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In August 2010 we published a Draft for Consultation and the responses were both considered and numerous. This final document has undertaken further work in the light of those responses and the subsequent analysis and results are presented here. We will now seek to have this review established as an addendum to the existing Route Utilisation Strategy.

It is over five years since the responsibility for developing and maintaining Route Utilisation Strategies was passed to Network Rail. It is a responsibility we have always sought to discharge through working with industry colleagues and wide consultation with stakeholders. I would like to take this opportunity to put on record Network Rail’s continuing gratitude for such generous support.

Richard Eccles
Director of Network Planning

The East Coast Main Line Route Utilisation Strategy was established in April 2008. Since then industry plans and aspirations have matured and therefore, consistent with our responsibility to ‘maintain’ established strategies, we have undertaken an additional piece of work that focuses on the capacity of the route in 2016 and the calls that are likely to be made on that capacity.
Executive summary

Introduction

The East Coast Main Line Route Utilisation Strategy was published in February 2008 and was established in April 2008. A number of the recommendations within the strategy have now been funded for delivery during Control Period 4 (2009 – 2014). These enhancements will significantly change the infrastructure capability of the route and as a consequence there is considerable potential to change the service offer on the East Coast Main Line.

This review has examined the aspirations of stakeholders for paths on the East Coast Main Line (ECML) in 2016 to establish whether there is capacity to meet the demand for paths.

A copy of the established East Coast Main Line Route Utilisation Strategy (RUS) can be found on the Network Rail website at www.networkrail.co.uk.

Capacity analysis

Analysis of the aspirations for paths on the ECML against the available capacity on completion of Control Period 4 (CP4) infrastructure schemes has shown that the demand for paths exceeds the capacity available.

The difference in the speed of services on the route is the key constraint to how the capacity is used on the ECML. This, along with service calling patterns, means that all the aspirations cannot be accommodated in 2016. Utilising more of the available capacity on the route requires some trade-offs to equalise the speed of services. The key areas that require trade-offs in journey time and service specification are:

- fast and slow line use between Finsbury Park and Welwyn Garden City
- three track section between Huntingdon and Peterborough
- two track section between Peterborough and Doncaster
- two track section between Northallerton and Newcastle.

These trade-offs are unlikely to meet passenger, freight customer or stakeholder requirements. Without any trade-offs there are limited opportunities to increase the number of train services beyond that anticipated at the end of CP4. In the short term there is potential to increase long distance high speed (LDHS) services to seven per hour before there is a requirement for two freight paths between Fletton Junction and Huntingdon. The constraints on the route have been identified and potential solutions suggested.

The key constraint on the ECML was found to be the section between Peterborough and Huntingdon, particularly in the southbound direction where the extended section of two-track railway is a large capacity constraint. Passenger and freight growth cannot both be accommodated in the southbound direction and the study recommends that as both passenger and freight traffic increases a scheme for partial four-tracking is undertaken.

A base assumption for this study is the upgrade to the GN/GE Joint Line between Peterborough and Doncaster via Spalding and Lincoln to enable W10 gauge clearance for freight services. The precise nature of these works has not yet been specified, however it is assumed that the required level of passenger and freight service will be able to access the GN/GE Joint Line without significant impact on the core ECML traffic. Should this not be possible, then the running of freight services over the section of the ECML between Peterborough and Doncaster will have a significant impact on available capacity.

The section between Northallerton and Newcastle is already approaching full capacity and the current
timetable makes significant use of the flighting of services to meet current demand. Any increase in freight or passenger services, or optimisation of passenger services to provide a more even spread, is likely to make demand exceed capacity. Potential capacity-enhancing solutions may include diversion of passenger or freight services via Eaglescliffe and the Stillington line (with associated linespeed and headway improvements) and the reopening of the Leamside Line.

**Economic analysis and conclusions**

Network Rail has assessed the socio-economic value and revenue generated by the aspirations for passenger and freight service increments to the May 2011 timetable and Thameslink Key Option 2 service specification. This assessment is, in effect, a quantification of the value of addressing a series of passenger and freight journey time and connectivity gaps. Under RUS governance criteria these gaps have been added to the list originally considered in the East Coast Main Line RUS as the capability changes funded for delivery in CP4 have provided the opportunity for funded stakeholder aspirations to address them. The key emerging conclusions from this work are detailed below.

Most aspirations for additional passenger services involve provision of direct trains between London and locations on or near to the ECML that have few or no direct services in the May 2011 timetable. There is little difference in the economic case to provide services to a number of the larger new markets that have been considered. However, there appears to be a diminishing marginal socio-economic value as the number of services increases. Once the frequency of trains to a newly served town or city reaches one train every two hours, more economic value can be derived by serving another new sizeable location rather than increasing the frequency further.

Despite inclusion of revenue generation in the methodology, the most valuable aspirations to increase passenger services typically increase the number of services between London and existing well served towns and cities at the southern end of the ECML, particularly Stevenage and Peterborough. However, the analysis suggests that there would be a diminishing marginal economic value as the frequency of calls at these stations increases. The increment at which the benefit of calling additionally at these locations is outweighed by the increased end-to-end journey time is between one train every two hours and one train per hour.

Additional intermodal container traffic at current anticipated path take-up rates is estimated to have a relatively high value per path compared with other aspirations. Furthermore, container traffic is estimated to have the highest economic value per path of all the aspirations considered if the proposed additional passenger services do not call at the busier existing well served stations.

A sensitivity test based on the Office of Rail Regulation (ORR) Rail Freight User Values of Time & Reliability study and the cost of the additional mileage incurred, suggests that there would be a relatively small economic penalty associated with diverting freight traffic to accommodate both freight and passenger growth aspirations where suitable routes are available. This is particularly applicable to the GN/GE Joint Line.

The value of the aspired passenger services considered would be improved if they enabled synergies with the most valuable existing ECML services. In principle this would involve calling additionally at intermediate stations replacing the calls made by other long distance services with more valuable markets at the extremities of the route. The study recommends that the industry work towards compiling a holistically planned timetable in order to maximise the economic value of the route.

In the absence of any further infrastructure capability changes, Scenario D (described in Chapter 2) with seven LDHS services from London should be viewed as the most valuable shorter-term blueprint for future timetable development.

Scenario F which introduces a further LDHS service from London may represent the most valuable longer-term proposition, and the infrastructure south of Peterborough that is required to allow this is recommended subject to the outcome of the development of the holistically planned timetable described above.

**Consultation process and overview**

The East Coast Main Line 2016 Capacity Review Draft for Consultation was published in August 2010. The draft and this final document have been developed as a result of considerable analysis and close collaboration between the industry working group and Network Rail. We are grateful to all those organisations and individuals who responded to the consultation and we hope that, where possible within our terms of reference, we have been able to take account of stakeholder concerns.

Subject to final establishment, this East Coast Main Line 2016 Capacity Review, is intended to inform the High Level Output Specifications produced by the Department for Transport and Scottish Ministers for Control Period 5. It will also inform the new ECML long distance franchise.
1. Background

1.1 Introduction to Route Utilisation Strategies

Following the Rail Review in 2004 and the Railways Act 2005, the Office of Rail Regulation (ORR) modified Network Rail’s network licence in June 2005 to require the establishment and maintenance of Route Utilisation Strategies (RUSs) across the network. Simultaneously, ORR published guidelines on RUSs and both of these documents were then updated and re-issued on 1 April 2009. A RUS is defined in Condition 1 of the network licence as, in respect of the network or a part of the network, a strategy which will “promote the route utilisation objective”.

The route utilisation objective is defined as:

“the effective and efficient use and development of the capacity available on the network, consistent with the funding that is, or is likely to become, available during the period of the route utilisation strategy and with the licence holder’s performance of the duty”.

Extract from ORR Guidelines on Route Utilisation Strategies, April 2009

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

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

Extract from ORR Guidelines on Route Utilisation Strategies, April 2009

The guidelines also set out principles for RUS scope, time period and processes to be followed and assumptions to be made. Network Rail has developed a RUS manual which consists of a consultation guide and a technical guide. These explain the processes used to comply with the Licence Condition and guidelines. These and other documents relating to individual RUSs and the overall RUS programme are available on our website at www.networkrail.co.uk.

The Network Licence requires Network Rail to both establish and maintain Route Utilisation Strategies. To ensure that RUSs take cognisance of changing circumstances Network Rail regularly reviews established RUS recommendations to ensure that they remain valid and fit for purpose. A number of factors can affect RUS recommendations over time, including changed Government policy, economic circumstance and franchise change and remapping. The publication of the High Level Output Specifications and Network Rail’s Delivery Plan in 2008/9 has also changed the way in which a number of recommendations will be delivered.

1.2 The established East Coast Main Line Route Utilisation Strategy

The East Coast Main Line RUS was published in February 2008 and was established in April 2008. A number of the recommendations within the RUS have now been funded for delivery during Control Period 4 (CP4). These enhancements will significantly change the infrastructure capability of the route and as a consequence there is considerable potential to change the service offer on the East Coast Main Line.

In December 2009, ORR wrote to Network Rail requesting that the East Coast Main Line RUS be reopened in the light of the funded CP4 infrastructure interventions and the potential impact of InterCity Express Programme trains operating on the route in the future. Following a number of meetings, Network Rail and ORR agreed terms of reference for this East Coast Main Line 2016 Capacity Review which, in due course, will form an addendum to the established East Coast Main Line RUS.

As with other RUS publications, the process is designed to be inclusive. Joint work is encouraged between industry parties and the results of the analysis have been extensively reviewed by an industry working group comprising Department for Transport, Transport Scotland, train operators, freight...
operators, Network Rail, the Association of Train Operating Companies, Passenger Focus, Passenger Transport Executives and ORR (as observers).

The agreed terms of reference for this East Coast Main Line 2016 Capacity Review have required Network Rail to understand the likely level of demand for train paths on the route in a potential December 2016 timetable, whether that demand can be met, in part or in full, after the committed CP4 capability changes to the route have been delivered and what economic trade-offs can be made either by providing additional infrastructure or by assessing the economic value of the paths aspired to.

In order to establish the likely level of demand for train paths in a December 2016 timetable, Network Rail wrote to all existing and known potential passenger and freight train operators asking for details of their aspirations. A number of respondees requested that their responses remain confidential and the analysis therefore considers the aspirations in aggregate rather than individually to comply with this request.

Aspirations have been received from the following organisations:

- Alliance Rail Holdings Limited
- CrossCountry
- DB Schenker
- Department for Transport
- East Midlands Trains
- First Capital Connect
- Freightliner Ltd
- Grand Central
- Hull Trains
- ScotRail
- South Yorkshire Passenger Transport Executive
- Transport Scotland
- West Yorkshire Passenger Transport Executive.

1.3 About this document

The responses from stakeholders to the Draft for Consultation published in August 2010 have shaped this final East Coast Main Line 2016 Capacity Review.

Chapter 2 of this document covers the capacity analysis that has been undertaken to establish the capability of the route by the end of CP4.

Chapter 3 details the economic analysis that has been undertaken within the terms of reference before going on to describe the additional work undertaken during and after the consultation period.

Chapter 4 explains the consultation process and provides a synopsis of the responses received, and when appropriate, explains how they have been incorporated into the final document.

Chapter 5 details the conclusions of the East Coast Main Line 2016 Capacity Review and outlines the next steps.
2. Capacity analysis

2.1 May 2011 timetable change
The proposed May 2011 timetable has been used as the base for this work. The key service changes for May 2011 are:

London based long distance high speed
- more standard hour calling patterns
- increased quantum of paths:
  - two trains per hour to Leeds
  - one train per hour to Edinburgh Waverley
  - one train per hour to Newcastle with one train every two hours extended to Edinburgh Waverley
  - an additional one train per hour, alternating between Newark North Gate and York
  - open access path – Hull or Sunderland/Bradford Interchange
- with intermediate stops in the York/Newark North Gate service, the other journey times have been improved

Non-London based long distance high speed
- Plymouth to Edinburgh Waverley via Leeds is extended to Glasgow Central (via Motherwell) every two hours.

2.2 Planned and proposed schemes
The schemes detailed in this section are included in the infrastructure baseline for this work. These are committed schemes due to be delivered by the end of Control Period 4 (CP4) and have been assumed in the capacity analysis.

2.2.1 Rolling stock
Provision of rolling stock to deliver the services described by the aspirants has been assumed in the baseline. This includes the new Thameslink rolling stock which will be required to deliver the Thameslink Programme. The Coalition Government is expected to make an announcement on the InterCity Express Programme (IEP) in 2011. It is envisaged that IEP rolling stock will replace high speed diesel trains currently operating on the route towards the end of the decade.1

2.2.2 Enhancements
The schemes in Table 2.1 have recently been completed or are due to be completed before the end of CP4 in 2014.

2.2.3 Thameslink
With the announcement in November 2010 by the Secretary of State of the commitment by the Coalition Government to implement the Thameslink Programme in full, the baseline for the capacity analysis assumes that the Thameslink infrastructure works to join suburban services from the East Coast Main Line (ECML) to the Thameslink Core between London St Pancras International Low Level and London Blackfriars is a committed scheme. Furthermore, the review assumes that the proposed new Thameslink timetable is part of the baseline.

2.2.4 Power supplies
This study only considers track capacity. Electrical power supply modelling combining the requirements of IEP, Thameslink Key Output 2 train specification and electrically hauled freight is being undertaken separately.

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1 ORR requested that Network Rail considers the impact of the InterCity Express Programme (IEP) as part of this work. A DfT review of the IEP has subsequently commenced and is yet to be completed. The assessment presented in this chapter remains applicable providing that the aspirations which are currently based on IEP rolling stock are operated with 125mph stock with similar acceleration characteristics.
As discussed in the previous chapter, all potential funders and train operating companies have been consulted to understand aspirations to run services on the ECML in 2016.

Some aspirants have requested that their submissions remain confidential. The analysis shown therefore does not differentiate between passenger operators. Figure 2.1 details the off-peak aspirations by the number of trains per hour over each route section. As a comparison Figure 2.2 shows the quantum of services in the May 2010 and May 2011 timetables. For the peak the quantum of suburban services is assumed to be fixed to cater for peak demand, therefore no more than eight long distance high speed (LDHS) services can be accommodated between London King’s Cross and Stevenage.

A range in the quantum of services shown in Figures 2.1–2.8 means that the number of paths may differ by hour depending on aspirant requirements for non-hourly services. Where aspirants requested a set of paths over the day (rather than the hour), these have been spread out over the operating hours, again resulting in the higher and lower ranges of aspirations per hour shown in Figures 2.1–2.8.

### 2.3.1 Freight

There is a mixture of freight services which use the ECML for either part of or their entire journey. For the purpose of this study freight has been split into Class 4 and Class 6. Class 4 is 75mph-capable freight (up to 1,600 tonnes trailing load) which would include intermodal container traffic and empty coal services. Class 6 is 60mph capable freight which would include coal and aggregate traffic and generally have heavier loads (up to 2,400 tonnes trailing load). Class 6 oil services are up to 3,000 tonnes trailing load.

### 2.3.2 Long distance high speed

#### London based services

LDHS services are those which connect London King’s Cross with various major towns and cities in Yorkshire, the East Midlands, East Anglia, Lincolnshire, the North East and Scotland. LDHS services are assumed to be formed of either IEP or Class 91 (or rolling stock with equivalent performance characteristics). No distinction is made between open access or franchised operators.
2. Capacity analysis

Non-London based services
Non-London LDHS refer to long distance services which use the ECML outside London such as the existing CrossCountry services between Reading and Newcastle, and between the South West and Scotland.

2.3.3 Cambridge fast
Cambridge fast services from London King’s Cross are assumed to be operated with 125mph rolling stock in all scenarios.

2.3.4 Regional passenger
Non-London regional services
These are short distance and medium distance services that operate over parts of the ECML.

London suburban services
These services only operate on the south end of the route, but have a variety of calling patterns and origins/destinations. For the purpose of this study they have been split into the groupings shown in the table below.

2.3.5 Other services
The analysis focuses on services which use the core ECML route. Where other services interact with the route, provision has been made for the current level of service to continue (eg. East Anglia – North West passenger service and passenger and freight services crossing the route north of Newark North Gate). Further timetable development will be required to destinations away from the core route on developing the preferred option.

<table>
<thead>
<tr>
<th>London suburban services</th>
</tr>
</thead>
<tbody>
<tr>
<td>GN outer fast</td>
</tr>
<tr>
<td>GN outer slow</td>
</tr>
<tr>
<td>GN inner</td>
</tr>
</tbody>
</table>
Figure 2.1 – Aspirational off-peak service level
2. Capacity analysis

Figure 2.2 – Current off-peak service level – comparison between May 2010 and May 2011 timetables

- Edinburgh Waverley
- Portobello Junction
- Drem
- Oxwellmains
- 2–3 tph/2-3 tph
- 1–2/1–2 tph
- 0–2/0–2 tph

- 2–3/2–3 tph
- 1/1–2 tph
- 0–2/0–2 tph

- 3–5/4–5 tph
- 2/2 tph
- 1–5/1–5 tph

- 4–6/5–6 tph
- 1/1 tph
- 0–2/0–2 tph

- 4–6/5–6 tph
- 2/2 tph
- 7/7 tph
- 0–2/0–2 tph

- 4–6/5–6 tph
- 1–5/1–5 tph
- 2/2 tph

- 3–5/3–5 tph
- 0–1/0–1 tph
- 1–2/1–3 tph

- 4/4 tph
- 1/1 tph

- 1–4/1–4 tph

- Newcastle
- King Edward Bridge Junction
- Northallerton

- 4–6/5–6 tph
- 1–4/1–4 tph

- Skelton Bridge Junction
- Colton Junction
- Hambleton South Junction
- Temple Hirst Junction
- Doncaster
- Loversall Carr Junction
- Retford

- 3–5/3–5 tph
- 0–1/0–1 tph
- 1–2/1–3 tph

- 1/1–2 tph

- Newark North Gate
- Grantham
- Helpston Junction/Werrington Junction
- Peterborough
- Huntington
- Hitchin

- 4–6/5–6 tph
- 2/2 tph
- 0–2/0–2 tph

- Woolmer Junction
- Welwyn Garden City
- Alexandra Palace
- Holloway Junction
- London King’s Cross

- LDHS
- Cambridge fast
- Regional
- Freight
2.4 Option definition and analysis

The ECML was split into sections to assess the various options of how the aspirations could be accommodated on the route. Sections of route where there was no identified constraint or without significant change from the current service levels, were not analysed further. The options which have been considered to examine whether aspirations can be accommodated on the route are:

- optimising the timetable
- routeing alternatives
- infrastructure works.

The analysis has examined the capacity of each route section by fixing the quantum and stopping pattern of the slowest services over the section so that the remaining capacity can be assessed for the fastest train over the section. The ECML is constrained by the difference in speeds between regional, freight and LDHS services so different options have been assessed.

The individual analysis has then been collated to give a picture of the whole route to understand how the capacity could be used by looking at different combinations of aspirations. A number of options have been developed which show the capacity trade-offs that can be made to accommodate the aspirations. This has been achieved by examining the key constraining sections of route to understand how a timetable could be developed for the full route.

2.4.1 Section analysis and options

This section summarises the analysis that has been undertaken on individual route sections. This shows the key constraints and trade-offs between aspirations which will be required for each section along with possible options for how the aspirations can be accommodated.

Tables 2.2–2.5 detail the analysis that has been completed to understand the theoretical capacity of each route section and how this compares to aspirations for services on each section. The options described in each table detail the potential solutions to provide capacity for all aspirations, these include changes to the service requirement or infrastructure changes.
## 2. Capacity analysis

### Table 2.2 – London King’s Cross – Stevenage

<table>
<thead>
<tr>
<th>Route description</th>
<th>Four track railway from London King’s Cross to Stevenage, except a two track section between Digswell Junction and Woolmer Green Junction (approximately 2.5 miles). Two track line from Moorgate to Finsbury Park and Alexandra Palace to Stevenage (Langley Junction) via Hertford North (Hertford Loop).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current service</td>
<td>Off-peak, four to six LDHS services per hour and six GN outer services (four fast, two semi-fast). Three GN inner services from Moorgate to Welwyn Garden City and three to Hertford North (one continuing to Letchworth). Less than one freight train per hour via Welwyn or Hertford North. Peak, six LDHS paths per hour and 10 GN outer services (eight fast, two semi-fast). Six GN inner services to Welwyn Garden City (four from Moorgate and two from London King’s Cross) and eight to Hertford North/Stevenage from Moorgate.</td>
</tr>
<tr>
<td>Aspirations</td>
<td>Between 11 and 13 LDHS services per hour including two non-stop IEP Cambridge services. The same level of GN outer services but with different stopping patterns. GN inner services to Welwyn Garden City and Hertford North/Letchworth increased to four tph. Two freight paths to run via Hertford North.</td>
</tr>
<tr>
<td>Theoretical capacity</td>
<td>The key constraint is the speed differential leading up to the two-track section over Welwyn viaduct. Maintaining journey times at a similar level to May 2011 allows up to six tph LDHS and suburban and freight services to run at the aspired level. Theoretical maximum capacity is between 10 and 12 LDHS services per hour but this requires compromises in journey time for both LDHS and some GN outer services.</td>
</tr>
</tbody>
</table>
| Options            | 1. Maximum number of LDHS paths requires a journey time penalty of 11 minutes between Alexandra Palace and Welwyn Garden City on the slower GN outer services. This journey time impact is sensitive to the inner suburban specification; if this journey time extension is not acceptable, changes to the specification should be sought. Allows up to four additional services over May 2011 timetable with 1.5 to 2 minutes pathing time per 125mph train due to the different rolling stock characteristics.  
2. Remove journey time impact from LDHS services. Allows up to two additional LDHS services with no journey time penalty, but journey time increase still exists for slower GN outer services.  
3. Provision of platform faces at Harringay and Hornsey on the down slow 2 and up slow 2 lines. Reduces journey time extension for GN outer slow services by approximately three minutes.  
4. Removal of 15 minute service interval for GN outer services. Allows two additional LDHS services.  
5. Reduce planning headway to 2.5 minutes between trains. Allows two additional LDHS services.  
6. Four track Welwyn viaduct. Allows two additional LDHS services.  
7. Route LDHS services via the Hertford Loop. Provides additional services but with journey time impact. |
| Impact of options  | 1. Slower LDHS services and large pathing time in some GN outer services.  
2. Large pathing time in GN outer services.  
3. Financial cost in building platforms.  
4. Not ideal service interval for Thameslink/GN outer services.  
5. Potential performance impact needs to be assessed.  
6. Large financial cost.  
7. Longer journey times for rerouted services. |
**Table 2.3 – Stevenage – Doncaster**

<table>
<thead>
<tr>
<th>Route description</th>
<th>Four track railway between Stevenage and Stoke Junction (except between Huntingdon/Holme Junction and Fletton Junction). Two track railway between Stoke Junction and Doncaster Loversall Carr Junction with passing loops.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current service</td>
<td>Four to six LDHS services per hour (one only as far as Newark North Gate in some hours). In the peak six LDHS services per hour. Two tph GN outer services from London King’s Cross to Peterborough (four in the peak). Services to/from East Anglia, the Midlands and Spalding in the Peterborough area. One tph from East Anglia to the North West running between Peterborough and Grantham on the ECML. Cambridge line services running between Stevenage and Hitchin Junction. A combination of freight with an average of one tph south of Peterborough and between one and two north of Peterborough.</td>
</tr>
<tr>
<td>Aspirations</td>
<td>Between 9 and 11 LDHS services per hour, some turning off the route in this section. Two freight paths per hour. All other services as current.</td>
</tr>
<tr>
<td>Theoretical capacity</td>
<td>This section is sensitive to the destinations and stopping patterns of the LDHS trains and the number and speed of freight services. The best achievable capacity is approximately 12 LDHS paths, which would preclude any freight from running over the section between Stoke Junction and Loversall Carr Junction except via the GN/GE Joint Line and require flighting of station calls over this section between Peterborough and Doncaster (which is less desirable from a passenger perspective). Taking into account the aspired calling patterns results in a similar structure to the May 2011 timetable: seven LDHS services (no Class 4 freight), six LDHS services (one Class 4 freight) and four to five services (two Class 4 freights), and one non-London long distance service. There is also a capacity constraint on the two track section south of Peterborough which has an impact on the provision of freight and passenger aspirations.</td>
</tr>
</tbody>
</table>
| Options            | 1. Spread station calls between services. This increases capacity by equalising running times. This achieves approximately 11 LDHS services with no freight, or nine LDHS services with one Class 4 freight service.  
2. Flighting of non-stop services and even spacing of stopping services. This would allow approximately 10–11 LDHS services (no freight) or six–eight LDHS services (one Class 4 freight).  
3. Additional infrastructure to allow easier overtaking of services (ie. partial fourtracking Stoke Junction – Loversall Carr Junction).  
4. Reduction of signalling headways in order to increase capacity.  
5. Route all freight via the GN/GE Joint Line to maximise passenger paths.  
| Impact of options  | 1. Extension of journey times for some services. Decreases journey opportunities for stations within the route (ie. Grantham, Newark North Gate and Retford).  
2. Unlikely to be able to achieve necessary even spacing for services outside of the Stevenage – Doncaster area. May require journey time extension in order to arrive in section at the correct time.  
3. Further analysis needed to evaluate benefits. Would have a financial impact.  
4. Further analysis needed to evaluate potential scope of change. Performance implications would need to be fully evaluated.  
5. Journey time for direct route compared to via GN/GE Joint Line would need to be verified. May be less commercially desirable.  
6. Feasibility would need to be investigated further and would have a high financial cost. |
### 2. Capacity analysis

**Table 2.4 – Doncaster – Newcastle**

<table>
<thead>
<tr>
<th><strong>Route description</strong></th>
<th>Two track railway with the exception of Colton Junction – Northallerton (four track) with station/passing loops where provided.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current service</strong></td>
<td>Three to four LDHS services running Doncaster – Newcastle. One to two additional LDHS services turning off south of York. Two 100mph services northwards from York, one turning off at Northallerton. A combination of freight paths, averaging two tph over the whole route. Up to two freight services between Doncaster and Colton Junction with up to an additional two services turning off at Shaftholme Junction, Temple Hirst Junction or Hambleton South Junction. Up to four freight services operate on the section between Northallerton and Newcastle with services using both the mainline and Stillington route. The freight service is accommodated over this section due to the close flighting of passenger services.</td>
</tr>
<tr>
<td><strong>Aspirations</strong></td>
<td>Seven to nine LDHS services south of York, and four to six services approaching Newcastle. One additional 100mph service York – Newcastle. Between one and six freight paths depending on route section.</td>
</tr>
<tr>
<td><strong>Theoretical capacity</strong></td>
<td>South of York, approximately six LDHS services and two freight paths can be accommodated. This is sensitive to the destination and speed of passenger and freight services. The key constraint on this section is between Northallerton and Newcastle. This allows four to five services but is sensitive to the number, routeing and speed of freight services (in this example, one Class 6 freight is included via the Stillington route; however, if an additional Class 4 freight services via Darlington is included, this drops to three to four LDHS services). An additional 100mph service could be provided but would need to replace one of the stated LDHS paths.</td>
</tr>
</tbody>
</table>
| **Options**           | 1. Optimise freight routeing between Doncaster and York. Freight services may diverge at Hambleton South, Temple Hirst or Shaftholme Junctions. This allows additional LDHS services, up to a maximum of nine trains.  
2. Routeing of LDHS services via the Stillington route. Use of the Stillington lines for additional LDHS services or regional passenger trains would provide additional capacity, as well as different journey opportunities (e.g. calling at Eaglescliffe).  
3. Remove capacity constraint at Darlington station. Due to the number of trains calling and long dwell and headway values, removing this (e.g. by providing additional platforms) would allow one additional LDHS path.  
4. Reopen the Leamside line between Tursdale Junction and Pelaw to provide an alternative route to the main line. |
| **Impact of options** | 1. Number of freight that can be accommodated is a function of the destination of those trains (i.e. not a standard number of paths).  
2. Extended journey times for passenger services (even with linespeed improvements) but with the opportunity to serve additional passenger markets.  
3. Financial impact of the option.  
4. Extended journey times for rerouted services and high financial impact of option. |
Table 2.5 – Newcastle – Edinburgh Waverley

<table>
<thead>
<tr>
<th>Route description</th>
<th>Mostly two track railway with passing and platform loops.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current service</td>
<td>Two to three LDHS services running between Newcastle and Edinburgh Waverley (up to four in the peak). One service running between Newcastle and Morpeth. Two trains per hour between Newcraighall and Edinburgh Waverley, and one between North Berwick and Edinburgh Waverley (two in Edinburgh area peak hours). One to two freight services over the whole section.</td>
</tr>
<tr>
<td>Aspirations</td>
<td>Up to five LDHS services, one of which is an inter-regional service calling at principal stations along the route. Local regional service as current, with an additional two tph from the Borders Railway (Tweedbank) via Newcraighall.</td>
</tr>
<tr>
<td>Theoretical capacity</td>
<td>Five LDHS services can be accommodated, including the inter-regional stopping service. The local services can be accommodated, although not at a precisely even service interval. Two freight paths can be accommodated as far as Edinburgh.</td>
</tr>
</tbody>
</table>

2.5 Route scenarios

This section details the possible scenarios for how aspirations can be accommodated on the whole route; ie what the effect is when the theoretical capacity detailed in Tables 2.2–2.5 is considered over the whole of the ECML and not just in isolation. Six scenarios have been described which show how capacity can be utilised to accommodate different combination of aspirations.

Figures 2.3–2.8 illustrate the number of services provided over the route for potential scenarios. Services have been split into LDHS, Cambridge fast, regional and freight. This capacity analysis has focused on constrained sections. Where there are no details indicated in the table or map no constraint was identified between the theoretical capacity and the aspirations.

Freight figures have been detailed as a range due to the nature of freight requirements. In Figures 2.3–2.8 the range shows the requirement between different hours of the day. If a range is quoted as 2–4 this means that at least two paths are required every hour with some hours requiring up to four paths (based on current usage).

It should be noted that where the range presented in the table does not match the aspiration or there are constraints to deliver all aspirations over a section, a potential solution is to more evenly spread the freight services so that path requirements are standardised. This will allow services to be more evenly distributed over hours so that standard freight paths can be constructed within the timetable and there is not a requirement to operate more freight on specific hours of the day. The operation of freight services is based on customer requirements and any further work on evenly spreading freight services would need to be done jointly between the industry and freight customers.
2. Capacity analysis

<table>
<thead>
<tr>
<th>Table 2.6 – Scenario A</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Concept</strong></td>
</tr>
<tr>
<td><strong>LDHS</strong></td>
</tr>
<tr>
<td><strong>Freight</strong></td>
</tr>
<tr>
<td><strong>Regional passenger</strong></td>
</tr>
<tr>
<td><strong>Capacity-enhancing solutions</strong></td>
</tr>
<tr>
<td><strong>Summary</strong></td>
</tr>
</tbody>
</table>

*London and non-London LDHS included in each section. Cambridge fast services included in LDHS.
**Figure 2.3 – Scenario A – capacity available by number of trains per hour over route section**

- **East Coast Main Line 2016 Capacity Review December 2010**

- **6 tph**: London King's Cross
- **2 tph**: Holloway Junction
- **9–10 tph**: Alexandra Palace
- **2 tph**: Welwyn Garden City
- **6 tph**: Hitchin
- **2 tph**: Hertford Loop
- **5–6 tph**: Oxwellmains
- **4 tph**: Drem
- **4 tph**: Edinburgh Waverley
- **5 tph**: Portobello Junction
- **2 tph**: Doncaster – Shaftholme Junction

- **Class 6 freight path not achievable in off-peak hours between Fletton Junction and Huntingdon in Southbound direction**

- **A second regional service between York and Newcastle would cost a LDHS service over this section**

- **Cambridge fast**:
  - 1 tph
  - 2–4 tph total with 1–2 tph via Stillington

- **Regional**:
  - 5 tph
  - 1 tph whole section and 2 tph Doncaster – Hambleton South Junction and 1–2 tph Doncaster – Shaftholme Junction

- **Freight**:
  - 4 tph
  - 1 tph
  - 2–4 tph total with 1–2 tph via Stillington

- **East Coast Main Line 2016 Capacity Review December 2010**
2. Capacity analysis

<table>
<thead>
<tr>
<th>Table 2.7 – Scenario B</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Concept</strong></td>
</tr>
<tr>
<td><strong>LDHS</strong></td>
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<tr>
<td></td>
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<td></td>
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<td></td>
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<tr>
<td><strong>Freight</strong></td>
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<td></td>
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<td></td>
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<tr>
<td><strong>Regional passenger</strong></td>
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<td></td>
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<tr>
<td><strong>Capacity-enhancing solutions</strong></td>
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<td></td>
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<tr>
<td></td>
</tr>
<tr>
<td><strong>Summary</strong></td>
</tr>
</tbody>
</table>

*London and non-London LDHS included in each section. Cambridge fast services included in LDHS.*
Figure 2.4 – Scenario B – capacity available by number of trains per hour over route section

- Edinburgh Waverley – Portobello Junction – Drem – Oxwellmains
  - 4 tph
  - 1–4 tph
  - 2 tph

- Newcastle – King Edward Bridge Junction – Northallerton
  - 6 tph and 1 tph via Stillington
  - 1 tph
  - 1 tph via Stillington

  - 9 tph
  - 1 tph
  - 1 tph whole section and 1–2 tph Doncaster – Shaftholme Junction

- Retford – Newark North Gate – Grantham – Helpston Junction/Werrington Junction – Peterborough – Huntington
  - 11 tph
  - 2 tph
  - 1 tph

- Woolmer Junction – Welwyn Garden City – Alexandra Palace – Holloway Junction
  - 11 tph
  - 2 tph
  - 9–10 tph
  - 2 tph

- Hertford Loop

- Figures:
  - LDHS
  - Cambridge fast
  - Regional
  - Freight

- Notes:
  - Four freight paths not achievable between Northallerton and Newcastle without capability change or use of alternative routes.
  - Journey time extension and sub-optimal calling pattern for LDHS.
  - Loss of 15-minute service interval and journey time extension to GN outer slow services.

- Two freight per hour not achievable between Fletton Junction and Huntingdon without capability change.
2. Capacity analysis

<table>
<thead>
<tr>
<th>Table 2.8 – Scenario C</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Concept</strong></td>
</tr>
</tbody>
</table>
| **LDHS**<sup>*</sup> | A maximum of 11 LDHS services from London with reasonable journey times but optimisation of calling patterns needed:  
• London King’s Cross – Cambridge. A maximum of two services  
• London King’s Cross – Doncaster. A maximum of eight services via Welwyn and an additional one service via Hertford North. Between Peterborough and Doncaster this would require redistribution of station calls to equalise service speeds, leading to loss of intermediate non-London journey opportunities and connections  
• Doncaster – York. A maximum of eight to nine services  
• York – Newcastle. A maximum of five services via Darlington and an additional one via the Stillington route  
• Newcastle – Edinburgh Waverley. A maximum of four LDHS services. One additional inter-regional service calling at primary stations. |
| **Freight** | • London – Peterborough. Two paths via the Hertford Loop, insufficient capacity to run more than one path Peterborough – Huntingdon without infrastructure intervention  
• Peterborough – Doncaster. All freight paths routed via the GN/GE Joint Line  
• Doncaster – York. Insufficient capacity provided; one Class 4 path over the whole section. One Class 6 between Doncaster and Hambleton South Junction and one further path between Doncaster and Shaftholme Junction  
• York – Newcastle. One Class 6 path running via the Stillington route and one path via Darlington  
• Newcastle – Edinburgh. One Class 4 path and one Class 6 path with some looping required. |
| **Regional passenger** | • suburban services to/from London. Desired quantum of services but with journey time extension or loss of service interval  
• regional long distance services. One service between York and Newcastle  
• aspired services in the Edinburgh area but not with precise service interval  
• all other services as May 2011. |
| **Capacity-enhancing solutions** | • committed infrastructure required  
• four tracking Huntingdon – Fletton Junction required to allow any freight service to operate  
• headway enhancements Alexandra Palace – Woolmer Green Junction not strictly necessary but would improve capacity/performance balance  
• headway or station enhancements at Darlington  
• reopen the Leamside line between Tursdale Junction and Pelaw to provide alternative routing for freight services. |
| **Summary** | Provides a high-level of LDHS service but with capacity trade-offs for freight and regional passenger. Suburban London passenger services are compromised by increased journey times on the slow GN outer services and a sub-optimal service pattern. Some infrastructure enhancements required to accommodate passenger and freight aspirations. |

<sup>*</sup>London and non-London LDHS included in each section. Cambridge fast services included in LDHS.
Figure 2.5 – Scenario C – capacity available by number of trains per hour over route section

- **Edinburgh Waverley**
- **Portobello Junction**
- **Drem**
- **Oxwellmains**

**Branches**:
- **4 tph**
- **1–4 tph**
- **2 tph**

**Journey time extension and sub-optimal calling pattern for LDHS leading to loss of non-London journey opportunities and connections**

**Main Line**:
- **Newcastle**
- **King Edward Bridge Junction**
- **Northallerton**
- **Skelton Bridge Junction**
- **Colton Junction**
- **Hambleton South Junction**
- **Temple Hirst Junction**
- **Doncaster**
- **Loversall Carr Junction**
- **Retford**
- **Newark North Gate**
- **Grantham**
- **Helpston Junction/Werrington Junction**
- **Peterborough**
- **Huntington**
- **Hitchin**

**Lost Connections**:
- **Loss of 15 minute service interval or journey time extension to GN outer slow service**

**Four freight paths not achievable between Northallerton and Newcastle without capability change or use of alternative routes**

**Eight to nine trains**
- **1 tph**
- **1 tph whole section and 1 tph Doncaster – Hambleton South Junction and 1 tph Doncaster – Shaftholme Junction**

**Six to seven trains**
- **1 tph**
- **1 tph all via GN/GE Joint Line**

**Eight to nine trains**
- **1 tph**
- **2 tph**

**Five to six trains**
- **1 tph**
- **2 tph**
- **9–10 tph**
- **2 tph**

**Eight to nine trains**
- **1 tph**
- **2 tph**

**Five to six trains**
- **1 tph**
- **2 tph**

**Nine to ten trains**
- **1 tph**
- **2 tph**

**Eight to nine trains**
- **1 tph**
- **2 tph**

**Journey time extension and sub-optimal calling pattern for LDHS leading to loss of non-London journey opportunities and connections**

**Freight paths not achievable between Northallerton and Newcastle without capability change or use of alternative routes**

**Two freight per hour not achievable between Fletton Junction and Huntingdon without capability improvement**

**Loss of 15 minute service interval or journey time extension to GN outer slow service**

**Cambridge fast**

**Regional**

**Freight**

---

**Figure 2.5 – Scenario C – capacity available by number of trains per hour over route section**

**Legend**:
- **LDHS**
- **Cambridge fast**
- **Regional**
- **Freight**
## 2. Capacity analysis

**Table 2.9 – Scenario D**

<table>
<thead>
<tr>
<th>Concept</th>
<th>A likely short-term outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>This scenario is designed to illustrate the most effective way to facilitate an improvement to the combined economic value and revenue generated by the ECML immediately after the assumed infrastructure base has been implemented. This is based on iteration between the capacity analysis and economic analysis, and comprises the following principles:</td>
</tr>
<tr>
<td></td>
<td>• the number of off-peak LDHS services to and from London King’s Cross would increase from six to seven per hour. The additional trains would serve a variety of stations on and adjacent to the ECML, operating no further north than Northallerton on the core route</td>
</tr>
<tr>
<td></td>
<td>• the suburban passenger service is increased to the committed changes introduced by the Thameslink KO2 timetable</td>
</tr>
<tr>
<td></td>
<td>• the total number of freight paths required would not increase over the 2011 base, as it is assumed that implementation of this scenario would be prior to planned new freight terminals operating at close to full capacity.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LDHS*</th>
<th>A maximum of nine LDHS services from London with good journey times and stopping patterns:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• London King’s Cross – Cambridge. A maximum of two services</td>
</tr>
<tr>
<td></td>
<td>• London King’s Cross – Doncaster. Seven trains via Welwyn. Some rationalisation of calling patterns required to achieve seven trains per hour between Peterborough and Doncaster</td>
</tr>
<tr>
<td></td>
<td>• Doncaster – York. A maximum of seven services, although six may be more likely on this section depending on the destination of LDHS services</td>
</tr>
<tr>
<td></td>
<td>• York – Newcastle. Four LDHS services via Darlington, an additional LDHS would be possible via the Stillington route</td>
</tr>
<tr>
<td></td>
<td>• Newcastle – Edinburgh Waverley. A maximum of four LDHS services. One additional inter-regional service calling at primary stations.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Freight</th>
<th>• London – Peterborough. A maximum of two paths via Hertford Loop. Between Peterborough and Huntingdon a maximum of one freight path</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Peterborough – Doncaster. Up to two freight paths via the GN/GE Joint Line</td>
</tr>
<tr>
<td></td>
<td>• Doncaster – York. One Class 4 path over the whole section and one Class 6 between Doncaster and as far north as Hambleton South Junction. Two further freight paths are available between Doncaster and Hambleton South Junction/Shaftholme Junction</td>
</tr>
<tr>
<td></td>
<td>• York – Newcastle. This section is dependent on the flighting of services. A total of four paths is possible utilising both the mainline and Stillington route. Any optimising of the passenger services to provide a more even spread will reduce the total freight capacity to three paths. This would require assuming an even spread based on averaging the freight requirements over this section</td>
</tr>
<tr>
<td></td>
<td>• Newcastle – Edinburgh. One Class 4 and one Class 6 path with some looping required.</td>
</tr>
</tbody>
</table>

| Regional passenger | • suburban services to/from London King’s Cross. Desired quantum of services with good journey times |
|                   | • regional long distance services. One path between York and Newcastle. A second path would require infrastructure alterations or the loss of one LDHS path |
|                   | • aspired services in the Edinburgh area but not with precise service interval |
|                   | • all other services as May 2011. |

| Capacity-enhancing solutions | • committed infrastructure required |
|                             | • fourtracking Huntingdon to Fletton Junction would be required to provide capacity for both a Class 4 and Class 6 daytime freight path over this section. The infrastructure would not be required if the Class 6 service could operate outside the daytime hours of passenger operation or if the passenger service was altered in specific hours to allow it to run. This would break the standard hourly pattern and have potential impact on passenger service journey times within the specific hour. |

| Summary | This scenario provides a potential short-term scenario for the route as it may not require infrastructure interventions. This would allow an additional LDHS service to be operated alongside aspired freight and regional passenger services. Provides seven LDHS services with good journey times. Suburban and regional services have good journey times and required service levels. |

*London and non-London LDHS included in each section. Cambridge fast services included in LDHS.*
Two freight per hour not achievable between Fletton Junction and Huntingdon without capability improvements.

Some rationalisation of calling patterns required to achieve 7 tph between Peterborough and Doncaster.

Freight levels are only achievable by flighting passenger services similar to today. Any optimisation over this section would require capability improvements or use of alternative routes.

Figure 2.6 – Scenario D – capacity available by number of trains per hour over route section
2. Capacity analysis

<table>
<thead>
<tr>
<th>Table 2.10 – Scenario E</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Concept</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>LDHS</strong></td>
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<tr>
<td></td>
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<tr>
<td><strong>Freight</strong></td>
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<tr>
<td></td>
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<tr>
<td><strong>Regional passenger</strong></td>
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<tr>
<td></td>
</tr>
<tr>
<td><strong>Capacity-enhancing solutions</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Summary</strong></td>
</tr>
</tbody>
</table>

*London and non-London LDHS included in each section. Cambridge fast services included in LDHS.*
Two freight per hour not achievable between Fletton Junction and Huntingdon without capability improvements.

LDHS paths would have to be reduced to below the current level or flighted similar to the current timetable to be able to accommodate all freight paths over this section without any capability change or use of alternative routes.

1 tph mainline and 2 tph GN/GE Joint Line

5 tph
1 tph
2 tph whole section and
2 tph Doncaster – Hambleton South Junction and 1–2 tph Doncaster – Shaftholme Junction

4 tph
1 tph
2–4 tph total with
1–2 tph via Stillington

3 tph
1–4 tph
2 tph

Figure 2.7 – Scenario E – capacity available by number of trains per hour over route section
2. Capacity analysis

<table>
<thead>
<tr>
<th>Concept</th>
<th>A likely medium-term outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>This scenario is designed to illustrate the most effective way to facilitate an improvement to the combined economic value and revenue generated by the ECML by using limited infrastructure capability changes in addition to those in the 2011 base. This is based on iteration between the capacity analysis and economic analysis, and comprises the following principles:</td>
<td></td>
</tr>
<tr>
<td>• the number of off-peak LDHS services to and from London King’s Cross would increase from six to eight per hour. The additional trains would serve a variety of stations on and adjacent to the ECML, operating no further north than Northallerton on the core route</td>
<td></td>
</tr>
<tr>
<td>• the suburban passenger service is increased to the committed changes introduced by the Thameslink K02 timetable</td>
<td></td>
</tr>
<tr>
<td>• the number of other passenger services would not increase over the 2011 base</td>
<td></td>
</tr>
<tr>
<td>• the total number of freight paths required would not increase over the 2011 base, as it is assumed that implementation of this scenario would occur after planned new freight terminals operating at close to full capacity</td>
<td></td>
</tr>
<tr>
<td>• the route section between Huntingdon and Fletton Junction would be increased to four tracks for at least four miles in the up direction.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LDHS*</th>
<th>A maximum of ten LDHS services from London with good journey times and stopping patterns:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• London King’s Cross – Cambridge. A maximum of two services</td>
<td></td>
</tr>
<tr>
<td>• London King’s Cross – Doncaster. Eight trains via Welwyn. Some rationalisation of calling patterns required to achieve eight trains per hour between Peterborough and Doncaster</td>
<td></td>
</tr>
<tr>
<td>• Doncaster – York. A maximum of eight services</td>
<td></td>
</tr>
<tr>
<td>• York – Newcastle. A maximum of four LDHS services via Darlington</td>
<td></td>
</tr>
<tr>
<td>• Newcastle – Edinburgh Waverley. A maximum of four LDHS services. One additional inter-regional service calling at primary stations.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Freight</th>
<th>• London – Peterborough. Two paths via Hertford Loop. Southbound between Peterborough and Huntingdon may require infrastructure alterations to run more than one path</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Peterborough – Doncaster. Two freight paths via the GN/GE Joint Line</td>
<td></td>
</tr>
<tr>
<td>• Doncaster – York. One Class 4 path over the whole section. One Class 6 between Doncaster and as far north as Hambleton South Junction. Between one to two paths between Doncaster and Hambleton South Junction or Shaftholme</td>
<td></td>
</tr>
<tr>
<td>• York – Newcastle. Maximum of two to four paths over this section with one to two routed via Stillington. To achieve this level of service the passenger services will require flighting over this section</td>
<td></td>
</tr>
<tr>
<td>• Newcastle – Edinburgh. One Class 4 and one Class 6 path with some looping required.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Regional passenger</th>
<th>• outer suburban services to/from London King’s Cross. Desired quantum of services with good journey times</th>
</tr>
</thead>
<tbody>
<tr>
<td>• inner suburban services to/from London King’s Cross. Changes to the services specification to provide additional LDHS service</td>
<td></td>
</tr>
<tr>
<td>• regional long distance services. One path between York and Newcastle. A second path would require infrastructure alterations or the loss of one LDHS path</td>
<td></td>
</tr>
<tr>
<td>• aspired services in the Edinburgh area but not with precise service interval</td>
<td></td>
</tr>
<tr>
<td>• all other services as May 2011.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Capacity-enhancing solutions</th>
<th>• committed infrastructure required</th>
</tr>
</thead>
<tbody>
<tr>
<td>• partial four tracking Huntingdon to Fletton Junction to provide capacity for both passenger and freight over this section</td>
<td></td>
</tr>
<tr>
<td>• headway improvement or station enhancements at Darlington to allow second regional service</td>
<td></td>
</tr>
<tr>
<td>• reopening of the Leamside line between Tursdale Junction and Pelaw would be required if there is any increase in requirement for freight and passenger paths north of Northallerton, or a need to optimise the spread of passenger services over this section.</td>
<td></td>
</tr>
</tbody>
</table>

| Summary | Provides eight LDHS services with good journey times. Suburban and regional services have good journey times and required service levels. Capability change would be required between Huntingdon and Fletton Junction to provide passenger quantum and a standard freight path. |

*London and non-London LDHS included in each section. Cambridge fast services included in LDHS.
Figure 2.8 – Scenario F – capacity available by number of trains per hour over route section

Freight levels are only achievable by flighting passenger services similar to today. Any optimisation over this section would require capability improvements or use of alternative routes.

Some rationalisation of calling patterns required to achieve 8 tph between Peterborough and Doncaster.

Two freight per hour not achievable between Fletton Junction and Huntingdon without capability improvements.

London King's Cross

Holloway Junction

Alexandra Palace

Woolmer Junction

Welwyn Garden City

8 tph

2 tph

9–10 tph

2 tph

4 tph

1–4 tph

2 tph

2 tph GN/GE Joint Line

Oxwellmains

Drem

Portobello Junction

Edinburgh Waverley

Freight

Regional

Cambridge fast

LDHS
2. Capacity analysis

2.6 Committed and future infrastructure works

A number of committed infrastructure changes have been assumed for the purposes of this review. The construction of the flyover at Hitchin facilitates the increase in train service levels by removing one of the key timetabling constraints on the route. This allows the timetable to be optimised around other constraints. Similarly the works at Shaftholme Junction decrease the number of freight paths running over the section north of Doncaster as the proposed viaduct will enable coal trains to take a much less circuitous route between the port of Immingham and the Aire Valley power stations. This scheme therefore provides extra capacity for other services whilst removing a timetabling constraint.

The upgrade to Peterborough station allows the station to deal more flexibly with consecutive departures on minimum headway, which will become a necessity as the number of LDHS services from London increases. Due to the focus on the off-peak timetable, the line upgrades between Finsbury Park and Alexandra Palace have a smaller impact, as the majority of services call at intermediate stations on this section. However, provision of platform faces on the upgraded lines has the potential to ease timetabling constraints on the busy Alexandra Palace – Welwyn section.

A base assumption for this study is the upgrade to the GN/GE Joint Line. The precise nature of these works has not been specified, however it is assumed that the required level of passenger and freight service will be able to access the GN/GE Joint Line without significant impact on the core ECML traffic. Should this not be possible, then running of freight services over the section of the ECML between Peterborough and Doncaster will have a significant impact on available capacity.

The key constraint on the ECML was found to be the section between Huntingdon and Peterborough, particularly in the southbound direction where the extended section of two-track railway is a large capacity constraint. The addition of a sixth LDHS service path per hour reduces freight capacity to just one path per hour in the southbound direction. Increasing the LDHS services to seven paths per hour results in this path being restricted to a Class 4 service. Use of Connington Loop (which happens currently) may partially mitigate this, at the cost of freight journey times. In the northbound direction, there is theoretical capacity for seven LDHS services and the required two freight paths although the section remains an important timetabling constraint. It is clear that both passenger and freight growth cannot be accommodated in the southbound direction and the study recommends that as both passenger and freight traffic increase a scheme for partial or full four tracking of this section is undertaken.

Other key capacity constraints include the section between Alexandra Palace and Welwyn, and between Northallerton and Newcastle.

The four-tracking of the Welwyn viaduct is not expected to resolve the capacity constraints on the southern end of the route. Four-tracking would allow the trains calling at Welwyn North to use the slow lines, providing an approximate two to three trains per hour increase in fast line capacity. Any other trains using the slow lines would either need to run along the slow lines from Finsbury Park (incurred significant pathing time) or weave to the slow lines north of Potters Bar. Weaving at Potters Bar (assuming an upgraded fast – slow crossover is provided) would result in capacity issues on the slow lines and extension of journey times unless the linespeed on the slow lines was increased. Weaving at Welwyn Garden City (assuming an upgraded crossover is provided) would be possible; however, the running time differential between LDHS and outer suburban services between Welwyn Garden City and Woolmer Green Junction is only 30 seconds and thus only a minimal capacity gain would result. Therefore, the total capacity gains from four-tracking Welwyn Viaduct would likely be too small to offset the significant cost. A more cost-effective solution would be to reduce signalling headways over the section.

The section between Northallerton and Newcastle is already approaching full capacity and the current timetable makes significant use of the flighting of services to meet current demand. Any increase in passenger or freight services, or optimisation of passenger service to provide a more even spread, is likely to make demand exceed capacity. Potential capacity-enhancing solutions include diversion of passenger or freight services via Eaglescliffe and the Stillington line (with associated linespeed and headway improvements) and the reopening of the Leamside line.

A further capacity constraint is between Peterborough and Doncaster. The speed differential between services (passenger and freight and non-stop and slower passenger services) reduces capacity. Even with the assumption that freight uses the GN/GE Joint Line, an increase in the number of passenger services over this section will likely require some rationalisation of stopping patterns (while maintaining journey opportunities between stations in the section). Sufficient paths have been provided for services crossing the route at Newark using Newark Flat Crossing. However, the times of these services are dictated by the intervals between trains on the ECML (and assume a degree of parallel movement whereby services in both directions between Newark Castle and Lincoln cross the ECML in the same time slot each hour). Should this prove to not be possible, or if there is an increase to the cross-ECML east to west traffic, an alternative solution may be required with the established East Midlands RUS noting that increased or altered
service frequency for Nottingham to Lincoln services would require the provision of a flyover over the ECML at Newark.

Where possible, freight services have been given a non-stop path over the individual sections (i.e. without looping) as it is clearly desirable for freight traffic to be kept on the move. When a whole-route timetable is constructed, looping of services may be required to enable the timetable to work. The operation of heavier and longer freight services in the future (up to 775-metre in length) could then act as a timetable constraint due to the lack of 775-metre-capable freight loops on the route. Similarly, increased use of non-ECML routes for freight (such as the GN/GE Joint Line, Stillington or Leamside lines) would reduce the potential for the use of electric traction on freight services. Consideration should be given to these factors for future timetable and infrastructure design.

The provision of more train paths on the ECML, and the diversion of services away from the main route, also has an impact on certain key level crossing where barrier down time is known to be an issue. This has not been considered here, but the increase in level crossing down time is an important factor in future planning.

2.7 Summary

Analysis of the aspirations for paths on the ECML against the available capacity on completion of CP4 infrastructure schemes has shown that the demand for paths exceeds the capacity available.

The difference in the speed of services on the route is the key constraint as to how the capacity is used on the ECML. Major stations and junctions such as Doncaster, York and Newark Flat Crossing have not been identified as constraints within this study. These locations have theoretical capacity to accommodate the aspirations, but are known constraints in timetable design, and will need to be considered together in further detail with the development of any timetable solution.

Without any trade-offs in journey times or specifications there are limited opportunities to increase the number of train services beyond that anticipated at the end of CP4. In the short term one additional LDHS service could be provided which will result in only one freight path being available between Fletton Junction and Huntingdon. To accommodate further services and provide the second freight path over this section capability changes would be required between Huntington and Fletton Junction.
2. Capacity analysis

Figure 2.9 shows the key freight flows in this area, it is the services to/from ECML south that are affected by this constrained section. In the May 2011 timetable there are generally no Class 6 freight services scheduled between 05:30 and 22:00 in the southbound direction between Peterborough and Huntingdon.

To provide sufficient freight paths over this section would require the timetable to be constructed and designed to make maximum use of capacity over this section. This, combined with the constraints identified on other areas of the route, would make it very difficult to develop a timetable for the whole route without some impact on journey times caused by having to path services through the most capacity constrained sections.

If capability improvements are provided between Huntingdon and Fletton Junction then the next sections which would have insufficient capacity to meet the aspirations would be the slow line between Finsbury Park and Welwyn Garden City and the main line between Peterborough and Doncaster. There are possible alterations to the calling patterns and specification over these sections which would allow further services to be provided. These would need to be developed through design of the timetable specification chosen. The section between Northallerton and Newcastle cannot accommodate all the aspirations. It is the difference in speed of services over this section which constrains the capacity so an alternative route for services or capability improvements would be required to achieve the aspired level of service on this section. To achieve Scenario D or F without capability change, the timetable structure would be fixed over this section to provide the required number of freight and passenger services. This could result in lengthening of journey times to enable the timetable to be constructed for the full route. Any requirement to operate an increase in either freight or passenger services over this section would require infrastructure intervention. Re-opening the Leamside Line would be the best solution to provide additional capacity.

Capability change to reduce the time penalty of calling at the stations would help alleviate the difference in speed over constrained sections and could contribute to journey time improvements.

Figure 2.9 – Key freight flows in the Peterborough area

![Diagram showing freight flows in the Peterborough area](image-url)
3. Economic analysis

3.1 Chapter overview

This chapter details the economic analysis that has been undertaken to support this addendum to the East Coast Main Line Route Utilisation Strategy (RUS) and is split into three sections:

- section 3.2 sets the context by explaining why an economic assessment of this nature was necessary, how the East Coast Main Line (ECML) is funded and how stakeholders can derive an economic and financial benefit from the route
- section 3.3 explains the economic assessment methodology
- section 3.4 details the results of this assessment, including some further work completed during the consultation period.

3.2 Context

As this is an addendum to the East Coast Main Line RUS, established in April 2008, it is important to emphasise how the work that has been undertaken is linked to that strategy. The RUS recommended a series of interventions to meet the following generic gaps on the network including:

- journey times
- connectivity
- on-train crowding
- freight capability.

This strategy recommended a course of action to meet these gaps which formed the basis of the infrastructure and rolling stock capability changes which were funded through the Control Period 4 (CP4) settlement.

This strategy is still valid and the recommendations within it are still the most appropriate way to meet the gaps considered. However, the capacity analysis presented in the previous chapter has demonstrated that the funded infrastructure and rolling stock changes will provide the opportunity for industry parties to improve long distance passenger and freight connectivity and journey times, which are some of the generic gaps considered in the RUS.

The organisations which have submitted aspirations for inclusion in this process all have potential funding available, and under the criteria which govern RUSs this availability of funding means that the journey time and connectivity issues in question should be formally considered as gaps.

The capacity analysis has also demonstrated that not all of the aspired services can be accommodated on the route once the funded capability changes have been implemented and once the May 2011 timetable has been implemented. This has necessitated an economic analysis to understand which aspirations are likely to be the most valuable, or in other words to identify which of the journey time and connectivity gaps addressed by the aspirations are likely to justify the dedication of scarce resources to meet them.

As the aspired additional services would be operated by a mixture of franchised and non-franchised operators a brief explanation of how the ECML is funded and how stakeholders generate a benefit from the route on behalf of the public and their own organisations has been provided. This is necessary as the analysis in the East Coast Main Line RUS is predicated on the assumption that all new passenger services are franchised, and it is important to draw the distinction.

3.2.1 How the East Coast Main Line is funded

Network Rail has three principal sources of income with which to maintain, renew, enhance and operate the ECML, these are:

- Variable access charges. The access charges paid by both franchised and open access (passenger and freight) operators for cost categories that vary with the volume of usage. These are principally measured by the number and type of vehicle miles operated, and are set at the marginal cost that each additional train mile imposes on Network Rail.
- Direct grant. Network Rail is paid a direct grant (subsidy) from central Government. This covers the shortfall between cost and revenue. This grant is not split by route, and instead Network Rail is simply allocated a single sum of money for its whole operation.2

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1 For simplicity, the terms ‘current’ or ‘existing’ refer to the planned May 2011 level of service plus the Thameslink Key Output 2 service specification. This is shown in diagramatic form in Figure 2.3 in Chapter 2.

2 Network Rail is allocated a direct grant for England and Wales by the Department for Transport, and a direct grant for Scotland by Transport Scotland.
3. Economic analysis

- Fixed access charges. The access charges paid by franchised operators to Network Rail to cover cost categories that do not normally vary with the volume of usage.

In addition to the direct grant to Network Rail, Government provides a net overall subsidy to franchised rail operators.

3.2.2 How stakeholders generate a benefit from the East Coast Main Line

The aspired new services have two types of impact which are quantified in this assessment. These can be viewed as the value of meeting the journey time and connectivity gaps, namely:

- socio-economic benefit. This is the socio-economic benefit generated by rail services and includes elements such as journey time savings for rail users and reduced environmental damage through a switch from road to rail transport. All the new service aspirations will generate this type of benefit.

- financial costs and revenues for operators. This is the overall generation of industry revenue and incremental change in operating costs. The analysis has not considered any transfer of revenue from one operator to another.

Most long distance high speed (LDHS) services on the ECML are run by franchised operators in a franchise specified by the Department for Transport (DfT). Hence the financial impact of new services on these operators may ultimately affect overall DfT funding requirements.

The Office of Rail Regulation (ORR) has the responsibility of granting access rights to all operators, including open access freight and passenger operators, when there is capacity available. The revenue and costs associated with services operated by open access operators are absorbed entirely by these organisations as there is no franchise agreement with Government.

Franchise operators have not historically used all capacity on the ECML during the off-peak, and open access passenger and freight operators currently run services.

3.3 Methodology

This is the first time Network Rail has produced a comparative assessment of propositions for additional franchised and non-franchised passenger and freight services. It was therefore decided to use the formal consultation process to review this methodology and improve it where possible. Specific consultation questions were asked to this intent, and two economic analysis workshops were undertaken with representatives from the Industry Working Group. These workshops were well attended and the changes made as a result of this dialogue and the general stakeholder correspondence are summarised throughout this chapter.

A three-stage economic assessment methodology has been developed as follows.

3.3.1 Estimate the economic value of service aspirations

Stakeholders have submitted their aspirations to specify or operate services in 2016. These are additional to the planned level of service in the May 2011 timetable which is the basis for the economic assessment. The first stage of the analysis was to assess the value of each of these aspirations.

Each aspiration for an additional passenger service is an increment to the May 2011 timetable so the economic assessment considers the incremental improvement to the timetable as a whole.

Additional passenger services between stations that already have an established (at least hourly) direct service have been tested using the industry standard MOIRA software. This is an elasticity based approach that estimates the percentage increase in demand based on the proportional reduction in generalised journey time\(^3\) between stations that a new service produces.

An elasticity based approach is less suitable for new or emerging markets as there are very few existing passengers to apply the proportional uplift to, typically because there are no direct services at present. Additional or new passenger services between stations that do not currently have at least an hourly direct service have therefore been tested using a gravity model as an alternative, which estimates the potential size of new markets based on the size and attractiveness of the station catchment areas, and the generalised journey time between the stations by rail and alternative modes of transport.\(^4\) The model has been calibrated against MOIRA (ensuring it gives similar results as MOIRA does for established markets), which allows a sensible comparison between aspirations that serve new and existing markets.\(^5\)

The economic value of additional freight services has been assessed using the existing WebTAG methodology based on the number of sensitive lorry miles removed from the road network when commodities are transported by rail rather than road.

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\(^3\) Journey time adjusted for service frequency and the requirement for interchange.

\(^4\) Network Rail has identified a statistically significant relationship between the number of journeys made on the 250 busiest flows between the principal ECML stations and the Gross Value Added (GVA) of the station catchment areas (population x economic productivity); rail generalised journey time; car journey time; and extremes in distance and GVA.

\(^5\) At the request of Transport Scotland the gravity model was used to assess aspirations to increase the frequency of services between London King’s Cross and Edinburgh Waverley, under the assertion that a relatively low air generalised journey time is currently suppressing the demand for travel by rail.
Network Rail had only assessed the socio-economic value of services, prior to publication of the Draft for Consultation in August 2010. The revenue and cost associated with these aspirations have not been estimated because:

- RUSs are obliged to use Government economic appraisal criteria, which treat revenue and costs that accrue to the private sector as economic benefits (or disbenefits) and revenue and costs that accrue to the public sector as a net scheme cost reduction (or increase). This means that identical franchised and non-franchised propositions for additional services will have different Benefit Cost Ratios, and it was considered that this may distort the analysis presented.

- due to a lack of available data Network Rail found it difficult to assess how the variable operating costs and the impact of differential pricing policies vary across franchised and non-franchised passenger operators.

This approach therefore highlighted the aspirations that are likely to generate the highest level of socio-economic benefit, leaving the financial risk of implementation with the organisations that have proposed the options. Prior to the publication of the Draft for Consultation Network Rail and ORR agreed that this approach was suitable to address the issues that ORR had asked Network Rail to consider in this capacity review.

Since the publication of the Draft for Consultation, Network Rail has undertaken extensive dialogue with stakeholders with regard to the economic analysis presented. The consensus of stakeholder opinion suggests that the methodology should be adjusted to include an estimate of the revenue and cost associated with each aspiration, and that any limitations in accuracy should be highlighted.

This consensus is supported by ORR, which has suggested a change to the methodology to include an estimated proxy for revenue and cost. This change, which has been adopted in the analysis presented in this document, is as follows:

- industry revenue generation has been estimated using the existing East Coast franchise average revenue yield per passenger mile. This therefore excludes any additional revenue that could be generated through a pricing policy that is bespoke for a new market. This estimate of revenue has been added to the socio-economic benefit of each option, and Figures 3.1 and 3.3 have been amended to reflect this adjustment.

- division of the socio-economic benefit (and revenue generation) by the number of trains, or in the case of freight aspirations by the number of train paths, has been replaced by the number of train miles. It is viewed that this provides a closer proxy for the likely operating cost of each aspiration and Figures 3.2 and 3.4 have been adjusted to reflect this.

### 3.3.2 Estimate the economic value of capacity trade-offs

The capacity assessment (detailed in Chapter 2) has identified a number of service and timetable trade-offs that could be made to increase the number of LDHs or freight services on the route. The relative value of these trade-offs has been estimated to inform which of these appear to be the most appropriate use of the funding that is already invested in the route.

Changes to passenger services have been assessed using MOIRA as the elasticity based approach of the software is well suited to small timetable changes of this nature.

Changes to freight services have been assessed based on the number of sensitive lorry miles that they would be expected to remove from the highway network. Changes to freight journey times though use of a diversionary route are considered using evidence from the ORR ‘Rail Freight User Values of Time & Reliability’ study. It should be noted that the existing DfT appraisal guidance does not recognise the value of freight journey time as a socio-economic benefit so this element of the work should be viewed as a sensitivity test. Following the methodological change made since publication of the Draft for Consultation it has also been possible to assess the impact of the cost of increased train mileage.

### 3.3.3 Assessing the value for money of infrastructure enhancements

The capacity assessment identified a number of infrastructure solutions that could be developed to accommodate a number of the service aspirations or prevent the need for some of the timetable trade-offs.

The work that is detailed above has been used to assess the business case for these enhancements. This complies with standard RUS/WebTAG/STAG appraisal guidance as DfT or Transport Scotland are the only likely funders, and includes high level estimates of the operating costs and revenue generated by the aspirations.

### 3.4 Results of the economic analysis

#### 3.4.1 Description of aspirations

**Passenger aspirations**

Network Rail has received aspirations to operate passenger services on the ECML that are additional to the May 2011 timetable. These aspirations are listed below, along with a number of aspirations that have been added by Network Rail to preserve stakeholder commercial confidentiality. Some stakeholders have included aspirations which will enable improvements to other existing services.
These contingent aspirations have been tested as a package, and are described as such below.

- London King’s Cross – Bishop Auckland: four per day (calling at Peterborough, Doncaster, York, Northallerton, Darlington)
- London King’s Cross – Bradford Interchange: four per day (calling at Doncaster, Pontefract, Wakefield Kirkgate, Brighouse, Halifax)
- London King’s Cross – Cleethorpes: four per day (calling at Thorne South, Scunthorpe, Habrough, Grimsby Town)
- London King’s Cross – Harrogate: four per day (calling at Stevenage, Peterborough, Doncaster, York, Cattal, Knaresborough)
- London King’s Cross – Harrogate: six per day (as above)
- Extend all London King’s Cross – Newcastle services to Edinburgh Waverley: nine per day (forming a half hourly London King’s Cross – Edinburgh Waverley pattern with one service calling at York, Darlington, Newcastle, Berwick-upon-Tweed, and one calling at Stevenage, Peterborough, Doncaster, York, Darlington, Durham, Newcastle, and one of Northallerton and Alnemouth on alternate hours)
- London King’s Cross – Huddersfield: four per day (calling at Stevenage, Peterborough, Retford, Worksop, Sheffield, Meadowhall, Barnsley, Penistone)
- London King’s Cross – Huddersfield: six per day (calling at Retford, Worksop, Sheffield, Meadowhall, Barnsley, Penistone)
- London King’s Cross – Hull: Eight per day (calling at Peterborough, Grantham, Newark North Gate, Doncaster, Selby, Brough)
- London King’s Cross – Lincoln: six per day (calling at Peterborough, Grantham, Newark North Gate)
- London King’s Cross – Lincoln: 12 per day (as above)
- London King’s Cross – Nottingham: six per day (calling at Grantham)
- London King’s Cross – Nottingham: 12 per day (as above)
- London King’s Cross – Scarborough (fast): four per day (calling at York, Malton, Seamer)
- London King’s Cross – Scarborough (semi-fast): two per day (calling at Stevenage, Peterborough, York, Malton, Seamer)
- London King’s Cross – Scarborough (mixed pattern): six per day (four calling at York, Malton, Seamer and two calling at Stevenage, Peterborough, York, Malton, Seamer)
- London King’s Cross – Skipton: six per day (calling at Micklefield, Garforth, Leeds, Shipley, Keighley)
- London King’s Cross – Skegness: four per day (calling at Peterborough, Spalding, Skegness, Boston)
- London King’s Cross – Saltburn: six per day, (calling at York, Thirsk, Eaglescliffe, Thornaby, Middlesbrough, Redcar Central)
- London King’s Cross – Sunderland: three per day (existing services are retimed to produce a regular two hourly pattern. The three new services call at Stevenage, Peterborough, Doncaster, York, Northallerton, Thirsk, Eaglescliffe, Thornaby, Middlesbrough, Hartlepool. The four existing services call at Stevenage, Peterborough, York, Thirsk, Northallerton, Eaglescliffe, Hartlepool)
- London King’s Cross – York: five per day (forming an hourly London King’s Cross – York stopping service, calling at York, Peterborough, Grantham, Newark North Gate, Retford, Doncaster)
- Manchester Piccadilly – Newcastle: one per hour (via Huddersfield and Leeds, calling at the following ECML stations: York, Northallerton, Darlington, Durham)
- Newcastle – Edinburgh Waverley: one per hour (calling at Morpeth, Alnemouth, Berwick-upon-Tweed, Dunbar, Musselburgh)
- Hull – Glasgow: seven per day (calling at York, Northallerton, Darlington, Newcastle, Edinburgh Waverley, Glasgow)
- Nottingham – Glasgow: seven per day (calling at Altrincham, Chesterfield, Sheffield, Meadowhall, Doncaster, York, Northallerton, Eaglescliffe, Durham, Newcastle, Edinburgh Waverley, Glasgow)
- Reading – Newcastle via Leeds: seven per day (via Birmingham New Street, Sheffield, Wakefield Westgate, Leeds, calling at the following ECML stations: York, Darlington, Durham).

**Freight aspirations**

Network Rail has agreed a set of freight aspirations with the principal operators on the route which are based on expected future volumes of freight traffic by commodity and are consistent with the strategic freight Network (SFN) work. Container freight traffic is expected to grow at the highest rate, particularly on routes to and from planned new terminals and ports such as the London Gateway Port due to open in 2014. Bulk freight traffic levels are likely to remain at a relatively constant rate.

Given the variability of the assumptions behind these expected volumes, however, it is not possible to accurately express these aspirations as a series.
of point-to-point services that are equivalent to the passenger aspirations. To allow a comparison it has been necessary to take a representative point-to-point freight flow as a proxy for all movements.

The route section between London and Peterborough is relatively lightly used by freight at present, however growth in container traffic is likely once the London Gateway port opens in 2014. The indicative future flow on this section is assumed to be a London Gateway – Leeds intermodal container path.

The route section between Doncaster and Peterborough is used by a mixture of freight traffic currently, although with continued container growth from the port of Felixstowe in particular, the most representative freight flow is assumed to be a Felixstowe – Teesside7 intermodal container path.

The predominant freight flow on the route section north of Doncaster is bulk traffic, in particular coal trains to and from the Aire Valley power stations. Whilst a decline in coal traffic is anticipated as the mix of UK power generation changes, this is not expected for some time, and the indicative freight flow is assumed to be a Blyth – Doncaster coal path.8

For comparative purposes it is assumed that aspirations for additional paths are grouped in increments of three paths, as three freight paths occupy an equivalent amount of capacity to six passenger services, which is typical of the aspirations received.

As freight path take-up rates9 tend to vary, Network Rail has assessed the economic value of these standard paths based on the rate estimated as part of the Strategic Freight Network forecasts, as well as a range of other rates to demonstrate the sensitivity of the economic assessment.

The following representative freight paths have been assessed:

- London Gateway – Leeds, 3 x container paths, 80 per cent take-up rate
- London Gateway – Leeds, 3 x container paths, 95 per cent take-up rate
- Felixstowe – Teesside, 3 x container paths, 80 per cent take-up rate
- Felixstowe – Teesside, 3 x container paths, 95 per cent take-up rate (SFN rate)
- Blyth – Doncaster, 3 x coal paths, 30 per cent take-up rate
- Blyth – Doncaster, 3 x coal paths, 45 per cent take-up rate (SFN rate)
- Blyth – Doncaster, 3 x coal paths, 60 per cent take-up rate.

Existing passenger services

For comparative purposes existing passenger services were also included in the assessment presented in the Draft for Consultation. Following further dialogue with stakeholders it was viewed that this assessment would be improved if it were replaced by an analysis of the potential synergies between the planned May 2011 timetable and the aspirations received.

3.4.2 Economic assessment of aspirations

Value of aspirations and average value per train mile

This section details the estimated value and revenue generation of the aspirations described above. Figure 3.1 illustrates the total estimated value of each aspiration and Figure 3.2 shows the average value per train mile, to allow a comparison of aspirations with differing numbers of additional services. It is important to emphasise that the total value of each aspiration is an appropriate way to assess the propositions that have been received, however the result of this is that aspirations with the largest number of additional services tend to have the highest estimated value.

The eight highest value options all have at least six additional passenger services per day which is equivalent to a frequency of one train every two hours spread over 12 hours. Most of these generate a slightly higher share of their total value from the currently less well established markets where the frequency of services is fewer than one per hour, as these are typically longer distance flows attracting higher fares.

The exception to this is the extension of London King’s Cross – Newcastle services to Edinburgh Waverley, which would target frequently served station pairs, and the London King’s Cross – Sunderland aspiration, which differs from most of the others received by targeting several types of market simultaneously, namely:

- the frequency of services to Sunderland, Hartlepool and other stations en route to/from London would increase from four to seven trains per hour with a relatively even service interval
- direct services would be provided between Middlesbrough, Thornaby and London
- the off-peak frequency of services between London, Stevenage and Peterborough would increase from approximately 4.5 and 3.5 to 5 and 4 trains per hour respectively
- the frequency of services between Stevenage, Peterborough and other stations such as York would increase by one train every two hours.

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7. Teesside was referred to as Middlesbrough in the Draft for Consultation.
8. This has been changed from Mossend – Doncaster on the advice of Freight Operating Companies.
9. The percentage of timetabled freight paths that are actually used.
3. Economic analysis

The majority of the economic benefit would accrue from the increase in frequency of services between well served stations such as London King’s Cross and Peterborough as the large number of existing passengers will derive a generalised journey time improvement, whereas the majority of the revenue benefit would occur as a result of generated new trips between London and better connected locations in the North East.

Conversely, the passenger service aspirations with the lowest estimated socio-economic value tend to have the fewest number of additional services. The majority of the benefit of these aspirations would accrue to new markets that currently have few or no direct services, which suggests that stakeholders favour an incremental approach to developing new markets.

The aspired London King’s Cross – Nottingham services performed well in the assessment presented in the Draft for Consultation however further capacity analysis conducted during the consultation period suggests that the aspired journey times would not be possible. This means that London – Nottingham journey times would not be faster than via the Midland Main Line, and most of the value of the aspiration would be foregone as a result.

The aspiration to increase the frequency of services between London King’s Cross and Sunderland from four to seven trains per day has the highest value per train mile. This is because the benefits outlined above could be delivered for a relatively small mileage increase, as four of the seven services already operate currently. The synergies of this aspiration with existing services on the ECML have therefore increased the value of it relative to the more incremental aspired services.

The remainder of the highest value aspirations are predominantly those that provide a new direct service between London and stations in Yorkshire such as Harrogate, Huddersfield, Barnsley, Scarborough and Skipton. The value of these services is split more evenly between new and existing markets than the analysis presented in the Draft for Consultation suggested. This is because the newly served destinations are typically further away from London and would attract higher fares if fares are structured on an average price per mile as assumed in this analysis. Despite this, an improved service offer to existing well served stations is likely to retain a significant value. This is discussed in the next section.

The aspired extension of London King’s Cross – Newcastle services to Edinburgh Waverley would also be expected to generate a sizable economic benefit and revenue per train mile as the resultant enhanced level of service to the valuable London – Edinburgh Waverley market, only incurs additional mileage between Newcastle and Edinburgh Waverley.

The majority of aspired passenger services that do not start or terminate in London have a relatively low value per train mile.

For indicative purposes it is estimated that the typical cost per train mile would be around £14 for an 11-car\(^10\) 125mph long distance service, £9 for a five-car 125mph long distance service, and £5 for a three-car 100mph inter-regional service. This means that very few of the aspirations considered would be likely to have a commercial case based only on generated rather than abstractive revenue, unless passenger demand significantly exceeded the levels forecast.

The freight paths considered have performed well in the economic assessment, namely:

- the existing Felixstowe – Teesside and likely new Thames Gateway – Leeds intermodal container services have some of the highest values of all the individual aspirations tested depending on the assumed path take-up rate
- the existing Blyth – Doncaster coal path has the highest value per train mile, although division by the number of train miles hides the impact that path take-up rates have on the overall value of the path.

Sensitivity test: excluding increments to existing passenger markets

A sensitivity test was conducted to understand how the assessment detailed above would change if only the benefit that accrued from passenger markets without existing regular direct services were considered. This assessment is presented in Figures 3.3 and 3.4.

Removal of all the benefit that accrues from existing markets reduces the value of most new passenger services relative to aspirations to increase freight traffic, to the extent that Felixstowe – Teesside and new London Gateway – Leeds container traffic has the highest estimated socio-economic value per path of all the aspirations that have been considered.

Similarly to the previous analysis, the aspirations with the highest estimated total value are those with the largest increase in the number of services. The aspired new services to Sunderland again perform well in this analysis, as do the aspirations for new London King’s Cross – Saltburn (Middlesbrough) services. This is because both aspirations would significantly increase the number of trains between

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10. Including a locomotive and driving van trailer or two power cars.
London and infrequently served sizable destinations by dovetailing with current services to provide a regular two hourly interval, and would provide direct services to and from locations that are not currently served, such as Middlesbrough. This is an indication of the value that could be generated by developing synergies between services on the route, and is discussed further in section 3.4.4.

Excluding the new London King’s Cross – Sunderland service which requires relatively few additional train miles, the estimated average economic benefit and revenue generation per train mile of each of the six most valuable aspirations to operate passenger services is separated by around £2, which implies that there is no single conurbation that is underserved relative to other similar places on or near the ECML. This is illustrated in Figure 3.5 which shows the current and estimated future annual demand for trips to and from London for the 20 largest existing markets that do not currently have at least an hourly frequency. Although there is some variation in the number of additional trips forecast between London and the aspired new locations, the differences are not sufficiently large that the value of the aspired service improvements between any pair of locations is markedly higher than the others.

This means that to maximise the socio-economic value of the ECML, a sound understanding of the aspirations that offer the best overall mix of services to the combination of stations on the route is necessary. This is discussed further in the following sections.
3. Economic analysis

Figure 3.1 – Total annual value of aspirations

- **Socio economic benefit established market**
- **Revenue generation established market**
- **Socio economic benefit new market**
- **Revenue generation new market**
- **Existing freight economic benefit + revenue**
- **New freight economic benefit + revenue**
Freight typically occupies twice the track capacity of passenger services, so the number of train miles has been multiplied by two. See page 37 and 38 for an explanation of the relativities in Figure 3.1 and 3.2.

<table>
<thead>
<tr>
<th>Route</th>
<th>Train Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>London King's Cross – Nottingham</td>
<td>12 per day</td>
</tr>
<tr>
<td>London King's Cross – Lincoln</td>
<td>12 per day</td>
</tr>
<tr>
<td>London King's Cross – Harrogate</td>
<td>6 per day</td>
</tr>
<tr>
<td>London King’s Cross – Sunderland</td>
<td>3 per day (7 regular per day)</td>
</tr>
<tr>
<td>Felixstowe – Teesside</td>
<td>3 x container path: 95% take up</td>
</tr>
<tr>
<td>London Gateway – Leeds</td>
<td>3 x container path: 95% take up</td>
</tr>
<tr>
<td>London King’s Cross – Edinburgh Waverley</td>
<td>9 per day (extend Newcastle services)</td>
</tr>
<tr>
<td>Felixstowe – Teesside</td>
<td>3 x container path: 80% take up</td>
</tr>
<tr>
<td>London Gateway – Leeds</td>
<td>3 x container path: 80% take up</td>
</tr>
<tr>
<td>London King’s Cross – Nottingham</td>
<td>6 per day</td>
</tr>
<tr>
<td>London King's Cross – Skipton</td>
<td>6 per day</td>
</tr>
<tr>
<td>London King’s Cross – Lincoln</td>
<td>6 per day</td>
</tr>
<tr>
<td>Nottingham – Glasgow Central</td>
<td>7 per day</td>
</tr>
<tr>
<td>Reading – Birmingham New Street</td>
<td>Leeds – Newcastle: 1 per hour</td>
</tr>
<tr>
<td>London King’s Cross – Harrogate</td>
<td>4 per day</td>
</tr>
<tr>
<td>London King’s Cross – Huddersfield</td>
<td>6 per day</td>
</tr>
<tr>
<td>London King’s Cross – Saltburn</td>
<td>6 per day</td>
</tr>
<tr>
<td>Manchester Piccadilly – Newcastle via Leeds</td>
<td>1 per hour</td>
</tr>
<tr>
<td>London King’s Cross – Huddersfield</td>
<td>4 per day</td>
</tr>
<tr>
<td>London King’s Cross – Scarborough (mixed calling pattern)</td>
<td>6 per day</td>
</tr>
<tr>
<td>London King’s Cross – York (stopping)</td>
<td>5 per day</td>
</tr>
<tr>
<td>Blyth – Doncaster</td>
<td>3 x cool paths: 60% take up</td>
</tr>
<tr>
<td>London King’s Cross – Huddersfield</td>
<td>8 per day</td>
</tr>
<tr>
<td>Hull – Glasgow</td>
<td>7 per day</td>
</tr>
<tr>
<td>Blyth – Doncaster</td>
<td>3 x cool paths: 45% take up</td>
</tr>
<tr>
<td>London King’s Cross – Bradford Interchange</td>
<td>4 per day</td>
</tr>
<tr>
<td>London King’s Cross – Scarborough (stopping)</td>
<td>2 per day</td>
</tr>
<tr>
<td>London King’s Cross – Cleethorpes</td>
<td>4 per day</td>
</tr>
<tr>
<td>London King’s Cross – Scarborough (semi-fast)</td>
<td>4 per day</td>
</tr>
<tr>
<td>London King’s Cross – Skegness</td>
<td>4 per day</td>
</tr>
<tr>
<td>Blyth – Doncaster</td>
<td>3 x cool paths: 30% take up</td>
</tr>
<tr>
<td>Newcastle – Edinburgh Waverley</td>
<td>Stopping service: 1 per hour</td>
</tr>
<tr>
<td>London King’s Cross – Bishop Auckland</td>
<td>4 per day</td>
</tr>
</tbody>
</table>

Figure 3.2 – Average annual value per train mile

*Socio economic benefit established market
Revenue generation established market
Socio economic benefit new market
Revenue generation new market
Existing freight economic benefit + revenue
New freight economic benefit + revenue

* Freight typically occupies twice the track capacity of passenger services, so the number of train miles has been multiplied by two. See page 37 and 38 for an explanation of the relativities in Figure 3.1 and 3.2.
3. Economic analysis

**Figure 3.3 – Total annual value of aspirations excluding increments to existing passenger markets**

- London King’s Cross – Nottingham: 12 per day
- London King’s Cross – Lincoln: 12 per day
- London King’s Cross – Harrogate: 6 per day
- London King’s Cross – Sunderland: 3 per day (7 regular per day)
- Felixstowe – Teesside 3 x container path: 95% take up
- London Gateway – Leeds 3 x container path: 95% take up
- London King’s Cross – Edinburgh Waverley: 9 per day (extend Newcastle services)
- Felixstowe – Teesside 3 x container path: 80% take up
- London Gateway – Leeds 3 x container path: 80% take up
- London King’s Cross – Nottingham: 6 per day
- London King’s Cross – Skipton: 6 per day
- London King’s Cross – Lincoln: 6 per day
- Nottingham – Glasgow Central: 7 per day
- Reading – Birmingham New Street – Leeds – Newcastle: 1 per hour
- London King’s Cross – Harrogate: 4 per day
- London King’s Cross – Huddersfield: 6 per day
- London King’s Cross – Saltburn: 6 per day
- Manchester Piccadilly – Newcastle via Leeds: 1 per hour
- London King’s Cross – Huddersfield 4 per day
- London King’s Cross – Scarborough (mixed calling pattern): 6 per day
- London King’s Cross – York (stopping): 5 per day
- Blyth – Doncaster 3 x coal paths: 60% take up
- London King’s Cross – Hull 8 per day
- Hull – Glasgow 7 per day
- Blyth – Doncaster 3 x coal paths: 45% take up
- London King’s Cross – Bradford Interchange: 4 per day
- London King’s Cross – Scarborough (stopping): 2 per day
- London King’s Cross – Cleethorpes 4 per day
- London King’s Cross – Scarborough (semi-fast): 4 per day
- London King’s Cross – Skegness: 4 per day
- Blyth – Doncaster 3 x coal paths: 30% take up
- Newcastle – Edinburgh Waverley stopping service: 1 per hour
- London King’s Cross – Bishop Auckland: 4 per day

<table>
<thead>
<tr>
<th>Route 1</th>
<th>Route 2</th>
<th>Route 3</th>
<th>Route 4</th>
<th>Route 5</th>
</tr>
</thead>
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<td>£1k</td>
<td>£2k</td>
<td>£3k</td>
<td>£4k</td>
<td>£5k</td>
</tr>
</tbody>
</table>

**Figure 3.4 – Socio economic benefit established market**

**Figure 3.5 – Revenue generation established market**

**Figure 3.6 – Socio economic benefit new market**

**Figure 3.7 – Revenue generation new market**

**Figure 3.8 – Existing freight economic benefit + revenue**

**Figure 3.9 – New freight economic benefit + revenue**
**Figure 3.4 – Average annual value per train mile** excluding increments to existing passenger markets

- **Socio economic benefit established market**
- **Revenue generation established market**
- **Socio economic benefit new market**
- **Revenue generation new market**
- **Existing freight economic benefit + revenue**
- **New freight economic benefit + revenue**

<table>
<thead>
<tr>
<th>Route Description</th>
<th>Average_annual_value_per_train_mile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading – Birmingham New Street – Leeds – Newcastle</td>
<td>1 per hour</td>
</tr>
<tr>
<td>London King’s Cross – Harrogate</td>
<td>4 per day</td>
</tr>
<tr>
<td>Manchester Piccadilly – Newcastle via Leeds</td>
<td>1 per hour</td>
</tr>
<tr>
<td>London King’s Cross – Huddersfield</td>
<td>6 per day</td>
</tr>
<tr>
<td>Manchester Piccadilly – Newcastle via Leeds</td>
<td>1 per hour</td>
</tr>
<tr>
<td>London King’s Cross – Huddersfield</td>
<td>4 per day</td>
</tr>
<tr>
<td>London King’s Cross – Scarborough (mixed calling pattern)</td>
<td>6 per day</td>
</tr>
<tr>
<td>London King’s Cross – York (stopping)</td>
<td>5 per day</td>
</tr>
<tr>
<td>Blyth – Doncaster 3 x cool paths</td>
<td>60% take up</td>
</tr>
<tr>
<td>London King’s Cross – Hull</td>
<td>8 per day</td>
</tr>
<tr>
<td>Hull – Glasgow</td>
<td>7 per day</td>
</tr>
<tr>
<td>Blyth – Doncaster 3 x cool paths</td>
<td>45% take up</td>
</tr>
<tr>
<td>London King’s Cross – Bradford Interchange</td>
<td>4 per day</td>
</tr>
<tr>
<td>London King’s Cross – Scarborough (stopping)</td>
<td>2 per day</td>
</tr>
<tr>
<td>London King’s Cross – Cleethorpes</td>
<td>4 per day</td>
</tr>
<tr>
<td>London King’s Cross – Scarborough (semi-fast)</td>
<td>4 per day</td>
</tr>
<tr>
<td>London King’s Cross – Skegness</td>
<td>4 per day</td>
</tr>
<tr>
<td>Blyth – Doncaster 3 x cool paths</td>
<td>30% take up</td>
</tr>
<tr>
<td>Newcastle – Edinburgh Waverley stopping service</td>
<td>1 per hour</td>
</tr>
<tr>
<td>London King’s Cross – Bishop Auckland</td>
<td>4 per day</td>
</tr>
</tbody>
</table>

* Freight typically occupies twice the track capacity of passenger services, so the number of train miles has been multiplied by two. See page 38 and 39 for an explanation of the relativities in Figure 3.3 and 3.4.*
3. Economic analysis

3.4.3 Economic assessment of service trade-offs

Potential combinations of aspirations if extra capacity could be made available

The value of any capacity that could be made available would be maximised by combining the highest value options that could be accommodated within this capacity. It appears from the economic assessment that there is a diminishing marginal value as the frequency of services between previously unconnected stations increases. This is evident in the relative difference in the value of aspirations that are similar in every respect other than the number of additional services, as the proportional increase in the economic value is lower than the proportional increase in service frequency. This diminishing return would not be true of combinations of separate aspirations to provide new direct services to a selection of currently unserved destinations because the combined value would simply equate to the sum of the value of the individual aspirations.

As discussed earlier in this chapter, a number of the higher value aspirations have a significant proportion of benefits that accrue from markets with existing direct services, particularly between London and Stevenage and London and Peterborough. Using the MOIRA software package it is possible to demonstrate that there is also a diminishing marginal value if the planned 2011 frequency between these stations were increased from five and three trains per hour respectively.

Figure 3.6 illustrates how the incremental benefit generated by additional services reduces as the frequency of services increases. The point at which the benefit of calling additionally at Stevenage and Peterborough is outweighed by the increased end-to-end journey time is between one train every two hours and one additional train per hour.

London King’s Cross – Stevenage: additional long distance high speed versus pathing time in GN outer services

The capacity assessment identified that more LDHS services can be accommodated by inserting pathing time between Alexandra Palace and Welwyn

---

<table>
<thead>
<tr>
<th>Station</th>
<th>Current annual trips</th>
<th>Trains per weekday currently</th>
<th>Maximum aspired trains per weekday</th>
<th>Current generalised journey time</th>
<th>New generalised journey time</th>
<th>Forecast annual trips post frequency increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hull</td>
<td>285,100</td>
<td>8</td>
<td>15</td>
<td>200</td>
<td>187</td>
<td>314,700</td>
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<tr>
<td>Harrogate</td>
<td>104,600</td>
<td>1</td>
<td>7</td>
<td>260</td>
<td>207</td>
<td>124,100</td>
</tr>
<tr>
<td>Lincoln Central</td>
<td>82,600</td>
<td>0</td>
<td>12</td>
<td>192</td>
<td>146</td>
<td>126,300</td>
</tr>
<tr>
<td>Bradford (both stations)</td>
<td>73,800</td>
<td>4</td>
<td>8</td>
<td>238</td>
<td>230</td>
<td>89,100</td>
</tr>
<tr>
<td>Brough</td>
<td>72,000</td>
<td>8</td>
<td>15</td>
<td>185</td>
<td>172</td>
<td>76,200</td>
</tr>
<tr>
<td>Sunderland</td>
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<td>4</td>
<td>7</td>
<td>275</td>
<td>269</td>
<td>63,600</td>
</tr>
<tr>
<td>Skipton</td>
<td>40,700</td>
<td>1</td>
<td>7</td>
<td>268</td>
<td>210</td>
<td>58,500</td>
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<tr>
<td>Grimsby Town</td>
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<td>4</td>
<td>262</td>
<td>211</td>
<td>50,500</td>
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<tr>
<td>Selby</td>
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<td>8</td>
<td>15</td>
<td>164</td>
<td>152</td>
<td>54,700</td>
</tr>
<tr>
<td>Scarborough</td>
<td>39,400</td>
<td>0</td>
<td>6</td>
<td>288</td>
<td>219</td>
<td>60,300</td>
</tr>
<tr>
<td>Middlesbrough</td>
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<td>Hartlepool</td>
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<td>7</td>
<td>249</td>
<td>241</td>
<td>34,100</td>
</tr>
<tr>
<td>Scunthorpe</td>
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<td>0</td>
<td>4</td>
<td>229</td>
<td>179</td>
<td>53,600</td>
</tr>
<tr>
<td>Halifax</td>
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<td>3</td>
<td>7</td>
<td>248</td>
<td>230</td>
<td>37,300</td>
</tr>
<tr>
<td>Huddersfield</td>
<td>29,500</td>
<td>0</td>
<td>6</td>
<td>250</td>
<td>234</td>
<td>52,900</td>
</tr>
<tr>
<td>Shipley</td>
<td>29,200</td>
<td>2</td>
<td>8</td>
<td>232</td>
<td>188</td>
<td>46,800</td>
</tr>
<tr>
<td>Eaglescliffe</td>
<td>26,400</td>
<td>4</td>
<td>7</td>
<td>227</td>
<td>215</td>
<td>27,600</td>
</tr>
<tr>
<td>Thirsk</td>
<td>24,900</td>
<td>4</td>
<td>7</td>
<td>202</td>
<td>188</td>
<td>25,800</td>
</tr>
<tr>
<td>Keighley</td>
<td>20,000</td>
<td>1</td>
<td>7</td>
<td>245</td>
<td>197</td>
<td>40,600</td>
</tr>
<tr>
<td>Malton</td>
<td>12,100</td>
<td>0</td>
<td>6</td>
<td>260</td>
<td>194</td>
<td>29,100</td>
</tr>
</tbody>
</table>
Garden City in the two GN outer services per hour that would call at all stations between Cambridge and Welwyn Garden City once the Thameslink project is completed. Assuming that the increase in LDHS services is limited to the inter-peak, the disbenefit of the pathing time that would be required to accommodate two additional LDHS paths is estimated at around £1.7 million per annum. This is less than 10 per cent of the value that an additional two LDHS trains per hour would be likely to generate, although these service changes may be unacceptable to stakeholders. To deliver an optimal solution without additional pathing time would require a review of the inner suburban service specification.

It is also important to emphasise that the Thameslink Key Output Two timetable development seeks to deliver an all day standard hour pattern. In the peak the disbenefit from additional pathing time would be significantly greater, therefore the combination of the future ECML and Thameslink Key Output Two timetable development should seek to avoid this.

**Stevenage – Doncaster: additional long distance high speed versus freight capacity and flighted station calls**

The capacity assessment suggests that there is a trade-off between accommodating additional LDHS passenger services and additional freight paths. Additional container paths typically have a higher average socio-economic value than an equivalent number of additional passenger services. This does not mean however that the economic value of any remaining capacity would be maximised by operating additional freight growth on this route section as the GN/GE Joint Line could accommodate this traffic once the planned upgrade work is completed. The ORR ‘Rail Freight User Values of Time & Reliability’ study suggests an average socio-economic value of £28 per intermodal train for an hour of planned increased travel time. It is anticipated that a Class 4 train of this nature would incur no more than an hour of additional journey time, which is equivalent to around £16,000 per path per annum or one per cent of the value of the path. This assumes no business is lost as a result of the additional journey time.
3. Economic analysis

**Figure 3.6 – Socio-economic value of increased London King’s Cross – Stevenage and London King’s Cross – Peterborough services**

- Stevenage – London
- Peterborough – London

**Figure 3.7 – Socio-economic value of direct services between intermediate stations**

- 4 tph
- 3 tph
- 2 tph
- 1 tph
- 1 train every 2 hours
The increase in distance through use of the GN/GE Joint Line would increase the cost to freight operators through additional fuel consumption and track access charges, thereby reducing the value per train mile in the assessment by around 13 per cent. However, this is a relatively small proportion of the total benefit and on balance far more value could be derived from the ECML by utilising the GN/GE Joint Line to increase both the quantum of freight and passenger services, than operating both types of traffic on the ECML only.

The capacity analysis in Chapter 2 has indicated that any additional long distance high speed services between Huntingdon and Peterborough will have a detrimental effect on the growth in freight services particularly in the southbound direction where the provision of a seventh LDHS service will mean that only one Class 4 path per hour can be accommodated. By 2030 the Strategic Freight Network has forecast that two freight trains per hour will need to operate on the section between Fletton and Holme Juncions. The growth is driven by container traffic from the planned opening of the Thames Gateway Port. The timeframe in which the second path is required will depend on the commercial decisions of the port and freight customers, route decisions considered in the London and South East RUS Draft for Consultation, published in December 2010, and the amount of freight trains that can be routed overnight. Nevertheless, the capacity provided under Scenario D of one freight train per hour is likely to be inadequate by 2030 and should only be considered as an interim solution.

The very limited proposed Class 6 paths available in Scenario F may inhibit the growth in bulk flows in the future, although the majority of growth is expected to be container traffic.

The capacity assessment also indicated that additional LDHS services could be accommodated by spreading the intermediate station calls between the services on the route, therefore reducing journey opportunities between these stations. Figure 3.7 illustrates the penalty that this loss of shorter distance connectivity would incur. One train every two hours between each of the intermediate stations would generate an estimated combined economic benefit and revenue increase of almost £800,000, and an hourly service would increase this to around £1.3 million. Although significant, this is markedly lower than the overall value that would be generated by additional LDHS services, so stakeholders may view this as an acceptable trade-off.

If it were necessary to make a compromise of this nature the most valuable direct flows to retain would be Grantham – Peterborough, Newark North Gate – Grantham, Doncaster – Retford, Newark North Gate – Peterborough, and Doncaster – Peterborough, which account for over 70 per cent of the total economic benefit and revenue benefit.

3.4.4 Improving the value of the aspired new services

Section 3.4.2 presents an assessment of the value for money for a change in the capability of the route to accommodate more services than possible after the funded changes in CP4 have been implemented (ie. the change from Scenario D to Scenario F). This involves a formal cost benefit assessment of the business case for both the additional services and the infrastructure required to accommodate them, assuming the infrastructure is government funded and the services are franchised passenger trains and/or freight traffic.

It is also possible to use this cost-benefit analysis to gain a better understanding of the likely standalone business case for the aspired new passenger services over the typical life of a future franchise. Based on this and the indicative costs per train mile detailed earlier in this section, it seems likely that very few of the aspirations received would have a commercially attractive business case if only generated rather than generated and abstracted revenue were considered.

This has a resonance with stakeholder dialogue and a number of consultation responses citing an absence of synergy with the base service offer as a reason for aspirations performing poorly in the analysis.

It was therefore decided to investigate whether it would be possible to improve the value of the aspirations received by developing synergies between them and the planned May 2011 timetable. This was an indicative analysis, as it was beyond the scope defined at the start of the review process; however it was considered that it would help identify the best options to meet the new RUS gaps that have been identified.

The ECML flows which currently generate the highest revenue are London King’s Cross – Leeds, London King’s Cross – Newcastle, London King’s Cross – York and London King’s Cross – Edinburgh Waverley. Further analysis has examined how the aspired services received could be adjusted to complement these flows, assuming the seventh hourly LDHS slot to/from London King’s Cross is available for a selection of the aspirations to use (Scenario D).

The aspiration to extend all London King’s Cross – Newcastle services to Edinburgh Waverley is one of the better performing aspirations under the assessment presented in the previous sections. Further analysis suggests that the value of the existing and new London King’s Cross – Newcastle – Edinburgh Waverley services could be improved significantly if:

- one each hour had a reduced number of stops south of Newcastle, thereby reducing the end to end journey time
- some of the aspired new services had station calls inserted to maintain the service frequency between London and key locations on the route.
Analysis suggests that it would be possible to remove both the York and Darlington calls from the faster of the two London King’s Cross – Edinburgh Waverley services, creating one express service each hour calling at Newcastle and Berwick-upon-Tweed only. Very few of the aspirations received could maintain the London – Darlington frequency, and the Darlington calls could not be retained without a service increment that is additional to the aspirations received. The London – York frequency could be maintained by a number of the aspired services.

Figure 3.8 below details the estimated increase in value if the London King’s Cross – Edinburgh Waverley service frequency were increased to two per hour, and the seventh LDHS path to/from London King’s Cross each hour were occupied by services which replace the otherwise lost London – York and London – Darlington service frequency.

It is estimated that this change to the York and Darlington calling patterns would increase the combined annual socio-economic value and revenue generation of the ECML over £9 million per annum. This could be as much as a 40 per cent increase in the total value of the aspired new services that would occupy the seventh LDHS path. However, this assumes that all the calls could be met at no additional operating cost, which is not the case for London – Darlington services based on the aspirations received.

It is noteworthy that there is significant air market competition between Edinburgh and London and to a lesser extent Newcastle and London. Speeding up rail journey times in these markets will encourage significant modal shift, thus increasing overall revenue beyond the level estimated.

The planned level of service between London King’s Cross, Wakefield Westgate and Leeds in the assumed May 2011 base could be improved significantly if:

- one of the two London King’s Cross – Leeds services each hour called only at Wakefield Westgate except in limited hours when the seating capacity is required to meet commuter peak flows
- some of the aspired new services had station calls inserted to maintain the service frequency between London King’s Cross and Doncaster, and London King’s Cross and other intermediate stations between London and Doncaster.

It would be possible to remove the intermediate calls from the faster of the half hourly London King’s Cross – Leeds services thereby creating an express London King’s Cross – Leeds service calling at Wakefield Westgate only. Several of the aspired new services could call additionally to retain the connectivity to and from London King’s Cross.

Alternatively, the Stevenage, Grantham and Doncaster calls in the other of the two Leeds services per hour could be moved into a number of the aspired new services. This would allow a fast London – Wakefield – Leeds service to be provided whilst maintaining connectivity between Peterborough, Doncaster and Leeds, as well as between London King’s Cross and all other existing calls.

Figure 3.8 also details the estimated increase in value if the seventh LDHS path to/from London King’s Cross were occupied by aspired services which replace the intermediate calls from the Leeds services in the two alternative ways described above.

Speeding up the faster of the London King’s Cross – Leeds services would increase the total annual economic value and revenue generated by around £4 million, whereas speeding up the slower of these services would increase the economic value and generated revenue by around £7 million. This could be up to as much as 23 and 39 per cent respectively of the total value of the aspired new services.

The analysis presented above illustrates three ways that the aspired new services could improve journey times on the most valuable existing flows on the ECML in addition to serving the originally intended markets. In reality there are several other combinations of aspired new services that could achieve the same outcome, or a combination of reduced journey times to both West Yorkshire and the North East and Scotland. Furthermore, these opportunities are not limited to the seventh LDHS path as not all planned services in the 2011 timetable will call at the intermediate stations discussed, and the eighth LDHS path which would be available through some infrastructure changes could also be utilised.

The conclusion of this further analysis is that a holistically planned timetable will generate a higher level of socio-economic benefits and revenue than a series of new services as an increment to an existing base ECML timetable.

The work required to conclude the most appropriate way to do this is well beyond the scope of this capacity review:

- a holistic timetable would need to be developed, to optimise the mix of final destinations, service frequencies and stopping patterns. The resulting package then would be built into an overall business case
- new services would require assessment under ORR’s ‘Not Primarily Abstractive’ test. It could be necessary to review the methodology employed in this test to enable it to recognise the benefits of a holistic package of services with a higher overall value over a series of incremental aspirations
● a holistically planned timetable operated by a collection of competing operators may not be achievable without some fundamental changes to the industry’s current approach to capacity allocation and access charging to encourage both collaboration and competition.

Noting the complexities involved, the East Coast Main Line 2016 Capacity Review recommends that the industry works towards compiling a holistically planned timetable in order to maximise the economic value of the route.

3.4.5 The business case for additional infrastructure to accommodate a greater number of aspired services

The capacity assessment has identified the route sections between Huntingdon and Fletton Junction and between Darlington and Newcastle as the key constraints to further growth on the route.

The most suitable infrastructure capability change between Darlington and Newcastle would involve reopening of the Leamside line which would allow segregation of passenger and freight services avoiding the capacity limitations imposed by the relative speed differentials of these types of trains. It is unclear however whether the level of traffic growth to necessitate this infrastructure will materialise for some time:

● the average requirement for freight paths is expected to remain relatively constant although the mix of commodities carried is likely to change

● the aspired new passenger services to and from London that have been submitted by stakeholders will not use the most constrained section of the route and the other aspired passenger services that would use this section have performed relatively poorly in the economic assessment. However, other services may operate on this section if holistic timetable development discussed above resulted in a different segregation of the London King’s Cross – Edinburgh Waverley and London King’s Cross – Darlington markets, than the alternatives considered.

Analysis suggests that there would be a high value for money business case to re-instate the Leamside line if it allowed around seven additional freight trains per day to operate in each direction. This number would reduce if the infrastructure were also required to accommodate additional passenger services with a good business case.

Further development of the business case for reopening the Leamside line may be required once future traffic levels are clearer.
3. Economic analysis

The most suitable infrastructure capability change between Huntingdon and Fletton Junction would involve an extension of the existing four track section. Further analysis completed during the consultation period suggests that extending the four track section south from Fletton Junction by around four miles would provide sufficient capacity for an eighth LDHS service and enable anticipated freight traffic growth to 2030 to be accommodated.

Figure 3.9 details the business case for an increase in the frequency of LDHS services from seven to eight trains per hour, and the additional four track infrastructure required to accommodate this. It is assumed that the incremental services are six trains per day between London King’s Cross and Harrogate, four trains per day between London King’s Cross and Huddersfield, and two trains per day between London King’s Cross and Scarborough. This provides a journey time saving in the faster of the two existing London King’s Cross – Leeds services as described in section 3.4.4. This assumed mix of services is purely for illustrative purposes.

Background passenger demand was estimated at 2.6 per cent per annum using the Network RUS: Scenarios and Long Distance Forecasts. This is slightly lower than typical comparable growth published in the ECML RUS, as the Network RUS forecasts which cover a much longer time period are based on a more conservative assessment of the long-term increase in the size of the total transport market and rail’s changing share of this.

It is estimated that around £629 million of transport economic benefits will be generated over the 60-year appraisal period in 2002 prices and values. Of this around £426 million is the benefit derived by passengers through improved journey times and connectivity between stations on and adjacent to the ECML and £203 million is a result of reduced road congestion, pollution and accidents through a stimulated switch from road travel to rail travel between the places connected by the new services.

The package of infrastructure and services is estimated to cost an additional £569 million over the appraisal period of which around 71 per cent is the increased operating cost and 20 per cent is the infrastructure investment cost, and 9 per cent is reduced taxation revenue through the switch from road to rail travel.

The overall cost of the package is offset by £308 million additional revenue generated from the new passengers. This reduces the public sector cost to around £260 million over 60 years.

Overall the package of services and infrastructure has a Benefit Cost Ratio (BCR) of 2.42 which indicates high value for money.

The potential wider economic benefit of the scheme was assessed as a sensitivity test. This assessment used the draft WebTAG methodology, which estimates the impact of transport improvements effectively bringing business, consumers and the labour supply closer together. On this basis the wider economic impact is estimated at around £90 million, which increases the BCR to 2.76.

It is estimated that the additional intermodal freight growth that could be accommodated by the infrastructure upgrade would have an economic benefit over the appraisal period of around £250 million. This is over twice the cost of providing the infrastructure, and on the assumption that freight revenues cover operating costs extending the four track section would have a high value for money if implemented on a standalone basis to accommodate freight growth.

The addition of both passenger and freight benefits would increase the overall BCR to in excess of three. Ordinarily this would be sufficient value for money to recommend an intervention of this type to meet identified RUS gaps. However it is not possible to conclude which services would use the new infrastructure until the holistic timetabling exercise recommended in the previous section has concluded. On this basis the recommendation to proceed with the new services and infrastructure is conditional on the outcome of that work.

Finally, it may also be necessary to revisit the length of the appraisal period once the Government’s plans for a new high speed line to and from London are clearer. This is discussed further in Chapter 5.
### Figure 3.9 – Illustrative transport economic efficiency table for eight long distance high speed services per hour and enabling infrastructure, £m 2002 prices, 60-year appraisal period

<table>
<thead>
<tr>
<th></th>
<th>Transport assessment</th>
<th>Transport and wider economic assessment</th>
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<td><strong>Benefits</strong></td>
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<tr>
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<tr>
<td>Wider economic benefits</td>
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<td><strong>Total benefits</strong></td>
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<td><strong>Costs to government</strong></td>
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<tr>
<td>Infrastructure</td>
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<td>112</td>
</tr>
<tr>
<td>Subtract revenue increase</td>
<td>-308</td>
<td>-308</td>
</tr>
<tr>
<td>Other Government impacts</td>
<td>53</td>
<td>53</td>
</tr>
<tr>
<td><strong>Total costs</strong></td>
<td>260</td>
<td>260</td>
</tr>
<tr>
<td><strong>Net Present Value (NPV)</strong></td>
<td>369</td>
<td>459</td>
</tr>
<tr>
<td><strong>Benefit Cost Ratio (BCR)</strong></td>
<td>2.42</td>
<td>2.76</td>
</tr>
</tbody>
</table>
4. Consultation process and overview

4.1 Background

The East Coast Main Line 2016 Capacity Review Draft for Consultation was published in August 2010. The document outlined a number of scenarios in which capacity could be used on the East Coast Main Line (ECML) and which to a greater or lesser degree could meet the aspirations of stakeholders who wished to operate services on the route in 2016.

A wide range of stakeholders were contacted informing them of the publication of the Draft for Consultation on Network Rail’s website. A period of 60 days was given to allow stakeholders to respond, this period ended on 1 November 2010.

During the consultation Network Rail held a series of economic workshops which were well attended by members of the industry working group. The workshops considered the economic analysis presented in the Draft for Consultation and suggested refinement of the methodology used to appraise the relative economic values of the aspirant services. This analysis has now been completed and details of the changed methodology and subsequent analysis can be found in Chapter 3.

Network Rail also held meetings with a number of stakeholders individually at which specific issues were discussed.

4.2 Consultation responses

The consultation garnered 58 responses and respondees fell into six broad categories:

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<th>Category</th>
<th>Number</th>
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<td>Rail industry</td>
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<tr>
<td>Councils/local authorities</td>
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<tr>
<td>Business forums/groups</td>
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<td>Rail user groups</td>
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<td>Members of the public</td>
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</tr>
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<td>Other</td>
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</table>

Copies of the responses can be found in the East Coast Main Line 2016 Capacity Review section of Network Rail’s website at www.networkrail.co.uk.

4.3 Key themes in the consultation responses

The responses were well considered and, in a number of cases, comprehensive. As a result, it is difficult to provide an individual précis of each one. Instead some of the key and recurring themes are summarised below.

4.3.1 Positive reaction

General reaction from most respondents was positive, welcoming the fact that the ECML was the subject of further detailed study, following the establishment of the East Coast Main Line Route Utilisation Strategy (RUS) in April 2008. Respondees felt that the review was particularly timely, providing important information on the level of capacity likely to be available on the ECML following completion of the infrastructure works planned for implementation in Control Period 4 (CP4, 2009–2014). The study would also inform the development of the next franchise for long distance services on the route.

4.3.2 Industry working group

Members of the industry working group concurred that not all of the aspirations to run services could be accommodated on the ECML after the planned infrastructure works in CP4 had been completed. Many working group members noted that the study had highlighted a number of trade-offs that could be made to accommodate additional services. Whilst individual organisations expressed concerns about the potential effect of these trade-offs on their own services, there was broad recognition that the ECML was a multi-operator mixed traffic route and that any timetable change should not be at the expense of the quantum of trains or journey times of existing services.

Taking note of the economic workshops that were held during the consultation period, a number of respondees suggested that the final economic analysis should take cognisance of the effect on other routes particularly where aspirations to destinations such as Nottingham and Sheffield were already well served.

Stakeholders suggested that further work needed to be done to understand the effect of abstraction from the air market on long distance flows through the provision of better rail journey times. This view was supplemented by the incumbent long distance operator on the route who suggested that the core value of the route lay in the total timetable offer and not with individual incremental aspirations. Moreover, revenue would be maximised by providing the fastest journey times to the core long distance markets of London to Leeds, Newcastle and Edinburgh. Whilst acknowledging that serving smaller stations and preserving direct journeys to small markets was important, the industry working group convened after the closure of the consultation period agreed that were the industry
to plan the timetable in a holistic way then the maximum value could be extracted from the route to the benefit of all operators and users.

Stakeholders expressed concerns that the economic methodology used to rank the aspirations takes no account of costs or revenues and that consequently, the ranking may not present the full picture. Noting that it is extremely difficult for Network Rail to model the effect on revenues where open access operators are involved, one response suggested an alternative mechanism to that used to assess revenues of franchised services which could be used as a proxy to assess costs and revenues in the round. This suggestion has been incorporated into the economic analysis that has been undertaken since the Draft for Consultation and is reported in section 3.4 of Chapter 3.

Freight operators expressed concerns over access to the GN/GE Joint Line. As detailed in section 2.2 the base assumption for this study is the upgrade to the GN/GE Joint Line and associated works at Werrington Junction. The precise nature of these works has not been specified, however it is assumed that the required level of passenger and freight service will be able to access the Joint Line without significant impact on the core ECML traffic. Should this not be possible, then the running of freight services over the section of the ECML between Peterborough and Doncaster will have a significant impact on available capacity. There was a general concern that the existing freight traffic and freight growth had not been accurately expressed in the capacity scenarios. Meetings have been held with freight operators and the scenarios have been revised accordingly and are shown in section 2.5 of Chapter 2. Freight operators requested that the final review note the significant extra costs that would accrue to them should services be diverted onto longer more circuitous routes. Lastly it was recommended that the final East Coast Main Line 2016 Capacity Review take cognisance of the work undertaken by the London and South East RUS (published as a draft for consultation in December 2010) on freight routings around London.

A number of members of the industry working group noted that since the publication of the Draft for Consultation the Government has stated a preference for a ‘Y’ shaped high speed rail network between London, Birmingham and on to Leeds. Once complete this will have a major impact on traffic along the entire ECML. It will provide the opportunity to alter the balance between long distance high speed services, freight and commuter services at the southern end of the route but it will exacerbate the constraints at the northern end of the route, particularly between Northallerton and Newcastle, but also onwards to Scotland as the quantum of services with significant differentials in speed will become harder to accommodate.

Funders noted that the Draft for Consultation had not fully assessed the business case for the various infrastructure interventions proposed. This work has now been undertaken and is reported in section 3.4.5 of Chapter 3.

4.3.3 Non-industry responses

Councils and local authorities were generally supportive of the methodology used but were understandably parochial about individual aspirations for new services along the route.

A number of stakeholders expressed concerns about the effects that additional passenger and freight services running both on the ECML itself and on the GN/GE Joint Line would have on level crossing down time. This issue is particularly acute in Lincolnshire and north of Peterborough. Network Rail is working with its industry colleagues to remove a number of crossings on the ECML.

Some stakeholders suggested that maximum use of capacity could be made if aspirations were operated as portions, with a long train operating on the core spine of the route from London King’s Cross and for example York, where portions to Harrogate and Scarborough could then operate. The practical difficulties of different operators being involved were noted.

Opinions were mixed as to which aspirations stakeholders would like to see progressed and one response suggested that the new ECML long distance franchise should take the highest priority in any consideration of aspirations. Others welcomed the regeneration effects that services to new markets could bring and suggested that any appraisal of the aspirations should take into account future growth rates, on-train crowding effects and wider economic impacts.

As with the industry working group, wider stakeholders also noted the recent change to Government policy on high speed rail and suggested that any infrastructure interventions should be compatible with the recently proposed ‘Y’ shaped network.

Stakeholders from the North East requested that should the option to reopen the Leamside line progress to implementation, that as well as being used for freight services, a passenger service be introduced serving the town of Washington.

We are grateful to all those who responded to the Draft for Consultation. The responses received were from an impressively broad spectrum of those with an interest in the ECML. We hope that where possible, within our terms of reference, we have been able to take account of genuine concerns.
5. Conclusions and next steps

5.1 Conclusions

The terms of reference for undertaking the East Coast Main Line 2016 Capacity Review have required Network Rail to understand the level of demand for train paths in a December 2016 timetable. It is important to note that whilst the industry agreed freight forecasts for 2019 have been used as a proxy for the required level of freight traffic, the demand for passenger train paths in 2016 has not considered how passenger growth would be accommodated. The established East Coast Main Line RUS considered passenger growth in detail, and the strategy it proposes for accommodating it remains valid.

The East Coast Main Line 2016 Capacity Review has demonstrated that the demand for paths exceeds the capacity available and that without any trade-offs in journey times or service specifications there are limited opportunities to increase the number of train services after the completion of the committed Control Period 4 infrastructure interventions. A number of scenarios are presented in Chapter 2 which detail how these various trade-offs will affect overall capacity on the route.

Chapter 3 explores the economic value of the aspirations and the economic consequences of the trade-offs described above and concludes that a number of the aspired services between London and currently not served locations have a similar overall value, and that the best performing options are those that dovetail with the rest of the timetable. The study also concludes that the majority of aspired passenger services that do not serve London have a relatively low economic value. Freight paths considered have performed well in the economic assessment reflecting the high value of rail freight traffic to the UK economy.

Additional work carried out since the publication of the Draft for Consultation has concluded that the overall value of the East Coast Main Line (ECML) can be maximised by reducing journey times on the key flows between London King’s Cross and Edinburgh Waverley/Newcastle and Leeds. This can be achieved by changing the timetable and calling patterns of existing franchised services, whilst balancing this potential loss of connectivity with additional station calls in other services. The study notes that the value of the incremental aspirations is also increased where the stopping patterns are altered to complement faster journeys on the highest earning flows and concludes by recommending that the industry develop a holistically planned timetable which will generate a higher level of socio-economic benefits and revenues than a series of new services introduced as increments to the existing ECML timetable.

During the consultation period, further analysis has been undertaken to understand the costs and benefits of infrastructure enhancements to accommodate additional services. The capacity assessment has concluded that the most constrained sections of route are those between Northallerton and Newcastle and between Huntingdon and Peterborough. In the case of the section north of Northallerton, the study notes that the current timetable and assumed freight growth can be accommodated providing that the timetable is constructed as now with a high degree of flighting of the passenger services and that future levels of freight growth do not require an increase in the number of daytime paths. Were any of these parameters to change, the reopening of the Leamside line would be the best solution to provide further capacity. To enable freight growth to be accommodated to 2030 and to enable further passenger services from London to be accommodated the East Coast Main Line 2016 Capacity Review has concluded that additional infrastructure must be provided between Huntingdon and Peterborough. The study has found a high value for money business case for such an intervention.

The analysis conducted suggests that there would be a good business case to implement the further infrastructure capability charges in Control Period 5. However, implementation is not recommended within a particular time period as under the current industry structure Government would be unlikely to fund this infrastructure unless it were required for franchised passenger or freight services, and it is not clear how these will materialise.

In the absence of any further infrastructure capability changes, Scenario D (detailed in Chapter 2) with seven long distance high speed services from London should be viewed as the most valuable blueprint for future timetable development in the shorter term. Although it is acknowledged that whilst the existing levels of freight can be accommodated, capacity south of Peterborough (in the southbound direction) is severely constrained and forecast future levels of freight will require additional infrastructure.
Scenario F, which introduces a further long distance high speed service from London, may represent the most valuable longer-term proposition at least until the introduction of services on a new high speed line, and the infrastructure south of Peterborough that is required to allow this is recommended subject to the outcome of the development of the holistically planned timetable described below.

Since the publication of the Draft for Consultation, the Government has announced its continuing support for the development of a high speed rail network in the UK. The Coalition Government’s preferred option is for an initial line between London and the West Midlands with subsequent branches to Manchester and Leeds to form a ‘Y’ shaped network. The proposed branch to Leeds will have a significant impact on the East Coast Main Line. To take advantage of the benefits that the high speed line will bring it is anticipated that a number of long distance high speed services will transfer to the new line which will enable changes to be made to the quantum and pattern of passenger and freight services at the south end of the route. In contrast the northern end of the route may become more constrained as the flighting required to accommodate existing passenger and freight services north of Northallerton may no longer be achievable thus strengthening the need for the reopening of the Leamside line.

5.2 Next steps

The Review will become established 60 days after its publication unless the Office of Rail Regulation (ORR) issues a notice of objection within this period. The recommendations of the review will inform High Level Output Specifications for Control Period 5 for England and Wales and for Scotland. They will also inform the development of the next East Coast franchise.
<table>
<thead>
<tr>
<th>Term</th>
<th>Meaning</th>
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<tbody>
<tr>
<td>ATOC</td>
<td>Association of Train Operating Companies</td>
</tr>
<tr>
<td>BCR</td>
<td>Benefit Cost Ratio</td>
</tr>
<tr>
<td>Car</td>
<td>Single rail vehicle such as a passenger carriage, locomotive, or driving van trailer (see glossary entry)</td>
</tr>
<tr>
<td>Control Period 4 (CP4)</td>
<td>The 2009 – 2014 period</td>
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<td>Control Period 5 (CP4)</td>
<td>The 2014 – 2019 period</td>
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<td>Control Period 6 (CP4)</td>
<td>The 2019 – 2024 period</td>
</tr>
<tr>
<td>DfT</td>
<td>Department for Transport</td>
</tr>
<tr>
<td>Down</td>
<td>The direction of trains normally when travelling away from London</td>
</tr>
<tr>
<td>Driving van trailer</td>
<td>Unpowered vehicle with controls to drive the train, and without any passenger accommodation</td>
</tr>
<tr>
<td>ECML</td>
<td>East Coast Main Line</td>
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<td>FOC</td>
<td>Freight Operating Company</td>
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<td>Gravity model</td>
<td>Passenger demand forecasting model based on a statistically significant link between the flow of passengers between pairs of locations, and factors which affect this such a population and journey time</td>
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<tr>
<td>GVA</td>
<td>Gross value added – measure of economic productivity of an area</td>
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<tr>
<td>HLOS</td>
<td>High Level Output Specification</td>
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<td>HS2</td>
<td>Proposed high speed rail link between London, the West Midlands and potentially beyond</td>
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<tr>
<td>Infrastructure</td>
<td>Network assets including signalling, track, structures and telecommunications apparatus</td>
</tr>
<tr>
<td>Intercity Express Programme (IEP)</td>
<td>The next generation of high speed train to replace the existing 125mph High Speed Trains</td>
</tr>
<tr>
<td>Loading Gauge (Gauge)</td>
<td>The profile for a particular route within which all vehicles or loads must remain to ensure that sufficient clearance is available at all structures</td>
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<tr>
<td>MOIRA</td>
<td>An industry standard passenger demand forecasting model which uses many of the principles published in the Passenger Demand Forecasting Handbook (see glossary entry)</td>
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<td>Office of Rail Regulation</td>
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<td>Passenger Demand Forecasting Handbook (version 5.0) – industry standard publication containing detailed research on passenger behaviour and trends</td>
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