Engineers Australia
Engineering Heritage Victoria

Nomination for Recognition
under the
Engineering Heritage Australia Heritage Recognition Program
for the

Goldfields Railways - Geelong to Ballarat Railway

January 2012

CAPTION FOR COVER PHOTOGRAPH

The magnificent Victorian Era train shed at Geelong Railway Station.

This train shed is reminiscent of the train sheds built on British railways during the same era. Only two other railway stations in Victoria had a train shed during this era - that was Ballarat at the other end of the Geelong to Ballarat Railway and St Kilda in suburban Melbourne.

Fortunately both train sheds on the Geelong to Ballarat Railway survive and remain with their original function after 150 years. Originally there were 4 tracks between the platforms but the through tracks have now been removed.

Note: The term "train shed" has been used here as it is the generic term used for a building which covers and protects platforms and tracks during the era when these structures were built. The terms goods shed, engine shed and carriage shed were used during the same era to describe other buildings at railway stations which contained railway tracks.

1 INTRODUCTION

The Extent of the Nomination

In the preparation of this nomination considerable discussion occurred as to the boundaries of the nomination. The two Goldfield Railways (Melbourne to Bendigo and Geelong to Ballarat) were commenced at the same time and were built to similar design standards. Consideration was given by Engineering Heritage Victoria to making a nomination for the two railways together as there is such synergy in timing, design, construction and purpose of the two projects.

It was however resolved that the two projects have such individual merit and significance that they should be nominated separately.

It was therefore decided to treat the railway from Geelong to Ballarat as a single nomination and name it accordingly.

Overview

The railway line from Geelong to Ballarat was one of the two Goldfields Railways built at the very beginning of the Victorian Railways era between 1858 and 1862. The railway was built to serve the gold mining town of Ballarat which, along with Bendigo, produced a large proportion of the great wealth with which Victoria was blessed during the second half of the nineteenth century.

A railway already existed between Melbourne and Geelong and the decision to build the line to Ballarat from Geelong rather than direct from Melbourne was made because the terrain was more accommodating between Geelong and Ballarat than between Melbourne and Ballarat.

The only major hurdle on this route was the Moorabool River valley close to Geelong. Bridging this required as major viaduct which was the outstanding engineering feature of the line.

These early lines, built by the expert design team which had been established within the Victorian Railways, were of the highest standards for mainline railway working and have stood the test of time.

The engineering features of the project were perhaps overshadowed by the superb architectural details of the railway station complexes, particularly those at Geelong and Ballarat. These remain in service today, much as they were built in the nineteenth century, and are elegant and functional in an era when railway building construction has generally declined to mediocrity.

Because of the great care with which this railway was constructed and the powerful engineering view of functionality which was deeply etched in the code of the old railway engineers most of its fabric has survived. The only serious casualties are some of the intermediate stations which are no longer in railway service.

Recognition of the heritage significance of this railway must be reinforced at all cost and over the long run. Marking under the Engineering Heritage Australia Heritage Recognition Program is a small but important step in this process.

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2 HERITAGE AWARD NOMINATION LETTER

The Administrator
Engineering Heritage Australia
Engineers Australia
Engineering House
11 National Circuit
BARTON ACT 2600

Name of work: Geelong to Ballarat Railway

The above-mentioned work is nominated to be awarded recognition under the terms of the Engineering Heritage Australia Heritage Recognition Program.

Location: Between the major towns of Geelong and Ballarat. Total distance approximately 88.4km. Grid references of the terminuses are:

Geelong Railway Station:

30°08'98" S

144°21'32.34" E

Ballarat Railway Station:

37°33'35.90" S

143°51'53.55" E

Owner (name & address): VicTrack is the actual owner of the assets however V/Line Pty Ltd is the operator of the stations and will be regarded as the owner for the purposes of this nomination.

Both VicTrack and V/Line has been advised of this nomination. V/Line has provided a letter of support at Appendix 1.

Access to site: Most parts of the railway which is in operation are readily accessible. Railway lines in Victoria are not generally fenced. Great care should be taken when in the vicinity of railway lines as operating trains present a constant danger.

Nominating Body: Engineering Heritage Victoria

Miles Pierce

Chair, Engineering Heritage Victoria

Date: January 2012

3 HERITAGE ASSESSMENT

3.1 Basic Data

3.1.1 Item Name: Geelong to Ballarat Railway

3.1.2 Other/Former Names: Sometimes referred to as one of two Goldfields Railways. The other was the Melbourne to Bendigo Railway, built at the same time.

3.1.3 Location: From Geelong Railway Station, Victoria to Ballarat Railway Station, Victoria including both stations and the permanent way, bridges, viaducts, culverts, stations and other structures along the route.

Major locations/stations along the route were:

> Geelong
> Geelong West
> Moorabool
> Gheringhap
> Bannockburn (Leighroad)
> Lethbridge
> Meredith
> Elaine
> Lal Lal
> Yendon
> Navigators
> Warrenheip

Major structures of note along the route are:
> Moorabool Viaduct over the Moorabool River valley (12 km NW of Geelong)

Between the major towns of Geelong and Ballarat. Total distance 52 miles 77 chains (85 km). Grid references of the most significant features are:

Geelong Railway Station:

30°08'98" S

144°21'32.34" E

Moorabool Viaduct

38°04'25.76" S

144°16'54.63" E

Elevation at rails 167 feet

Ballarat Railway Station:

37°33'35.90" S

143°51'53.55" E

3.1.4 Address: As above

3.1.5 Suburb/Nearest Town: Geelong and Ballarat

3.1.6 State: Victoria

3.1.7 Local Govt. Areas covered by Geelong to Ballarat Railway:

Start of Coverage	End of coverage	Local Government Area
Geelong	Moorabool Viaduct	City of Greater Geelong
Moorabool Viaduct	5 km south of Elaine	Golden Plains Shire
5 km south of Elaine	Warrenheip	Shire of Moorabool
Warrenheip	**Ballarat**	City of Ballarat

Main terminus stations are marked in bold

3.1.8 Owner: VicTrack is the actual owner of the assets however V/Line Pty Ltd is the operator of the stations and will be regarded as the owner for the purposes of this nomination.

3.1.9 Current Use: Railway line

3.1.10 Former Use: Railway line

3.1.11 Designer: Victorian Railways

3.1.12 Maker/Builder: Evans, Merry & Co.

3.1.13 Year Started: 1858

3.1.14 Year Completed: 1862

3.1.15 Physical Description: Maps of the railway alignment are at Appendix 8.

The length of the railway is 54.6 miles (88.4 km).

Railway line including the following significant features:

- Railway permanent way including earthworks track-work and other associated ancillary equipment
- Bridges, viaducts, culverts
- Railway stations and other buildings

Most of the assets are fully maintained and still perform the function of an operating railway line although some elements no longer perform their intended task such as some railway station buildings. Most of the line, from Bannockburn to Warrenheip is now only used for freight traffic.

The line was originally built as a double track line of Irish Broad Gauge (5'3").

3.1.16 Physical Condition: All assets still in existence appear to be in good condition. This includes the permanent way, bridges and those railway buildings still in railway service. Speed restrictions on some sections suggest that trackwork may need maintenance. The principal assets still remaining but not in railway service consist primarily of railway stations which have been adapted to other uses. The condition of these is difficult to assess however by and large they are bluestone buildings where the basic structures are extremely robust.

3.1.17 Modifications and Dates: No modifications to the original construction have been discovered in the early days after construction.

All stations along the line (except for the terminal stations at Geelong and Ballarat) have been closed. In some cases the old station buildings remain in other uses.

Single tracking with passing loops commenced in1892 with the largest section between Bannockburn and Warrenheip done in 1934. No rationale is known for this change.

In 1995 the line between north Geelong and Gheringhap was converted to dual gauge [Irish Broad Gauge (5'3") and Standard Gauge (4'8½")] by adding a third rail as part of the gauge standardisation of the Melbourne-Adelaide railway. At the same time the two tracks between Warrenheip and Ballarat were converted to two independent lines, and the junction at Warrenheip abolished.

In 2008 track upgrading work commenced on the line as part of the rail freight improvements to the Mildura line[1].

There have been changes to signalling equipment during the life of the line.

Passenger services between Geelong and Ballarat on the line were withdrawn in 1978, being replaced by an infrequent and poorly timed bus service.

The following branch lines were added:

- Fyansford branch line in suburban Geelong to serve the cement works in 1918[2].

- Maroona branch line in 1913 from the main line at Gheringhap. This became the western standard gauge line towards Adelaide in 1995.

- Melbourne new main line from Warrenheip via Bacchus Marsh was added in 1889.

Moorabool Viaduct was upgraded by changing the trusses from wrought iron to steel plate and adding intermediate steel piers in c1918.

3.1.18 Historical Notes:

Early Work and Government Involvement

Early railways in the Melbourne metropolitan area had been built by private companies and were quite successful. The first non-metropolitan railway was the Melbourne to Geelong Railway which traversed quite easy country from a railway construction perspective. The company set up to build it by Act of Parliament in 1853 completed the railway works in 1857 and opened for business. However they had over-estimated its potential customer base and found themselves in strong competition with shipping companies. The company failed not long after the line was completed and it was taken over by the government in 1860.

A company was formed in 1854 to build the Geelong to Ballarat Railway called the Geelong, Ballarat & North Western Railway Company. A prospectus appeared in The Argus of 24 January 1854 proposing to float the company with 50,000 shares of £25 for an initial capital of £1,000,000. The engineer for the proposed company was stated to be Francis Bell, Esq.[3]

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[1] Wikipedia, Geelong-Ballarat railway line, 29 November 2010 version, under the heading of History.

[2] Rail Geelong website www.railgeelong.com under the heading Fyansford Line Guide.

[3] The article from The Argus newspaper can be found at http://nla.gov.au/nla.news-article4802331

Research by Ken McInnes from Engineering Heritage Victoria has discovered drawings of the proposed route of the line which shows a very close correlation to the line "as built" by the Victorian Railways some years later. One sheet of these drawings showing the works at the Geelong end and North West as far as about Gheringhap is reproduced below. These drawings are in the collection of the Public Records Office of Victoria.
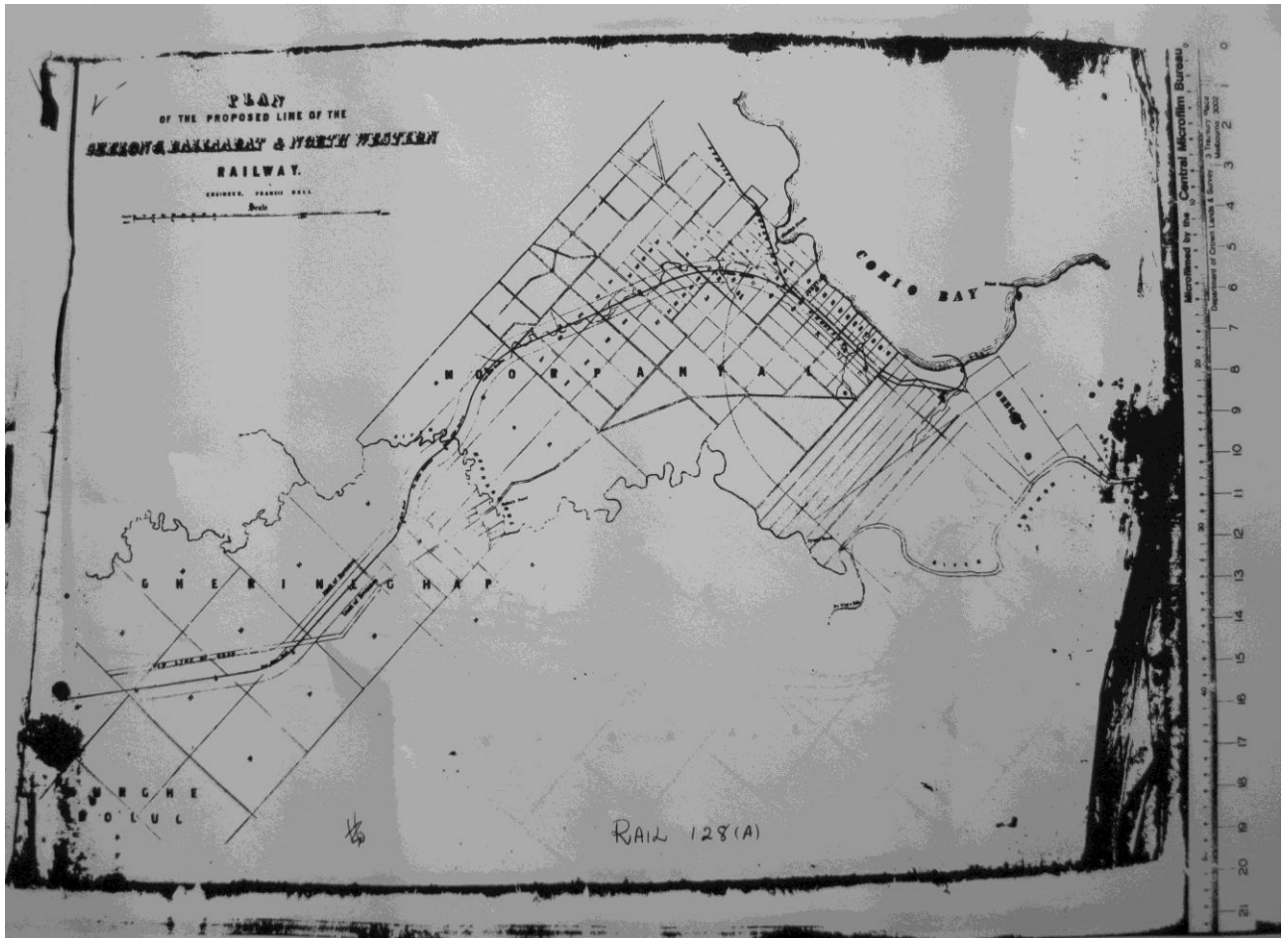
Original Route Map of the Geelong to Ballarat Railway by Francis Bell. This map is one sheet of a set of 5 covering the whole route. The map is not dated but is most likely from the period 1854 to 1856. Note that the orientation of the map is not NS/EW and there is no north point. The plan should be moved about 45 degrees clockwise to obtain "north at top" orientation. The river running across the map is the Moorabool River.

Research by Ken McInnes also suggests that Francis Bell might have been the source of the idea to use a wrought iron truss structure for the crossing of the Moorabool River valley. There is some similarity of the design and materials later used by the Victorian Railways with other wrought iron truss bridges known to have been designed by Francis Bell[4].

It is not known precisely what happened to the Geelong, Ballarat & North Western Railway Company. Did the company fail to raise the required capital and never formally come into existence or was it established and later taken over by Victorian Railways in, or after, 1856? Ken McInnes is continuing his research.

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[4] Refer to biography of Francis Bell at Appendix 3.

Another private venture, the Melbourne, Mount Alexander and Murray River Railway Company aimed to build a link between Spencer Street Station in Melbourne and Williamstown then build from Melbourne to Sandhurst (later Bendigo) and then on to Echuca. This enterprise started badly with investors reluctant to put capital into the venture. By the time the government took over the project in 1856 the company had only carried out some earthworks on the Melbourne to Williamstown line.

In March 1855 Governor Hotham suggested that the colony could build railways itself using borrowed capital from London markets. A Legislative Council Committee was quickly set up to examine the proposal. It recommended that the government should build railways in Victoria and that funding should be obtained from the London Bond Market. The priorities should be firstly to complete the link between Spencer Street and Williamstown followed by the simultaneous construction of lines from Melbourne to Mount Alexander and from Geelong to Ballarat.[5]

The Government was fortunate at this time to have Andrew Clarke, Royal Engineer at its disposal as Surveyor-General and nominated member of the Victorian Legislative Council. Clarke negotiated with the Melbourne, Mount Alexander and Murray River Railway (MMA&MRR) Company to sell the line to the government for £68,100. The Victorian Legislative Council approved this purchase and simultaneously created the Victorian Railways Department in the Crown Land Office on 19 March 1856. The sale occurred on 23 May 1856. The Victorian Railways Department became the Victorian Railways under a Board of Commissioners in 1883[6].

George Christian Darbyshire, the District Surveyor of Williamstown and Alexander Galt, an accountant, were appointed to audit the books and works of MMA&MRR.[7]

Clarke set his surveyors to work without delay and they quickly established a base survey, establishing locations by large-scale triangulation and levels by the building of permanent bench marks. Clarke's people immediately went to the next step and established likely routes for railways through areas thought to be desirable for the future of the colony.

George Christian Darbyshire was appointed Engineer-in-Chief and Robert Watson was appointed as his deputy on 1 April 1856.[8] Their first task was to carry out the design and construction of the lines from Melbourne to Bendigo and from Geelong to Ballarat. From this small office came the beginnings of the Victorian Railways, still a year in the future, and the concepts that led to the finely graded sweeping curves of the railway lines we see today.

Whilst work was getting under way to build the line to Bendigo there was also work to be done closer to Melbourne. The MMA&MRR had only carried out earthworks for the railway between Melbourne (Spencer Street) and Williamstown at the time that the company was purchased by the Government. This link line was essential to the proper working of the first two main country railways being contemplated by the Victorian Railways - to Ballarat and Bendigo. The line included a substantial bridge over the Saltwater River (now called the

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[5] Robert Lee, The Railways of Victoria 1854-2004, 2007, page 25.

[6] In this document the term Victorian Railways will be used from the formation of the new organisation in 1856.

[7] Robert Lee, The Railways of Victoria 1854-2004, 2007, page 26-27. A date for this appointment has not been found however it seems likely that it would have been after March 1856 and before the acquiring of the shares of MMA&MRR by the government in May 1856.

[8] Ibid page 27.

Maribyrnong River) between South Kensington and Footscray. The bridge was a single span but at 220 feet it remained the longest span railway bridge in Australia for 75 years[9].

Darbyshire and his men were instructed to find the 'best and most direct' route from Geelong to Ballarat. A design criteria was that the line should be positioned to facilitate the construction of lines into the Western District. Darbyshire estimated civil works would be required amounting to 49 million cubic yards of earthworks. There were 120 bridges, viaducts and culverts on the line with the Moorabool viaduct being the most impressive structure at 1299 feet total length and 188 feet above the valley floor at its highest[10].

The design team was careful to design a line with a happy medium between the somewhat extravagant designs of early British railways and the typical under-investment and low standard of construction now causing problems for the American railways. The design running speed for the double track railway was "not less than 20 miles per hour", a respectable speed for that era. They avoided unnecessary expenditure and priced numerous alternatives for major elements of the work.

For instance the following alternatives were originally considered for the Moorabool Viaduct:

- Stone [as at Malmsbury] (estimated at £251,441)

- Laminated timber arches on stone piers (estimated at £214,568)

- Timber throughout (estimated at £204,636)

In the event none of these options was adopted but rather iron trusses on stone piers[11].

Tenders were called in Victorian, South Australian and New South Welsh newspapers in December 1857. Tenderers had the option of tendering for short sections of work (typically 10 miles), for major sections or for the whole work comprising 206 miles 62 chains or railway.

Tenders closed on 24 March 1858 and 133 tenders were received. The tenders were referred to a three man professional board which made its recommendations on 23 April 1858. They recommended John Musson and Co. to build the Geelong to Ballarat section for £1,310,797. Tender negotiations with Musson were not successful and the contract was awarded to Evans, Merry & Co. In current day dollars (2010) the value of this contract would have been $60 million[12]

The work was to commence on 1 June 1858 and be completed by 31 July 1861[13].

Darbyshire's Assistants

At the time that the work in Victoria was starting there was a slump in railway construction in United Kingdom and many engineers with railway experience were unemployed. Some of these emigrated to the Colonies in order to find work in their areas of experience. Darbyshire employed the following engineers in his office to work on the railways:

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[9] Description of this bridge is contained in the nomination for the Melbourne to Bendigo and Echuca Railway, January 2011.

[10] Robert Lee, The Railways of Victoria 1854-2004, Melbourne University Publishing, 2007, page 33.

[11] Ibid page 33

[12] Phillips Brett, *The Australian Phillips Curve in the Long Run,* July 2007. Figure 1 of this paper shows Australian Consumer Price Index from 1850 to 2006. Extrapolating this curve from 2006 to 2010 at 3% per annum gives a ratio of prices between 1860 and 2010 (150 years) of 45.

[13] Robert Lee, The Railways of Victoria 1854-2004, Melbourne University Publishing, 2007, page 42

- Robert Adams CE, most senior engineer under Darbyshire. He had more than 20 years experience on a string of projects and it is known that Darbyshire valued him very highly.

- William Bryson CE, Head Draftsman. His work concentrated on the design of large structures such as bridges and viaducts.

- William O'Hara, Senior Draftsman, he had experience in the design of masonry structures and was undoubtedly used in this capacity within the team.

- William Zeal was involved in both the preliminary survey work and in the setting out of the adopted line.

- William Hull worked on preliminary surveys and in supervision of construction as a senior supervising engineer. He had carried out similar tasks for the Great Western Railway before leaving England.

- George Knight came from a family of contractors. His work experience was on the East and West India Docks and on the Birmingham Junction Railway.

All these engineers possessed the skills to design and supervise the construction of the Geelong to Ballarat and Melbourne to Bendigo Railways. The quality of their work is there for us to see 150 years later, still in railway service, still demonstrating the zenith of railway design and construction in Australia.[14]

Geelong to Melbourne Railway

The town of Geelong was gazetted in 1838 and grew quickly with its port and ready access to the fine pastoral areas of the Western District. The city fathers realized that railways would add to their wealth. However before they set out to the west they promoted a railway link between Melbourne and Geelong. This initiative was driven by the Geelong end. The Geelong and Melbourne Railway Company was formed and built the line over a 38.5 mile distance over quite easy railway building terrain.

The line was completed in 1857 and there was great celebration when the first train departed - significantly it ran from Geelong to Melbourne.

However the company had over-estimated the available traffic and found itself in deadly competition with shipping between Geelong and Melbourne. The company fell into financial difficulties and was purchased by the government in 1860.

This line was therefore in place and owned by the government by the time the line from Geelong to Ballarat was completed in 1862.

In fact by the end of 1862 it was possible to travel by train from Ballarat to Echuca via Geelong and Melbourne.

Construction of the Geelong to Ballarat Line

Whilst work on the Melbourne to Bendigo line progressed ahead of schedule things did not go so well on the Geelong to Ballarat line.

After some difficulties with the lowest tender, which was eventually passed over the contract was let to Evans, Merry & Co. for £1,310,797[15]. In current day dollars (2010) the value of this contract would have been $60 million

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[14] Ibid pages 87-88.

[15] This number has not been confirmed.

In February 1859 the Board of Land and Works notified them that if progress did not resume within 7 days the government would take possession of the works. Evans and Merry transferred the work to Williams and Little in a somewhat irregular arrangement.

Williams and Little completed the work in less than the specified time and passenger operations commenced on 11 April 1862 with freight services commencing on 20 August 1862.

The work was completed under the schedule of rates type contract for £1,044,000 which was £267,000 (21%) below the estimate[16].

The bluestone used in the construction of bridges, culverts and buildings on this line was apparently won from quarries at Lethbridge[17]. The location of these quarries close to the railway line made transport of the heavy stone relatively easy.

3.1.19 Heritage Listings

Listed from the Geelong end of the line.

Name: Geelong Railway Station Complex

Location: Railway Terrace, Geelong

National Trust File Number: B6093

Listing Date: 4 December 1989 (First Classification) 3 August 1998 (Revised to State classification).

Name: Cowies Creek Rail Bridge No.1

Location: Cowies Creek 9 km from Geelong

Victorian Heritage Register Number: H2240

National Trust File Number: B6394

Listing Date: Not known

Name: Cowies Creel Rail Bridge No.2

Location: Cowies Creek 9 km from Geelong

Victorian Heritage Register Number: H2241

National Trust File Number: B6395

Listing Date: Not known

Name: Moorabool Railway Station

Location: Moorabool (previously called Steiglitz Road)

National Trust File Number: B1372

Listing Date: Not known

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[16] Robert Lee, The Railways of Victoria 1854-2004, Melbourne University Publishing, 2007, page 47

[17] The Argus newspaper, Melbourne, 19 December 1859.

Name: Moorabool Railway Viaduct, Ballarat Railway

Location: Moorabool River, Moorabool, 12 km NW of Geelong

Victorian Heritage Register Number: H1105

National Trust File Number: B5142

Listing Date: Not known

Name: Railway Bridge, Blue Bridge Road, Elaine

Location: Elaine, Victoria

Victorian Heritage Register Number: H1693

National Trust File Number: B2551

Listing Date: Not known

Name: Yendon Railway Station

Location: Yendon

National Trust File Number: B1364

Listing Date: Not known

Name: Railway Bridge, Navigators

Location: Navigators, Victoria

National Trust File Number: B3166

Listing Date: Not known

Name: Railway Bridge Peel Street

Location: Peel Street, Ballarat

National Trust File Number: B3395

Listing Date: Not known

Name: Ballarat Railway Complex

Location: 140 Lydiard Street, Ballarat

Victorian Heritage Register Number: H0902

Listing Date: Not known

Name: Geelong - Ballarat Railway Bridges

Location: Various

National Trust File Number: B6408

 Listing Date: Not known

Note: This listing apparently refers to B5142 Moorabool Railway Viaduct: B6394 Cowies Creek Railway Bridge No.1: B6395 Cowies Creek Bridge No.2: B2551 Blue (Elaine) Bridge.

3.2   ASSESSMENT OF SIGNIFICANCE

3.2.1 Historical Significance: See Historical Notes above.

3.2.2 Historic Individuals or Association: Refer to Appendix 3 for notes on Andrew Clarke, George Darbyshire and Thomas Higinbotham.

3.2.3 Creative or Technical Achievement: The circumstances of the construction of this railway (and the simultaneously constructed Melbourne to Bendigo Railway) made them unique in Australian railway history. At the time of their commencement the Colony of Victoria was going through a period of great wealth and community confidence as a consequence of the extremely rich goldfields, particularly in the vicinity of Ballarat and Bendigo.

The Victorian Colonial Government was going through the process of discovering that private railway companies did not have the capability to build and operate railways. In particular these companies lacked the ability to raise the large capital sums required. The Government made the key decision to build and operate railways itself, commenced the process of setting up the Victorian Railways and purchasing those private railways then in existence or under construction.

The Government had the benefit of very competent advice from within its departments in the person of Captain Andrew Clarke, Royal Engineer, Surveyor-General and George Darbyshire, Engineer-in-Chief of Victorian Railways.

As a consequence the Government was presented with plans for railways which were based largely on standards then in use in the United Kingdom and which would prove to ensure long term assets suitable for development of the railway system over the next 150 years.

In fact no other railways were ever constructed to such high standards in Australia.

High levels of creative engineering and aesthetic design were assured, delivered by a team of hand-picked experts recruited by Clarke and Darbyshire. The high level of technical achievement was characterised by a balance between high technical standards combined with diligent assessment of needs so that the railway was entirely fit-for-purpose but without being extravagant.

 We can see these characteristics today most obviously in the great viaduct at Moorabool which remain in service, although it has been modified to increase its load carrying capacity.

The Geelong to Ballarat Railway did not present the challenges of the Melbourne to Bendigo railway, with its crossing of the Great Dividing Range. The grades were slight with an overall rise of only 417 metres from Geelong to Ballarat which is an average grade of only 1 in 212. Generally this rise was consistent throughout the 88.4 km of the line. There was also no terrain which dictated tight radius bends. Most of the country was flat and without significant features apart from the crossing of the Moorabool River valley. Nevertheless the design of the line reflected great attention to detail. It is remarkable how the route selected avoided watercourses with very few bridges over rivers or creeks being required.

3.2.4 Research Potential: The history of the railway has been well researched as have the key events, such as the Gold Rush, which it relates too. Most of the technical features of the railway are extant and therefore require limited research.

3.2.5 Social: The social impact of the railway in its early days was great as it provided an economical and convenient transport mechanism for Ballarat and the little towns between Geelong and Ballarat. This was important until the emergence of economical and reliable road transport in the early decades of the 20th Century when rail transport became less important.

There has been a resurgence of railway passenger traffic in recent years as both Geelong and Ballarat have grown into large regional cities with populations over 100,000 people. Commuting between the two cities and between both and Melbourne is growing rapidly. It is very likely that these pressures will lead to a re-opening of passenger services on the railway. Once this happens the small towns along the way will become dormitory towns for both Geelong and Ballarat and will begin to grow and prosper again. Current technology high speed trains could link the two cities with travelling times of less than 20 minutes.

3.2.6 Rarity: The high quality design of the railway could be said to have an element of rarity as far as Australian experience is concerned. Only the Melbourne to Bendigo line has been built to similar high standards anywhere else in Australia.

The large viaduct across the Moorabool River valley is comparatively rare in Australian railways. Although only the piers are constructed of bluestone with wrought iron trusses forming the deck (later replaced by steel plate girders) it is a vast viaduct more than 396m long and standing 33.5m above the valley floor. It is one of the most spectacular railway structures in Australia, rivalling the two great viaducts on the Melbourne to Bendigo line, built at the same time, at Malmsbury and Taradale.

The fine architectural features of the majority of the stations, large and small, along the railway has a degree of rarity in that most later railway stations were built to lesser, more utilitarian standards. This is particularly true of the stations at Geelong and Ballarat both of which have train sheds completely covering the platforms and the tracks between them. This feature was unique in early railway development in Victoria and these two stations, at either ends of the same line, were the only stations with train sheds in Victoria apart from one other at St Kilda. This includes the two major stations in Melbourne at Flinders Street and Spencer Street, neither of which had train sheds.

3.2.7 Representativeness: If this railway is compared to British railways of the same period it can be said to be highly representative of that era of railway construction. However if it is compared to Australian railways of the same era it displays higher standards of design and construction which are not representative of that era of railway construction in Australia generally.

This endows this railway (and the closely associated Melbourne to Bendigo Railway) with important significance.

3.2.8 Integrity/Intactness: The line is remarkably intact for its age. The only significant changes are as follows:

- The reduction of the line from two tracks to one for most of its length. This change is reversible. The bulk of the length of the railway remains at the superior Irish Broad

Gauge standard. A section of the line has been converted to dual (Standard Gauge and Irish Broad Gauge) by the addition of a third running rail.

- The replacement, in 1918, of the original Warren truss wrought iron trusses with steel plate girders and the fitting of inter-span steel trestles to increase the loading capacity of the Moorabool Viaduct.

3.2.9 Statement of Significance: There is no single statement of significance for the railway in the Victorian Heritage Register as there is no listing for the railway as a whole. Rather individual components are listed.

The following Statement of Significance relating to the Moorabool Viaduct is taken from the Victorian Heritage Register:

"Statement of Significance

What is significant?

The 396 m long railway line viaduct over the Moorabool River was completed in 1862. It featured nine massive bluestone piers up to 34 metres in height, massive bluestone abutments, and ten deck type warren truss spans of 36.9 metres. Intermediate steel trestles were introduced in 1918, when the original metal[18] trusses were replaced with metal[19] steel girders. A new concrete deck was installed in 1983. With the addition of the third rail, the bridge currently carries the National standard gauge track.

How is it significant?

The Railway Viaduct is of architectural, historic, and scientific significance to the State of Victoria.

Why is it significant?

The Railway Viaduct over the Moorabool River demonstrates a technical accomplishment in the history of bridge construction during the 19th century. At the time of its erection it was regarded as the greatest engineering feat in Australasia, being the largest early metal truss bridge in Australia, until the construction of the Hawkesbury River Bridge in 1889. The viaduct demonstrates the sequence of usage over time by the alteration of the structure and the introduction of intermediate trestle piers in 1918, to accommodate progressively larger locomotives that travelled over the bridge.

The Viaduct is architecturally significant as an extraordinary example of a large metal railway bridge. It remained the longest in Victoria until 1875 when the Echuca girder bridge was built and is currently the second longest in the state, after the 869.9m railway bridge at Stratford over the Avon River (1887). The viaduct's original deck-type warren trusses were an example of design by the international engineer Isambard Kingdom Brunel[20], who was also

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[18] The original trusses were wrought iron. OP.

[19] The word "metal" here is superfluous here. OP.

[20] Note that association of Brunel with the design of the Moorabool viaduct has been found to be unfounded. Refer to reference 5.5, Goudy, A, *Renewing the Moorabool Viaduct,* The Commonwealth Engineer, August 1, 1918.

responsible for designing the Great Western Railway, from Bristol to London. The replacement metal girders are also of significant size for their age.

The Railway Viaduct demonstrates an important historical association with the important expansion of the rail network in the 1860s between Geelong and Ballarat, which became Victoria's first main trunk line. The 1918 modifications to the structure, instigated by Professor WC Kernot, Professor of Engineering, University of Melbourne, were designed by A Goudy, an engineer with Victorian Railways, and fabricated by Dorman, Long and Co. Ltd".

The following Statement of Significance has been written for this nomination to reflect the whole railway rather than just components of it:

The railway from Geelong to Ballarat, sometimes referred to as the Ballarat Railway, opened to passengers on 10 April 1862 and to freight traffic in August 1862.

The whole of the railway is significant, incorporating high engineering and aesthetic standards and showing great sympathy for the country through which it travels. The major elements of significance are the civil works and the permanent way of the railway; the major engineering structures of the railway including the Moorabool Viaduct and seven stone bridges and the buildings associated with the railway, particularly the railway precincts at the major railway stations at Geelong and Ballarat.

The railway is significant because it incorporates components of historical, engineering, architectural and scientific interest to the State of Victoria.

The most important factor imparting significance for this railway is that it was built to the very high standards adopted for the construction of railways at the time in the United Kingdom. The only other railway in Australia built to such high standards was the Melbourne to Bendigo Railway, constructed at the same time and by the same design team as this railway. A team of highly competent engineers was assembled to carry out the design and supervision of the work.

The size of the project is of significance. Combined with the Melbourne to Bendigo Railway, built at the same time, it was the largest ever project in the Colony to that time. Railway contractor Evans, Merry & Co. employed a large labour force to construct the railway.

The railway made an important contribution to defining the character of the Victorian Railways which was formed at the beginning of the project. The Victorian Railways set about building main lines in several directions earlier than their counterparts in New South Wales. In Victoria main lines had reached Geelong, Ballarat and Bendigo by 1862, all of which led to further main line extensions and extensive branch line developments. Meanwhile in New South Wales the first line between Sydney and Parramatta Junction was built in 1854 but the Main Western Line via the Zig Zag at Lapstone in the Blue Mountains was not opened until 1867; the Main Southern Line did not reach Goulburn until 1869; the South Coast Line did not reach Wollongong until 1884 and the connection between Sydney and Newcastle was not opened via the Hawkesbury River Bridge until 1889.[21] The Victorian Railways maintained this lead into the 20th century and ultimately achieved a much more comprehensive railway network than any other Australian state.

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[21] Refer Appendix 5.

Several individual items of engineering significance were constructed as part of the Geelong to Ballarat Railway.

The great 10 span viaduct over the Moorabool River valley, originally with its deck supported by wrought iron Warren trusses of 121 feet span supported on 9 massive bluestone piers remain amongst the most impressive railway structures in Australia of any era.

The railway also incorporates seven significant bluestone bridges including bridges over streams and roads and road-over-rail bridges.

3.2.10 Area of Significance: NATIONAL

National significance is claimed for this railway as it was one of only two railways (the Melbourne to Bendigo Railway being the other one built at the same time and designed by the same team) built to full British standards of the day in Australia.

4 INTERPRETATION PLAN

4.1 General Approach:

The ceremonies should be held on **Tuesday 10 April 2012** which is the 150th anniversary of the opening of the railway. The ceremonies will be held at Geelong Railway Station and Ballarat Railway Station. Due to the possible availability of the Governor of Victoria on that day the ceremonies will held in the afternoon, notionally at 2:00 pm (Geelong) and 4:30 pm (Ballarat).

Any ceremonies should have the involvement of the Regional Groups in Geelong and Ballarat and of the local government councils in the respective areas.

 At December 2011 the Geelong Group his planning a bus tour of railway-related engineering heritage sites between Geelong and Ballarat. This tour will take place on Saturday 14 April and will occupy most of the day.

The Ballarat Group will probably be involved in the arrangements for a dinner on Saturday 14 April at Ballarat to celebrate the event. This is yet to be confirmed.

Locations for interpretation of this railway require some thought. The nomination is for the whole railway however most public attention is focussed on the iconic structures of the railway - primarily on Moorabool Viaduct and the railway stations at Geelong and Ballarat.

Railways stations are high visibility features of the railway and in this particular case there are significant engineering structures incorporated in both railway stations.

The Moorabool Viaduct is not suitable for interpretation or for a ceremony as it is not easily accessible. It can only be approached on public land by walking along the railway line itself, which is an operating line with significant traffic.

Marking and ceremonies at both of the operating railway stations would be a very good outcome and is recommended. Interpretation panels at these locations would be highly visible and would be located in a controlled area within the precincts of manned railway stations.

In discussions with EHV Chairman Miles Pierce on 25 March 2011, Miles indicated strong support for the railway stations as locations for ceremonies. He also strongly supports co-operation with the two Regional Groups.

Subsequent discussions with V/Line indicate that they support the recognition and marking at both stations. V/Line has a preference for the interpretation panels and markers to be mounted on the "standard" EHA mounting frame as illustrated at Appendix 9. Arrangements are in hand with V/Line to find suitable locations at each railway station for the mounting of the panels. This should be resolved in January 2011.

Heritage Victoria will probably not need to approve the mounting of the interpretation panels and markers as they will not be attached to heritage listed buildings, however they will be consulted as a courtesy.

4.2 General Attributes of the Interpretation Panel:

1) A title **"Geelong to Ballarat Railway".**

2) Logos of Engineers Australia, Greater Geelong City Council, Ballarat City Council, V/Line and VicTrack to be incorporated.

3) A small scale representation of the EHA marker plate.

4) Heading to use Victorian Railways corporate colours of deep blue banner with gold/deep yellow lettering

5) The date and other details of the marking ceremony.

6) Text should be 24 point Arial Bold.

7) A map showing the route of the railway and stations along it.

5) A background image of Moorabool Viaduct in greyscale and faded into the surrounding text.

6) Brief captions for each photograph.

4.3 The Interpretation Panel:

1) Size to be nominally 1200 mm wide by 600 mm high.

2) The panel to be constructed of vitreous enamel-on-steel plate with flanges as per drawing at Appendix 9.

3) The panel to be mounted on a steel free-standing frame as per drawing at Appendix 9.

4) The EHA marker to be mounted below the interpretation panel as shown below.

5) Heritage Victoria to be asked if they would like their oval "blue markers" for the sites to be added to the crossbar.

4.4 Possible Interpretation themes for Interpretation Panel:

The following subjects have been assessed as themes for the interpretation panels:

Theme No.	Subject	Geelong Interpretation Panel	Ballarat Interpretation Panel
1	1(a) The formation of the Victorian Railways and the purchase of the Melbourne, Mount Alexander and Murray River Railway Co. and the Geelong to Melbourne Railway. 1(b) The construction of the line by contractors Evans, Merry & Co.	Must include (148 words)	Must include (148 words)
2	The three men who were most instrumental in the building of the railway - Andrew Clarke, George Darbyshire and Thomas Higinbotham.	Must include (150 words)	Must include (150 words)

3	The Moorabool Viaduct. [This site represents the most notable engineering achievement of the railway].	Must include (117 words)	Must include (117 words)
4	The 7 bluestone bridges.	Optional inclusion, see note below	Optional inclusion, see note below
5	The Geelong Railway Station.	Must include (99 words)	Not include
6	The Ballarat Railway Station.	Not include	Must include (99 words)
	Total words	514	514

NOTE: Good interpretation practice dictates that not more than 4 themes and a total of about 500 words be incorporated. Hence the Bluestone Bridges theme will need to be dropped from both panels.

4.5 Preliminary Text Blocks for Interpretation Panels:

Theme No.1 - Victorian Railways

Government owned Victorian Railways was formed in 1856, at the same time as the government purchased the Melbourne, Mount Alexander & Murray River Railway Company. The first task was to build railways from Melbourne to Bendigo and from Geelong to Ballarat. The existing private railway from Melbourne to Geelong was taken over by Victorian Railways in 1860. Engineer-in-Chief George Darbyshire quickly built up a competent design team and Victorian Railways had access to London capital markets. This proved to be the beginning of a long period of expansion for Victorian Railways which built a comprehensive railway network throughout the state over the next 83 years[22].

Tenders for extensive railway works closed in March 1858. A contract was awarded to Evans, Merry & Co. for the Geelong to Ballarat line. Work commenced in June 1858 and the railway was opened by the Victorian Governor on 10 April 1862.

148 words

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[22] The 83 years is based on the period 1856, when the Victorian Railways was formed, until July1939 which saw the end of the term of Harold Clapp as Commissioner. There was almost constant construction of new railways during this period and the Clapp term from 1920 to 1939 saw many innovations in the integration of the Victorian Railways into the social fabric of Victoria and also saw the introduction of high speed express services such as the *Spirit of Progress,* hauled by iconic streamlined steam locomotives, capturing the imagination and support of the Victorian travelling public. World War II saw a period of stagnation although Victorian Railways provided dedicated support for the War Effort in many ways. Following the war there was an absence of inspired leadership within Victorian Railways and the organisation became vulnerable to the Economic Rationalist crusade to shut down the railways.

Theme No.2 - The Early Railway Engineers

Captain Andrew Clarke (1824-1902) was a Royal Engineer and public servant who started his career in Tasmania in 1847. He replaced Robert Hoddle in 1853 as Surveyor-General of Victoria. Clarke was involved in selecting routes for railways and in the formation of Victorian Railways. He returned to Britain in 1858.

George Christian Darbyshire (1820-1898) came to Melbourne in 1853, having gained extensive railway experience in England. He took up a post as engineer for the Melbourne and Mount Alexander Railway in 1855, was appointed Engineer-in-Chief of the Victorian Railways from 1856 until 1860 when he was replaced by Thomas Higinbotham.

Thomas Higinbotham (1819-1880) was an experienced railway engineer before he moved to Melbourne in 1857. He was Engineer-in-Chief of Victorian Railways almost continuously from 1860 until his death. Higinbotham was one of a select band of English railway engineers who exercised a profound influence on the development of Australian railways.

150 words

> **This theme is to be accompanied by photographs of Andrew Clarke, George Darbyshire and Thomas Higinbotham.**

Theme No.3 - The Moorabool Viaduct.

The Moorabool Viaduct, 12 km North West of Geelong, is the most important engineering feature of the Geelong to Ballarat Railway. It was the largest in Australia until the construction of the Hawkesbury River Bridge in 1889 and remains in railway service today.

The viaduct was built between 1858 and 1862 to the design of Victorian Railways engineers. It has a total length 1299 feet (396m) consisting of 10 spans resting on 9 bluestone piers up to 110 feet (33.5m) high above the valley floor. Originally the deck consisted of 120 foot (36.9m) wrought iron Warren truss girders. These were replaced in 1918 by steel plate girders. At the same time intermediate steel support trestles were added.

117 words

> **This theme is to be accompanied by 2 photographs of Moorabool Viaduct; one historical photograph and one modern.**

Theme No.5 - Geelong Railway Station

Geelong Railway Station stands on the site of the former Geelong and Melbourne Railway Company terminus and is noteworthy as the largest complex of polychrome brick buildings constructed by the Victorian Railways. It was built between 1877 and 1882.

The first Geelong Station was a dead ended terminus located somewhere near the present Law Courts Complex. In 1876 the railway was extended south to Colac, and the station was altered considerably.

The present station has three platforms and is one of the three nineteenth century Victorian stations to have a train shed (the others being Ballarat and St Kilda).

99 words

> **This theme is to be accompanied by a historical photograph of Geelong Railway Station.**

Theme No.6 - Ballarat Railway Station

Originally called Ballarat West the bluestone station was constructed in 1862. An engine shed and goods shed were added 1863. In 1877 a footbridge between the platforms was added.

When the direct Melbourne to Ballarat line was completed in 1889 patronage increased and the station was upgraded. A grand portico was built with a station masters office and clocktower in 1891. In 1981 fire badly damaged the interiors however the damage was subsequently repaired.

The two platforms station is one of the three nineteenth century Victorian stations to have a train shed (the others being Geelong and St Kilda).

99 words

> **This theme is to be accompanied by a historical photograph of Ballarat Railway Station.**

4.6 Preliminary Mock-up for Interpretation Panels:

Preliminary mock-ups of the Geelong and Ballarat panels have been developed and are shown below.

Geelong Panel

Ballarat Panel

5 REFERENCES:

5.1 Lee, Robert S, *The Railways of Victoria 1854 - 2004*, Melbourne University Publishing Limited, 2007.

5.2 Harper, Brian, *The true history of the design of the Melbourne, Mount Alexander and Murray River Railway*, Institution of Engineers, Australia, Australian Journal of Multi-disciplinary Engineering, Vol 3, No.1, 2004.

5.3 Mills, John, *Australia's mixed gauge railway system: a reassessment of its origi*ns, Journal of the Royal Australian Historical society, Volume 96 PART 1, June 2010

5.4 Australian Railway Historical Society, Victorian Division, web site as at December 2010.

5.5 Goudy, A, *Renewing the Moorabool Viaduct,* The Commonwealth Engineer, August 1, 1918.

This nomination was prepared by a committee of Engineering Heritage Victoria consisting of the following members:

Matthew Churchward

Carl Doring

Margret Doring

Bruce McCann

Ken McInnes

Owen Peake

Correspondence should be directed to the secretary of this group, Owen Peake
 4 Islington Street, Collingwood, Victoria 3066
 Phone: +61 3 9419 0820
 Email: owen.peake@bigpond.com

Appendix 1
Approval from Owner - V/Line Pty Ltd

Email from: Moloney, Daniel Daniel.Moloney@vline.com.au

Date: Sunday, 11 December 2011 5:59 PM

Subject: GEELONG TO BALLARAT RAILWAY - 150TH ANNIVERSARY CELEBRATIONS

Hi Owen,

I'm sorry for the slow reply to your email (we've had a busy past fortnight), but we're still very committed to recognising the 150th anniversary of the Ballarat to Geelong line as discussed at our meeting on 1/12/11.

A couple of weekends ago I met with the Minister for Public Transport, Terry Mulder, as part of an event in Clunes and he also confirmed his support (though it won't be until closer to the anniversary before his diary is confirmed for the ceremony on Tues 10/4/12 and / or a community event on Sat 14/4/12, though we'd recommend both at this stage).

From a V/Line perspective, I can confirm that we are happy to provide access to Geelong and Ballarat stations on Tuesday 10/4/12 for the ceremonies you're planning. As the station managers, we'll provide the access, ensure local staff are aware of the events, the stations clean and a suitable area agreed in advance to not impede normal passenger train operations. We'll need event running orders from you to confirm timing, but this can be provided any time up until a fortnight before the events. We'll also need to discuss any logistical support you need from V/Line, such as access to power and other amenities which we're happy to provide.

I can arrange a site inspection of Ballarat Station with you at almost any time as a local (but would prefer either the start or end of the day to facilitate my work in Melbourne), so will leave it to you to suggest some times that suit. As for Geelong Station, I only really have one day free in January due to my annual leave (from 16/1) and other commitments, so would it work to meet on Tuesday 10 January sometime in the morning (this is the day after the Meredith meeting which at this stage I should be able to attend)? Otherwise, we'll need to schedule something in February sorry.

As we discussed when we met, while we're happy to help promote and facilitate the ceremonies in Geelong and Ballarat, we will leave the organisation of those and other events to your team. However, we're particularly keen to stage a community event at Ballarat Station on Saturday 14/4/12 which we would organise in conjunction with the City of Ballarat and any other parties that demonstrate an interest.

Also as discussed, we're happy to make available our internal graphic designer to assist with the interpretation panel if you like.

Thanks again for your excellent planning and work to date, which we really appreciate. This should be an excellent event which I know our staff will keenly support.

Cheers,
Daniel

Daniel Moloney | Marketing & Communications Manager

V/Line Pty Ltd
Level 23, 570 Bourke St
Melbourne VIC 3000
GPO Box 5343

MEDIA LINE: Ph. 03 9619 5955 or @VlineMedia on Twitter

T 03 9619 5085
M 0409 805 768
E daniel.moloney@vline.com.au
W www.vline.com.au

Please consider your environmental responsibility.
Before printing this e-mail message, ask yourself whether you really need a hard copy.

Appendix 2

Major Engineering Features of the Geelong to Ballarat Line

1) **Geelong Railway Station**

2) **Cowies Creek Bridges**

3) **Moorabool Railway Station**

4) **Moorabool Viaduct**

5) **Gheringhap Railway Station**

6) **Bannockburn Railway Station**

7) **Lethbridge Railway Station and Overbridge**

8) **Meredith Railway Station**

9) **Elaine rail-over-road Bridge**

10) **Lal Lal Iron Works**

11) **Warrenheip Railway Station**

12) **Ballarat Railway Station**

1 Geelong Railway Station

Geelong Station was the original terminus of the Geelong and Melbourne Railway Company line. The first Geelong Station was a dead ended terminus located somewhere near the present Law Courts Complex. In 1876 the railway was extended south to Colac, and the station was altered.

The present station building dates back to the 1870/80s. It was originally surrounded by a goods yard which has been progressively relocated. A locomotive depot remains to the north, and carriage stabling sidings are to the west[23].

The station has 3 platforms and is one of the 3 nineteenth century Victorian stations to have a train shed (the others being Ballarat and St Kilda).

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[23] Wikipedia, Geelong Railway Station, 17 December 2010 version.

NEW RAILWAY STATION, GEELONG.

Geelong Railway Station in 1883

Photo: Wikipedia, Geelong Railway Station, 17 December 2010 version

Geelong Railway Station, 2009

Photo: Panoramio 32681916

2 Cowies Creek Bridges

There are two Cowies Creek bridges close together just to the west of the present Geelong Bypass freeway. Both bridges are of bluestone construction and date from the original construction of the Geelong to Ballarat Railway. No.1 Bridge has two arches. One span crosses over Bluestone Bridge Road whilst the other crosses what looks like a storm water drain but is probably a tributary of Cowies Creek. The stone lining of this drain tends to place it at the time of the construction of the bridge. No.2 Bridge is of one span and crosses Cowies Creek itself.

Cowies Creek Bridge No.1 across Bluestone Bridge Road, 2008.

Photo: Panoramio 13598124

3 Moorabool Railway Station

Although long retired as a railway station the old bluestone building remains in use as a private dwelling. This form of adaptive reuse seems to be quite common amongst old Victorian railway stations and is very appropriate. This station lies on the section of track which is dual gauge and forms part of the main Standard Gauge link between Melbourne and Adelaide. We can only speculate that the family who lives in this old station has become accustomed to the sounds of long diesel-hauled freight trains passing within five metres of their bedrooms!

Moorabool Railway Station, now a private dwelling, 2010

4 Moorabool Viaduct

The viaduct was built between 1858 and 1862 to the design of Victorian Railways engineers. It has a total length 1299 feet (396m). It consists of 10 spans resting on 9 bluestone (basalt) piers up to 110 feet (33.5m) high above the valley floor. Originally the deck was supported on 10 x 120 foot (36.9m) wrought iron Warren truss girders. These were replaced in 1918 by steel plate girders. At the same time intermediate steel support trestles were added. The 1918 modifications to the structure were instigated by Professor W C Kernot, Professor of Engineering, University of Melbourne, were designed by A Goudy, an engineer with Victorian Railways, and fabricated by Dorman, Long and Co. Ltd, Middlesbrough, England.

A new concrete deck was installed in 1983.

The viaduct was the largest in Australia until the construction of the Hawkesbury River Bridge in 1889 (27 years after Moorabool was built)[24].

The upgrading of the viaduct in 1918 is now of considerable heritage significance. This work was carried out by Dorman, Long and Co Ltd, Middlesbrough, England[25] during the First World War. The steel would have been fabricated in 1917 or early 1918 when manpower in British factories must have been at a premium. Once fabricated the steel would have had to been carried by ship to Australia under wartime conditions. German U boats still hunted in the oceans which the ships carrying this steel had to cross. Then it had to be erected at the site at the very time when manpower shortages were at their most severe at the end of the war in Australia.

This steelwork carries the hallmark of Dorman Long which was at the time a universal guarantee of quality in steel manufacture and fabrication. The steelwork, particularly in the trestles bears the evidence that the designers were well aware of the need for economy with the steel. The bracing members of the trestles are made of quite light materials incorporating four angle iron members braced by diagonal flat bar bracing on all 4 faces of the members. Such fabrication resulted in strong but light weight members with excellent strength in

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[24] Victorian Heritage Register, Railway Viaduct over Moorabool River, Moorabool and Batesford, Greater Geelong City and Golden Plains Shire, Number B1105, Statement of Significance.

[25] This company built the Sydney Harbour and Story Bridges amongst other iconic structures.

compression. However they also involved a great deal of fabrication as thousands of small members had to be cut, punched, reamed and riveted.

The quality of the steelwork fabrication is very high, but typical of that produced by top-rung fabricating shops in the early 20th century. Even on the basis of this 93 year old steelwork the Moorabool Viaduct is significant and should be preserved.

Moorabool Viaduct, 1910 - as originally built

Photo: Museum Victoria, Collection 4774, Record No.MM004773

Moorabool Viaduct, 2010
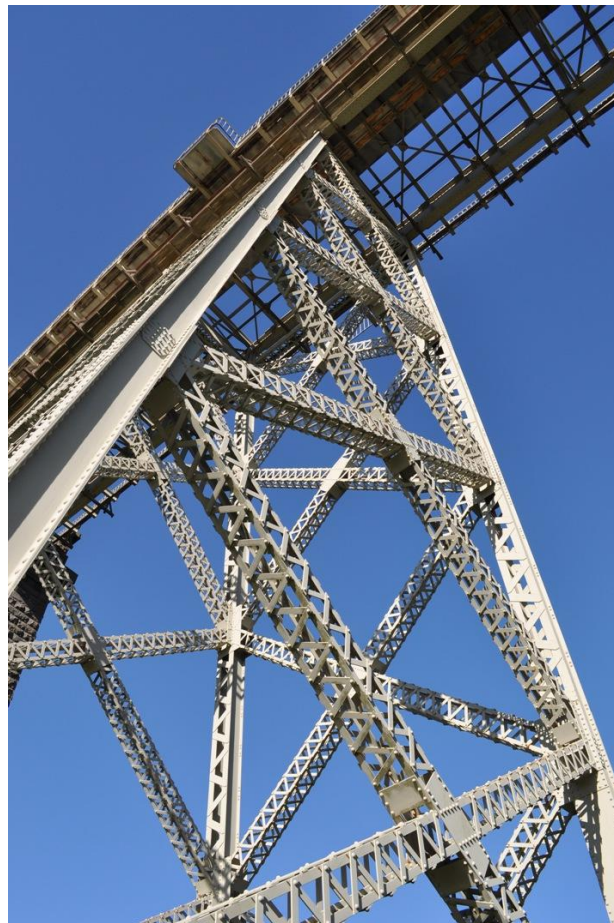
Fabricated members in the 1918 trestle structures, 2010

Moorabool Viaduct, 2010. Fabrication details of one leg of one of the trestles - Dorman, Long & Co. Ltd. c1918.

5 Gheringhap Railway Station

This railway station was at the junction where the Western Line left the Geelong to Ballarat Line. The construction of the railway station is different to the ones built at the time of initial construction of the Geelong to Ballarat Railway as it appears to be a lighter construction with galvanised iron sheeting on the walls. The station is also unusual in that it appears to incorporate a signal box in the station building. This is consistent with the station having been built at the time of the construction of the Western Line, with its lower standards, and that one of its primary purposes was to control the junction.

Gheringhap Railway Station circa 1925. The sign on the left indicates that the station serves two lines although the wording is unclear.

6 Bannockburn Railway Station

This was one of the original bluestone railway stations. Although the date of this photograph is unknown it is known that the steam locomotive is of O-class and is hauling a goods train. There are few photographs of trains on the Geelong to Ballarat Railway in the early days. The name on the station fence is "Leighroad" which appears to predate the name Bannockburn

Bannockburn Railway Station

Photo: Museum Victoria reference 12800-00001-000007-100

7 Lethbridge Railway Station and Overbridge

The town of Lethbridge (originally called Muddy Water Holes) has seen fluctuating circumstances over its 150 year existence. Its population was probably greatest during the time of construction of the railway as there were four bluestone quarries in the vicinity. The stone was regarded as superior in quality[26]. The railway itself would have lent some support to the town as it served the pastoral community in the area. However population dropped from 400 to 140 and remained low for a long time.

There was another growth spurt after the end of the Second World War as local sheep station land was acquired for 26 Soldier Settlement blocks.

Population is now on the rise again as the little town is within easy reach of commuters to both Ballarat and Geelong by car. Its next Golden Age will have to wait for the railway to

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[26] Heritage Victoria website, http://vhd.heritage.vic.gov.au/places/show_history/42800

recommence passenger train services with higher train speeds as the population of Melbourne creeps towards to six million.

The railway station is one of the fine bluestone building built with the railway.

There is also a fine bluestone overbridge near the town.

Lethbridge Railway Station. Date not known but the station was clearly still open for business.

Photo: Museum Victoria reference 12800-090001-000083-030

Lethbridge bluestone overbridge

Photo: Wikipedia

8 Meredith Railway Station

Another original bluestone railway station. Note that even in these small towns there were often two platforms. The sign on the fence made it very difficult to get off at the wrong stop!

Meredith Railway Station in 1895

Photo: Museum Victoria reference 12800-00001-000108-340

9 Elaine rail-over-road Bridge

The single arch bridge was one of those built when the railway was built. Even in sparsely populated areas there were few level crossings on this railway. This is one of the design standards used at the time which has since been abandoned at the cost of many lives and rendering the permanent ways unsuitable for true high speed rail traffic. We have leant little in the 150 years since this fine bridge was built.

This bridge has been sensitively modified by adding a concrete reinforcing arch within the original bluestone arch. This modern addition (date not known) is unusual but effective.

The photograph of the track above this bridge shows that the single track has been left to one side and not placed in the centre of the bridge. This at least makes the work easier when the railway is returned to two track configuration as it surely will be as the population of the nearby cites of Ballarat and Geelong grow. Commuters on this line could be within a maximum of 20 minutes of either city with the use of even modest high speed train technology.

It should also be noted that wooden sleepers are still in place.
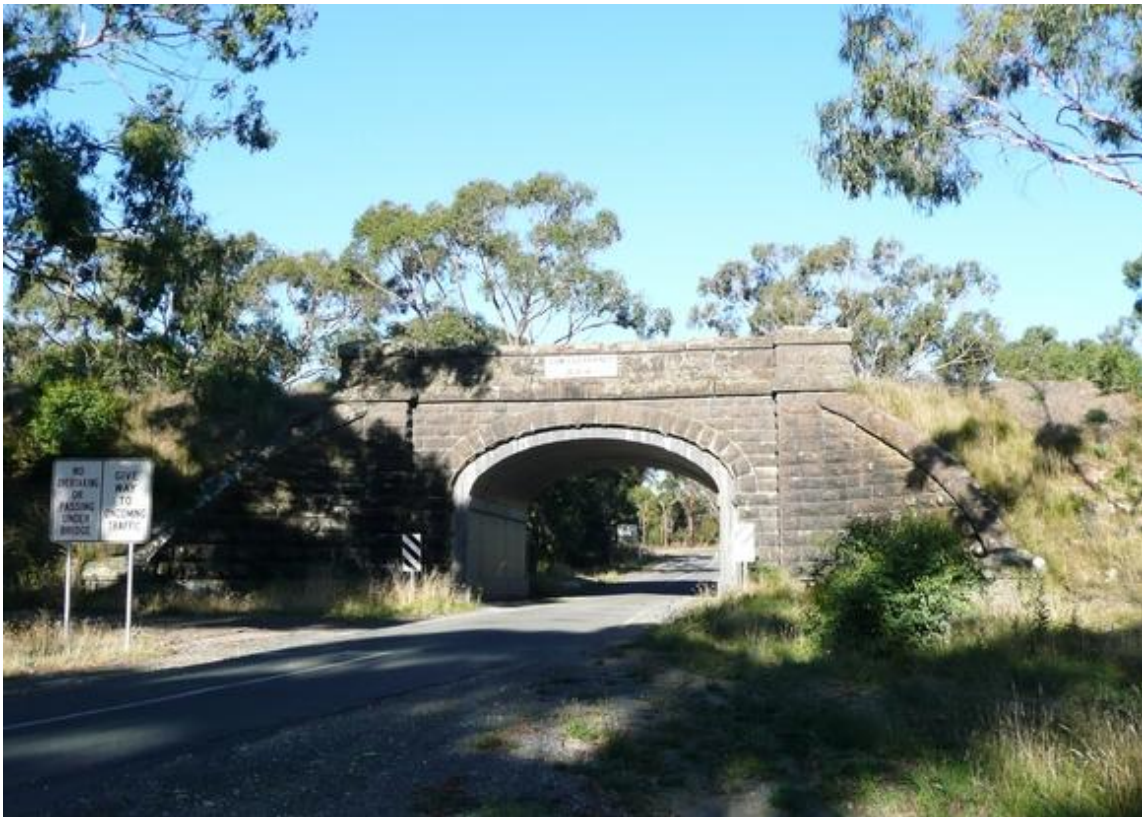
Elaine rail-over-road Bridge clearly showing modern strengthening.

Photo: Heritage Victoria

Track above the Elaine Bridge

Photo: Heritage Victoria

10 Lal Lal Iron Works

An iron deposit was discovered on the west bank of the Moorabool River in 1854. The Lal Lal Iron Company Ltd was registered in 1874 and in 1875 the iron deposit had been opened up and an experimental blast furnace was built. In 1876 the company was deregistered and a No Liability Company was formed. The company struggled to find a combination of materials and fuel for the blast furnace with charcoal, brown coal from a local mine and coke from gas works at Ballarat and Geelong all being tried. In 1878 a larger blast furnace was built and in 1880 a third, even larger, blast furnace was built. The third blast furnace produced its first charge of iron in March 1881 and over the next 4 years the furnace produced 2,260 tonnes of pig iron. The iron produced is said to be of high quality but price reductions led to the company ceasing operation in 1884.

The Lal Lal Company had also set up a foundry in Ballarat which continued to operate until c1887.

The mine was at the top of a hill overlooking the river and several terraces were built below the mine level to accommodate the blast furnaces and other facilities. The remains of the 17m high blast furnace and fragments of other parts of the mine remain on the terraces. A horse-drawn tramway was built between the mine and the Lal Lal railway station 5.6 km from the mine to transport fuel and supplies to the mine and iron product out.

In 1884, at the peak of operations, about 160 men were employed at the mine. Most lived in a self-contained community at the mine site with houses of various quality to accommodate workers and families[27].

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[27] Forests Commission Victoria, Lal Lal Blast Furnace, undated but probably 1985.

11 Warrenheip Railway Station

The station was opened in 1873 and became a junction when the direct line between Warrenheip and Melbourne was completed in 1879. The station was closed in 1981 during one of the many government purges of country rail services. In 1995 the double line between Warrenheip and Ballarat was converted to two parallel and independent lines and the junction was abolished. At some time after its closure the old railway station was demolished.

12 Ballarat Railway Station

What was originally called Ballarat West railway station commenced with the construction of the original buildings in 1862 at a cost of £22,000. A bluestone engine shed was built to the south of the original buildings in 1863 along with a goods shed to the north. In 1877 a footbridge between the platforms and waiting rooms on the south side were built.

The original layout was two platforms either side of a 4 track layout with the two central tracks for through traffic. The trackwork has now been reduced to three tracks.

When the direct Melbourne to Ballarat line was completed in 1889 patronage increased and the station was upgraded. A grand portico was built with a station masters office and clocktower in 1891. Oddly enough the clock was not added to the clocktower until 1984, 93 years after the tower was built.

When Ballarat East railway station was closed the named of main Ballarat station reverted to just plain Ballarat.

On 13 December 1981 fire badly damaged the interiors of the 1889 section including the station masters office, waiting room, booking office, dining room and clock tower. The damage was subsequently repaired.

In 2005, with the introduction of VLocity trains as well as services to Ararat it became necessary to build a second station at Wendouree further to the west.

Most V/Line services use Platform 1 as it is closer the station facilities.

The original swing gates to the immediate west of the station have been modernised but remain in operation. Two signal boxes in the vicinity of the station have also been preserved[28].

The photograph of the locomotive decorated to transport soldiers from Ballarat to Geelong for transport to overseas postings during World War One was apparently typical of the patriotic fervour of the time. The images shows a class-D (or D^P) locomotive.

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[28] Wikipedia, Ballarat Railway Station, Victoria, downloaded as at 27 February 2011.

The 1888-1891 buildings of the Ballarat Railway Station, 2005.

Photo: Panoramio reference 2934270

Ballarat Railway Station from the east with the train shed in the centre and the clocktower behind.

Photo: Panoramio reference 11546354

The main signal box at Ballarat east of the Railway Station.

Photo: Panoramio reference 41965970

Inside the train shed at Ballarat Railway Station with the footbridge in the centre.

Photo: Panoramio reference 11543985

Decorated locomotive to transport soldiers, Ballarat, 1916

Photo: Museum Victoria, Collection Number 1969, Record No. MM001963

Appendix 3
Historic Individuals or Associations

1) **Francis Bell**
2) **Andrew Clarke**
3) **John Christian Darbyshire**
4) **Thomas Higinbotham**

1) Francis Bell[29]
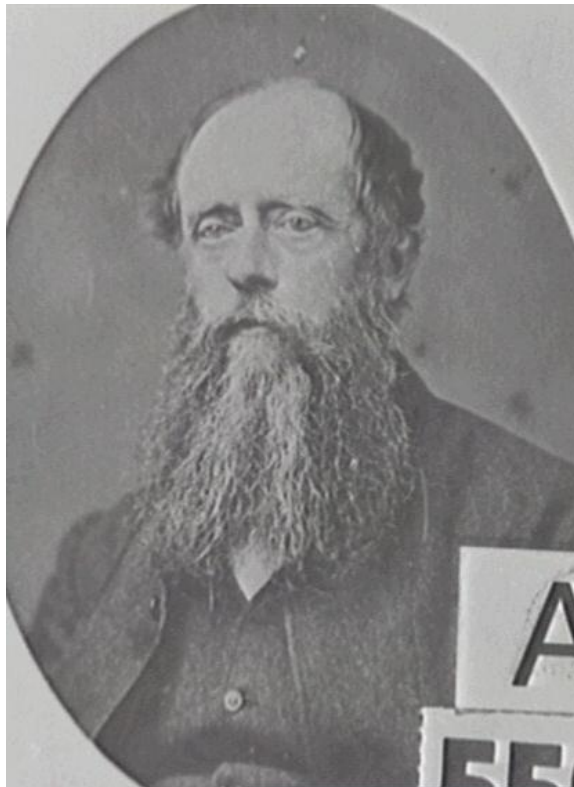
Francis Bell CE MICE (c1800 - 9 September 1879), was a British railway engineer, who worked extensively in Australia, and was involved in a number of important railway construction projects and bridges.

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[29] Biography from Wikipedia, version dated 22 December 2011.

Bell commenced his engineering career in 1837, building railways in England and Scotland, and also worked under Sir John McNeil MICE, on the Southern and Western Railway in Ireland. By 1854 Bell had migrated to Australia, and was in listed in Victoria as the engineer on the £1,000,000 prospectus for the Geelong to Ballarat railway, and for the Melbourne to Essendon and Kilmore Railway. He was also listed as the surveyor for the Colonial Insurance Company, and there are a number of tender advertisements, for reinstatement for damaged buildings. In 1855, he presented a well received paper on the merits of iron truss bridges to the Victorian Institute for the Advancement of Science (later the Royal Society of Victoria). Other works he designed included 17 miles of the railway from Newcastle to Singleton, New South Wales prior to 1858, the design and construction of the Melbourne and Essendon Railway in 1859, and works for the Yarra Yarra Mining Company, and Sandridge Lagoon, Port Melbourne.

Bell was responsible for a number of fairly similar wrought iron lattice truss road and rail bridges, several of which were fabricated from components supplied by Messrs. Lloyds, Fosters, and Company's Wednesbury, Old Park Ironworks, Staffordshire. The West Maitland Bridge was the sixth bridge this firm exported for Bell, with the others including the Hawthorn Railway Bridge and Hawthorn Road Bridge over the River Yarra, in Melbourne, and the Gundagai, Pitnacree, and Dunmore bridges in New South Wales.

His expertise was sought for a number of Melbourne civic works projects as he gave evidence to the Victorian Royal Commissions on the River and Harbour Trust in 1858 and 1860, and to the Select Committees on the Railway Department in 1860 and on the Central Railway Terminus in 1861 and in the same year was a member of the Royal Society of Victoria's Sanitary Committee.

Bell was City Engineer for the City of Sydney, Australia from about 1871 to 1879, a member of the Sewerage and Health Board, and was responsible for improving the storage capacity of the Botany watershed and planned a system for sewering the city in the direction of Bondi.

Bell was the sixth son of John Bell, of Belfast, Ireland. He was married on 17 June 1858 at the Cathedral, Newcastle, New South Wales to Jane E. Livingstone, youngest daughter of Captain Livingstone of Newcastle. In May 1872 he was living in St. Leonards, on the North Shore of Sydney, when his wife gave birth to a daughter. His youngest daughter married Charles Wade, who, amongst other things, became premier of NSW in 1907, was the Agent-General for NSW in 1917, and was knighted in 1918.

Francis Bell died in 1879 at his residence in Petersham, New South Wales, and was buried at the Necropolis.

2) Andrew Clarke[30]
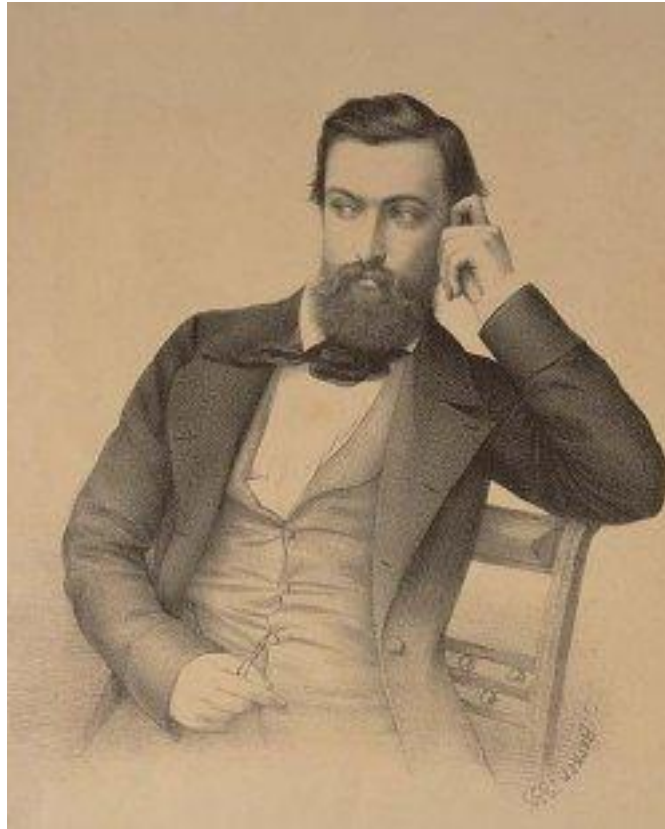
CLARKE, Sir ANDREW (1824-1902), military engineer and public servant, was born on 27 July 1824 at Southsea, Hampshire, England, the eldest son of Andrew Clarke and his wife Frances Jackson, née Lardner. His first years were spent in India with his parents but later, while his father was serving abroad, he was brought up by his paternal grandfather and two uncles, one of whom was the father of Marcus Clarke, at the family home, Belmont, near Lifford, Ireland. He was educated at The King's School, Canterbury, and at Portora School, Enniskillen, Ireland. At 16 he entered the Royal Military Academy at Woolwich, where one of his teachers was Michael Faraday. He graduated in 1844, was commissioned a second lieutenant in the Royal Engineers and after a year of further study at Chatham was sent to the Fermoy district in Ireland at the height of the disastrous famine there.

In 1846 Clarke was nominated to the Oregon Boundary Commission. His father, then governor of Western Australia, urged him instead to come to Australia with the hope of gaining a professional post with him later. As a lieutenant in command of a detachment of Royal Sappers and Miners Clarke sailed with the new lieutenant-governor, Sir William Denison in the *Windermere* and arrived at Hobart Town on 26 January 1847. His father's death next month left Clarke with little motive for remaining in the colonies but he continued to superintend convict labour and to survey the area around Hobart and design wharf accommodation. He and Denison became firm friends.

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[30] Betty Malone, 'Clarke, Sir Andrew (1824 - 1902)', *Australian Dictionary of Biography*, Volume 3, Melbourne University Press, 1969, pp 409-411.

His next tour of duty, from September 1848, was with Governor Sir George Grey in New Zealand. There he and his detachment worked primarily on road building, and Clarke first revealed his gift for dealing with native problems and native peoples when he was sent on a special peace-making mission to the Bay of Islands.

In 1849 he returned to Hobart as private secretary to Denison. In May 1850 he wrote to his uncle, enthusiastic about Denison's help and friendship. 'I have fortunately been thrown across one who is now my guide … Had it not been for him I should have been but a mere drudging sub. of Engineers, still dreaming on and still castle-building; now I find myself, it is true but at the lowest rungs of the ladder, but the ladder is there'. Clarke was ambitious. Although his letters reveal him as a man of action and impatient of red tape he never made a hasty judgment, especially of any move connected with his own career. While in Hobart he had avowed his deepest ambition: 'I am trying to seize the golden opportunity … which may lead ultimately not alone to wealth, but that which I prize still higher, the establishment of a name and character'.

Clarke found the confinement of an office irksome, but proved conscientious and tactful, mediating between Denison and the community in the controversy over transportation and showing resource with an unexpected influx of 150 military pensioners and their families. He dealt tactfully with immigrants seeking official posts, and found time to collect fifty tons of local products for The Great Exhibition in London. He was also an official nominee in the Legislative Council in 1851-53. More congenial duties were the control of the mounted police and the relaxation of occasional hunting and shooting expeditions with Denison.

Invited in March 1853 to replace Robert Hoddle as Surveyor-General of Victoria at a salary of £1200 ($2400),[31] he decided to accept and arrived at Melbourne in May. Clarke entered enthusiastically into his new duties, reorganizing the department, travelling widely in the Colony, noting routes for roads and railways, supervising surveys and land sales. His success and energy resulted in more land being sold in the next eighteen months than since 1836. He also initiated the Roads Boards that preceded the introduction of local government. When discontent increased on the Bendigo goldfields he was sent to Tasmania to recruit police reinforcements.

Clarke entered the Victorian Legislative Council in August 1853 as an official representative. He was active in the drafting of the new constitution and in debates revealed himself as more liberal and progressive than most of his colleagues. He was also responsible for the drafting and successful inauguration in December 1854 of the Municipal Institutions Act, which provided for local government, based on the English model, in the fast-growing suburbs of Melbourne, on the goldfields and in the country. Writing to his uncle in 1857 he reported, 'This Act has done more to establish order and good government and to create a healthy conservative feeling than even I ever anticipated'.

The new Constitution Act, proclaimed in November 1855, altered the status of the Victorian executive, which then became responsible to the Victorian parliament and not to the Colonial Office. When reappointed, Clarke became entitled to a civil pension of £800 in addition to his army pay. This dual income must have been of great assistance to an official who admitted that he lived out of Melbourne on a small farming property in order to make ends meet, but

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[31] In current day (2010) dollars this salary would have been equivalent to $108,000 per annum. Phillips Brett, *The Australian Phillips Curve in the Long Run,* July 2007. Figure 1 of this paper shows Australian Consumer Price Index from 1850 to 2006. Extrapolating this curve from 2006 to 2010 at 3% per annum gives a ratio of prices between 1860 and 2010 (150 years) of 45.

until 1886, when he retired from the Royal Engineers, the pension led to controversy with the Victorian government whenever he accepted other paid appointments.

At the elections in 1856 Clarke refused an invitation to stand for Bendigo. Instead he spent £700 ($1400)[32] in a vigorous but successful campaign against David Blair for South Melbourne in the Legislative Assembly. This seat he held till he left the colony. He joined the first cabinet, under William Haines, as Surveyor-General and Commissioner for Lands. In February 1858, when his moving of a successful amendment to Haines's electoral bill was followed by the government's resignation, Sir Henry Barkly invited Clarke to form a government but he failed to get the support he needed, and declined. In March he was appointed permanent head of the Lands and Surveys Department. At this stage he decided to return to England. He had sought to rejoin his regiment when the Crimean War broke out, and never forgot that he was a soldier by profession. He seems to have been conscious that he had lost face by his failure to form a ministry and wrote that 'a graceful retreat at this moment is my best policy'. He also planned to seek appointment as first governor of the Moreton Bay District while in London.

Clarke paid a farewell visit to Denison in Sydney and returned to Melbourne for a banquet given in his honour by the Freemasons of which he was grand master. He was optimistic about his record in Victoria, and in a letter to his uncle commented, 'I think I leave Victoria … at a good time, in tolerable favour with the country, my name connected with much of its national progress, and that I will not soon be forgotten'. The *Argus*, 11 August 1858, was less complimentary, observing that despite his creditable start 'that promise has been but half fulfilled … It is not apprehended anywhere that the colony will suffer material loss or inconvenience from [his] absence'. Whatever critics might say, the list of his successes was impressive. Much of the colony's scientific, material and artistic development stemmed from Clarke's interest and effort. From his appointment in 1853 he was responsible for much of the planning of Victoria's first railways, and his formal proposals for a government-controlled railway system were examined by a select committee and made law in 1857. Despite the derision of his more conservative colleagues, he was able to install the first electric telegraph from Melbourne to Williamstown and to report in November 1857 that the service had reached the borders of New South Wales and South Australia.

Clarke initiated the Museum of Natural History and controlled the spending of grants for its exhibits from 1853 on, and he held office in both the Victorian Institute for the Advancement of Science and the Philosophical Society of Victoria, becoming president on their amalgamation as the Philosophical Institute (later Royal Society of Victoria) in July 1855. He designed the building for the first Melbourne Industrial Exhibition in which the exhibits for the Paris Exhibition were displayed. He made sure that land was set aside for public reserves, helped to enlarge the St Kilda cemetery and selected the sites for the Botanic Gardens and St Paul's Anglican Cathedral. He also made certain that Melbourne should have a pure water supply, and the first meteorological statistics were begun under his tutelage. On his way to Britain he visited Italy and was so impressed by the art treasures there that he wrote to the Victorian government urging them to found an art gallery. With Hugh Childers he selected the first of its works of art.

In London Clarke failed to secure the governorship of Queensland and spent many months on barrack duty at Colchester. He served in 1859-64 on the Gold Coast and in England. In

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[32] In current day (2010) dollars this sum would have been equivalent to $63,000. Phillips Brett, *The Australian Phillips Curve in the Long Run,* July 2007. Figure 1 of this paper shows Australian Consumer Price Index from 1850 to 2006. Extrapolating this curve from 2006 to 2010 at 3% per annum gives a ratio of prices between 1860 and 2010 (150 years) of 45.

1864-73 he was director of works at the Admiralty, and in 1873-75 Governor of the Straits Settlements. He was on the council of the Viceroy of India in 1875-80, commandant of the School of Military Engineering at Chatham in 1881-82 and inspector-general of fortifications in England in 1882-86. He was responsible for the design and construction of the floating dock at Bermuda and the navy docks of Portsmouth, Chatham and Malta. He also promoted the Brennan torpedo. He gradually mounted the ladder of promotion until he became lieutenant-general, and was appointed C B (civil) in 1869, K C M G in 1873, C I E in 1877 and G C M G in 1885. After his retirement from the army, he unsuccessfully contested Chatham for the House of Commons in 1886 and 1892 as a follower of Gladstone and home rule.

Clarke never lost his interest in the Australian colonies and was often asked to carry out official commissions in Britain for the Victorian and Tasmanian governments. In Birmingham he helped to found the Colonial Emigration Society. Commissioned in 1859 to buy arms for Victoria's defence, he firmly refused to allow the government to foist obsolete weapons on the colonists, weathering both the British government's opposition and the criticisms of the Victorian government over the delay.

Clarke was a special agent for Victoria from April to August 1864 and acted as agent-general briefly in 1886 and 1891 and longer in 1893. He was appointed agent-general in 1899-1902 and at times served in the same capacity for Tasmania. He fought for moderate postal charges to the colonies, was an important spokesman on their behalf when German colonization of the Pacific Islands made the Australian governments anxious for British intervention and annexation of the New Hebrides and south-east New Guinea. His help to Victoria in the financial depression of the 1890s was particularly valuable. In 1899 he acted as Australian representative at the International Commercial Congress in Philadelphia and on the board of the Pacific Telegraph Cable Co. His last service was to help in steering the Commonwealth bill through the British parliament in 1900 when he replaced Alfred Deakin as delegate for Victoria. Clarke died at his home in Portland Place, London, on 29 March 1902. He was predeceased by his wife, Mary Margaret MacKillop, whom he had married in London on 17 September 1867, and was survived by their only child, Elinor Mary de Winton.

Colourful as was his career, the man himself was equally interesting. Bulky and ruggedly handsome, with strong features and soldierly stance, hasty but kind, he had the gift of universal popularity. Contemporaries labelled him tactful, genial and ardent and admired his zeal and ability. The colonists christened him 'Spicy Andrew'. He was not deeply religious: both Denison and General Gordon tried to convert him to an interest in the Bible without success. He was, rather, a scientist, a humanitarian and an idealist, and these traits, coupled with his practical approach to colonial problems, made him popular.

3) George Christian Darbyshire[33]
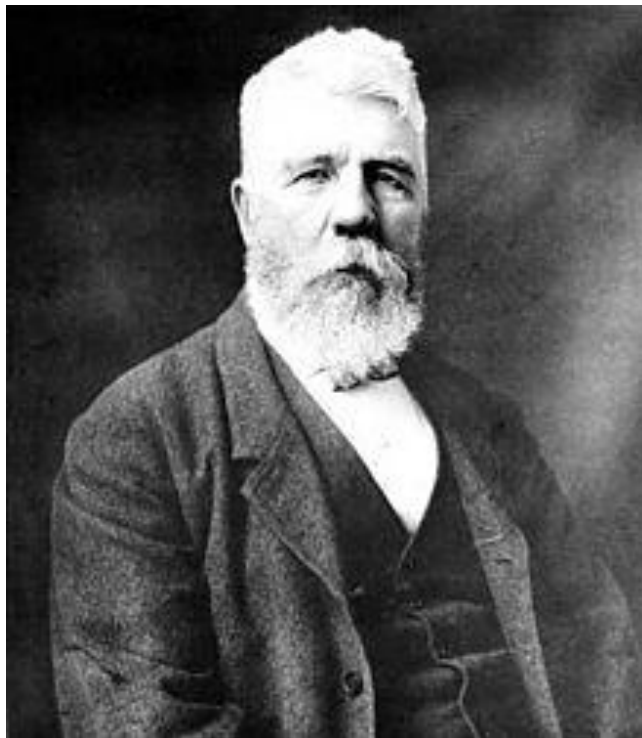
George Christian Darbyshire (1820-1898) was an English and Australian civil engineer. He was the second son of George Darbyshire, also a surveyor and railway engineer.

Early life

Darbyshire was born at sea in 1820 and spent his early life in Derby, England. His father, George was a Civil Engineer who worked for George Stephenson. His mother was Elizabeth Darbyshire, née Smith. Later Darbyshire worked under Robert Stephenson and was involved on the various lines in the north engineered by Robert Stephenson. He married his wife Maria Wragg in 1846 when he was aged 21. Maria was the daughter of Samuel Wragg, an engineer who also worked for George Stephenson, and the widow of a man called Stafford who was killed in an accident.

Training

Darbyshire, in evidence to the Select Committee on the Chewton Railway Station given on 12 June 1863 related that his whole railway experience in Britain had been on the Midland Railway. Robert Stephenson was engineer for the Midland Railway on which construction began in February 1837. The Midland Railway, under Hudson became an extensive system through construction and acquisitions. George Darbyshire's brother, John Darbyshire who

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[33] Biography adapted from Wikipedia.

also came out to Victoria, became Mining Surveyor and later Inspector of Mines with the Victorian government Mines Department.

However, George Darbyshire may also have trained as a surveyor in England, being initially employed by his father in the firm of George Darbyshire and Sons, then with his brother in the partnership John and George C Darbyshire. They were responsible for a number of surveys for Tithe Maps in around 1839-41.

Migration to Australia

George Darbyshire travelled to Australia with his wife Maria on the *Pemambuco* arriving in Melbourne on 7 July 1853 and became Engineer of Construction and District Surveyor under Victorian Government at Williamstown in 1854. He was also appointed Deputy Surveyor-General of Victoria on 9 April 1857, to the Board of Science on 4 June 1858, and Territorial Magistrate for Wyndham on 7 April 1865.

George Darbyshire's migration to Victoria coincides with the end of what is now termed the 'railway mania'. The drop off in competing proposals and line construction saw many men who had entered the new profession of civil engineer become unemployed. The obituaries of a number of these early members of the profession published by the ICE refer to the member being forced to retreat to the family property to be supported through the downturn, or for those from less well established families to find employment overseas.

Victorian Railways

George Darbyshire took up a post as Engineer for the Melbourne and Mount Alexander Railway Company in 1855. He was then appointed Engineer-in-Chief of the Victorian Railways from 1 April 1856 until 17 May 1860 when he was replaced by Thomas Higinbotham.

The Victorian Government Railway Department was established as part of the Board of Land and Works in 1856. Among Darbyshire's first responsibilities was supervising the design and construction of the Melbourne to Bendigo and Echuca line.

Darbyshire saw himself as an engineer, and was recruited to the Survey Department by the Surveyor-General Andrew Clarke, as an engineer. In response to a question when appearing before the Select Committee upon the Railways on 4 May 1860 to describe an engineer he stated – *A man who has actually been employed for some years, having actual experience in the working and construction is a civil engineer, as compared with the man who has no experience in works of construction.*

George Darbyshire was well experienced in railway work when he came to Victoria and was highly skilled in surveying for, and designing a railway line. A small but significant example is that the lines were set out with the section in the stations above the general grade and at a flatter grade than the line. This produced a situation where the trains approached the platform on an up-grade that aided braking, and departed on a down grade that aided starting. Higinbotham was not aware of this detail in design and changed some station locations after he took over to the detriment of efficient running. The Chewton Station had to be abandoned because the trains to Castlemaine could not stop on the grade at the point where Higinbotham placed it, and the trains to Melbourne were unable to start again up the grade if they stopped at the station.

Surveying and Later Career

In the 1860s and 1870s, Darbyshire was a licensed surveyor undertaking township and rural surveys for government and private practice. He may also have won a tender for surveying part of the Victoria/South Australia Border, and was responsible for the Town Plan of Lorne in 1871.

Darbyshire had risen to District Surveyor at Williamstown, the most senior position in the Department under the Deputy Surveyor-General, when Clarke directed him to carry out surveys for country rail lines.

He accepted the appointment as Chief Engineer of the Railways on the condition that he retained his substantive appointment as District Surveyor Williamstown and could return to that at any time. He acted as Deputy Surveyor-General from May to July 1857 while holding the position of Engineer-in-Chief. He returned to his position as District Surveyor on resigning his position as Engineer-in-Chief Railways.

Darbyshire was also Surveyor-General in 1857 and reported extensively on railway and bridge engineering to a number of Select Committees and is credited with the design of a number of early and important railway structures such as the Saltwater River Bridge on the Maribyrnong River. He was responsible for the design of the Geelong to Ballarat railway as well as that to Bendigo and Echuca. As Engineer-in-Chief, he was responsible for supervising the design of five major iron bridges, including the Warren truss Moorabool Viaduct, the plate girder bridge at Jackson's Creek, and in particular, the five span continuous box girder viaduct at Taradale. In Britain at the time they were tentatively doing two span continuous girders.

Darbyshire remained in the Survey Department and became Surveyor-General. He was one of the 137 officials removed from office on "Black Wednesday" on 8 January 1878 when the Government was denied supply. He, like a number of other senior officers, was not reappointed.

Darbyshire returned to the railway department in 1881 as Engineer for Construction and Surveys, laying out many new lines. On the unexpected death of Robert Watson in 1891 he again became Chief Engineer a position he held until near his death.

In other areas of interest, Darbyshire was appointed as a trustee of the Werribee Cemetery in February 1865. He is listed in 1891 in the first list published of Licensed Surveyors under the Transfer of Land Act, 1890 with his address as Railway Department, Melbourne.

Darbyshire had offices in Temple Court on Collins Street but resided at a substantial property at The Grange in Wyndham, Werribee where he contributed to the local community as Magistrate. In his last years he moved to Power Street Hawthorn, where he lived out his life as a Pensioner of the Victorian Government (Railways) and where he died on 5 March 1898 aged 78 years. He was buried at Werribee Cemetery.

4) Thomas Higinbotham[34]

Thomas Higinbotham (1819-1880), engineer and civil servant, was born in Dublin, the third son of Henry Higinbotham, merchant, and his wife Sarah, née Wilson. Educated in Dublin at Castle Dawson School and the Royal Dublin Society House, Higinbotham moved to London about 1839. At first he worked for a firm that promoted railway companies, and often appeared before parliamentary committees on railways. He then worked for several years as an engineer on British railroads and won high repute in his profession. He was elected a member of the Institution of Civil Engineers on 7 February 1854.

In 1857 Higinbotham followed his younger brother George to Melbourne. He joined his brother's household first at Emerald Hill and after 1860 near the beach at Brighton in a villa which Thomas was chiefly responsible for designing. He never married and lived with his brother, sister-in-law, nephews and nieces till 1880 in a relationship characterized by remarkable tolerance, friendship and respect despite strong differences in political opinion.

After a short time in private practice in Melbourne, Higinbotham was appointed Inspector-General of Roads and Bridges. In 1860 he became Engineer-in-Chief of the Victorian Railways. He supervised the surveying and construction of all new Victorian lines and also guided the settlement of such railway questions as city stations and facilities and the lighting of trains. He fearlessly contested proposals that he considered unsound, such as cheap narrow-gauge lines, and showed great vision in advocating a railway renewals fund, construction of Melbourne's outer-circle railway and adaptations to permit unbroken rail traffic between Sydney and Melbourne. At the government's request in 1874-75 he investigated and reported on the latest developments in railway construction and management in Europe, America and India. With other senior public officials he was removed from office in January 1878 by the Berry government. In the next two years he was invited by the South Australian, Tasmanian and New Zealand governments to report on their railway systems. In March 1880 the Service government reappointed him Engineer-in-Chief of the Victorian Railways, but the ministry soon fell and he was unhappy under its successor. He had decided to resign but died in his sleep on 5 September.

Thomas Higinbotham

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[34] This biography is reproduced from the Australian Dictionary of Biography, online version.

Higinbotham was one of that select band of English railway engineers who exercised a profound influence on the development of Australian communications in the second half of the nineteenth century. They provided practically the only mark of distinction in the Australian colonies' railway departments of the day. But their efforts were not enough to provide firm foundations for sound management as political pressures developed. Though Higinbotham did not live to see the change, his own Victorian service became the first candidate for management by public corporation when the system of political control was formally discredited in 1883.

Higinbotham was an Anglican and for many years a member of the Royal Society of Victoria. His loss was greatly lamented by a society in which public officials of such widely-acknowledged integrity were all too rare. His property, valued at £21,000 ($42,000)[35], was left to his brother George and his family with the request that the family name be changed to Verner, the maiden name of his paternal grandmother. This odd request was not a condition and was therefore ignored.

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[35] In current day (2010) dollars this estate would have been valued at $2.206 million. Phillips Brett, *The Australian Phillips Curve in the Long Run,* July 2007. Figure 1 of this paper shows Australian Consumer Price Index from 1850 to 2006. Extrapolating this curve from 2006 to 2010 at 3% per annum gives a ratio of prices between 1880 and 2010 (130 years) of 52.5.

Appendix 4

Time Line for Victorian Railway Development 1839 to 1874

1839	**Government Surveyor Robert Hoddle makes provision for railway linking Melbourne and Hobsons Bay.**
1851	**September 7th Public meeting calls for a railway linking Melbourne to Sandridge (Port Melbourne).**
1853	**January 20th Government approves the establishment of the Melbourne and Hobsons Bay Railway Company.**
1853	**February 8th Government approves the establishment of the Geelong and Melbourne Railway Company and the Melbourne, Mount Alexander and Murray River Railway Company.**
1854	**September 12th Opening of the Melbourne and Hobsons Bay Railway using a locally constructed locomotive. This is possibly the first locomotive hauled train in the Southern Hemisphere.**
1854	**December 25th First imported locomotive of the Melbourne & Hobsons Bay Railway Co enters service.**
1855	**Victorian Colonial Government conducts various enquiries and surveys are carried out for country railways.**
1856	**April 1 Victorian Government Railway Department established as part of the Board of Land and Works. George Christian Darbyshire appointed as Engineer- in-Chief.**
1856	**May 23 Government takes over the Melbourne, Mount Alexander and Murray River Railway Co.**
1857	**May 13th Melbourne & Hobsons Bay Railway line to St Kilda opened.**
1857	**June 25th Geelong and Melbourne Railway opened.**
1857	**June Government approves the establishment of the St Kilda and Brighton Railway Co.**
1857	**November 24th Government approves the establishment of the Melbourne and Suburban Railway Company. On the same day a series of Acts were passed approving the construction by the Government of railways linking Melbourne to Echuca and Geelong to Ballarat.**
1858	**March Contracts let for the construction of railways between Melbourne and Bendigo (Cornish and Bruce) and Geelong and Ballarat (Evans, Merry and Co).**
1858	**May 12th & 31st First five locomotives for the Victorian Railways delivered from George England & Co.**
1858	**June 7th Work begins on the Melbourne Bendigo Line.**
1858	**July 23rd Work commences on the Melbourne and Essendon Railway**

Company.

1858	**July Second batch of ten locomotives ordered from Beyer Peacock & Co. Five passenger engines and five goods engines. Later J and P Classes.**
1858	**August 26 Work begins of the Geelong to Ballarat Line.**
1858	**First Spencer Street Station constructed.**
1859	**January 13 Opening of the Government Railway from Melbourne to Williamstown and Melbourne to Sunbury.**
1859	**June, Third order for locomotives, ten saddle tank locomotives placed with George England & Co (7) and Slaughter Gruning & Co (3). Possibly for the Williamstown branch. Later L Class.**
1860	**May 17th Thomas Higinbotham replaces George Darbyshire as Engineer-in-Chief.**
1860	**September 3rd Colonial Government takes over the Geelong & Melbourne Railway Co.**
1860	**Second order of locomotives delivered during this year.**
1861	**July 8th Sunbury to Woodend opened.**
1861	**Additional orders for goods and passenger locomotives (B Class & O Class) placed with a number of British manufacturers The first of these Locomotives were delivered in July/August 1862. Successive orders were placed for locomotives of these classes into the 1880's.**
1862	**March 29th Geelong to Ballarat line completed.**
1862	**April 10th Geelong to Ballarat line opened.**
1862	**March 31st Melbourne & Suburban Railway Co is purchased at auction by the Melbourne Railway Company.**
1862	**April 25th Woodend to Kyneton opened.**
1862	**May Melbourne Railway Co takes over the operation of the St Kilda and Brighton Railway Co.**
1862	**October 7th First locomotive reaches Bendigo.**
1862	**October 20th Official opening of the Melbourne to Bendigo Railway. Another Official Opening was held at Castlemaine on 15th October.**
1863	**Tenders called for the railway from Bendigo to Echuca.**
1864	**July 1st Melbourne & Essendon Railway Co. closes and locomotives Disposed of to South Australia and New Zealand. Colonial Government eventually purchases the line in 1867.**
1864	**September 19th Railway to Echuca opened.**
1865	**June 15th St Kilda and Brighton Railway Co taken over by Melbourne & Hobsons Bay United Railway Co.**

1865	**June 30th Melbourne Railway Co amalgamates with the Melbourne & Hobsons Bay United Railway Co.**
1867	**August 27th Government purchases the Melbourne & Essendon Railway Co. As prelude to the construction of the North East Line to Wodonga.**
1869	**Surveys conducted for the North East Line.**
1870	**Tenders let for the North East Line.**
1870	**October 18th Thomas Higinbotham submits a series of proposals for lines to link towns in Western Victoria. Because the lines were colour coded on the map the resulting discussions become known as "the Battle of the Coloured Lines".**
1871	**January 9th Government resumes services to Essendon.**
1872	**April 18th North East Line opened to School House Lane, just south of Seymour.**
1872	**August 26th North East Line reaches Seymour following the completion of the Goulburn River bridge.**
1872	**Victorian Railway builds its first locomotive at the old Williamstown Workshops, No100.**
1873	**November 21st North East Line completed to Wodonga.**
1873/74	**Phoenix Foundry of Ballarat builds ten goods locomotives (Q Class) for The North East Line. The Phoenix Foundry was ultimately to build 352 locomotives for the Victorian Railways by 1904.**

Appendix 5

Time Line for NSW Railway Development 1849 to 1969

1849   The Sydney Railway company came into existence and planned to build a railway from Sydney to Parramatta Junction.

1855   The property of the Sydney Railway Company was transferred to the NSW Government and the line was completed on 26 September 1855.

1855-1881   Construction of railway from Parramatta Junction to Albury. This line reached Goulburn in 1869, Yass Junction in 1876, Wagga Wagga in 1879 and Albury in 1881.

1857-1888   Newcastle to Wallangarra (on the Queensland border).

1863-1885   The Main Western Line reached Penrith in 1863 and was built over the Blue Mountains using the Great Zig Zag at Lapstone in 1867 reaching Lithgow in 1869. This line was extended to Bathurst in 1876, Orange in 1877, Dubbo in 1888 and Bourke in 1885.

1883   The interconnection with Victoria in the form of a Broad Gauge line from Wodonga to Albury station.

1885-1914   A branch line was built from Goulburn to Queanbeyan in 1885, extended To Cooma in 1887 and a short branch line from this branch was completed to Canberra in 1914.

1889   Sydney connected to Newcastle after the completion of a bridge over the Hawkesbury River.

1893   The Illawarra Line to Wollongong and Nowra was completed.

1905-1932   The North coast Line from Sydney to Brisbane was completed with the completion of the bridge at Grafton in 1932.

1926   Work began on electrifying the Sydney urban network.

1927-1969   Main Line to Broken Hill was completed in 1927 and was connected to the South Australian Narrow Gauge system by the Silverton Tramway between Broken Hill and the SA border. In 1969 the South Australian section between the border and Port Pirie was converted to Standard Gauge. This facilitates a route between Sydney and Perth by Standard Gauge.

Appendix 6
Time Line History of Geelong[36]

1802	Lieutenant John Murray R.N. discovered and explored Corio Bay
1802	Matthew Flinders explored Corio Bay and climbed the You Yangs
1835	John Batman landed at Indented Head representing members of the Port Phillip Association from Van Diemens Land
1837	Captain Foster Fyans arrived in Geelong as Police Magistrate and Protector of Aborigines
1838	First survey plan of Geelong issued
1839	First sale of Geelong town allotments
1839	First mail between Geelong and Melbourne
1840	First ship load of wool for London left from Point Henry
1840	First Post Office established in Barwon Terrace
1840	First issue of the Geelong Advertiser published - it is Victoria's oldest morning newspaper
1840	First stone building in Geelong erected - Strachan's Wool Store
1841	First race meeting in Geelong
1844	First theatre in Geelong opened
1848	First Barwon Bridge was built

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[36] Many of these entries were extracted from "Geelong Events in History" 1802 - 1972" by David J Davies.

1849	Town of Geelong incorporated
1850	First meeting of Geelong Town Council held in the Royal Hotel, Malop Street
1851	Bush fires destroyed most of the countryside between Shelford, Barrabool Hills and the Otways - BLACK THURSDAY February 6th
1851	Gold found in the Mt. Buninyong district
1852	Large floods on the Barwon River washed away the Barwon Bridge
1855	Moorabool Pier constructed - demolished in 1949
1857	Australia's first country railway : Geelong to Melbourne
1857	First wool sales in Geelong
1860	Gas introduced to Geelong
1862	Geelong - Ballarat railway opened
1866	First meeting of the Borough of Steiglitz
1867	Winchelsea Bridge over the Barwon River opened
1869	Clipper "Lightning" burnt on Corio Bay
1870	Severe floods in the Barwon & Moorabool valleys following the great droughts of 1869
1871	Meredith Shire proclaimed
1873	Geelong Footballers changed their colours to the familiar Blue and White stripes
1874	Shire of South Barwon came into being with amalgamation of the Connewarre Road District and the Borough of South Barwon
1875	Geelong West proclaimed a Borough
1876	Railway line from Geelong to Winchelsea opened
1877	Railway line from Winchelsea to Colac was officially opened

1879	Railway line between Geelong and Queenscliff opened
1885	King Billy, the last of the Barrabool Tribe died
1888	Electric light seen in Geelong for the first time
1888	First Telephone Exchange in Geelong was opened
1891	Ship "Joseph H. Scammell" wrecked at Torquay
1893	Hopetoun Channel through Corio Bay was opened
1898	Anglesea Hotel destroyed by fire
1902	Electric light lit the streets of Geelong for the first time
1910	Geelong was proclaimed a city
1912	Trams first appeared in the streets of Geelong, Geelong West and Newtown
1912	First automatic telephone exchange in the Southern Hemisphere opened in Geelong
1925	Ford Motor Company commenced operations in Geelong
1926	Tornado struck Highton
1927	Barwon Heads - Ocean Grove Bridge opened
1930	Radio Station 3GL "The voice of Geelong" was on the air for the first time
1938	Geelong & District Centenary Celebrations
1940	Bushfires destroyed practically everything in their path in the Torquay area
1954	Shell Refinery opened at Corio

Appendix 7
Time Line for History of Ballarat[37]

1838	Coronation of Queen Victoria
1838	Mar WC Yuille's camp at the Black Swamp
1838	Aug White settlement of the Ballarat district
1839	WC Yuille homestead site chosen on Yarrowee
1851	About the beginning of August a Mr Hiscock found gold in a gully near Buninyong.
1851	Aug 21 Gold discovery at Poverty Point
1851	Aug 25 Golden Point named when gold was discovered in that area. This was the beginning of the great gold discovery that became The Ballarat Diggings.
1851	From the end of August till September a number of parties arrived at Golden Point
1851	Sep 4 Geelong Advertiser report of gold discovery
1851	Sep 10 Messr Esmond and Cavanagh washed out 50 lbs of gold and this was the first gold sent down by escort to Geelong
1851	Sep 19 Police Camp established near Magpie St hill
1851	Sep 20 First gold licence issued
1852	First house built by David Meek, corner Mair & Lydiard
1852	Post Office moved to corner of Mair & Lydiard Sts
1852	Proclamation of Township of Ballaarat
1852	Jan 17 W.S. Urquhart's survey map of Ballarat
1852	Aug 25 First Township land sale
1853	Jul 1 Thomas Bath opened the Ballaarat Hotel (Craig's)
1854	Christ Church building commenced
1854	Apr 5 Gold claim extent 12ft x 12ft for one man
1854	May 19 Post Office opened corner Mair & Lydiard Sts
1854	Jul 12 Bentley's "Eureka Hotel" opened
1854	Oct 17 Burning of Bentley's Hotel
1854	Nov 11 Ballarat Reform League formed
1854	Nov 29 Eureka Flag first raised on Bakery Hill

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[37] Historic timeline of Ballarat, Harris House of Photography, created 28 June 1999, latest revision 7 March 2007.

1854	Nov 18 Bentley's Trial
1854	Dec 3 Eureka Stockade
1855	Mar 4 First Wesleyan Church in Lydiard St opened
1855	Mar 4 St Paul's first church opened
1855	Sep 22 The Star first published
1855	Nov 10 P Lalor & J B Humffray elected to parliament
1855	Dec 8 Ballarat proclaimed a Municipality
1856	First Ballarat Council election
1856	Gaol building commenced at southern end of Lydiard Street
1856	Apr Temporary Council building completed in Sturt St
1856	Aug 11 Hospital opened in Drummond St
1856	Oct 24 Streets being metalled in Township
1856	Dec 3 First electric telegraph from Melbourne to Ballarat
1857	May 5 Ballaarat East Municipality proclaimed
1857	Jul 1 Union Bank opening in Lydiard St
1857	Sep 13 Christ Church, Lydiard St opened
1858	Ballarat Botanical Gardens begun
1858	Jan 20 Wesleyan Chapel in Lydiard St opened
1858	Jun 9 Welcome Nugget unearthed
1858	Jul 17 Opening of the Gas Company Works
1858	Aug St Paul's Church built in Humffray St on Bakery Hill
1858	Nov 21 Ballarat's first water pipeline from Yuille's Swamp
1858	Dec 19 Post Office building in Sturt St opened
1859	Apr 12 Botanical Gardens planting commenced
1859	Sep 24 Town Hall burnt down
1860	Barkly Street Church built
1860	Western Fire Brigade Foundation Stone laid
1860	Feb 20 Ballarat Benevolent Asylum opened
1860	Aug 16 City Hall 1st Foundation Stone laid
1860	Aug 28 Brick Police Barracks completed
1860	Sep 28 Mechanics Institute Foundation Stone laid

1861	Nov 20 Ballarat Rowing Club established
1861	Burke and Wills perished
1861	Feb 1 First part of City Hall opened
1861	Oct 1 Last issue of Ballarat Times
1861	Dec 26 Ballarat East Town Hall Foundation Stone laid
1862	Kirks Reservoir obtained by both Councils
1862	St Paul's Anglican Church red brick tower built
1862	Feb 18 Ballarat Gaol walls completed
1862	Apr 11 First train from Geelong
1862	Dec 10 Ebenezer Church Foundation Stone laid
1863	Christ Church in Lydiard St completed
1863	Gate Lodges built at the Gardens
1863	Nov 8 St Patrick's Cathedral opened
1864	Ballarat East Fire Station tower erected
1864	Apr 4 St Paul's Church subsided
1864	May 6 First Rowing Regatta on Lake Wendouree
1864	Jul 1 Ballarat College founded
1864	Aug 14 St Andrew's Church opened
1864	Dec 29 Post Office building (present) opened
1865	First steamer placed on Lake Wendouree
1865	Jan 11 Main Road fire destroyed 60 premises
1865	Feb 11 Shenandoah Grand Ball at Craig's
1865	Apr 23 St Paul's Anglican Church rebuilding in front of the tower opening
1865	Jun 11 Opening of St Peter's Church of England
1866	Jul 8 Ballarat & District Orphan Asylum opened
1867	Jun 10 First issue of the Courier
1867	Aug 26 Burke & Wills monument second Foundation Stone laid
1867	Nov 4 Burke & Wills monument completed
1867	Nov 20 Alfred Hall completed across Yarrowee
1867	Dec 9 First Royal visit, Prince Alfred, Duke of Edinburgh
1868	Clarendon Ladies College founded

1868	Court-house south of the gaol opened
1868	Rowing course at Lake Wendouree created
1870	Sep 9 Ballaarat proclaimed a City
1870	Oct 26 School of Mines opened
1871	Ballarat Town Hall completed
1872	State Savings Bank built
1872	Aug 23 Borough of Ballaarat East proclaimed a Town
1873	Jun 30 Sunnyside Woollen Mill commenced production
1875	Jun 7 Academy of Music (Her Majesty's) opened
1875	Dec 18 Launch of first commercial *PS Wendouree*
1876	Queen's College founded
1876	Jul 31 First football match played on Saxon Paddock
1877	Gong Gong Reservoir built
1877	May 29 Ballarat Yacht Club formed
1879	Crown-shaped Rockery built at the lake
1880	Apr 1 Galloway Monument presented
1881	Congregational Church built
1881	Jun 29 Royal visit Prince Albert Victor, Duke of Clarence & Prince George, Duke of York (George V)
1883	Oct 15 Wendouree Rowing Club formed
1884	Ballarat Football League formed
1884	St Andrew's Kirk spire erected
1884	Jul Ballarat Fine Art Gallery established
1885	Post Office tower commenced
1885	Jun 16 *Golden City* steamer launched on Lake Wendouree
1886	Aug 27 Eureka Monument presented to Town Council
1887	Jun 21 Queen Victoria's Jubilee Foundation Stones laid for Mining Exchange, Art Gallery & Old Colonists Hall
1887	Dec 21 Horse-drawn trams commenced on Gardens route
1888	Old Colonists Hall built in Lydiard St
1888	Feb 13 Mining Exchange in Lydiard St opened
1889	Feb 9 Death of Peter Lalor

1890	Claxton Memorial Fountain erected
1891	Mar 9 Death of J.B. Humffray
1892	Jan 14 Death of Prince Albert Victor, Duke of Clarence & Avondale
1892	Jun 22 Disastrous cyclone, loss of life and immense damage
1892	Dec 31 66 Hotels closed by Local Option
1893	Bank Smash
1893	Jan 26 Peter Lalor Statue unveiled
1894	Ballarat Electric Supply Company founded
1895	Jan 24 Electric Light illuminates Ballarat streets
1897	Queen Victoria's Diamond Jubilee
1897	May 10 Severe earthquake shock
1898	Apr 11 Battle of Ballarat at Victoria Park
1898	Dec 17 Official trial of Ballarat Melbourne telephone line
1899	Apr 3 Her Majesty's Theatre opened
1900	May 24 Queen Victoria Statue unveiled
1901	Queen Alexandra Bandstand built in Sturt St
1901	Jan 22 Death of Queen Victoria
1901	Jan 31 Edward VII proclaimed King
1901	May 9 Federation - First Federal Parliament, Royal Exhibition Building
1901	May 13 Royal visit, Prince George & Princess May (King George V and Queen Mary)
1901	May 13 Soldiers Statue Foundation Stone laid
1902	Yarrowee paved with basalt
1902	May 24 Queen Victoria drinking fountain presented
1902	Aug 9 Coronation of Edward VII and Queen Alexandra formerly Prince Albert Edward, Prince of Wales who succeeded his mother Queen Victoria
1904	Aug 23 Power House Foundation Stone laid
1904	Dec 3 50th Anniversary of Eureka
1905	Aug 18 First electric tram
1906	Nov 1 Soldiers Statue unveiled
1908	Nov 10 Moorabool Reservoir construction began
1910	Aug 27 Ballarat High School opened

1911	King Edward VII Pavilion built
1912	Apr 15 Titanic sank on maiden voyage from England to New York
1913	Titanic Bandstand built
1913	Apr 14 Last horse-tram to Sebastopol
1914	Aug 4 War declared against Germany
1917	Ballarat Railway Workshops completed
1917	Oct 23 Exceptionally brilliant meteor
1918	Nov 11 Armistice Day, end of WW I
1919	Jun 9 Avenue of Honour planting completed
1920	Jun 2 Royal visit, Prince Edward, Prince of Wales (Duke of Windsor)
1920	Jun 3 Arch of Victory opened
1921	May 25 Amalgamation 0f Ballarat East and West
1922	Dec 6 Sewerage construction commenced
1923	Mar 7 Fire destroyed Sunshine Biscuit Factory
1925	Jul 1 Sewerage scheme in operation
1927	Apr 29 Duke & Duchess of York (later King George VI) visited Ballarat
1934	Jul 1 State Electricity Commission assumed charge of electricity supply
1934	Nov 1 Royal visit, Prince Henry, Duke of Gloucester
1937	George V Statue erected in Sturt St
1938	Centenary of founding of Ballarat Colony of Victoria
1945	Dec 6 Royal visit, Duke and Duchess of Gloucester
1952	Frank Pinkerton Bequest Statue unveiled in Sturt St
1953	First Begonia Festival held
1954	Mar 6 Royal visit, Queen Elizabeth II & Duke of Edinburgh
1956	Olympic Games events on Lake Wendouree
1958	Mar 2 Royal visit, Queen Mother
1965	Ballarat Gaol closed
1969	Horse Statue erected in Sturt St
1970	Nov 29 Sovereign Hill opened
1971	Ballarat Tramways closed
1983	Apr 15 Royal visit, Prince Charles & Princess Diana

1989   Jul 4 Ballarat Goldfields mine shaft sunk

1989   Nov 16 Freak hailstorm, damaged roofs and cars

1991   First Ballarat Region Conservation Strategy

1992   Jan International Scout Jamboree at Victoria Park

1994   Mar Royal visit, HRH Prince Edward

1994   Local government amalgamation, City of Ballarat

1998   Jan 1 Merger of School of Mines, Wimmera TAFE & University of Ballarat

1998   Mar 27 Eureka Centre opening

Appendix 8
Maps of Railway Lines

EARLY VICTORIAN COUNTRY RAILWAYS

BALLARAT
NAVIGATORS
LAL-LAL
ELAINE
MEREDITH
MOORABOOL RIVER
MOORABOOL VIADUCT
TO WEST
BARWON RIVER
LETHBRIDGE
BANNOCKBURN
GEELONG
NORTH GEELONG
LARA
LITTLE RIVER
WERRIBEE
LAVERTON
NEWPORT
WILLIAMSTOWN
MELBOURNE
SUNBURY
TO BENDIGO
RIDDELLS CREEK

N

0   10   20   30 km

OWEN PEAKE   11/3/2011

		Melbourne-Geelong railway towards Geelong
	69.950 km	North Geelong Junction
	70.900 km	Fyansford branch line
		Melbourne-Geelong railway towards Melbourne
	71.142 km	North Geelong C
		Western standard gauge towards Melbourne
	77.483 km	Moorabool
	78.820 km	Moorabool Viaduct
		Western standard gauge towards Adelaide
	83.454 km	Gheringhap
	89.702 km	Bannockburn
	97.100 km	Lethbridge Block Point
	99.262 km	Lethbridge
	101 km	RMSP 13
	105.390 km	Medina
	107.401 km	RMSP 52
	110.619 km	RMSP 12
	114.198 km	Meredith
	117.055 km	RMSP 14
	122.959 km	Elaine
	134.758 km	Lal Lal
	137.440 km	Lal Lal Block Point
	140.268 km	Yendon
	144.810 km	Navigator
		Melbourne-Ballarat railway towards Melbourne
	148.800 km	Warrenheip
	154.694 km	Ballarat East
	155.386 km	Ballarat
		Serviceton railway west and Mildura railway north

Appendix 9
Mounting Frame for Interpretation Panel

DIMENSIONS IN mm   SCALE: 1:10

1205

A

AMDT. 1. LENGTHEN LESS. 10/6/2011

MOUNTING OF 300Ø MARKER (TO BE CUSTOM DRILLED)

NOMINAL GROUND LINE

A

DRAWN: OWEN PEAKE
DATE: 14 APRIL 2011

INTERPRETATION PANEL FRAME
SHEET 1 OF 2
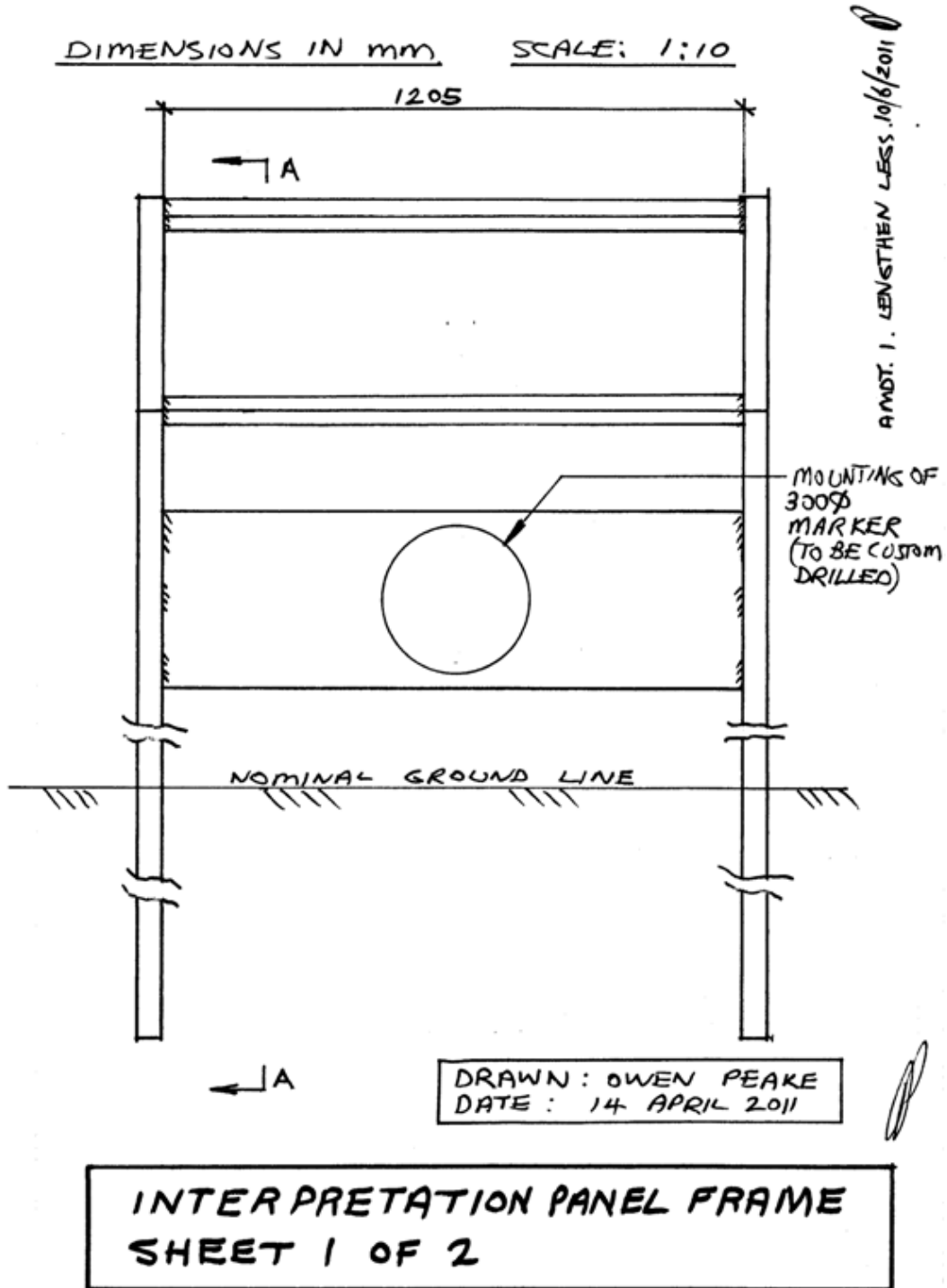
GEELONG & BALLARAT STATIONS

DIMENSIONS IN mm

DETAIL 1

600 +0/-1
CRITICAL DIMENSION

2

45°

200

WELD

350

1550

300

500 - ASSUME FIRM GROUND

NOMINAL GROUND LINE

50×50×2·5 SHS

350×5 FLAT STEEL

FINISH: POWDER COATING BLACK

INTERPRETATION PANEL FRAME
SHEET 2 OF 2

SECTION A-A
SCALE 1:10

50×50×2·5 SHS

40×40×2·5 SHS

2

PLUG AND SEAL WELD

WELD ALL ROUND

DETAIL 1 2
SCALE: FULL SIZE
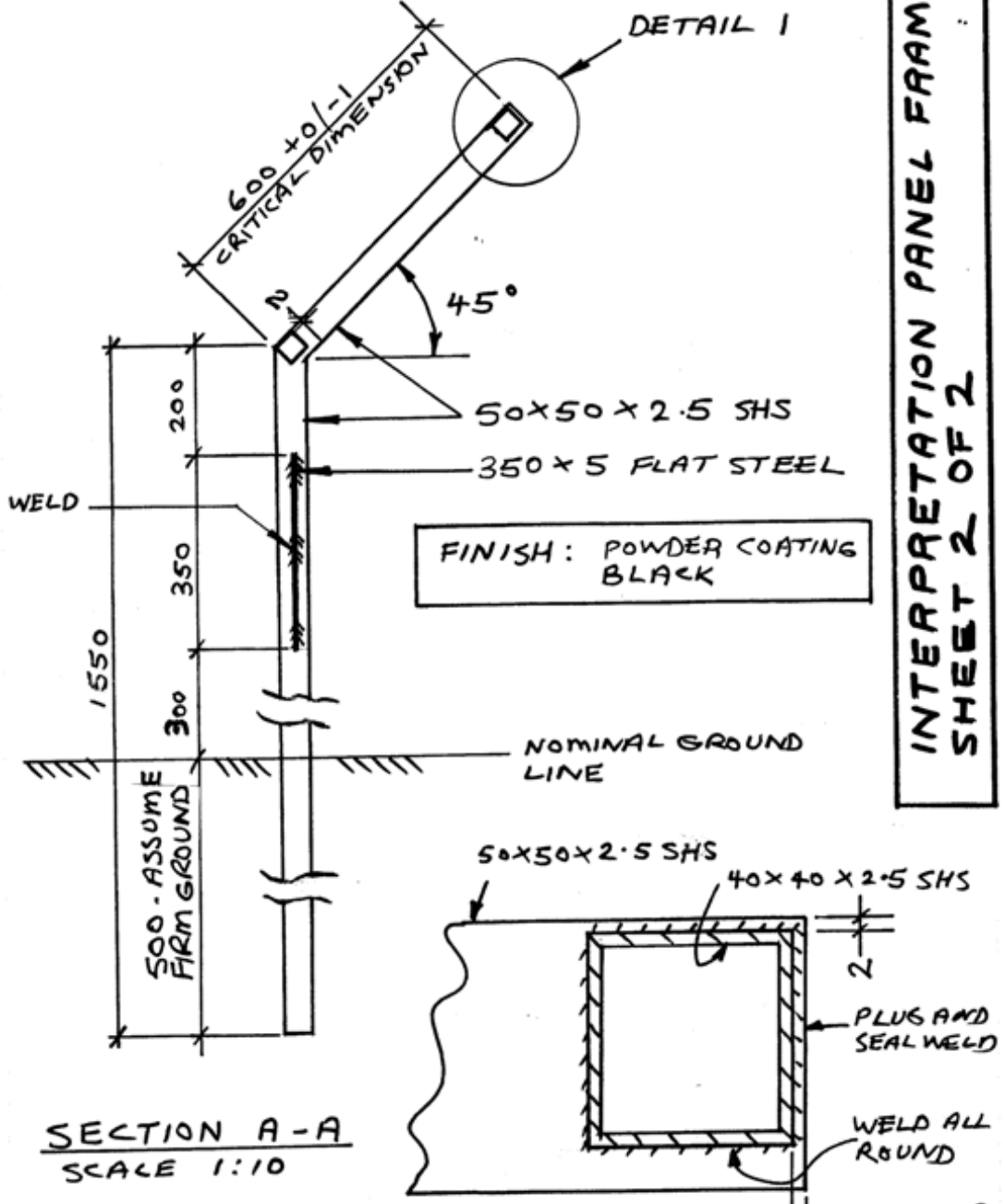
DRAWN: OWEN PEAKE
DATE: 14 APRIL 2011

AMDT. 1. LENGTHEN LESS. 10/6/2011
AMDT. 2. GEELONG/BALLARAT 15/12/2011

5mm Squares

CRITICAL DIMENSION
600 +/- 0
INSIDE DIMENSION
SLOTS CUT OUT
FOR CROSS
MEMBERS
40
50   50
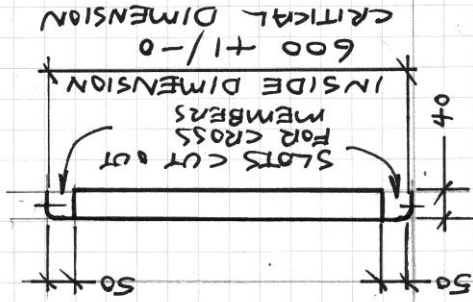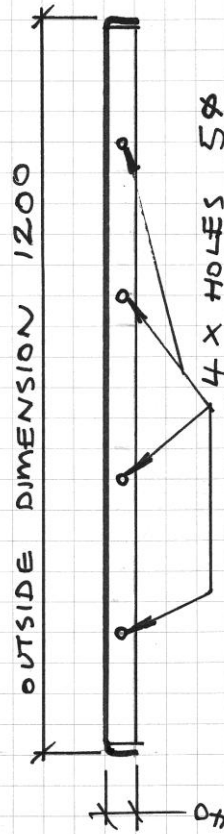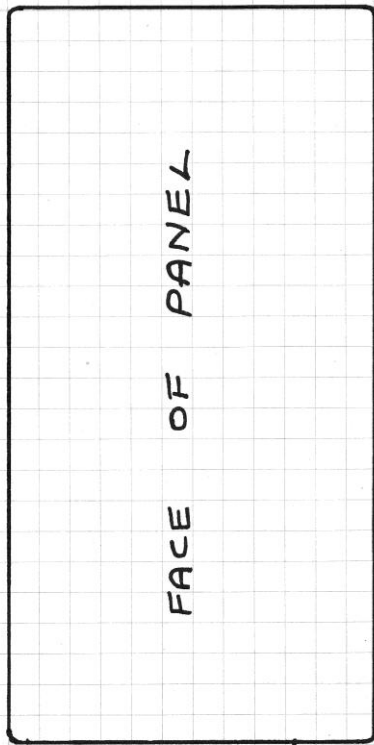
NOTES:
1) EDGES FOLDED DOWN
   ALL ROUND 40 mm
2) MATERIAL: SHEET STEEL
   SHEET 2.4 mm
3) PANEL FINISH: DIGITALLY
   PRINTED 3M CLASS 2
   WHITE REFLECTIVE VINYL
   WITH UV LAMINATE

DRAWN: OWEN PEAKE
DATE: 14 APRIL 2011

DIMENSIONS IN mm

SCALE: 1:10

FACE   OF   PANEL

RADIUS OF
FOLD DOWN
NOT MORE
THAN 5mm
ALL ROUND

OUTSIDE DIMENSION 1200

4 x HOLES 5∅
(FOR POP RIVET
PANEL FIXING)

USE STAINLESS STEEL
RIVETS 4.8∅ L=12

40

INTERPRETATION PANEL

AMDT. 1. SPECIAL S/S RIVETS 18/6/2011

CHANGE CONTROL

VERSION 1	9 June 2010		Copied from shell document + Added additional headings based on recent changes to Guidelines
VERSION 2	29 June 2010	1131 words	Added Higinbotham Text from Steam Hammer nomination + completed Basic Data Entry
VERSION 3	30 June 2010	1312 words	Added Basic Data
VERSION 4	2 July 2010	1510 words	Added Local Government Areas
VERSION 5	27 Feb 2011	1510 words	Added Line Diagram as Appendix 8
VERSION 6	27 Feb 2011	2231 words	Further drafting
VERSION 7	4 March 2011	11315 words	Further drafting inc copying from Bendigo document
VERSION 8	8 March 2011	13441 words	Further drafting
VERSION 9	9 March 2011	14600 words	Further drafting including adding images
VERSION 10	10 March 2011	14600 words	Minor changes and formatting
VERSION 11	11 March 2011	16078 words	Added Appendix 7 - Ballarat timeline
VERSION 12	12 March 2011	16216 words	Added map to Appendix 8
VERSION 13	24 March 2011	16538 words	Added section on Lal Lal Iron Works
VERSION 14	26 March 2011	16776 words	Added to concepts for interpretation location
VERSION 15	2 May 2011	16776 words	Added footer
VERSION 16	14 Aug 2011	16712 words	Minor updates of interpretation proposals
VERSION 17	13 Dec 2011	17120 words	Rewrite of Interpretation Plan
VERSION 18	14 Dec 2011	17396 words	Check read
VERSION 19	15 Dec 2011	17396 words	Added 3 drawings to create Appendix 9
VERSION 20	15 Dec 2011	17423 words	Added Footnote 18
VERSION 21	16 Dec 2011	17423 words	Correction from David Beauchamp. "or" to "of" p19, line 2.
VERSION 22	25 Dec 2011	17367 words	Correction from Miles Pierce via email of 19 December.
VERSION 23	27 Dec 2011	17410 words	Correction from MP via email of 20 December re clause 3.1.18.
VERSION 24	28 Dec 2011	17738 words	Added section on Geelong, Ballarat & North western Railway in section 3.1.18.
VERSION 25	28 Dec 2011	18258 words	Added section on Francis Bell to Appendix 3.
VERSION 26	28 Dec 2011	18258 words	Added image of Geelong interpretation panel mock-up to Interpretation Plan.
VERSION 27	2 Jan 2012	18284 words	Corrections from MP email dated 2 Jan 2012.