



Timber bridge management

Roads and Traffic Authority of NSW
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Monkerai Bridge, Karuah River: an Old Public Works timber truss bridge opened in 1882



Timber bridge management

The Roads and Traffic Authority of New South Wales (RTA) is constantly under pressure to replace or significantly upgrade many of the remaining timber bridges on NSW roads, because they do not meet current width and loading standards, because of local community pressures for improved access and/or because of the large maintenance burden the bridges impose.

Many of these bridges, especially those employing truss designs, are of heritage significance. Several have recently been listed on the *State Heritage Register*.

Most of the remaining timber road bridges in NSW are nearing the end of their service lives, so decisions need to be made about how best to manage them, with due consideration both of their heritage significance and of current and future road transport needs.

In August 2001 the RTA controlled 58 of the 82 surviving timber truss bridges in NSW and 82 of the approximately 4,000 timber beam bridges, plus timber beam approach spans for eight other RTA bridges. 70 of the RTA's timber beam bridges are being replaced under programs extending to June 2003.

The timber bridge management strategy summarised in this document provides clear direction for the management of all of the RTA's timber bridges, taking account of all the competing factors affecting their future, especially heritage, safety and access issues.

In developing its strategy the RTA has carried out four relevant studies of the heritage significance of all the State's timber truss road bridges and the RTA-controlled timber beam bridges.

The issues examined in these studies, which yielded much valuable heritage information, included:

- The design evolution of all timber truss and timber beam road bridges in NSW, and
- The historical background and economic circumstances associated with timber bridge developments from the mid 19th century to the early 20th century.

Most of the RTA's timber bridges do not meet current RTA bridge design standards for width, load-carrying capacity and height clearance.

The RTA's timber bridge management strategy proposes that the RTA should retain all but one of its 29 timber truss bridges assessed as being of "State" heritage significance and recommended for inclusion on the *State Heritage Register* (see page 6).

It also proposes the retention of the only two RTA timber beam bridges assessed as being of "State" heritage significance.

Implementation of the strategy is closely tied to the RTA's *Heritage Guidelines* (1999), under which *Conservation Management Plans* will be prepared to guide the future management of all heritage items of "State" significance. Each bridge's *Conservation Management Plan* will be part of an overall management strategy also linked to the bridge's maintenance schedule and network significance.

All bridges of heritage significance are recorded in the RTA's *Heritage and Conservation Register*, which may be viewed in the "Environment" section of the RTA's website, www.rta.nsw.gov.au.



Rossi bridge, Wollondilly River (1898)



The Fladbury timber beam bridge on the Severn River near Glen Innes (1910)

Historical and operational background

In 1861 the NSW parliament decreed that local materials and labour should be used wherever practicable in government-funded construction.

Steel and iron were in short supply and expensive and had to be imported. Even after the State's first steelworks were set up in Lithgow in 1878, steel continued to be in short supply until some years after the end of the Great War of 1914–18.

During this period bridge structures in America and Europe moved to all-steel trusses, because steel was readily and dependably available and their timbers had lesser quality, strength and durability. But in Australia the abundance of good timber and its relatively low cost, compared to steel and masonry or concrete, meant that timber remained the dominant construction material for bridges in the late 19th and early 20th centuries. This was particularly so in New South Wales, with its abundant supplies of superior hardwoods — so much so that for a time NSW was known as the “Timber Truss Colony”.

Operational issues

Timber degrades when left exposed to the elements, and therefore has a high maintenance demand if used for permanent outdoor structures. An unprotected timber structure will need to be continually rebuilt throughout its service life. A timber structure more than 50 years old will in all probability have had all its timber elements replaced at least once — and in the case of its decking, as many as four times.

Today, timber bridges are no longer a low cost option, especially when one counts their accumulated maintenance costs, which are many times greater than their initial costs.

Further, the steady depletion of hardwood forests makes the supply of good timber a critical factor in continually rebuilding the State's timber bridges. Timber used in bridge

construction, with the exception of piles and girders, needs to be sourced from large diameter hardwood trees. These are becoming increasingly scarce, and have in the past been supplied from diminishing old growth forests. Where possible, the RTA now endeavours to source timber only from managed regrowth or plantation forests.

The main shortcomings of timber bridges are:

- Their low strength for heavier and faster modern traffic
- Their high maintenance costs
- Construction details which allow the penetration of water and hence the deterioration of structural members
- Lower durability, because of the declining quality of the hardwoods available for replacement elements, and
- The overall structural superiority of steel and concrete bridges.

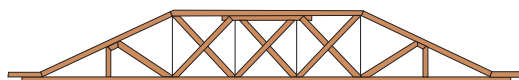


New Buildings bridge, Towamba River (1921)

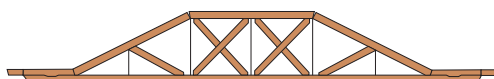
The evolution of timber truss bridge designs

There are five types of timber truss bridges in NSW:

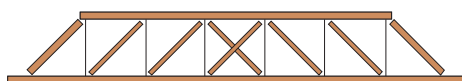
- **Old Public Works Department trusses**, built from 1860 to 1886. These bridges were designed by British engineers working in NSW, and adopted British styles of construction.



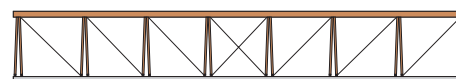
- **McDonald trusses**, built from 1886 to 1893, still using British styles of construction.



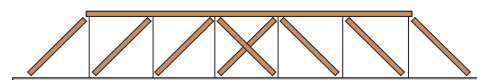
- **Allan trusses**, built from 1893 to 1929. This design was similar to the American Howe truss design, with cast iron connection pieces. The trusses were constructed in two halves, to facilitate maintenance.



- **DeBurgh trusses**, built from 1899 to 1905. This was a pin-jointed design, similar to the American Pratt truss design. In some cases steel replaced timber for the bottom chord.



- **Dare trusses**, built from 1905 to 1936. This design was very similar to the Allan truss, with the main difference being a steel bottom chord.



(The truss sketches above are from the Department of Main Roads' *Timber Truss Bridge Maintenance Manual*, 1987.)

From a heritage perspective these truss bridges are technically very significant.

Each type of truss represented an important technical advance over the last, in a process of evolution that culminated in NSW's having bridges of world class engineering design. It is therefore important for examples of each class of truss to be preserved.

As a group the truss bridges also have historical significance because of their contribution to the expansion of the NSW road network and hence the economic and social development of the State.

Many of the bridges have aesthetic significance, mainly through their landmark qualities and their functioning as "gateways" to a town or area, and social significance, being highly valued by their local communities.

Timber beam bridges

The timber beam bridge is one of the simplest forms of bridge structure.

In the period between 1797 and 1920, many timber beam road bridges with spans of less than 10 metres were

Truss type	Number built in NSW	Number surviving in NSW	Controlled by the RTA	Controlled by others
Old Public Works Department	147	2	2	–
McDonald	91	6	6	–
Allan	105	37	22	15
DeBurgh	20	10	9	1
Dare	40	27	19	8
Total	422	82	58	24

constructed in NSW, both to cross minor streams and as approaches to main spans, especially truss spans. By 1902, approximately 3,700 timber beam bridges had been built, making up 87% of the bridge population of the day.

The construction of these bridges substantially improved road transport in the State and made a major contribution to economic activity, particularly in the agricultural sector.

As already indicated, the RTA controls 82 of the approximately 4,000 timber beam bridges still in use on NSW roads. The RTA's bridges are mainly on the highly trafficked State Road system.

Local government authorities and the Rail Infrastructure Corporation control most of the other timber bridges on roads in NSW. The Council bridges are usually on lightly traf-

ficked roads, and hence are not under the same pressure for replacement as those controlled by the RTA.

Many of the State's timber beam bridges have been subjected to modifications and the replacement of various elements during their lives, and are not original.

The heritage significance of the bridges depends primarily on the rarity of each particular type of bridge. The NSW *Heritage Manual* specifies four levels of significance which may be used to describe heritage items: "World", "National", "State" and "Local".

Only two of the timber beam bridges controlled by the RTA have "State" significance. The others either have no heritage significance or have "Local" heritage significance, being culturally significant within an area approximately equal to that of their local community.



Management options and strategies

In all cases decisions on the future of the RTA's timber bridges will be subject to an assessment of options as part of the environmental impact assessment process, which must consider all the impacts of a proposal, including operational, heritage and any other relevant issues. A *Statement of Heritage Impact* will be prepared for any proposal affecting a heritage item.

The practical options available to the RTA for managing each of its timber bridges are to:

- Conserve the bridge "as is", in operational condition
- Conserve the bridge with substantive change, in operational condition
- Replace the bridge on a new alignment and hand over the bridge to a new owner for an alternative use, or
- Replace the bridge and demolish the existing bridge.

- The location of any new structure, considering the best alignment for the road and the flood consequences of retaining the existing structure, and
- The remoteness of the structure from road maintenance facilities.

The timeframes for any timber truss bridge replacements or upgrades will take account of each bridge's current condition, maintenance demands and traffic loads and the extent of disruption being caused.

Timber truss bridges

Wherever possible, the RTA will retain the current function of all timber truss bridges of "State" heritage significance, in accordance with a *Conservation Management Plan* prepared for each bridge.

Of the 29 RTA timber truss bridges listed on the *State Heritage Register* the only bridge proposed for replacement is the Five Day Creek bridge on the Kempsey–Wollombi road at Comara. (Two other timber truss bridges assessed as being of "State" heritage significance — the Cobram bridge across the Murray River at Barooga and the bridge over Sportmans Creek at Lawrence — have not been listed on the *State Heritage Register*, pending the outcomes of current investigations into their replacement.)

For its timber truss bridges of "Local" significance, the RTA will develop the best management option in the light of:

- Road network requirements
- The availability of similar structures with a similar heritage significance
- The possibility of handing over the bridge to another interested party for adaptive re-use



New Buildings bridge (Dare truss), Towamba River



Korns Crossing bridge (Dare truss), Rous River



RTA timber truss bridges listed on the *State Heritage Register*

Old Public Works Department timber truss

Limeburners–Clarence Town	Clarence Town Bridge over Williams River	1880
Maitland–Bucketts Way	Monkerai bridge over Karuah River	1882

McDonald timber truss

Local road	Tumut River Junction bridge	1892
Asquith–Galston	Bridge over Pearces (Tunks) Creek at Galston Gorge	1893
Kempsey–Wollomombi	Comara bridge over Five Day Creek*	1893
Local road	McKanes Bridge over Cox River at McKanes Falls, Lithgow	1893
Bombala–Pambula	Bridge over Coolumbooka Creek at Crankies	1893

Allan timber truss

Swan Hill–Willandra	Swan Hill bridge over Murray River	1896
Local road	Victoria Bridge over Stonequarry Creek at Picton railway station	1897
Goulburn–Mudgee	Wallaby Rocks bridge over Turon River, north of Bathurst	1897
East Maitland–Wallalong	Morpeth bridge over Hunter River	1898
Local road	Rossis Crossing bridge over Wollondilly River	1898
Gresford Road	Vacy bridge over Paterson River	1898
Raymond Terrace Road–Brookfield	Dunmore bridge over Paterson River at Woodville	1899
East Maitland–Wallalong	Hinton bridge over Paterson River	1901
Local road	Carathool bridge over Murrumbidgee River	1922
Regional road	Wee Jasper bridge over Goodradigbee River	1923
Regional road	Tooleybuc bridge over Murray River	1925

DeBurgh timber truss

Mt Thorley–Gresford	Dunns Crossing bridge over Webbers Creek	1901
Bruxner Highway	Tabulam bridge over Clarence River	1902
McGraths Hill–Broke	St Albans Bridge over Macdonald River	1902
Local road	Middle Falbrook bridge over Glennies Creek	1904
Barham–Maude	Barham bridge over Murray River	1905

Dare timber truss

Maitland–Bucketts Way	Cooreei bridge over Williams River at Dungog	1904
Lismore–Cedar Point	Colemans Bridge over Leycester Creek at Lismore	1907
Wilberforce–Mt Thorley	Bulga ridge over Wollombi Brook	1910
Local road	New Buildings bridge over Towamba River	1921
Barham–Swan Hill	Coonamit bridge over Wakool River	1929
Local road	Gee Gee bridge over Wakool River	1929

* The heritage status of the McDonald truss bridge at Comara is currently being reassessed in the light of new evidence.

Timber beam bridges

As already indicated, only two of the RTA's timber beam bridges have been assessed as being of "State" heritage significance. These bridges are:

- The 14-span Fladbury Bridge over the Severn River near Glen Innes, built in 1910, and
- The single-span southbound Federal Highway bridge over Wollogorang Creek, 20.1 km south of Goulburn, built in 1954.

These two bridges will be conserved under *Conservation Management Plans*.

The RTA will replace and demolish its other timber beam bridges of "Nil" or "Local" heritage significance. The timeframes for these replacements or any upgrades will take account of each bridge's current condition, maintenance demands and traffic loads and the extent of disruption being caused.



Kynumboon, Rous River



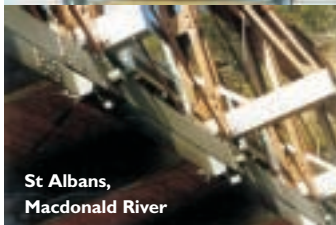
Monkerai bridge, Karuah River



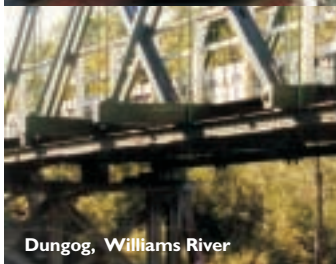
Bulga,
Wollombi Brook



St Albans,
Macdonald River



St Albans,
Macdonald River



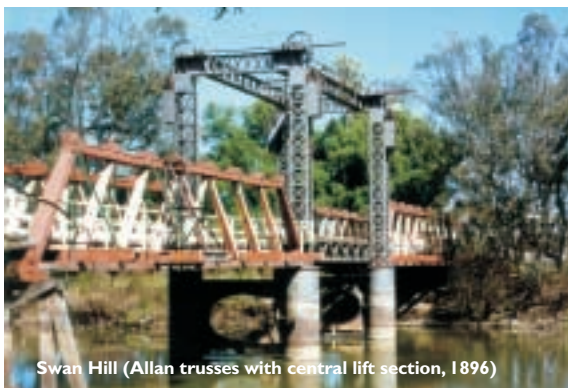
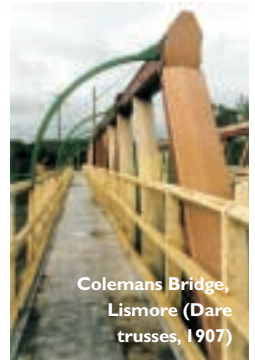
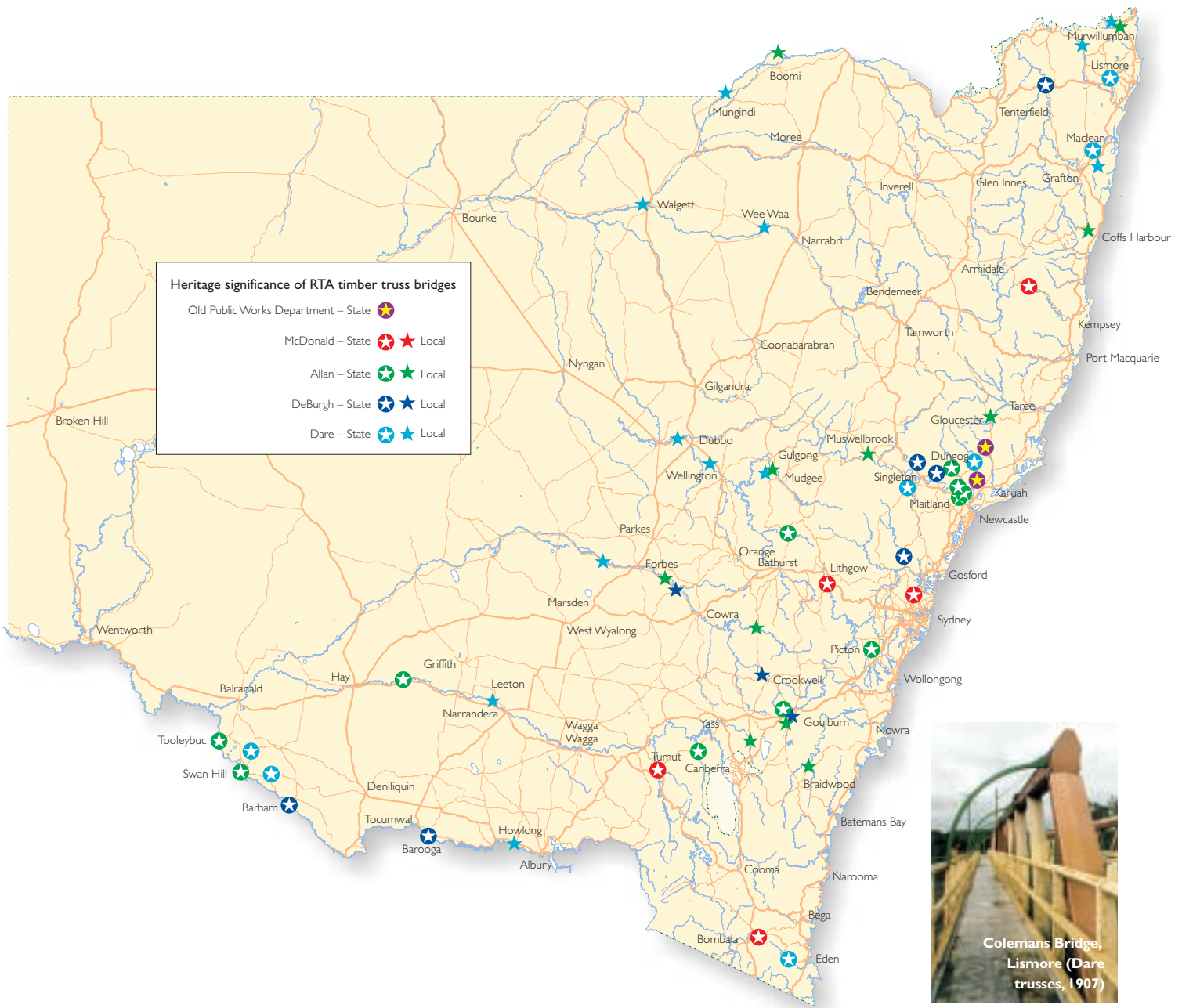
Dungog, Williams River



Fladbury bridge, Severn River

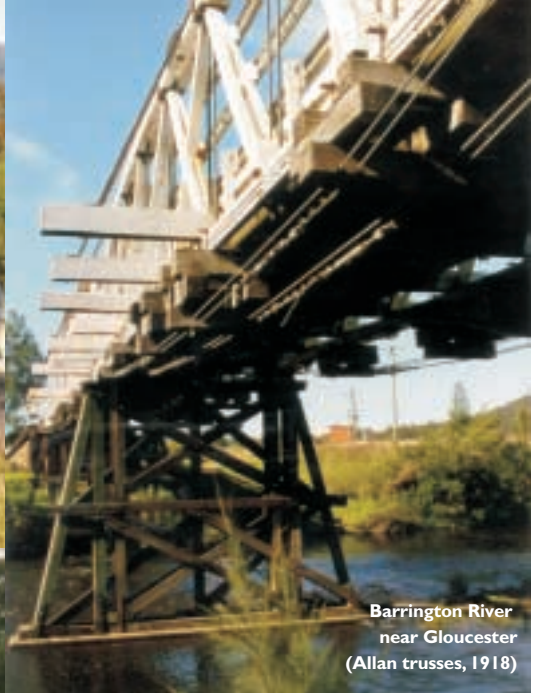


Wollogorang Creek bridge, Federal Highway





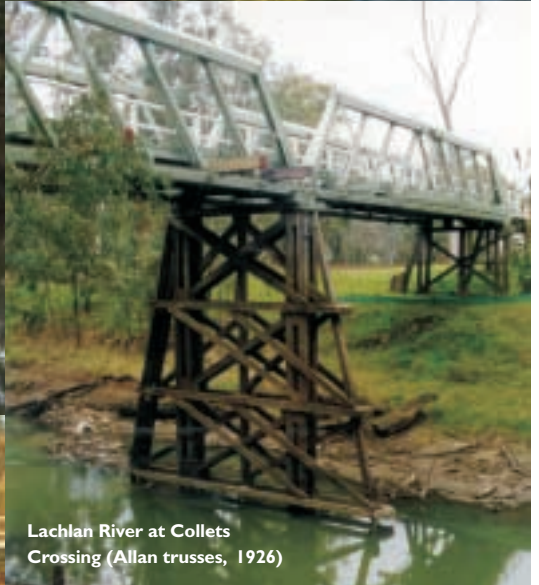
Vacy bridge, Paterson River (Allan trusses, 1898)



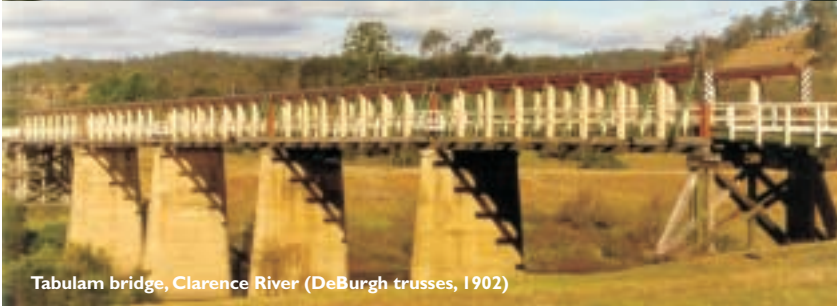
Barrington River near Gloucester (Allan trusses, 1918)



Charleyong bridge, Mongarlowe River (Allan truss, 1901)



Lachlan River at Collets Crossing (Allan trusses, 1926)



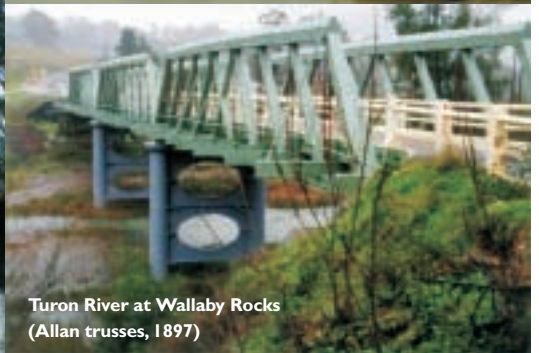
Tabulam bridge, Clarence River (DeBurgh trusses, 1902)



Murray River at Swan Hill (Allan trusses with central lift section, 1896)



Barham (DeBurgh trusses with central lift section, 1905)



Turon River at Wallaby Rocks (Allan trusses, 1897)