Chiltern line capacity issues

Central Railway proposes to upgrade about 25 miles of the Chiltern Line system for shared use by passenger services and Central Railway trains. It commissioned Halcrow Transmark to carry out an initial study of track capacity on the Chiltern Line to determine what infrastructure enhancements would be required to accommodate passenger service requirements and projected traffic levels specified by Central Railway. This document summarises the findings of the study.

Executive summary of Halcrow study

The Chiltern Line 'Franchising has yet to be finalised by the SRA. Central Railway has made it clear that it will provide additional capacity for Chiltern Services and to facilitate the development of new and faster services..

Halcrow Transmark was retained by Central Railway to undertake an initial study of track capacity between Northholt Junction and the former Ashendon Junction. It was envisaged that this twin-track section will be upgraded and incorporated into Central Railway's Liverpool to Lille railway and therefore new freight services will share the line with the local Chiltern Lines services. New track will be provided within the existing railway corridor to create capacity where this is required.

Taking the winter 1998/99 Chiltern Railway's timetable as a base and using the approved Protim timetabling software, Halcrow evaluated various options for accommodating Central Railway's projected traffic of four to six freight trains per hour of either 750 metres or 1000 metres in length by 2020. The options included flexing the Chiltern Railway timetable and installing passing tracks at three locations. There appeared to be sufficient flexibility within the existing Chiltern Railways timetable to permit Central Railway freight trains to operate with a minimum of additional infrastructure or tracks. While flexing the schedule is the preferred approach, another option was to provide passing tracks, two kilometres in length at High Wycombe, Gerrards Cross and West Ruislip, where a need for additional capacity has been identified to allow slightly faster passenger trains to overtake freight trains. There seemed no case for the view that two Central Railway tracks need to be constructed along the length of the existing two tracks in the railway corridor. If it were assumed that Central Railway operates 1000 metre trains, then the new freight traffic could be accommodated with no new passing tracks and minimal flexing of the Chiltern Railway timetable. If shorter trains are operated and with the provision of passing tracks described above, Central Railway freight traffic, as projected to 2020, can be accommodated without changing the current Chiltern Lines timetable.

A further, more detailed study will be undertaken before the submission of an application. This will evaluate the scope for improvements to Chiltern Railways services, and Central Railway services combined, as appropriate, with an evaluation of the scope for re-timetabling. This work will be coordinated with the Strategic Rail Authority and Chiltern Railways to make sure that their

Central Railway and passenger services

Central Railway is proposing to make a major investment in a new north-south railway system which will create opportunities for new passenger services, including to and from Heathrow as well as London, in addition to the lorries-on-trains service the company intends operating. The company will work with the SRA and existing passenger franchise operators to ensure that these opportunities are developed for the benefit of communities along the route. For details of possible services see the economic and environmental benefits document.

Since the study the company has adopted a route which follows the M25 and therefore these stations are no longer on Central Railway's route. The section over which shared use is now proposed begins at Gerrards Cross and is approximately 25 miles long, this further easing any potential capacity constraints.

This study examined the proposed route between Northolt Junction and the former Ashendon Junction – part of the Chiltern Line*. The section has an intensive passenger service operated by Chiltern Railways using modern diesel multiple-unit trains.

The study concentrates on the train capacity between the two locations to determine what infrastructure enhancements may be required to accommodate the projected traffic levels as specified by Central Railway. The requirements depend on the length of freight trains used:

Train length	No trains in 2010	No trains in 2020
750m	4.4 each way per hour	5.5 each way per hour
1000m	3.3 each way per hour	4.2 each way per hour

The following key issues were assessed when undertaking the study:

- geography of the route
- current users of the route.

Geography
The route segment is 33 miles long and passes through he following stations: South Ruislip*, West Ruislip*, Denham*, Denham Golf Club, Gerrards Cross, Seer Green and Jordans, Beaconsfield, High Wycombe, Saunderton, Prices Risborough and Haddenham and Thame Parkway. The branch line between Princes Risborough and Aylesbury did not form part of the study. The section currently has on track northbound and on track southbound.

Current users
The winter 1998/1999 Chiltern Railways timetable was used to establish the volume of train traffic at the time of the study. Reference was also made to the Railtrack Working Timetable and Railtrack Rules of the Plan for the segment concerned. From these documents the following information was gained:

- headway between trains (minimum time allowed between each train)
- point-to-point timings for all existing types of trains using the route
- junction margins (minimum time allowed between conflicting train movements at junctions)
- station dwell time (minimum time allowed at each station)
- speed restrictions over the section.

Chiltern Railways operated a maximum of two trains an hour between Birmingham and London and had a large number of local services. The services were operated by class 165 and 168 diesel multiple units, which are capable of maximum speeds of 75 mph and 100 mph respectively.

English, Welsh and Scottish Railway (EWS) currently operates three daily freight trains in each direction on a flexible daily schedule. These services have not been included in his study as they have a minor effect on capacity.

Methods
A timetable was constructed for the study using Protim – a computer software package widely used throughout the UK rail industry for timetable planning. The following steps were taken:

- create a geographical database
- input point-to-point timings for the existing Chiltern Railways services
- input Chiltern Railways timetable
- calculate point-to-point timings for the proposed Central Railway freight services
- input Central Railway freight trains into Protim database.

Point-to-point timings were calculated using an average speed of 68mph for Central Railway trains assuming the use of, for example, Class 92 locomotives. The point-to-point timings for 750m and 1000m freight trains when rounded were found to be identical.

The timetable was divided into the following segments:

- morning peak 0700 -1000
- typical off-peak 1100 -1400
- evening peak 1600 -1900

These segments are representative of the varying traffic glows on the passenger network. Between 1900-0600 very few trains are operated.

Time graphs were produced that recognised the individual performance capabilities of each type of train and the respective timings over the segment concerned. Spare train paths were identified from the time graphs.

* Since the study the company has adopted a route which follows the M25 and therefore these stations are no longer on Central Railway's route. The section over which shares use is now proposed begins at Gerrards Cross and is approximately 25 miles long, this further easing any potential capacity constraints.

Results

Existing timetable

Using the methods described above, the number of additional freight train paths available in the existing Chiltern Railways timetable was calculated. If no infrastructure enhancements are made, the number of available freight paths per hour falls short of Central Railway's required level of service during he 'up' morning peak and the 'down' evening peak. In order to find or develop solutions to this shortfall in capacity, the study created two new timetables:

- Timetable Option1: limited rescheduling of existing Chiltern Lines timetable.
- Timetable Option 2: construction of additional railway infrastructure.

Timetable Option 1

Timetable Option 1 'flexed' the existing passenger services to create the required number of freight pathways for Central Railway. Flexing the timetable created 5.66 freight train paths per hour in each direction sufficient for Central Railway's requirement.

However, this would result in slower Chiltern Railway services. The delay would depend on the length of Central Railway freight trains and which year is considered. The worst case is for 750m trains in 2020, when 34 of 128 passenger trains would be delayed, by an average of 2.5 minutes per delayed train, with a total delay of 86 minutes between 0700 and 1700. The total increase in train times was less than 2%.

This delay would be minimised if 1000m length trains are operated, as fewer train paths would be required. The delay could be further minimised if Chiltern Railways and Central Railway were to plan a timetable re-cast.

Timetable Option1 demonstrated that the current service level of Chiltern Railways and the maximum freight service level of Central Railway can be achieved by 'flexing' the current Chiltern Railways service. No infrastructure enhancements would be required.

Timetable Option 2

In developing Timetable Option 2 'pinch points' on the existing track layout were identified. Pinch points are where congestion over the section at peak periods is high, eg where an express train catches up with a slower service and is slowed down. Three potential pinch points were identified:

- West Ruislip
- Gerrards Cross
- High Wycombe

Timetable Option 2 introduced passing tacks at the three pinch points that allowed fast passenger services to pass the slightly slower freight trains. Passing tracks would be constructed for both the up and the down line and would need to accommodate the longest trains operating on the Chiltern Line.

In only in one instance is Central Railway's service requirements not met. This is for 750m freight trains on the up line during the mid-morning peak in 2020.

Timetable Option 2 would cause delay to Central Railway freight services while they wait for existing services to bypass. Delay would affect 24 of 103 trains by an average of 12 minutes per stopped train, with a total delay of 291 minutes per day.

Timetable Option 2 demonstrates that the current service level for Chiltern Railways and the maximum freight service level of Central Railway could be accommodated without delaying any Chiltern Railway services. This can be achieved by using 1000m freight trains and constructing passing tracks at West Ruislip, Gerrards Cross and High Wycombe.

Additional passenger services

A further study was conducted to demonstrate the effect of two additional passenger services, every hour and in each direction. For the purposes of the study one service stops at High Wycombe only and one service stops at Gerrards Cross, High Wycombe and Prices Risborough.

To accommodate the additional services the current timetable was flexed. This affected 51 of 128 trains with an average of 2.5 minute delay per delayed train, with a total delay of 137.5 minutes between 0700-1900. However, it should be noted that this is in a worst case scenario for 750m length freight services in 2020. Delays would be reduced if 1000m length freight services were operated and could be minimised if Chiltern Railways and Central Railway were to re-cast the timetable to create extra train paths required.

Overnight services
The final part of the study was to identify how many overnight train paths are available, with no infrastructure enhancements. Currently no services are operated on the line between 01.50 and 04.42. There are therefore a significant number of train paths available to Central Railway between 1900 and 6:00.

Conclusions and recommendations
Taking the winter 1998/99 Chiltern Railways timetable as the basis for this study, the analysis indicates there is sufficient flexibility within the existing schedules to permit Central Railways services to operate with a minimum of additional infrastructure.

Timetable options 1 and 2 demonstrate that by slightly retiming existing services, or by the installation of passing tracks at three locations, there will be little impact on existing journey times. Central Railway's preferred option of 1000m length trains will greatly reduce an impact on Chiltern Railways' services as fewer train paths are required.

A revised study will be prepared as part of the company's application detailing the improvements to passenger services and infrastructure envisaged by the company.

* Since the study the company has adopted a route which follows the M25 and therefore these stations are no longer on Central Railway's route. The section over which shares use is now proposed begins at Gerrards Cross and is approximately 25 miles long, this further easing any potential capacity constraints.

To receive further information documents or to discuss specific issues please write to us as the address below, email info@central-railway.co.uk or phone Robert Raffety, Development Director on 020 7930 6655. For further information about Central Railway please visit our website, www.central-railway.co.uk

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