that already many users travel to the station with more than one person. The measure would simply provide preferential parking to such users
- increasing the drop off areas at the station and reducing car park charges were considered but it was deemed inappropriate since the measure would not encourage sustainable travel
- provision of a bridge over the track to allow passengers to go over the bridge rather than use the existing subway was proposed as an option. It was felt that this measure would be too costly and had no demonstrable benefit in increasing accessibility or encouraging users to travel to the station via sustainable modes
- installation of a bicycle lift on the uphill approach to the station was proposed. It was deemed too costly to install and there was uncertainty as to the ongoing maintenance costs, eg would the lift mechanism fill with leaves in the winter?

The objectives and targets of the plan are being implemented by means of a detailed action plan. The plan is a three year strategy and concentrates upon the implementation of real time bus information at the station, signage improvements in the vicinity of the station, promotional and marketing initiatives to encourage 'smarter travel choices' and establishing the commercial viability of operating both service buses and Park and Ride buses to/from the station.

Appendix B – References

Company Fire Safety Handbook, Network Rail, October 2006

Developing Modern Facilities at Stations, Railtrack, November 1998

Fire Safety – Fire Risk Assessment, Network Rail, August 2006

Fire Safety – Managed Stations, Network Rail, August 2006

Fire Safety Risk Assessment – Transport Premises and Facilities, Department for Communities and Local Government, February 2007

Franchised Station Design Guidance (Draft Issue 2), Network Rail, January 2008

Guidance on Automatic Ticket Gates at Stations GI/GN7515, Railway Safety and Standards Board, February 2003

Guide to Platform Extensions (Draft Issue 1.1), Network Rail, April 2009

Interface between Station Platforms, Track and Trains GI/RT7016, Railway Safety and Standards Board, December 2007

Managed Station Design Guidance (Draft Issue 3), Network Rail, March 2007

Managed Stations Manual, Network Rail, August 2008

National Control Instructions and Approved Code of Practice Section 4.7 Station Overcrowding and Special Events, Network Rail, June 2008

National Control Instructions and Approved Code of Practice Section 4.6 Train Evacuation, Network Rail, June 2008

Network Rail Guide to Station Planning and Design, Network Rail, 2011

Rail Industry Standard for Station Infrastructure RIS7700-INS, Railway Safety and Standards Board, December 2007

Rail Safety Principles and Guidelines, Health and Safety Executive, July 1997

Sponsors Manual, Section 5.3 – The Application of GRIP, Network Rail, June 2009

Station Capacity Assessment Guidance, Network Rail, 2011

Geographic RUSs can be found at Network Rail's website **www.networkrail.co.uk**

Non-Network Rail documentation

A number of existing documents from other sources have also been used to compile this document. These include the following:

Accessible Train and Station Design for Disabled People: A Code of Practice, Department for Transport and Transport Scotland, July 2008

Getting to the Station – Findings of research conducted in the East of England, Passenger Focus, 2007

Quantifying the Benefits of Applying Best Practice at Stations, RSSB, 2011

Station Planning Standards and Guidelines, London Underground, 2008

Station Travel Plan Research Toolkit, ATOC, Passenger Focus and RSSB, 2009

Relevant Network Rail standards and guidance documents

Network Rail Corporate Sustainability Statement

Network Rail Environmental Policy

Network Rail GIRT 7016

Network Rail Guide to Best Practice for Station Interchange on the UK Rail Network

Network Rail Guide to the Care and Development of Network Rail's Architectural Heritage (2007 Draft)

Network Rail Investment in Stations – A Guide for Promoters and Developers

Network Rail Making Rail Accessible – A Guide to our Policies and Practices

Network Rail Managed Stations Wayfinding and Design Guidelines and Specifications

Network Rail Operational Property Design and Construction Handbook

Network Rail Passenger Surveys: Network Rail Key Performance Indicator Study (2009)

Network Rail Stations Strategy and Plan for CP4

Network Rail Sustainable Stations Policy Statement

Network Rail: Action Stations – Draft Report. Passenger and stakeholder consultation on the future of Britain's railways, PricewaterhouseCooper (on behalf of Network Rail)

Other useful documents

ACPO Secured by Design Principles (2004)

BRE Environmental Assessment Method, BRE Global

British Standards

CABE Building for Life: Great Places to Live

CABE Delivering Quality Places

CABE The Value of Urban Design

CABE Urban Design Principles

CEEQUAL The Assessment and Awards Scheme for improving Sustainability in Civil Engineering and the Public Realm

DfT Accessible Train and Station Design for Disabled People: A Code of Practice

DfT Better Rail Stations

DfT National Station Improvement Programme – Final Report

DfT Secure Stations Scheme – Guideline 8: Crime Reduction Strategy

DfT The Eddington Transport Study: Transport's role in sustaining the UK's productivity and competitiveness

DfT The Stern Review on the Economics of Climate Change

DFT WebTag Guidance

English Heritage Managing Heritage Assets

English Heritage Protocol for the Care of the Government Historic Estate (2009)

The Equality Act 2010

HMRI Guidance

London Cycle Design Standards

PRM TSI

Railway Safety and Standards Board - Group Standards

Railway Safety Principles and Guidance

TfL Cycle Parking Standards

TfL Interchange Best Practice Guidelines

TfL Streetscape Guidance for the Transport for London Road Network (TLRN)

The Town and Country Planning Act – Permitted Development Rights

Glossary

The following is a list of definitions for some of the terminology used in this document:

Term	Meaning
AfA	Access for All
APC	Automatic Passenger Counting
ATG	Automatic Ticket Gates
ATOC	Association of Train Operating Companies
BCR	Benefit cost ratio
CIS	Customer Information Screen
CP	Control Period (Network Rail five year funding period eg CP4 is from 2009-14)
DfT	Department for Transport
Dynamic Modelling	An analysis of station capacity using a commercially available micro simulation software package
EGIP	Edinburgh – Glasgow Improvement Programme
Forecast	An estimate of patronage in a given future year
Fruin Levels of Service	A measure of passenger/customer density derived by Prof. John J Fruin in 1971. Three levels have been derived, for walkways, stairways and queueing areas, and these form the basis of some of the analyses in this document.
GRIP	Guide to Railway Investment Projects
HLOS	High Level Output Statement
HS2	High Speed 2
IEP	Intercity Express Programme
ITA	Integrated Transport Authority
LATS	London area travel survey
LDHS	Long Distance High Speed
Legion	A commercially available pedestrian micro simulation software package
LENNON	Latest Earnings Networked Nationally Over Night
LPT	Local Transport Plan
LRT	Light Rail Transit
MOIRA	timetable based demand forecasting software
MML	Midland Main Line
ORCATS	Operational Research Computerised Allocation of Tickets to Services
ORR	Office of Rail Regulation
NPS	National Passenger Survey
NSIP	National Station Improvement Programme
Peak period	The period during the traffic day with the highest patronage
PIXC	Passengers in Excess of Capacity
PTE/PTA	Passenger Transport Executive/Authority
RFG	Rail Freight Group
ROSCOs	Rolling Stock Companies

RSSB	Rail Safety and Standards Board
Run-off	The space in front of an escalator, staircase or ticket gate where passengers reorientate themselves and move away from the element. This space should be kept free of obstructions
RUS	Route Utilisation Strategy
SDO	Selective Door Opening
SFO	Station Facility Owner
SMART	Specific, Measureable, Aligned, Realistic and Time-specific
SMG	Stakeholder Management Group
SPT	Strathclyde Passenger Transport
SRA	Strategic Rail Authority
STAG	Scottish Transport Appraisal Guidance
Static Analysis	An analysis of station capacity against relevant standards using a spreadsheet
STPR	Strategic Transport Projects Review
SYPTE	South Yorkshire PTE
TfL	Transport for London
TfGM	Transport for Greater Manchester
TOC	Train Operating Company
WG	Welsh Government
WebTAG	Web Based Transport Analysis Guidance
W&C	Waterloo & City Line
WCML	West Coast Main Line
WYPTE	West Yorkshire PTE