

**Department of Infrastructure**

# **Clifton Hill Rail Group Review**

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## **Phase 1: Identification of Network Capacity Issues**

**December 2004**



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# Executive Summary

Patronage on Melbourne's trains has grown by 35% over the past 20 years. To date this has been absorbed on the existing infrastructure.

Congestion problems are emerging at a number of points on the network. Various studies are underway to identify solutions.

In the 2002 State election, the Victorian Government made a commitment to investigate the possibility of making improvements to the Hurstbridge line, including the feasibility of track duplication between Greensborough and Hurstbridge.

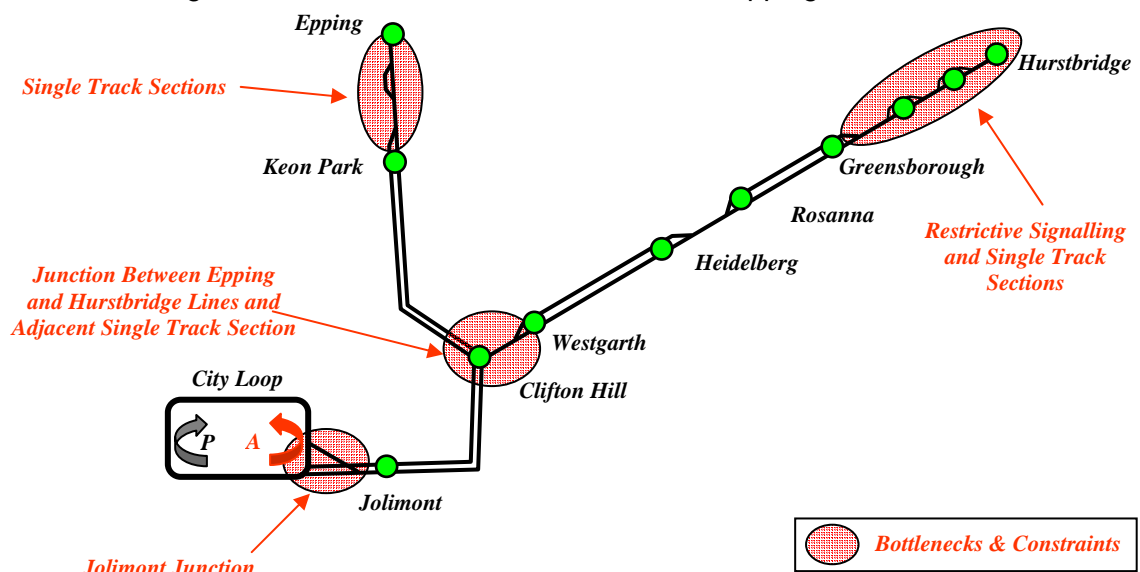
The objectives of the Clifton Hill Rail Group Review are to:

1. Develop a long term planning framework for the whole of the Clifton Hill Rail Group that will ensure rail and associated improvements are identified within a wider integrated transport and land use context.
2. Conduct detailed project development to address priority constraints on the Hurstbridge and Epping lines. In developing the scope it is important to identify the current capacity and operational issues that have an adverse impact on service performance and limit the Group's capacity to meet current and future demand.

The purpose of this report is to present the results of the first phase of the review: the identification of current issues, focusing on network capacity issues.

The Clifton Hill Rail Group is operating below the metropolitan network average in terms of on time performance and speed. The key operational constraints are largely capacity and/or reliability related. These can be summarised as follows:

- The at-grade junction at Jolimont where trains enter and leave the loop.
- The junction between the Hurstbridge and Epping lines at Clifton Hill and the adjacent single track crossing of Merri Creek.
- The restrictive signalling system and single track sections between Greensborough and Hurstbridge.
- The single track section between Keon Park and Epping.



Train loadings do not currently exceed the Load Standard. However, population growth, particularly in the Epping corridor, will add to demands on the lines in the years ahead.

Extensions to the Epping Line to Epping North and South Morang / Mernda are under consideration, but cannot be delivered without addressing existing capacity constraints.

Further stages of the review will: examine the existing and future market in more detail; examine a range of operating and infrastructure changes that could improve the performance of the line; examine rail stations and connecting services; and prioritise any potential future investments.

# 1 Introduction

The Clifton Hill Rail Group consists of two separate rail lines, one from Hurstbridge and the other from Epping that join at Clifton Hill and link to the City Loop at Jolimont Junction (see Figure 1).

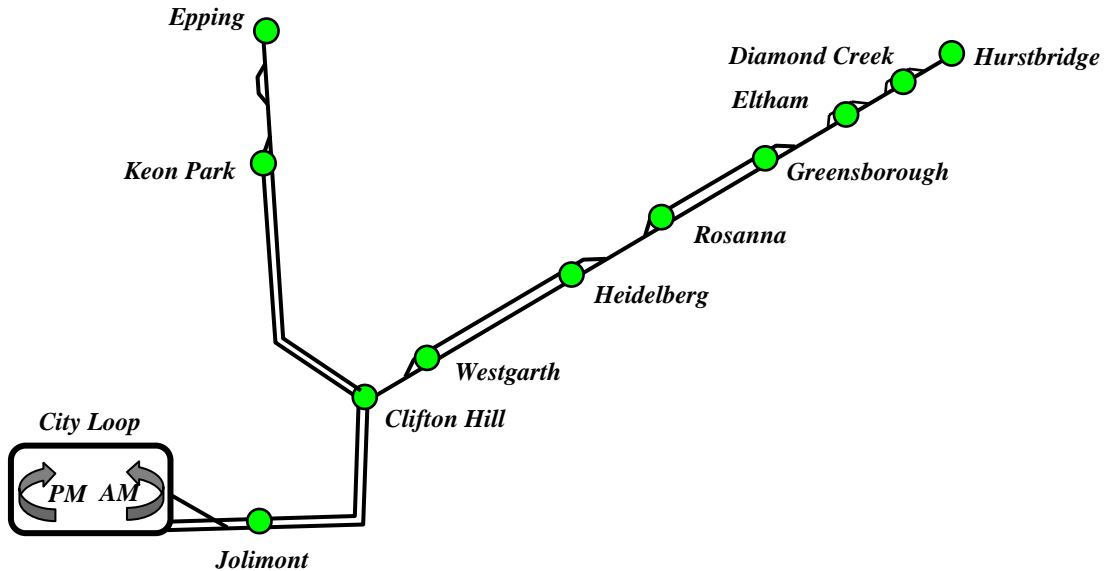


Figure 1 - Clifton Hill Rail Group

## 1.1 Study Objectives & Scope

The objectives of the Clifton Hill Rail Group study are to:

1. Develop a long term planning framework for the whole of the Clifton Hill Rail Group that will ensure rail and associated improvements are identified within a wider integrated transport and land use context.
2. Conduct detailed project development to address priority constraints on the Hurstbridge and Epping lines. In developing the scope it is important to identify the current capacity and operational issues that have an adverse impact on service performance and limit the group's capacity to meet current and future demand.

The purpose of this document is to present the results of Phase 1, namely the identification of network capacity issues.

## 1.2 Study Context

Patronage on Melbourne's trains has grown by 35% over the past 20 years. To date this has been absorbed on the existing infrastructure.

Congestion problems are emerging at a number of points on the network. Various studies are underway to identify solutions.

In the 2002 State election, the Victorian Government made a commitment to investigate the possibility of making improvements to the Hurstbridge line, including investigating the feasibility of track duplication between Greensborough and Hurstbridge.

The Clifton Hill Rail Group Study is being developed within a clear policy framework in which the Government has committed to significant improvements in public transport through the following policies:

- Growing Victoria Together (GVT) - the State Government's vision for Victoria which announced a target to increase public transport's mode share in Melbourne to 20% of motorised trips by 2020 (20/2020);
- Melbourne 2030 - the metropolitan planning strategy for Melbourne that provides a land use and transport management framework for achieving a more sustainable metropolitan area as the city grows.
- Metropolitan Transport Plan - the integrated transport plan for Melbourne. The Plan includes initiatives to address various rail capacity issues, with triplication of the Dandenong line as a first priority, and subsequent selective investments elsewhere, including the Clifton Hill Group.

## 2 Group Description

### 2.1 Route Function

The route function describes the current purpose of the route. Generally the existing function of the Clifton Hill Rail Group is:

- to provide an efficient, safe and reliable rail service between central Melbourne and Epping and Hurstbridge for a variety of journey types and users;
- to provide access to the Central Activities District (CAD), activity centres and neighbouring communities along the route;
- to be part of an integrated transport system and provide access to the wider Principal Public Transport Network;
- to provide reliable rail journey times;
- to provide travellers with travel choices;
- to be environmentally sustainable; and
- to support sustainable development.

### 2.2 Number of Services

The following number of services are provided each day on the Epping and Hurstbridge lines:

#### *Epping Line Services*

##### Up (To the City) Direction

Service	Monday to Friday	Saturday	Sunday
Epping to the City	61	50	38
<b>Total</b>	<b>61</b>	<b>50</b>	<b>38</b>

##### Down (Away from the City) Direction

Service	Monday to Friday	Saturday	Sunday
City to Epping	58	50	39
<b>Total</b>	<b>58</b>	<b>50</b>	<b>39</b>

#### *Hurstbridge Line Services*

##### Up (To the City) Direction

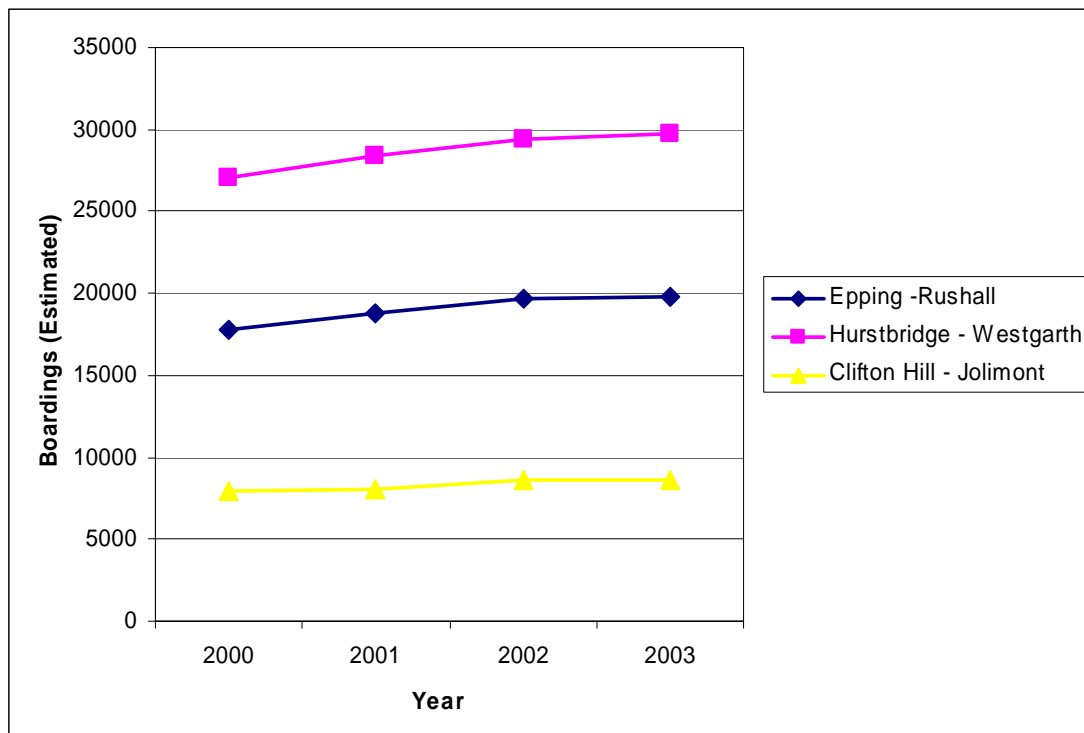
Service	Monday to Friday	Saturday	Sunday
Hurstbridge to the City	31	27	25
Eltham to the City	21	23	12
Greensborough to the City	15	--	--
<b>Total</b>	<b>67</b>	<b>50</b>	<b>37</b>

### Down (Away from the City) Direction

Service	Monday to Friday	Saturday	Sunday
City to Hurstbridge	29	28	24
Eltham to Hurstbridge	2	--	1
City to Eltham	23	22	13
City to Greensborough	16	--	--
City to Macleod	2	--	--
<b>Total</b>	<b>72</b>	<b>50</b>	<b>38</b>

### 2.3 Patronage and Growth Rates

Based on validation data the Clifton Hill Rail Group has approximately 60,000 boardings on an average day (see Figure 2) with the average growth rate being 3.3% pa over the calendar years 2000 to 2003.



Note: Estimated patronage is based on validations data including an estimate for fare evasion and non validation.

**Figure 2 – Estimated Boardings on the Clifton Hill Rail Group**

Cordon count data was also analysed to determine growth in the peak periods. The cordon count survey is a passenger count undertaken annually in May at the maximum load point which is Jolimont station for the Clifton Hill Rail Group.

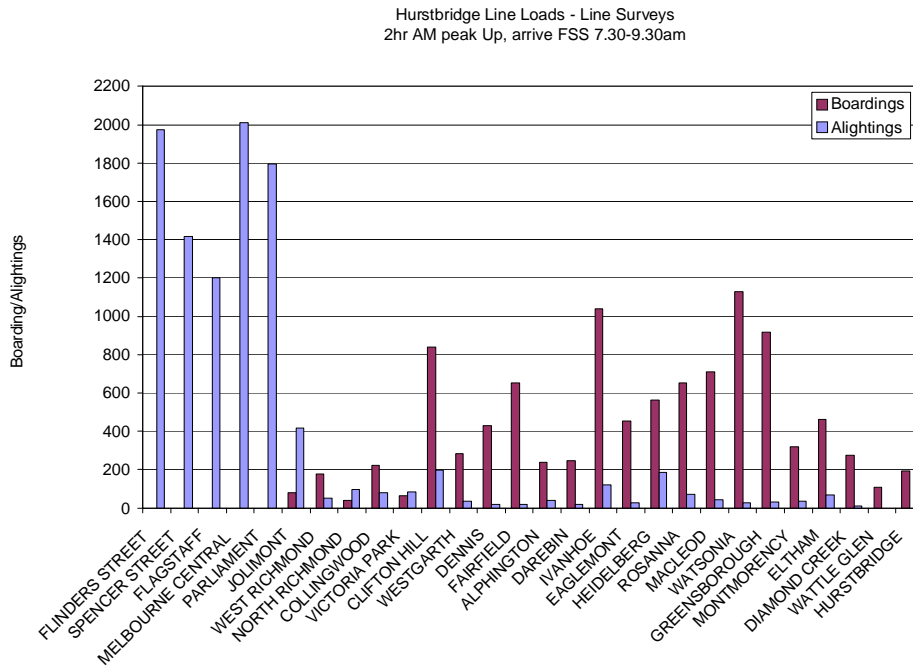
Time Period	Average Annual Growth Rate (2001-2004)	
	Epping	Hurstbridge
AM Peak 1hr	-2.1%	0.4%
AM Peak 2hr	0.2%	0.4%
PM Peak 1hr	-0.4%	0.3%
PM Peak 2hr	0.6%	-0.4%

Note: AM Peak 1 hour (7:30-8:30) AM Peak 2 hour (7:30-9:30)  
 PM Peak 1 hour (5:00 -6:00) PM Peak 2 hour (4:30 – 6:30)

The strongest growth in demand has therefore been outside peak periods and / or beyond the peak load point.

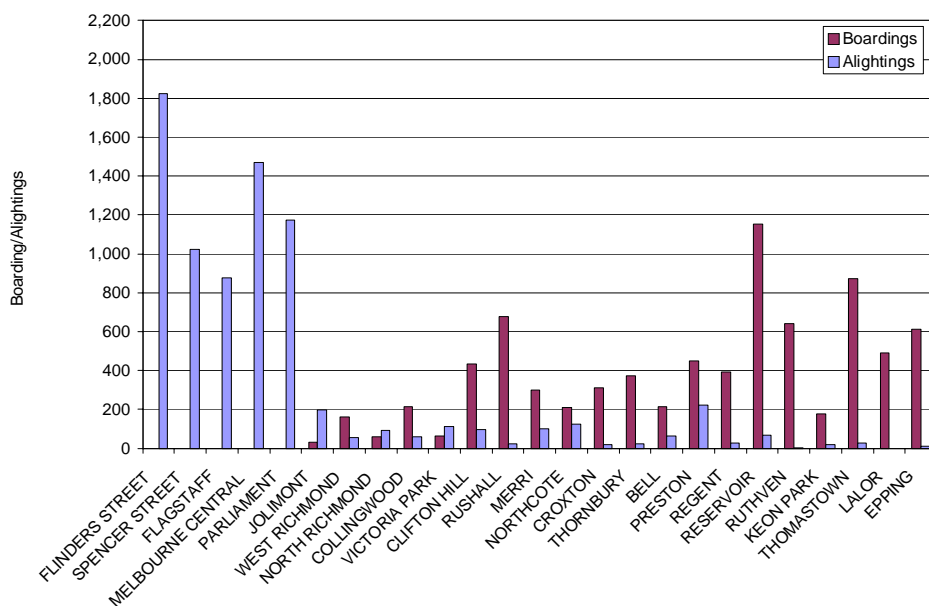
Figures 3 and 4 show the boarding and alighting patterns at stations in the morning peak. As expected, most passengers have a destination in the City. More than 80% travel into or from City Loop stations

The suburban stations with the highest boardings are Clifton Hill, Ivanhoe, Watsonia and Greensborough on the Hurstbridge line and Reservoir and Thomastown on the Epping line.



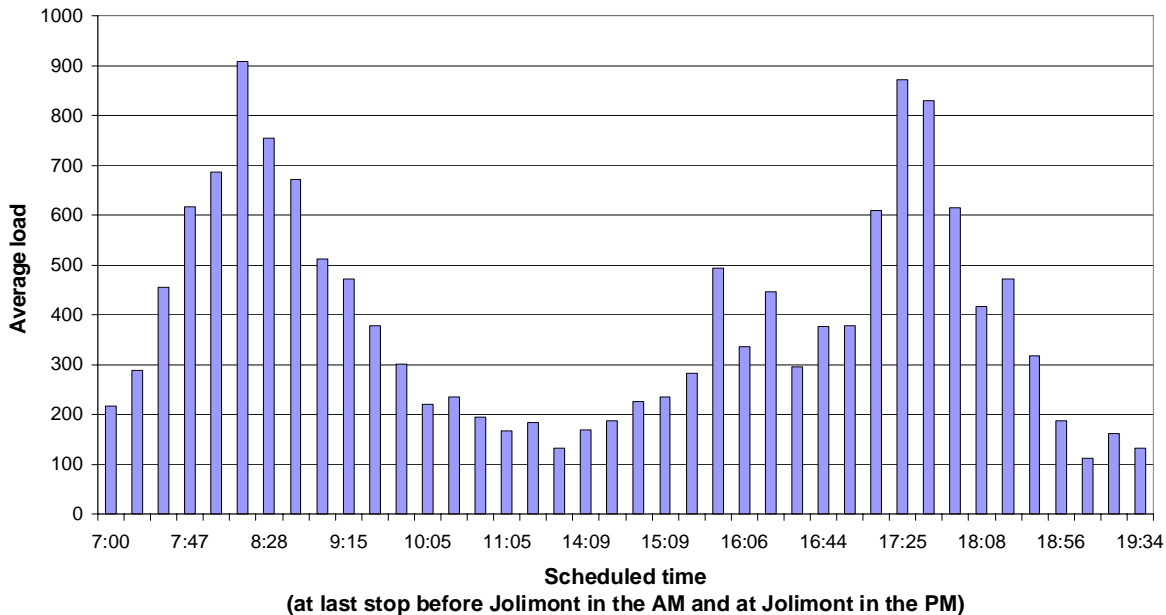
**Figure 3 - Hurstbridge Line in AM Peak towards CBD**

Epping Line Loads - Line Surveys  
2hr AM peak Up, arrive FSS 7.30-9.30am



**Figure 4 - Epping Line in AM Peak towards CBD**

Figures 5 and 6 show loadings on individual peak trains at the peak load point on these lines (at Jolimont). While some individual train loads exceed 800, the Load Standard of 800 per train averaged over the busiest hour is not currently exceeded.



**Figure 5 - Epping Line Loads by Service, 2004 Cordon Courts**

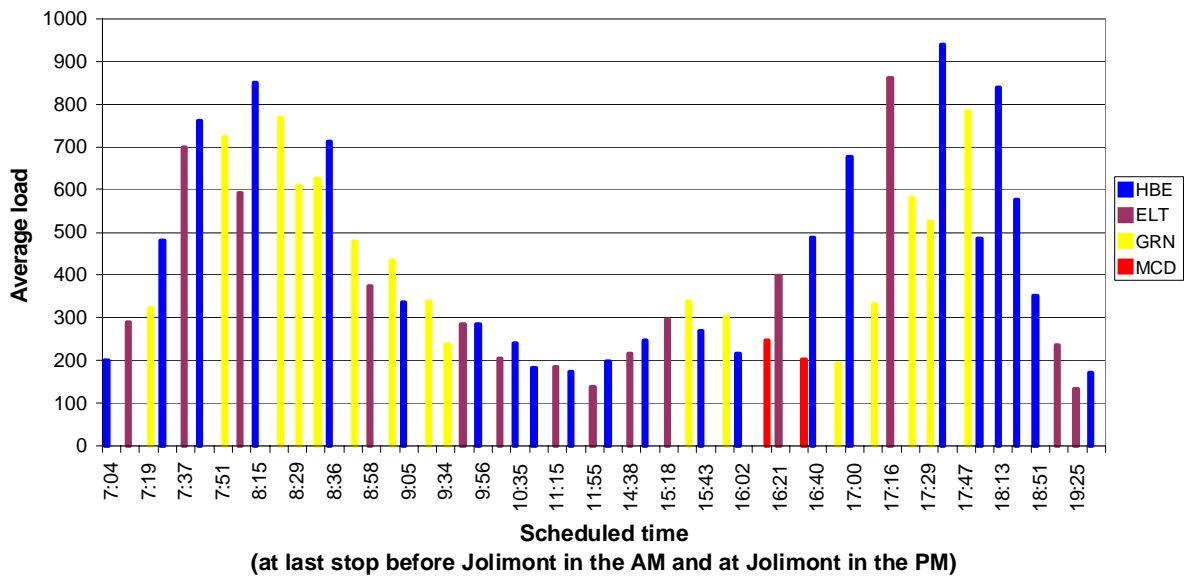


Figure 6 - Epping Line Loads by Service, 2004 Cordon Courts

## 2.4 On-Time Performance

On average, in terms of on-time performance the Hurstbridge Line is performing below the network average (see Figure 7). This is due to the difficulties in presenting trains at key pinch-points on both the Epping and Hurstbridge lines as subsequently discussed.

The performance of all lines has been affected by train driver shortages through much of 2004.

In terms of cancellations the Clifton Hill Rail Group is better than average (0.3% compared to 0.5%).

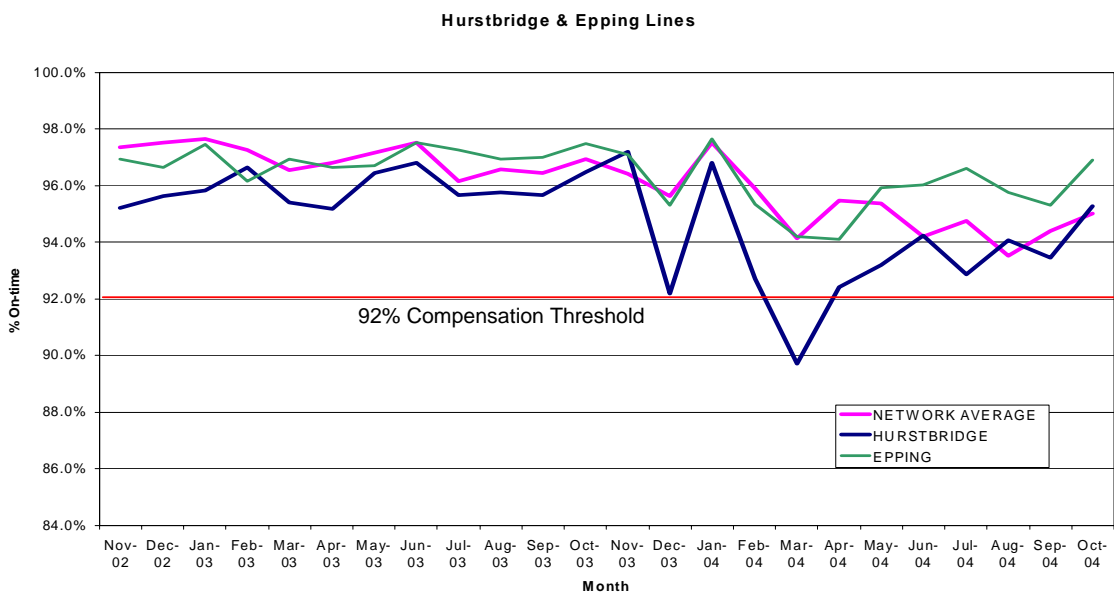
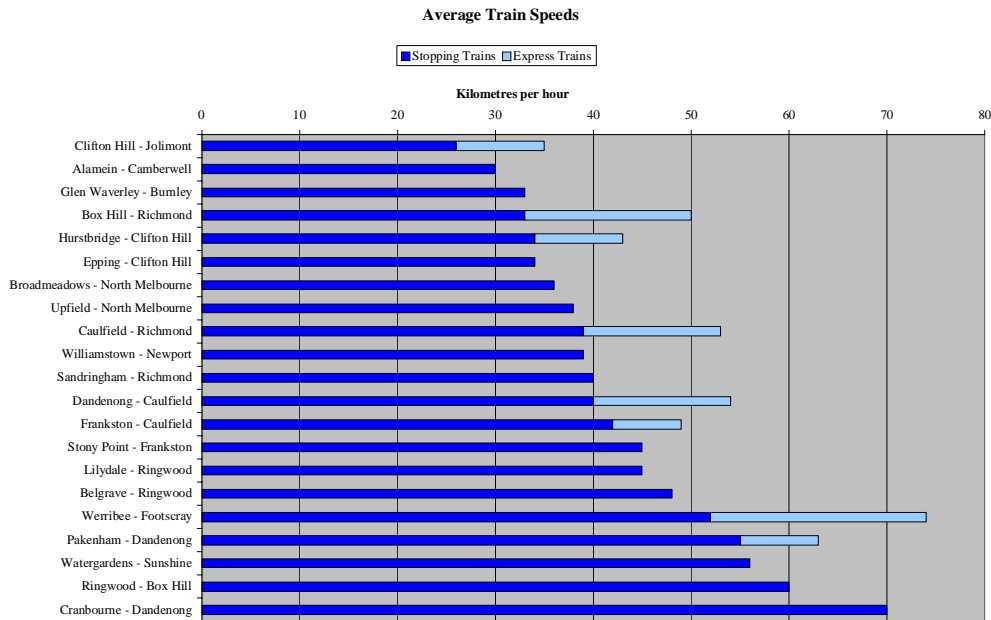


Figure 7 - On Time Performance

## 2.5 Train Speeds

Generally, train speeds on the Clifton Hill Rail Group are lower than average (see Figure 8). This is due to a combination of factors including the alignment of the track, the closely spaced stations, particularly south of Clifton Hill, as well as reliability issues caused by single track sections, conflicts at junction points and restrictive signalling systems. Constraints at particular locations are not isolated and affect the operation of the whole group.

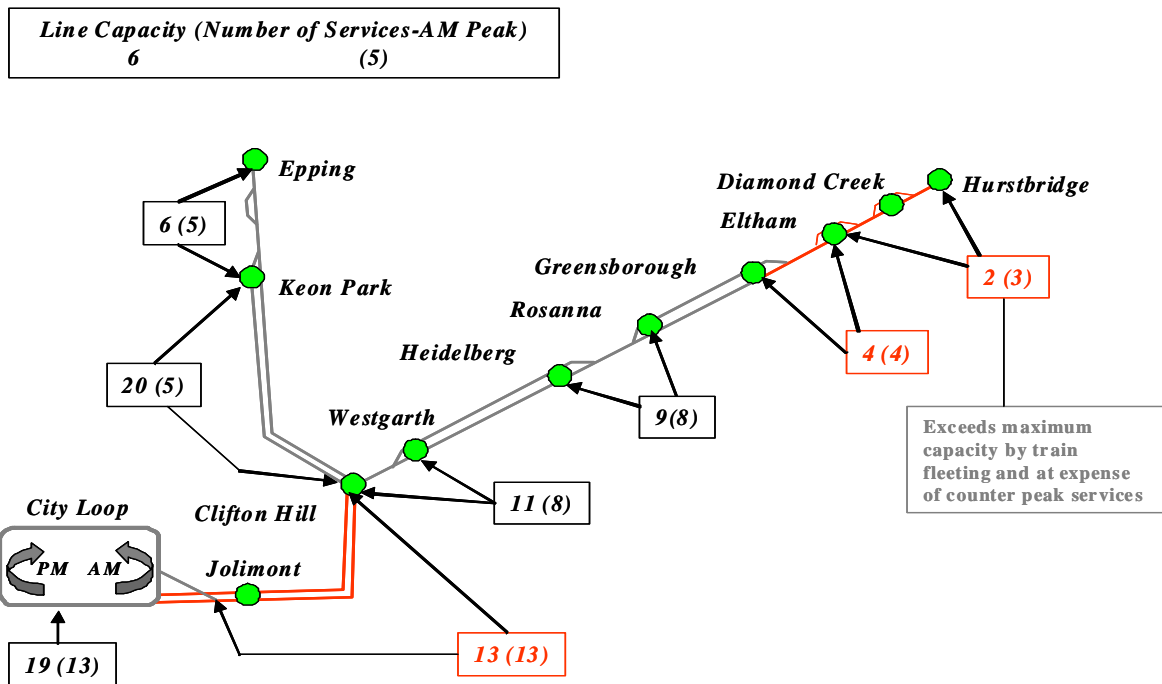


**Figure 8 - Average Train Speed**

## 2.6 Network Capacity

A double track railway with modern signalling, adequate platform capacity and free of junctions can carry more than 24 trains per hour. The capacity of the Clifton Hill Group is well below this level (see Figure 9).

The Jolimont to Clifton Hill and Greensborough to Hurstbridge line sections are currently operating at their maximum capacity limit. Other line sections are also approaching their maximum capacity.



**Figure 9 - Capacity vs Current Services (line section capacity shown as trains per hour per direction)**

The Eltham to Hurstbridge section exceeds its capacity by 'fleeting' trains, that is, having additional trains at the end of the line ready to run in the peak period. The penalty for fleeting trains is that fewer counter peak services can be run.

By operating at or near capacity there is a strong relationship between congestion and reactionary delays. Reactionary (or secondary) delays compound the effect of any single delay by having a disproportionate impact on other services on the group due to the limited availability of opportunities to recover the timetable. Such delays on the Clifton Hill Rail Group also have the potential to impact on the wider network if rolling stock and/or train crews are out of place according to service rosters.

## 2.7 Line Sections

The Clifton Hill Rail Group can be considered to have four distinct sections, namely;

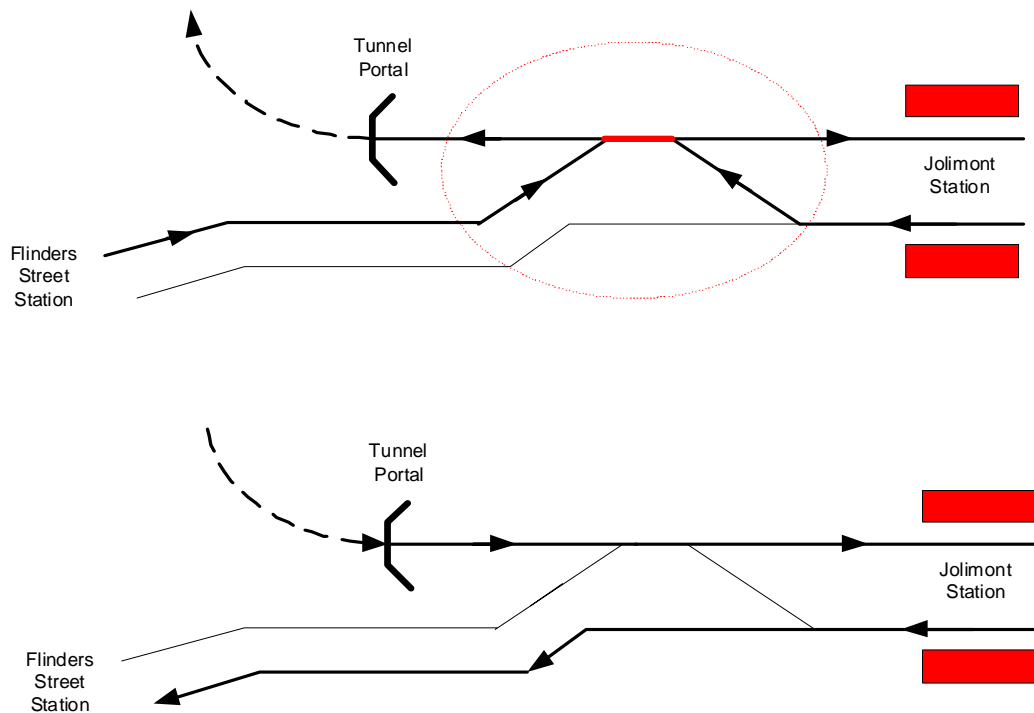
- The section from City Loop to Jolimont;
- Jolimont to Clifton Hill, which is common to both the Hurstbridge and Epping Lines
- The Epping line from Clifton Hill to Epping; and
- The Hurstbridge line from Clifton Hill to Hurstbridge.

### 2.7.1 City Loop Section

The capacity of the Clifton Hill loop is restricted to 13 trains per hour because of the conflict at Jolimont Junction, but also to a lesser extent train service reliability and platform availability at Flinders Street Station. All Clifton Hill services use Platform 1 at Flinders Street and there is little interaction with the other rail groups during normal operations.

Morning services on the Clifton Hill Loop run in an anti-clockwise direction (i.e. Parliament - Melbourne Central - Flagstaff - Spencer Street - Flinders Street). This

requires trains travelling towards Melbourne to cross the path of opposing trains at Jolimont Junction (see Figure 10). This conflict is removed when the loop is switched to clockwise operations for afternoon services.



**Figure 10 - Jolimont Junction**

### 2.7.2 Jolimont to Clifton Hill

The line between Jolimont and Clifton Hill is 3.5km long and consists of double track for its entire length. There are two tunnels located between Jolimont and West Richmond. The tunnel closest to Jolimont is 146 metres long, whilst the tunnel closest to West Richmond is 113 metres long.

The line between Jolimont and Victoria Park (then known as Collingwood) was opened to traffic in 1901, whilst the section between Victoria Park and Clifton Hill was opened in 1888 as a part of a line between Collingwood and Heidelberg. Prior to the direct route via Jolimont being opened, the Heidelberg line was linked to the rest of the metropolitan network via the “Inner Circle” line via Royal Park and Rushall. The “Inner Circle” was closed to passenger traffic in 1948.

Stations in this section are very closely spaced by Melbourne metropolitan standards (500 to 700m) and average line speeds are necessarily reduced for this reason. Stopping trains average 25km/h, while express trains average 35km/h. The stations and their facilities within this section are listed below:

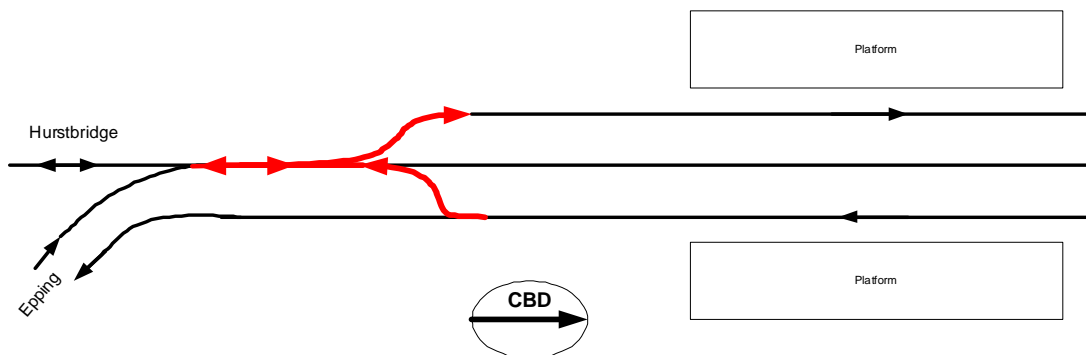
Station	Distance from Spencer Street (kms)	Distance between Stations (kms)	Platform Arrangement	Premium / Host	Car Parking Capacity (Spaces)	Bicycle Lockers (October 2004)
Jolimont	2.905	---	Side	Host	None	No
West Richmond	3.659	0.754	Side	No	See Note 1	No
North Richmond	4.163	0.504	Side	No	None	No
Collingwood	4.834	0.671	Side	No	None	No
Victoria Park	5.423	0.589	Side	No	See Note 2	No

Note 1: Some commuters use a small informal car park located on the eastern side of the line.

Note 2: Some commuters use a small informal car park located on the former Victoria Park goods yard.

Trains are stabled between peak periods on a siding located between Victoria Park and Clifton Hill.

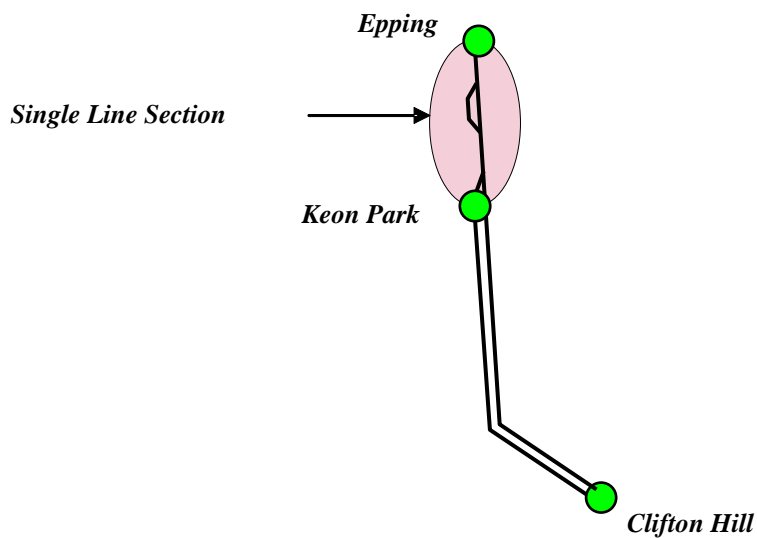
The junction at Clifton Hill (see Figure 11) imposes the need to regulate the arrival of Epping and Hurstbridge services at Clifton Hill station. This task is made more difficult because of the single line sections on both lines and the manual signalling systems employed beyond Greensborough on the Hurstbridge line.



**Figure 11 - Clifton Hill Junction**

### 2.7.3 Epping Line

The 16km line between Epping and Clifton Hill consists of double track between Clifton Hill and Keon Park (11 kms.) and single track between Keon Park and Epping (5 kms.), with a crossing loop at Lalor (see Figure 12).



**Figure 12 - Epping Line**

The line between Clifton Hill and Epping was opened in 1889. The line beyond Lalor (that actually extended as far as Whittlesea) was closed to all traffic in 1959. It was re-opened between Lalor and Epping in 1964.

The stations and their facilities within this section are listed below:

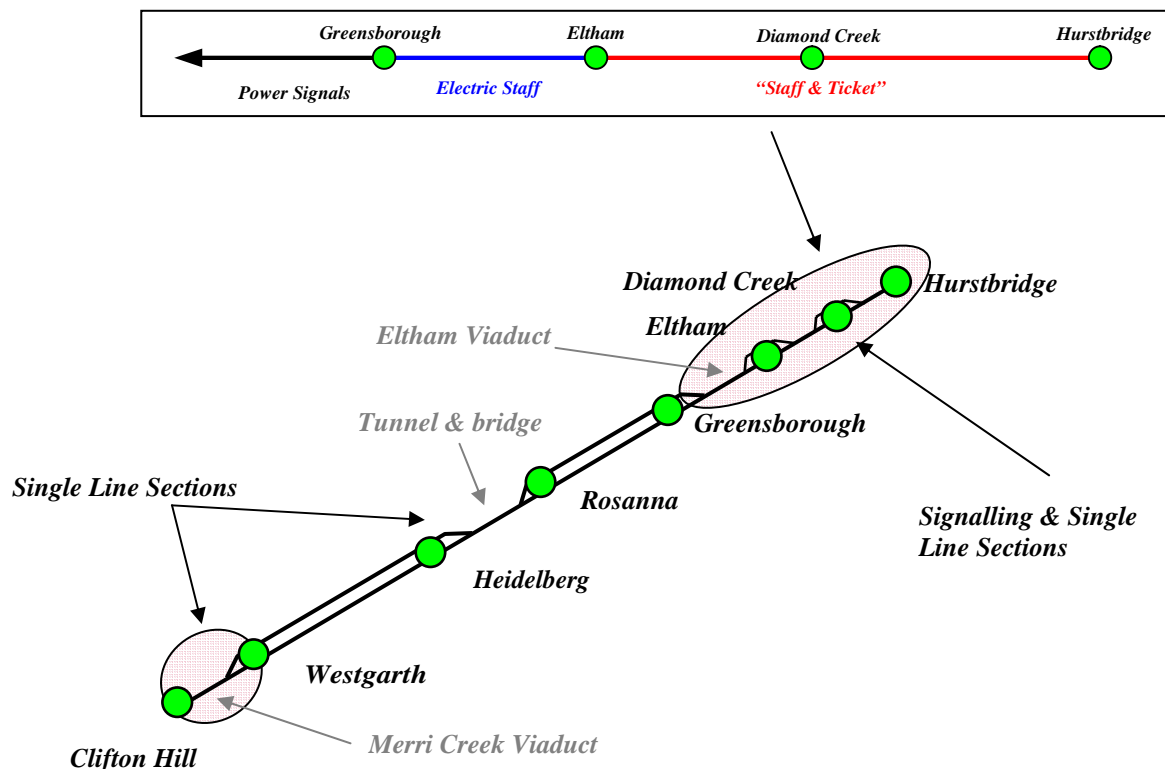
Station	Distance from Spencer Street (kms)	Distance between Stations (kms)	Platform Arrangement	Premium / Host	Car Parking Capacity (Spaces)	Bicycle Lockers (October 2004)
Rushall	7.544	---	Side	No	None	No
Merri	8.042	0.498	Side	No	None	No
Northcote	8.967	0.925	Side	No	None	No
Croxton	9.611	0.644	Side	No	None	No
Thornbury	10.617	1.006	Side	No	None	No
Bell	11.703	1.086	Side	No	20	No
Preston	12.468	0.765	Side	Premium	70	4
Regent	13.387	0.919	Side	No	110	No
Reservoir	14.943	1.556	Side	Premium	500	6
Ruthven	15.945	1.002	Island	No	80	No
Keon Park	17.536	1.591	Island	No	80	No
Thomastown	19.086	1.550	Side	Premium	200	4
Lalor	20.717	1.631	Island	No	220	4
Epping	22.163	1.744	Island	Premium	200	4

At Epping there is a major train maintenance depot and stabling sidings.

The track currently operates within its capacity except that out of course running (when trains do not run to the timetable) can sometimes cause further delays for access to the single track section.

#### 2.7.4 Hurstbridge Line

The 32km line between Hurstbridge and Clifton Hill consists of single track from Hurstbridge to Greensborough (16 kms.) with crossing loops at Eltham and Diamond Creek, and then double track from Greensborough to Clifton Hill (16 kms.) punctuated by short single track sections between Rosanna and Heidelberg (1.25 kms.) for a tunnel and a bridge (see Figure 13), and between Westgarth and Clifton Hill (0.7 kms.) for a bridge over the Merri Creek.



**Figure 13 - Hurstbridge Line**

The line between Clifton Hill and Hurstbridge was opened in three stages - between Clifton Hill and Heidelberg in 1888, between Heidelberg and Eltham in 1902 and between Eltham and Hurstbridge in 1912. The line between Westgarth and Greensborough was duplicated in the following five stages - Westgarth to Alphington in 1912, Alphington to Ivanhoe in 1951, Ivanhoe to Heidelberg in 1949, Rosanna Junction to Macleod in 1958 and Macleod to Greensborough in 1979.

The line crosses four major watercourses - Merri Creek between Clifton Hill and Westgarth, Darebin Creek between Alphington and Darebin, Plenty River between Greensborough and Montmorency and Diamond Creek between Montmorency and Eltham and the same watercourse again at four points between Eltham and Diamond Creek.

The bridge that crosses Diamond Creek south of Eltham is a lengthy timber trestle bridge. It is the only timber trestle remaining on the Melbourne electrified

metropolitan network and one of only four over which passenger trains regularly operate in Victoria. There will be both environmental and heritage issues associated with any changes that might be proposed for this bridge as a part of this study.

Likewise, there will be both environmental and heritage issues associated with any works that might be proposed for the bridge over Merri Creek at Clifton Hill.

The stations and their facilities within this section are listed below:

<b>Station</b>	<b>Distance from Spencer Street (kms)</b>	<b>Distance between Stations (kms)</b>	<b>Platform Arrangement</b>	<b>Premium / Host</b>	<b>Car Parking Capacity (Spaces)</b>	<b>Bicycle Lockers (October 2004)</b>
Westgarth	7.551		Side	No	0	No
Dennis	8.398	0.847	Side	No	30	No
Fairfield	9.154	0.756	Side	Host	70	12
Alphington	10.458	1.304	Side	No	150	No
Darebin	11.215	0.757	Side	No	30	No
Ivanhoe	12.144	0.929	Side	Premium	310	8
Eaglemont	13.089	0.945	Side	No	25	No
Heidelberg	14.042	0.953	Island	Premium	300	8
Rosanna	15.795	1.753	Side	No	220	No
Macleod	17.710	1.915	Side	Premium	100	No
Watsonia	19.921	2.211	Island	Host	450	4
Greensborough	22.934	3.013	Island	Premium	250	8
Montmorency	24.746	1.812	Side	No	100	No
Eltham	27.389	2.643	Island	Premium	300	8
Diamond Creek	32.630	5.241	Side	No	80	No
Wattle Glen	35.058	2.428	Side	No	30	No
Hurstbridge	38.019	2.961	Side	No	80	No

Trains are currently stabled overnight and between peak periods on special sidings located at Macleod, Eltham and Hurstbridge.

Train movements over the line section between Greensborough to Eltham are controlled by the 'Electric Staff' safeworking system. The section from Eltham to Hurstbridge is controlled by "Staff and Ticket" (Figure 13). While both systems are safe, they are restrictive, labour intensive and unsuitable for the long term operation of a modern electrified railway. They also have an impact on the reliable operation of the whole group.

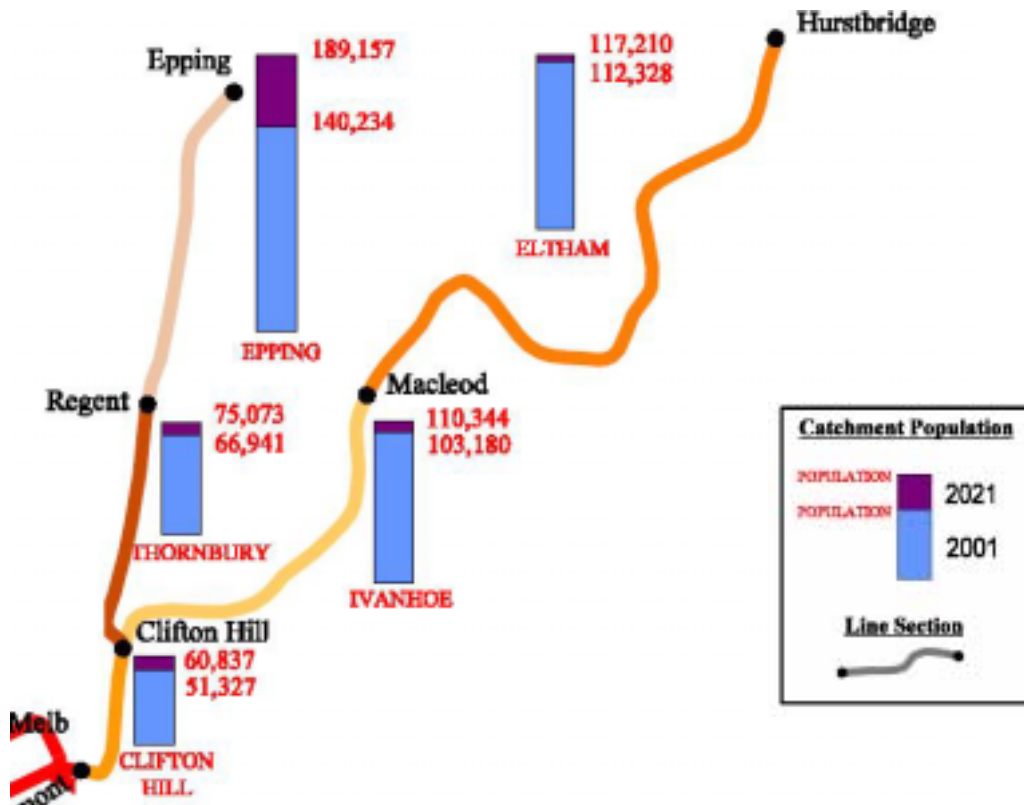
Scheduling of train services on this line is constrained by the single line sections and the Greensborough to Hurstbridge signalling system. A fine balance is required between inbound and outbound services in order to ensure that conflicts do not occur. The frequency of service provision on this line means that irrespective of how good the timetabling is, in practice the late running of trains can result in delays to opposing trains at a number of locations (Clifton Hill, Westgarth, Heidelberg, Rosanna and Greensborough).

Delays are also experienced due to the single platform at Hurstbridge and inefficient access to train stabling at Eltham and Hurstbridge.

## 2.8 Future Growth

The population of the Clifton Hill rail catchment (see Figure 14) is expected to have moderate growth of 0.8%pa to 2021 (17% in total).

Population is expected to grow from 470,000 to 550,000. The majority of this growth is expected to take place beyond the current end of the Epping line with the City of Whittlesea expected to grow at a rate of 1.9% pa to 2021.



**Figure 14 - Melbourne 2030 Population Growth Forecasts by Rail Line Section Catchment**

Melbourne 2030 identifies the Epping North and Plenty Valley regions as future growth corridors and argues that this growth must be located close to transport corridors and facilities. Proposals are being considered for extension of the line beyond Epping to South Morang and possibly Mernda, and a new branch line from Lalor to Epping North.

The increased patronage expected from these new lines will require the operation of additional train services and will place congestion pressure not only on the Epping-Keon Park single track section but also at Clifton Hill and Jolimont Junctions.

A successful bus service (*TrainLink*) was introduced between Epping and South Morang in December 2003. This service meets every train arriving and departing at Epping station and the bus patronage results so far have been positive.

### 3 Conclusions and Next Steps

The Clifton Hill Group is operating below its capacity potential due to:

- The at-grade junction at Jolimont where trains enter and leave the Loop.
- The junction between the Hurstbridge and Epping lines at Clifton Hill and the adjacent single track crossing of Merri Creek.
- The restrictive signalling system and single track sections between Greensborough and Hurstbridge.
- The single track section between Keon Park and Epping.

The Group is operating close to its existing capacity, leading to service reliability on the Hurstbridge line often being below the system average.

Train loadings do not currently exceed the Load Standard. However, population growth, particularly in the Epping corridor, will add to demands on the lines in the years ahead.

Extensions to the Epping Line to Epping North and South Morang / Mernda are under consideration, but cannot be delivered without first addressing existing capacity constraints.

The second phase of works will involve undertaking detailed feasibility studies over the next 12 months to look at ways of improving the capacity of the rail network to allow more frequent and reliable train services in Melbourne's North East in the longer term

The next stages of the Review include:

- Further analysis of the existing travel market in the Clifton Hill corridor.
- Projecting future rail demand.
- Testing the adequacy of the rail infrastructure to accommodate growth in demand (using the SIMU++ train operation simulation model).
- Identifying, scoping and costing options for increasing rail capacity through combinations of operational changes and infrastructure investments.
- Identifying rolling stock and stabling requirements.
- Identifying station and interchange requirements.
- Evaluating and prioritising investment options.