

Brunner Suspension Bridge, 1876

Prepared by Colin Perfect
and Paul Mahoney
Department of Conservation
for the
Brunner Industrial Site
Co-ordinating Committee.

2nd June 2004

- The **Brunner Mine Industrial Area** comprises three sites:
 - The Brunner mine, north side of the Grey River, managed by the Department of Conservation; *and*
 - The Tyneside mine, south side of the Grey River, managed by the Historic Places Trust; *and*
 - The Brunner bridge, spanning the Grey River and linking the mine sites, managed by the Grey District Council.
- The Brunner Industrial Site Coordinating Committee brings together the three agencies and community stakeholders to coordinate management of the area.
- The Brunner bridge never closes and can be accessed by road from either side; State Highway 7 and Taylorville-Blackball Road, and by rail via Brunner Station.

HISTORY DESCRIPTION

The Brunner mine, sited on the north bank of the Grey River, was one of New Zealand's earliest, opened in 1864. For 12 years its output was barged 13 kilometres down the river to the port of Greymouth. The mine produced a high quality coal that was shipped to markets throughout New Zealand and to New South Wales, Australia. Other mines opened along the Grey River and by the early 1870's the Brunner coalfield was the largest producer in New Zealand.

A railway linking the Grey River mines with the port was built as part of the 1870s' government public works and immigration programme which focused on railway development; particularly establishing lines that would promote profitable coal mines. The Brunner bridge was required to link the Brunner mine with the railway and was owned and operated by the Government.

The railway to Brunner officially opened on 7 April 1876, while the suspension bridge was still under construction. All were awakened when the bridge collapsed with a resounding crash at 4.00 am on 28 July 1876. The enquiry absolved the contractor and the design engineers but pinned some of the blame on the local Resident Engineer of the Public Works Department, Mr McArthur. The wreckage was salvaged and the rebuilt bridge opened for traffic on 11 April 1877. The Brunner bridge was important as the first bridge across the Grey River and catered for both road and rail traffic on a shared deck. It was designed by the Engineer-in-Chief of the Public Works Department, John Carruthers and built by E. B. Garven.

With the railway Brunner mine coal production immediately rose. Coke was produced for steel making and in 1875 fireclay bricks became another Brunner industry. Bridge tolls were instituted in 1879 but were abolished seven years later following strident and prolonged protests from users. Because of congestion and for safety reasons, a pedestrian walkway on top of the trusses was in use by 1885 to separate foot and freight traffic. So busy was the bridge that in 1889 lighting was installed.

Production at the Brunner and nearby Coal-pit Heath mines peaked in 1892 when 181,075 tonnes of coal were won. Railway wagons at the time carried six tons so that represents 30,000 wagon loads or around 100 per day passing over Brunner bridge. During its life the Brunner mine twice gained fame nationally from infamy

DOC's mission is:

To conserve New Zealand's natural and historic heritage for all to enjoy now and in the future.

He a-ta whakaute,
manaaki, me te tiaki ia
Papatuanuku ki Aotearoa
kia u- tonu ai to-na
whakawaiu-tanga hei
oranga ngakau mo- te tini
te mano ina-ianeī, a-ke
tonu ake.



Department of Conservation
Te Papa Atawhai

and human misery. A gas explosion in the mine on 26 March 1896 killed 65 miners in New Zealand's greatest workplace disaster. On 24 May 1904 a landslide engulfed the Cosgrove house and killed all their seven children and one adult. The parents survived and had two more children.

Coal production ended in May 1921 when accessible seams were worked out. Meanwhile, the Brunner bridge had been allowed to deteriorate to a poor condition and the Railways wanted to remove it. After strong local protests, ownership was transferred to the Brunner Borough Council on 18 May 1923. Extensive refurbishment was required to make it fit for road traffic and the cables were replaced in 1925-26. By 1961 the condition of the bridge had again deteriorated so badly that it was once more threatened with closure. Local protests resulted in major refurbishments being carried out during 1963-64, and again in 1969 and 1977.

During 1977 the heritage values of the Brunner mine site came to the attention of Historic Places Trust and work began on conserving the ruins and developing the site for visitors. Brunner bridge closed to vehicles after the opening of the Stillwater bridge on 29 September 1978 but was retained as a pedestrian link and key site element. A heritage milestone in 1983 was the installation of interpretation panels on site, the biggest project of its kind to that time.

In 1996 the bridge was closed because it had deteriorated and failed an engineering inspection. It was faced with demolition but the managing agencies realised that this would split the site and greatly reduce the quality of the visitor experience. The marking of the centenary of the Brunner mine disaster in 1996 helped raise the profile of the site. A major fund raising initiative resulted in the 2003-04 restoration project and saw the bridge reopened in essentially its sixth reincarnation.

FABRIC DESCRIPTION

The Brunner bridge is a classic suspension bridge spanning a steep gorge. It clears 90 metres between towers and the deck height is 12 metres above mean water flow. The Grey River is prone to flood and the high flood levels through the gorge section at Brunner made it uneconomic to build a multi-span bridge founded on piers.

Foremost in the minds of the designers was resistance to the side loading of wind. This section of the Grey River valley is famed for its wind called 'The Barber'; reputedly sharp enough to trim your hair. Designers were also concerned, because of its intended railway use, to minimise deflection under load. This led to the adoption at Brunner of the concept of a suspension bridge stiffened by a substantial box truss giving strength in all directions.

The bridge that opened for traffic in 1876 was stiffened with a box girder built of wood. The exact species of timber used in its construction is unclear. One source refers to black birch; another, a mixture of silver pine and kauri. The box girder cross section was 2.65 metres high and 2.7 metres wide. The 30 girder panels were each 3 metres long and were cross braced with diagonal bracing on all four faces. The lower chord of the truss was decked and accommodated both rail and road traffic. Transoms under the box girder were supported by hangers from the suspension cables, tying together the truss and suspension designs.

It was most unusual to use a suspension bridge for railway traffic. No locomotives crossed the Brunner bridge; to keep the weight down wagons were hauled one at a time by horse. Reflecting the operating conditions, the bridge was built with a slight downgrade to assist passage of the loaded wagons. Access on the railway side was by a curve too tight for a locomotive, on the more restricted mine side wagon turntables gave access to the sidings on the site.

Details of the 1922 refurbishment are lost, but it is likely that decayed members were replaced, but the original design was retained. The box girder dimensions restricted the size of motor vehicles that could cross the bridge. In 1960 a local service bus was especially modified with a squat roof to fit the bridge and became known as 'The Lizard'.

The 1963-64 refurbishment included the replacement in steel of the wooden support towers. Further work in 1969 involved splaying the side trusses with arched steel spacers to increase the carriageway dimensions ending the vehicle height restriction. This work weakened the bridge to such an extent that in about 1977 the timber side trusses and high-level steel bracing were removed and replaced by a steel Bailey bridge with raised deck. The Bailey was a portable modular truss used by the military in World War 2 and popular in New Zealand afterwards. By then all that remained from 1923 was the horizontal wooden cross bracing and transoms, which were protected from the weather by the deck.

The reconstructed bridge of 2004 retains the 1964 steel towers. It reintroduces the 'box girder truss' which is a close copy of the version opened in 1876 but scaled down 10%. Although now in its sixth incarnation, the Bridge tower positions and key dimensions remain essentially unchanged.

CULTURAL CONNECTIONS

Since it opened in 1876 the bridge has a long utility history to Grey Valley communities, providing commercial and social connections. Right from the start it provided for road traffic and served in an important role until a new bridge at Stillwater opened in 1978. Evidence of its strong symbolic value is its adoption as an emblem of the Brunner Rugby League Club. Today it continues in a significant heritage role providing visitor access to the Brunner mine Industrial Area.



Brunner mine site in the foreground and railway on the opposite bank, c. 1883-1888.

Photograph: West Coast Historical & Mechanical Society Collection.
ATL F91702½

HISTORIC SIGNIFICANCE

The Brunner bridge is historically significant principally in the greater context of the Brunner mine Historic Area, rated by Historic Places Trust as one of the most significant industrial heritage sites in the country. The Brunner mine was the first large scale coal mine in New Zealand. It was a significant mine of the Grey Valley coal field, now called the Paparoa coal field, one of three principal coalfields on the West Coast. The West Coast mines have been, and still are, the major producers of high quality coal in New Zealand.

The history of Brunner bridge illustrates the economic problems New Zealand faced having to build so many bridges, in a country with a relatively low population, starting an industrial economy off from scratch. To save money Brunner bridge was built as cheaply as possible (a) as a suspension bridge and (b) from wood. Even after it was worn out in 1922 it received three major refurbishments to extend its life. It was 102 years before a full replacement bridge at Stillwater could be afforded.

FABRIC SIGNIFICANCE

Brunner bridge is a nationally notable early suspension bridge. It was the first suspension bridge designed and built by the Public Works Department. It was the first and only suspension bridge built for Government railway traffic. On a world scale few railway traffic suspension bridges have ever been built.

From an engineering aspect it was a bold response to difficult site criteria; a high gorge, strong winds and rail traffic. To build such a bridge in wood was a significant achievement because of the difficulties in designing connections between timber members that are strong enough to transfer the loads. The unusual 'box girder truss' was a bold response that worked well. The 1876 collapse of the bridge under construction reflects the difficult site constraints and the lack of practical experience of those building it.

The 2004 bridge contains few 1876 bridge components. The replacement of such a high proportion of fabric is a characteristic of the life of timber bridges and structures in New Zealand. They were viewed as 'temporary' requiring the frequent replacement of decayed timber members, reflected in the three major rebuilds of 1923, 1964, and 2004, after 46, 41, and 40 years respectively. It is surprising that any of the original materials survives in use.

CULTURAL SIGNIFICANCE

The Brunner mine Historic Area attracts some 30,000 visitors annually. It combines fascinating history, extensive mining ruins, and a great natural setting, and has an Historic Places Trust category one heritage registration. It is fair to say that the 2004 bridge restoration project has significantly increased cultural heritage values by strengthening interpretation and landmark aspects. A walk through the restored box girder is an experience that will excite most visitors and is something they will photograph and recommend to friends.

The Brunner bridge has significant landmark qualities and is clearly visible from the road. The restored box girder is a more dramatic structure to view. The bridge is the key feature that defines and differentiates the Brunner site and helps to trigger a visitor interest in stopping and exploring. It also provides an essential link between parts of the site on opposite banks of the river and a great viewpoint to help with interpretation. Added to this, coal trains laden with Paparoa coal still pass through the site several times daily.

2003 RESTORATION

The Brunner Industrial Site Co-ordinating Committee resolved to retain the bridge at all costs. In fact a restored bridge, as a landmark, would rejuvenate the cultural status of the site. A conservation plan was developed for the site (Kelly 2000) and then a more specific conservation plan developed for the bridge (Kelly 2002). The bridge was already in its fifth reincarnation, but still retained most of its original form. In view of the fact it was decided that an 'evolving heritage' approach was acceptable and a full reconstruction of the 1887 bridge was decided.

The engineering design and cost estimates were undertaken by Montgomery Watson Harza, Consulting Engineers of Greymouth. The task of fund-raising got under way and the major contributors were:



The restored Brunner Bridge in 2004 from the Brunner mine site. A Q class coal wagon is shown to the left; horses pulled these across the bridge. Tyneside with its chimney is depicted across the river. Photograph: David Chung

Lottery Grants Board	\$350,000
Grey District Council	\$100,000
Tourism Facilities Grant	\$66,666
West Coast Development Trust	\$44,444
Stout Trust	\$31,111
DOC	\$30,000
HPT	\$20,000
DOC underwriting of shortfall	\$14,485
HPT underwriting of shortfall	\$14,485
Solid Energy	\$5,000
West Coast Community Trust	\$2,000
Total	\$678,191

Bridge Tender Price	\$585,000
Conservation Plan and Design Work	\$43,193
Contract Supervision	\$23,000
Consents and Tender Preparation	\$27,000
Total	\$678,193

The successful tender was from Works Infrastructure Limited for \$585,000. The 2003-04 work began with the complete disassembly of the bridge including the steel towers. Restoration commenced with the re-erection of the rebuilt towers followed by the stringing and fixing of the new suspension cables. The treated radiata pine box girder trusses were prefabricated and reinstated in sections. The first two sections were hung from the cables on the Taylorville side of the river with the assistance of a mobile crane. The remaining sections were winched out from the Tyneside side of the river. Sections were progressively bolted together when the cross bracing was correctly aligned. Bolted connections were used for the main timber structural joints. The foundations, 2 steel towers, 8 timber transoms and some cable clamps survive from the earlier bridges, all other components are new material.

The bridge was formally reopened by Hon. Chris Carter, Minister of Conservation on 27 March 2004 before an audience of several hundred people.

FURTHER READING

- 1998: Disaster at Brunner; Brian Wood, Greymouth
- 2000: Brunner mine Concept Plan; M Kelly, DOC.
- 2002: Brunner bridge Conservation Plan; M. Kelly, BISCC
- 2004: The Heritage and Environment of Coal Gorge and the Brunner Suspension Bridge; Brian Wood, Greymouth